PSYCHOMETRIC
SOLUTIONS
GROUP

Examination Report

Refraction Certificate Examination

Birmingham - December 2024

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1 Introduction

95 candidates sat the Birmingham Refraction Certificate exam, held on the 10 to 12th December 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 balancing / Further refinement

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 105/150 (70%) being applied. On average, candidates scored highest in the Simulated Retinoscopy 1 (SR1) and 2 (SR2) stations. On average, candidates scored lowest in the Subjective refraction: Cylinder (SC) and Binocular Balancing (BB) stations. The overall exam pass rate was 77.9%, with 74/95 of the candidates successful.

The reliability of the exam was α=0.65, with all stations contributing positively. Nine out of ten station scores correlated well with overall total exam scores. In particular, Simulated Retinoscopy 2 (SR2) station showed the strongest discriminative power.

3 Standard setting

The exam pass mark is generated 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 105.5/150 (70.3%).

4 Results

Table 1: Results summary

Statistic	Value	Percentage
Number of candidates	95	
Maximum possible mark	150	
Mean candidate mark	111.76	74.5%
Median candidate mark	111.00	74.0%
Standard deviation	17.00	11.3%
Highest candidate mark	140	93.3%
Lowest candidate mark	57	38.0%
Reliability	0.648	
Standard error of measurement	10.09	6.7%
Hofstee pass mark (final; rounded)	105/150	70%
Pass rate*	74/95	77.9%

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

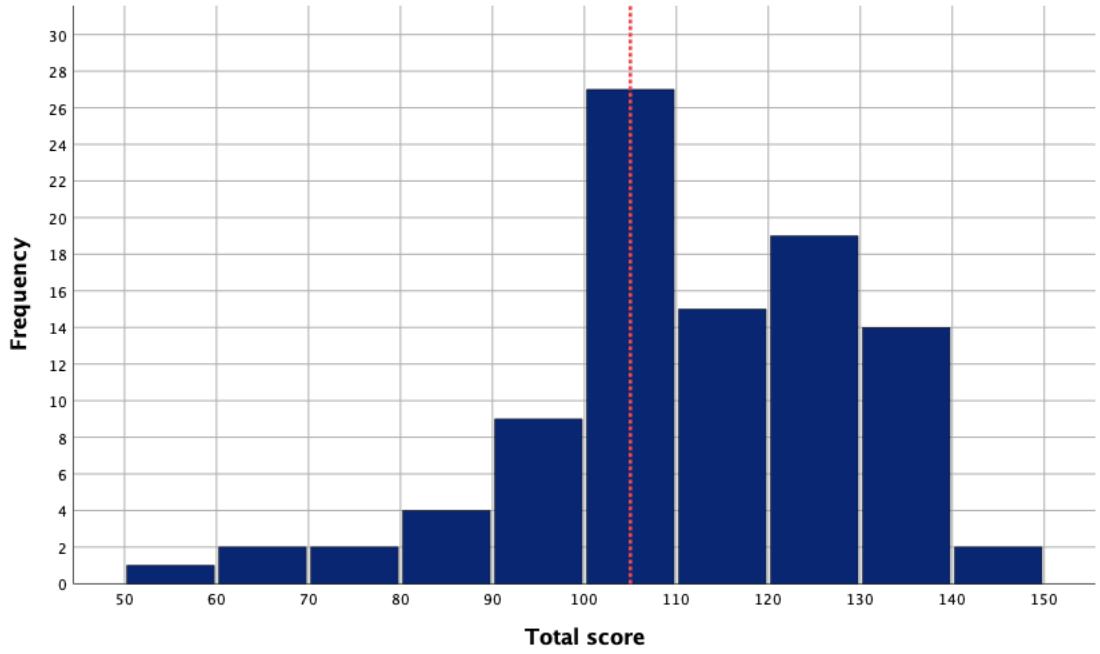

Figure 1: Distribution of marks

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

Table 2: Station summary

Station	Category	Mean	Median	Standard deviation	Minimum	Maximum
1	SR1	13.41	14	2.59	2	15
2	SR2	12.63	14	3.50	1	15
3	SR3	12.15	13	2.84	1	15
4	SR4	12.14	13	3.12	2	15
5	NR1	10.55	12	3.97	1	15
6	NR2	10.23	12	4.38	0	15
7	SC	9.99	12	4.30	0	15
8	LN	10.84	12	3.40	0	15
9	SS	10.54	11	2.62	4	15
10	BB	9.28	9	3.63	1	15

The stations with the highest mean scores are highlighted in green (SR1 and SR2). The stations highlighted in light red have the lowest mean scores (SC and BB). The NR2 station saw the largest variation in candidate performance (largest SD).

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

Table 3: Weights for each skill

Clinical Skill	Number of stations	Contribution to total marks	Median mark
Retinoscopy	6	60%	13
Subjective	3	30%	11
Other	1	10%	12

Table 4: Correlation between stations

	SR1	SR2	SR3	SR4	NR1	NR2	SC	LN	SS
SR2	0.37								
SR3	0.22	0.06							
SR4	0.34	0.19	0.28						
NR1	0.16	0.25	0.13	0.01					
NR2	0.17	0.16	0.12	-0.01	0.49				
SC	0.14	0.13	0.11	0.12	0.18	0.13			
LN	0.10	0.29	-0.03	0.08	0.12	0.29	0.19		
SS	0.03	0.19	0.07	0.02	0.07	-0.01	0.19	0.12	
BB	0.05	0.25	0.10	-0.03	0.11	0.19	0.13	0.29	0.48

Within Table 4, cells are highlighted green if the correlation is ≥ 0.50 and orange if the correlation is between 0 and 0.20 (inclusive). Negative correlations between stations are highlighted in light red.

The median correlation between all stations was 0.13. There were 4/45 instances of a negative correlation between stations, 30/45 instances of a weak correlation (orange), and 0/45 instances of a strong relationship between stations (green). The strongest *negative* correlations were seen between the SR4 station and the BB station, and between the SR3 station and the LN station. The strongest *positive* correlations were seen between the NR1 and NR2 stations, and the SS and BB stations.

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	0.35	0.41	0.22	0.19	0.37	0.37	0.29	0.34	0.26	0.34

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. Ten out of ten correlations were positive and 9/10 were of an acceptable strength (correlation ≥0.20). Data suggests that the Simulated Retinoscopy 2 (SR2) station had the strongest relationship with total scores and was therefore the better discriminator.

5 Breakdown of results

Table 6: Breakdown of results by demographic groups

Demographics	Passed	Total	Pass rate
Ethnicity (grouped)			
Arab	7	11	63.6%
Asian/Asian British	37	45	82.2%
Black/Black British	4	5	80%
Mixed	3	4	75%
White/White British	16	20	80%
Other	2	2	100%
Unknown	5	8	62.5%
PMQ			
OS	37	46	80.4%
UK	36	45	80%
Unknown	1	4	25%
Gender			
Female	28	36	77.8%
Male	45	55	81.8%
Unknown	1	4	25%
Attempt			
1st Attempt	62	78	79.5%
2nd Attempt	12	16	75%
4th Attempt	0	1	0%
Training			
In OST	2	2	100%
Not in OST	26	32	81.3%
Unknown	46	61	75.4%

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-24	**Birmingham**	**95**	**70%**	**78%**	**100%**	**2**	**0.65**	**10 (7%)**
Nov-24	Cairo	30	69%	73%	n/a	n/a	0.48	10 (7%)
Sept-24	Malaysia	22	69%	68%	n/a	n/a	0.65	11 (7%)
May-24	Birmingham	100	69%	67%	n/a	n/a	0.76	11 (7%)
Feb-24	Rawalpindi	18	71%	72%	n/a	n/a	0.67	10 (7%)
Feb-24	Chennai	21	67%	52%	n/a	n/a	0.72	12 (8%)
Jan-24	Singapore	14	72%	93%	n/a	n/a	0.40	TBC
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%)

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

Deanery	Pass	Total	Pass rate (%)
London	240	319	*75.2*
East Midlands	55	74	*74.3*
East of England	67	91	*73.6*
East of Scotland	16	22	*72.7*
Kent, Surrey, and Sussex	57	74	*77.0*
Mersey	55	71	*77.5*
North of Scotland	18	23	*78.3*
Northwest	28	38	*73.7*
Northwestern	29	37	*78.4*
Northern	48	64	*75.0*
Northern Ireland	20	30	*66.7*
Oxford	33	41	*80.5*
Peninsula (Southwest)	34	67	*50.7*
Severn	29	43	*67.4*
Southeast of Scotland	26	30	*86.7*
South Yorks & Humber	3	6	*50.0*
Wales	43	75	*57.3*
Wessex	40	60	*66.7*
West Midlands	92	130	*70.8*
West of Scotland	42	58	*72.4*
Yorkshire	81	118	*68.6*
Eire	3	9	*33.3*
Europe and Overseas	35	55	*63.6*
Unknown; N/A	87	142	*61.3*
Total	1181	1677	*70.4*