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PSYCHOMETRIC
SOLUTIONS
GROUP

Examination Report

Refraction Certificate Examination

Singapore – January 2024

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1 Introduction

14 candidates sat the Singapore Refraction Certificate exam on the 16th of January 2024. The examination consists of 10 objective structured clinical examination (OSCE) stations, covering a range of skills required to assess visual acuity, refractive error, and the prescription of spectacles.

1.1 Examination blueprint

The Refraction Certificate (RCert) is designed to assess the following learning outcomes from the Royal College of Ophthalmologists curriculum for ophthalmic specialist training (OST):

CA2 Assess vision

PM14 To use spectacle lenses and prisms when indicated

PS2 Perform a refractive assessment and provide an optical prescription

C1 Establish a good rapport with patients and relatives

C11 Keep clinical records

BCS6 Optics and Medical physics

1.2 Examination structure

The examination consists of 10 OSCE stations. Each station contributes 15 marks to the overall total. The stations used for the examination were:

- SR1 - SR4: Simulated retinoscopy
- NR1 - NR2: Non-cycloplegic retinoscopy
- SC: Subjective refraction cylinder
- LN: Lens neutralisation
- SS: Subjective refraction sphere
- BB: Binocular balance

2 Summary

The Hofstee method of standard setting was used to generate the pass mark for this examination, with a final rounded pass mark of 108/150 (72.0%). On average, candidates scored highest in the four Simulated retinoscopy stations (SR1-SR4) and one of the 'Non-cycloplegic retinoscopy' stations (NR2). As with the previous exam diet, candidates scored lowest on the 'Binocular balance' (BB) station. The overall exam pass rate was 92.9%.

The reliability of the exam was $\alpha=0.40$; this falls below the desired level of 0.80; the alpha value can be negatively affected by small cohort sizes and small standard deviations, both of which occurred in this exam. Performance in the 'Simulated Retinoscopy 2' (SR2) station correlated negatively with overall exam performance. The 'Lens neutralisation' (LN) and 'Non-cycloplegic retinoscopy 1' (NR1) station scores had the strongest correlations with overall scores, suggesting they were the better discriminators.

3 Standard setting

Candidates must be able to accurately assess visual acuity, measure refractive error and recommend an appropriate spectacle correction to pass the RCert. The pass mark is identified using the Hofstee method.

3.1 Hofstee method

After the examination, examiners were asked to review the parameters for the standard setting based upon their judgment of the difficulty of the stations. The following values were used to set the pass mark:

- The maximum credible pass mark for the examination = 75%
- The minimum credible pass mark for the examination = 60%
- The maximum credible pass rate for the examination = 100%
- The minimum credible pass rate for the examination = 0%

The cumulative fail rate as a function of the pass mark and the co-ordinates derived from the four values above were plotted on a graph. The point where a line joining the two coordinates intersects the cumulative function curve is used to identify the pass mark. This pass mark is rounded to the nearest achievable mark.

The raw Hofstee pass mark (before rounding) for this examination was 108.4/150 (72.3%).

4 Results

Table 1: Results summary

Statistic	Value	Percentage
Number of candidates	14	
Maximum possible mark	150	
Mean candidate mark	116.57	77.7%
Median candidate mark	115.50	77.0%
Standard deviation	9.06	6.0%
Highest candidate mark	131	87.3%
Lowest candidate mark	101	67.3%
Reliability	0.399	
Standard error of measurement (SEM rounded)	7.02 (7)	4.7% (4.7%)
Hofstee pass mark	108/150	72.0%
Pass rate*	13/14	92.9%

**Please note that the final pass rate presented reflects any adjustments to candidates scores. All other analyses are based on original, unadjusted score data.*

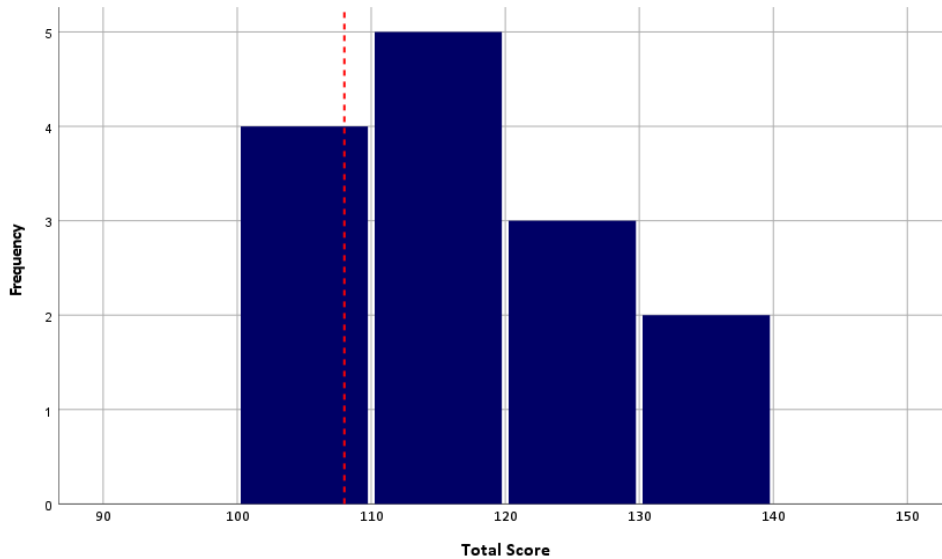


Figure 1: Distribution of marks

The dotted red vertical line denotes the point on the score distribution where the pass mark lies.

Table 2: Station summary

Station	Category	Mean	Median	Standard deviation	Minimum	Maximum
1	SR1	13.00	13.0	1.47	10	15
2	SR2	13.07	13.5	1.49	9	15
3	SR3	13.79	14.5	1.97	8	15
4	SR4	14.21	14.5	1.12	11	15
5	NR1	10.93	9.5	2.95	7	15
6	NR2	13.71	14.0	2.13	7	15
7	SC	10.79	11.0	3.26	2	14
8	LN	9.71	10.0	3.29	0	14
9	SS	9.29	9.0	2.23	6	13
10	BB	8.07	8.0	2.73	4	14

Stations with a mean station score above twelve (highest mean scores) are highlighted in green. Stations highlighted red have the lowest mean scores. The LN and SC stations see the largest variations in candidate performance.

The relative weights for each skill in refraction (based upon the number of stations) are shown in Table 3 below.

Table 3: Weights for each skill

Clinical Skill	Number of stations	Contribution to total marks	Median mark
Retinoscopy	6	60%	14.0
Subjective	3	30%	9.5
Other	1	10%	10.0

Table 4: Correlation between stations

	SR1	SR2	SR3	SR4	NR1	NR2	SC	LN	SS
SR2	0.70								
SR3	0.16	-0.07							
SR4	-0.19	0.08	-0.08						
NR1	-0.02	-0.30	0.33	0.05					
NR2	0.35	-0.02	0.13	-0.20	0.27				
SC	-0.11	-0.09	0.15	-0.24	-0.05	0.08			
LN	0.00	-0.04	-0.06	0.66	0.39	-0.11	0.12		
SS	0.05	0.06	-0.11	0.31	0.00	-0.22	0.08	0.22	
BB	-0.02	-0.15	-0.33	0.07	0.35	-0.22	-0.11	0.30	0.46

Within Table 4, cells are highlighted green if the correlation is greater than 0.5, orange if the correlation is between 0 and 0.2 and red if the correlation is negative.

The median correlation between all stations was 0.00. There were 21/45 negative correlations between stations (red), and 13/45 instances of a weak relationship between stations (orange). The strongest negative correlation was seen between the SR3 (Simulated Retinoscopy 3) station and the BB (Binocular balance) station (-0.33). The strongest positive correlation was between the SR1 (Simulated Retinoscopy 1) station and the SR2 (Simulated Retinoscopy 2) station (0.70), closely followed by the SR4 (Simulated Retinoscopy 4) and LN (Lens Neutralisation) station scores (0.66).

Table 5: Correlation between each station score and total score

Station	SR1	SR2	SR3	SR4	NR1	NR2	SC	LN	SS	BB
Correlation with total score	0.17	-0.07	0.05	0.19	0.36	0.01	0.00	0.42	0.24	0.16

Table 5 shows the corrected station-total correlations. This is the correlation between the station score and the overall total score without the score of that specific station included. Data suggests that the 'Lens Neutralisation' (LN) and 'Non-cycloplegic Retinopathy 1' (NR1) station scores had the strongest relationships with total scores and were therefore the better discriminators.

5 Breakdown of results

Table 6: Breakdown of results by demographic groups

Demographics	Passed	Total	Pass rate (Rounded)
Ethnicity (grouped)			
Asian - Chinese	9	10	90%
Asian - Indian	1	1	100%
Unknown	3	3	100%
PMQ			
OS	11	12	91.7%
UK	2	2	100%
Gender			
Female	5	6	83.3%
Male	6	6	100%
Unknown	2	2	100%

**Please note that the pass rates presented in Table 6 reflect any adjustments to candidate scores.*

6 Comparison to previous examinations

Table 7: Comparison to previous years' exams

Date	Centre	Number of Candidates	Pass mark	Pass rate	Pass rate in OST	% of candidates in OST	Reliability (alpha)	SEM (rounded)
Jan-24	Singapore	14	72%	93%	n/a	n/a	0.40	7 (5%)
Dec-23	Birmingham	75	71%	79%	n/a	n/a	0.70	10 (7%)
Nov-23	Cairo	10	69%	80%	n/a	n/a	0.81	9 (6%)
Sept-23	Birmingham	58	67%	55%	n/a	n/a	0.66	11 (8%)
June-23	Kuching	44	69%	75%	n/a	n/a	0.41	11 (7%)
May-23	Birmingham	75	70%	71%	n/a	n/a	0.79	10 (7%)
Jan-23	Singapore	22	71%	82%	100%	5%	0.54	9 (6%)
Dec-22	London	63	69%	62%	86%	22%	0.73	11 (7%)
Jul-22	Glasgow	109	72%	81%	n/a	n/a	0.85	9 (6%)
May-22	Birmingham	83	72%	80%	94%	20%	0.77	9 (6%)
May-22	Delhi	33	66%	39%	n/a	n/a	0.81	11 (7%)
Apr-22	Cairo	36	73%	86%	n/a	n/a	0.76	8 (5%)
Dec-21	Singapore	131	72%	79%	80%	31%	0.78	10 (6%)
May-21		171	71%	57%	58%	42%	0.83	10 (7%)
Jan-21		39	74%	92%	n/a	n/a	0.51	9 (6%)
Dec-20		141	70%	57%	72%	56%	0.81	11 (8%)
Jun-19		40	70%	57%	n/a	n/a	0.73	11 (7%)
Jun-19		52	74%	67%	n/a^	n/a^	0.76	9 (6%)
Apr-19		87	72%	59%	68%	51%	0.54	12 (6%)
Dec-18		68	72%	54%	70%	63%	0.7	11 (6%)
Jul-18		64	75%	67%	77%	55%	0.74	11 (6%)
Jun-18		39	75%	74%	n/a^	n/a^	0.69	10 (5%)
Apr-18		60	75%	68%	73%	75%	0.55	10 (6%)
Dec-17		63	71%	56%	59%	65%	0.72	11 (6%)
Jul-17		62	72%	61%	68%	60%	0.7	12 (6%)
Apr-17		63	73%	67%	69%	62%	0.7	11 (6%)
Jan-17		62	72%	63%	64%	90%	0.6	10 (6%)
Jul-16		64	70%	64%	67%	67%	0.6	12 (7%)
Jun-16		23	70%	57%	n/a^	n/a^	0.7	11 (6%)
Mar-16		57	77%	81%	83%	70%	0.9	7.7 (4%)
Jan-16		70	70%	60%	60%	81%	0.8	10 (6%)
Jul-15		31	66%	58%	55%	65%	0.65	9.4 (5%)
Jun-15		33	69%	58%	n/a^	n/a^	0.73	10 (6%)
Apr-15		57	77%	65%	73%	65%	0.4	11 (7%)
Dec-14		63	71%	68%	77%	68%	0.6	12 (7%)
Jul-14		34	74%	62%	55%	65%	0.4	11 (6%)
Apr-14		56	73%	84%	89%	66%	0.6	9.5 (5%)
Dec-13		75	72%	67%	76%	65%	0.7	10 (6%)
Jul-13		42	72%	74%	90%	48%	0.7	10 (6%)
Apr-13		64	74%	61%	64%	64%	0.8	11 (6%)

Table 8: Performance of candidate by deanery for all examinations to date, where deanery is known

Deanery	Pass	Total	Pass rate (%)
London	218	294	74.1
East Midlands	47	64	73.4
East of England	59	82	72.0
East of Scotland	15	21	71.4
Kent, Surrey, and Sussex	46	60	76.7
Mersey	50	66	75.8
North of Scotland	15	17	88.2
Northwest	28	38	73.7
Northwestern	20	25	80.0
Northern	39	53	73.6
Northern Ireland	19	29	65.5
Oxford	28	35	80.0
Peninsula (Southwest)	27	58	46.6
Severn	26	40	65.0
Southeast of Scotland	25	29	86.2
South Yorks & Humber	2	5	40.0
Wales	36	65	55.4
Wessex	38	56	67.9
West Midlands	80	114	70.2
West of Scotland	40	54	74.1
Yorkshire	72	108	66.7
Eire	2	3	66.7
Europe and Overseas	22	32	68.8
Unknown; N/A	25	43	58.1
Total	979	1391	70.4%

**Please note that the pass rates presented in Table 8 reflect any adjustments to candidates scores.*