PSYCHOMETRIC
SOLUTIONS
GROUP

Examination Report

Refraction Certificate Examination

Birmingham - December 2023

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1 Introduction

75 candidates sat the Birmingham December 2023 Refraction Certificate exam. 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	Vision
CA7	Motility
PM1	Management plan
PM14	Spectacles
PS2	Refraction
PS21	Hand hygiene
C1	Rapport
C2	Communication
C12	Records
BCS6	Optics
BCS14	Instrument technology
AER16	Time management

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 107/150 (71.3%). On average, candidates scored highest on the SR3 station, closely followed by the SR4 and SR1 stations (all three are Simulated Retinoscopy stations). Candidates scored lowest on the Binocular balance station. The overall exam pass rate was 78.7%.

The reliability of the exam was α=0.70; this falls just below the desired level of 0.80 and is lower than that of the previous diet (0.81). The 'Subjective refraction sphere' and 'Subjective refraction cylinder' station scores had the weakest correlations with overall scores. The SR2, 3 and 4 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 107.4/150 (71.6%).

4 Results

Table 1: Results summary

Statistic	Value	Percentage
Number of candidates	75	
Maximum possible mark	150	
Mean candidate mark	116.03	77.4%
Median candidate mark	120.00	80.0%
Standard deviation	17.57	11.7%
Highest candidate mark	141	94.0%
Lowest candidate mark	43	28.7%
Reliability	0.702	
Standard error of measurement (SEM rounded)	9.59 (10)	6.4% (6.7%)
Hofstee pass mark	107/150	71.3%
Pass rate*	59/75	78.7%

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

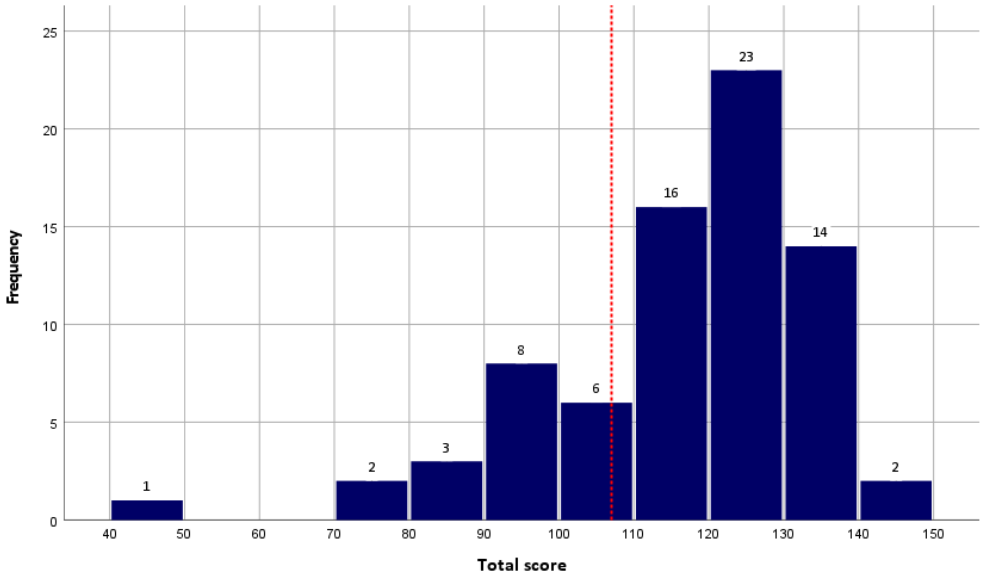

Figure 1: Distribution of marks

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

Table 2: Station summary

Station	Category	Mean	Median	Standard deviation	Minimum	Maximum
1	SR1	12.68	14.0	3.29	3	15
2	SR2	11.20	13.0	3.84	1	15
3	SR3	13.01	15.0	3.56	1	15
4	SR4	12.96	14.0	3.56	0	15
5	NR1	11.57	13.0	3.42	3	15
6	NR2	10.76	12.0	3.32	1	15
7	SC	10.52	12.0	3.91	1	15
8	LN	11.85	12.0	2.91	4	15
9	SS	11.21	12.0	2.58	4	14
10	BB	10.25	11.0	3.35	1	15

Stations with a mean station score above twelve (highest mean scores) are highlighted in green. Stations highlighted red have the lowest mean scores.

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%	11.0
Other	1	10%	12.0

Table 4: Correlation between stations

	SR1	SR2	SR3	SR4	NR1	NR2	SC	LN	SS
SR2	0.43								
SR3	0.21	0.35							
SR4	0.18	0.24	0.59						
NR1	0.10	0.19	0.21	0.35					
NR2	0.16	0.30	0.08	0.21	0.60				
SC	0.16	0.17	0.31	0.06	0.15	0.11			
LN	0.20	0.30	0.17	0.41	0.15	0.19	0.05		
SS	0.09	0.13	0.05	-0.05	-0.02	0.02	0.01	0.09	
BB	0.17	0.21	0.17	0.02	0.07	0.00	0.08	0.13	0.76

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 0.16. There were 2/45 negative correlations between stations (red), and 28/45 instances of a weak relationship between stations (orange). The most negative correlation was seen between the SR4 (Simulated Retinoscopy 4) station and the SS (Subjective refraction sphere) station (-0.05). The strongest positive correlation was between the BB (Binocular balance) and SS (Subjective refraction sphere) station scores (0.76).

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	0.36	0.50	0.48	0.43	0.39	0.35	0.23	0.35	0.21	0.30

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 three of the Simulated Retinoscopy stations (SR2, SR3 and SR4) had the strongest relationships with total scores and were therefore the best discriminators.

5 Breakdown of results

Table 6: Breakdown of results by demographic groups

Demographics	Passed	Total	Pass rate (Rounded)
Ethnicity (grouped)			
Arab	6	8	75.0%
Asian	16	22	72.7%
Black	0	2	0%
White	20	21	95.2%
Other	5	6	83.3%
Unknown	12	16	75.0%
PMQ			
OS	20	30	66.7%
UK	38	44	86.4%
Unknown	1	1	100%
Gender			
Female	23	28	82.1%
Male	34	43	79.1%
Unknown	2	4	50.0%

**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)
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	9	18	*50.0*
Unknown; N/A	25	43	*58.1*
Total	***966***	***1377***	***70.2***

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