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Use of the Multifacet Rasch Model to Adjust for the Error Variance Due to the Examiner Stringency/Leniency Effects in OSCEs

by

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Use of the Multifacet Rasch Model to Adjust for the Error Variance Due to the Examiner Stringency/Leniency Effects in OSCEs" submitted by Douglas M. Lawson in partial fulfillment of the requirements for the degree of Master of Science.

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Abstract

The decisions regarding candidate competency / incompetency (pass/fail) for professional certification from "high stakes" Objective Structured Clinical Skills Examinations (OSCEs) should be both reliable and valid. Thus, it is necessary to ensure that the scores contain minimal error variance including error variance due to examiner stringency/leniency effects. Although examiner variance has been found to be extensive in oral examinations, no studies have been done with OSCEs. OSCE scores are believed to contain insignificant amounts of error variance because of the use of structured checklists, standardized patients, and trained examiners. Investigations on the use of dual examiners at the same OSCE station have found high inter-rater correlations. However, this does not guarantee that candidate scores will not be inappropriately biased by examiner stringency/leniency effects. The purpose of this study was to determine if the multifaceted Rasch model (MFRM) of Item Response Theory (IRT) could be used to identify the presence and amount of error variance due to examiner stringency/leniency effects. In addition, the Classical Test Theory (CCT) and MFRM were compared to determine which provided overall better analyses of candidate performance.

METHODS: The data were supplied by the Canadian Chiropractic Examining Board and consisted of candidate data for all OSCEs administered in 2002 (8 OSCEs). Candidate checklist scores were available as well as their grade-point-average while at chiropractic college. There were 513 candidates evaluated over 10 stations measuring six skills. Two methods of analysis were compared, CTT and Item Response Theory. Each method of analysis was applied to evaluate the data and to determine the presence, size, and impact of the stringency/leniency effect of examiners on candidate scores and examination decisions (pass/fail). The appropriateness of the data to model fit was explored for the MFRM.

RESULTS: Both methods of analysis yielded high reliability coefficients for the OSCEs (>0.85), and confirmed the presence of a stringency/leniency effect of examiners on candidate scores. With CTT the size of the effect was smoothed over a 10 station OSCE but had a significant impact on mean candidate scores for one-third of the examinations. CTT was unable to estimate the size of the effect on individual candidate scores or on pass/fail decisions. With regard to MFRM, there was appropriate evidence of data to model fit. The MFRM was able to demonstrate that the size of the examiner stringency/leniency variance was greater than the size of candidate ability variance. Further, the MFRM was able to adjust for the stringency/leniency effect of examiners to arrive at an estimate of candidates' "true" scores.

CONCLUSION: CCT provided some evidence of an examiner stringent/leniency effect but IRT provided clear evidence of a large amount of error variance due to examiner stringency/leniency effects. In fact, for approximately 6% of the candidates near the pass/fail score, outcomes were changed. The IRT method was deemed to be more informative since it dealt with the issues of unidimensionality and fit of data to model. No comparable data to model fit is necessary when using CCT. Although both methods of analysis require a high level of expertise to ensure appropriate analysis, IRT provided far more useful information about the characteristics of the facets, plus it estimated candidate "true" scores by adjusting for examiner stringency/leniency effects. The findings of this study should encourage other licensing bodies that use OSCEs to

examine a range of candidates (50 – 750) to explore the potential of analyzing their data using the multifaceted Rasch model.

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CHAPTER ONE: INTRODUCTION

The Challenge of Examiner Scored Testing

Objective Structured Clinical Examinations (OSCEs) have been used in medical education for formative and summative evaluations for over twenty-five years.[1-3] OSCEs, in brief, generally are a series of stations in which competencies are evaluated. Each station may consist of a candidate, a standardized patient, a structured checklist consisting of skills and rating scales, and an examiner. Candidates rotate through all stations where they are evaluated on sets of skills based on an examination blueprint. More recently OSCEs are used for "high-stakes" evaluations upon which decisions related to licensure are being made. The movement from oral examinations to OSCEs was, in part, due to the oral examiner's stringency/leniency effect on candidate scores.[4-7] There seems to be a general acceptance of the position that the OSCE use of structured checklists, standardized patients, and examiner training ensures that there is no stringency/leniency effect on OSCE raw scores. That the raw scores are, in fact, "objective" and that the examinations are reliable.[8-14]

While examiner training is intended to ensure there is no stringency/leniency effect within OSCE scores, it remains an assumption that trained examiners grade with fidelity and that they make similar decisions while observing the same event. The degree that stringency/leniency effects may be present in OSCE scores has not been empirically investigated. If candidate scores fluctuate according to examiners' stringency/leniency effects, then candidates' outcomes could inadvertently be altered especially around the passing level resulting in unwanted errors in certification decisions.

Classical Test Theory (CTT) is unable to correct for the stringency/leniency effect of examiners. Basically, CTT treats all items as being equal (i.e., a value of 1.0) regardless of the difficulty of the item or the stringency/leniency of the examiner. Thus, candidates' scores are equal to the sum total of correct items.

Relatively new psychometric procedures could help shed light on the extent that examiners' decisions vary following training. For example, Item Response Theory (IRT) in its simplest form independently estimates item/question difficulty and candidate ability. The multifacet Rasch model (MFRM) extends the simple IRT approach to include an additional facet/variable of examiners. Through the use of this model it is possible to examine the amount of variance that can be attributed to examiners. In addition, it is also possible to remove that stringency/leniency effect of examiners so as to estimate a candidate's true examination score (i.e., without the stringency/leniency effect of examiners).

Because OSCE examiners are trained, it is believed that all candidates are uniformly scored according to their performance and that there is no variation in marks awarded due to the characteristics of the examiner. However, candidate raw scores may be reflective of both the candidate's ability and the stringency/leniency effect of examiners. In other words, candidates with the same ability may be awarded different scores depending on the stringency or leniency of the examiners awarding their marks.

Application of the MFRM of IRT on oral examinations has shown a significant variance in examinee scores due to examiner stringency/leniency effects. In addition, it was shown that the "error variance" due to examiners can be removed so as to arrive at an examinee's "true-score".[4-7;15-17] With oral examinations, one expects variation in examinee scores due to differences in examiner stringency/leniency effect and due to the flexibility of the oral examination which may allow examiners to explore candidate performance with their own questions. Oral examinations lost their appeal because they tended not to be standardized.

OSCEs, on the other hand, became popular because they are standardized (e.g., same clinical problems, same checklist, and supposedly same examiner scoring). In high stakes skills examinations where there are multiple tracks, the same clinical problems and checklists are used, but individual examiners (although trained) may not have equivalent perceptions. This raises the important question of whether there are possibly inadvertent decisions made on candidates' performance due to examiner characteristics not corrected by training. Is it possible that candidates may receive a passing grade due to being evaluated by a group of examiners that were less stringent than average, or receive a failing grade due to being evaluated by a group of examiners more stringent than average? The purpose of this quantitative retrospective study is to determine whether the multifacet Rasch model can successfully be applied to OSCE scores of the CCEB so as to determine whether there is a significant stringency/leniency effect due to examiners; if there is, to determine how large it is and the impact on candidate scores and pass/fail decisions after removing the "error variance".

CHAPTER TWO: LITERATURE REVIEW

The following key words were searched on Medline (1965 to current), Pub Med, Allied and Complementary Medicine, Psyc-INFO, and google.com: latent trait, item response theory, IRT, Generalizability theory, multifacet Rasch model, Rasch, OSCE, standards, examiner stringency, examiner leniency, observer variance, examiner variance, performance assessment, and latent. The result of the search was a list of over 200 articles of varying relevance to the project.

Objective Structured Clinical Examinations (OSCEs)

Purpose of examination

"An OSCE focuses on the ability to synthesize and apply knowledge in clinical settings, as well as interact effectively with a patient". [18] OSCEs have been used to evaluate motor skills, interpretive skills, and the ability to integrate knowledge into clinical practice.[19] Interest in OSCEs increased as research on oral examinations revealed considerable concern regarding low reliability and validity of its scores.[4;5;20]

Direct observation evaluations in clinical settings (e.g., hospitals) may be feasible but tend not to be reliable or valid due to uncontrolled environmental variables such as: differences in patients seen (i.e., even within the same disease - case difficulties may vary), differences in experiences and expertise of examiners, lack of agreement among examiners on acceptable performance, and variation among examiners on prior knowledge of a candidate's ability.

Structure of the OSCE

In general, the OSCE has candidates rotate through a series of stations where performance skills are assessed. OSCE methods of assessment can include: clinical observation, use of standardized patients, oral interactions, and written components.[3] Each OSCE station with a standardized patient has one or more examiners, an examinee/candidate, and a checklist or rating scale. The checklist provides structure to the scoring of each station. Standardized patients (SPs) are trained to present various patient conditions and to perform at a reproducible level. Examiners are trained with regard to consistency of scoring and appropriate actions during the candidate-SP encounter. Generally, examiners are observers and do not interact with candidates, thus ensuring a more reproducible examination environment. Standardized patients can also be used as examiners, but not in "high-stakes" examinations. For licensure examinations, candidates deserve to be evaluated by peers. The reliability of scores generated by SPs tend not to be as high as those produced by peer examiners.[21;22]

An OSCE can have up to 25 stations and occur simultaneously in up to 16 different centers (Medical Council of Canada, Part II Examinations).[19;23] An OSCE can have multiple centers, multiple tracks, morning and afternoon cycles, and may occur over more than one day. Each OSCE track consists of a complete set of stations and there can be 2-7 tracks running at the same time for either the morning or afternoon cycle. Not all candidates start at the same station, thus a total examination is a rotation of candidates through all stations within a track. All candidates must attend every station within a given track. It is common to have morning and afternoon cycles using the same cases as long as morning candidates cannot contaminate afternoon candidates. Candidate contamination can be avoided by having the afternoon candidates sequestered prior to the morning candidates leaving the site. Some stations may have a post-encounter-probe following the station. This can be a patient note concerning the details encountered during the last station. When an OSCE occurs over multiple days, it is necessary to utilize different but equivalent set of cases on each day.

Weakness/Limitations of OSCEs

OSCEs take considerable time, money, and administrative efforts.[24] Generally, OSCEs are approximately 2-4 hours long and may involve almost as many administrative personnel, SPs, and examiners as candidates. OSCEs are focused on a sampling of skills and some of the skills may be dependent upon clinical cases used. The chiropractic profession (the source of the data for this study) has identified approximately 44 (+ or - 4) clinical presentations (why patients see chiropractors). It may not be possible to generalize OSCE scores to the full range of diagnostic abilities (44 presentations with, perhaps, 15 causes each). However, it is believed that OSCEs can reliably and validly assess skills that are independent of cases selected. Given this assumption, the number of stations can be limited to 10 - 20 depending on the specific skills being evaluated. For example, communications skills may be adequately assessed in one or two stations while physical examination skills may require several stations. From a psychometric perspective, the balancing of stations and skills is generally determined by the assumed generalizability of the skills being assessed. This area has been neglected and requires further research which is beyond the scope of this study.

Examiners as a source of error variance in oral examinations

The literature indicates that examiners, on oral examinations, may be a source of error variance. Inconsistency of examiners on oral examinations, has been studied extensively.[4;6;7;25-28] In 1993, Lunz and Stahl reviewed an oral examination administered by the American Board of Urology. Each candidate took two 20-minute oral examinations. Candidates were graded on a 4-point scale labeled excellent (3), acceptable (2), marginal (1), and unacceptable (0). Each candidate had six scores (three cases times two examiners). Lunz and Stahl found that examinees with identical raw scores often had differing ability measures after removing the effects due to examiner stringency/leniency and case difficulty[4]. They found that each examiner had a unique perspective about the individual case and the performance of candidates depending upon their area of specialization. However, an important finding of this study is that "examiners vary markedly in their level of severity but tend to be consistent in that level of severity across candidates and cases" (p. 179).

In 1991, Raymond, Webb and Houston reported on an oral certification examination for a medical specialty.[5] Raters were trained through the use of candidate videotapes and feedback on their scoring. Each candidate was evaluated with four clinical problems. All candidates took all problems and received three scores from each of two raters using a 12-point scale. Raw scores were adjusted using an Ordinary Least Squares (OLS) regression model. Correlation between raw score ratings and OLS ratings was 0.94 for the 3 years included in the analysis. Raymond et al found that the percentage of candidates for whom pass/fail decisions changed due to the adjustment for rater severity ranged from 3.1% to 10.5% with an average of 5.9%. Raters were found to be lenient or stringent by about one-half of a standard deviation on the original raw score scale. Some raters exceeded a full standard deviation in the lenient to stringency bias.

Lunz and Schumacker in 1997 compared four methods of analysis of performance examinations: 1. traditional summary statistics, 2. inter-examiner correlations, 3. Generalizability theory, and 4. the multifacet Rasch model.[15] The examination was an oral medical specialty certification examination (pathology). Seventy-four candidates were evaluated on three tasks: recall of factual information, interpretation of data, and clinical problem solving. A five-point rating scale was used: excellent (4-points), above average (3-points), average (2-points), below average (1-point), and failing (0-points). All candidates were rated on the same three topics (pathological problem), and each topic was rated by a pair of examiners (6 examiners in total per candidate). The examination produced a high measure of internal consistency (Cronbach's Alpha = 0.91). The inter-examiner correlations were based upon a limited number of common candidates seen (1-9) and produced Pearson product moment coefficients ranging from –1.0 to +1.0 with an average of 0.0. The Generalizability theory analysis revealed that examiners were not consistent in rating persons within a task (15% error variance) and that examiners' ratings of a person on a task within a topic produced a significant amount of error variance (25%) (p. 227). Most importantly, Lunz and Schumacker found that while the candidate raw scores distributed normally, the assignment of scores was linked to the examiners encountered by a given candidate. Thus the "interpretation of candidate performance is dependent upon the characteristics of the examiners encountered… …The reality is that the examiners are forgotten, while the interpretation of the candidate's performance stands" (p. 236). This statement is similar to Blak's in 1985 "Each individual examiner must be viewed as a different measuring instrument".[29] Lunz and Schumacker concluded that similar sources of variance were identified using each of the four analytical methods; however, the multifacet Rasch model was the only method that linearized the scores and accounted for the differences in the examination among candidates before ability estimates were calculated. That is, the multifacet Rasch model calculates candidate abilities that are statistically independent of case difficulties, examiner severities, and rating scale structure.[30]

Examiners as a source of error variance in OSCEs

In 2002 six actors were trained to be standardized examinees (SEs) and were included with 110 real candidates who took a certifying OSCE.[31] Two actors were trained at each of the following performance levels: excellent performers (80%), borderline passing performers (60%), and failing performers (40%). The examiners and standardized patients were blind to the presence of SEs. The SEs completed a cycle in the morning over two tracks (blue and red), and then switched tracks and completed the afternoon cycle over a different two tracks (green and orange). Appendix 'A' reveals their performance scores. The study found clear evidence of high reliability (Cronbach's alpha = 0.96) and evidence of construct validity (means of 80%, 59%, and 46%). Two conclusions were made: while the 3 mean scores estimate the programmed SE performance there is notable and significant variance among examiners as reflected by the standard deviation in SE scores (4% for excellent performers, 1.5% for borderline passing performers, and 2.9% for failing performers). It was also observed that all examiners, not just the lenient examiners, tended to give the benefit of the doubt to candidates at the lower end of the scale as observed by a 6% inflation in score of the failing SEs. Fortunately, the group of SEs for whom pass/fail decisions are most critical (i.e., the borderline pass group) had the least amount of examiner stringency/leniency effect. Most importantly, this is the first evidence available that variance in candidate performance in OSCEs occurred because of examiners' stringency/leniency effects.

Weaknesses/Limitations of Classical Test Theory and OSCEs

The foundation for classical test theory (CTT) was laid almost 100 years ago by Charles Spearman (1904: General Intelligence, Objectively Determined and Measured). Spearman was the first person to report that an observed score was composed of a "true score" and an error, and showed how to estimate the reliability of observed scores. In 1968 Lord and Novick provided a thorough exposition of classical test theory.(32)

Under classical test theory (CTT), the observed score X_{ij} of person *i* for the *jth* measurement protocol is modeled as:

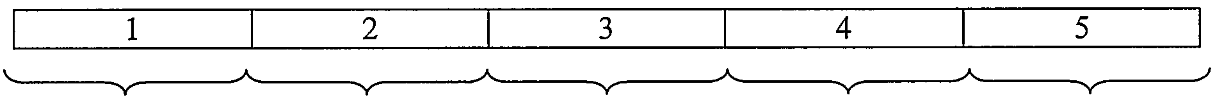
$$X_{ij} = \theta_i + \varepsilon_{ij}$$

Where θ_i, is the true score and ε_{ij} is an error in the observation.

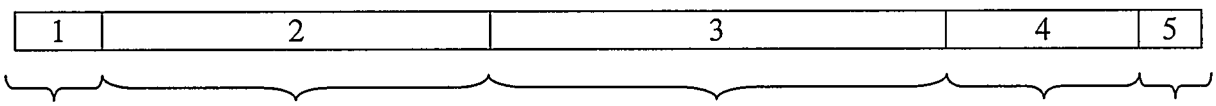
CTT analysis of scores requires the data to fit the following assumptions:

- the scores have a Gaussian distribution.
- each item contributes the same amount of information to the underlying construct being measured.
- the distances between values on the raw score scale are equal intervals and can therefore be summed.

Applying CTT to rating scales (commonly used in OSCEs) can be reviewed with the following example. Suppose a 5-point rating scale is used. CTT requires the assumption that the step between the ratings is interval (equal differences in ability).



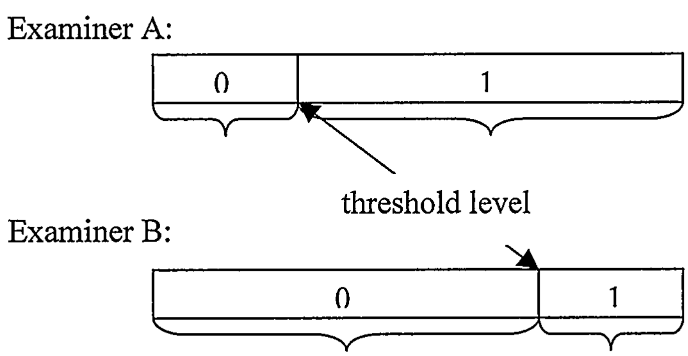
Most examiners, however do not apply the rating scale in such a manner.[33-35] Each examiner or examiner has a unique rating system based on their experience and knowledge of the content area. Consequently, a rating scale may look more like the following.



The examiner-based rating scales vary among examiners and among cases.[34] In addition, an individual examiner may apply the rating scale differently to each item on the checklist (depending on the examiners' perceived importance of the item). For example, in the above scale the candidate does not need to demonstrate much improvement in skills to jump from a "1" to a "2". Considerably more skill must be demonstrated to jump from "2" to "3", or "3" to "4". There are very few candidates who are going to be awarded a "5" from this examiner. With such differences in the application of the rating scale, each item by each examiner does not contribute the same amount of information about the ability of the candidate. This failure to meet the underlying assumptions of CTT means that theoretically there is a "built-in" error variance to raw scores.

In addition, the stringency and leniency effect can occur when the thresholds for awarding marks varies among examiners. For example, shifts in thresholds may be observed in the above hypothetical situation: while observing candidate X, examiner A may award a candidate a score of 3, examiner B may award the same candidate a score of 4 and yet examiner C may award the candidate a score of 2. While research indicates that the threshold remains constant within examiners, it can vary among examiners.

Further, type of scale (0,1 or 1-5) does not change or remove the threshold effect among examiners. For example, using a dichotomous scale (0,1) examiner A may award candidate X a 0 but examiner B may award the same candidate a score of 1. This phenomenon can be diagrammatically represented as follows:



In the above example, the threshold level for Examiner B is higher than that of Examiner A, therefore Examiner A's behavior would be identified as lenient and Examiner B's as stringent.

CTT Examination statistics

When using CTT, examination statistics are generally reported as: highest possible score, highest candidate score, lowest candidate score, range, mean candidate score, median candidate score, standard deviation, reliability, standard errors of measurement, minimal performance level (MPL), number of examinees satisfactory, and number of examinees unsatisfactory. In addition, item statistics generally include: mean, difficulty, correlation of item to total test scores, discrimination, standard deviation, item MPL, number students above MPL, number of students below MPL, and frequency of response by quartile for each alternative:

Using CTT, the above examination and item statistics are appropriate for OSCEs. However, additional information can also be provided if more than one examiner is used within a station (i.e., inter-rater reliability).

Weaknesses/Limitations to Measures of Inter-rater Reliability

In 1997 Lunz and Schumacker[15] reported on the use of inter-rater reliability in the oral examinations. The most common measure of inter-examiner reliability is the Pearson correlation coefficient. However, the inter-rater correlation reveals only the degree of linear relationship between two sets of scores as indicated in the following example:

Candidate	Examiner 1	Examiner 2
1	10	15
2	12	17
3	10	15
4	14	19
5	8	13
6	10	15
7	7	12
8	12	17
9	14	19
10	12	17
Mean	10.9	15.9
Correlation	1.0	

The Pearson correlation coefficient for the two examiners is 1.00 – perfect positive correlation. Examiner 1 was, however, a more stringent examiner and his scores averaged 5 points lower than Examiner 2.
The Pearson correlation coefficient is thus an inappropriate method of demonstrating inter-rater reliability for performance-based examinations.

The mean rating of examiner 1 is 10.9 and the mean rating of examiner 2 is 15.9 yet the inter-rater reliability is 1.0 (i.e., a perfect positive linear relationship). The Kappa statistic can also be used to indicate inter-examiner reliability. Applied to the above example, Kappa = -0.03, Prob>Z= 0.75. As the statistic is not significant and as Kappa is less than zero it can be concluded that there is "poor" agreement between the two raters. However, while both the Pearson correlation and Kappa coefficient will provide information regarding inter-examiner reliability (each reflecting the nature of its calculation), neither statistic is sufficient to identify and remove the source of the error variance due to variation in examiner behaviour. Generalizability theory is useful for identifying potential sources of error variance but it too has limitations.

Limitations of Generalizability Theory

As an extension of CTT, generalizability theory is used to partition the sources of variance for each variable/facet of an examination that can be manipulated. The model then estimates the various sources of error variance within identified facets of the examination. This analysis is used to evaluate the amount of variance underlying each facet. This information is then used to redesign future examinations in a manner that reduces unwanted error variance. For example, Generalizability theory can be used to determine how many stations are needed to obtain a reliability of 0.80 given the same pool of candidates and same pool of stations. Or, it can be used to estimate how many more observers/examiners are required to reduce the error variance by 35% in candidate scores for the next examination administration. Generalizability theory does not, however, assist in estimating the true-scores of the current examination's candidates.[15]

For Generalizability theory to be applied, the data must be complete (all examiners must score all candidates over all items). OSCE data is usually not complete (examiners only score a portion of candidates). Thus, this research project will not concern itself with a comparison of Generalizability theory to the multifacet Rasch model of Item Response Theory.

Item Response Theory (IRT)

IRT modeling focuses on the responses to individual items of an examination and not on the total test scores. The term "ability" is used in IRT to refer to an extensive listing of latent traits such as reading ability, arithmetic ability, and clinical competency. These are traits that are not directly observable and are therefore "latent". These traits can be described, but not directly measured as are height or weight.(36)

Under CTT, the candidate's test score is the sum of the scores received on the items on a test. Individual examinees are placed onto the CTT total examination scale. Within the CTT model, the mean examination score is dependent upon the ability level of the group of examinees taking the examination.

Whereas, under the IRT model, the primary focus is in whether an examinee correctly or incorrectly responds to each item. Item difficulties are independently estimated and not dependent on the ability level of the group of examinees taking the examination. Both item difficulty and examinee ability are placed onto the same IRT logist scale. Within the IRT model it is assumed that the candidate will correctly answer the items below his/her ability level and incorrectly answer the more difficult items that are above his/her ability level.

There are three IRT models that can be used to analyze examinee performance. In the one-parameter model, item difficulty is estimated. In the two-parameter model, item difficulty and item discrimination are estimated. In the three-parameter model, the parameters of item difficulty, item discrimination, and ease of guessing are all estimated. The probability calculation for each of the three models is as follows.

One-parameter model (Rasch model)

$$P(\theta) = \frac{1}{1+e^{-L}} = \frac{1}{1+e^{-1(\theta-b)}}$$

Where:

- P(θ) = the probability that a candidate with ability θ getting the question correct
- θ = examinee ability level
- $L = 1(\theta - b)$ = discrimination of 1 * (ability level – item difficulty)
- e = constant 2.718
- b = item difficulty level

Two-parameter model

$$P(\theta) = \frac{1}{1+e^{-L}} = \frac{1}{1+e^{-a(\theta-b)}}$$

Where:

- P(θ) = the probability that a candidate with ability θ getting the question correct
- θ = examinee ability level

- $L = a(\theta - b)$ = discrimination * (ability level – item difficulty)
- e = constant 2.718
- a = discrimination index = slope of Item Characteristic Curve (ICC)
- b = item difficulty level

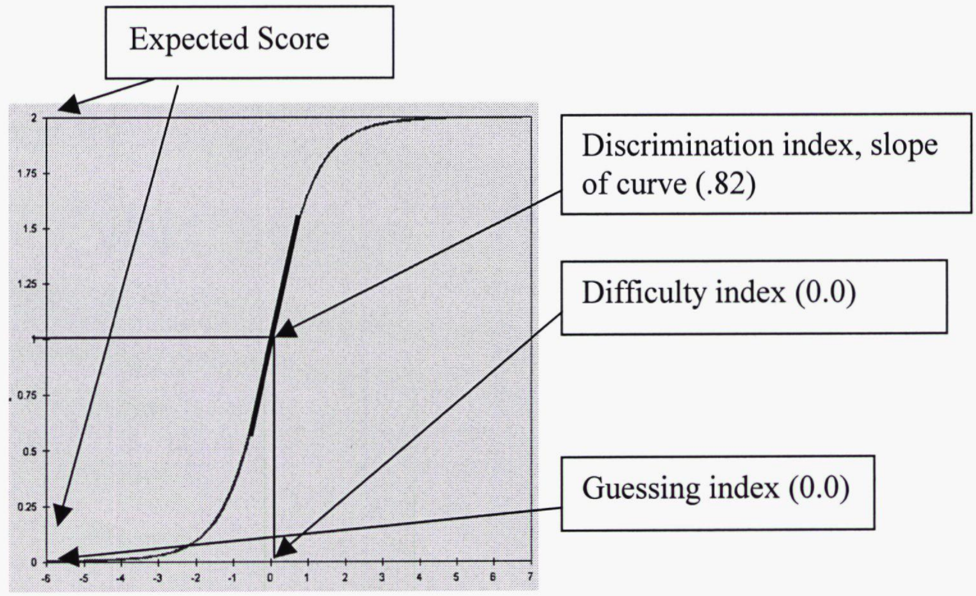
Three-parameter model

$$P(\theta) = c + (1-c)\frac{1}{1+e^{-L}} = \frac{1}{1+e^{-a(\theta-b)}}$$

Where:

- P(θ) = the probability that a candidate with ability θ getting the question correct
- θ = examinee ability level
- $L = a(\theta - b)$ = discrimination * (ability level – item difficulty)
- e = constant 2.718
- a = discrimination index (= slope of ICC)
- b = item difficulty level
- c = guessing index (point where ICC crosses Y axis)

An item characteristic curve (ICC) is a probability graph of the likelihood that an examinee with ability level θ getting item X with difficulty level b correct. Thus, in this type of ICC the scale of the Y-axis will go from 0.0 to 1.0. However, it is also possible to use the ICC to determine the most likely score for a person at each ability level. This type of graph is illustrated in figure 1 below.



Ability

Figure 1: Item Characteristic Curve reflecting the expected score for examinees at different ability levels.

Given an item with a 3-point scale (0.0, 1.0, or 2.0) the expected score of a person with ability 0.0 is 1.0. Likewise, the expected score of an examinee with an ability of 3.0 is 2.0. Thus, IRT models provide estimates of the most likely or expected score for a given item across the entire examinee ability range. Since ability is placed on an interval scale (without a true zero point), it can be observed that the mean ability level is set at zero and the standard deviation at 1.0.

In theory, ability levels can go from minus infinity to plus infinity. In reality, ability levels from -3.0 to +3.0 will contain most candidates. The ability scale is a true interval scale. That is to say, the intervals are equal and there is no meaningful zero point (i.e., zero does not indicate the absence of ability).

The estimated probabilities or expected values of the ICCs across the ability scale are independent of candidate ability levels answering the items. That is, the same ICC will be obtained if either a group of low or high ability examinees is used to estimate the probability or expected values. In classical test theory (CTT), a group of candidates with high ability will get more items correct than a group of candidates with low ability. Thus in CTT, the difficulty level of an item is dependent on the ability level of the candidate pool. While in IRT, the estimate of the probabilities or expected values of the ICC is independent of the ability level of the candidates taking the examination.

In IRT an examinee's "true" examination score is calculated by summing the individual probabilities or expected scores over all items. The equation used to estimate an examinee's true score (D.N. Lawley) is:

$$TS_j = \sum_{i=1}^{N} P_i(\theta)$$

where:

- TS_j is the true score for examinee j
- i = item 1 to item N
- $\sum$ = the sum of probabilities or expected scores on individual items (i-N) *for* examinee j

In other words, the estimation of "true" examination score is dependent on the contribution of each individual item within the test.

The Assumption Underlying The IRT Model

There is one key assumption with IRT. The examination must be unidimensional (i.e., only measure one latent trait). As an example, it would be inappropriate to include diagnostic imaging items (essentially a knowledge trait) within an OSCE station (essentially a skills trait). When the unidimensional assumption is met, the application of

IRT benefits the analysis in the following ways. Item parameters (e.g., difficulty level) are not dependent on the ability level of the examinees responding to the item; the statistics in the 1-3 item parameters are a property of the item and not the group of examinees responding to the items. The opposite is true under classical test theory (CTT). The item difficulty of CTT is the proportion of correct responses to an item. Another benefit of IRT is that the item characteristic curve (ICC) is an inherent property of the item and is stable over time. Pools of examinees with different abilities do not change the ICC. Examinees with different abilities are represented at different points on the X axes of the ICC. The application of IRT can also estimate the examiner stringency/leniency effect, adjust for its impact, and generate examinee "true" scores.

IRT Models and OSCEs

The decision of which IRT model (1, 2 or 3 parameter model) to use can best be determined by examining the types of scores generated (dichotomous, polytomous, partial credit), the number of examinees, and the number of facets/variables of interest. The 2-parameter and 3-parameter models require large sample sizes (in excess of 600 candidates). On the other hand, many 1-parameter (Rasch) models allow for only two facets, candidates and items. The multifacet Rasch model has several advantages over the other Rasch models including the identification of additional facets (e.g., different examiners , tracks, cycles, or cases), the ability to evaluate polytomous data, and the calibration of items with as few as 50 candidates.[37] For these reasons, the multifacet Rasch model was determined to be the IRT model of choice for this project.

The Multifacet Rasch Model and Fit of Data

The fit of data to the model is essentially a quality assurance process. Issues to be considered are: unidimensionality and fit statistics (i.e., candidate fit, examiner fit, and item fit).

Unidimensionality: All IRT models require unidimensionality. That is, the construct being measured (chiropractic clinical skills/competency) must have one underlying trait. As examinations are developed it is important to design the items to measure a single trait. In our example of competency, an OSCE measures skills, and should not include items that measure only knowledge (i.e., these type of items should be reserved for the pencil and paper format). The steps in assuring unidimensionality start with the development of an examination blueprint based on a job analysis and defining the construct to be measured. Such a blueprint will ensure that the skills being tested and the clinical cases being used are part of the construct being measured (e.g., chiropractic clinical skills).

One can estimate how well the unidimensionality assumption has been met by utilizing the scree plot method that uses factor analytic techniques.[38] This will be further defined in the "Methods" section.

Fit Statistics: In the multifacet Rasch model, the purpose of fit statistics is to aid in measurement quality control and to identify those parts of the data that meet and do not meet the model specifications. Those parts of the data that don't fit the model can be evaluated to determine if they need to be removed from the data-set. In addition, fit statistics can be used to determine if specific items need to be modified and/or specific facets/variables require modifications in future administrations. For example, it is possible to determine whether a communication station has equal fit statistics to that of the manipulation station.

Rasch analysis programs generally report fit statistics as two chi-squares: infit and outfit mean square statistics.[39] Data responses (candidate, examiner, or item) that best fit the multifacet Rasch model exhibit a MnSq near 1.0. MnSqs less than 1.0 indicate a better than expected fit to the model (e.g., as a possible occurrence in forced examiner agreement). Examiners trying not to contradict other examiners may emphasize central categories and so be reported with low MnSqs. In other words, values less than 1.0 suggest that the observations are too predictable (e.g., in the case of unintended redundancy).

MnSqs above 1.0 indicate the possible presence of error variance (noise, unpredictability) along with useful statistical information. A MnSq of 2.0 indicates that there is twice as much variance in the data responses as is expected in the model. Although the acceptable range of MnSqs is somewhat arbitrary and must be set by those performing the analysis, for clinical observations, the guideline of 0.5 to 1.7 has been suggested.[39]

Fit statistics can be applied to each of the facets in a multifacet Rasch model analysis. Candidates, examiners, and items can all be reviewed through the use of fit statistics to determine which of the candidates, examiners, or items are demonstrating more or less variance than the model expects. To evaluate the fit of a facet to the multifacet Rasch model, both Infit and Outfit statistics can provide useful information.

Infit Statistics: Infit is an information weighted sum. Each observation in a Rasch analysis has a variance that is larger for well-targeted observations and smaller for extreme observations. To calculate infit, each squared standardized residual value for each item in the observation string of items encountered by a person is weighted by its variance and then summed. This total is then divided by the sum of the variances. This chi-squared ratio has an expected value of 1.0 and a range from 0 to positive infinity and is differentially weighted so that the well-targeted observations have a greater effect on the ratio. Infit can reveal information, for example, when a examiner is influenced by traits other than that being measured (appearance, ethnicity) and does not apply the rating scale evenly to all candidates.

Outfit Statistics: Outfit is calculated on the conventional sum of squared residuals, with each observation contributing equally. As an example, for each person, each standardized residual cell is squared and the string of those squared residuals (one for each item encountered by this person) is summed and its average found by dividing by the number of items (mean squares). As there is no variance weighting, each observation contributes equally to the final ratio. Because of the lack of weighting, extreme values are reflected to a greater extent in outfit values than infit values (where their contribution is discounted). This chi-squared ratio has an expected value of 1.0 and a range from 0 to positive infinity. Outfit can reveal information, for example, of a examiner who awards higher marks to extremely weak candidates because he/she has difficulty using the lower regions of a rating scale.

Multifacet Rasch Model Fit Statistics vs Classical Test Theory

In classical test theory (CTT), overall examination and item statistics are easily calculated and reviewed. However, the fit statistics that are part of the analysis of the multifacet Rasch model are more informative and complete. They can assist in answering the following questions:

- Candidate fit: Are there candidates that performed significantly higher or lower on portions of the examination (e.g., that some candidates may have had prior knowledge of the contents of some of the examination items)?
- Examiner fit: Are there examiners who did not consistently apply the rating scale to all candidates through the full range of the scale (consistency)?
- Item fit: Are there items that did not contribute to the measure of competency? For example, are there items that were answered correctly by candidates of less ability, or, are there items that were answered incorrectly by candidates with higher ability?

Multifacet Rasch Model and Equivalency of Examination Decisions

Because Classical Test Theory (CTT) is dependent on the ability level of the candidate pool, equivalence of examination decisions is difficult and the similarity of examinee outcomes tends to be questionable. The equivalency of examination decisions must be made after the examinations have been offered and through the analysis of the different candidate pools.[40]

Multifacet Rasch modeling has the advantage that the item calculation of the item characteristic curve is independent of the ability level of the candidate pool. Different administrations of an examination can be placed onto a common scale and comparisons can be made between examinations (e.g., average item difficulty level, average candidate performance, and equivalency of pass/fail points).

Item Response Theory and Medical OSCEs

There is only one study reported in the medical educational literature regarding the use of IRT and OSCEs. Rothman, Blackmore, and Reznick presented their study at the 1995 American Education Research Association on the calibration of multiple station clinical skills examination stations with item response theory.[41] In their presentation they state, "…the shortcomings inherent in the classical measurement models, mainly as their inability to separate candidate and test characteristics, have been acknowledged and some interest in the application of Item Response Theory has been demonstrated." In their study, the checklist and answer sheet score distributions associated with the adequate (pass) or not adequate (fail) judgments for each station or station part were calculated. The points of intersection of these pairs of (normalized) distributions were defined as the station or station part cutting score. Two sets of results were produced, 744 candidates in the first set and 607 candidates in the second set. The 20 station scores were dichotomized (0 = fail, 1 = pass) and the dichotomized scores were used in the IRT analysis. This, in effect, resulted in an examination with twenty case scores. The specific questions addressed in their study were: given that derived binary data were used, did the data satisfy the basic IRT assumption of unidimensionality, which of the three IRT models might be usefully applied, and whether the test stations could be successfully calibrated (i.e., demonstrated station parameter invariance, ability parameter invariance, stations-model fit).

In their test for unidimensionality, Rothman et al performed a principal component factor analysis. The first component accounted for 21% of the variance. The low amount of variance accounted by the first factor would strongly question the assumption of unidimensionality. The data were analyzed with BILOG 3.[42] The two-parameter model was selected as the model of choice. The three-parameter model was rejected, as there is no guessing parameter in OSCEs. The one-parameter model (Rasch model) was rejected because the item discrimination indices were not equal. Data misfit was evaluated by considering item residual values greater than 2.0 in the ability regions of interest or item residual mean square values greater than 2.0. Their conclusion statement was: "Overall the results were positive, and particularly because of their unique characteristics and associated problems (not the least of which are the relatively small number of stations per test, and the obvious limitations to the potential size of station (item) pools), these results suggest a potential role for IRT in the development and scoring of tests of this type."

Unfortunately, the analysis by Rothman et al. analyzed only two variables – candidates and stations (pass/fail - 0 or 1). With only two variables, the issue concerning examiner stringency/leniency effects was not considered. The small item size (20 stations and 20 dichotomized scores) contributes to an inability to generalize the results of this study. It is further assumed that the reliability would have been low because of the questionable unidimensionality of the data set (although this wasn't reported). Further, there was an unfortunate loss of data due to the collapsing of scores to pass/fail decisions only. It would have been meaningful to run the full data-set with the one-parameter and two parameter polytomous models and compare the results to the dichotomous analysis. The question of data-fit should have included the review of residual mean squares for evidence of data to model fit (fit statistics of less than 0.5) and not just for excessive variance (fit statistics of greater than 2.0). For high-stakes examinations, perhaps the upper boundary of the fit statistics should have been reduced to 1.7.

The Multifacet Rasch Model and OSCEs

This research project extends the analysis by Rothman et al. (candidates and scores) to include a third variable/facet – examiners. It is the introduction of the third variable that allows variance to be separated into the three variables, for estimating the size of the stringency/leniency effect of examiners, and for scores to be adjusted for the examiner stringency/leniency effect.

When using the multifacet Rasch model, and more specifically the program FACETS, data is atomized (broken down to its smallest components – individual items rather than station scores are used) and the data does not need to be dichotomous. The data can be entered by individual items of candidates evaluated using a 3-point rating scale (0 = not done, 1 = tried and 2 = done). In this manner there is no loss of data (as in the Rothman study) as each station had 15 to 18 checklist items. In summary, the use of the multifacet Rasch model has the advantage that it can be applied to a smaller examinee sample size and can be used to analyze the contribution of error variance due to examiner inconsistency.

Summary of Literature

Although there is considerable literature on what might be called structured oral examinations and the effects of examiner stringency/leniency, there is no research on the variation of scores due to the examiners' stringency/leniency effects in OSCEs. The multifacet Rasch model has proven to be a useful tool for analyzing oral examinations, but such utility has not been applied nor demonstrated for OSCEs. The single research article (Rothman et al) on IRT and OSCEs concerned itself with only two variables (candidates and stations) and used dichotomous scores (station pass/fail decisions). Most importantly, they did not comment on the error variance due to examiners. In their test for unidimensionality, the first principal components accounted for only 21.0% of the variance.

This project will expand the above works by utilizing data from 'high-stakes' OSCEs. To date, there has been no study on whether there is error variance due to inconsistencies among examiners' observations, the possible size of that effect, or whether the multifacet Rasch model can meet the underlying assumptions of the model and be used to adjust candidate scores for that effect.

The Research Questions

In "high-stakes" OSCEs:

- can CTT or IRT provide evidence that there is an error variance due to the stringency/leniency effect of examiners?
  - If yes,
    - how large is the effect?
    - what impact does it have on examination decisions (pass/fail decisions)?
    - can the multifacet Rasch model be used to correct for the effects of the variance prior to examination decisions being made?
      - does the data satisfy the unidimensionality assumption required of IRT?
      - how useful are Fit statistics in the analysis of OSCE scores?

    - how reliable are the results of the multifacet Rasch model?

- How does the multifacet Rasch model analysis compare to CCT statistical methods in effectiveness and utility?

CHAPTER THREE: METHODOLOGY

Data Source

The data to be used in this study were supplied by the Canadian Chiropractic Examining Board (CCEB). The CCEB administers a 10 station OSCE at four different time periods each year (March, June, September and December). The CCEB OSCE uses optically read scoring sheets. The structured checklists consist of three different scales: a 3-point scale (0= not performed, 1= performed but inadequate, 2= performed adequately), a 5-point scale on professionalism, and a 10-point scale on overall approach to the station.

The data used in this study were collected in 2002 and include stations from March (2 days, 2 tracks, morning and afternoon cycles), June (2 days, 2 centers, five tracks one day, 6 tracks the next day, morning and afternoon cycles), September (1 day, 1 center, 4 tracks, morning and afternoon cycles) and December (2 days, 1 center, 2 tracks per day, morning and afternoon cycles). As cases differed from Saturday to Sunday, and since the two centers for the June 9th examination were completely different candidate pools (French and English), the data represents eight different OSCEs. The candidates for the afternoon cycle were registered prior to the morning cycle candidates leaving so that there was no opportunity for contamination of afternoon candidates. Table 1 lists the variables in the data.

Table 1

Data From Eight OSCEs

Name	**Description**
cand	Candidate number
exam	Examination number, by sequence: 1= March 16, 2= March 17, 3= June 8, 4= June 9 English, 5= June 9 French, 6=Sept 9, 7= Dec 7, 8= Dec 8
centre	Site of examination: 1= Calgary, 2=Toronto, 3= Quebec City
stn1per	Percent score for station 1, Patient Interview
stn2per	Percent score for station 2, Physical Examination
stn4per	Percent score for station 4, Differential Examination
stn5per	Percent score for station 5, Informed Consent
stn6per	Percent score for station 6, Combined Patient Interview and Physical Examination
stn8per	Percent score for station 8, Combined Patient Interview and Physical Examination
stn9per	Percent score for station 9, Patient Interview
stn10per	Percent score for station 10, Physical Examination
stn11per	Percent score for station 11, Differential Examination
stn11per	Percent score for station 13, Chiropractic Treatment
totper	Average of all station percentage scores
gpa	Grade-point-average from chiropractic college
pregpa	Grade-point-average from pre-chiropractic college requirements
measure	Log-linear measure of ability
totpass	Pass/fail (1=pass, 0=fail) for each candidate

Candidates

The candidates are individuals who have graduated from chiropractic colleges accredited by the Council on Chiropractic Education Canada. Candidates have a minimum of 3 years at a Canadian university of pre-chiropractic education and a minimum of 4 academic years at a chiropractic college. Candidates must have also been successful on the written examination administered by the CCEB.

"High Stakes" OSCE

The OSCE consists of 10 stations: 2 patient interview stations, 2 physical examination stations, 2 stations each of 4 multiple directed physical examinations, 2 combined patient interview and physical examination stations, 1 informed consent station, and 1 chiropractic treatment station. Like stations are combined to arrive at the six skills being evaluated: patient interview, physical examination, combined interview and examination, differential examination, informed consent, and chiropractic treatment. These six skills combine to be the chiropractic clinical competencies being measured by the examination. The second page of Appendix 'B' provides detailed descriptions of these six skills. The OSCE uses optical score sheets (for sample, see Appendix 'C') so that examiners can bubble in the score sheets and the score sheets can be computer scored at a later date. After examinations are scored, candidates are informed of their status (successful, unsuccessful) and provided with a feedback sheet as to the strengths and weaknesses of their performance (for sample, see Appendix 'B').

Data Analysis

The data were analyzed by two different methods. Classical Test Theory analysis was performed using STATA Special Edition 8 (www.stata.org) and multifacet Rasch analysis was performed using FACETS for Windows Version No. 3.4.2.0 (www.winsteps.com). Where appropriate, the Stata command statements and the FACETS model statements are included with the reporting.

Classical Test Theory Analysis

Data generation

For each OSCE, candidate station scores were determined by summing items scores. As the June 9 OSCE was held in two centers, the English and French center data were separated in the analysis as, for example, the 'Blue' track data in Quebec City could not be added to the 'Blue' track data in Toronto. Due to the "high-stakes" nature of the examination, all items counted toward a candidate's score. No items were removed from the calculation on the basis of item analysis due to the "high stakes" nature of the examination and of the desire to compare CTT analysis to multifacet Rasch model analysis. Station scores were converted to percentage scores. Candidate overall OSCE percentage score was calculated by averaging the station scores. Thus, all stations were equally weighted in determining the overall OSCE score.

Output

Descriptive statistics were generated by item and station. Station discrimination (-1.0 to 1.0) was calculated by taking the average proportion score [maximum = 1.0 and minimum = 0.0] for the top 25% of candidates minus the average proportion score for the lowest 25%. A measure of internal consistency of the examinations (Reliability: Cronbach's Alpha) was calculated.

The data for each administration were analyzed by assigned tracks, as all examiners do not score all candidates. Box-plots of the data, after being assigned to tracks, were visually compared for differences in performance of tracks on each examination day. For those tracks for which the performance appeared to be visually different, 95% confidence intervals for the mean score were calculated and compared for overlap. Due to ease of calculation, 95% confidence intervals for all tracks were calculated. With 10 different stations and 8 administrations, there were 80 tracks available for comparison.

The data were then analyzed by individual station scores for each track for each examination administration. Box-plots of the station data were visually compared for differences in performance of tracks on each examination day. For those tracks for which the station performance appeared to be visually different, 95% confidence intervals for the mean score by station were calculated and compared for overlap. Due to ease of calculation, 95% confidence intervals for all tracks were calculated.

Eight analyses of variance (ANOVAs) of examination scores, one for each examination, by track were performed to estimate the assigned track contribution to error variance. ANOVAs of station scores by track were performed to estimate the examiner contribution to error variance. Analyses of covariance (ANCOVA) to control for the effect of candidate ability by including the grade-point-average (GPA) variable were not performed to determine if differences in examination scores and station scores were not simply differences in candidate ability. There were 23 different colleges in the data, and previous studies have found that the GPAs at chiropractic college are not comparable.[27] Analysis of covariance would have been misleading and was therefore not performed.

Multifacet Rasch Model Analysis

Data generation

For each OSCE, the data were entered into the program FACETS. There was one line of data for each candidate for each station. Each line of data contained the candidate identification number, the examiner identification number, the number of items in the station, and the polytomous points awarded for each of the items in the station. For each

OSCE, every candidate had 10 lines of data (one for each station). No items were removed from the data on the basis of item analysis due to the "high stakes" nature of the examination and the desire to compare multifacet Rasch model analysis with CTT.

Facets

The three facet Rasch model was defined (candidate, examiner, and item) [FACET model statement:?,?,#,R9]. For the June 9 OSCE, examiners in each center (Toronto and Quebec City) were group anchored so that the average stringency/leniency measure for each group of examiners were fixed at zero (0) [FACET label statement: 2=examiners,G. 1=Smith,0,1]. The program FACETS is controlled by "model" statements. For the three facets identified, the first facet is modeled as being a positive facet (increasing scores mean increasing abilities) and is allowed to float (no pre-determined mean). All other facets (examiners and items) are modeled to have a mean of zero. Appendix 'D' contains example program statements from FACETS.

Unidimensionality and data fit

The data were checked for the unidimensionality assumption: for this analysis data were collapsed into the six major skills assessment (Patient Interview, Physical Examination, Differential Examination, Informed Consent, Treatment, and Combined Interview and Physical Examination). Unidimensionality was then examined using the scree plot method [Stata command: factor hx-tx, ipf]. The Principal Axis Factoring was used to determine the number of factors underlying the six skills scores. Utilizing the recommended methods of Stark et al, the magnitude of the first and second eigenvalues were compared.(38) In this method, the first eigenvalue must be significantly higher than the second for the assumption of unidimensionality to be met.

The data were checked to determine whether there was a fit to model through the examination of the infit and outfit statistics for all facets (candidates, examiners, items).

Output

The program FACETS creates an "output" file for review. Convergence was reached after the following number of iterations: March 16 - 198, March 17 – 137, June 8 – 239, June 9 - 343, September 9 – 141, December 7 – 258, and December 8 – 280). In all analyses, independent subsets of data were avoided. Appropriate modeling was checked by confirming that the mean data summary table reported that the mean standard residual was in all cases 0.0, and that the standard deviation was 1.0. The vertical table was then reviewed for a visual comparison of measures for candidates, examiners, and items. Tables of ability measures for each candidate, stringency/leniency measures for each examiner, and item difficulty measures were reviewed for each examination. The FACET calculations of separation reliability coefficients for candidates, examiners, and items were reviewed. The candidate identification number and measure of ability were added to the Stata file of CTT information for comparison purposes.

A comparison was made of the stringency/leniency measure of examiners by FACETS with the stringency/leniency rankings of the standardized candidate project in June 2002.[31]

Comparison of Methods

The data were compared and reviewed to determine if the quality and ease of calculation indicates that one method of analysis is preferable to the other. The criteria used to compare methods included: ease of use, background knowledge, computer program requirements, reliability, fit of data to model, identification of examiner stringency/leniency effect, and generation of candidate "true" scores. Whether candidate scores can be adjusted for error variance to arrive at a candidate's "true-score" is of primary importance. The application of each method to the research questions was reviewed for accuracy and ease of process. A scatterplot matrix of ability measures to raw scores was performed to visualize the transformation from raw score to logit-linear ability measures. Correlation coefficients were calculated to determine if they were reasonable (>0.94).[(5)] Correlation coefficients less than 0.94 indicate either a flaw in the program statements in FACETS, or indicate a less than ideal data to model fit. A two-by-two table was prepared to compare the effect of using the multifacet Rasch model to pass/fail decisions.

CHAPTER FOUR: RESULTS

Classical Test Theory

Five hundred and thirteen (513) candidates were evaluated in 2002. Table 2 summarizes the reliability and descriptive statistics for the eight OSCEs: estimated reliability coefficients (internal consistency, Cronbach's Alpha – all checklist items included), and the descriptive statistics (number of candidates, mean, standard deviation, minimum score, maximum score, discrimination index, and the percentage of candidates passing.

Table 2

Reliability and Descriptive Statistics
for
Eight 2002 OSCEs
(percentage of raw score)

Exam	n	Reliability Alpha	Mean%	SD%	Min%	Max%	Discrim	Pass%
March 16	46	0.95	69.4	7.38	50	83	.12	87.0
March 17	49	0.91	70.5	7.18	54	83	.11	89.8
June 8	105	0.95	73.0	6.58	55	84	.09	92.4
June 9 English	97	0.85	73.8	5.64	56	86	.07	87.6
June 9 French	42	0.89	78.5	5.74	56	84	.06	97.6
Sept 8	75	0.88	68.8	6.67	50	82	.09	85.3
Dec 7	53	0.88	75.3	5.19	60	85	.08	90.6
Dec 8	46	0.91	75.2	6.89	49	88	.09	89.1
Average	73	0.91	72.3	6.55	53	84	.10	89.2

Table 2 reveals that the reliability of the OSCEs is high (the gold standard being 0.80). The mean scores ranged from 68.8% to 78.5%, a spread of 9.7%. The standard deviation (candidate score spread) ranged from 5.19% to 7.38%. The minimum scores ranged from 49% to 60%, and the highest scores ranged from 82% to 88%. The discrimination values ranged from .08 to .12. The pass rates ranged from 85.3% to

97.6%, a range of 12.3%. It should be noted that the strongest colleges[27;43] (the Canadian colleges: Canadian Memorial Chiropractic College in Toronto and the Universite du Québec à Trois-Rivières) supply candidates only for the June examinations. In accordance to expectations, pass rates were higher for the June examinations (92.4%, 87.6% and 97.6%).

Research Question: In "high-stakes" OSCES, is there error variance due to the stringency/leniency effect of examiners?

The analysis for each track is demonstrated in Table 3. The rows in the table are numbered to assist in describing the results. Table 3 summarizes the descriptive statistics (number of candidates, mean percent performance, percent passing, percent standard error of the mean, and 95% mean confidence interval) [Stata command: by exam track: ci toper, level(95)]. For each examination, the 95% confidence intervals for each track all overlap. The bold rows are those tracks whose mean 95% confidence intervals are close to not overlapping.

Table 3 reports the findings for each track. The track means are an average of the percentage scores awarded by each of 10 separate examiners. The mean of examination scores per track range from a low of 66.43%, to a high of 77.86% (a range of 11.43%). The pass rates by track range from a low of 69.7% to a high of 100% (a range of 30.3%). When Table 3 is compared to Table 2, there is a greater variance in mean examination scores by track when compared to mean scores by examination. This is expected, as the mean of a set of means will have less variance. The range of mean scores is greater when mean examination scores by track are compared to examination mean scores (9.7% to

11.43%). Similarly the range of pass percentages by examination increases when pass percentages by track are compared to pass percentages by examination (12.3% to 30.3%).

Table 3

Mean, Standard Error and 95% Confidence Intervals
For Each Track Used in Eight OSCEs Administered by CCEB in 2002
(percentage of raw score)

Row		n	Mean%	Pass%	Std. Err.%	[95% Conf.	Interval]
1	**March 16, track = 1**	**23**	**66.43**	**78.3**	**1.41**	**63.51**	**69.36**
2	**March 16, track = 2**	**23**	**72.30**	**95.6**	**1.44**	**69.32**	**75.29**
3	March 17, track = 1	25	72.36	92.0	1.37	69.53	75.19
4	March 17, track = 2	24	68.50	87.5	1.46	65.49	71.51
5	June 8, track = 1	21	70.81	90.5	1.46	67.76	73.84
6	**June 8, track = 2**	**20**	**70.60**	**85.0**	**1.72**	**67.00**	**74.20**
7	**June 8, track = 3**	**20**	**75.75**	**100.0**	**0.91**	**73.84**	**77.66**
8	June 8, track = 4	20	74.65	92.0	1.46	71.58	77.72
9	June 8, track = 5	24	73.42	95.8	1.30	70.73	76.10
10	**June 9, Toronto, track = 1**	**25**	**73.40**	**92.0**	**0.98**	**71.38**	**75.42**
11	**June 9, Toronto, track = 2**	**23**	**69.35**	**69.7**	**1.11**	**67.05**	**71.65**
12	June 9, Toronto, track = 3	24	72.92	89.5	1.10	70.63	75.20
13	**June 9, Toronto, track = 4**	**25**	**73.72**	**94.4**	**1.13**	**71.38**	**76.06**
14	June 9, Québec, track = 1	21	77.86	100.0	.83	76.13	79.58
15	June 9, Québec, track = 2	21	76.14	95.2	1.54	72.92	79.36
16	Sept 9, track = 1	19	66.47	68.4	2.09	62.07	70.87
17	Sept 9, track = 2	19	70.32	89.5	1.28	67.63	73.00
18	Sept 9, track = 3	19	68.37	89.5	1.10	66.07	70.67
19	Sept 9, track = 4	18	70.11	94.4	1.45	67.05	73.17
20	Dec 7, track = 1	27	75.26	88.9	1.06	73.08	77.44
21	Dec 7, track = 2	26	75.35	92.3	0.97	73.34	77.35
22	Dec 7, track = 1	22	76.14	90.9	1.34	73.36	78.91
23	Dec 7, track = 2	24	74.25	87.5	1.52	71.11	77.39

The greater variance in mean scores and pass rates within tracks than within examinations indicates that some tracks may be introducing an undesirable source of error variance. A review of the 95% confidence intervals by examinations (Table 3) reveals that all confidence intervals overlap. There are some tracks, however, that are close to not overlapping: for the March 16th examination, rows 1 and 2, for the June 8th examination, rows 6 and 7, for the June 9th examination, rows 10, 11, and 13. This observation increases the concern that candidate assignment to tracks may be introducing an undesirable source of error variance and an alternative analysis should be performed.

An analysis of variance (ANOVA) can also be used to provide evidence of the significant effect of track differences and examiner differences. ANOVA of the mean examination scores for each examination by track reveals that the March 16, June 8, and June 9 (English) mean examination score differences between tracks were significant [Stata command: by exam centre: anova totper track, category(track)]. Table 4 is the result of the ANOVA for the March 16th examination. Appendix 'E', contains the analysis of variance for all eight examinations (tables 4 through 11). Tables 4, 6, and 7 provide evidence that there is a significant difference between tracks. Tables 5 and 8 through 11, for the other examinations, demonstrate no significant difference in mean examination scores due to assignment to tracks.

Table 4

Analysis of Variance (ANOVA)
By Track – March 16 Examination

Number of obs = 46
Root MSE = 6.83

Source	Partial SS	df	MS	F	Prob > F
Model	396.20	1	396.20	8.48	0.01
track	396.20	1	396.20	8.48	0.01
Residual	2054.52	44	46.70		
Total	2450.72	45	54.46		

From Table 4, the F statistic for tracks is 8.48 and the probability of another sample having the same result or greater is 0.01. For this examination, the mean examination scores by track are significantly different.

Tables 12 through 21 in Appendix 'F' reveal a more detailed analysis of the data by analyzing by examination mean scores by examiner and not by examination mean scores by track. Up to this point, the track mean scores were calculated by averaging the 10 station scores. For the analysis in Tables 12 through 21, each track represents the single examiner in that track. The rows that are in 'bold', are those rows for which there is not an overlap of the examination mean scores in the 95% confidence interval, indicating that there is evidence that the examination mean scores by examiner are not equivalent. For example, in Table 12 (Station 1, Patient Interview): the confidence intervals do not cross for rows 1 and 2 on the March 16 examination, rows 7 and 8 for examination 3 (June 8), and row 16 does not cross with any other row for the 5^{th} examination (Sept 9). As there are 10 stations and 8 OSCEs, and each OSCE had more than one track, there are 80 opportunities to compare the consistency of examiners' scores among tracks. The number times that the examiners' scores failed to overlap on at least 2 of the tracks, is 31 out of 80 possibilities (38.8%). There are more examiners whose examination mean scores do not cross at the 95% confidence levels, than tracks whose examination mean scores do not cross the 95% confidence levels. This is evidence that examiners are a source of undesirable error variance.

Analysis of variance of station scores by track (80 ANOVAs: 8 examinations x 10 stations) can provide evidence of the significant effect of track assignment to station scores (individual examiner scores). ANOVA of the mean station scores for each examination by track reveals that the 40 out of 80 (50%) possible mean station score differences between tracks were significant [e.g., Stata command: by exam centre: anova stn1per track, category(track)]. It should be noted that repeated ANOVAs increase the probability of making a Type I error (rejecting the null hypothesis when there is no difference in mean scores). Theoretically 5% of the time the hull hypothesis would be rejected when there is no difference. The data, however, revealed that in 50% of the cases the tracks per examiner were rejected which is 10 times what would be expected. In summary, a potential error in candidate scores due to the examiner stringency/leniency effect is evident.

The above analysis evaluated the effect on examination mean scores by the assignment of candidates to parallel tracks, and then by individual examiners. The analysis indicates that there is an undesirable error variance due to examiners, and that the averaging of examination scores over 10 examiners (10 stations in a track) does not always remove this error variance.

CTT is unable to calculate a candidate's "true" score, a score free of the error variance due to the examiner stringency/leniency effect. The best that CTT can achieve is to provide a range within which the candidate's "true" score will exist. In CTT a candidate's observed score is equal to the true score plus or minus one (64% probability), two (95% probability) and three (99% probability) standard error of measurement.

Multifacet Rasch model

Research Question: Does the data satisfy the unidimensionality assumption required of IRT?

Checking the assumption of unidimensionality

Chiropractic clinical competency was measured with six skill scores (Patient Interview, Physical Examination, Differential Examination, Informed Consent, Treatment, and Combined Interview and Physical Examination). These six skill scores were calculated for all candidates that wrote the eight examinations. A scree test indicated that the variance of the 6 rating scores was primarily explained by one eigenvalue, thus meeting the demands of unidimensionality. Table 22 reveals the results of the factor analysis estimated by iterated principal-component factor analysis.

Table 22

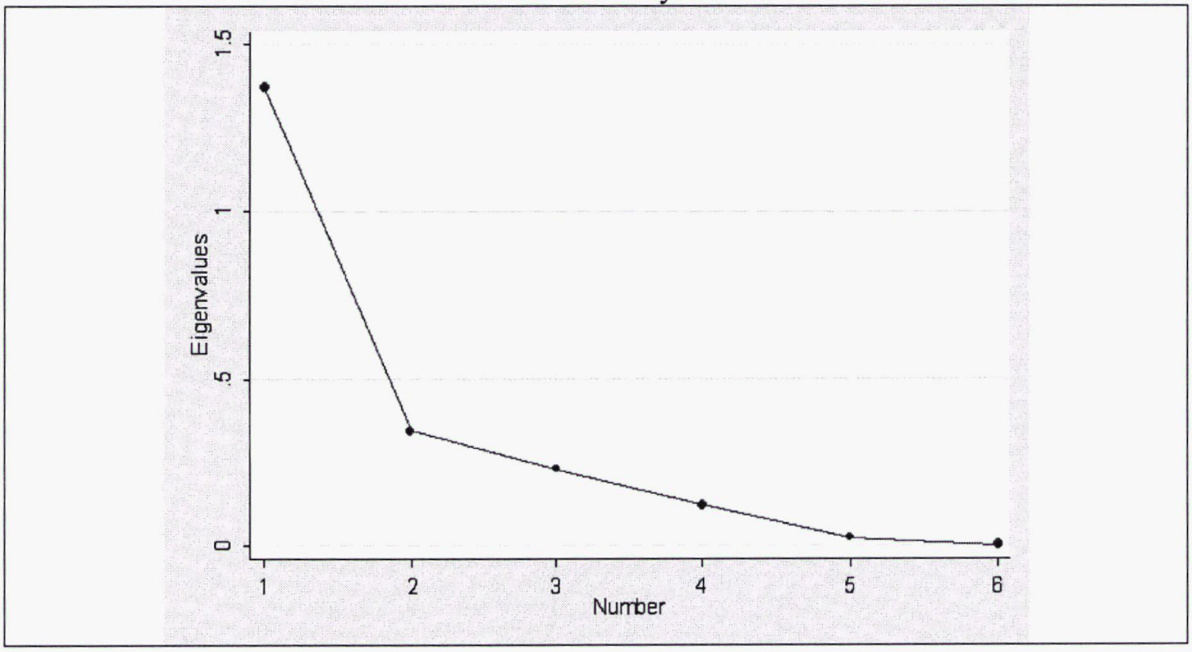
Factor Analysis
Iterated Principal Component Factors
6 Rating Scores

(iterated principal factors; 5 factors retained)

Factor	Eigenvalue	Difference	Proportion	Cumulative
1	1.37205	1.02778	0.6573	0.6573
2	0.34427	0.11598	0.1649	0.8223
3	0.22829	0.10678	0.1094	0.9317
4	0.12151	0.10019	0.0582	0.9899
5	0.02133	0.02153	0.0102	1.0001
6	-0.00020	.	-0.0001	1.0000

The first eigenvalue is almost four times the second eigenvalue. The first eigenvalue also accounts for almost 66% of the variance in the model. Figure 2 demonstrates the unidimensionality of the examination.

Figure 2
Scree Plot
6 Factor Analysis



Research Question: How useful are Fit statistics of OSCE scores?

Checking the data to model fit

Appendix ‘G’ is the output of the program FACETS for candidates, Appendix ‘H’ for examiners, and Appendix ‘I’ for items. The fit of the data to the model can be best evaluated with a review of the infit and outfit mean square statistics. Data responses (candidates, examiners, and items) that best fit the multifacet Rasch model exhibited a MnSq near 1.0. A data response that had a MnSq of 2.0 has twice as much variance in the model as expected. A data response that had a MnSq of 0.5 has half as much variance as expected. The acceptable range of MnSqs for this analysis was set as 0.5 to 1.7 (as recommended by Bond and Fox for clinical observation).[39] Table 23 summarizes the data responses for candidates, examiners and items.

Table 23

Infit and Outfit Mean Squares
Candidates, Examiners, and Items

	Candidates	Examiners	Items
Infit> 1.7	0	0	0
Outfit > 1.7	3	1	2
Infit <0.5	0	0	0
Outfit <0.5	0	0	5
Total data responses	513	231	1162

Table 23 reveals that all data responses were within the acceptable range for infit MnSqs. The infit MnSqs is the most important fit statistic because it is not affected by outliers. The data responses outside the range represented an extremely small percentage of data responses: 0.5% for candidates (3/513), 0.4% for examiners (1/231), and 0.6% for items (7/1162). The score sheets of the three candidates whose outfit MnSqs exceeded 1.7 were examined, looking for missed items and appropriate relationships between check-lists scores and global scores. All three candidates were well above the raw score Minimum Performance Level. Therefore, no adjustment was made to their scores. The single examiner whose outfit MnSq exceeded 1.7 was identified and advised, prior to the next OSCE sitting, of ensuring appropriate application of the rating scales over the entire continuum of abilities and not to be overly concerned with weak candidates. This examiner did not appear in the Fit statistic analysis for any of the other examinations. The items that exceeded the MnSq acceptable ranges were reviewed. These items were either extremely difficult or extremely easy (either most candidates getting the item correct, or most getting the item incorrect). The scoring forms have since been reevaluated to determine if these items should be changed. Due to the "high stakes" nature of the examination and the desire to compare the multifacet Rasch model to CTT, none of the items were removed from the calculation of candidate measures. Based on this analysis of infit and outfit mean squares, the data does match the model.

Research Question: How reliable are the results of the multifacet Rasch model? Calculation of ability measures for candidates, stringency/leniency measures for examiners and item difficulty measures

Table 24 reveals the reliability of each OSCE as measured by FACETS, and the descriptive statistics (number of candidates, mean ability measure, standard deviation, minimum score, maximum score, discrimination index, and the percent passing rate.

Table 24

Reliability and Descriptive Statistics
for
2002 OSCEs
Candidate Measures (Ability)
(Logit, Log-Linear Score)

Exam	n	Separation Reliability	Mean	SD	Min	Max	Discrim	Pass
March 16	46	0.89	0.82	0.32	0.02	1.51	0.44	87.0%
March 17	49	0.89	0.91	0.33	0.19	1.54	0.46	89.8%
June 8	105	0.88	0.97	0.31	0.21	1.57	0.43	92.4%
June 9*	139	0.85	1.07	0.28	0.24	1.74	0.43	89.9%
Sept 8	75	0.88	0.83	0.30	0.00	1.47	0.41	85.3%
Dec 7	53	0.85	1.14	0.31	0.25	1.75	0.38	90.6%
Dec 8	46	0.90	1.23	0.38	-.09	2.07	0.34	89.1%
Average	73	0.88	1.00	0.32	0.12	1.66	0.41	89.0%

*The two OSCEs on June 9 (English and French) were combined for the IRT analysis.

Table 24 reveals that the reliability values calculated by FACETS were high and all exceeded the gold standard of 0.80. The Item Response Theory measure of ability (the logit) has a range, at least in theory, from minus infinity to plus infinity. For practical purposes, the measure of ability is usually in the range of -3.0 to +3.0. The mean ability measures ranged from 0.82 for the March 16 examination to 1.23 for the December 8th examination. The standard deviation ranged from 0.28 to 0.38. The minimum ability measures ranged from -.09 to 0.25, and the maximum ability measures ranged from 1.47 to 2.07. The discrimination ranged from a low of 0.34 to a high of 0.46. The passing percentage was set by CTT, and the table reflects the CTT pass/fail decisions ranging from 85.3% to 92.4%.

The FACET program provides a multifacet Rasch model analysis on each of the facets of the examinations (candidates, examiners, and items) and log-linear measures (logits) for each facet. Table 25 summarizes the reliability, mean, standard deviation and range for examiners (examiner stringency/leniency).

Research Question: How large is the stringency/leniency effect of examiners?

Table 25

Reliability and Descriptive Statistics
for
2002 OSCEs
Examiner Measures (Stringency/Leniency)
(Logit, Log-Linear Score)

Exam	n	Separation Reliability	Mean	SD	Min	Max
March 16	20	0.97	0.00	0.42	-.35	1.05
March 17	20	0.93	0.00	0.25	-.67	0.40
June 8	51	0.94	0.00	0.32	-.60	0.72
June 9*	60	0.97	0.00	0.46	-1.34	0.95
Sept 8	40	0.92	0.00	0.28	-.56	0.76
Dec 7	20	0.97	0.00	0.45	-.71	0.98
Dec 8	20	0.98	0.00	0.61	-1.35	0.96
Average	33	0.95	0.00	0.40	-.78	0.83

*The two OSCEs on June 9 (English and French) were combined for the IRT analysis.

Table 25 is most meaningful if it is compared to Table 24, the candidate measures table. The average reliability for examiners is 0.95 – indicating that the examiners were separated along the stringency/leniency measure and yet consistent across candidates. In IRT, the reliability reflects the spread of the members of the facet (candidates, examiners and items) across the measure. If all examiners exhibited the same stringency/leniency measure, the standard deviation in Table 30 would be zero (0). The mean measure of examiner stringency/leniency is set by the multifacet Rasch model to zero. However, the average standard deviation for examiner stringency/leniency measure was observed to be 0.40, a quite large amount of variation. In comparison, the average standard deviation for candidate ability measures was 0.32. Surprisingly, the measures of examiner stringency/leniency were more spread out (exhibited more variance) than measures of candidate ability. On December 8th, 2003, the examiner measure range was 2.31 (-1.35 to 0.96), or 3.8 standard deviations. This finding was not observable with CTT and raises concern regarding the amount of error variance contained in candidate scores due to the examiner stringency/leniency effect.

Table 26 summarizes the reliability, mean, standard deviation and range for examination items (item difficulty).

Table 26

Reliability and Descriptive Statistics
for
2002 OSCEs
Check-list Item Measures (Difficulty)
(Logit, Log-Linear Score)

Exam	**n**	**Separation Reliability**	**Mean**	**SD**	**Min**	**Max**
March 16	171	0.90	0.00	1.01	-3.16	2.47
March 17	208	0.91	0.00	1.12	-3.18	4.88
June 8	169	0.95	0.00	0.86	-2.88	2.05
June 9*	169	0.96	0.00	0.98	-3.64	2.36
Sept 8	170	0.94	0.00	0.97	-3.40	2.47
Dec 7	172	0.90	0.00	1.15	-3.65	2.46
Dec 8	173	0.88	0.00	1.18	-3.10	2.35
Average	176	0.92	0.00	1.04	-3.29	2.72

*The two OSCEs on June 9 (English and French) were combined for the IRT analysis.

Table 26 reveals that the reliability for items is high (above 0.80). The standard deviations ranged from 0.86 to 1.18 indicating that the items measure a broad aspect of difficulty level. In Item Response Theory, the difficulty level of an item is the ability level of candidates at which the item will be most effective. In all examinations, the difficulty values indicate a broad range of abilities that can be evaluated, from -3.65 (very weak candidates) to 4.88 (very strong candidates). The standard deviation is higher than that for candidates or examiners. This is a desirable psychometric property since it is advantageous to have items measure candidate abilities across the range of abilities.

Figure 3 is an output from the FACETS program that places all facets (candidates, examiners, and items) on the same vertical axis. Figure 3 is the output for the March 2002 examination and is provided as an example.

Figure 3

Logit Values for
Candidates, Examiners, and Items

```
|Logit| +Candidates|-Examnrs   |-Items
|     |  Stronger  | Strict    | Harder
+   3 +            +           +
|     |            |           | *
|     | *          |           |
|     | *          |           | *
|     | ****       |           | *
|     | *****      |           | **
+   1 + ******     + *         + ****.
|     | ********   |           | ****
|     | ******     |           | ****.
|     | *******    | *         | *****.
|     | ******     |           | *******
|     | **         | ***       | ***.
|     |            | ***       | *******.
*   0 * *          * ****      * ***.
|     |            | *         | ***
|     |            | ****      | ******.
|     |            | *         | ******
|     |            |           | ****
|     |            | **        | **.
|     |            |           | .
+  -1 +            +           + **
|     |            |           | .
|     |            |           | **.
|     |            |           | *
|     |            |           |
|     |            |           | *
|     |            |           |
+  -2 +            +           + *
|     |            |           |
|     |            |           | .
|     |            |           | *
|     |            |           |
|     |            |           |
|     |            |           | **
|     |Weaker      | Lenient   | Easier
+  -3 +            +           +
```

For the first time, candidates, examiners, and items are placed on the same scale, a log-linear measure. Because all three variables are placed on the same scale, it is easier to compare the variance for each variable. Figure 3 makes it easy to visualize the full range of candidates (from weaker to stronger), examiners (from lenient to stringent), and items (from easier to hardier).

Research Question: Can the multifacet Rasch model be used to correct for the effects of variance prior to examination decisions being made?

Examiner stringency/leniency measure compared to standardized examinee performance

For the June 8, 2002 OSCE, 6 examinees were trained to portray specific behaviors. The two teams of 3 examinees consisted of 2 strong examinees, 2 borderline pass examinees, and 2 weak/failure examinees. In the morning, team one was assigned to track one, and team two to track two. In the afternoon, team one was assigned to track three, and team two was assigned to track four. As each examiner evaluated a team of standardized examinees, some measure of stringency/leniency can be determined. For each station, the examiners were rank ordered from most stringent to least stringent based on the total scores awarded to the team of standardized examinees. This can be compared to the multifacet Rasch model analysis of the same data to determine if the Rasch analysis ranks the examiners in a similar manner to the raw data analysis.

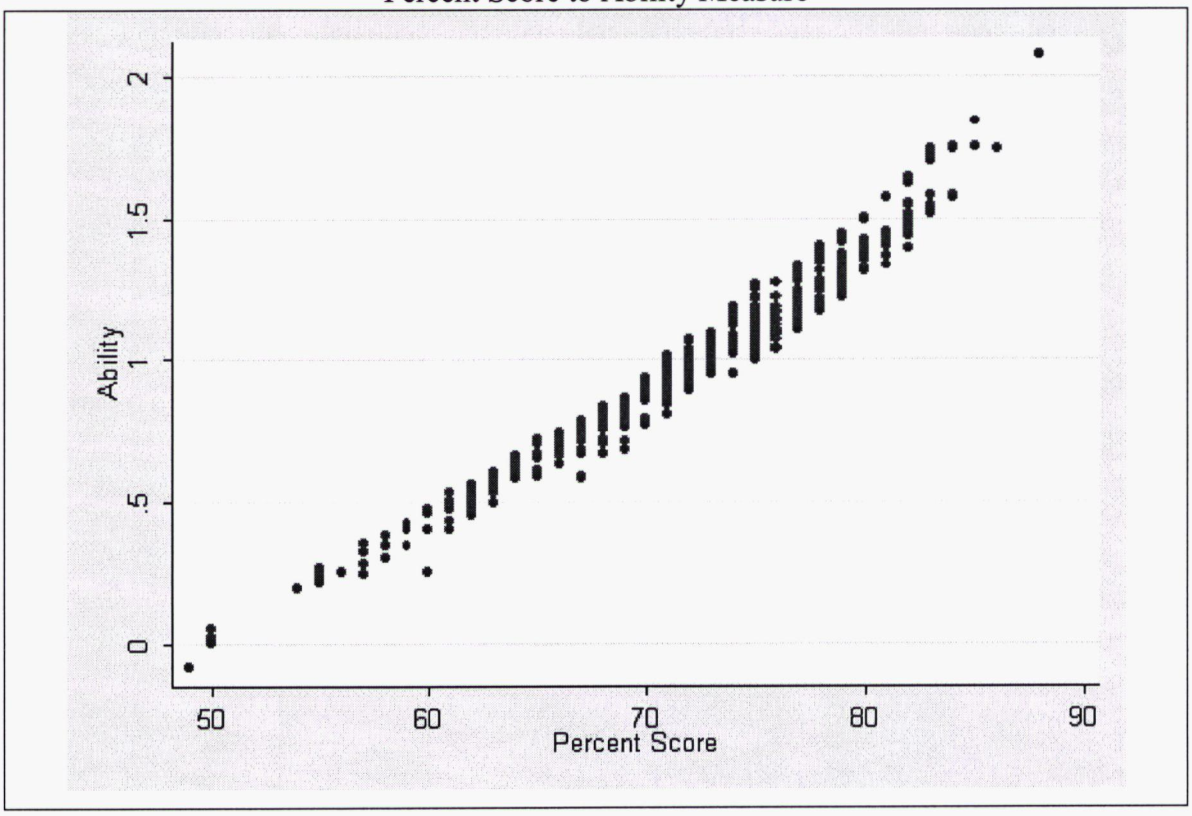
Appendix 'J' is a table that compares the raw score rankings of examiners for each of the stations evaluated by the Standardized Examinee project[31] with the FACET output of examiner stringency/leniency for the same examination (June 8). The similarity of rankings was evaluated with the Pearson product moment correlation, which was 0.96. This comparison of standardized examinee ratings of examiners and the multifacet Rasch model measurement of examiner stringency/leniency provides evidence of validity of the model.

Research Question: What impact does the stringency/leniency effect of examiners have on examination decisions (pass/fail) decisions?

The impact of adjusting for the examiner stringency/leniency effect can be evaluated by the use of a scatterplot of examination scores vs logit measures [Stata command: scatter measure totper]. Figure 4 is a scatterplot matrix of percent examination score to ability measure.

Figure 4

Scatterplot Matrix
Percent Score to Ability Measure



The vertical axis of Figure 4 is the log-linear measure of ability calculated by the multifacet Rasch model. The horizontal axis is the candidate percent score (average of station percentage scores). From the tightness of the data-oval it can be observed that there is a high correlation between percent scores and Logit measure. The Pearson product moment correlation confirms that observation and estimates the correlation to be 0.98.

While the correlation between percent score and logit measure is extremely high, the outcome fail/pass decision of individual candidates may shift. The effect of reporting candidate scores as ability measures rather than percent scores is revealed in Table 27, a 2x2 table comparing pass/fail decisions based on percent scores and pass/fail decisions based on Logit/ability measures.

Table 27

2x2 Table
Percent Score Decisions vs Logit/Ability Decisions

		Logit		
		Pass	Fail	
Percent	Pass	443	15	458
	Fail	14	41	55
		457	56	513

From Table 27 it can be determined that using percent scores as the method for determining pass/fail decisions resulted in 55 candidates failing the examination and 458 passing the examination (89.3% pass rate). If the Logit measure of ability was used to determine pass/fail decisions, 56 candidates would have failed the examination and 457 candidates would have passed (89.1% pass rate). When using the multifacet Rasch model of analysis and removing the stringency/leniency effect from candidate measures, 14 candidates who failed the examination on the basis of percent score decisions would have passed, and 15 candidates who passed the examination on the basis of percent score decisions would have failed. Those 15 candidates who were advantaged because they were assigned to a track with more lenient examiners and passed on the basis of percent scores would have failed with the multifacet Rasch model analysis. Also, those 14 candidates who were disadvantaged because they were assigned to a track with more strict examiners and failed on the basis of percent scores would have passed with the multifacet Rasch model analysis. Twenty-nine (29) candidates would be affected by the adjustment for the stringency/leniency effect of examiners.

Research Question: How does the multifacet Rasch model analysis compare to CTT statistical methods in effectiveness and utility?

Comparison of Classic Test Theory analysis to the multifacet Rasch model analysis

A comparison of CTT and multifacet Rasch model by the criteria listed in the Methods Chapter are demonstrated in Table 28. A four-point scale was used for the comparison; cannot be done, easy, moderate and difficult.

Table 28

Comparison of Classical Test Theory (CTT) and Multifacet Rasch Model (MFRM) Ease of Use and Utility

Criteria	**CTT**	**MFRM**
Ease of use: descriptive statistics	Easy	Easy
Calculation of candidate score reliability	Easy	Easy
Calculation of examiner reliability	Cannot be done	Easy
Calculation of item reliability	Cannot be done	Easy
Accumulating background knowledge required	Difficult	Difficult
Computer programs required	STATA	FACETS
Fit of data to model	n/a	Easy
Identification of examiner stringency/leniency effect	Difficult	Easy
Generation of candidate "true" scores	n/a	Easy

Table 28 reveals that both methods of calculation are computer programmed based. Both computer programs require extensive background knowledge in order to calculate the relevant statistics with proper statistical methods. Descriptive statistics (mean, median, standard deviation, pass/fail percentages) were easy to calculate with both methods. The identification of the error variance of the examiner stringency/leniency effect required considerable effort with CTT and was much easier to calculate with the MFRM. The MFRM calculates the examiner reliability measures, item reliability measures, as a matter of course, while these values are not obtainable with CTT. And finally, only the multifacet Rasch model was able to generate candidate "true" scores after the adjustment for the error variance of the examiner stringency/leniency effect.

In comparison to the multifacet Rasch model analysis, CTT was cumbersome and time consuming. It was necessary to convert the data from a wide format (one row for each candidate) to a long format (ten rows for each candidate, one for each station). The contribution of the examiner stringency/leniency effect was difficult to measure because each station has a different difficulty level. In comparison, the multifacet Rasch model analysis resulted in far more information with less time and difficulty than CTT. The multifacet Rasch model also provided information not available through CTT.

CHAPTER FIVE: DISCUSSION

The purpose of this study was to compare two theories of analyzing candidate OSCE scores to determine specifically whether the Classical Test Theory (CCT) and Item Response Theory (IRT) generated equal or even equivalent findings. The criteria used to compare methods included: ease of use, background knowledge, computer program requirements, reliability, fit of data to model, identification of examiner stringency/leniency effect, and generation of candidate "true" scores. This study also determined whether the multifacet Rasch model could successfully be applied to OSCE scores so as to determine whether there was a significant stringency/leniency effect due to examiners; if there was, to determine how large it was; and whether the multifacet Rasch model could remove this "error variance" from candidate OSCE scores

The performance data from a 10 station OSCE administered over eight examinations by the Canadian Chiropractic Examining Board (CCEB) was analyzed by both CTT and the multifacet Rasch model. CTT provided evidence that the candidate scores were highly reliable (Cronbach's alpha >0.85) and that there was an error variance due to the stringency/leniency effect of examiners. When the examiner stringency/ leniency effect was averaged over a 10 station OSCE, and ANOVAs were calculated on examination score and assigned track, the effect was significant for 38% of the examinations (3 of 8). The differences in individual examiner mean scores was done by not averaging candidate scores over the 10 station OSCEs, resulting in 80 possible station comparisons (8 examinations x 10 stations). When comparing the mean scores by station, ANOVAs revealed that 50% of the time the track assignment was significant. This provided evidence that there was potential error in candidate scores due to the examiner stringency/leniency effect. CTT did not, however, reveal the extent of the impact on individual candidate scores. Therefore, candidate scores analyzed by CTT cannot be interpreted as being independent of the examiners who evaluated the candidates.

In order to apply IRT to a set of performance data, it must be firstly demonstrated that the data is unidimensional and that the data fits the model. Six skill scores (Patient Interview, Physical Examination, Differential Examination, Informed Consent, Treatment, and Combined Interview and Physical Examination) were calculated for all candidates that wrote the eight examinations. A scree test indicated that the variance of the 6 rating scores was primarily explained by one eigenvalue. More than 66% of the variance was accounted for with the first factor, and the first to second factor ratio was greater than 4. The data was thus confirmed to be unidimensional.

Data to model fit was evaluated through the review of infit and outfit mean square statistics (MnSqs) for the three facets of the OSCEs: candidates, examiners, and items. The data to model fit was very acceptable. Less than 0.5% of all candidates (3/513), 0.4% of all examiners (1/231), and 0.6% of all items (7/1162), failed to fall within the 0.5 to 1.7 MnSqs range of acceptability. As the data met the assumption of unidimensionality, and since the data fit the model, the multifacet Rasch model was appropriately used to analyze the data.

The appropriateness of the assignment of examiners along the stringency/leniency measure was validated by comparing the examiner measure produced by FACETS to the raw scores of examiners from the Standardized Examinee project for the June 8th OSCE. A 0.96 correlation coefficient provides evidence of the appropriateness of the multifacet Rasch model measure of examiner stringency/leniency.

This study found that there was a large error variance due to the stringency/leniency effect of examiners and that this error variance adversely affected the pass/fail decisions of approximately 6% (29/513) of candidates. Approximately 3% (15/513) of the candidates who were determined to be competent by CTT methods passed because the examiners on their track were more lenient. Also, an additional 3% (14/513) of candidates who were determined not to be competent by CTT methods failed because the examiners on their track were more stringent. This is an extremely important finding that was not available through CTT analyses of OSCE candidate scores. It was further found that the multifacet Rasch model could adjust candidate scores to arrive at candidate "true-scores", by reducing the error variance due to the examiner stringency/leniency effect.

Although the examiners exhibited large differences in their level of stringency / leniency, this behavior was consistent across candidates. Evidence of the consistency across candidates is found in the reliability of the examiner facet (0.95), the acceptability of examiner fit statistics (>99.6% of all examiners), and the findings of the standardized examinee project. The comparison of examiner stringency/leniency ratings for both the standardized examinee project and the multifacet Rasch model analysis provides evidence, though the high correlation coefficient (0.96) of the validity of applying the multifacet Rasch model to this data.

The OSCE is generally used by licensing bodies to evaluate the competencies of prospective practitioners and is one component of the assessment to determine who is competent to practice, and who is not. "High stakes" examinations need to be, as much as possible, free of error variance. There has been a general acceptance by the measurement community that that OSCE scores have very small amounts of error variance through the use of detailed checklists, standardized patients and examiner training. The stringency/leniency effect of examiners has not been questioned as a significant source of error variance since CTT performance analysis of OSCEs does not generally include an analysis by track or comparison of examiners' performances. Thus, the "Objective" part of the OSCE has been more on faith than on supported research findings.

There is only one study in the literature applying IRT to an OSCE.[41] Rothman et al, applied the two-parameter model to the Medical Council of Canada Part II OSCE. In light of the findings of this study, the Rothman study was not as useful as they did not include a facet for examiners, so the issue of error variance due to the examiner stringency/leniency effect was not addressed. In addition, their data consisted of dichotomous data (pass/fail, 1 or 0) for each of 20 stations and not polytomous data that some schools and licensing bodies use. Their use of the two-parameter model requires a large number of candidates, which may not be available to some schools or testing organization. Their test for unidimensionality (principal component factor analysis) provided for the first component accounting for only 21% of the variance when continuous scores were analyzed, and a very small amount (16%) of the variance when binary data was used. The first to second component ratio was about 3 for the continuous data and about 2.5 for the binary data. The range of acceptable fit statistics was set at <2.0, with no lower value making this a much larger range than used in the current study. On the other hand, the factor analysis in the study of CCEB data revealed that 66% of the variance was accounted for with the first component and that the first to second component ratio was close to 4, far greater evidence of unidimensionality. The range of acceptable fit statistics for the CCEB data was set from 0.5 to 1.7, a narrower range than that set by Rothman et. al. The use of the narrower range in the CCEB study, provides a more critical analysis of the fit statistics. In summary, Rothman et. al. used the two-parameter model (requiring large numbers of candidates), dichotomous data (reflecting a potential loss of information), found weaker evidence for unidimensionality, used a wider range of acceptable fit statistics, and did not consider the examiner facet as a source of error variance. Thus, it is very difficult to generalize their findings to that of other OSCEs.

The multifacet Rasch model produces log-linear measures for all facets of an examination: candidates along a strong to weak ability measure, examiners along a stringent to lenient measure and items along a difficult to easy measure. The multifacet Rasch model analysis also provided evidence of high reliability in candidate scores (>0.84) and that there was considerable examiner variance (Table 25 and Figure 3, Results section). The examiner variance along the stringency/leniency measure was larger than the candidate variance along the strong/weak measure. This was a surprising finding! The reason for the large variance is unknown, but may be due to: examiners being more stringent as their level of expertise increases or it even could be due to subtle differences in the amount of information provided candidates by the standardized patients. In a pilot study of the March 2003 OSCE administered by the CCEB, a 0.36 correlation was found between self perceived expertise in the station content and the stringency/leniency measure calculated by IRT. This finding suggests that part of examiner stringency/leniency effect may be due to expertise, that is the greater the perceived level of expertise the more stringent the examiner's behavior, and visa versa.

This possibility is important since it may be necessary to focus more on content within the preparation materials and training session given to examiners.

The multifacet Rasch model was able to reveal the impact of the examiner stringency/leniency effect on individual candidate scores and on examination decisions (Table 33, Results section). The multifacet Rasch model adjusted candidate scores for the examiner stringency/leniency effect and provided a better estimate of the candidate "true-score".

A significant benefit to the multifacet Rasch model is the calculation of candidate "true-scores". In CTT the candidate's observed score was equal to the true score plus or minus one (64% probability), two (95% probability) and three (99% probability) standard error of measurement. CTT can only provide a range of possible values in which the candidate's true score is likely to fall. That range will include the error variance for the examiner stringency/leniency effect. In the estimation of the candidate's true score by the multifacet Rasch model, the error variance due to the examiner stringency/leniency effect was removed. Theoretically, it is impossible to remove all error variance from examination scores but it is desirable to reduce the error as much as possible. Thus, there is still error variance even in a candidate's true score as measured by IRT, and the exact candidate's true score cannot be determined. The removal of the error variance due to the examiner stringency/leniency effect by the multifacet Rasch model provides a more accurate estimation of a candidate's true scores.

The multifacet Rasch model calculates a different measurement error for each candidate, examiner, and item measure. As an example, candidates who perform at extremes will have larger error measures than candidates who perform close to the average item measure. Appendix 'G' lists the measurement error for each candidate over the eight examinations.

Challenges by candidates on licensure examinations are generally not made on the basis of the effect of examiner stringency/leniency on the average candidate or on the candidate well removed from the pass/fail score. Challenges are made on the effect on individual candidates whose scores are close to the pass/fail point. Licensing bodies should ensure failing candidates and the public that the pass/fail decisions are free of examiner stringency/leniency effect. The multifacet Rasch model may be a useful tool to be used by licensing bodies to improve on estimates of candidate's "true-score" prior to pass/fail decisions being made.

The multifacet Rasch model is not a replacement for Classical Test Theory. With OSCEs, both forms of analysis are appropriate for different purposes. Once the assumption of unidimensionality and issues of data fit are met, and after the multifacet Rasch model has been used to generate log-linear measures of candidate ability, examiner stringency/leniency measures and item difficulty, CTT can assist in the further analysis of the data to arrive at station difficulty, time of day measures, and the analysis of other possible variables (gender, race, start station, etc.). For example, gender should not be entered as a facet/variable of the multifacet Rasch model analysis. If gender is entered as a facet (candidates, examiners, gender, items), the analysis will correct for gender differences when it should not be done. Once log-linear measures have been calculated by the multifacet Rasch model, CTT can be used to analyze the "true" scores in order to determine effects due to gender. In past analyses, it was found with the data from the CCEB, females performed better than males (March 2002 OSCE, unpublished analysis).

This finding was not unusual since females had significantly higher GPAs from chiropractic college and significantly higher pre-chiropractic college GPAs. Thus, it would clearly be inappropriate to have the multifacet Rasch model correct for gender performance differences.

The multifacet Rasch model is also not a substitute for careful examination planning, appropriate sampling of cases based upon the profession's blueprint of clinical presentation, selection of checklist items that reflect the critical behaviors to be displayed by the candidate, rating scale design (polytomous versus dichotomous scales) and appropriate examiner training. OSCE checklist items must consist of those skills that are key to the ability being measured; rating scales that maximize the measure of ability must be used; and examiners must receive training on the application of the rating scales, appropriate conduct, and receive feedback on their performance. This process is iterative, continuous, and necessary for "high" stakes OSCEs.

A note of caution is warranted. The application of the multifacet Rasch model requires careful examination administration. Examiners see only a portion of the candidate pool, and if an examination track has a group with higher ability, the multifacet Rasch model if used inappropriately may indicate that the examiners were more lenient in that track relative to examiners in other tracks. To avoid this type of inappropriate adjustment of candidate scores, the modeling statements in FACETS must be carefully written, and the examination administration must ensure that there are sufficient linkages between candidates and examiners. Ideally there should be crossovers of candidates and examiners so that creating entirely separate subsets of candidates is avoided. However, it is also possible to anchor examiners to groups so that the average of examiner measures for each track will be fixed. For example, the June 9th examination was held in two centers, Toronto and Quebec City. The candidates in Quebec City are all from one college, and from past experience we know that those candidates have greater ability than the average candidate in the Toronto center. If all candidates for that examination were pooled together, the multifacet Rasch model might determine that the Quebec City examiners were more lenient and adjust the performance measures of those candidates down. By group anchoring the examiners so that the examiners in Toronto were anchored to an average stringency/leniency measure of zero and the examiners in Quebec City were anchored to an average stringency/leniency measure of zero, the candidates in Quebec City were appropriately awarded higher measures of ability. Caution is in order when writing these modeling controlling statements, and the final set up of the program should be checked by an expert. Dr. Mike Linacre, the author and owner of the multifacet Rasch program used in this study, provided expert opinion on the appropriate modeling and anchoring methods used for the June 9th OSCE.

In summary, this research project compared two theories of analyzing candidate OSCE scores and found that CTT and IRT generated significantly different findings for approximately 6% of the candidates. Both methods required considerable training, background knowledge, and specialized computer programs. Both theories of analysis generated similarly high reliability coefficients. Only IRT dealt with the issues of unidimensionality and fit of data to model, and only IRT was able to estimate candidates' "true" scores. It was found that CTT and IRT analyses of data have important contributions to the understanding of candidate performance and examination results. The effect of the error variance due to the stringency/leniency effect of examiners and the estimation of candidates' "true" scores could only be estimated with IRT. Table 34, in the Results section, demonstrates the conclusions. Although both models require a high level of expertise to ensure appropriate analysis, IRT was easier to use to evaluate the stringency/leniency effect and reliability of candidate scores. Only IRT could estimate item reliability, examiner reliability, fit of data to model, impact of the examiner stringency/leniency effect on individual candidate scores, and to estimate candidates' true scores.

The research project found evidence of a large examiner stringency/leniency effect for the eight OSCEs administered by the CCEB in 2002; the effect tends to be statistically significant on half of the eight examinations when averaged over a 10 station OSCE. Since the data met the requirements of unidimensionality and data to model fit, the multifacet Rasch model was appropriately used to estimate candidates' "true-scores" by correcting for the examiner stringency/leniency effect.

Based upon the findings of this study it is recommended that: if the assumption of unidimensionality can be met, and if there is evidence of data to model fit, the multifacet Rasch model should be applied to OSCE scores in order to estimate candidates' "true-scores" prior to pass/fail decisions being made. Licensing organizations must reveal the source of data analysis used, and whether that data analysis corrected the error variance due to examiner stringency/leniency effect prior to candidate pass/fail decisions being made. The multifacet Rasch model provides a suitable means for analysis and the correcting of candidate scores. Based on this study, the CCEB has incorporated the multifacet Rasch model analysis into its processes and corrects for the examiner stringency/leniency effect before finalizing performance measures and pass/fail decisions.

Limitations and future research

This research project analyzed the data from one licensing agency's Objective Structured Clinical Examination. Application of the multifacet Rasch model to OSCEs from other organizations should be reviewed prior to any general statements being made to the application of the multifacet Rasch model to OSCEs.

Future research should also consider the application of the multifacet Rasch model to test equating. Examination decisions should be consistent over time, and no candidate should be advantaged or disadvantaged due to the date that he/she takes an examination. The application of the multifacet Rasch model should be researched to determine the suitability of its application to test equating for OSCEs. IRT has been used for test equating in multiple-choice examinations, but there is no research on its use with OSCEs. Standardized patients and examiners are now "teamed" during an examination. Future research should use the multifacet Rasch model to separate standardized patient error variance from examiner error variance, to assist in suitable examiner and standardized patient training and performance correction. The finding of large examiner variance along the stringency/leniency measure was a surprising finding. Future research should attempt to determine the reason for the variance. Research could be directed at determining if examiners are more stringent when observing stations in which they have a high level of expertise. Lastly, the stringency/leniency effect of standardized patients should also be investigated. It is possible that the standardized patient and examiner characteristics interact to enhance, decrease, or even neutralize the overall error variance in candidate OSCE scores.

Reference List

(1) Petrus ER, Blackwell TA, Rogers LP, Sayjari C, Parcel S, Guckian JC. An objective measure of clinical performance. American Journal of Medicine 1987; 83:34-42.

(2) Robb K, Rothman AI. Assessment of clinical skills in general internal medicine residents - comparison of the objective structured clinical examination to a conventional oral examination. Annals of the Royal College of Physicians and Surgeons of Canada 1985; 18:235-238.

(3) Harden RM, Stevenson M, Downie WW, Wilson GM. Assessment of clinical competence using objective structured examination. British Medical Journal 1975; 1(5955):447-51.

(4) Lunz ME, Stahl JA. Impact of examiners on candidate scores: an introduction to the use of multifacet Rasch model analysis for oral examinations. Teaching and Learning in Medicine 1993; 5(3):174-181.

(5) Raymond MR, Webb LC, Houston WM. Correcting performance-rating errors in oral examinations. Evaluation & the Health Professions 1191; 14(1):100-122.

(6) Lunz ME, Stahl JA. The effect of rater severity on person ability measure: a Rasch model analysis. American Journal of Occupational Therapy 1993; 47(4):311-317.

(7) De Gruiter DNM. Two sample models for rater effects. Applied Psychological Measurement 1984; 86:213-218.

(8) Regehr G, Freeman R, Robb A, Missiha N, Heisey R. OSCE performance evaluations made by standardized patients: comparing checklist and global rating scores. Academic Medicine 1999; 74(10 Suppl):S135-S137.

(9) Lawson DM, Harasym PH. Standardized Examinees: Their Role in Evaluating Interexaminer Reliability, Consistency of Performance of Standardized Patients and Candidate Anxiety on Licensure Examinations. Research in Medical Education, American Association of Medical Colleges 2 A.D.; Poster Presentation.

(10) Cohen R, Reznick RK, Taylor BR, Provan J, Rothman A. Reliability and validity of the objective structured clinical examination in assessing surgical residents. American Journal of Surgery 1990; 160(3):302-305.

(11) Petrusa ER, Blackwell TA, Ainsworth MA. Reliability and validity of an objective structured clinical examination for assessing the clinical performance of residents. Archives of Internal Medicine 1990; 150(3):573-577.

(12) Matsell DG, Wolfish NM, Hsu E. Reliability and validity of the objective structured clinical examination in paediatrics. Medical Education 1991; 25(4):293-299.

(13) Hodges B, Turnbull J, Cohen R, Bienenstock A, Norman G. Evaluating communication skills in the OSCE format: reliability and generalizability. Medical Education 1996; 30(1):38-43.

(14) Brown G, Manogue M, Martin M. The validity and reliability of an OSCE in dentistry. European Journal of Dental Education 1999; 3(3):117-125.

(15) Lunz ME, Schumacker RE. Scoring and analysis of performance examinations: a comparison of methods and interpretations. Journal of Outcome Measurement 1997; 1(3):219-238.

(16) Lunz ME, Wright BD, Linacre JM. Measuring the impact of judge severity on examination scores. Applied Measurement in Education 1990;(3):331-345.

(17) Schumacker RE. Many-facet Rasch analysis with crossed, nested, and mixed designs. Journal of Outcome Measurement 1999; 3(4):323-338.

(18) Shaw L. Performance Based Evaluation of Clinical Competence: The Objective Structured Clinical Examination (OSCE). Comsep . 10-13-0020.
Ref Type: Electronic Citation

(19) Reznick R, Smee S, Rothman A, Chalmers A, Swanson D, Dufresne L et al. An objective structured clinical examination for the licentiate: report of the pilot project of the Medical Council of Canada. [Review] [23 refs]. Academic Medicine 1992; 67(8):487-494.

(20) Rothman AI, Blackmore D, Cohen R, Reznick R. The consistency and uncertainty in examiners' definitions of pass/fail performance on OSCE (objective structured clinical examination) stations. Evaluation & the Health Professions 1996; 19(1):118-124.

(21) De Champlain AF, Macmillan MK, Margolis MJ, King AM, Klass DJ. Do discrepancies in standardized patients' checklist recording affect case and examination mastery-level decisions? Academic Medicine 1998; 73(10 Suppl):S75-S77.

(22) De Champlain AF, Margolis MJ, King A, Klass DJ. Standardized patients' accuracy in recording examinees' behaviors using checklists. Academic Medicine 1997; 72(10 Suppl 1):S85-S87.

(23) Grand'Maison P, Lescop J, Rainsberry P, Brailovsky CA. Large-scale use of an objective, structured clinical examination for licensing family physicians. CMAJ 1992; 146(10):1735-1740.

(24) Cusimano MD, Cohen R, Tucker W, Murnaghan J, Kodama R, Reznick R. A comparative analysis of the costs of administration of an OSCE (objective structured clinical examination). Academic Medicine 1994; 69(7):571-576.

(25) Lunz ME, Stahl JA. A comparison of intra- and interjudge decision consistencies using analytic and holistic scoring criteria. Journal of Allied Health 1990; 19(2):173-179.

(26) Littlefield JH, Harrington JT, Anthracite NE, Garmon RE. A description and four year analysis of a clinical clerkship evaluation system. Journal of Medical Education 1981; 56:334-340.

(27) Lawson DM, McDonald C, Naseem MT. Comparing the performance of graduates of American chiropractic colleges to that of English speaking graduates of the Canadian chiropractic college. Ottawa Conference on Medical Education.

(28) Cason GJ, Cason CL. A deterministic theory of clinical performance rating. Evaluation and the Health Professions 1984; 7:221-247.

(29) Blak H. Estimating the reliability, validity, and invalidity of essay ratings. Journal of Educational Measurement 1985; 22(2):41-52.

(30) Adjusting for Examiners Who Are Hawks and Doves on a "High Stake" OSCE. 02 Nov 9; Generalists in Medical Education Conference, 2002.

(31) Lawson DM, Harasym PH. The reliability and validity of OSCE "High Stake" examination scores obtained by standardized candidates. Evaluation & the Health Professions . Submitted for publication, 2004.

(32) Lord FM, Novick MR. Statistical theories of mental test scores. Addison-Wesley, 1968.

(33) Gumpel T, Wilson M, Shalev R. An item response theory analysis of the Conners Teacher's Rating Scale. Journal of Learning Disabilities 1998; 31(6):525-532.

(34) Linacre JM. Investigating rating scale category utility. Journal of Outcome Measurement 1999; 3(2):103-122.

(35) Zhu W. A confirmatory study of Rasch-based optimal categorization of a rating scale. Journal of Applied Measurement 2002; 3(1):1-15.

(36) Baker FB. The Basics of Item Response Theory. ERIC Clearinghouse on Assessment and Evaluation, 2001.

(37) Linacre JM. Sample Size and Item Calibration Stability. Rasch Measurement Transactions 1994; 7(4):328.

(38) Stark S, Chemyshekno S, Chuah D, Lee W, Wadlington P. Investigation of Dimensionality. University of Illinois IRT Laboratory , 22-23. 2001. University of Illinois. Ref Type: Electronic Citation

(39) Bond TG, Fox CM. Applying the Rasch Model: Fundamental Measurement in the Human Sciences. 1 ed. Lawrence Erlbaum Associates, 2001.

(40) Kolen MJ, Brennan RL. Test Equating: Methods and Practices. 2nd ed. Springer, 1995.

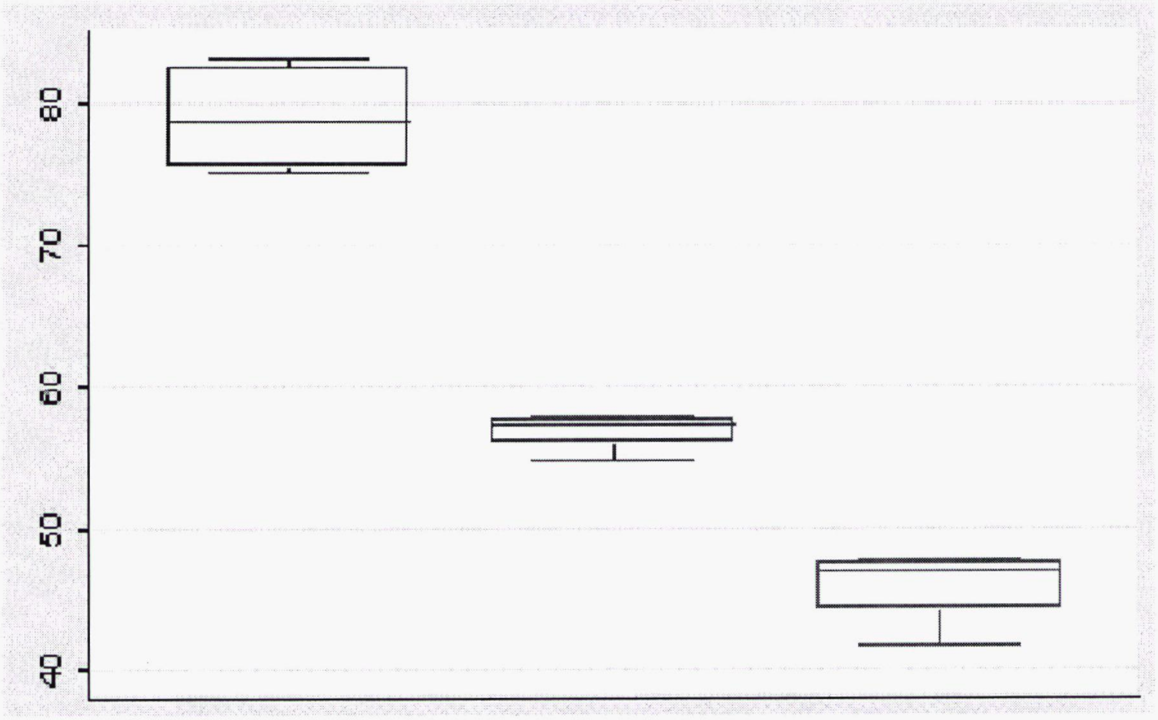
(41) Rothman AI, Blackmore D, Reznick R. IRT Calibration of Multiple Station Clinical Skills Examination Stations. 1995. American Education Research Association. 1995. Conference Presentation

(42) BILOG 3: Item Analysis and Test Scoring with Binary Logistic Models. Mooresville, IN: 1990.

(43) Lawson D, Violato C, Marini A, McEwen M. Differential performance on the Canadian Chiropractic Examining Board Examinations: an eight year longitudinal study. Journal of the Canadian Chiropractic Association 1998; 39(1):11-17.

APPENDIX 'A'

Standardized Examinees
Performance of 3 Groups
Strong, Borderline Pass and Fail
Over 4 tracks –Percentage Scores



APPENDIX 'B'

Candidate Feedback

Friday, January 3, 2003

Dear Dr. ****:

It is a pleasure to inform you that you have passed the Clinical Skills Examination (CSE) administered on December 7 & 8, 2002 and have been awarded Certificate # ***. A detailed profile of your performance is provided below:

Candidate ID: ####

TASK	*YOUR SCORE*	*Minimum Performance Level (MPL)*	*WEIGHT*	*Performance SATISFACTORY OR UNSATISFACTORY*
DIAGNOSTIC IMAGING (DI)	**69.4%**	**63.9%**	**100%**	**S**
OSCE stations	**77.6%**	**66.0%**	**100%**	**S**
a. Patient Interview	**76.6%**	**62.4%**	**20%**	**S**
b. Physical Exam	**70.2%**	**64.0%**	**20%**	**S**
c. Multiple Directed Physical Exam	**98.6%**	**68.6%**	**20%**	**S**
d. Combined History and Physical	**77.9%**	**67.4%**	**20%**	**S**
e. Informed Consent	**33.3%**	**60.0%**	**10%**	**U**
f. Chiropractic Treatment	**95.7%**	**75.0%**	**10%**	**S**

You must be satisfactory on both the DI and Objective Structured Clinical Examination (OSCE) to pass. If you are unsatisfactory on any component of the Clinical Skills Examination, it is advised that you undertake self-directed studies to overcome your noted deficiencies. A description of the tasks is provided on page 2.

A transcript of your marks has been mailed to the licensing boards you requested on your application. Additional transcripts cost $15 each. Remember that a passing score on both the Written Cognitive Skills Examination and the Clinical Skills Examination are only part of the requirement for licensure. Please contact the province in which you intend to practice for further information about its requirements.

On behalf of the staff at the CCEB and our team of dedicated examiners, we wish you success in your future Chiropractic endeavors.

Please do not hesitate to contact the CCEB should you require further explanations regarding your CSE performance. The Information Brochure and the web page are also sources of reference.

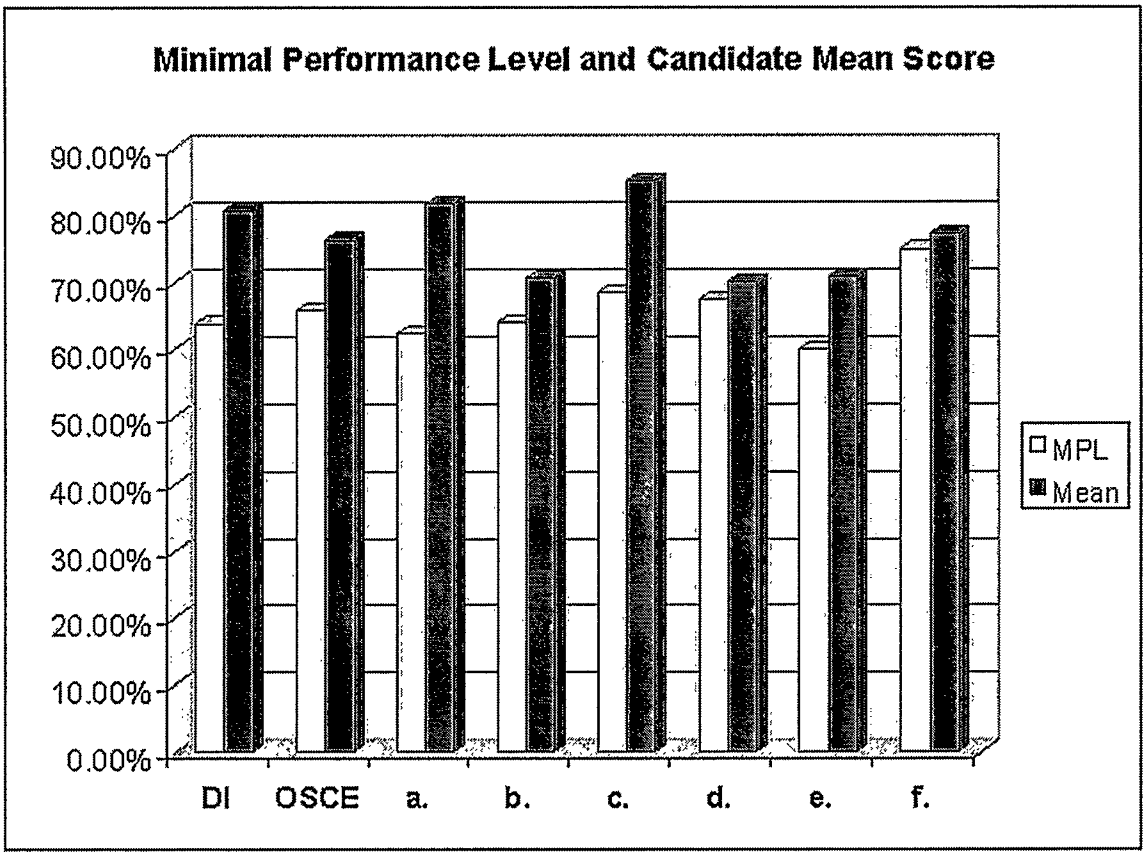
Sincerely,

Douglas M. Lawson, BA, DC
Chief Executive Officer

TASK
DIAGNOSTIC IMAGING = the percentage score obtained in reading and interpreting X-rays.
OSCE = the percentage score obtained on all 10 clinical stations (excluding Diagnostic Imaging).
a. Patient interview = the ability to conduct a focused patient interview, arrive at a diagnosis, and to communicate a diagnosis and plan of management.
b. Physical exam = the ability to conduct a focused physical examination, arrive at a diagnosis, and to communicate a diagnosis and plan of management.
c. Multiple directed physical examination = the ability to demonstrate physical examinations that differentiate between conditions and to explain the rationale.
d. Combined interview and physical examination = the ability to conduct a focused patient interview and physical examination, arrive at a diagnosis, and to communicate a diagnosis and plan of management.
e. Informed consent = the ability to obtain informed consent from a patient, including explaining the benefits and risks of chiropractic treatment and other treatments - including the natural course of the condition.
f. Chiropractic treatment = the ability to demonstrate the set-up for chiropractic adjustments, and the ability to respond to the patient's response to such procedures.

To further your understanding of how well you performed on this examination relative to your colleagues, the graph below shows the mean performance of all first-time candidates. In interpreting your scores, it is important to keep in mind that the CSE is a competency examination. The mean performance of you and your colleagues is provided only for the sake of interest. The groups' response to the exam had no effect on whether your performance was declared either satisfactory or unsatisfactory. Your status was determined by comparing your performance on each task against the minimum performance level.

Group Performance



APPENDIX 'C'

Optical Score Sheet
OSCE

STATION #	I.D. NUMBER
0 ●○	0 ○○○○
1 ○●	1 ○○○○
2 ○○	2 ○○○○
3 ○○	3 ○○○○
4 ○○	4 ○○○○
5 ○○	5 ○○○○
6 ○○	6 ○○○○
7 ○○	7 ○○○○
8 ○○	8 ○○○○
9 ○○	9 ○○○○

Reminder: Examiners are to function as observers, any communication with candidates that is not authorized is totally inappropriate.

Bubble in ID NUMBER

PLACE CANDIDATE STICKER HERE

CHIROPRACTIC CHIROPRATIQUE Canada

Station 01, Saturday, December 08, 2001

0=not performed 1=performed but inadequate 2=performed correctly

PATIENT HISTORY	Please respond to each checklist item (one bubble per row)	0	1	2
1	nothing seemed to cause the headaches	○	○	○
2	top and back of right side of head, radiating to right eye	○	○	○
3	moderate to severe	○	○	○
4	from 6 to 8 out of 10	○	○	○
5	aggravated by school, computer, driving	○	○	○
6	lying down in dark room with pillow over ears	○	○	○
7	nausea and vomiting	○	○	○
8	has to go to bed at end of day	○	○	○
9	aggravated by aged cheddar, bright lights, loud noises	○	○	○
10	there is no night pain	○	○	○
COMMUNICATION				
11	-nonverbal communication, eye contact		○	○
12	-appropriate sensitivity to patient needs (language), sequencing of questions		○	○
DIAGNOSIS AND MANAGEMENT				
13	Migraine Headache	○	○	○
14	Treat with chiropractic adjustments	○	○	○
15	Diet counseling and reassess	○	○	○

GLOBAL RATING SCALE		0	1	2	3	4	5	6	7	8	9
		unsatisfactory		satisfactory							
16	Attitude	○	○	○	○	○					
		unsatisfactory					satisfactory				
17	Overall Technique	○	○	○	○	○	○	○	○	○	○

Examiner	**Initial if yes. If no, initial and enter comments below**
Did the standardized patient perform according to scenario?	
Standardized Patient	**Initial if correct. If not correct, initial and enter comments below**
SP confirmation of examiner's scoring - all bubbles filled in?	

APPENDIX 'D'

Example Program Statements from Facets

```
Title= 2002 OSCEs, March 16, 2002: No Anchor
Output=02March16.OUT   ;name of output file
Score file=02March16.SC ; score files .SC1, .SC2, .SC3
Facets=3               ;Three facets, Candidate, Examiners, Items
Arrange=m,2N,0f        ;arrange tables in measure order, descending, etc
Positive=1             ;the candidates have greater ability with greater
score
Non-centered=1         ;Candidates are non-centred, all other facets are
centred.
Unexpected=2           ;report ratings if standardized residual >=|2|
Usort = (1,2,3),(Z3)   ;sort unexpected ratings various ways
Vertical=1*,2*,3*      ;define rulers
Zscore=1,2             ;report bias size than 1 logit or z>2

Gstats=yes

Model=
?,?,#,R9          ;Station items reported
*

data=02March16.csv
*

Labels=                ;to name the components

1,Candidates           ; Name of First Facet
31101-31813            ;31101-124813
64101-66913            ;31101-124813
95104-95812            ;
124101-124813          ;
7001=MPLMarch16

*

2,Examiners            ;name of Second facet
500-530
1001=Adler
1002=Allan
1003=Anctil
1003=Anctil
1004=Andrews
1005=Arbour
1006=Armata
1007=Aubin
1008=Baloo
1009=Barrette-Plante
1010=Berman
1011=Bjornson
1012=Bourdon
1013=Brickman
```

1014=Bureau
1015=Bussieres
1016=Carter
1017=Cashman
1018=Cere
1019=Chan
1020=Couture
1021=Damecou
1022=Domingo
1023=Dougley
1024=Dyck
1025=Fafard
1026=Filion
1027=Fournelle
1028=Gorchynski
1029=Green
1030=Groleau
1031=Guben
1032=Houle
1033=Kanovsky
1034=Kennedy
1035=Konczak
1036=LaFlamme
1037=Lambert
1038=Langford
1039=Lee
1040=Lefebvre
1041=Lemaire
1042=Lu
1043=Luckhurst
1044=Makos
1045=Mason
1046=Mizel
1047=Moreau
1048=Narayan
1049=Nasser
1050=Newton
1051=NG
1052=Nsitem
1053=Olin
1054=Orchard
1055=Parr
1056=Perron
1057=Pikula
1058=Pinard
1059=Poitras
1060=Prete
1061=Prince
1062=Proulx
1063=Pszeniczny
1065=Puchalski
1066=Richard
1067=Rissis
1068=Roy
1069=Schoonderwoerd

1070=Shahrokh
1071=Shaughnessy
1072=Skleryk
1073=Storey
1074=Stover
1075=Styles
1076=Suleman
1077=Terlesky
1078=Teschl
1079=Thomson
1080=Tucker
1081=Van Walleghem
1082=Voisard
1083=Wasser
1084=Whale
1085=Wibaut
1086=Bernard
1087=Schuster
1088=Lee-Ying
1089=Kwok
1090=Dhalla
1091=Cashman
1092=Doll
1093=Sembrat
1094=Morton
1095=Brooker
1096=Wong
1097=Metz
1098=Scott
1099=Rawson
1100=Abdulla
1101=Homer
1102=Gardiner
1103=Tridico
1104=Schellenberg
1105=Langdon
1106=Shankar
1107=Lyn
1108=Jackson
1109=Zulani
1110=Kiely
1111=Dumanski
1112=Yearwood
1113=Poulot
1114=LaChance
1115=Langlois
1116=St-Hilaire
1117=Lepage
1118=Cadoret-Auger
1119=Chabot
1120=Thibaudeau
1121=Levaque
1122=Girard
1123=Jongedijk
1124=Hehn-Zwicker

```
1125=Drover
1126=Guthrie
1127=Heimark
1128=Mattinen
1129=Hector
1130=Morin
1131=Normandin
*

3,Items         ;No Anchoring
1-754           ;No information about the items
*
```

```
Title= 2002 OSCEs, June 9, 2002: Anchor Examiners
Output=02June9.OUT   ;name of output file
Score file=02June9.SC ; score files .SC1, .SC2, .SC3
Facets=3              ;Three facets, Candidate, Examiners, Items
Arrange=m,2N,0f       ;arrange tables in measure order, descending, etc
Positive=1            ;the candidates have greater ability with greater
score
Non-centered=1        ;Candidates are non-centred, all other facets are
centred.
Unexpected=2          ;report ratings if standardized residual >=|2|
Usort = (1,2,3),(Z3)  ;sort unexpected ratings various ways
Vertical=1*,2*,3*     ;define rulers
Zscore=1,2            ;report bias size than 1 logit or z>2

Gstats=yes

Model=
?,?,#,R9          ;Station items reported
*

data=02June9.csv
*

Labels=               ;to name the components

1,Candidates          ; Name of First Facet
31101-31813           ;31101-124813
64101-66913           ;31101-124813
95104-95812           ;
124101-124813         ;
8002=MPLJune9

*

2,Examiners,G,0           ;name of Second facet
500-530
1001=Adler,0,1
1002=Allan,0,1
1003=Anctil,0,1
1004=Andrews,0,1
1005=Arbour,0,1
1006=Armata,0,1
```

```
1007=Aubin,0,1
1008=Baloo,0,1
1009=Barrette-Plante,0,2
1010=Berman,0,1
1011=Bjornson,0,1
1012=Bourdon,0,2
1013=Brickman,0,1
1014=Bureau,0,2
1015=Bussieres,0,2
1016=Carter,0,1
1017=Cashman,0,1
1018=Cere,0,1
1019=Chan,0,1
1020=Couture,0,1
1021=Damecou,0,1
1022=Domingo,0,1
1023=Dougley,0,1
1024=Dyck,0,1
1025=Fafard,0,1
1026=Filion,0,1
1027=Fournelle,0,1
1028=Gorchynski,0,1
1029=Green,0,1
1030=Groleau,0,1
1031=Guben,0,1
1032=Houle,0,1
1033=Kanovsky,0,1
1034=Kennedy,0,1
1035=Konczak,0,1
1036=LaFlamme,0,1
1037=Lambert,0,1
1038=Langford,0,1
1039=Lee,0,1
1040=Lefebvre,0,1
1041=Lemaire,0,1
1042=Lu,0,1
1043=Luckhurst,0,1
1044=Makos,0,1
1045=Mason,0,1
1046=Mizel,0,1
1047=Moreau,0,1
1048=Narayan,0,1
1049=Nasser,0,1
1050=Newton,0,1
1051=NG,0,1
1052=Nsitem,0,1
1053=Olin,0,1
1054=Orchard,0,1
1055=Parr,0,1
1056=Perron,0,1
1057=Pikula,0,1
1058=Pinard,0,1
1059=Poitras,0,1
1060=Prete,0,1
1061=Prince,0,1
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1062=Proulx,0,1
1063=Pszeniczny,0,1
1065=Puchalski,0,1
1066=Richard,0,1
1067=Rissis,0,1
1068=Roy,0,2
1069=Schoonderwoerd,0,1
1070=Shahrokh,0,1
1071=Shaughnessy,0,1
1072=Skleryk,0,1
1073=Storey,0,1
1074=Stover,0,1
1075=Styles,0,1
1076=Suleman,0,1
1077=Terlesky,0,1
1078=Teschl,0,1
1079=Thomson,0,1
1080=Tucker,0,1
1081=Van Walleghem,0,1
1082=Voisard,0,1
1083=Wasser,0,1
1084=Whale,0,1
1085=Wibaut,0,1
1086=Bernard,0,1
1087=Schuster,0,1
1088=Lee-Ying,0,1
1089=Kwok,0,1
1090=Dhalla,0,1
1091=Cashman,0,1
1092=Doll,0,1
1093=Sembrat,0,1
1094=Morton,0,1
1095=Brooker,0,1
1096=Wong,0,1
1097=Metz,0,1
1098=Scott,0,1
1099=Rawson,0,1
1100=Abdulla,0,1
1101=Homer,0,1
1102=Gardiner,0,1
1103=Tridico,0,1
1104=Schellenberg,0,1
1105=Langdon,0,1
1106=Shankar,0,1
1107=Lyn,0,1
1108=Jackson,0,1
1109=Zulani,0,1
1110=Kiely,0,1
1111=Dumanski,0,1
1112=Yearwood,0,1
1113=Poulot,0,2
1114=LaChance,0,2
1115=Langlois,0,2
1116=St-Hilaire,0,2
1117=Lepage,0,2
```

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1118=Cadoret-Auger,0,2
1119=Chabot,0,2
1120=Thibaudeau,0,2
1121=Levaque,0,2
1122=Girard,0,2
1123=Jongedijk,0,2
1124=Hehn-Zwicker,0,1
1125=Drover,0,1
1126=Guthrie,0,1
1127=Heimark,0,1
1128=Mattinen,0,2
1129=Hector,0,2
1130=Morin,0,2
1131=Normandin,0,2
*

3,Items          ;No Anchoring
1-754            ;No information about the items
```

APPENDIX 'E'
ANOVA for Eight Examinations

Table 4

Analysis of Variance (ANOVA)
By Track – March 16 Examination

Number of obs = 46
Root MSE = 6.83

Source	Partial SS	df	MS	F	Prob > F
Model	396.20	1	396.20	8.48	0.01
track	396.20	1	396.20	8.48	0.01
Residual	2054.52	44	46.70		
Total	2450.72	45	54.46		

Table 5

Analysis of Variance (ANOVA)
By Track – March 17 Examination

Number of obs = 49
Root MSE = 6.99

Source	Partial SS	df	MS	F	Prob > F
Model	182.44	1	182.44	3.74	0.06
track	182.44	1	182.44	3.74	0.06
Residual	2295.76	47	48.84		
Total	2478.20408	48	51.63		

Table 6

Analysis of Variance (ANOVA)
By Track – June 8 Examination

Number of obs = 105
Root MSE = 6.39

Source	Partial SS	df	MS	F	Prob > F
Model	425.68	4	106.42	2.61	0.04
track	425.68	4	106.42	2.61	0.04
Residual	4080.17	100	40.81		
Total	4505.85	104	43.32		

Table 7

Analysis of Variance (ANOVA)
By Track – June 9 Examination (English)

Number of obs = 97
Root MSE = 89.84

Source	Partial SS	df	MS	F	Prob > F
Model	83390.21	3	27796.74	3.44	0.02
track	83390.21	3	27796.74	3.44	0.02
Residual	750689.68	93	8071.93		
Total	834079.89	96	8688.33		

Table 8

Analysis of Variance (ANOVA)
By Track – June 9 Examination (French)

Number of obs = 42
Root MSE = 95.01

Source	Partial SS	df	MS	F	Prob > F
Model	7747.93	1	7747.93	0.86	0.36
track	7747.93	1	7747.93	0.86	0.36
Residual	361075.01	40	9026.88		
Total	368822.94	41	8995.68		

Table 9

Analysis of Variance (ANOVA)
By Track – Sept 9 Examination

Number of obs = 75
Root MSE = 6.62

Source	Partial SS	df	MS	F	Prob > F
Model	180.10	3	60.32	1.38	0.26
track	180.96	3	60.32	1.38	0.26
Residual	3113.04	71	43.85		
Total	3294	74	44.51		

Table 10

Analysis of Variance (ANOVA)
By Track – Dec 7 Examination

Number of obs = 53
Root MSE = 5.24

Source	Partial SS	df	MS	F	Prob > F
Model	.10	1	.10	0.00	0.95
track	.10	1	.10	0.00	0.95
Residual	1401.07	51	27.47		
Total	1401.17	52	26.94		

Table 11

Analysis of Variance (ANOVA)
By Track – Dec 8 Examination

Number of obs = 46
Root MSE = 6.90

Source	Partial SS	df	MS	F	Prob > F
Model	40.84	1	40.84	0.86	0.36
track	40.84	1	40.84	0.86	0.36
Residual	2093.09	44	47.57		
Total	2133.93478	45	47.42		

APPENDIX 'F'

Tables 12 to 21

Examination Mean Scores by Examiner

Station Results

Table 12

Station 1 – Patient Interview

Mean Scores and Confidence Intervals

All Examinations and Tracks

Row		Obs	Mean	Std. Err.	[95% Conf.	Interval]
1	**exam = 1, centre = 1, exmnr = 1, stn1per**	**23**	**69.00**	**2.74**	**63.31**	**74.69**
2	**exam = 1, centre = 1, exmnr = 2, stn1per**	**23**	**85.48**	**2.32**	**80.67**	**90.29**
3	exam = 2, centre = 1, exmnr = 1, stn1per	25	84.96	2.49	79.83	90.09
4	exam = 2, centre = 1, exmnr = 2, stn1per	24	76.00	2.30	71.25	80.75
5	exam = 3, centre = 2, exmnr = 1, stn1per	21	80.10	2.90	74.04	86.15
6	exam = 3, centre = 2, exmnr = 2, stn1per	20	76.30	2.79	70.45	82.15
7	**exam = 3, centre = 2, exmnr = 3, stn1per**	**20**	**85.60**	**1.85**	**81.74**	**89.46**
8	**exam = 3, centre = 2, exmnr = 4, stn1per**	**20**	**73.30**	**3.04**	**66.93**	**79.67**
9	exam = 3, centre = 2, exmnr = 5, stn1per	24	83.54	2.32	78.75	88.34
10	exam = 4, centre = 2, exmnr = 1, stn1per	25	80.28	1.36	77.46	83.10
11	exam = 4, centre = 2, exmnr = 2, stn1per	23	78.04	2.17	73.54	82.55
12	exam = 4, centre = 2, exmnr = 3, stn1per	24	78.67	1.93	74.67	82.66
13	exam = 4, centre = 2, exmnr = 4, stn1per	25	84.08	1.34	81.31	86.85
14	exam = 4, centre = 3, exmnr = 1, stn1per	21	75.57	2.16	71.06	80.09
15	exam = 4, centre = 3, exmnr = 2, stn1per	21	76.95	2.26	72.23	81.67
16	**exam = 5, centre = 2, exmnr = 1, stn1per**	**19**	**58.89**	**3.31**	**51.95**	**65.84**
17	**exam = 5, centre = 2, exmnr = 2, stn1per**	**19**	**80.79**	**2.49**	**75.55**	**86.03**
18	**exam = 5, centre = 2, exmnr = 3, stn1per**	**19**	**73.63**	**2.86**	**67.62**	**79.65**
19	**exam = 5, centre = 2, exmnr = 4, stn1per**	**18**	**73.50**	**3.50**	**66.12**	**80.88**
20	exam = 6, centre = 3, exmnr = 1, stn1per	27	80.11	2.43	75.11	85.11
21	exam = 6, centre = 3, exmnr = 2, stn1per	26	77.46	2.25	72.82	82.10
22	exam = 7, centre = 3, exmnr = 1, stn1per	22	75.00	2.49	69.83	80.17
23	exam = 7, centre = 3, exmnr = 2, stn1per	24	75.00	2.72	69.38	80.62

Table 13

Station 2 – Physical Examination
Mean Scores and Confidence Intervals
All Examinations and Tracks

	Obs	Mean	Std. Err	[95% Conf.	Interval]
exam = 1, centre = 1, exmnr = 1, stn2per	23	73.70	2.54	68.42	78.97
exam = 1, centre = 1, exmnr = 2, stn2per	23	71.04	2.73	65.39	76.70
exam = 2, centre = 1, exmnr = 1, stn2per	25	66.72	2.10	62.38	71.06
exam = 2, centre = 1, exmnr = 2, stn2per	**24**	**52.50**	**3.70**	**44.85**	**60.15**
exam = 3, centre = 2, exmnr = 1, stn2per	21	63.62	4.01	55.25	71.98
exam = 3, centre = 2, exmnr = 2, stn2per	20	69.30	3.01	62.99	75.61
exam = 3, centre = 2, exmnr = 3, stn2per	20	74.20	2.28	69.44	78.96
exam = 3, centre = 2, exmnr = 4, stn2per	20	70.65	2.93	64.51	76.79
exam = 3, centre = 2, exmnr = 5, stn2per	24	65.71	2.38	60.79	70.62
exam = 4, centre = 2, exmnr = 1, stn2per	25	78.52	1.98	74.43	82.61
exam = 4, centre = 2, exmnr = 2, stn2per	23	68.96	3.23	62.27	75.65
exam = 4, centre = 2, exmnr = 3, stn2per	**24**	**68.13**	**2.84**	**62.25**	**74.00**
exam = 4, centre = 2, exmnr = 4, stn2per	**25**	**66.84**	**2.91**	**60.83**	**72.85**
exam = 4, centre = 3, exmnr = 1, stn2per	21	74.19	2.98	67.96	80.42
exam = 4, centre = 3, exmnr = 2, stn2per	21	76.29	2.31	71.46	81.11
exam = 5, centre = 2, exmnr = 1, stn2per	19	62.11	3.19	55.41	68.80
exam = 5, centre = 2, exmnr = 2, stn2per	19	70.74	2.72	65.02	76.46
exam = 5, centre = 2, exmnr = 3, stn2per	19	60.68	2.11	56.24	65.13
exam = 5, centre = 2, exmnr = 4, stn2per	18	70.17	3.52	62.75	77.59
exam = 6, centre = 3, exmnr = 1, stn2per	27	72.37	2.20	67.86	76.88
exam = 6, centre = 3, exmnr = 2, stn2per	26	74.50	1.43	71.56	77.44
exam = 7, centre = 3, exmnr = 1, stn2per	22	76.45	2.07	72.16	80.75
exam = 7, centre = 3, exmnr = 2, stn2per	24	79.33	2.45	74.27	84.39

Table 14

Station 4 – Multiple Directed Physical Examination
Mean Scores and Confidence Intervals
All Examinations and Tracks

	Obs	Mean	Std. Err.	[95% Conf.	Interval]
exam = 1, centre = 1, exmnr = 1, stn4per	23	80.78	1.62	77.43	84.14
exam = 1, centre = 1, exmnr = 2, stn4per	23	80.61	2.52	75.39	85.83
exam = 2, centre = 1, exmnr = 1, stn4per	25	73.56	3.38	66.58	80.54
exam = 2, centre = 1, exmnr = 2, stn4per	24	63.75	3.93	55.62	71.88
exam = 3, centre = 2, exmnr = 1, stn4per	21	76.71	1.85	72.86	80.57
exam = 3, centre = 2, exmnr = 2, stn4per	20	77.20	2.48	72.01	82.39
exam = 3, centre = 2, exmnr = 3, stn4per	20	82.30	1.64	78.86	85.74
exam = 3, centre = 2, exmnr = 4, stn4per	20	77.60	2.45	72.47	82.73
exam = 3, centre = 2, exmnr = 5, stn4per	24	83.08	2.57	77.76	88.41
exam = 4, centre = 2, exmnr = 1, stn4per	25	80.28	2.58	74.95	85.61
exam = 4, centre = 2, exmnr = 2, stn4per	23	81.52	2.50	76.34	86.70
exam = 4, centre = 2, exmnr = 3, stn4per	24	82.04	3.01	75.81	88.28
exam = 4, centre = 2, exmnr = 4, stn4per	**25**	**90.68**	**1.30**	**87.99**	**93.37**
exam = 4, centre = 3, exmnr = 1, stn4per	21	91.90	1.73	88.29	95.52
exam = 4, centre = 3, exmnr = 2, stn4per	**21**	**83.81**	**1.95**	**79.74**	**87.88**
exam = 5, centre = 2, exmnr = 1, stn4per	19	78.26	3.84	70.20	86.32
exam = 5, centre = 2, exmnr = 2, stn4per	**19**	**55.05**	**4.59**	**45.40**	**64.70**
exam = 5, centre = 2, exmnr = 3, stn4per	19	65.63	3.62	58.03	73.24
exam = 5, centre = 2, exmnr = 4, stn4per	18	70.44	2.86	64.41	76.48
exam = 6, centre = 3, exmnr = 1, stn4per	27	83.37	2.15	78.95	87.79
exam = 6, centre = 3, exmnr = 2, stn4per	26	84.27	1.99	80.16	88.38
exam = 7, centre = 3, exmnr = 1, stn4per	22	83.14	2.00	78.97	87.30
exam = 7, centre = 3, exmnr = 2, stn4per	**24**	**90.96**	**0.95**	**88.99**	**92.93**

Table 15

Station 5 – Informed Consent
Mean Scores and Confidence Intervals
All Examinations and Tracks

	Obs	Mean	Std. Err.	[95% Conf. Interval]	
exam = 1, centre = 1, exmnr = 1, stn5per	23	71.61	4.54	62.20	81.02
exam = 1, centre = 1, exmnr = 2, stn5per	23	68.13	2.96	61.99	74.27
exam = 2, centre = 1, exmnr = 1, stn5per	25	78.64	2.57	73.34	83.94
exam = 2, centre = 1, exmnr = 2, stn5per	**24**	**57.83**	**3.30**	**51.00**	**64.67**
exam = 3, centre = 2, exmnr = 1, stn5per	21	69.00	4.36	59.90	78.10
exam = 3, centre = 2, exmnr = 2, stn5per	20	68.15	4.60	58.51	77.79
exam = 3, centre = 2, exmnr = 3, stn5per	20	80.40	2.72	74.72	86.08
exam = 3, centre = 2, exmnr = 4, stn5per	20	74.05	3.41	66.91	81.19
exam = 3, centre = 2, exmnr = 5, stn5per	24	68.33	4.12	59.81	76.86
exam = 4, centre = 2, exmnr = 1, stn5per	25	78.44	2.69	72.89	83.99
exam = 4, centre = 2, exmnr = 2, stn5per	**23**	**63.91**	**3.21**	**57.25**	**70.57**
exam = 4, centre = 2, exmnr = 3 stn5per	24	80.83	2.46	75.74	85.93
exam = 4, centre = 2, exmnr = 4, stn5per	25	73.96	2.57	68.66	79.26
exam = 4, centre = 3, exmnr = 1, stn5per	21	67.81	2.20	63.22	72.40
exam = 4, centre = 3, exmnr = 2, stn5per	21	68.43	1.96	64.34	72.52
exam = 5, centre = 2, exmnr = 1, stn5per	19	58.84	4.30	49.82	67.87
exam = 5, centre = 2, exmnr = 2, stn5per	19	68.79	2.55	63.43	74.15
exam = 5, centre = 2, exmnr = 3, stn5per	**19**	**74.95**	**2.93**	**68.79**	**81.11**
exam = 5, centre = 2, exmnr = 4, stn5per	18	66.89	3.32	59.88	73.90
exam = 6, centre = 3, exmnr = 1, stn5per	27	65.52	3.15	59.04	71.99
exam = 6, centre = 3, exmnr = 2, stn5per	**26**	**78.15**	**2.23**	**73.55**	**82.75**
exam = 7, centre = 3, exmnr = 1, stn5per	22	71.73	2.82	65.87	77.58
exam = 7, centre = 3, exmnr = 2, stn5per	24	74.79	3.45	67.65	81.93

Table 16

Station 6 – Combined Patient Interview and Physical Examination
Mean Scores and Confidence Intervals
All Examinations and Tracks

	Obs	Mean	Std. Err.	[95% Conf.	Interval]
exam = 1, centre = 1, exmnr = 1, stn6per	23	74.00	2.49	68.83	79.17
exam = 1, centre = 1, exmnr = 2, stn6per	23	70.04	2.07	65.75	74.34
exam = 2, centre = 1, exmnr = 1, stn6per	25	67.40	2.60	62.04	72.76
exam = 2, centre = 1, exmnr = 2, stn6per	24	72.54	2.62	67.12	77.96
exam = 3, centre = 2, exmnr = 1, stn6per	**21**	**68.67**	**2.05**	**64.38**	**72.95**
exam = 3, centre = 2, exmnr = 2, stn6per	20	59.15	2.35	54.23	64.07
exam = 3, centre = 2, exmnr = 3, stn6per	20	62.30	2.69	56.68	67.92
exam = 3, centre = 2, exmnr = 4, stn6per	20	68.70	3.17	62.06	75.34
exam = 3, centre = 2, exmnr = 5, stn6per	24	58.67	2.43	53.64	63.69
exam = 4, centre = 2, exmnr = 1, stn6per	25	65.04	2.66	59.55	70.53
exam = 4, centre = 2, exmnr = 2, stn6per	23	50.78	4.31	41.85	59.72
exam = 4, centre = 2, exmnr = 3, stn6per	24	61.54	3.33	54.65	68.44
exam = 4, centre = 2, exmnr = 4, stn6per	25	61.92	3.73	54.22	69.62
exam = 4, centre = 3, exmnr = 1, stn6per	21	79.62	1.80	75.86	83.38
exam = 4, centre = 3, exmnr = 2, stn6per	21	70.00	3.08	63.57	76.43
exam = 5, centre = 2, exmnr = 1, stn6per	19	70.00	2.07	65.66	74.34
exam = 5, centre = 2, exmnr = 2, stn6per	19	72.37	1.62	68.96	75.77
exam = 5, centre = 2, exmnr = 3, stn6per	19	71.00	2.31	66.15	75.85
exam = 5, centre = 2, exmnr = 4, stn6per	18	64.11	2.70	58.41	69.82
exam = 6, centre = 3, exmnr = 1, stn6per	27	73.70	2.76	68.02	79.39
exam = 6, centre = 3, exmnr = 2, stn6per	26	69.04	2.40	64.09	73.98
exam = 7, centre = 3, exmnr = 1, stn6per	22	62.36	3.49	55.10	69.62
exam = 7, centre = 3, exmnr = 2, stn6per	24	60.17	3.12	53.71	66.62

Table 17

Station 8 – Combined Patient Interview and Physical Examination
Mean Scores and Confidence Intervals
All Examinations and Tracks

	Obs	Mean	Std. Err.	[95% Conf.	Interval]
exam = 1, centre = 1, exmnr = 1, stn8per	23	63.91	2.62	58.49	69.34
exam = 1, centre = 1, exmnr = 2, stn8per	23	64.96	2.96	58.82	71.09
exam = 2, centre = 1, exmnr = 1, stn8per	25	70.76	1.97	66.70	74.82
exam = 2, centre = 1, exmnr = 2, stn8per	24	72.71	2.15	68.26	77.16
exam = 3, centre = 2, exmnr = 1, stn8per	21	68.71	3.10	62.24	75.19
exam = 3, centre = 2, exmnr = 2, stn8per	20	71.65	2.35	66.73	76.57
exam = 3, centre = 2, exmnr = 3, stn8per	20	68.80	2.16	64.27	73.33
exam = 3, centre = 2, exmnr = 4, stn8per	20	77.15	2.22	72.50	81.80
exam = 3, centre = 2, exmnr = 5, stn8per	**24**	**77.46**	**1.49**	**74.37**	**80.54**
exam = 4, centre = 2, exmnr = 1, stn8per	25	64.56	3.10	58.17	70.95
exam = 4, centre = 2, exmnr = 2, stn8per	23	74.09	2.27	69.37	78.80
exam = 4, centre = 2, exmnr = 3, stn8per	**24**	**59.83**	**2.54**	**54.59**	**65.08**
exam = 4, centre = 2, exmnr = 4, stn8per	25	76.32	2.42	71.32	81.32
exam = 4, centre = 3, exmnr = 1, stn8per	21	80.33	1.60	77.00	83.67
exam = 4, centre = 3, exmnr = 2, stn8per	**21**	**69.24**	**2.78**	**63.44**	**75.04**
exam = 5, centre = 2, exmnr = 1, stn8per	19	60.47	3.56	52.99	67.96
exam = 5, centre = 2, exmnr = 2, stn8per	19	57.63	3.82	49.61	65.65
exam = 5, centre = 2, exmnr = 3, stn8per	19	56.79	3.32	49.81	63.77
exam = 5, centre = 2, exmnr = 4, stn8per	18	56.39	2.84	50.40	62.38
exam = 6, centre = 3, exmnr = 1, stn8per	27	69.19	1.66	65.76	72.61
exam = 6, centre = 3, exmnr = 2, stn8per	**26**	**61.08**	**1.73**	**57.50**	**64.65**
exam = 7, centre = 3, exmnr = 1, stn8per	22	77.55	2.65	72.03	83.06
exam = 7, centre = 3, exmnr = 2, stn8per	24	68.21	2.66	62.71	73.71

Table 18

Station 9 – Patient Interview
Mean Scores and Confidence Intervals
All Examinations and Tracks

	Obs	Mean	Std. Err.	[95% Conf.	Interval]
exam = 1, centre = 1, exmnr = 1, stn9per	**23**	**54.09**	**3.19**	**47.48**	**60.70**
exam = 1, centre = 1, exmnr = 2, stn9per	23	72.91	2.11	68.54	77.29
exam = 2, centre = 1, exmnr = 1, stn9per	25	72.04	2.30	67.30	76.78
exam = 2, centre = 1, exmnr = 2, stn9per	24	66.63	2.24	61.99	71.26
exam = 3, centre = 2, exmnr = 1, stn9per	21	72.00	2.13	67.56	76.44
exam = 3, centre = 2, exmnr = 2, stn9per	20	74.70	1.98	70.56	78.84
exam = 3, centre = 2, exmnr = 3, stn9per	**20**	**81.45**	**1.51**	**78.30**	**84.60**
exam = 3, centre = 2, exmnr = 4, stn9per	**20**	**82.20**	**2.18**	**77.64**	**86.76**
exam = 3, centre = 2, exmnr = 5, stn9per	24	78.38	2.02	74.20	82.55
exam = 4, centre = 2, exmnr = 1, stn9per	25	80.80	1.77	77.15	84.45
exam = 4, centre = 2, exmnr = 2, stn9per	23	78.30	2.21	73.72	82.89
exam = 4, centre = 2, exmnr = 3, stn9per	24	77.13	2.17	72.63	81.62
exam = 4, centre = 2, exmnr = 4, stn9per	25	75.92	1.47	72.88	78.96
exam = 4, centre = 3, exmnr = 1, stn9per	21	76.48	1.49	73.36	79.59
exam = 4, centre = 3, exmnr = 2, stn9per	21	74.81	2.17	70.27	79.34
exam = 5, centre = 2, exmnr = 1, stn9per	19	76.58	1.57	73.28	79.88
exam = 5, centre = 2, exmnr = 2, stn9per	**19**	**88.00**	**1.99**	**83.82**	**92.18**
exam = 5, centre = 2, exmnr = 3, stn9per	19	75.79	1.34	72.98	78.60
exam = 5, centre = 2, exmnr = 4, stn9per	18	83.61	2.93	77.43	89.80
exam = 6, centre = 3, exmnr = 1, stn9per	27	82.07	1.52	78.95	85.20
exam = 6, centre = 3, exmnr = 2, stn9per	26	78.15	1.67	74.71	81.60
exam = 7, centre = 3, exmnr = 1, stn9per	22	85.95	1.60	82.62	89.29
exam = 7, centre = 3, exmnr = 2, stn9per	**24**	**75.75**	**2.40**	**70.78**	**80.72**

Table 19

Station 10 – Physical Examination
Mean Scores and Confidence Intervals
All Examinations and Tracks

	Obs	Mean	Std. Err.	[95% Conf.	Interval]
exam = 1, centre = 1, exmnr = 1, stn10per	23	67.26	2.74	61.57	72.95
exam = 1, centre = 1, exmnr = 2, stn10per	23	62.22	2.42	57.21	67.23
exam = 2, centre = 1, exmnr = 1, stn10per	25	66.16	2.23	61.56	70.76
exam = 2, centre = 1, exmnr = 2, stn10per	24	72.33	1.75	68.72	75.95
exam = 3, centre = 2, exmnr = 1, stn10per	21	48.24	3.02	41.95	54.53
exam = 3, centre = 2, exmnr = 2, stn10per	20	60.80	3.59	53.29	68.31
exam = 3, centre = 2, exmnr = 3, stn10per	20	58.50	1.94	54.44	62.56
exam = 3, centre = 2, exmnr = 4, stn10per	20	55.35	2.99	49.09	61.61
exam = 3, centre = 2, exmnr = 5, stn10per	**24**	**67.21**	**2.24**	**62.58**	**71.84**
exam = 4, centre = 2, exmnr = 1, stn10per	25	67.16	1.91	63.21	71.11
exam = 4, centre = 2, exmnr = 2, stn10per	**23**	**53.13**	**2.12**	**48.73**	**57.53**
exam = 4, centre = 2, exmnr = 3, stn10per	24	61.25	2.29	56.51	65.99
exam = 4, centre = 2, exmnr = 4, stn10per	25	60.52	2.32	55.72	65.32
exam = 4, centre = 3, exmnr = 1, stn10per	21	71.10	2.82	65.20	76.99
exam = 4, centre = 3, exmnr = 2, stn10per	21	73.86	3.19	67.19	80.52
exam = 5, centre = 2, exmnr = 1, stn10per	19	54.95	3.97	46.61	63.28
exam = 5, centre = 2, exmnr = 2, stn10per	19	63.63	3.19	56.94	70.33
exam = 5, centre = 2, exmnr = 3, stn10per	19	68.42	2.52	63.13	73.72
exam = 5, centre = 2, exmnr = 4, stn10per	18	66.28	2.91	60.14	72.42
exam = 6, centre = 3, exmnr = 1, stn10per	27	67.74	2.32	62.97	72.51
exam = 6, centre = 3, exmnr = 2, stn10per	26	68.04	2.01	63.90	72.18
exam = 7, centre = 3, exmnr = 1, stn10per	22	69.23	2.27	64.52	73.94
exam = 7, centre = 3, exmnr = 2, stn10per	24	65.92	2.49	60.77	71.06

Table 20

Station 11 – Multiple Directed Physical Examination
Mean Scores and Confidence Intervals
All Examinations and Tracks

	Obs	Mean	Std. Err.	[95% Conf.	Interval]
exam = 1, centre = 1, exmnr = 1, stn11per	23	68.74	3.16	62.18	75.30
exam = 1, centre = 1, exmnr = 2, stn11per	23	78.78	2.98	72.59	84.97
exam = 2, centre = 1, exmnr = 1, stn11per	**25**	**71.12**	**3.20**	**64.51**	**77.73**
exam = 2, centre = 1, exmnr = 2, stn11per	24	84.33	3.05	78.03	90.64
exam = 3, centre = 2, exmnr = 1, stn11per	**21**	**88.19**	**1.79**	**84.46**	**91.92**
exam = 3, centre = 2, exmnr = 2, stn11per	20	79.30	4.57	69.74	88.86
exam = 3, centre = 2, exmnr = 3, stn11per	20	74.45	3.05	68.06	80.84
exam = 3, centre = 2, exmnr = 4, stn11per	20	89.90	2.19	85.32	94.48
exam = 3, centre = 2, exmnr = 5, stn11per	24	80.46	3.05	74.15	86.76
exam = 4, centre = 2, exmnr = 1, stn11per	25	78.20	1.87	74.34	82.06
exam = 4, centre = 2, exmnr = 2, stn11per	23	80.30	1.66	76.86	83.75
exam = 4, centre = 2, exmnr = 3, stn11per	24	81.71	1.49	78.62	84.79
exam = 4, centre = 2, exmnr = 4, stn11per	25	83.92	2.23	79.33	88.51
exam = 4, centre = 3, exmnr = 1, stn11per	21	89.05	0.85	87.28	90.81
exam = 4, centre = 3, exmnr = 2, stn11per	21	91.43	1.59	88.12	94.73
exam = 5, centre = 2, exmnr = 1, stn11per	19	65.42	4.27	56.45	74.40
exam = 5, centre = 2, exmnr = 2, stn11per	19	64.00	2.83	58.06	69.94
exam = 5, centre = 2, exmnr = 3, stn11per	19	68.42	3.83	60.37	76.48
exam = 5, centre = 2, exmnr = 4, stn11per	18	66.94	3.16	60.27	73.62
exam = 6, centre = 3, exmnr = 1, stn11per	27	88.63	3.09	82.29	94.97
exam = 6, centre = 3, exmnr = 2, stn11per	26	84.54	2.15	80.11	88.97
exam = 7, centre = 3, exmnr = 1, stn11per	22	88.68	1.19	86.20	91.16
exam = 7, centre = 3, exmnr = 2, stn11per	**24**	**81.29**	**1.91**	**77.34**	**85.24**

Table 21

Station 13 – Treatment
Mean Scores and Confidence Intervals
All Examinations and Tracks

	Obs	Mean	Std. Err.	[95% Conf.	Interval]
exam = 1, centre = 1, exmnr = 1, stn13per	**23**	**45.30**	**3.41**	**38.23**	**52.38**
exam = 1, centre = 1, exmnr = 2, stn13per	23	70.96	3.58	63.53	78.39
exam = 2, centre = 1, exmnr = 1, stn13per	25	71.04	3.54	63.73	78.35
exam = 2, centre = 1, exmnr = 2, stn13per	24	68.04	2.89	62.06	74.03
exam = 3, centre = 2, exmnr = 1, stn13per	21	75.90	2.29	71.12	80.69
exam = 3, centre = 2, exmnr = 2, stn13per	20	70.10	3.82	62.10	78.10
exam = 3, centre = 2, exmnr = 3, stn13per	**20**	**88.20**	**1.81**	**84.41**	**91.99**
exam = 3, centre = 2, exmnr = 4, stn13per	20	77.80	2.78	71.98	83.62
exam = 3, centre = 2, exmnr = 5, stn13per	24	73.88	2.34	69.03	78.72
exam = 4, centre = 2, exmnr = 1, stn13per	25	63.64	2.35	58.79	68.49
exam = 4, centre = 2, exmnr = 2, stn13per	23	68.57	2.96	62.42	74.71
exam = 4, centre = 2, exmnr = 3, stn13per	**24**	**80.50**	**2.58**	**75.17**	**85.83**
exam = 4, centre = 2, exmnr = 4, stn13per	25	67.52	2.22	62.94	72.10
exam = 4, centre = 3, exmnr = 1, stn13per	21	76.57	3.65	68.96	84.19
exam = 4, centre = 3, exmnr = 2, stn13per	21	80.81	2.75	75.07	86.55
exam = 5, centre = 2, exmnr = 1, stn13per	19	80.05	2.99	73.77	86.34
exam = 5, centre = 2, exmnr = 2, stn13per	19	77.21	3.62	69.60	84.82
exam = 5, centre = 2, exmnr = 3, stn13per	**19**	**67.74**	**2.90**	**61.64**	**73.84**
exam = 5, centre = 2, exmnr = 4, stn13per	18	80.44	2.72	74.70	86.19
exam = 6, centre = 3, exmnr = 1, stn13per	27	73.22	2.02	69.06	77.38
exam = 6, centre = 3, exmnr = 2, stn13per	26	81.08	2.18	76.59	85.56
exam = 7, centre = 3, exmnr = 1, stn13per	22	74.09	1.86	70.23	77.95
exam = 7, centre = 3, exmnr = 2, stn13per	24	75.08	2.83	69.24	80.93

APPENDIX 'G'

Candidates

OSCEs 2002 – FACET Output

Obsvd Score	Obsvd Count	Obsvd Average	Fair-M Avrage	Measure	Model S.E.	Infit MnSq	Outfit MnSq	PtBis	Candidates
291	170	1.7	1.99	0.87	0.1	1.6	1.4	0.37	95306
334	169	2	2.24	1.45	0.11	1.5	1.2	0.47	31802
319	169	1.9	2.07	0.94	0.1	1.5	**1.9**	0.46	64601
327	169	1.9	2.09	1.08	0.11	1.5	1.6	0.45	65404
216	170	1.3	1.69	0.41	0.1	1.5	1.6	0.36	95106
295	165	1.8	1.98	0.81	0.1	1.4	1.3	0.47	31103
273	165	1.7	1.85	0.58	0.1	1.4	1.1	0.41	31113
266	165	1.6	1.82	0.53	0.1	1.4	1.3	0.4	31310
243	169	1.4	1.84	0.58	0.1	1.4	1.4	0.37	31808
345	169	2	2.18	1.3	0.11	1.4	1.5	0.52	65411
305	169	1.8	2.02	0.85	0.1	1.4	**1.9**	0.42	66311
235	170	1.4	1.82	0.59	0.1	1.4	1.4	0.36	95511
260	165	1.6	1.76	0.45	0.1	1.3	0.9	0.45	31105
297	165	1.8	2	0.83	0.11	1.3	1.1	0.48	31110
244	165	1.5	1.66	0.3	0.1	1.3	1	0.4	31112
314	169	1.9	2.17	1.23	0.1	1.3	1.1	0.43	31507
272	169	1.6	1.99	0.83	0.1	1.3	1.2	0.43	31613
323	169	1.9	2.2	1.32	0.1	1.3	1.1	0.47	31702
311	169	1.8	2.16	1.2	0.1	1.3	1	0.47	31801
297	169	1.8	2.1	1.07	0.1	1.3	1.1	0.44	31809
293	169	1.7	2.09	1.03	0.1	1.3	1.5	0.44	31812
326	169	1.9	2.02	0.85	0.1	1.3	1.7	0.47	64709
310	169	1.8	2.2	1.38	0.1	1.3	1.2	0.46	65104
313	169	1.9	2.03	0.88	0.1	1.3	1.1	0.45	66704
261	170	1.5	1.82	0.59	0.09	1.3	1.1	0.38	95302
284	170	1.7	2.07	1.04	0.1	1.3	1.3	0.43	95510
337	170	2	2.18	1.32	0.11	1.3	1.2	0.46	95603
344	170	2	2.21	1.41	0.11	1.3	1	0.51	95613
296	172	1.7	2.08	0.87	0.09	1.3	1.1	0.44	124106
280	173	1.6	1.8	0.34	0.09	1.3	1.3	0.39	124612
375	173	2.2	2.32	1.26	0.11	1.3	0.9	0.49	124708
272	165	1.6	1.87	0.62	0.1	1.2	1.2	0.44	31101
301	165	1.8	2.02	0.87	0.11	1.2	1.2	0.48	31104
250	165	1.5	1.71	0.37	0.1	1.2	1.1	0.44	31111
268	165	1.6	1.81	0.52	0.1	1.2	1.1	0.42	31201
253	165	1.5	1.72	0.39	0.1	1.2	1.1	0.42	31302
325	165	2	2.15	1.17	0.11	1.2	1.2	0.47	31308
207	165	1.3	1.36	-0.07	0.1	1.2	1.6	0.33	31309
274	165	1.7	1.88	0.63	0.1	1.2	0.9	0.43	31311
344	165	2.1	2.22	1.39	0.12	1.2	1.2	0.49	31403
283	165	1.7	1.9	0.66	0.1	1.2	1.1	0.43	31411

337	169	2	2.25	1.48	0.11	1.2	1.3	0.47	31508
231	169	1.4	1.76	0.46	0.1	1.2	1.5	0.36	31509
275	168	1.6	2.02	0.88	0.1	1.2	1.3	0.43	31609
313	169	1.9	2.17	1.23	0.1	1.2	1.1	0.46	31813
323	169	1.9	2.08	0.99	0.1	1.2	1.4	0.5	64611
326	169	1.9	2.1	1.03	0.1	1.2	1.1	0.49	64613
234	169	1.4	1.42	0.02	0.09	1.2	1.3	0.41	64708
312	169	1.8	2.21	1.4	0.1	1.2	1	0.46	65107
268	169	1.6	2	0.88	0.09	1.2	1.3	0.4	65211
328	169	1.9	2.23	1.47	0.11	1.2	0.9	0.47	65213
313	169	1.9	2.17	1.27	0.1	1.2	1.2	0.45	65303
260	169	1.5	1.7	0.42	0.09	1.2	1.5	0.42	65408
306	169	1.8	1.98	0.86	0.1	1.2	1.2	0.48	65409
259	169	1.5	1.7	0.41	0.09	1.2	1.1	0.43	65412
333	169	2	2.28	1.64	0.11	1.2	1.3	0.49	65612
308	169	1.8	2.16	1.25	0.1	1.2	1.2	0.45	65701
287	169	1.7	2.08	1.05	0.1	1.2	1.1	0.44	65710
312	169	1.8	2.16	1.26	0.1	1.2	1	0.48	65811
265	169	1.6	1.93	0.76	0.09	1.2	1.2	0.41	66006
265	169	1.6	1.93	0.76	0.09	1.2	1.2	0.42	66011
304	169	1.8	2.11	1.12	0.1	1.2	1.1	0.45	66012
273	169	1.6	1.8	0.5	0.09	1.2	1.5	0.43	66203
317	169	1.9	2.05	0.91	0.1	1.2	0.9	0.45	66204
307	169	1.8	2	0.82	0.1	1.2	1	0.43	66701
290	169	1.7	1.9	0.65	0.1	1.2	1.2	0.44	66706
315	169	1.9	2.04	0.9	0.1	1.2	1.2	0.45	66711
345	170	2	2.28	1.69	0.11	1.2	1	0.49	95111
286	170	1.7	1.96	0.81	0.1	1.2	1.6	0.42	95309
297	170	1.7	2.12	1.16	0.1	1.2	1.2	0.44	95506
267	170	1.6	1.84	0.62	0.09	1.2	1.1	0.41	95606
283	170	1.7	1.93	0.77	0.1	1.2	1.3	0.48	95609
320	170	1.9	2.11	1.14	0.1	1.2	1.2	0.48	95706
332	172	1.9	2.23	1.21	0.1	1.2	0.9	0.48	124107
354	172	2.1	2.3	1.39	0.11	1.2	1.1	0.49	124206
290	172	1.7	1.99	0.72	0.1	1.2	1.8	0.43	124212
331	172	1.9	2.23	1.21	0.1	1.2	1.1	0.48	124313
320	173	1.8	2.04	0.68	0.09	1.2	1	0.45	124605
359	173	2.1	2.25	1.08	0.1	1.2	0.9	0.5	124705
363	173	2.1	2.25	1.07	0.1	1.2	0.7	0.49	124802
331	173	1.9	2.1	0.77	0.09	1.2	1	0.46	124805
357	173	2.1	2.22	1.01	0.1	1.2	0.8	0.47	124806
278	165	1.7	1.89	0.64	0.1	1.1	1.1	0.47	31102
238	165	1.4	1.62	0.25	0.1	1.1	1.2	0.4	31107
302	165	1.8	2.02	0.89	0.11	1.1	1.2	0.47	31108
290	165	1.8	1.97	0.79	0.1	1.1	1	0.48	31109
257	165	1.6	1.74	0.41	0.1	1.1	1.2	0.4	31202

244	165	1.5	1.64	0.27	0.1	1.1	1	0.42	31205
334	165	2	2.18	1.26	0.12	1.1	0.9	0.51	31207
298	165	1.8	1.99	0.82	0.1	1.1	1	0.49	31212
299	165	1.8	2.02	0.89	0.11	1.1	1.2	0.49	31303
244	165	1.5	1.68	0.33	0.1	1.1	0.8	0.41	31312
323	165	2	2.11	1.06	0.11	1.1	0.9	0.48	31404
337	165	2	2.18	1.27	0.12	1.1	1.1	0.51	31406
347	165	2.1	2.24	1.43	0.13	1.1	0.9	0.52	31409
303	169	1.8	2.14	1.15	0.1	1.1	0.9	0.45	31501
352	169	2.1	2.29	1.67	0.12	1.1	0.7	0.49	31506
343	169	2	2.27	1.56	0.11	1.1	0.8	0.5	31511
293	169	1.7	2.09	1.03	0.1	1.1	1	0.45	31611
264	169	1.6	1.95	0.76	0.1	1.1	1	0.45	31612
267	169	1.6	1.96	0.78	0.1	1.1	0.9	0.4	31709
345	168	2.1	2.28	1.61	0.11	1.1	1	0.51	31803
312	169	1.8	2.16	1.21	0.1	1.1	1.1	0.48	31806
318	169	1.9	2.07	0.94	0.1	1.1	1.3	0.47	64109
351	169	2.1	2.21	1.31	0.11	1.1	1.4	0.5	64111
312	169	1.8	1.94	0.71	0.1	1.1	1.1	0.5	64201
349	169	2.1	2.14	1.11	0.11	1.1	1.1	0.51	64205
314	169	1.9	1.96	0.73	0.1	1.1	1.1	0.5	64210
308	169	1.8	2.01	0.84	0.1	1.1	1	0.46	64609
328	169	1.9	2.11	1.04	0.1	1.1	1.1	0.49	64610
367	169	2.2	2.23	1.36	0.13	1.1	0.8	0.52	64701
288	169	1.7	1.8	0.49	0.09	1.1	1.5	0.47	64712
322	169	1.9	2.24	1.51	0.11	1.1	1.3	0.48	65108
248	169	1.5	1.95	0.79	0.09	1.1	1.1	0.39	65112
279	169	1.7	2.05	0.98	0.09	1.1	1.1	0.43	65209
289	169	1.7	1.89	0.69	0.1	1.1	1.5	0.46	65401
321	169	1.9	2.06	1.01	0.1	1.1	1.1	0.51	65405
326	169	1.9	2.09	1.07	0.11	1.1	1	0.5	65406
277	169	1.6	1.81	0.58	0.1	1.1	1	0.47	65410
286	169	1.7	2.12	1.14	0.1	1.1	1.1	0.46	65603
308	169	1.8	2.16	1.25	0.1	1.1	1.2	0.46	65703
321	169	1.9	2.21	1.39	0.1	1.1	1.1	0.48	65704
328	169	1.9	2.23	1.47	0.11	1.1	1	0.49	65711
244	169	1.4	1.88	0.68	0.09	1.1	1.2	0.34	65712
341	169	2	2.26	1.59	0.11	1.1	1.2	0.5	65813
329	169	1.9	2.1	1.1	0.11	1.1	1.1	0.5	65905
337	169	2	2.23	1.48	0.11	1.1	1.1	0.49	66013
350	169	2.1	2.22	1.35	0.12	1.1	0.9	0.51	66102
287	169	1.7	1.89	0.62	0.1	1.1	1.1	0.46	66206
344	169	2	2.19	1.27	0.11	1.1	1	0.52	66301
311	169	1.8	2.05	0.91	0.1	1.1	1.2	0.48	66304
310	169	1.8	2.05	0.91	0.1	1.1	1.1	0.45	66306
237	169	1.4	1.4	0	0.09	1.1	1.1	0.41	66410

292	169	1.7	1.96	0.73	0.09	1.1	1.1	0.47	66613
313	169	1.9	2.06	0.93	0.1	1.1	1.2	0.47	66803
343	169	2	2.19	1.25	0.11	1.1	1	0.49	66804
333	169	2	2.03	0.87	0.11	1.1	1	0.51	66902
313	170	1.8	2.18	1.32	0.1	1.1	1.2	0.47	95113
274	170	1.6	1.89	0.71	0.09	1.1	0.9	0.43	95308
260	170	1.5	1.81	0.59	0.09	1.1	1.1	0.4	95310
308	170	1.8	1.99	0.87	0.1	1.1	1	0.47	95409
260	170	1.5	1.95	0.81	0.1	1.1	1.2	0.4	95504
315	170	1.9	2.19	1.35	0.1	1.1	1.2	0.49	95513
295	170	1.7	1.99	0.88	0.1	1.1	1	0.46	95607
320	170	1.9	2.11	1.14	0.1	1.1	0.8	0.5	95713
323	170	1.9	2.06	1.03	0.1	1.1	1.1	0.47	95804
279	170	1.6	1.82	0.6	0.1	1.1	1.1	0.46	95806
313	170	1.8	2.02	0.93	0.1	1.1	1	0.48	95809
366	172	2.1	2.36	1.59	0.11	1.1	0.7	0.52	124104
286	172	1.7	2.03	0.78	0.09	1.1	1.1	0.48	124109
315	172	1.8	2.16	1.04	0.1	1.1	1.2	0.48	124111
326	172	1.9	2.21	1.16	0.1	1.1	1	0.47	124301
302	172	1.8	2.11	0.93	0.1	1.1	1	0.47	124308
342	172	2	2.24	1.24	0.11	1.1	1	0.47	124402
359	172	2.1	2.31	1.44	0.11	1.1	0.8	0.51	124408
303	172	1.8	2.06	0.83	0.1	1.1	1.1	0.48	124412
352	173	2	2.22	1.01	0.1	1.1	0.8	0.48	124505
318	173	1.8	2.03	0.65	0.09	1.1	1.5	0.43	124601
211	173	1.2	1.28	-0.25	0.1	1.1	1.3	0.37	124608
325	173	1.9	2.1	0.77	0.09	1.1	1.1	0.46	124703
356	173	2.1	2.24	1.05	0.1	1.1	0.9	0.49	124706
357	173	2.1	2.25	1.07	0.1	1.1	0.8	0.48	124712
334	173	1.9	2.11	0.79	0.09	1.1	0.8	0.44	124809
358	173	2.1	2.23	1.02	0.1	1.1	0.9	0.47	124810
317	165	1.9	2.09	1.02	0.11	1	0.7	0.51	31203
256	164	1.6	1.76	0.44	0.1	1	1.1	0.42	31204
315	165	1.9	2.06	0.97	0.11	1	0.9	0.48	31209
312	164	1.9	2.06	0.95	0.11	1	0.8	0.47	31210
298	163	1.8	2.01	0.85	0.1	1	1.2	0.48	31211
313	165	1.9	2.09	1.02	0.11	1	0.9	0.48	31305
271	165	1.6	1.82	0.54	0.1	1	0.8	0.43	31410
272	165	1.6	1.84	0.57	0.1	1	1.5	0.44	31413
267	169	1.6	1.96	0.78	0.1	1	0.9	0.43	31504
316	169	1.9	2.17	1.25	0.1	1	1	0.46	31510
337	169	2	2.25	1.49	0.11	1	1.1	0.51	31512
272	169	1.6	1.99	0.83	0.1	1	0.9	0.43	31602
305	169	1.8	2.14	1.15	0.1	1	0.9	0.46	31603
239	169	1.4	1.81	0.53	0.1	1	1	0.39	31605
341	169	2	2.26	1.54	0.11	1	1.1	0.5	31606

312	169	1.8	2.16	1.21	0.1	1	0.8	0.48	31607
330	169	2	2.23	1.42	0.11	1	1	0.49	31610
302	169	1.8	2.12	1.11	0.1	1	0.7	0.45	31701
313	169	1.9	2.17	1.23	0.1	1	0.7	0.46	31703
321	169	1.9	2.19	1.3	0.1	1	0.9	0.48	31704
297	169	1.8	2.1	1.06	0.1	1	1.4	0.46	31707
284	168	1.7	2.05	0.97	0.1	1	1	0.44	31708
316	169	1.9	2.18	1.26	0.1	1	1.1	0.47	31710
328	169	1.9	2.22	1.38	0.11	1	0.9	0.5	31713
275	169	1.6	2.01	0.87	0.1	1	1	0.45	31807
333	169	2	2.13	1.09	0.11	1	1	0.5	64101
338	169	2	2.15	1.15	0.11	1	1.1	0.5	64102
327	169	1.9	2.1	1.03	0.1	1	1	0.49	64105
343	169	2	2.17	1.21	0.11	1	1.4	0.49	64110
337	169	2	2.15	1.15	0.11	1	1.3	0.49	64112
351	169	2.1	2.15	1.13	0.11	1	1.1	0.52	64206
324	169	1.9	2	0.82	0.1	1	0.9	0.5	64211
356	169	2.1	2.23	1.39	0.12	1	1.2	0.5	64604
337	169	2	2.15	1.14	0.11	1	1.3	0.48	64608
331	169	2	2.27	1.62	0.11	1	0.9	0.5	65113
289	169	1.7	2.09	1.07	0.1	1	0.8	0.43	65204
279	169	1.7	2.05	0.98	0.09	1	1	0.43	65206
236	169	1.4	1.83	0.61	0.09	1	1.1	0.42	65208
332	169	2	2.23	1.48	0.11	1	1.3	0.51	65302
297	169	1.8	2.1	1.1	0.1	1	1	0.47	65309
337	169	2	2.14	1.2	0.11	1	0.9	0.51	65402
328	169	1.9	2.1	1.09	0.11	1	1.1	0.5	65403
302	169	1.8	1.96	0.82	0.1	1	1.1	0.49	65413
297	169	1.8	2.08	1.06	0.1	1	1.1	0.47	65501
319	169	1.9	2.17	1.29	0.1	1	1	0.48	65509
350	169	2.1	2.28	1.66	0.12	1	1.5	0.51	65510
297	169	1.8	2.16	1.25	0.1	1	0.9	0.48	65601
296	169	1.8	2.15	1.24	0.1	1	1	0.46	65602
278	169	1.6	2.08	1.06	0.1	1	1.1	0.47	65605
265	169	1.6	2.03	0.94	0.1	1	1.1	0.44	65608
258	169	1.5	1.95	0.8	0.09	1	1.3	0.43	65705
310	169	1.8	2.15	1.24	0.1	1	1.2	0.48	65804
349	169	2.1	2.19	1.35	0.12	1	0.8	0.51	65904
321	169	1.9	2.06	1.01	0.1	1	1	0.5	65906
337	169	2	2.14	1.2	0.11	1	0.7	0.52	65909
276	169	1.6	1.98	0.86	0.1	1	1.2	0.42	66001
341	169	2	2.25	1.53	0.11	1	1	0.5	66002
338	169	2	2.24	1.49	0.11	1	0.8	0.5	66010
299	169	1.8	1.99	0.79	0.1	1	1.1	0.44	66101
296	169	1.8	1.97	0.76	0.1	1	0.9	0.49	66105
321	169	1.9	2.09	1	0.1	1	0.9	0.51	66106

312	169	1.8	2.05	0.91	0.1	1	1.1	0.48	66110
312	169	1.8	2.05	0.92	0.1	1	1.2	0.46	66112
275	169	1.6	1.82	0.51	0.09	1	1.1	0.44	66205
320	169	1.9	2.07	0.95	0.1	1	0.9	0.47	66209
349	169	2.1	2.2	1.28	0.11	1	0.9	0.5	66210
333	169	2	2.03	0.88	0.11	1	0.8	0.5	66408
324	169	1.9	1.98	0.78	0.1	1	1.1	0.5	66409
296	169	1.8	1.98	0.77	0.1	1	1	0.44	66603
330	169	2	2.14	1.11	0.11	1	1	0.49	66606
274	169	1.6	1.82	0.51	0.09	1	1.6	0.41	66705
312	169	1.8	2.05	0.92	0.1	1	1	0.47	66805
298	169	1.8	1.99	0.8	0.1	1	1.2	0.47	66809
295	169	1.7	1.98	0.77	0.1	1	1.1	0.46	66810
296	169	1.8	1.98	0.78	0.1	1	1.1	0.47	66812
326	169	1.9	1.99	0.79	0.1	1	1	0.47	66907
269	170	1.6	2	0.89	0.1	1	0.9	0.42	95105
247	170	1.5	1.89	0.7	0.1	1	1.2	0.38	95109
335	170	2	2.25	1.57	0.11	1	1.1	0.49	95110
279	170	1.6	1.91	0.73	0.1	1	1	0.45	95206
291	170	1.7	1.97	0.84	0.1	1	1.1	0.45	95208
321	170	1.9	2.11	1.14	0.1	1	1.2	0.45	95211
273	170	1.6	1.89	0.7	0.09	1	1	0.45	95304
322	170	1.9	2.12	1.16	0.1	1	0.9	0.48	95305
303	170	1.8	2.04	0.97	0.1	1	1.1	0.43	95311
305	170	1.8	2.05	0.99	0.1	1	1.1	0.47	95313
286	170	1.7	1.88	0.68	0.1	1	1.3	0.42	95401
351	170	2.1	2.19	1.36	0.12	1	0.9	0.49	95402
236	170	1.4	1.53	0.22	0.09	1	1	0.43	95406
316	170	1.9	2.03	0.95	0.1	1	1.1	0.47	95408
305	170	1.8	1.98	0.85	0.1	1	0.9	0.46	95410
280	170	1.6	1.83	0.61	0.1	1	1.1	0.45	95413
316	170	1.9	2.19	1.35	0.1	1	1.1	0.48	95502
213	170	1.3	1.67	0.39	0.1	1	1.1	0.39	95503
300	170	1.8	2.14	1.2	0.1	1	0.8	0.48	95505
336	170	2	2.26	1.58	0.11	1	1	0.48	95509
312	170	1.8	2.07	1.05	0.1	1	0.8	0.49	95608
263	170	1.5	1.82	0.59	0.09	1	1.2	0.47	95611
319	170	1.9	2.11	1.13	0.1	1	0.8	0.46	95705
312	170	1.8	2.08	1.07	0.1	1	1	0.48	95709
288	170	1.7	1.88	0.68	0.1	1	1	0.45	95810
318	170	1.9	2.05	1	0.1	1	1.2	0.47	95812
332	172	1.9	2.23	1.21	0.1	1	0.9	0.5	124103
338	172	2	2.26	1.27	0.1	1	0.8	0.49	124105
339	172	2	2.26	1.28	0.1	1	0.8	0.51	124108
295	172	1.7	2.07	0.86	0.09	1	1	0.47	124110
335	172	1.9	2.22	1.17	0.1	1	1	0.49	124210

345	172	2	2.29	1.35	0.1	1	1	0.52	124302
259	172	1.5	1.88	0.56	0.09	1	1.1	0.43	124303
340	172	2	2.27	1.3	0.1	1	1	0.5	124309
325	172	1.9	2.21	1.15	0.1	1	1	0.5	124312
330	172	1.9	2.19	1.11	0.1	1	0.9	0.5	124401
325	172	1.9	2.17	1.05	0.1	1	0.9	0.49	124403
317	172	1.8	2.13	0.97	0.1	1	1.3	0.49	124406
336	172	2	2.22	1.17	0.1	1	0.9	0.48	124411
325	173	1.9	2.1	0.78	0.09	1	1	0.48	124504
319	173	1.8	2.07	0.72	0.09	1	1	0.47	124506
309	173	1.8	2.02	0.64	0.09	1	1	0.44	124511
323	173	1.9	2.05	0.7	0.09	1	0.9	0.45	124603
316	173	1.8	2.02	0.64	0.09	1	1	0.46	124604
321	173	1.9	2.05	0.69	0.09	1	1	0.45	124609
312	173	1.8	2	0.61	0.09	1	1.2	0.45	124610
308	173	1.8	1.97	0.57	0.09	1	0.9	0.42	124611
342	173	2	2.18	0.93	0.1	1	0.8	0.49	124713
307	173	1.8	1.96	0.56	0.09	1	1.1	0.43	124801
341	173	2	2.15	0.87	0.1	1	0.9	0.47	124803
342	173	2	2.15	0.87	0.1	1	0.9	0.48	124808
300	173	1.7	1.92	0.5	0.09	1	0.9	0.44	124812
333	173	1.9	2.11	0.79	0.09	1	0.8	0.45	124813
328	164	2	2.14	1.14	0.11	0.9	1.1	0.48	31213
297	165	1.8	1.99	0.82	0.1	0.9	0.8	0.48	31402
319	165	1.9	2.11	1.06	0.11	0.9	0.8	0.51	31405
300	165	1.8	1.99	0.81	0.1	0.9	1.4	0.48	31408
311	165	1.9	2.06	1.03	0.11	0.9	0.8	0.46	31412
310	169	1.8	2.15	1.19	0.1	0.9	0.7	0.47	31505
236	168	1.4	1.8	0.52	0.1	0.9	0.9	0.41	31601
299	169	1.8	2.11	1.08	0.1	0.9	0.8	0.49	31604
262	169	1.6	1.94	0.73	0.1	0.9	0.9	0.41	31705
293	169	1.7	2.08	1.02	0.1	0.9	0.9	0.47	31706
331	169	2	2.23	1.41	0.11	0.9	0.7	0.49	31712
283	169	1.7	2.05	0.95	0.1	0.9	1.4	0.47	31804
274	169	1.6	2	0.85	0.1	0.9	0.8	0.44	31805
304	169	1.8	2.14	1.14	0.1	0.9	1.1	0.49	31810
348	169	2.1	2.2	1.27	0.11	0.9	1	0.51	64106
353	169	2.1	2.16	1.17	0.12	0.9	1	0.5	64202
358	169	2.1	2.18	1.23	0.12	0.9	0.9	0.52	64209
339	169	2	2.08	0.99	0.11	0.9	0.8	0.52	64213
354	169	2.1	2.22	1.35	0.12	0.9	0.8	0.52	64602
292	169	1.7	1.93	0.69	0.1	0.9	1.1	0.47	64605
328	169	1.9	2.11	1.04	0.1	0.9	0.9	0.49	64606
321	169	1.9	1.99	0.8	0.1	0.9	0.8	0.51	64706
297	169	1.8	1.86	0.58	0.1	0.9	1.3	0.49	64710
352	169	2.1	2.15	1.14	0.11	0.9	1	0.52	64711

291	169	1.7	2.14	1.19	0.1	0.9	0.8	0.48	65110
328	169	1.9	2.23	1.47	0.11	0.9	0.7	0.49	65205
338	169	2	2.25	1.56	0.11	0.9	1	0.51	65301
328	169	1.9	2.22	1.44	0.11	0.9	1.1	0.49	65304
337	169	2	2.25	1.54	0.11	0.9	1.2	0.51	65305
356	169	2.1	2.31	1.8	0.12	0.9	0.9	0.5	65310
290	169	1.7	2.05	1	0.1	0.9	1	0.44	65502
330	169	2	2.21	1.41	0.11	0.9	0.9	0.51	65503
335	169	2	2.23	1.47	0.11	0.9	0.7	0.52	65504
338	169	2	2.24	1.5	0.11	0.9	1.1	0.51	65508
340	169	2	2.25	1.53	0.11	0.9	0.8	0.52	65512
333	169	2	2.28	1.64	0.11	0.9	0.8	0.52	65609
329	169	1.9	2.26	1.59	0.11	0.9	0.8	0.52	65611
325	169	1.9	2.22	1.43	0.1	0.9	0.8	0.5	65706
336	169	2	2.25	1.56	0.11	0.9	0.9	0.51	65708
353	169	2.1	2.3	1.75	0.12	0.9	1.2	0.51	65805
343	169	2	2.27	1.62	0.11	0.9	0.9	0.52	65806
327	169	1.9	2.22	1.42	0.11	0.9	1.2	0.5	65809
320	169	1.9	2.19	1.35	0.11	0.9	1.2	0.5	65812
342	169	2	2.16	1.26	0.11	0.9	0.9	0.52	65908
359	169	2.1	2.24	1.49	0.12	0.9	0.8	0.53	65910
335	169	2	2.13	1.17	0.11	0.9	1	0.5	65911
330	169	2	2.11	1.11	0.11	0.9	0.9	0.52	65912
293	169	1.7	2.06	1.01	0.1	0.9	1	0.46	66005
307	169	1.8	2.12	1.15	0.1	0.9	1	0.49	66008
271	169	1.6	1.96	0.81	0.09	0.9	0.9	0.45	66009
342	169	2	2.18	1.24	0.11	0.9	0.9	0.49	66104
327	169	1.9	2.12	1.08	0.1	0.9	0.9	0.49	66108
312	169	1.8	2.05	0.91	0.1	0.9	0.9	0.47	66109
278	169	1.6	1.84	0.54	0.09	0.9	1	0.45	66208
247	169	1.5	1.64	0.28	0.09	0.9	0.9	0.42	66211
260	169	1.5	1.78	0.46	0.09	0.9	1.1	0.45	66302
320	169	1.9	2.1	1.01	0.1	0.9	0.9	0.48	66308
311	169	1.8	2.05	0.91	0.1	0.9	1	0.48	66313
277	169	1.6	1.69	0.34	0.09	0.9	1	0.46	66401
340	169	2	2.07	0.96	0.11	0.9	0.7	0.53	66403
338	169	2	2.06	0.92	0.11	0.9	1	0.51	66404
308	169	1.8	1.89	0.62	0.1	0.9	1.2	0.49	66406
322	169	1.9	1.97	0.75	0.1	0.9	0.9	0.49	66412
313	169	1.9	2.06	0.93	0.1	0.9	1	0.47	66601
273	169	1.6	1.85	0.56	0.09	0.9	1	0.44	66602
315	169	1.9	2.06	0.94	0.1	0.9	0.9	0.48	66604
306	169	1.8	2.03	0.86	0.1	0.9	1	0.47	66608
340	169	2	2.18	1.22	0.11	0.9	0.9	0.49	66611
350	169	2.1	2.22	1.34	0.12	0.9	0.7	0.48	66612
306	169	1.8	2	0.81	0.1	0.9	0.9	0.48	66708

322	169	1.9	2.07	0.96	0.1	0.9	0.9	0.5	66713
313	169	1.9	2.06	0.94	0.1	0.9	1.3	0.49	66801
282	169	1.7	1.91	0.65	0.09	0.9	1	0.46	66811
328	169	1.9	2	0.81	0.1	0.9	0.9	0.51	66901
316	169	1.9	1.94	0.7	0.1	0.9	0.7	0.49	66905
291	169	1.7	1.78	0.47	0.09	0.9	0.8	0.48	66906
326	169	1.9	1.99	0.8	0.1	0.9	1.1	0.48	66908
304	169	1.8	1.86	0.59	0.1	0.9	1.1	0.46	66909
314	170	1.8	2.18	1.33	0.1	0.9	1	0.49	95104
267	170	1.6	1.99	0.88	0.1	0.9	0.9	0.46	95108
323	170	1.9	2.12	1.16	0.1	0.9	0.7	0.51	95205
295	170	1.7	1.99	0.88	0.1	0.9	0.9	0.45	95207
319	170	1.9	2.1	1.12	0.1	0.9	1.1	0.48	95210
318	170	1.9	2.11	1.12	0.1	0.9	0.8	0.46	95301
318	170	1.9	2.04	0.97	0.1	0.9	0.9	0.48	95404
301	170	1.8	2.14	1.21	0.1	0.9	0.9	0.5	95501
273	170	1.6	2.02	0.93	0.1	0.9	1.1	0.44	95508
319	170	1.9	2.1	1.12	0.1	0.9	0.8	0.49	95605
328	170	1.9	2.14	1.22	0.1	0.9	0.8	0.51	95610
285	170	1.7	1.95	0.81	0.1	0.9	0.9	0.46	95704
298	170	1.8	2.01	0.93	0.1	0.9	0.9	0.45	95708
282	170	1.7	1.94	0.79	0.09	0.9	0.8	0.47	95710
279	170	1.6	1.92	0.76	0.09	0.9	0.9	0.45	95711
301	170	1.8	1.96	0.82	0.1	0.9	1	0.49	95808
276	170	1.6	1.81	0.58	0.1	0.9	1.5	0.46	95811
328	172	1.9	2.22	1.17	0.1	0.9	0.8	0.5	124101
306	172	1.8	2.12	0.96	0.1	0.9	0.9	0.5	124112
326	172	1.9	2.18	1.08	0.1	0.9	0.9	0.5	124114
320	172	1.9	2.15	1.02	0.1	0.9	0.8	0.48	124202
297	172	1.7	2.03	0.79	0.1	0.9	1.2	0.46	124205
311	172	1.8	2.11	0.92	0.1	0.9	1	0.49	124209
316	172	1.8	2.13	0.97	0.1	0.9	1	0.47	124211
329	172	1.9	2.19	1.11	0.1	0.9	0.8	0.5	124213
349	172	2	2.3	1.4	0.11	0.9	0.8	0.52	124304
354	172	2.1	2.32	1.45	0.11	0.9	1	0.52	124305
330	172	1.9	2.23	1.2	0.1	0.9	0.7	0.5	124306
349	172	2	2.3	1.4	0.11	0.9	0.7	0.52	124310
329	172	1.9	2.23	1.19	0.1	0.9	0.8	0.5	124311
323	172	1.9	2.16	1.03	0.1	0.9	1.1	0.49	124404
303	172	1.8	2.06	0.83	0.1	0.9	0.8	0.47	124405
352	172	2	2.29	1.35	0.11	0.9	0.7	0.51	124407
348	172	2	2.27	1.3	0.11	0.9	0.8	0.51	124410
267	173	1.5	1.77	0.3	0.09	0.9	1.2	0.42	124501
328	173	1.9	2.11	0.79	0.09	0.9	0.8	0.47	124502
335	173	1.9	2.14	0.86	0.09	0.9	0.9	0.48	124503
332	173	1.9	2.13	0.84	0.09	0.9	0.8	0.47	124509

278	173	1.6	1.84	0.39	0.09	0.9	0.9	0.45	124510
306	173	1.8	2	0.61	0.09	0.9	0.8	0.46	124513
323	173	1.9	2.06	0.71	0.09	0.9	0.8	0.46	124602
317	173	1.8	2.02	0.65	0.09	0.9	1.1	0.45	124606
308	173	1.8	1.97	0.57	0.09	0.9	0.9	0.45	124613
337	173	1.9	2.15	0.87	0.09	0.9	0.8	0.48	124701
338	173	2	2.16	0.89	0.1	0.9	0.8	0.48	124702
334	173	1.9	2.11	0.79	0.09	0.9	0.8	0.46	124804
276	173	1.6	1.77	0.3	0.09	0.9	0.8	0.45	124811
257	165	1.6	1.79	0.49	0.1	0.8	0.8	0.45	31301
294	165	1.8	1.98	0.81	0.1	0.8	0.9	0.46	31304
310	165	1.9	2.11	1.08	0.11	0.8	0.9	0.5	31313
281	165	1.7	1.89	0.65	0.1	0.8	0.8	0.48	31401
354	169	2.1	2.3	1.7	0.12	0.8	0.8	0.52	31513
301	169	1.8	2.12	1.1	0.1	0.8	1	0.46	31711
333	169	2	2.13	1.09	0.11	0.8	0.9	0.5	64104
345	169	2	2.18	1.23	0.11	0.8	1.5	0.51	64108
353	169	2.1	2.22	1.34	0.12	0.8	0.6	0.52	64113
338	169	2	2.08	0.97	0.11	0.8	0.8	0.52	64204
323	169	1.9	2	0.82	0.1	0.8	0.7	0.52	64208
346	169	2	2.12	1.07	0.11	0.8	0.7	0.52	64702
340	169	2	2.09	1	0.11	0.8	0.8	0.52	64704
323	169	1.9	2	0.82	0.1	0.8	0.8	0.51	64705
297	169	1.8	1.85	0.57	0.09	0.8	0.9	0.5	64713
314	169	1.9	2.22	1.42	0.1	0.8	1	0.52	65105
299	169	1.8	2.17	1.27	0.1	0.8	0.8	0.5	65106
357	169	2.1	2.34	1.96	0.12	0.8	0.8	0.53	65109
296	169	1.8	2.15	1.24	0.1	0.8	0.8	0.5	65111
339	169	2	2.26	1.59	0.11	0.8	0.7	0.5	65210
334	169	2	2.25	1.54	0.11	0.8	0.8	0.49	65212
317	169	1.9	2.18	1.31	0.1	0.8	0.8	0.5	65308
310	169	1.8	2.15	1.24	0.1	0.8	0.8	0.49	65312
331	169	2	2.23	1.47	0.11	0.8	1	0.51	65313
353	169	2.1	2.29	1.7	0.12	0.8	0.7	0.53	65505
333	169	2	2.22	1.44	0.11	0.8	0.9	0.53	65506
323	169	1.9	2.19	1.33	0.1	0.8	1.1	0.49	65511
315	169	1.9	2.16	1.24	0.1	0.8	0.8	0.5	65513
298	169	1.8	2.16	1.26	0.1	0.8	0.8	0.49	65606
242	169	1.4	1.91	0.73	0.09	0.8	1	0.45	65613
336	169	2	2.25	1.56	0.11	0.8	0.9	0.5	65709
302	169	1.8	2.14	1.2	0.1	0.8	0.7	0.47	65713
302	169	1.8	2.12	1.15	0.1	0.8	1	0.49	65808
295	169	1.7	2.09	1.08	0.1	0.8	0.9	0.48	65810
322	169	1.9	2.18	1.31	0.1	0.8	0.7	0.5	66003
303	169	1.8	2.1	1.11	0.1	0.8	0.9	0.51	66004
337	169	2	2.17	1.19	0.11	0.8	0.9	0.5	66103

306	168	1.8	2.03	0.89	0.1	0.8	0.8	0.5	66107
317	169	1.9	2.08	0.97	0.1	0.8	0.8	0.49	66111
299	169	1.8	1.99	0.8	0.1	0.8	0.8	0.48	66113
284	169	1.7	1.88	0.6	0.09	0.8	0.9	0.46	66202
295	169	1.7	1.93	0.69	0.1	0.8	1	0.45	66213
335	169	2	2.16	1.16	0.11	0.8	0.9	0.51	66303
353	169	2.1	2.24	1.4	0.12	0.8	0.8	0.53	66305
305	169	1.8	2.03	0.86	0.1	0.8	0.9	0.49	66309
350	169	2.1	2.22	1.36	0.12	0.8	0.7	0.52	66310
307	169	1.8	2.03	0.87	0.1	0.8	1.1	0.48	66312
310	169	1.8	1.89	0.63	0.1	0.8	0.9	0.5	66402
317	169	1.9	1.94	0.7	0.1	0.8	0.8	0.52	66411
334	169	2	2.03	0.88	0.11	0.8	0.8	0.52	66413
274	169	1.6	1.86	0.58	0.09	0.8	0.9	0.47	66609
305	169	1.8	1.99	0.8	0.1	0.8	0.9	0.49	66703
326	169	1.9	2.09	1	0.1	0.8	0.7	0.49	66709
292	169	1.7	1.92	0.68	0.1	0.8	0.7	0.48	66710
290	169	1.7	1.91	0.66	0.1	0.8	1.2	0.46	66712
293	169	1.7	1.96	0.74	0.1	0.8	0.8	0.47	66802
282	169	1.7	1.91	0.65	0.09	0.8	0.9	0.47	66806
309	169	1.8	2.04	0.9	0.1	0.8	1	0.5	66808
317	169	1.9	1.94	0.7	0.1	0.8	0.8	0.51	66903
330	169	2	2.01	0.83	0.1	0.8	0.8	0.5	66904
289	169	1.7	1.77	0.45	0.09	0.8	1.1	0.47	66910
340	169	2	2.07	0.95	0.11	0.8	0.9	0.51	66913
317	170	1.9	2.1	1.1	0.1	0.8	0.6	0.5	95209
274	170	1.6	1.89	0.7	0.1	0.8	0.7	0.46	95213
280	170	1.6	1.93	0.77	0.09	0.8	0.8	0.46	95303
289	170	1.7	1.89	0.7	0.1	0.8	1	0.47	95405
296	170	1.7	1.92	0.76	0.1	0.8	0.7	0.48	95411
290	170	1.7	1.97	0.84	0.1	0.8	1	0.45	95602
285	170	1.7	1.94	0.79	0.1	0.8	1	0.47	95604
340	170	2	2.15	1.23	0.11	0.8	0.7	0.52	95805
322	172	1.9	2.19	1.11	0.1	0.8	0.8	0.5	124102
326	172	1.9	2.21	1.15	0.1	0.8	0.8	0.5	124113
270	172	1.6	1.87	0.54	0.1	0.8	0.8	0.45	124201
309	172	1.8	2.1	0.91	0.1	0.8	0.8	0.48	124203
329	172	1.9	2.19	1.11	0.1	0.8	0.8	0.5	124204
337	172	2	2.23	1.19	0.1	0.8	1	0.49	124207
340	172	2	2.24	1.23	0.11	0.8	0.7	0.51	124208
289	172	1.7	2.05	0.82	0.09	0.8	0.7	0.48	124307
340	172	2	2.24	1.21	0.11	0.8	1	0.51	124409
299	173	1.7	1.96	0.55	0.09	0.8	0.8	0.46	124508
310	173	1.8	2.02	0.65	0.09	0.8	0.8	0.47	124711
321	169	1.9	2.19	1.3	0.1	0.7	0.6	0.5	31502
324	169	1.9	2.21	1.39	0.11	0.7	0.7	0.51	65311

329	169	1.9	2.26	1.59	0.11	0.7	0.7	0.52	65610
281	169	1.7	1.85	0.57	0.09	0.7	1	0.45	66212
321	169	1.9	1.97	0.75	0.1	0.7	0.9	0.52	66405
309	169	1.8	2.04	0.88	0.1	0.7	0.8	0.49	66605
280	169	1.7	1.85	0.57	0.09	0.7	0.7	0.47	66702
347	169	2.1	2.21	1.3	0.11	0.7	0.8	0.52	66813
286	169	1.7	1.74	0.41	0.09	0.7	0.7	0.48	66911
342	169	2	2.08	0.97	0.11	0.7	0.7	0.53	66912
312	172	1.8	2.1	0.92	0.1	0.7	0.7	0.49	124413
303	173	1.8	1.98	0.58	0.09	0.7	0.7	0.48	124512
316	173	1.8	2.05	0.69	0.09	0.7	0.6	0.5	124709
331	169	2	2.14	1.12	0.11	0.6	0.7	0.51	66610

APPENDIX 'H'

Examiners

OSCEs 2002 – FACET Output

Obsvd Score	Obsvd Count	Obsvd Average	Fair-M Avrage	Measure	Model S.E.	Infit MnSq	Outfit MnSq	PtBis	Examnr	Exam
757	399	1.9	1.69	0.61	0.07	1.6	**2.1**	0.54	1036	June9
575	280	2.1	2.12	-0.13	0.09	1.5	1.4	0.61	1024	June8
752	342	2.2	2.23	-0.53	0.09	1.5	1.4	0.64	1112	Sept9
665	340	2	2.21	-0.19	0.07	1.4	1.1	0.62	1104	June8
671	321	2.1	2.17	-0.35	0.08	1.3	1.2	0.55	1095	March16
472	323	1.5	1.87	0.06	0.07	1.3	1.3	0.39	1125	Sept9
591	340	1.7	2.09	-0.25	0.07	1.3	1.5	0.5	1032	June8
621	357	1.7	2.12	0.00	0.07	1.3	1.3	0.54	1097	June8
846	432	2	2.11	-0.19	0.08	1.3	1.3	0.61	1053	June8
587	280	2.1	2.19	0.00	0.08	1.3	1.2	0.56	1093	June8
641	378	1.7	1.8	0.56	0.07	1.2	1.1	0.59	510	June9
766	468	1.6	2.02	0.21	0.06	1.2	1.2	0.59	520	Dec8
533	288	1.9	2.03	-0.02	0.08	1.2	1	0.58	1011	Sept9
387	266	1.5	1.41	0.76	0.07	1.2	1.1	0.49	1016	Sept9
904	425	2.1	2.33	-0.58	0.08	1.2	1.2	0.63	1019	June9
566	336	1.7	1.88	0.30	0.06	1.2	1.2	0.52	1035	March17
489	437	1.1	1.18	1.05	0.06	1.2	1.3	0.46	1089	March16
847	456	1.9	1.95	0.20	0.08	1.2	1.1	0.59	1130	Dec9
460	266	1.7	2.02	-0.09	0.08	1.2	1	0.49	1058	Sept9
632	357	1.8	2.18	-0.06	0.06	1.2	1.3	0.58	1061	June9
444	304	1.5	1.7	0.48	0.07	1.2	1.3	0.5	1065	Sept9
465	323	1.4	1.9	0.00	0.07	1.2	1	0.6	1069	Sept9
870	425	2	2.21	-0.42	0.08	1.2	1	0.63	1098	June9
626	391	1.6	1.79	0.20	0.07	1.2	1	0.47	1093	March16
672	378	1.8	1.86	0.37	0.07	1.2	1.5	0.55	1116	June9
772	391	2	2.29	-0.41	0.07	1.2	1.2	0.58	1074	June9
729	336	2.2	2.26	-0.28	0.08	1.2	1.1	0.6	1076	June9
852	468	1.8	2.16	-0.20	0.07	1.2	1	0.58	1077	Dec8
829	380	2.2	2.17	-0.43	0.1	1.2	1.5	0.63	1081	June8
834	456	1.8	1.75	0.44	0.07	1.2	1.2	0.61	1083	June8
682	391	1.7	2.13	0.01	0.06	1.2	1.2	0.55	1109	June9
660	374	1.8	2.05	-0.02	0.06	1.1	1	0.47	501	March16
576	408	1.4	1.82	0.40	0.06	1.1	1.1	0.44	504	March17
613	360	1.7	1.95	0.20	0.06	1.1	1	0.57	506	June8
661	414	1.6	1.92	0.38	0.07	1.1	1.1	0.59	513	June9
874	432	2	2.2	-0.23	0.07	1.1	1	0.62	514	June9
503	342	1.5	1.7	0.43	0.07	1.1	1.1	0.52	516	Sept9
689	357	1.9	2.12	0.03	0.07	1.1	1.1	0.61	1009	June9
863	408	2.1	2.26	-0.40	0.08	1.1	1.2	0.64	1010	June8
786	432	1.8	2.19	-0.52	0.08	1.1	1	0.62	1012	Dec8
469	252	1.9	1.86	0.16	0.08	1.1	1.2	0.56	1021	Sept9

686	322	2.1	2.23	-0.46	0.09	1.1	1	0.61	1092	March16
546	352	1.6	1.55	0.96	0.06	1.1	1	0.5	1026	Dec9
694	322	2.2	2.31	-0.42	0.08	1.1	1	0.58	1102	June9
530	342	1.5	1.78	0.25	0.07	1.1	1.1	0.55	1029	Sept9
633	286	2.2	2.38	-0.26	0.1	1.1	1.2	0.62	1030	Dec9
685	396	1.7	1.94	0.33	0.08	1.1	1	0.6	1031	Dec9
672	360	1.9	2.08	-0.12	0.08	1.1	1	0.63	1033	June8
574	384	1.5	1.55	0.95	0.06	1.1	1.2	0.42	1036	Dec9
666	280	2.4	2.38	-0.56	0.12	1.1	1.1	0.65	1105	June8
711	294	2.4	2.48	-1.34	0.14	1.1	1.3	0.67	1121	June9
695	408	1.7	1.93	0.06	0.07	1.1	0.9	0.53	1107	June8
811	416	1.9	2.24	-0.26	0.08	1.1	1	0.61	1045	Dec8
568	324	1.8	1.9	0.07	0.07	1.1	1.1	0.55	1128	Sept9
724	350	2.1	2.18	-0.14	0.09	1.1	0.9	0.58	1047	June9
938	468	2	1.99	0.30	0.08	1.1	1.1	0.62	1130	Dec8
737	408	1.8	2.14	-0.13	0.07	1.1	1.1	0.62	1051	March17
650	391	1.7	1.83	0.21	0.07	1.1	0.9	0.54	1053	March16
775	408	1.9	2.15	0.20	0.07	1.1	1.1	0.58	1053	Dec9
743	350	2.1	2.22	-0.18	0.08	1.1	1.1	0.6	1053	June9
682	357	1.9	2.12	0.11	0.07	1.1	0.9	0.55	1056	June9
670	357	1.9	2.04	0.20	0.07	1.1	1.1	0.59	1058	June9
930	432	2.2	2.3	-0.24	0.07	1.1	0.9	0.62	1058	Dec8
599	342	1.8	1.97	-0.18	0.08	1.1	1	0.56	1067	Sept9
886	378	2.3	2.45	-0.59	0.09	1.1	1	0.65	1068	Dec8
476	340	1.4	1.58	0.64	0.07	1.1	0.9	0.56	1069	June8
568	357	1.6	1.89	0.05	0.08	1.1	1	0.51	1087	March16
677	324	2.1	2.13	-0.25	0.09	1.1	1.5	0.6	1071	Sept9
493	384	1.3	1.85	0.23	0.07	1.1	1	0.5	1072	March17
606	342	1.8	1.96	-0.16	0.08	1.1	1.1	0.59	1075	Sept9
537	340	1.6	1.93	0.08	0.07	1.1	1.3	0.47	1076	June8
618	340	1.8	2.19	-0.15	0.07	1.1	0.9	0.54	1077	June8
724	374	1.9	2.22	-0.16	0.08	1.1	0.9	0.58	1077	Dec9
697	378	1.8	1.98	0.15	0.07	1.1	1.1	0.58	1120	June9
450	266	1.7	1.89	0.12	0.08	1.1	1.1	0.51	1083	Sept9
520	323	1.6	1.96	0.04	0.07	1.1	1	0.59	1084	Sept9
834	425	2	2.17	-0.29	0.07	1	0.7	0.54	503	March17
410	216	1.9	1.98	0.16	0.09	1	0.9	0.58	509	June8
641	342	1.9	2.02	-0.15	0.07	1	1	0.61	518	Sept9
710	396	1.8	2.02	0.38	0.07	1	1	0.62	522	Dec9
509	340	1.5	2	-0.05	0.07	1	1	0.47	1100	June8
737	340	2.2	2.26	-0.39	0.09	1	1.2	0.64	1001	June8
860	450	1.9	2.04	0.04	0.07	1	0.9	0.59	1005	June9
740	360	2.1	2.17	-0.38	0.09	1	1.2	0.63	1005	June8
564	304	1.9	2.07	-0.10	0.08	1	0.9	0.59	1006	Sept9
746	425	1.8	2.01	0.16	0.06	1	0.9	0.58	1008	March17
768	396	1.9	2.04	0.21	0.08	1	0.9	0.6	1012	Dec9

772	407	1.9	2.03	0.14	0.07	1	1.1	0.54	1095	March17
696	402	1.7	1.99	0.08	0.06	1	0.9	0.58	1016	March16
689	391	1.8	1.98	0.00	0.07	1	0.9	0.54	1091	March16
637	360	1.8	1.97	0.11	0.07	1	0.9	0.59	1019	June8
800	368	2.2	2.3	-0.65	0.08	1	1.1	0.62	1090	March16
749	336	2.2	2.25	-0.67	0.09	1	1	0.6	1090	March17
898	486	1.8	2.16	-0.21	0.07	1	1.2	0.6	1025	Dec8
820	408	2	2.29	-0.40	0.08	1	1.1	0.62	1025	Dec9
802	432	1.9	1.87	0.59	0.07	1	1.1	0.59	1026	Dec8
906	425	2.1	2.18	-0.19	0.08	1	1.1	0.62	1026	March17
834	378	2.2	2.28	-0.46	0.09	1	1.1	0.64	1030	Dec8
788	459	1.7	1.92	0.34	0.07	1	0.9	0.62	1031	Dec8
652	294	2.2	2.26	-0.27	0.09	1	0.9	0.66	1031	June9
605	361	1.7	1.92	0.14	0.07	1	0.9	0.5	1127	Sept9
636	408	1.6	2.11	0.09	0.06	1	1	0.49	1035	June9
837	475	1.8	1.99	-0.11	0.07	1	0.9	0.53	1089	March17
481	266	1.8	2.05	-0.15	0.08	1	1	0.54	1089	Sept9
449	323	1.4	1.84	0.23	0.07	1	1.1	0.52	1039	Sept9
585	322	1.8	2.06	-0.08	0.07	1	1	0.57	1088	March16
737	432	1.7	1.86	0.59	0.07	1	1.1	0.57	1041	Dec9
674	375	1.8	1.93	0.09	0.08	1	1	0.56	1042	March17
735	384	1.9	2.23	-0.11	0.08	1	1.1	0.6	1045	Dec9
621	357	1.7	2.17	-0.45	0.07	1	1	0.57	1045	June8
747	407	1.8	2.19	-0.32	0.07	1	1	0.63	1094	March17
646	432	1.5	1.65	0.69	0.06	1	1.1	0.47	1050	June9
436	357	1.2	1.52	0.72	0.07	1	1	0.5	1054	June8
761	442	1.7	1.84	0.49	0.07	1	1.1	0.63	1056	Dec8
522	340	1.5	1.85	0.21	0.07	1	1	0.54	1063	June8
775	391	2	2.21	-0.41	0.08	1	1.2	0.62	1063	June9
572	280	2	2.19	-0.31	0.09	1	0.9	0.59	1099	June8
797	408	2	2.14	-0.16	0.08	1	0.8	0.63	1066	June9
654	378	1.7	1.81	0.47	0.07	1	1	0.55	1068	June9
686	368	1.9	2.18	-0.32	0.07	1	1.1	0.58	1068	March16
722	308	2.3	2.52	-1.35	0.12	1	1	0.67	1068	Dec9
767	414	1.9	2.08	-0.05	0.07	1	1.2	0.55	1104	June9
682	342	2	2.16	-0.42	0.08	1	1	0.61	1104	Sept9
704	408	1.7	2.04	0.21	0.06	1	1	0.5	1087	June9
502	391	1.3	2.03	0.24	0.05	1	0.9	0.41	1093	June9
624	360	1.7	2.03	0.00	0.07	1	0.9	0.55	1074	June8
519	342	1.5	1.69	0.37	0.07	1	0.9	0.49	1076	Sept9
736	407	1.8	2.17	-0.19	0.06	1	1.1	0.6	1076	March17
741	437	1.7	1.74	0.54	0.07	1	0.9	0.55	1077	June9
593	340	1.7	1.97	0.25	0.07	1	0.9	0.54	1103	June8
690	361	1.9	2.08	-0.22	0.08	1	0.6	0.58	1103	Sept9
601	378	1.6	1.9	0.24	0.07	1	1.1	0.53	1080	June8
494	323	1.5	2	-0.21	0.07	1	1.1	0.54	1080	Sept9

657	350	1.9	1.89	0.21	0.07	1	0.9	0.49	1081	March17
726	336	2.2	2.28	-0.42	0.1	1	1.2	0.64	1081	June9
777	350	2.2	2.33	-0.60	0.1	1	1.2	0.64	1084	June9
591	360	1.6	1.88	0.19	0.08	1	1	0.5	1096	March17
724	360	2	2.08	-0.05	0.08	0.9	0.9	0.63	507	June8
883	450	2	2.17	-0.14	0.07	0.9	0.9	0.64	512	June9
587	342	1.7	1.83	0.21	0.07	0.9	0.8	0.6	517	Sept9
542	324	1.7	1.8	0.27	0.07	0.9	1	0.61	519	Sept9
942	486	1.9	2.17	-0.20	0.07	0.9	0.8	0.62	521	Dec8
808	432	1.9	2.13	0.11	0.07	0.9	0.8	0.59	523	Dec9
908	456	2	2.03	0.05	0.08	0.9	0.9	0.61	1001	June9
696	357	1.9	2.18	-0.05	0.08	0.9	1.3	0.61	1086	June9
669	400	1.7	2.08	-0.20	0.07	0.9	0.7	0.54	1086	March17
717	391	1.8	2.13	-0.34	0.07	0.9	1	0.57	1086	March16
688	322	2.1	2.3	-0.68	0.09	0.9	0.9	0.63	1012	March16
767	456	1.7	1.98	-0.10	0.07	0.9	1	0.54	1091	March17
668	360	1.9	2	0.05	0.07	0.9	0.9	0.61	1018	June8
619	342	1.8	1.97	-0.16	0.08	0.9	0.9	0.61	1018	Sept9
812	408	2	2.25	-0.26	0.07	0.9	1	0.61	1018	June9
876	486	1.8	1.81	0.66	0.07	0.9	1.1	0.59	1021	Dec8
710	432	1.6	1.88	0.27	0.06	0.9	0.9	0.55	1021	June8
719	425	1.7	2	0.28	0.06	0.9	1	0.55	1024	June9
844	424	2	2.21	-0.21	0.07	0.9	0.8	0.61	1026	June9
739	336	2.2	2.27	-0.60	0.1	0.9	0.9	0.64	1026	June8
610	280	2.2	2.21	-0.38	0.1	0.9	0.9	0.64	1102	June8
724	357	2	2.24	-0.32	0.08	0.9	0.8	0.6	1029	June8
660	380	1.7	1.71	0.51	0.07	0.9	0.9	0.56	1101	June8
514	306	1.7	2.03	-0.09	0.07	0.9	0.8	0.59	1032	Sept9
839	350	2.4	2.44	-0.94	0.11	0.9	0.7	0.66	1032	June9
560	323	1.7	2.12	-0.27	0.07	0.9	0.8	0.6	1035	Sept9
759	378	2	2.04	0.03	0.08	0.9	0.8	0.6	1114	June9
811	364	2.2	2.25	-0.35	0.1	0.9	0.8	0.65	1114	Dec8
720	416	1.7	1.58	0.98	0.07	0.9	0.9	0.54	1036	Dec8
666	425	1.6	2.11	0.10	0.05	0.9	0.9	0.55	1105	June9
691	357	1.9	2.05	0.09	0.08	0.9	1.4	0.61	1115	June9
661	416	1.6	1.97	0.19	0.08	0.9	1	0.6	1041	Dec8
676	357	1.9	2.04	0.11	0.08	0.9	0.8	0.6	1041	June9
770	352	2.2	2.37	-0.69	0.1	0.9	0.9	0.66	1117	Dec9
890	432	2.1	2.34	-0.71	0.08	0.9	0.9	0.64	1117	Dec8
548	414	1.3	1.65	0.68	0.06	0.9	0.9	0.44	1042	June9
656	340	1.9	2.17	-0.13	0.08	0.9	0.9	0.58	1042	June8
550	266	2.1	2.16	-0.42	0.09	0.9	0.9	0.58	1045	Sept9
756	450	1.7	1.91	0.29	0.06	0.9	1.2	0.59	1097	June9
733	360	2	2.13	-0.24	0.09	0.9	1	0.63	1050	June8
867	416	2.1	2.2	0.08	0.07	0.9	0.9	0.61	1053	Dec8
725	450	1.6	1.78	0.52	0.06	0.9	0.8	0.52	1054	June9

798	399	2	1.91	0.29	0.08	0.9	1	0.61	1055 June9
712	432	1.6	1.9	0.42	0.07	0.9	0.8	0.6	1056 Dec9
714	294	2.4	2.42	-0.88	0.13	0.9	1.1	0.67	1113 June9
489	368	1.3	1.82	0.33	0.07	0.9	0.9	0.48	1060 March16
719	357	2	2.27	-0.37	0.07	0.9	0.9	0.58	1062 June9
722	336	2.1	2.43	-0.66	0.1	0.9	0.8	0.64	1062 Dec9
598	390	1.5	1.55	0.62	0.07	0.9	1	0.54	1066 March16
708	425	1.7	1.98	0.21	0.06	0.9	0.8	0.53	1068 March17
817	425	1.9	2.11	-0.07	0.08	0.9	0.9	0.64	1069 June9
606	408	1.5	1.92	0.10	0.06	0.9	0.8	0.47	1087 June8
685	294	2.3	2.39	-0.57	0.11	0.9	1	0.64	1098 June8
712	425	1.7	1.99	0.16	0.07	0.9	1	0.6	1070 March17
681	450	1.5	1.71	0.60	0.06	0.9	0.9	0.55	1106 June9
714	336	2.1	2.14	0.08	0.08	0.9	0.9	0.6	1071 June8
519	324	1.6	1.76	0.25	0.08	0.9	0.9	0.53	1074 Sept9
693	407	1.7	1.81	0.32	0.06	0.8	0.8	0.51	502 March16
328	216	1.5	1.78	0.47	0.08	0.8	0.7	0.52	503 June8
652	378	1.7	1.97	0.18	0.06	0.8	0.8	0.6	505 June8
833	450	1.9	2.07	0.10	0.07	0.8	0.9	0.64	515 June9
623	304	2	2.19	-0.36	0.08	0.8	0.7	0.62	1005 Sept9
793	475	1.7	1.55	0.79	0.06	0.8	0.7	0.56	1008 June9
631	340	1.9	2.02	0.22	0.07	0.8	0.9	0.58	1008 June8
604	342	1.8	1.9	0.05	0.07	0.8	0.8	0.59	1008 Sept9
680	349	1.9	2.01	0.10	0.07	0.8	0.8	0.62	1012 March17
865	425	2	2.28	-0.36	0.07	0.8	0.6	0.61	1021 June9
636	368	1.7	2.04	0.01	0.07	0.8	0.8	0.55	1026 March16
714	361	2	2.2	-0.56	0.08	0.8	1.3	0.6	1026 Sept9
461	266	1.7	1.78	0.29	0.07	0.8	0.7	0.49	1102 Sept9
437	306	1.4	1.85	0.10	0.07	0.8	0.8	0.55	1129 Sept9
700	425	1.6	2.16	-0.02	0.06	0.8	0.9	0.55	1108 June9
750	399	1.9	1.9	0.20	0.08	0.8	0.6	0.62	1034 June8
759	312	2.4	2.55	-1.29	0.14	0.8	0.6	0.66	1114 Dec9
446	252	1.8	1.97	-0.01	0.08	0.8	0.8	0.54	1042 Sept9
680	378	1.8	2.02	0.04	0.07	0.8	0.8	0.57	1047 June8
655	342	1.9	2.01	-0.02	0.08	0.8	0.9	0.59	1050 Sept9
711	374	1.9	2.12	0.25	0.07	0.8	0.9	0.6	1058 Dec9
813	364	2.2	2.31	-0.10	0.08	0.8	0.8	0.63	1062 Dec8
504	340	1.5	1.63	0.57	0.07	0.8	1	0.54	1066 June8
662	432	1.5	1.75	0.54	0.06	0.8	0.8	0.56	1070 June9
551	280	2	1.88	0.52	0.08	0.8	0.9	0.58	1070 June8
800	408	2	2.24	-0.27	0.07	0.8	0.7	0.6	1106 June8
749	475	1.6	1.41	0.95	0.06	0.8	0.7	0.59	1071 June9
767	437	1.8	1.79	0.30	0.07	0.8	0.6	0.59	1072 March16
732	380	1.9	1.86	0.28	0.08	0.8	0.6	0.64	1075 June8
666	360	1.9	1.97	0.18	0.07	0.7	0.8	0.62	508 June8
647	378	1.7	1.84	0.51	0.07	0.7	0.7	0.64	511 June9

767	418	1.8	1.9	0.32	0.08	0.7	0.9	0.62	1021	Dec9
648	342	1.9	1.93	0.11	0.08	0.7	0.7	0.6	1101	Sept9
676	366	1.8	2.16	-0.28	0.07	0.7	1	0.61	1094	March16
596	294	2	2.17	-0.26	0.09	0.7	0.9	0.63	1067	June8
684	322	2.1	2.3	-0.48	0.1	0.7	0.7	0.61	1103	June9
692	294	2.4	2.41	-0.93	0.12	**0.5**	**0.5**	0.68	1117	June9

APPENDIX 'I'

Check-list Items

OSCEs 2002 – FACET Output

Obsvd Score	Obsvd Count	Obsvd Average	Fair-M Avrage	Logit Measure	Model S.E.	Infit MnSq	Outfit MnSq	PtBis	Item	Exam
33	48	0.7	1.15	0.64	0.18	1.5	**1.8**	-0.03	183	02Mar16
155	47	3.3	3.06	1.04	0.27	1.5	1.5	-0.05	653	02Dec8
94	76	1.2	1.26	0.54	0.13	1.4	1.5	-0.02	306	02Sept9
43	47	0.9	0.39	2.35	0.19	1.4	1.5	-0.03	742	02Dec8
203	46	4.4	4.7	0.48	0.1	1.4	1.4	-0.04	118	02Mar16
131	76	1.7	1.7	-0.1	0.18	1.3	1.7	-0.08	207	02Sept9
81	54	1.5	1.44	0.61	0.18	1.3	1.5	-0.06	494	02Dec7
32	48	0.7	1.11	0.69	0.18	1.3	1.5	0.07	182	02Mar16
188	140	1.3	1.67	0.21	0.1	1.3	1.4	-0.08	725	02June9
67	50	1.3	1.51	0.27	0.17	1.3	1.4	-0.14	244	02Mar17
80	106	0.8	1.12	0.84	0.11	1.3	1.4	-0.04	529	02June8
54	47	1.1	1.34	0.58	0.2	1.3	1.3	-0.12	725	02Dec8
358	54	6.6	6.69	0.87	0.11	1.3	1.3	0.09	78	02Dec7
277	46	6	5.52	0.9	0.09	1.3	1.3	0.16	174	02Mar16
34	47	0.7	0.8	1.06	0.17	1.3	1.3	-0.16	108	02Mar16
142	140	1	0.76	1.66	0.13	1.3	1.3	-0.01	742	02June9
86	50	1.7	1.75	-0.15	0.22	1.2	1.6	-0.04	205	02Mar17
33	47	0.7	1.51	0.65	0.16	1.2	1.6	-0.05	661	02Dec8
25	54	0.5	0.32	2.04	0.17	1.2	1.5	-0.16	430	02Dec7
87	47	1.9	1.92	-0.45	0.3	1.2	1.4	-0.04	604	02Dec8
79	50	1.6	1.73	-0.04	0.18	1.2	1.4	0.01	245	02Mar17
123	76	1.6	1.57	0.17	0.16	1.2	1.4	-0.01	206	02Sept9
86	47	1.8	1.67	0.51	0.4	1.2	1.4	-0.05	750	02Dec8
30	48	0.6	1.05	0.76	0.19	1.2	1.4	0.12	185	02Mar16
44	47	0.9	1.13	1.09	0.16	1.2	1.4	-0.04	609	02Dec8
58	47	1.2	1.02	1.21	0.17	1.2	1.4	-0.05	629	02Dec8
39	54	0.7	0.68	1.49	0.16	1.2	1.4	-0.02	64	02Dec7
39	106	0.4	0.27	1.91	0.13	1.2	1.4	-0.03	470	02June8
83	54	1.5	1.73	-0.3	0.21	1.2	1.3	-0.1	190	02Dec7
233	140	1.7	1.81	-0.17	0.12	1.2	1.3	0.01	683	02June9
53	47	1.1	1.72	0.14	0.17	1.2	1.3	-0.02	664	02Dec8
129	106	1.2	1.55	0.27	0.11	1.2	1.3	0.02	527	02June8
173	106	1.6	1.56	0.31	0.13	1.2	1.3	0.04	408	02June8
75	50	1.5	1.49	0.33	0.18	1.2	1.3	-0.06	327	02Mar17
71	47	1.5	1.24	0.44	0.22	1.2	1.3	-0.11	51	02Mar16
368	76	4.8	4.86	0.62	0.07	1.2	1.3	0.03	477	02Sept9
65	47	1.4	1	0.82	0.19	1.2	1.3	-0.03	41	02Mar16
99	106	0.9	1.09	0.86	0.12	1.2	1.3	0.1	183	02June8
83	47	1.8	1.57	0.93	0.36	1.2	1.3	-0.01	744	02Dec8

41	50	0.8	0.91	1.03	0.17	1.2	1.3	-0.13	308	02Mar17
44	50	0.9	0.89	1.03	0.15	1.2	1.3	-0.13	288	02Mar17
142	140	1	1.02	1.05	0.09	1.2	1.3	0	663	02June9
62	54	1.1	0.97	1.17	0.15	1.2	1.3	-0.07	429	02Dec7
57	76	0.8	0.68	1.24	0.14	1.2	1.3	-0.09	286	02Sept9
82	106	0.8	0.6	1.42	0.11	1.2	1.3	0	509	02June8
76	106	0.7	0.64	1.42	0.11	1.2	1.3	-0.12	495	02June8
71	47	1.5	1.89	-0.38	0.19	1.2	1.2	-0.03	665	02Dec8
117	76	1.5	1.66	-0.15	0.16	1.2	1.2	-0.05	141	02Sept9
131	76	1.7	1.7	-0.1	0.18	1.2	1.2	0.02	208	02Sept9
171	50	3.4	3.35	0.12	0.23	1.2	1.2	0.01	353	02Mar17
77	50	1.5	1.57	0.2	0.18	1.2	1.2	0.04	206	02Mar17
367	76	4.8	5.39	0.4	0.08	1.2	1.2	0.25	554	02Sept9
55	47	1.2	1.27	0.46	0.17	1.2	1.2	-0.05	106	02Mar16
110	106	1	1.38	0.5	0.11	1.2	1.2	0.04	526	02June8
157	140	1.1	1.19	0.56	0.14	1.2	1.2	-0.08	68	02June9
152	106	1.4	1.31	0.62	0.12	1.2	1.2	0.04	407	02June8
127	140	0.9	1.37	0.64	0.09	1.2	1.2	0.01	182	02June9
51	47	1.1	1.13	0.67	0.17	1.2	1.2	0.12	127	02Mar16
110	106	1	1.22	0.7	0.11	1.2	1.2	0.14	182	02June8
146	140	1	1.31	0.74	0.09	1.2	1.2	0.06	689	02June9
130	106	1.2	1.18	0.78	0.11	1.2	1.2	0.03	484	02June8
167	140	1.2	1.29	0.78	0.09	1.2	1.2	0	628	02June9
44	47	0.9	1	0.82	0.3	1.2	1.2	-0.29	107	02Mar16
134	140	1	1.16	0.85	0.1	1.2	1.2	0	690	02June9
90	76	1.2	0.97	0.87	0.13	1.2	1.2	0.08	196	02Sept9
47	47	1	0.89	0.93	0.16	1.2	1.2	0.02	83	02Mar16
132	140	0.9	1.11	0.96	0.09	1.2	1.2	0.07	65	02June9
69	54	1.3	1.17	0.97	0.15	1.2	1.2	0.03	484	02Dec7
989	140	7.1	6.19	1	0.06	1.2	1.2	0.16	654	02June9
44	49	0.9	0.91	1.01	0.17	1.2	1.2	0.14	66	02Mar17
43	49	0.9	0.89	1.03	0.17	1.2	1.2	0.17	69	02Mar17
40	49	0.8	0.81	1.11	0.17	1.2	1.2	0.18	70	02Mar17
97	106	0.9	0.83	1.14	0.1	1.2	1.2	0.01	489	02June8
38	47	0.8	0.71	1.2	0.17	1.2	1.2	-0.07	95	02Mar16
94	106	0.9	0.79	1.23	0.11	1.2	1.2	-0.01	466	02June8
30	47	0.6	0.6	1.29	0.18	1.2	1.2	0.12	129	02Mar16
36	50	0.7	0.64	1.34	0.16	1.2	1.2	-0.06	328	02Mar17
53	47	1.1	0.88	1.36	0.16	1.2	1.2	0.08	630	02Dec8
58	54	1.1	0.7	1.52	0.16	1.2	1.2	-0.02	510	02Dec7
24	50	0.5	0.47	1.71	0.2	1.2	1.2	-0.07	296	02Mar17
32	49	0.7	0.6	1.76	0.31	1.2	1.2	-0.31	184	02Mar17
36	47	0.8	0.56	2.06	0.21	1.2	1.2	0.07	715	02Dec8
79	47	1.7	1.95	-0.65	0.21	1.2	1.1	0.05	668	02Dec8
76	47	1.6	1.93	-0.55	0.2	1.2	1.1	0.02	674	02Dec8
69	47	1.5	1.73	0.21	0.18	1.2	1.1	0.04	685	02Dec8

76	47	1.6	1.45	0.71	0.21	1.2	1.1	0.13	703	02Dec8
142	106	1.3	1.14	0.77	0.13	1.2	1.1	-0.04	445	02June8
85	47	1.8	1.97	-1	0.27	1.2	1	0.01	666	02Dec8
95	50	1.9	1.92	-0.78	0.35	1.1	1.7	-0.04	208	02Mar17
93	50	1.9	1.88	-0.75	0.32	1.1	1.6	-0.05	202	02Mar17
139	76	1.8	1.82	-0.36	0.22	1.1	1.6	0	216	02Sept9
83	47	1.8	1.73	-0.24	0.25	1.1	1.6	-0.07	26	02Mar16
134	76	1.8	1.74	-0.18	0.19	1.1	1.6	-0.01	213	02Sept9
10	48	0.2	0.32	2.47	0.48	1.1	1.6	-0.06	184	02Mar16
94	54	1.7	1.92	-0.8	0.23	1.1	1.5	-0.09	475	02Dec7
141	76	1.9	1.87	-0.55	0.23	1.1	1.5	-0.07	461	02Sept9
95	54	1.8	1.75	0.04	0.23	1.1	1.5	-0.07	403	02Dec7
35	76	0.5	0.4	1.55	0.14	1.1	1.5	0.08	310	02Sept9
262	140	1.9	1.95	-1.14	0.19	1.1	1.4	-0.03	188	02June9
260	140	1.9	1.95	-1	0.18	1.1	1.4	-0.07	193	02June9
255	140	1.8	1.93	-0.74	0.16	1.1	1.4	-0.01	733	02June9
238	140	1.7	1.86	-0.47	0.13	1.1	1.4	-0.04	736	02June9
199	106	1.9	1.88	-0.43	0.21	1.1	1.4	-0.01	461	02June8
177	106	1.7	1.8	-0.28	0.15	1.1	1.4	0.07	181	02June8
88	50	1.8	1.79	-0.26	0.24	1.1	1.4	0	204	02Mar17
55	47	1.2	1.52	0.64	0.16	1.1	1.4	0.11	689	02Dec8
66	47	1.4	1.16	1.05	0.18	1.1	1.4	0.14	710	02Dec8
23	50	0.5	0.38	1.69	0.18	1.1	1.4	-0.01	335	02Mar17
36	106	0.3	0.37	1.99	0.16	1.1	1.4	-0.02	436	02June8
257	140	1.8	1.87	-1.61	0.22	1.1	1.3	-0.08	75	02June9
95	50	1.9	1.91	-1.35	0.47	1.1	1.3	-0.09	272	02Mar17
264	140	1.9	1.81	-0.59	0.24	1.1	1.3	0.03	744	02June9
71	46	1.5	1.77	-0.31	0.19	1.1	1.3	-0.07	154	02Mar16
188	106	1.8	1.75	-0.31	0.19	1.1	1.3	0	502	02June8
187	106	1.8	1.73	-0.2	0.18	1.1	1.3	-0.01	406	02June8
80	47	1.7	1.64	-0.17	0.25	1.1	1.3	0.08	4	02Mar16
131	76	1.7	1.7	-0.15	0.19	1.1	1.3	0.04	209	02Sept9
78	47	1.7	1.83	-0.07	0.21	1.1	1.3	0.05	734	02Dec8
179	106	1.7	1.65	-0.06	0.16	1.1	1.3	-0.03	513	02June8
182	106	1.7	1.67	-0.05	0.16	1.1	1.3	-0.01	402	02June8
179	106	1.7	1.63	0.13	0.15	1.1	1.3	0.02	403	02June8
73	46	1.6	1.51	0.2	0.2	1.1	1.3	0.06	168	02Mar16
45	47	1	1.67	0.35	0.16	1.1	1.3	0.02	663	02Dec8
83	54	1.5	1.48	0.61	0.17	1.1	1.3	0.05	483	02Dec7
87	54	1.6	1.32	0.78	0.19	1.1	1.3	0	513	02Dec7
199	140	1.4	1.24	0.79	0.1	1.1	1.3	0.04	613	02June9
35	54	0.6	1.33	0.79	0.15	1.1	1.3	-0.01	470	02Dec7
83	54	1.5	1.21	0.91	0.17	1.1	1.3	0.03	505	02Dec7
143	76	1.9	1.86	-0.98	0.36	1.1	1.2	-0.02	194	02Sept9
96	54	1.8	1.93	-0.93	0.24	1.1	1.2	-0.01	462	02Dec7
95	54	1.8	1.92	-0.91	0.24	1.1	1.2	0	465	02Dec7

75	46	1.6	1.58	-0.77	0.29	1.1	1.2	0.05	162	02Mar16
132	76	1.7	1.81	-0.71	0.21	1.1	1.2	0.04	72	02Sept9
90	47	1.9	1.89	-0.54	0.43	1.1	1.2	0.1	707	02Dec8
79	46	1.7	1.68	-0.52	0.28	1.1	1.2	0.05	171	02Mar16
90	50	1.8	1.82	-0.52	0.27	1.1	1.2	-0.01	269	02Mar17
194	106	1.8	1.81	-0.49	0.26	1.1	1.2	-0.13	504	02June8
134	76	1.8	1.81	-0.45	0.2	1.1	1.2	0.13	302	02Sept9
194	106	1.8	1.85	-0.4	0.19	1.1	1.2	0.05	544	02June8
89	54	1.6	1.79	-0.36	0.22	1.1	1.2	-0.04	534	02Dec7
99	54	1.8	1.81	-0.3	0.37	1.1	1.2	-0.08	431	02Dec7
253	140	1.8	1.78	-0.27	0.17	1.1	1.2	-0.1	701	02June9
137	76	1.8	1.79	-0.27	0.2	1.1	1.2	0.07	204	02Sept9
92	54	1.7	1.66	-0.23	0.26	1.1	1.2	-0.14	435	02Dec7
85	54	1.6	1.81	-0.17	0.19	1.1	1.2	0.03	195	02Dec7
183	106	1.7	1.62	0.03	0.17	1.1	1.2	0.02	448	02June8
185	106	1.7	1.71	0.03	0.16	1.1	1.2	0.09	508	02June8
72	47	1.5	1.49	0.06	0.21	1.1	1.2	-0.13	94	02Mar16
187	106	1.8	1.66	0.06	0.17	1.1	1.2	-0.04	444	02June8
112	76	1.5	1.51	0.08	0.16	1.1	1.2	0.2	309	02Sept9
80	54	1.5	1.43	0.09	0.23	1.1	1.2	-0.02	488	02Dec7
248	140	1.8	1.69	0.12	0.15	1.1	1.2	0.06	614	02June9
68	47	1.4	1.56	0.15	0.17	1.1	1.2	0.03	109	02Mar16
71	50	1.4	1.55	0.25	0.17	1.1	1.2	0.09	306	02Mar17
207	140	1.5	1.54	0.25	0.12	1.1	1.2	-0.01	634	02June9
226	140	1.6	1.56	0.27	0.12	1.1	1.2	-0.01	713	02June9
151	106	1.4	1.38	0.38	0.13	1.1	1.2	0.01	465	02June8
153	106	1.4	1.43	0.39	0.13	1.1	1.2	0.09	547	02June8
103	76	1.4	1.37	0.39	0.14	1.1	1.2	-0.04	464	02Sept9
206	140	1.5	1.41	0.44	0.12	1.1	1.2	-0.05	714	02June9
161	140	1.2	1.51	0.45	0.09	1.1	1.2	0.04	726	02June9
178	140	1.3	1.42	0.53	0.1	1.1	1.2	0.11	71	02June9
86	54	1.6	1.43	0.56	0.2	1.1	1.2	0.02	544	02Dec7
62	50	1.2	1.28	0.58	0.17	1.1	1.2	0.1	230	02Mar17
36	48	0.8	1.15	0.61	0.19	1.1	1.2	0.19	187	02Mar16
131	46	2.8	2.72	0.63	0.18	1.1	1.2	0.09	173	02Mar16
147	106	1.4	1.29	0.63	0.12	1.1	1.2	0.07	510	02June8
71	47	1.5	1.38	0.7	0.21	1.1	1.2	0.04	634	02Dec8
61	47	1.3	1.09	0.72	0.17	1.1	1.2	0.19	5	02Mar16
48	47	1	1.3	0.8	0.18	1.1	1.2	0.09	688	02Dec8
55	50	1.1	1.08	0.81	0.16	1.1	1.2	0.08	210	02Mar17
65	76	0.9	0.96	0.9	0.15	1.1	1.2	-0.01	73	02Sept9
189	140	1.4	1.14	0.92	0.1	1.1	1.2	0.04	607	02June9
64	54	1.2	1.21	0.92	0.15	1.1	1.2	0.12	69	02Dec7
65	76	0.9	0.81	1.03	0.12	1.1	1.2	0.08	223	02Sept9
39	47	0.8	0.69	1.2	0.17	1.1	1.2	0	35	02Mar16
37	49	0.8	0.74	1.2	0.17	1.1	1.2	0.23	65	02Mar17

66	76	0.9	0.7	1.3	0.15	1.1	1.2	0	182	02Sept9
63	106	0.6	0.48	1.58	0.11	1.1	1.2	0.06	468	02June8
19	47	0.4	0.35	1.68	0.2	1.1	1.2	0.14	133	02Mar16
65	140	0.5	0.43	1.91	0.12	1.1	1.2	0.07	670	02June9
79	50	1.6	1.62	-0.99	0.27	1.1	1.1	-0.08	309	02Mar17
88	50	1.8	1.73	-0.87	0.31	1.1	1.1	0.01	344	02Mar17
248	140	1.8	1.92	-0.75	0.15	1.1	1.1	0.07	181	02June9
136	76	1.8	1.84	-0.55	0.21	1.1	1.1	0.13	303	02Sept9
80	49	1.6	1.61	-0.51	0.37	1.1	1.1	-0.12	181	02Mar17
81	47	1.7	1.79	-0.41	0.24	1.1	1.1	0.13	122	02Mar16
116	76	1.5	1.55	-0.39	0.28	1.1	1.1	0.05	307	02Sept9
126	76	1.7	1.76	-0.37	0.17	1.1	1.1	0.01	154	02Sept9
242	140	1.7	1.61	-0.35	0.18	1.1	1.1	0.02	652	02June9
70	47	1.5	1.57	-0.34	0.26	1.1	1.1	0.05	62	02Dec8
74	50	1.5	1.54	-0.3	0.33	1.1	1.1	-0.02	307	02Mar17
233	140	1.7	1.86	-0.28	0.12	1.1	1.1	0.08	729	02June9
83	47	1.8	1.86	-0.28	0.26	1.1	1.1	0.05	195	02Dec8
249	140	1.8	1.67	-0.25	0.18	1.1	1.1	0.01	651	02June9
186	106	1.8	1.77	-0.23	0.17	1.1	1.1	0.07	548	02June8
71	47	1.5	1.48	-0.22	0.24	1.1	1.1	-0.01	93	02Mar16
246	76	3.2	3.24	-0.15	0.13	1.1	1.1	0.02	453	02Sept9
100	76	1.3	1.31	-0.14	0.21	1.1	1.1	-0.01	450	02Sept9
86	47	1.8	1.79	-0.13	0.31	1.1	1.1	0.05	626	02Dec8
129	47	2.7	2.97	-0.04	0.24	1.1	1.1	0.1	198	02Mar16
99	54	1.8	1.8	0	0.26	1.1	1.1	0.04	428	02Dec7
186	54	3.4	3.38	0.01	0.24	1.1	1.1	-0.1	437	02Dec7
61	47	1.3	1.61	0.05	0.16	1.1	1.1	0	145	02Mar16
74	47	1.6	1.8	0.05	0.2	1.1	1.1	0.17	694	02Dec8
70	50	1.4	1.53	0.08	0.19	1.1	1.1	0.11	242	02Mar17
119	76	1.6	1.59	0.08	0.15	1.1	1.1	0.07	229	02Sept9
173	106	1.6	1.57	0.11	0.15	1.1	1.1	0.09	413	02June8
67	47	1.4	1.24	0.13	0.26	1.1	1.1	0.07	48	02Mar16
115	76	1.5	1.53	0.13	0.15	1.1	1.1	0.09	227	02Sept9
75	47	1.6	1.37	0.14	0.25	1.1	1.1	0	43	02Mar16
151	106	1.4	1.4	0.14	0.15	1.1	1.1	0.04	493	02June8
174	106	1.6	1.64	0.17	0.14	1.1	1.1	0.15	488	02June8
60	50	1.2	1.28	0.2	0.23	1.1	1.1	-0.09	250	02Mar17
172	106	1.6	1.62	0.2	0.13	1.1	1.1	0.03	487	02June8
221	140	1.6	1.65	0.21	0.11	1.1	1.1	0.14	626	02June9
168	106	1.6	1.58	0.23	0.13	1.1	1.1	0.02	494	02June8
140	49	2.9	2.89	0.24	0.2	1.1	1.1	0.13	77	02Mar17
197	140	1.4	1.46	0.26	0.12	1.1	1.1	-0.09	633	02June9
161	106	1.5	1.49	0.27	0.14	1.1	1.1	0.03	475	02June8
59	54	1.1	1.67	0.27	0.15	1.1	1.1	0.06	468	02Dec7
64	50	1.3	1.37	0.31	0.19	1.1	1.1	0.05	314	02Mar17
71	50	1.4	1.45	0.32	0.18	1.1	1.1	0.06	268	02Mar17

94	76	1.2	1.38	0.33	0.14	1.1	1.1	0.09	142	02Sept9
63	47	1.3	1.6	0.33	0.19	1.1	1.1	0.18	683	02Dec8
63	50	1.3	1.27	0.34	0.21	1.1	1.1	0.02	274	02Mar17
72	54	1.3	1.31	0.34	0.23	1.1	1.1	-0.04	413	02Dec7
93	76	1.2	1.37	0.35	0.14	1.1	1.1	-0.01	64	02Sept9
67	54	1.2	1.61	0.37	0.15	1.1	1.1	0.09	196	02Dec7
162	106	1.5	1.38	0.38	0.15	1.1	1.1	-0.02	442	02June8
187	47	4	6.28	0.38	0.09	1.1	1.1	0.13	678	02Dec8
61	47	1.3	1.52	0.39	0.19	1.1	1.1	0.08	721	02Dec8
97	76	1.3	1.25	0.41	0.16	1.1	1.1	-0.01	285	02Sept9
179	140	1.3	1.51	0.42	0.1	1.1	1.1	0.17	684	02June9
104	76	1.4	1.38	0.42	0.13	1.1	1.1	0.1	225	02Sept9
90	76	1.2	1.35	0.43	0.13	1.1	1.1	0.12	145	02Sept9
157	50	3.1	3.14	0.44	0.25	1.1	1.1	0.02	277	02Mar17
45	47	1	1.29	0.46	0.16	1.1	1.1	0.11	143	02Mar16
57	46	1.2	1.16	0.46	0.23	1.1	1.1	0.08	166	02Mar16
58	47	1.2	1.16	0.49	0.3	1.1	1.1	-0.17	27	02Mar16
199	140	1.4	1.52	0.5	0.1	1.1	1.1	0.05	630	02June9
94	76	1.2	1.21	0.5	0.15	1.1	1.1	0	284	02Sept9
39	47	0.8	1.58	0.51	0.16	1.1	1.1	0.04	662	02Dec8
64	50	1.3	1.31	0.55	0.16	1.1	1.1	0.07	284	02Mar17
220	140	1.6	1.43	0.56	0.11	1.1	1.1	0.01	606	02June9
61	50	1.2	1.24	0.58	0.17	1.1	1.1	0.04	285	02Mar17
50	47	1.1	1.19	0.59	0.16	1.1	1.1	0.13	66	02Mar16
80	76	1.1	1.23	0.59	0.12	1.1	1.1	0.15	62	02Sept9
62	50	1.2	1.21	0.61	0.18	1.1	1.1	0.03	325	02Mar17
59	54	1.1	1.39	0.61	0.16	1.1	1.1	0.03	529	02Dec7
49	47	1	1.12	0.62	0.19	1.1	1.1	0.06	116	02Mar16
57	50	1.1	1.15	0.63	0.2	1.1	1.1	0.15	235	02Mar17
123	106	1.2	1.3	0.65	0.11	1.1	1.1	-0.01	427	02June8
85	76	1.1	1.1	0.65	0.15	1.1	1.1	0.06	447	02Sept9
57	50	1.1	1.16	0.67	0.18	1.1	1.1	0.02	287	02Mar17
63	50	1.3	1.22	0.68	0.16	1.1	1.1	0.15	330	02Mar17
88	76	1.2	1.15	0.68	0.13	1.1	1.1	0.08	224	02Sept9
70	47	1.5	1.11	0.69	0.19	1.1	1.1	0.02	42	02Mar16
74	76	1	1.13	0.69	0.13	1.1	1.1	0.09	71	02Sept9
73	76	1	1.12	0.7	0.13	1.1	1.1	0.11	70	02Sept9
214	140	1.5	1.27	0.73	0.12	1.1	1.1	0.01	644	02June9
69	47	1.5	1.33	0.73	0.21	1.1	1.1	0.09	627	02Dec8
130	106	1.2	1.16	0.75	0.12	1.1	1.1	0.03	474	02June8
79	54	1.5	1.34	0.76	0.17	1.1	1.1	0.04	423	02Dec7
175	140	1.3	1.28	0.77	0.09	1.1	1.1	0.09	675	02June9
131	106	1.2	1.17	0.78	0.11	1.1	1.1	0.04	462	02June8
163	140	1.2	1.24	0.78	0.1	1.1	1.1	0	629	02June9
82	76	1.1	1.03	0.79	0.13	1.1	1.1	0.09	296	02Sept9
66	76	0.9	1.03	0.8	0.12	1.1	1.1	0.09	149	02Sept9

51	50	1	1.03	0.87	0.16	1.1	1.1	0.05	265	02Mar17
190	140	1.4	1.16	0.89	0.1	1.1	1.1	-0.02	609	02June9
50	47	1.1	1.25	0.89	0.17	1.1	1.1	0.05	183	02Dec8
127	140	0.9	1.17	0.9	0.09	1.1	1.1	0.16	687	02June9
76	76	1	0.94	0.9	0.13	1.1	1.1	0.02	290	02Sept9
112	106	1.1	1	0.97	0.11	1.1	1.1	0.03	485	02June8
601	106	5.7	5.51	0.97	0.07	1.1	1.1	0.23	497	02June8
217	49	4.4	4.56	0.99	0.08	1.1	1.1	0.5	78	02Mar17
48	47	1	1.21	0.99	0.16	1.1	1.1	0.08	613	02Dec8
110	106	1	0.97	1	0.1	1.1	1.1	0.11	490	02June8
58	54	1.1	1.08	1.01	0.18	1.1	1.1	0.01	73	02Dec7
62	76	0.8	0.79	1.06	0.13	1.1	1.1	0.01	462	02Sept9
70	76	0.9	0.89	1.06	0.23	1.1	1.1	-0.09	288	02Sept9
153	140	1.1	0.98	1.1	0.1	1.1	1.1	0.05	710	02June9
88	140	0.6	0.96	1.12	0.1	1.1	1.1	0.1	722	02June9
80	106	0.8	0.85	1.14	0.11	1.1	1.1	0.02	425	02June8
160	140	1.1	0.9	1.18	0.09	1.1	1.1	0.06	610	02June9
37	50	0.7	0.73	1.19	0.15	1.1	1.1	0.04	286	02Mar17
63	76	0.8	0.66	1.22	0.13	1.1	1.1	0.12	210	02Sept9
50	54	0.9	0.91	1.24	0.15	1.1	1.1	0.16	70	02Dec7
32	54	0.6	0.94	1.26	0.21	1.1	1.1	0	466	02Dec7
58	76	0.8	0.57	1.43	0.14	1.1	1.1	0.13	197	02Sept9
34	76	0.4	0.53	1.43	0.15	1.1	1.1	0.07	155	02Sept9
33	47	0.7	0.88	1.45	0.21	1.1	1.1	0.01	724	02Dec8
41	76	0.5	0.49	1.47	0.14	1.1	1.1	0.03	235	02Sept9
48	54	0.9	0.75	1.51	0.17	1.1	1.1	0.02	436	02Dec7
27	106	0.3	0.4	1.79	0.17	1.1	1.1	0.04	530	02June8
11	47	0.2	0.28	2.2	0.35	1.1	1.1	-0.05	182	02Dec8
24	54	0.4	0.37	2.46	0.22	1.1	1.1	0.06	495	02Dec7
89	47	1.9	1.93	-1.04	0.4	1.1	1	0.05	189	02Dec8
80	47	1.7	1.93	-0.81	0.23	1.1	1	0.04	669	02Dec8
134	76	1.8	1.84	-0.55	0.19	1.1	1	0.1	156	02Sept9
77	46	1.7	1.63	-0.48	0.27	1.1	1	0.05	165	02Mar16
249	47	5.3	6.77	-0.25	0.1	1.1	1	0.4	199	02Mar16
80	47	1.7	1.8	-0.23	0.25	1.1	1	0.08	190	02Dec8
225	140	1.6	1.84	-0.16	0.11	1.1	1	0.11	730	02June9
67	49	1.4	1.46	0.31	0.18	1.1	1	0.26	62	02Mar17
87	76	1.1	1.32	0.43	0.13	1.1	1	0.18	547	02Sept9
63	54	1.2	1.5	0.43	0.16	1.1	1	0.13	185	02Dec7
61	47	1.3	1.6	0.52	0.16	1.1	1	0.12	727	02Dec8
439	76	5.8	5.86	0.61	0.07	1.1	1	0.39	317	02Sept9
79	54	1.5	1.43	0.67	0.16	1.1	1	0.05	414	02Dec7
224	50	4.5	4.44	0.84	0.09	1.1	1	0.28	237	02Mar17
303	49	6.2	6.25	0.86	0.1	1.1	1	0.27	218	02Mar17
97	106	0.9	1.06	0.91	0.11	1.1	1	0.16	64	02June8
32	47	0.7	1.18	0.91	0.21	1.1	1	0.06	670	02Dec8

147	140	1.1	1.06	1.01	0.09	1.1	1	0.13	665	02June9
34	47	0.7	0.81	1.02	0.16	1.1	1	0.1	115	02Mar16
27	47	0.6	0.82	1.08	0.2	1.1	1	0.1	146	02Mar16
314	54	5.8	5.58	1.31	0.12	1.1	1	0.15	438	02Dec7
32	49	0.7	0.54	1.43	0.16	1.1	1	0.14	185	02Mar17
77	48	1.6	1.9	-0.72	0.2	1.1	0.8	0.26	181	02Mar16
86	47	1.8	1.78	0.06	0.29	1.1	0.8	0.12	623	02Dec8
85	47	1.8	1.74	0.23	0.27	1.1	0.7	0.19	709	02Dec8
107	54	2	1.99	-3.39	1.01	1	**2.3**	-0.19	192	02Dec7
93	47	2	1.98	-3.16	1.01	1	1.6	-0.11	124	02Mar16
93	47	2	1.95	-1.8	1.02	1	1.6	-0.03	741	02Dec8
192	106	1.8	1.82	-0.65	0.21	1	1.6	0.02	541	02June8
148	76	1.9	1.94	-1.87	0.52	1	1.5	-0.09	188	02Sept9
149	76	2	1.95	-1.2	0.46	1	1.5	0.01	187	02Sept9
257	140	1.8	1.72	-0.21	0.2	1	1.5	0.06	745	02June9
83	47	1.8	1.68	0.27	0.26	1	1.5	0.09	705	02Dec8
93	47	2	1.97	-2.4	1.01	1	1.4	-0.07	631	02Dec8
197	106	1.9	1.91	-1.14	0.23	1	1.4	0.01	193	02June8
89	49	1.8	1.87	-0.69	0.28	1	1.4	0.08	68	02Mar17
106	54	2	1.98	-3.39	1.01	1	1.3	-0.06	194	02Dec7
92	47	2	1.95	-2.83	1.01	1	1.3	-0.05	3	02Mar16
107	54	2	1.97	-2.41	1.01	1	1.3	-0.05	516	02Dec7
98	50	2	1.96	-2.34	0.72	1	1.3	0.02	283	02Mar17
104	54	1.9	1.97	-1.45	0.42	1	1.3	0.04	191	02Dec7
100	54	1.9	1.82	-0.34	0.31	1	1.3	0.08	424	02Dec7
258	140	1.8	1.79	-0.11	0.17	1	1.3	0	603	02June9
176	106	1.7	1.64	0.16	0.14	1	1.3	0.1	464	02June8
2	50	0	0.04	4.88	1.01	1	1.3	0.01	222	02Mar17
141	76	1.9	1.85	-1.29	0.3	1	1.2	-0.05	282	02Sept9
104	54	1.9	1.91	-1.23	0.52	1	1.2	-0.09	434	02Dec7
78	47	1.7	1.8	-0.74	0.24	1	1.2	0.04	153	02Mar16
256	140	1.8	1.75	-0.63	0.21	1	1.2	0.04	642	02June9
84	50	1.7	1.69	-0.61	0.27	1	1.2	0.08	213	02Mar17
101	54	1.9	1.81	-0.49	0.35	1	1.2	-0.01	442	02Dec7
81	50	1.6	1.72	-0.36	0.22	1	1.2	0.09	246	02Mar17
181	106	1.7	1.67	-0.12	0.17	1	1.2	0.08	514	02June8
126	76	1.7	1.66	-0.07	0.17	1	1.2	0.08	294	02Sept9
75	47	1.6	1.5	0.1	0.22	1	1.2	0.22	7	02Mar16
75	47	1.6	1.53	0.12	0.2	1	1.2	-0.02	25	02Mar16
67	47	1.4	1.6	0.47	0.18	1	1.2	0.13	607	02Dec8
66	47	1.4	1.24	0.55	0.18	1	1.2	0.25	15	02Mar16
92	47	2	1.97	-2.89	1.01	1	1.1	-0.02	605	02Dec8
92	47	2	1.97	-2.89	1.01	1	1.1	-0.02	614	02Dec8
150	76	2	1.97	-2.59	0.72	1	1.1	0.01	193	02Sept9
92	47	2	1.96	-2.44	0.73	1	1.1	0.05	131	02Mar16
91	47	1.9	1.95	-2.03	0.6	1	1.1	0.03	103	02Mar16

92	47	2	1.95	-1.68	0.73	1	1.1	-0.04	621	02Dec8
265	140	1.9	1.95	-1.49	0.23	1	1.1	0.03	191	02June9
90	47	1.9	1.93	-1.42	0.53	1	1.1	-0.01	612	02Dec8
263	140	1.9	1.92	-1.4	0.26	1	1.1	0.02	731	02June9
206	106	1.9	1.94	-1.35	0.36	1	1.1	0.05	471	02June8
144	76	1.9	1.89	-1.32	0.33	1	1.1	0	283	02Sept9
85	47	1.8	1.88	-1.17	0.34	1	1.1	0.13	686	02Dec8
92	49	1.9	1.87	-1.03	0.44	1	1.1	0	332	02Mar17
194	106	1.8	1.87	-1.02	0.22	1	1.1	0.07	63	02June8
259	140	1.9	1.78	-0.99	0.23	1	1.1	0.03	643	02June9
254	140	1.8	1.84	-0.92	0.19	1	1.1	0.03	622	02June9
202	106	1.9	1.89	-0.91	0.28	1	1.1	0.03	401	02June8
233	140	1.7	1.81	-0.91	0.15	1	1.1	0.07	186	02June9
94	50	1.9	1.91	-0.9	0.33	1	1.1	0.04	304	02Mar17
83	50	1.7	1.62	-0.78	0.28	1	1.1	0.04	351	02Mar17
173	106	1.6	1.71	-0.71	0.18	1	1.1	0.09	192	02June8
86	47	1.8	1.71	-0.57	0.34	1	1.1	0.08	49	02Mar16
91	50	1.8	1.88	-0.53	0.26	1	1.1	0.09	302	02Mar17
83	47	1.8	1.79	-0.52	0.35	1	1.1	-0.02	101	02Mar16
96	54	1.8	1.68	-0.51	0.44	1	1.1	-0.05	508	02Dec7
267	140	1.9	1.88	-0.49	0.23	1	1.1	0	602	02June9
124	76	1.6	1.64	-0.39	0.19	1	1.1	0	463	02Sept9
88	54	1.6	1.52	-0.3	0.27	1	1.1	0.02	441	02Dec7
98	54	1.8	1.81	-0.23	0.27	1	1.1	0.04	404	02Dec7
87	47	1.9	1.72	-0.14	0.37	1	1.1	0.03	645	02Dec8
183	106	1.7	1.74	-0.12	0.16	1	1.1	0.08	551	02June8
85	47	1.8	1.75	-0.1	0.31	1	1.1	0.19	713	02Dec8
129	76	1.7	1.67	-0.08	0.18	1	1.1	0.12	201	02Sept9
73	47	1.6	1.77	0.02	0.2	1	1.1	0.21	684	02Dec8
208	140	1.5	1.54	0.09	0.13	1	1.1	0.07	623	02June9
209	140	1.5	1.69	0.13	0.11	1	1.1	0.15	688	02June9
95	54	1.8	1.73	0.17	0.32	1	1.1	-0.07	432	02Dec7
80	47	1.7	1.48	0.33	0.28	1	1.1	0.08	650	02Dec8
92	54	1.7	1.54	0.39	0.22	1	1.1	0.01	448	02Dec7
519	106	4.9	5.79	0.42	0.07	1	1.1	0.18	537	02June8
57	47	1.2	1.12	0.69	0.16	1	1.1	0.14	90	02Mar16
56	47	1.2	1.39	0.75	0.17	1	1.1	0.09	65	02Dec8
69	76	0.9	1.07	0.76	0.12	1	1.1	0.18	150	02Sept9
337	76	4.4	4.2	0.9	0.06	1	1.1	0.25	454	02Sept9
49	47	1	0.77	1.07	0.17	1	1.1	0.3	14	02Mar16
36	47	0.8	1.02	1.2	0.18	1	1.1	0.16	687	02Dec8
57	47	1.2	1.01	1.22	0.18	1	1.1	0.18	633	02Dec8
32	47	0.7	0.96	1.27	0.17	1	1.1	0.1	723	02Dec8
116	140	0.8	0.87	1.28	0.11	1	1.1	0.06	635	02June9
51	76	0.7	0.65	1.39	0.15	1	1.1	0.04	466	02Sept9
20	54	0.4	0.55	1.88	0.23	1	1.1	0.1	182	02Dec7

43	106	0.4	0.29	2.05	0.14	1	1.1	0.13	515	02June8
33	54	0.6	0.34	2.2	0.18	1	1.1	0.07	515	02Dec7
26	76	0.3	0.32	2.47	0.31	1	1.1	0	230	02Sept9
150	76	2	1.97	-3.4	1.01	1	1	0.01	203	02Sept9
92	47	2	1.97	-2.92	1.01	1	1	-0.02	187	02Dec8
150	76	2	1.97	-2.69	0.72	1	1	0	211	02Sept9
90	47	1.9	1.93	-2.49	0.72	1	1	0.1	67	02Mar16
96	50	1.9	1.92	-2.26	0.72	1	1	-0.03	326	02Mar17
96	49	2	1.96	-2.19	0.72	1	1	0.01	192	02Mar17
149	76	2	1.95	-2.17	0.59	1	1	0.06	192	02Sept9
92	47	2	1.97	-2.17	0.73	1	1	0.01	611	02Dec8
247	140	1.8	1.84	-1.81	0.19	1	1	0.07	732	02June9
89	47	1.9	1.93	-1.76	0.48	1	1	-0.02	156	02Mar16
270	140	1.9	1.97	-1.72	0.28	1	1	0.02	190	02June9
90	47	1.9	1.9	-1.36	0.53	1	1	0.09	2	02Mar16
272	140	1.9	1.96	-1.35	0.3	1	1	0	67	02June9
262	140	1.9	1.9	-1.3	0.23	1	1	0.06	63	02June9
89	47	1.9	1.92	-1.27	0.4	1	1	-0.02	111	02Mar16
269	140	1.9	1.91	-1.27	0.32	1	1	0.04	702	02June9
267	140	1.9	1.97	-1.26	0.22	1	1	0.02	194	02June9
264	140	1.9	1.96	-1.24	0.21	1	1	0.04	195	02June9
191	106	1.8	1.78	-1.2	0.23	1	1	0.19	501	02June8
139	76	1.8	1.87	-1.19	0.26	1	1	0.07	153	02Sept9
94	54	1.7	1.82	-1.19	0.29	1	1	0	533	02Dec7
88	50	1.8	1.8	-1.15	0.3	1	1	0.13	303	02Mar17
247	140	1.8	1.83	-1.13	0.18	1	1	0.2	692	02June9
95	50	1.9	1.91	-1.12	0.4	1	1	0.15	282	02Mar17
82	47	1.7	1.82	-1.11	0.44	1	1	0.13	729	02Dec8
118	76	1.6	1.55	-1.07	0.22	1	1	0.17	443	02Sept9
126	76	1.7	1.71	-1.06	0.22	1	1	0.09	144	02Sept9
116	76	1.5	1.52	-1.04	0.22	1	1	0.09	449	02Sept9
86	47	1.8	1.88	-0.99	0.35	1	1	0.14	191	02Dec8
86	50	1.7	1.73	-0.96	0.41	1	1	0.13	295	02Mar17
180	106	1.7	1.62	-0.94	0.21	1	1	0.08	446	02June8
173	106	1.6	1.55	-0.88	0.2	1	1	0.09	450	02June8
195	106	1.8	1.9	-0.88	0.21	1	1	0.11	196	02June8
253	140	1.8	1.7	-0.87	0.21	1	1	0.09	752	02June9
86	50	1.7	1.69	-0.83	0.3	1	1	0.08	347	02Mar17
127	76	1.7	1.66	-0.81	0.22	1	1	0.1	292	02Sept9
256	140	1.8	1.85	-0.79	0.19	1	1	0.13	625	02June9
199	106	1.9	1.87	-0.76	0.24	1	1	-0.01	463	02June8
87	47	1.9	1.9	-0.74	0.29	1	1	0.09	72	02Mar16
181	106	1.7	1.84	-0.73	0.17	1	1	0.12	521	02June8
80	50	1.6	1.55	-0.72	0.28	1	1	0.14	343	02Mar17
94	54	1.7	1.73	-0.72	0.41	1	1	0.02	402	02Dec7
103	54	1.9	1.89	-0.71	0.39	1	1	-0.02	433	02Dec7

84	54	1.6	1.71	-0.63	0.33	1	1	0.1	181	02Dec7
251	140	1.8	1.88	-0.62	0.16	1	1	0.07	696	02June9
106	76	1.4	1.45	-0.61	0.21	1	1	0.14	75	02Sept9
263	140	1.9	1.86	-0.58	0.21	1	1	-0.01	707	02June9
83	47	1.8	1.83	-0.57	0.29	1	1	0.1	603	02Dec8
165	106	1.6	1.72	-0.55	0.16	1	1	0.13	522	02June8
193	106	1.8	1.8	-0.54	0.21	1	1	0.13	516	02June8
190	106	1.8	1.8	-0.53	0.2	1	1	0.06	545	02June8
89	54	1.6	1.9	-0.53	0.19	1	1	0.08	464	02Dec7
98	54	1.8	1.75	-0.52	0.32	1	1	0.05	552	02Dec7
86	50	1.7	1.69	-0.5	0.27	1	1	0.12	350	02Mar17
85	47	1.8	1.85	-0.5	0.38	1	1	0.12	192	02Dec8
85	47	1.8	1.85	-0.5	0.38	1	1	0.12	193	02Dec8
145	106	1.4	1.34	-0.48	0.19	1	1	0.1	473	02June8
134	76	1.8	1.77	-0.47	0.21	1	1	0.09	444	02Sept9
188	106	1.8	1.81	-0.46	0.24	1	1	0.07	75	02June8
91	49	1.9	1.85	-0.43	0.29	1	1	0.08	188	02Mar17
126	76	1.7	1.75	-0.43	0.18	1	1	0.21	74	02Sept9
169	106	1.6	1.7	-0.41	0.16	1	1	0.16	197	02June8
107	76	1.4	1.41	-0.4	0.21	1	1	0.06	467	02Sept9
86	54	1.6	1.61	-0.38	0.25	1	1	0.14	74	02Dec7
85	50	1.7	1.74	-0.37	0.24	1	1	0.14	233	02Mar17
128	76	1.7	1.7	-0.37	0.19	1	1	0.11	222	02Sept9
149	106	1.4	1.38	-0.34	0.18	1	1	0.04	467	02June8
78	50	1.6	1.58	-0.33	0.24	1	1	0.06	273	02Mar17
62	47	1.3	1.49	-0.27	0.31	1	1	0.01	149	02Mar16
189	106	1.8	1.76	-0.24	0.18	1	1	0.19	507	02June8
427	140	3.1	3.43	-0.19	0.1	1	1	0.25	198	02June9
107	76	1.4	1.51	-0.19	0.17	1	1	0.14	543	02Sept9
75	46	1.6	1.57	-0.13	0.24	1	1	0.17	161	02Mar16
108	76	1.4	1.54	-0.13	0.16	1	1	0.19	542	02Sept9
68	46	1.5	1.41	-0.11	0.25	1	1	0.12	172	02Mar16
163	50	3.3	3.24	-0.11	0.21	1	1	0.12	336	02Mar17
87	50	1.7	1.73	-0.1	0.33	1	1	0.03	324	02Mar17
185	54	3.4	3.32	-0.09	0.26	1	1	0.05	453	02Dec7
64	47	1.4	1.42	-0.08	0.32	1	1	0.05	104	02Mar16
175	106	1.7	1.75	-0.08	0.14	1	1	0.09	433	02June8
80	54	1.5	1.67	-0.08	0.2	1	1	0.04	527	02Dec7
214	140	1.5	1.68	-0.06	0.12	1	1	0.18	685	02June9
86	47	1.8	1.78	-0.06	0.4	1	1	0.17	712	02Dec8
75	47	1.6	1.4	-0.05	0.26	1	1	0.08	47	02Mar16
79	50	1.6	1.52	-0.05	0.23	1	1	0.15	341	02Mar17
92	54	1.7	1.74	-0.05	0.23	1	1	0.17	72	02Dec7
246	140	1.8	1.63	-0.04	0.17	1	1	0.05	650	02June9
71	54	1.3	1.31	-0.04	0.26	1	1	0.19	76	02Dec7
244	140	1.7	1.71	-0.01	0.15	1	1	0.05	703	02June9

81	47	1.7	1.78	-0.01	0.33	1	1	0.11	194	02Dec8
74	47	1.6	1.69	-0.01	0.22	1	1	0.17	68	02Dec8
72	46	1.6	1.5	0.02	0.22	1	1	0.21	167	02Mar16
82	50	1.6	1.68	0.02	0.2	1	1	0.09	293	02Mar17
108	76	1.4	1.59	0.02	0.15	1	1	0.16	541	02Sept9
173	106	1.6	1.59	0.04	0.15	1	1	0.21	505	02June8
221	140	1.6	1.7	0.04	0.12	1	1	0.17	62	02June9
223	140	1.6	1.65	0.07	0.12	1	1	0.1	621	02June9
85	54	1.6	1.45	0.08	0.25	1	1	0.03	447	02Dec7
70	54	1.3	1.2	0.09	0.28	1	1	0.05	451	02Dec7
58	47	1.2	1.52	0.1	0.17	1	1	0.13	142	02Mar16
112	76	1.5	1.47	0.13	0.16	1	1	0.14	441	02Sept9
91	76	1.2	1.27	0.13	0.19	1	1	0.2	68	02Sept9
76	47	1.6	1.76	0.17	0.2	1	1	0.21	606	02Dec8
118	47	2.5	3.31	0.18	0.16	1	1	0.14	677	02Dec8
70	50	1.4	1.38	0.2	0.21	1	1	0.05	334	02Mar17
70	47	1.5	1.44	0.21	0.2	1	1	0.14	86	02Mar16
168	140	1.2	1.53	0.21	0.11	1	1	0.19	187	02June9
79	47	1.7	1.73	0.21	0.32	1	1	0.12	76	02Dec8
166	106	1.6	1.57	0.24	0.13	1	1	0.15	550	02June8
63	46	1.4	1.29	0.29	0.22	1	1	0.13	164	02Mar16
65	46	1.4	1.32	0.3	0.21	1	1	0.33	170	02Mar16
166	106	1.6	1.5	0.31	0.13	1	1	0.19	506	02June8
92	76	1.2	1.21	0.32	0.18	1	1	0.11	473	02Sept9
69	47	1.5	1.42	0.34	0.18	1	1	0.16	87	02Mar16
82	50	1.6	1.64	0.34	0.3	1	1	0.1	212	02Mar17
351	106	3.3	3.29	0.35	0.15	1	1	0.11	496	02June8
130	106	1.2	1.37	0.36	0.13	1	1	0.26	187	02June8
156	140	1.1	1.49	0.36	0.1	1	1	0.18	185	02June9
133	106	1.3	1.34	0.38	0.13	1	1	0.1	435	02June8
782	140	5.6	6.63	0.38	0.06	1	1	0.4	199	02June9
62	50	1.2	1.25	0.39	0.3	1	1	0.14	223	02Mar17
192	140	1.4	1.31	0.39	0.13	1	1	0.13	705	02June9
67	47	1.4	1.59	0.39	0.19	1	1	0.11	66	02Dec8
130	47	2.8	2.86	0.4	0.18	1	1	0.14	117	02Mar16
178	106	1.7	1.64	0.4	0.21	1	1	0.16	412	02June8
216	140	1.5	1.48	0.4	0.12	1	1	0.08	704	02June9
162	47	3.4	3.35	0.4	0.25	1	1	0.18	637	02Dec8
154	140	1.1	1.31	0.42	0.17	1	1	0.12	727	02June9
55	46	1.2	1.34	0.43	0.16	1	1	-0.03	64	02Mar16
289	50	5.8	6.43	0.43	0.08	1	1	0.38	254	02Mar17
116	106	1.1	1.46	0.43	0.11	1	1	0.12	525	02June8
60	45	1.3	1.24	0.44	0.2	1	1	0.12	169	02Mar16
127	106	1.2	1.35	0.44	0.13	1	1	0.24	185	02June8
161	140	1.2	1.49	0.44	0.1	1	1	0.14	734	02June9
180	106	1.7	1.63	0.45	0.21	1	1	0.1	443	02June8

195	140	1.4	1.42	0.47	0.11	1	1	0.24	664	02June9
63	47	1.3	1.2	0.49	0.21	1	1	0.29	6	02Mar16
65	47	1.4	1.28	0.49	0.17	1	1	0.15	22	02Mar16
87	76	1.1	1.33	0.49	0.12	1	1	0.17	69	02Sept9
86	76	1.1	1.3	0.5	0.13	1	1	0.22	66	02Sept9
51	47	1.1	1.18	0.53	0.19	1	1	0.21	73	02Mar16
125	50	2.5	2.58	0.54	0.2	1	1	0.2	316	02Mar17
116	76	1.5	1.57	0.54	0.23	1	1	0.07	63	02Sept9
61	47	1.3	1.47	0.54	0.18	1	1	0.15	185	02Dec8
41	47	0.9	1.25	0.55	0.16	1	1	0.23	150	02Mar16
387	76	5.1	5.57	0.55	0.07	1	1	0.3	158	02Sept9
75	54	1.4	1.42	0.55	0.18	1	1	0.14	66	02Dec7
60	47	1.3	1.18	0.57	0.18	1	1	0.18	36	02Mar16
61	47	1.3	1.19	0.59	0.17	1	1	0.12	21	02Mar16
57	54	1.1	1.4	0.59	0.16	1	1	0.13	197	02Dec7
153	47	3.3	3.12	0.6	0.21	1	1	0.26	16	02Mar16
52	47	1.1	1.3	0.61	0.3	1	1	0.1	693	02Dec8
61	50	1.2	1.25	0.62	0.16	1	1	0.16	263	02Mar17
64	50	1.3	1.25	0.62	0.16	1	1	0.19	322	02Mar17
52	50	1	1.14	0.63	0.2	1	1	0.11	251	02Mar17
122	106	1.2	1.31	0.63	0.11	1	1	0.23	71	02June8
181	140	1.3	1.38	0.63	0.1	1	1	0.19	624	02June9
114	106	1.1	1.16	0.65	0.2	1	1	0.18	69	02June8
59	50	1.2	1.21	0.67	0.16	1	1	0.19	226	02Mar17
55	49	1.1	1.17	0.67	0.18	1	1	0.3	73	02Mar17
185	140	1.3	1.36	0.67	0.1	1	1	0.22	662	02June9
55	47	1.2	1.1	0.68	0.18	1	1	0.01	84	02Mar16
110	106	1	1.09	0.68	0.17	1	1	0.16	68	02June8
114	106	1.1	1.15	0.68	0.2	1	1	0.08	429	02June8
170	54	3.1	3.15	0.69	0.24	1	1	0.14	77	02Dec7
59	49	1.2	1.13	0.74	0.17	1	1	0.19	186	02Mar17
82	76	1.1	1.07	0.75	0.12	1	1	0.09	469	02Sept9
81	76	1.1	1.05	0.75	0.15	1	1	0.09	448	02Sept9
51	47	1.1	1.39	0.76	0.16	1	1	0.17	722	02Dec8
43	47	0.9	1.05	0.77	0.16	1	1	0.13	65	02Mar16
66	54	1.2	1.15	0.77	0.22	1	1	0.09	425	02Dec7
253	49	5.2	4.84	0.8	0.08	1	1	0.32	199	02Mar17
52	49	1.1	1.07	0.81	0.17	1	1	0.19	275	02Mar17
126	140	0.9	1.15	0.81	0.11	1	1	0.16	724	02June9
458	106	4.3	3.99	0.82	0.06	1	1	0.21	477	02June8
77	76	1	1.01	0.82	0.14	1	1	0.26	314	02Sept9
31	47	0.7	1.29	0.82	0.19	1	1	0.07	667	02Dec8
50	54	0.9	1.21	0.84	0.16	1	1	0.04	523	02Dec7
163	140	1.2	1.19	0.86	0.1	1	1	0.22	667	02June9
100	106	0.9	1.09	0.87	0.1	1	1	0.21	70	02June8
64	76	0.8	0.97	0.87	0.13	1	1	0.16	143	02Sept9

267	50	5.3	4.51	0.89	0.08	1	1	0.25	354	02Mar17
101	106	1	1.08	0.89	0.1	1	1	0.13	430	02June8
64	47	1.4	1.22	0.89	0.2	1	1	0.12	635	02Dec8
69	47	1.5	1.27	0.89	0.2	1	1	0.24	714	02Dec8
48	54	0.9	1.15	0.91	0.17	1	1	0.09	525	02Dec7
50	54	0.9	1.1	0.91	0.21	1	1	0.04	535	02Dec7
84	54	1.6	1.56	0.91	0.28	1	1	0.15	75	02Dec7
49	50	1	0.99	0.92	0.17	1	1	0.22	290	02Mar17
89	106	0.8	1.02	0.92	0.15	1	1	0.08	535	02June8
349	54	6.5	6.34	0.92	0.08	1	1	0.2	417	02Dec7
116	140	0.8	1.08	0.93	0.11	1	1	0.21	723	02June9
72	76	0.9	0.94	0.93	0.14	1	1	0.09	474	02Sept9
71	76	0.9	0.9	0.95	0.13	1	1	0.17	445	02Sept9
140	140	1	1.07	0.99	0.09	1	1	0.14	627	02June9
68	76	0.9	0.88	1	0.14	1	1	0.1	475	02Sept9
46	50	0.9	0.92	1.01	0.17	1	1	0.24	229	02Mar17
127	140	0.9	1.07	1.01	0.09	1	1	0.19	66	02June9
66	76	0.9	0.83	1.02	0.13	1	1	0.17	221	02Sept9
46	47	1	0.9	1.03	0.3	1	1	0.05	30	02Mar16
109	106	1	0.92	1.05	0.1	1	1	0.17	469	02June8
45	49	0.9	0.9	1.06	0.18	1	1	0.19	215	02Mar17
67	54	1.2	1.08	1.06	0.15	1	1	0.13	421	02Dec7
42	47	0.9	1.09	1.06	0.3	1	1	0.12	690	02Dec8
38	47	0.8	0.8	1.07	0.18	1	1	0.26	128	02Mar16
304	47	6.5	6.82	1.07	0.13	1	1	0.31	78	02Dec8
48	47	1	0.75	1.1	0.17	1	1	0.3	13	02Mar16
114	140	0.8	0.96	1.12	0.09	1	1	0.13	69	02June9
46	54	0.9	1	1.13	0.22	1	1	0.05	524	02Dec7
82	140	0.6	0.94	1.16	0.11	1	1	0.15	183	02June9
55	54	1	0.99	1.19	0.34	1	1	0.01	486	02Dec7
36	54	0.7	0.95	1.2	0.17	1	1	0.07	528	02Dec7
39	47	0.8	1.02	1.21	0.16	1	1	0.17	602	02Dec8
129	49	2.6	2.6	1.23	0.21	1	1	0.14	198	02Mar17
98	140	0.7	0.83	1.25	0.09	1	1	0.16	70	02June9
53	54	1	0.9	1.25	0.15	1	1	0.15	409	02Dec7
57	54	1.1	0.9	1.27	0.16	1	1	0.11	427	02Dec7
35	47	0.7	0.65	1.28	0.18	1	1	0.12	85	02Mar16
80	47	1.7	1.49	1.28	0.33	1	1	0.06	748	02Dec8
46	76	0.6	0.57	1.32	0.13	1	1	0.08	468	02Sept9
35	54	0.6	0.88	1.33	0.19	1	1	0.05	530	02Dec7
58	76	0.8	0.62	1.35	0.14	1	1	0.16	215	02Sept9
132	140	0.9	0.79	1.45	0.11	1	1	0.08	615	02June9
27	47	0.6	0.54	1.48	0.2	1	1	0.22	125	02Mar16
57	76	0.8	0.72	1.49	0.18	1	1	0.12	287	02Sept9
670	106	6.3	5.87	1.5	0.08	1	1	0.21	454	02June8
23	47	0.5	0.72	1.54	0.18	1	1	0.14	726	02Dec8

30	76	0.4	0.36	1.62	0.15	1	1	0.08	470	02Sept9
32	47	0.7	0.6	1.66	0.31	1	1	0.12	29	02Mar16
51	47	1.1	0.91	1.74	0.33	1	1	0.12	747	02Dec8
271	47	5.8	5.32	1.76	0.12	1	1	0.22	638	02Dec8
44	54	0.8	0.48	1.87	0.16	1	1	0.15	509	02Dec7
14	50	0.3	0.23	2	0.22	1	1	0.1	228	02Mar17
16	47	0.3	0.37	2.31	0.39	1	1	0.06	105	02Mar16
62	140	0.4	0.38	2.36	0.14	1	1	0.06	715	02June9
28	54	0.5	0.44	2.39	0.32	1	1	0.08	485	02Dec7
107	54	2	1.99	-3.39	1.01	1	0.9	0.02	187	02Dec7
93	47	2	1.99	-3.1	1.01	1	0.9	0.06	681	02Dec8
278	140	2	1.98	-2.94	0.71	1	0.9	0.07	601	02June9
93	47	2	1.98	-2.89	1.01	1	0.9	0.04	601	02Dec8
210	106	2	1.98	-2.88	0.72	1	0.9	0.05	511	02June8
105	54	1.9	1.97	-2.24	0.6	1	0.9	0.04	186	02Dec7
276	140	2	1.96	-2.23	0.51	1	0.9	0.06	612	02June9
92	47	2	1.97	-2.2	0.73	1	0.9	0.04	186	02Dec8
88	47	1.9	1.89	-2.01	0.6	1	0.9	0.1	121	02Mar16
104	54	1.9	1.96	-1.93	0.52	1	0.9	0.11	189	02Dec7
142	76	1.9	1.87	-1.8	0.46	1	0.9	0.07	281	02Sept9
92	49	1.9	1.87	-1.76	0.6	1	0.9	0.12	193	02Mar17
273	140	2	1.98	-1.73	0.31	1	0.9	0.08	189	02June9
105	54	1.9	1.94	-1.65	0.6	1	0.9	0.05	406	02Dec7
105	54	1.9	1.94	-1.65	0.6	1	0.9	0.07	412	02Dec7
83	47	1.8	1.91	-1.63	0.32	1	0.9	0.08	672	02Dec8
90	47	1.9	1.89	-1.63	0.73	1	0.9	0.07	706	02Dec8
205	106	1.9	1.92	-1.54	0.39	1	0.9	0.11	411	02June8
96	50	1.9	1.92	-1.51	0.52	1	0.9	0.08	331	02Mar17
89	47	1.9	1.91	-1.5	0.47	1	0.9	0.13	74	02Mar16
90	47	1.9	1.94	-1.46	0.53	1	0.9	0.11	188	02Dec8
100	54	1.9	1.93	-1.41	0.39	1	0.9	0.1	472	02Dec7
204	106	1.9	1.95	-1.39	0.3	1	0.9	0.15	191	02June8
203	106	1.9	1.91	-1.35	0.31	1	0.9	0.04	486	02June8
88	47	1.9	1.89	-1.29	0.44	1	0.9	0.12	75	02Mar16
88	47	1.9	1.9	-1.28	0.37	1	0.9	0.05	61	02Mar16
92	47	2	1.92	-1.28	0.73	1	0.9	-0.01	643	02Dec8
89	47	1.9	1.89	-1.24	0.48	1	0.9	0.11	92	02Mar16
141	76	1.9	1.84	-1.24	0.3	1	0.9	0.12	212	02Sept9
203	106	1.9	1.95	-1.19	0.27	1	0.9	0.09	194	02June8
255	140	1.8	1.92	-1.19	0.18	1	0.9	0.12	196	02June9
145	76	1.9	1.89	-1.17	0.35	1	0.9	0.15	189	02Sept9
97	50	1.9	1.95	-1.15	0.46	1	0.9	0.07	261	02Mar17
264	140	1.9	1.9	-1.13	0.24	1	0.9	0.1	671	02June9
94	50	1.9	1.88	-1.11	0.44	1	0.9	0.16	211	02Mar17
80	47	1.7	1.74	-1.08	0.41	1	0.9	0.08	113	02Mar16
92	50	1.8	1.85	-1.07	0.34	1	0.9	0.1	201	02Mar17

103	54	1.9	1.9	-1.05	0.47	1	0.9	0.05	482	02Dec7
86	47	1.8	1.88	-0.98	0.35	1	0.9	0.17	74	02Dec8
88	47	1.9	1.86	-0.97	0.37	1	0.9	0.04	34	02Mar16
254	140	1.8	1.74	-0.96	0.21	1	0.9	0.13	649	02June9
138	76	1.8	1.82	-0.94	0.26	1	0.9	0.1	442	02Sept9
141	76	1.9	1.85	-0.92	0.33	1	0.9	0.21	291	02Sept9
261	140	1.9	1.78	-0.91	0.24	1	0.9	0.13	746	02June9
254	140	1.8	1.71	-0.87	0.21	1	0.9	0.09	748	02June9
271	140	1.9	1.92	-0.85	0.29	1	0.9	0.09	605	02June9
188	106	1.8	1.75	-0.84	0.21	1	0.9	0.17	503	02June8
126	76	1.7	1.66	-0.84	0.22	1	0.9	0.09	472	02Sept9
80	47	1.7	1.74	-0.81	0.28	1	0.9	0.2	126	02Mar16
253	140	1.8	1.83	-0.78	0.19	1	0.9	0.23	632	02June9
81	47	1.7	1.83	-0.75	0.28	1	0.9	0.19	682	02Dec8
143	76	1.9	1.87	-0.72	0.27	1	0.9	0.06	205	02Sept9
104	54	1.9	1.91	-0.72	0.42	1	0.9	0.05	426	02Dec7
122	76	1.6	1.57	-0.69	0.22	1	0.9	0.16	214	02Sept9
127	76	1.7	1.68	-0.68	0.21	1	0.9	0.21	234	02Sept9
86	47	1.8	1.82	-0.66	0.31	1	0.9	0.13	81	02Mar16
193	106	1.8	1.83	-0.66	0.21	1	0.9	0.1	546	02June8
193	106	1.8	1.88	-0.61	0.19	1	0.9	0.22	67	02June8
251	140	1.8	1.7	-0.6	0.2	1	0.9	0.1	641	02June9
176	106	1.7	1.57	-0.57	0.19	1	0.9	0.14	451	02June8
259	140	1.9	1.75	-0.56	0.22	1	0.9	0.07	750	02June9
265	140	1.9	1.83	-0.53	0.28	1	0.9	0.1	741	02June9
254	140	1.8	1.7	-0.53	0.2	1	0.9	0.1	751	02June9
123	76	1.6	1.72	-0.5	0.18	1	0.9	0.19	546	02Sept9
96	54	1.8	1.71	-0.49	0.3	1	0.9	0.05	545	02Dec7
172	47	3.7	3.73	-0.49	0.27	1	0.9	0.23	617	02Dec8
85	47	1.8	1.85	-0.49	0.38	1	0.9	0.13	63	02Dec8
187	106	1.8	1.69	-0.46	0.2	1	0.9	0.13	449	02June8
193	106	1.8	1.88	-0.45	0.18	1	0.9	0.15	428	02June8
98	54	1.8	1.74	-0.45	0.32	1	0.9	0.08	449	02Dec7
66	47	1.4	1.82	-0.41	0.18	1	0.9	0.27	197	02Mar16
88	50	1.8	1.79	-0.41	0.33	1	0.9	0.13	312	02Mar17
126	76	1.7	1.62	-0.41	0.21	1	0.9	0.14	202	02Sept9
190	106	1.8	1.79	-0.4	0.19	1	0.9	0.19	482	02June8
147	47	3.1	3.24	-0.37	0.18	1	0.9	0.3	77	02Mar16
130	76	1.7	1.81	-0.36	0.17	1	0.9	0.24	148	02Sept9
253	140	1.8	1.89	-0.35	0.15	1	0.9	0.11	72	02June9
87	50	1.7	1.76	-0.34	0.25	1	0.9	0.13	207	02Mar17
255	140	1.8	1.8	-0.33	0.22	1	0.9	0.19	712	02June9
101	54	1.9	1.81	-0.33	0.41	1	0.9	0.14	512	02Dec7
191	106	1.8	1.78	-0.29	0.25	1	0.9	0.14	512	02June8
63	48	1.3	1.74	-0.28	0.18	1	0.9	0.31	192	02Mar16
76	46	1.7	1.6	-0.27	0.25	1	0.9	0.15	163	02Mar16

220	140	1.6	1.78	-0.23	0.12	1	0.9	0.18	721	02June9
88	54	1.6	1.59	-0.23	0.35	1	0.9	0.14	487	02Dec7
188	106	1.8	1.74	-0.21	0.18	1	0.9	0.12	404	02June8
100	54	1.9	1.79	-0.21	0.31	1	0.9	0.05	547	02Dec7
66	47	1.4	1.87	-0.2	0.17	1	0.9	0.11	675	02Dec8
90	47	1.9	1.83	-0.2	0.43	1	0.9	0.1	648	02Dec8
232	76	3.1	3.09	-0.19	0.15	1	0.9	0.29	316	02Sept9
178	106	1.7	1.76	-0.18	0.15	1	0.9	0.17	434	02June8
82	49	1.7	1.65	-0.17	0.24	1	0.9	0.21	191	02Mar17
259	140	1.9	1.77	-0.13	0.24	1	0.9	0.11	749	02June9
175	106	1.7	1.6	-0.11	0.17	1	0.9	0.18	410	02June8
240	140	1.7	1.75	-0.11	0.14	1	0.9	0.1	674	02June9
77	50	1.5	1.63	-0.08	0.2	1	0.9	0.24	313	02Mar17
98	54	1.8	1.7	-0.05	0.29	1	0.9	0.14	502	02Dec7
88	47	1.9	1.78	-0.05	0.45	1	0.9	0.06	646	02Dec8
255	140	1.8	1.71	-0.02	0.17	1	0.9	0.11	648	02June9
99	54	1.8	1.76	0	0.28	1	0.9	0.06	546	02Dec7
238	140	1.7	1.56	0.01	0.16	1	0.9	0.13	646	02June9
125	76	1.6	1.56	0.01	0.18	1	0.9	0.13	184	02Sept9
109	76	1.4	1.43	0.01	0.17	1	0.9	0.21	451	02Sept9
98	54	1.8	1.73	0.01	0.27	1	0.9	0.07	549	02Dec7
243	140	1.7	1.7	0.03	0.14	1	0.9	0.16	709	02June9
96	54	1.8	1.66	0.11	0.26	1	0.9	0.04	445	02Dec7
94	54	1.7	1.73	0.13	0.22	1	0.9	0.11	405	02Dec7
235	140	1.7	1.59	0.15	0.14	1	0.9	0.09	604	02June9
114	76	1.5	1.56	0.15	0.15	1	0.9	0.27	313	02Sept9
160	106	1.5	1.62	0.16	0.12	1	0.9	0.19	426	02June8
97	54	1.8	1.7	0.16	0.25	1	0.9	0.07	542	02Dec7
65	47	1.4	1.45	0.18	0.19	1	0.9	0.31	130	02Mar16
66	47	1.4	1.54	0.18	0.17	1	0.9	0.16	62	02Mar16
90	54	1.7	1.65	0.19	0.21	1	0.9	0.11	410	02Dec7
122	76	1.6	1.5	0.24	0.16	1	0.9	0.17	181	02Sept9
168	106	1.6	1.58	0.25	0.13	1	0.9	0.26	483	02June8
251	140	1.8	1.69	0.27	0.21	1	0.9	0.14	743	02June9
174	106	1.6	1.5	0.28	0.15	1	0.9	0.11	441	02June8
234	140	1.7	1.56	0.37	0.13	1	0.9	0.12	608	02June9
183	140	1.3	1.55	0.41	0.1	1	0.9	0.22	695	02June9
211	140	1.5	1.56	0.42	0.1	1	0.9	0.18	669	02June9
94	54	1.7	1.55	0.43	0.23	1	0.9	0.09	507	02Dec7
75	54	1.4	1.41	0.48	0.19	1	0.9	0.22	68	02Dec7
61	47	1.3	1.62	0.48	0.17	1	0.9	0.28	695	02Dec8
199	140	1.4	1.47	0.53	0.1	1	0.9	0.2	673	02June9
63	50	1.3	1.29	0.56	0.17	1	0.9	0.2	267	02Mar17
125	106	1.2	1.34	0.59	0.11	1	0.9	0.23	66	02June8
60	47	1.3	1.49	0.67	0.16	1	0.9	0.25	69	02Dec8
78	54	1.4	1.32	0.78	0.17	1	0.9	0.14	422	02Dec7

55	47	1.2	1.37	0.79	0.17	1	0.9	0.22	70	02Dec8
47	50	0.9	0.95	0.97	0.15	1	0.9	0.2	264	02Mar17
71	106	0.7	1	0.97	0.11	1	0.9	0.15	524	02June8
116	140	0.8	0.81	1.27	0.09	1	0.9	0.26	666	02June9
48	76	0.6	0.72	1.27	0.16	1	0.9	0.17	146	02Sept9
111	140	0.8	0.77	1.31	0.09	1	0.9	0.26	661	02June9
317	47	6.7	5.9	1.48	0.13	1	0.9	0.12	54	02Mar16
86	106	0.8	0.67	1.49	0.12	1	0.9	0.22	409	02June8
7	47	0.1	0.26	1.82	0.29	1	0.9	0.1	155	02Mar16
106	54	2	1.98	-3.65	1.01	1	0.8	0.05	461	02Dec7
98	50	2	1.97	-3.18	1.01	1	0.8	0.08	301	02Mar17
278	140	2	1.98	-3.05	0.71	1	0.8	0.05	711	02June9
106	54	2	1.98	-2.93	0.72	1	0.8	0.07	471	02Dec7
93	47	2	1.97	-2.35	1.02	1	0.8	0.09	711	02Dec8
148	76	1.9	1.95	-2.16	0.52	1	0.8	0.21	304	02Sept9
271	140	1.9	1.95	-1.96	0.35	1	0.8	0.17	691	02June9
273	140	2	1.97	-1.81	0.34	1	0.8	0.1	681	02June9
267	140	1.9	1.94	-1.78	0.27	1	0.8	0.14	682	02June9
84	47	1.8	1.86	-1.76	0.48	1	0.8	0.09	147	02Mar16
92	49	1.9	1.87	-1.76	0.6	1	0.8	0.19	190	02Mar17
201	106	1.9	1.92	-1.56	0.29	1	0.8	0.16	431	02June8
141	76	1.9	1.89	-1.55	0.3	1	0.8	0.2	151	02Sept9
90	49	1.8	1.83	-1.45	0.52	1	0.8	0.15	194	02Mar17
268	140	1.9	1.92	-1.42	0.3	1	0.8	0.25	631	02June9
206	106	1.9	1.94	-1.37	0.36	1	0.8	0.1	481	02June8
203	106	1.9	1.91	-1.35	0.31	1	0.8	0.14	492	02June8
200	106	1.9	1.92	-1.26	0.26	1	0.8	0.19	61	02June8
86	47	1.8	1.86	-1.25	0.34	1	0.8	0.25	76	02Mar16
84	47	1.8	1.84	-1.21	0.48	1	0.8	0.2	181	02Dec8
88	49	1.8	1.78	-1.2	0.47	1	0.8	0.24	195	02Mar17
148	76	1.9	1.94	-1.2	0.42	1	0.8	0.12	191	02Sept9
95	50	1.9	1.91	-1.12	0.4	1	0.8	0.11	216	02Mar17
203	106	1.9	1.96	-1.05	0.25	1	0.8	0.14	195	02June8
143	76	1.9	1.92	-1.03	0.27	1	0.8	0.19	147	02Sept9
191	106	1.8	1.85	-0.86	0.2	1	0.8	0.2	74	02June8
200	106	1.9	1.89	-0.85	0.25	1	0.8	0.12	543	02June8
200	106	1.9	1.85	-0.75	0.26	1	0.8	0.16	447	02June8
98	54	1.8	1.9	-0.72	0.27	1	0.8	0.1	521	02Dec7
130	76	1.7	1.81	-0.58	0.19	1	0.8	0.17	545	02Sept9
131	76	1.7	1.83	-0.53	0.19	1	0.8	0.14	544	02Sept9
75	47	1.6	1.93	-0.48	0.19	1	0.8	0.13	673	02Dec8
104	54	1.9	1.87	-0.46	0.42	1	0.8	0.07	514	02Dec7
91	49	1.9	1.85	-0.43	0.29	1	0.8	0.16	189	02Mar17
255	140	1.8	1.85	-0.36	0.16	1	0.8	0.15	668	02June9
88	49	1.8	1.79	-0.26	0.26	1	0.8	0.18	197	02Mar17
102	54	1.9	1.84	-0.23	0.33	1	0.8	0.07	551	02Dec7

85	47	1.8	1.65	-0.22	0.3	1	0.8	0.09	44	02Mar16
98	54	1.8	1.73	0.01	0.27	1	0.8	0.09	548	02Dec7
100	54	1.9	1.73	0.12	0.28	1	0.8	0.12	506	02Dec7
85	47	1.8	1.68	0.45	0.38	1	0.8	0.06	641	02Dec8
224	140	1.6	1.36	0.63	0.12	1	0.8	0.13	645	02June9
99	50	2	1.98	-3.08	1.01	1	0.7	0.11	232	02Mar17
148	76	1.9	1.96	-3.03	0.72	1	0.7	0.18	67	02Sept9
92	47	2	1.97	-2.91	1.01	1	0.7	0.11	67	02Dec8
107	54	2	1.98	-2.8	1.01	1	0.7	0.13	401	02Dec7
106	54	2	1.95	-2.48	1.01	1	0.7	0.05	444	02Dec7
92	47	2	1.95	-2.23	0.72	1	0.7	0.21	82	02Mar16
106	54	2	1.96	-2.08	0.72	1	0.7	0.18	411	02Dec7
92	49	1.9	1.9	-1.99	0.6	1	0.7	0.22	72	02Mar17
91	47	1.9	1.96	-1.89	0.6	1	0.7	0.14	732	02Dec8
264	140	1.9	1.92	-1.11	0.23	1	0.7	0.18	74	02June9
89	47	1.9	1.88	-0.99	0.4	1	0.7	0.12	33	02Mar16
89	47	1.9	1.92	-0.93	0.35	1	0.7	0.08	114	02Mar16
104	54	1.9	1.92	-0.81	0.42	1	0.7	0.03	491	02Dec7
86	47	1.8	1.82	-0.47	0.29	1	0.7	0.16	89	02Mar16
85	49	1.7	1.72	-0.12	0.23	1	0.7	0.24	196	02Mar17
97	54	1.8	1.62	0.39	0.24	1	0.7	0.19	503	02Dec7
279	140	2	1.99	-3.64	1	1	0.6	0.06	611	02June9
107	54	2	1.99	-3.39	1.01	1	0.6	0.13	188	02Dec7
97	49	2	1.98	-3.15	1.01	1	0.6	0.13	63	02Mar17
97	49	2	1.98	-3.15	1.01	1	0.6	0.14	67	02Mar17
93	47	2	1.99	-3.04	1.01	1	0.6	0.13	731	02Dec8
93	47	2	1.98	-2.89	1.01	1	0.6	0.23	31	02Mar16
93	47	2	1.98	-2.89	1.01	1	0.6	0.23	32	02Mar16
107	54	2	1.97	-2.41	1.01	1	0.6	0.14	511	02Dec7
273	140	2	1.96	-1.69	0.34	1	0.6	0.17	61	02June9
202	106	1.9	1.89	-0.57	0.25	1	0.6	0.18	405	02June8
99	50	2	1.98	-3.05	1.01	1	**0.5**	0.24	291	02Mar17
209	106	2	1.97	-1.39	0.45	1	**0.4**	0.2	491	02June8
137	76	1.8	1.88	-0.81	0.22	0.9	1.1	0.2	551	02Sept9
80	47	1.7	1.83	-0.35	0.25	0.9	1.1	0.16	735	02Dec8
82	47	1.7	1.83	-1.16	0.44	0.9	1	0.2	696	02Dec8
98	54	1.8	1.89	-0.91	0.29	0.9	1	0.09	522	02Dec7
217	140	1.6	1.5	0.1	0.14	0.9	1	0.18	708	02June9
93	54	1.7	1.72	0.21	0.21	0.9	1	0.16	407	02Dec7
71	50	1.4	1.47	0.29	0.18	0.9	1	0.28	225	02Mar17
674	106	6.4	6.8	0.48	0.08	0.9	1	0.44	199	02June8
40	47	0.9	0.98	0.84	0.16	0.9	1	0.2	69	02Mar16
23	47	0.5	0.48	2.01	0.25	0.9	1	0.33	135	02Mar16
139	76	1.8	1.87	-1.56	0.28	0.9	0.9	0.27	61	02Sept9
134	76	1.8	1.81	-1.48	0.26	0.9	0.9	0.26	152	02Sept9
193	106	1.8	1.85	-1.16	0.23	0.9	0.9	0.19	424	02June8

81	50	1.6	1.68	-1.1	0.27	0.9	0.9	0.27	243	02Mar17
74	47	1.6	1.7	-0.98	0.26	0.9	0.9	0.2	144	02Mar16
195	106	1.8	1.83	-0.93	0.24	0.9	0.9	0.12	472	02June8
88	50	1.8	1.73	-0.87	0.31	0.9	0.9	0.14	349	02Mar17
175	106	1.7	1.73	-0.83	0.18	0.9	0.9	0.31	186	02June8
85	50	1.7	1.66	-0.81	0.29	0.9	0.9	0.21	342	02Mar17
80	54	1.5	1.71	-0.81	0.23	0.9	0.9	0.17	473	02Dec7
83	50	1.7	1.62	-0.78	0.28	0.9	0.9	0.18	352	02Mar17
89	47	1.9	1.87	-0.68	0.48	0.9	0.9	0.2	632	02Dec8
83	47	1.8	1.83	-0.55	0.25	0.9	0.9	0.26	68	02Mar16
84	47	1.8	1.66	-0.54	0.32	0.9	0.9	0.09	46	02Mar16
90	50	1.8	1.81	-0.53	0.36	0.9	0.9	0.32	292	02Mar17
81	54	1.5	1.67	-0.44	0.22	0.9	0.9	0.28	184	02Dec7
135	76	1.8	1.78	-0.42	0.28	0.9	0.9	0.18	471	02Sept9
91	54	1.7	1.83	-0.42	0.3	0.9	0.9	0.16	467	02Dec7
108	76	1.4	1.41	-0.4	0.2	0.9	0.9	0.27	452	02Sept9
75	47	1.6	1.43	-0.38	0.28	0.9	0.9	0.13	52	02Mar16
67	47	1.4	1.61	-0.37	0.21	0.9	0.9	0.1	148	02Mar16
115	76	1.5	1.6	-0.36	0.18	0.9	0.9	0.33	76	02Sept9
81	47	1.7	1.8	-0.35	0.26	0.9	0.9	0.22	608	02Dec8
78	47	1.7	1.59	-0.33	0.29	0.9	0.9	0.22	625	02Dec8
80	46	1.7	1.76	-0.31	0.34	0.9	0.9	0.3	132	02Mar16
81	47	1.7	1.75	-0.29	0.33	0.9	0.9	0.15	112	02Mar16
109	76	1.4	1.54	-0.27	0.18	0.9	0.9	0.24	552	02Sept9
79	50	1.6	1.69	-0.24	0.21	0.9	0.9	0.33	241	02Mar17
69	50	1.4	1.46	-0.21	0.23	0.9	0.9	0.27	252	02Mar17
58	48	1.2	1.55	-0.2	0.2	0.9	0.9	0.32	186	02Mar16
249	140	1.8	1.75	-0.18	0.16	0.9	0.9	0.11	706	02June9
79	50	1.6	1.61	-0.13	0.22	0.9	0.9	0.26	294	02Mar17
123	76	1.6	1.61	-0.13	0.18	0.9	0.9	0.28	293	02Sept9
158	54	2.9	3.12	-0.13	0.21	0.9	0.9	0.34	198	02Dec7
104	76	1.4	1.36	-0.11	0.19	0.9	0.9	0.29	446	02Sept9
333	106	3.1	3.07	-0.1	0.15	0.9	0.9	0.37	517	02June8
74	54	1.4	1.82	-0.06	0.16	0.9	0.9	0.16	469	02Dec7
72	54	1.3	1.77	-0.05	0.16	0.9	0.9	0.19	474	02Dec7
472	140	3.4	3.18	0.02	0.14	0.9	0.9	0.19	653	02June9
223	140	1.6	1.78	0.02	0.11	0.9	0.9	0.26	694	02June9
148	106	1.4	1.33	0.08	0.17	0.9	0.9	0.32	415	02June8
78	54	1.4	1.67	0.09	0.18	0.9	0.9	0.14	526	02Dec7
119	76	1.6	1.59	0.11	0.15	0.9	0.9	0.26	233	02Sept9
68	47	1.4	1.58	0.12	0.17	0.9	0.9	0.07	71	02Mar16
59	47	1.3	1.33	0.14	0.26	0.9	0.9	0.23	184	02Dec8
77	50	1.5	1.58	0.15	0.19	0.9	0.9	0.25	266	02Mar17
331	106	3.1	3.09	0.15	0.14	0.9	0.9	0.21	553	02June8
93	76	1.2	1.32	0.15	0.17	0.9	0.9	0.29	549	02Sept9
304	106	2.9	2.92	0.16	0.16	0.9	0.9	0.33	437	02June8

159	47	3.4	3.02	0.19	0.19	0.9	0.9	0.02	53	02Mar16
211	76	2.8	2.89	0.2	0.15	0.9	0.9	0.36	157	02Sept9
66	50	1.3	1.34	0.21	0.3	0.9	0.9	0.29	227	02Mar17
426	140	3	3.01	0.21	0.18	0.9	0.9	0.14	716	02June9
156	106	1.5	1.59	0.22	0.12	0.9	0.9	0.21	422	02June8
63	50	1.3	1.37	0.23	0.2	0.9	0.9	0.25	249	02Mar17
144	47	3.1	3.22	0.24	0.23	0.9	0.9	0.15	157	02Mar16
90	54	1.7	1.66	0.25	0.2	0.9	0.9	0.18	408	02Dec7
62	47	1.3	1.25	0.26	0.23	0.9	0.9	0.3	23	02Mar16
112	76	1.5	1.46	0.26	0.15	0.9	0.9	0.24	289	02Sept9
72	50	1.4	1.42	0.27	0.19	0.9	0.9	0.19	333	02Mar17
350	54	6.5	6.92	0.27	0.13	0.9	0.9	0.18	538	02Dec7
63	50	1.3	1.4	0.31	0.18	0.9	0.9	0.24	247	02Mar17
93	76	1.2	1.4	0.31	0.14	0.9	0.9	0.26	548	02Sept9
226	76	3	2.85	0.31	0.16	0.9	0.9	0.24	198	02Sept9
69	50	1.4	1.41	0.32	0.18	0.9	0.9	0.23	289	02Mar17
172	54	3.2	3.37	0.35	0.2	0.9	0.9	0.15	537	02Dec7
89	54	1.6	1.52	0.37	0.22	0.9	0.9	0.09	541	02Dec7
90	76	1.2	1.37	0.38	0.13	0.9	0.9	0.25	550	02Sept9
54	47	1.1	1.21	0.39	0.3	0.9	0.9	0.26	110	02Mar16
183	140	1.3	1.55	0.41	0.1	0.9	0.9	0.32	693	02June9
114	106	1.1	1.37	0.43	0.12	0.9	0.9	0.14	523	02June8
318	106	3	2.87	0.48	0.15	0.9	0.9	0.29	453	02June8
216	46	4.7	5.63	0.49	0.1	0.9	0.9	0.26	158	02Mar16
149	47	3.2	3.25	0.49	0.25	0.9	0.9	0.32	77	02Dec8
60	47	1.3	1.41	0.53	0.2	0.9	0.9	0.22	615	02Dec8
216	47	4.6	5.37	0.54	0.07	0.9	0.9	0.25	78	02Mar16
66	50	1.3	1.29	0.54	0.17	0.9	0.9	0.26	321	02Mar17
66	54	1.2	1.17	0.57	0.25	0.9	0.9	0.18	493	02Dec7
88	76	1.2	1.16	0.58	0.15	0.9	0.9	0.17	465	02Sept9
62	47	1.3	1.52	0.58	0.17	0.9	0.9	0.28	196	02Dec8
168	140	1.2	1.34	0.61	0.1	0.9	0.9	0.27	73	02June9
79	76	1	1.21	0.61	0.12	0.9	0.9	0.24	65	02Sept9
155	140	1.1	1.35	0.65	0.1	0.9	0.9	0.28	686	02June9
68	54	1.3	1.19	0.75	0.29	0.9	0.9	0.15	489	02Dec7
108	106	1	1.18	0.78	0.1	0.9	0.9	0.27	65	02June8
49	50	1	1.07	0.81	0.18	0.9	0.9	0.25	315	02Mar17
691	106	6.5	6.53	0.83	0.07	0.9	0.9	0.23	554	02June8
66	54	1.2	1.24	0.83	0.16	0.9	0.9	0.25	65	02Dec7
87	76	1.1	0.98	0.86	0.15	0.9	0.9	0.23	185	02Sept9
313	50	6.3	6.34	0.87	0.09	0.9	0.9	0.19	298	02Mar17
444	140	3.2	3.07	0.87	0.14	0.9	0.9	0.2	616	02June9
87	76	1.1	0.96	0.88	0.14	0.9	0.9	0.27	183	02Sept9
81	106	0.8	1.06	0.89	0.12	0.9	0.9	0.2	528	02June8
277	106	2.6	2.53	0.91	0.11	0.9	0.9	0.23	476	02June8
73	47	1.6	1.21	0.91	0.23	0.9	0.9	0.12	652	02Dec8

50	47	1.1	1.28	0.93	0.16	0.9	0.9	0.26	71	02Dec8
262	47	5.6	5.11	0.94	0.09	0.9	0.9	0.31	38	02Mar16
666	106	6.3	6.05	0.95	0.08	0.9	0.9	0.29	518	02June8
71	47	1.5	1.57	0.95	0.3	0.9	0.9	0.18	75	02Dec8
47	50	0.9	0.94	0.98	0.17	0.9	0.9	0.23	221	02Mar17
900	140	6.4	6.24	0.98	0.07	0.9	0.9	0.21	717	02June9
47	47	1	1.15	0.98	0.19	0.9	0.9	0.27	197	02Dec8
46	50	0.9	0.92	0.99	0.15	0.9	0.9	0.24	270	02Mar17
839	140	6	6.3	0.99	0.05	0.9	0.9	0.33	637	02June9
88	54	1.6	1.54	1	0.29	0.9	0.9	0.15	450	02Dec7
48	49	1	0.88	1.04	0.16	0.9	0.9	0.27	187	02Mar17
46	47	1	1.09	1.06	0.3	0.9	0.9	0.29	610	02Dec8
44	50	0.9	0.88	1.07	0.17	0.9	0.9	0.17	276	02Mar17
191	76	2.5	2.51	1.07	0.18	0.9	0.9	0.13	476	02Sept9
228	50	4.6	4.81	1.08	0.1	0.9	0.9	0.4	317	02Mar17
459	140	3.3	3	1.08	0.13	0.9	0.9	0.21	753	02June9
287	49	5.9	5.91	1.12	0.09	0.9	0.9	0.25	278	02Mar17
113	140	0.8	0.97	1.15	0.14	0.9	0.9	0.2	735	02June9
88	140	0.6	0.93	1.16	0.11	0.9	0.9	0.31	728	02June9
434	76	5.7	5.04	1.16	0.07	0.9	0.9	0.33	199	02Sept9
43	49	0.9	0.77	1.17	0.16	0.9	0.9	0.35	182	02Mar17
54	76	0.7	0.67	1.25	0.14	0.9	0.9	0.31	308	02Sept9
90	140	0.6	0.88	1.31	0.18	0.9	0.9	0.42	184	02June9
875	140	6.3	5.83	1.32	0.07	0.9	0.9	0.16	617	02June9
32	47	0.7	0.85	1.39	0.17	0.9	0.9	0.21	64	02Dec8
33	49	0.7	0.57	1.45	0.17	0.9	0.9	0.33	183	02Mar17
163	54	3	2.89	1.55	0.26	0.9	0.9	0.25	517	02Dec7
30	47	0.6	0.81	1.58	0.22	0.9	0.9	0.21	728	02Dec8
88	140	0.6	0.7	1.7	0.18	0.9	0.9	0.26	64	02June9
140	47	3	2.9	1.7	0.31	0.9	0.9	0.25	717	02Dec8
216	76	2.8	2.83	1.72	0.25	0.9	0.9	0.2	297	02Sept9
36	54	0.7	0.51	1.73	0.16	0.9	0.9	0.16	490	02Dec7
26	50	0.5	0.56	1.85	0.33	0.9	0.9	0.23	310	02Mar17
15	50	0.3	0.24	1.95	0.21	0.9	0.9	0.18	329	02Mar17
194	106	1.8	1.86	-1.51	0.25	0.9	0.8	0.24	432	02June8
99	54	1.8	1.9	-1.26	0.33	0.9	0.8	0.16	531	02Dec7
94	50	1.9	1.89	-1.1	0.37	0.9	0.8	0.18	214	02Mar17
193	106	1.8	1.88	-1.02	0.26	0.9	0.8	0.28	531	02June8
127	76	1.7	1.69	-0.96	0.23	0.9	0.8	0.35	312	02Sept9
253	140	1.8	1.7	-0.87	0.21	0.9	0.8	0.15	747	02June9
101	54	1.9	1.88	-0.83	0.41	0.9	0.8	0.26	67	02Dec7
173	106	1.6	1.77	-0.8	0.17	0.9	0.8	0.25	534	02June8
98	54	1.8	1.87	-0.77	0.35	0.9	0.8	0.22	532	02Dec7
252	140	1.8	1.82	-0.73	0.18	0.9	0.8	0.22	672	02June9
85	47	1.8	1.87	-0.66	0.38	0.9	0.8	0.32	692	02Dec8
91	47	1.9	1.87	-0.63	0.61	0.9	0.8	0.16	743	02Dec8

182	106	1.7	1.64	-0.62	0.2	0.9	0.8	0.28	452	02June8
89	47	1.9	1.8	-0.61	0.4	0.9	0.8	0.06	45	02Mar16
66	47	1.4	1.72	-0.57	0.21	0.9	0.8	0.36	196	02Mar16
140	76	1.8	1.85	-0.51	0.23	0.9	0.8	0.16	295	02Sept9
94	54	1.7	1.76	-0.51	0.27	0.9	0.8	0.27	63	02Dec7
74	47	1.6	1.69	-0.48	0.36	0.9	0.8	0.23	730	02Dec8
99	54	1.8	1.76	-0.46	0.33	0.9	0.8	0.13	452	02Dec7
96	54	1.8	1.69	-0.42	0.3	0.9	0.8	0.13	443	02Dec7
96	54	1.8	1.69	-0.42	0.3	0.9	0.8	0.14	446	02Dec7
81	50	1.6	1.57	-0.41	0.26	0.9	0.8	0.2	346	02Mar17
181	106	1.7	1.8	-0.32	0.16	0.9	0.8	0.26	72	02June8
198	54	3.7	3.65	-0.31	0.25	0.9	0.8	0.24	416	02Dec7
84	50	1.7	1.68	-0.23	0.24	0.9	0.8	0.24	323	02Mar17
80	47	1.7	1.62	-0.23	0.42	0.9	0.8	0.31	702	02Dec8
96	54	1.8	1.79	-0.16	0.33	0.9	0.8	0.32	61	02Dec7
82	54	1.5	1.74	-0.16	0.19	0.9	0.8	0.32	183	02Dec7
78	47	1.7	1.47	-0.1	0.27	0.9	0.8	0.1	50	02Mar16
170	106	1.6	1.72	-0.08	0.14	0.9	0.8	0.34	62	02June8
88	47	1.9	1.78	-0.05	0.45	0.9	0.8	0.15	647	02Dec8
88	54	1.6	1.53	-0.04	0.25	0.9	0.8	0.15	550	02Dec7
78	47	1.7	1.6	0.07	0.21	0.9	0.8	0.25	28	02Mar16
146	47	3.1	3.04	0.07	0.22	0.9	0.8	0.2	37	02Mar16
178	106	1.7	1.62	0.07	0.15	0.9	0.8	0.26	414	02June8
149	47	3.2	3.14	0.11	0.31	0.9	0.8	0.32	96	02Mar16
164	106	1.5	1.67	0.14	0.12	0.9	0.8	0.3	421	02June8
165	106	1.6	1.68	0.14	0.12	0.9	0.8	0.32	423	02June8
77	50	1.5	1.57	0.16	0.19	0.9	0.8	0.27	209	02Mar17
244	140	1.7	1.6	0.16	0.15	0.9	0.8	0.13	647	02June9
81	54	1.5	1.52	0.21	0.21	0.9	0.8	0.33	62	02Dec7
86	47	1.8	1.72	0.3	0.4	0.9	0.8	0.11	649	02Dec8
93	54	1.7	1.7	0.31	0.31	0.9	0.8	0.21	492	02Dec7
66	47	1.4	1.35	0.32	0.19	0.9	0.8	0.2	88	02Mar16
66	47	1.4	1.25	0.49	0.19	0.9	0.8	0.36	10	02Mar16
140	47	3	3.12	0.51	0.2	0.9	0.8	0.34	198	02Dec8
55	50	1.1	1.26	0.58	0.16	0.9	0.8	0.31	248	02Mar17
52	47	1.1	1.26	0.82	0.19	0.9	0.8	0.32	73	02Dec8
72	47	1.5	1.34	0.83	0.2	0.9	0.8	0.32	708	02Dec8
272	47	5.8	6.15	0.88	0.13	0.9	0.8	0.34	199	02Dec8
256	47	5.4	5.99	1.3	0.09	0.9	0.8	0.35	618	02Dec8
71	47	1.5	0.94	1.31	0.21	0.9	0.8	0.21	745	02Dec8
25	76	0.3	0.28	1.76	0.16	0.9	0.8	0.2	228	02Sept9
208	106	2	1.98	-1.76	0.42	0.9	0.7	0.17	189	02June8
207	106	2	1.97	-1.75	0.39	0.9	0.7	0.18	190	02June8
90	47	1.9	1.94	-1.44	0.53	0.9	0.7	0.23	61	02Dec8
202	106	1.9	1.9	-1.28	0.34	0.9	0.7	0.16	542	02June8
91	50	1.8	1.85	-0.79	0.3	0.9	0.7	0.24	234	02Mar17

257	140	1.8	1.9	-0.54	0.17	0.9	0.7	0.29	76	02June9
87	50	1.7	1.76	-0.48	0.26	0.9	0.7	0.29	262	02Mar17
82	47	1.7	1.69	-0.47	0.44	0.9	0.7	0.32	628	02Dec8
90	47	1.9	1.82	-0.32	0.53	0.9	0.7	0.19	746	02Dec8
174	106	1.6	1.64	-0.25	0.17	0.9	0.7	0.21	549	02June8
174	106	1.6	1.64	-0.25	0.17	0.9	0.7	0.22	552	02June8
98	54	1.8	1.74	-0.18	0.29	0.9	0.7	0.13	543	02Dec7
83	47	1.8	1.56	0.27	0.3	0.9	0.7	0.12	644	02Dec8
83	47	1.8	1.56	0.27	0.3	0.9	0.7	0.1	651	02Dec8
70	47	1.5	1.27	0.94	0.19	0.9	0.7	0.38	704	02Dec8
92	47	2	1.97	-2.37	0.73	0.9	0.6	0.32	691	02Dec8
94	49	1.9	1.93	-1.68	0.53	0.9	0.6	0.27	75	02Mar17
203	106	1.9	1.95	-1.19	0.27	0.9	0.6	0.23	188	02June8
147	76	1.9	1.92	-1.19	0.39	0.9	0.6	0.21	186	02Sept9
92	47	2	1.91	-1.07	0.73	0.9	0.6	0.18	749	02Dec8
90	47	1.9	1.89	-0.54	0.43	0.9	0.6	0.27	622	02Dec8
87	47	1.9	1.65	0.05	0.37	0.9	0.6	0.18	751	02Dec8
96	49	2	1.97	-2.43	0.73	0.9	**0.5**	0.23	74	02Mar17
93	47	2	1.97	-2.83	1.01	0.9	**0.4**	0.23	1	02Mar16
92	47	2	1.97	-3.04	1.01	0.9	**0.3**	0.33	736	02Dec8
93	47	2	1.95	-1.8	1.02	0.9	**0.2**	0.23	752	02Dec8
274	47	5.8	5.59	0.9	0.1	0.8	0.9	0.33	97	02Mar16
55	106	0.5	0.59	1.47	0.13	0.8	0.9	0.37	184	02June8
166	106	1.6	1.67	-1.6	0.19	0.8	0.8	0.27	532	02June8
170	106	1.6	1.73	-0.96	0.18	0.8	0.8	0.25	533	02June8
169	47	3.6	3.72	-0.63	0.26	0.8	0.8	0.39	697	02Dec8
334	106	3.2	3.25	-0.53	0.15	0.8	0.8	0.44	198	02June8
166	49	3.4	3.5	-0.48	0.2	0.8	0.8	0.42	253	02Mar17
77	47	1.6	1.57	-0.43	0.27	0.8	0.8	0.39	8	02Mar16
79	47	1.7	1.77	-0.37	0.32	0.8	0.8	0.23	152	02Mar16
64	48	1.3	1.7	-0.37	0.19	0.8	0.8	0.4	191	02Mar16
423	140	3	3.26	-0.19	0.11	0.8	0.8	0.35	737	02June9
153	54	2.8	3.37	-0.19	0.16	0.8	0.8	0.3	477	02Dec7
164	50	3.3	3.3	-0.15	0.23	0.8	0.8	0.45	297	02Mar17
229	76	3	3.01	0.02	0.16	0.8	0.8	0.38	236	02Sept9
183	54	3.4	3.34	0.02	0.25	0.8	0.8	0.25	497	02Dec7
253	76	3.3	3.27	0.05	0.2	0.8	0.8	0.35	217	02Sept9
67	50	1.3	1.27	0.1	0.25	0.8	0.8	0.3	345	02Mar17
210	76	2.8	2.87	0.1	0.16	0.8	0.8	0.36	553	02Sept9
71	47	1.5	1.42	0.15	0.26	0.8	0.8	0.36	624	02Dec8
275	106	2.6	2.85	0.21	0.12	0.8	0.8	0.27	536	02June8
440	139	3.2	3.26	0.22	0.09	0.8	0.8	0.49	636	02June9
404	140	2.9	2.93	0.25	0.1	0.8	0.8	0.37	676	02June9
56	46	1.2	1.25	0.31	0.31	0.8	0.8	0.48	134	02Mar16
393	140	2.8	2.91	0.41	0.14	0.8	0.8	0.38	697	02June9
960	140	6.9	7.17	0.44	0.07	0.8	0.8	0.39	78	02June9

66	50	1.3	1.37	0.48	0.17	0.8	0.8	0.37	224	02Mar17
473	76	6.2	6.63	0.49	0.09	0.8	0.8	0.48	78	02Sept9
275	54	5.1	6.84	0.51	0.09	0.8	0.8	0.26	478	02Dec7
279	47	5.9	6.6	0.55	0.12	0.8	0.8	0.46	698	02Dec8
159	50	3.2	3.17	0.63	0.19	0.8	0.8	0.34	217	02Mar17
426	76	5.6	5.51	0.63	0.09	0.8	0.8	0.39	298	02Sept9
86	76	1.1	1.14	0.64	0.14	0.8	0.8	0.4	315	02Sept9
184	54	3.4	3.25	0.67	0.21	0.8	0.8	0.19	553	02Dec7
272	47	5.8	6.16	0.68	0.15	0.8	0.8	0.37	738	02Dec8
112	106	1.1	1.18	0.72	0.12	0.8	0.8	0.43	73	02June8
596	106	5.6	5.95	0.77	0.07	0.8	0.8	0.42	438	02June8
415	76	5.5	5.45	0.78	0.08	0.8	0.8	0.41	237	02Sept9
332	106	3.1	3.04	0.9	0.14	0.8	0.8	0.34	416	02June8
394	54	7.3	6.79	0.96	0.11	0.8	0.8	0.15	554	02Dec7
34	47	0.7	0.83	1	0.16	0.8	0.8	0.29	70	02Mar16
355	54	6.6	5.97	1.04	0.13	0.8	0.8	0.27	518	02Dec7
319	50	6.4	6.34	1.05	0.12	0.8	0.8	0.34	337	02Mar17
747	140	5.3	5.52	1.14	0.05	0.8	0.8	0.43	677	02June9
907	140	6.5	5.48	1.2	0.07	0.8	0.8	0.32	754	02June9
310	54	5.7	5.61	1.44	0.16	0.8	0.8	0.28	498	02Dec7
131	47	2.8	2.89	1.63	0.27	0.8	0.8	0.35	737	02Dec8
141	76	1.9	1.86	-1.02	0.33	0.8	0.7	0.41	311	02Sept9
80	49	1.6	1.67	-0.72	0.38	0.8	0.7	0.41	61	02Mar17
352	106	3.3	3.48	-0.38	0.12	0.8	0.7	0.42	77	02June8
64	48	1.3	1.72	-0.34	0.19	0.8	0.7	0.42	189	02Mar16
64	48	1.3	1.74	-0.32	0.18	0.8	0.7	0.44	188	02Mar16
173	106	1.6	1.72	-0.26	0.15	0.8	0.7	0.4	76	02June8
69	47	1.5	1.71	-0.22	0.18	0.8	0.7	0.25	141	02Mar16
488	140	3.5	3.57	-0.12	0.13	0.8	0.7	0.42	77	02June9
125	76	1.6	1.67	-0.12	0.17	0.8	0.7	0.35	226	02Sept9
123	76	1.6	1.53	-0.02	0.18	0.8	0.7	0.38	190	02Sept9
78	47	1.7	1.78	0	0.22	0.8	0.7	0.34	72	02Dec8
187	140	1.3	1.67	0.04	0.11	0.8	0.7	0.44	192	02June9
122	76	1.6	1.52	0.05	0.18	0.8	0.7	0.36	195	02Sept9
138	47	2.9	3.03	0.06	0.16	0.8	0.7	0.5	136	02Mar16
81	47	1.7	1.67	0.1	0.34	0.8	0.7	0.46	9	02Mar16
220	76	2.9	3	0.27	0.16	0.8	0.7	0.51	77	02Sept9
63	49	1.3	1.38	0.47	0.17	0.8	0.7	0.48	64	02Mar17
133	50	2.7	2.73	0.51	0.17	0.8	0.7	0.34	236	02Mar17
77	54	1.4	1.47	0.57	0.17	0.8	0.7	0.42	71	02Dec7
331	54	6.1	6.83	0.89	0.11	0.8	0.7	0.42	199	02Dec7
74	48	1.5	1.9	0.91	0.19	0.8	0.7	0.42	193	02Mar16
73	48	1.5	1.99	1	0.18	0.8	0.7	0.4	194	02Mar16
372	54	6.9	6.23	1.34	0.11	0.8	0.7	0.17	454	02Dec7
327	47	7	6.14	2.02	0.15	0.8	0.7	0.23	654	02Dec8
145	76	1.9	1.92	-1.52	0.35	0.8	0.6	0.33	305	02Sept9

133	76	1.8	1.76	-0.75	0.23	0.8	0.6	0.42	232	02Sept9
86	47	1.8	1.8	-0.55	0.4	0.8	0.6	0.42	12	02Mar16
66	47	1.4	1.78	-0.46	0.19	0.8	0.6	0.43	195	02Mar16
66	48	1.4	1.78	-0.37	0.18	0.8	0.6	0.43	190	02Mar16
88	50	1.8	1.73	-0.34	0.27	0.8	0.6	0.26	348	02Mar17
90	47	1.9	1.96	-1.18	0.43	0.8	**0.5**	0.28	733	02Dec8
140	76	1.8	1.85	-1.02	0.27	0.8	**0.4**	0.5	231	02Sept9
168	140	1.2	1.58	0.25	0.1	0.7	0.7	0.5	197	02June9
693	106	6.5	7.11	0.42	0.06	0.7	0.7	0.48	78	02June8
753	140	5.4	5.97	0.48	0.06	0.7	0.7	0.46	698	02June9
505	76	6.6	6.26	0.48	0.08	0.7	0.7	0.34	218	02Sept9
747	140	5.3	6.42	0.51	0.05	0.7	0.7	0.46	738	02June9
280	47	6	5.26	0.85	0.1	0.7	0.7	0.55	17	02Mar16
697	106	6.6	6.22	1.09	0.07	0.7	0.7	0.42	417	02June8
311	47	6.6	6.19	1.29	0.13	0.7	0.7	0.47	718	02Dec8
343	47	7.3	6.13	1.51	0.14	0.7	0.7	0.28	754	02Dec8
59	49	1.2	1.29	0.6	0.17	0.7	0.6	0.59	71	02Mar17
165	47	3.5	3.18	0.76	0.27	0.7	0.6	0.29	753	02Dec8
226	47	4.8	4.85	0.87	0.09	**0.5**	0.6	0.66	137	02Mar16

APPENDIX 'J'

Table of Examiner Severity/Leniency Rating
Comparing Raw Scores by Station
For the Standardized Examinee Project
to
Log-linear Measures by Station

station	Score	Track	Examiner	Logit	Stations ScoreRank	LogitRank
1	30.67	1	1029	-0.38	3	3
1	25.67	2	1001	0.36	1	1
1	31.33	3	1010	-0.51	4	4
1	27.00	4	1090	0.1	2	2
2	28.00	1	1080	0.44	1	1
2	29.00	2	1018	0.34	2	2
2	29.00	3	1021	0.24	3	3
2	32.00	4	1074	-0.29	4	4
4	27.33	1	1067	-0.54	3	3
4	28.00	2	1102	-0.57	4	4
4	24.33	3	1026	0.19	2	2
4	22.33	4	1099	0.95	1	1
5	27.67	1	1115	-0.06	2	3
5	28.67	2	1116	-0.01	3	2
5	31.67	3	1117	-0.48	4	4
5	27.00	4	1118	0.25	1	1
6	33.33	1	1045	-0.87	4	4
6	29.00	2	1076	0.25	2	2
6	26.00	3	1087	0.43	1	1
6	30.33	4	1100	-0.08	3	3
8	21.00	1	1097	0.79	1	1
8	29.33	2	1103	-0.23	3	3
8	24.67	3	1106	0.32	2	2
8	31.67	4	1077	-0.66	4	4
9	30.00	1	1047	-0.07	3	3
9	32.00	2	1050	-0.21	4	4
9	29.67	3	1053	-0.07	1	2
9	29.67	4	1033	0.1	2	1
10	18.67	1	1054	1.12	1	1
10	31.67	2	1066	-0.79	4	4
10	28.00	3	1107	-0.31	3	3
10	23.00	4	1063	0.63	2	2
11	32.33	1	1098	-0.77	4	4
11	29.00	2	1070	0.04	2	2
11	27.33	3	1071	0.57	1	1
11	30.67	4	1093	-0.24	3	3

APPENDIX 'K'

GLOSSARY OF TERMS

CCEB	Canadian Chiropractic Examining Board
CTT	Classical Test Theory
Examiner	Individual scoring a candidate's performance
Facet	For this research project, candidates, examiners and items, each being an aspect of the measurement condition (this item, by this candidate, evaluated by this examiner).
ICC	Item Characteristic Curve: Ogive-shaped plot of the probability of a correct response on an item by a candidate various ability levels.
Infit	Degree of fit of a candidate, examiner, or item to the Rasch model. Infit is a weighted statistic, giving emphasis to "on-target" measures.
Interval scale	Measurement scale in which the value of the unit of measurement is equivalent throughout the scale.
IRT	Item Response Theory: the probability of a candidate's expected response to an item is the joint function of that person's ability, item difficulty, and item discrimination (two-parameter model).
Judges	Judges or observers who are responsible for evaluating candidate performance and marking a rating scale
Measure	A logit-linear score calculated by item response theory.
Multifacet Rasch model or many-facets Rasch model	Extension of the Rasch model by Dr. Mike Linacre of Chicago to include additional facets such as examiners.
Must/may know method	A method of setting the cut-score where a committee of experts, through consensus, arrives at a list of items that minimally competent candidates must know. The cut-score is the sum of the must know items.
OSCE	Objective Structured Clinical Examination
OSCE Cycle	Generally a morning or afternoon cycle, consisting of a number of tracks of stations, candidates, examiners, and standardized patients.
OSCE Track	OSCEs may consist of multiple tracks: a series of rooms with the same stations/cases as another series of rooms. This can increase the amount of candidates tested during each cycle.
Outfit	Degree of fit of a candidate, examiner, or an item. Outfit statistics are unweighted and tend to be influenced by "off-target) observations.
Rasch Model	One-parameter item response model where the slope of the item characteristic curve (discrimination) is fixed at 1 and where there is no guessing parameter
Reliability index (IRT)	Analogous to Cronbach's Alpha, bounded by 0 and 1, estimate of the replicability of candidates, examiners, or items if the

	candidates were given another set of items measuring the same construct and evaluated by the same examiners.
SPs	Standardized Patients: actors trained to perform as patients in an encounter setting
Standardized candidate/examinee	An actor trained to perform at a specified level
True-score	A score free of error variance, especially the error variance contributed to examiner differences
Unidimensionality	One attribute of an object (length, width, ability) can be measured at a time.
Validity	Evidence to support the inferences made.