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FROM THE EXAMINATIONS DEPARTMENT

Final Report July 2013 Refraction Certificate Examination

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1 Introduction

The eleventh Refraction Certificate examination in the format was held in Glasgow from 8 to 10 July 2013. 42 candidates presented themselves for the examination. The examination consisted of a 12 station OSCE covering a range of skills required to assess visual acuity, refractive error and the prescription of spectacles.

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

Examination Structure

The examination consists of 12 OSCE stations. Each station contributes a possible 15 marks to the overall total. The stations for the July 2013 examination were:

1. Cycloplegic Retinoscopy 1 (CR1)
2. Cycloplegic Retinoscopy 2 (CR2)
3. Subjective Refraction Cylinder (SRC)
4. Cycloplegic Retinoscopy 3 (CR3)
5. Cycloplegic Retinoscopy 4 (CR4)
6. Lens Neutralisation (LN)
7. Non Cycloplegic Retinoscopy 1 (NCR1)
8. Non Cycloplegic Retinoscopy 2 (NCR2)
9. Visual acuity and IPD measurement (VA)
10. Subjective Refraction Sphere (SRS)
11. Binocular balance (BB)
12. Near Addition (NA)

2 Summary

This is the third sitting of the refraction certificate with 12 OSCE stations. The reliability of the examination fell slightly from the last sitting.

The pass rate in OST continues to rise, which suggests that trainees are learning how to perform retinoscopy in preparation for the examination. A small number of candidates performed very badly. These candidates were particularly poor in the cycloplegic retinoscopy stations.

Candidate performance was best in two of the cycloplegic retinoscopy stations (CR1 and CR2). Performance was poorest in the non-cycloplegic retinoscopy 2 station.

The examination is heavily weighted toward cycloplegic retinoscopy (4 stations) and there was a good correlation between performances in all of these stations. Stations CR4 and binocular balance were the most highly discriminating between poor and well performing candidates in the examination overall. The near add and subjective refinement of the cylinder were the poorest discriminating stations.

There was a statistically significant difference in the performance of candidates based on training status, country of qualification and first language.

3 Standard setting

Candidates must be able to accurately assess visual acuity, measure refractive error and recommend an appropriate spectacle correction to pass the Refraction Certificate. The pass mark was identified using two different methods:

Borderline candidate method (BCM)

Examiners marked the station they were supervising according to the marking guidance provided. In addition they were asked to rate the candidates overall performance as a pass, a fail or borderline. The median mark allocated to the borderline candidates then becomes the pass mark for that station. The sum of the borderline marks for each station is the examination pass mark.

Hofstee method (see appendix 1 for details)

In advance of the examination, members of the College's Examinations Committee were asked to nominate the values for the following:

1. The maximum credible pass mark for the examination
2. The maximum credible pass rate for the examination
3. The minimum credible pass mark for the examination
4. The minimum credible pass rate for the examination

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 co-ordinates intersects the cumulative function curve is used to identify the pass mark. The Hofstee pass mark used to compare the difficulty of successive examinations.

4. Results (Table 1)

Number of candidates	42
Maximum possible mark	180
Mean candidate mark	134 (74%)
Median candidate mark	137 (76%)
Standard deviation	17.8 (10%)
Highest candidate mark	165 (92%)
Lowest candidate mark	92 (51%)
Range of marks	73 (41%)
Reliability	0.7
Standard error of measurement (SEM)	10 (5%)
BCM pass mark	120 (67%)
Hofstee pass mark	133/180 (74%)
Pass mark used (BCM + 1 SEM)	130 (72%)
Pass rate	31/42 (74%)
Pass rate in OST	18/20 (90%)
Pass rate if Hofstee mark had been used	27/42 (64%)

Distribution of marks (Table 2)

Score	Distribution	Total
81-85		0
86-90		0
91-95	/	1
96-100	/	1
101-105	///	3
106-110	//	2
111-115		0
116-120	///	3
121-125	/	1
126-130	//	2
131-135	//// //	7
136-140	//	2
141-145	////	5
146-150	//// ////	10
151-155	///	3
156-160	/	1
161-165	/	1
166-170		0
Total		42

/ Candidate failed / candidate passed

Statistics for each station (Table 3)

		Mean	Mean %	Median	Median %	Standard deviation	Minimum	Maximum
1	CR1	12.3	82	14	93	3.3	4	15
2	CR2	12.3	82	13.5	90	3.0	3	15
3	SRC	10.9	73	12	80	3.9	0	15
4	CR3	11.7	78	13	87	3.7	2	15
5	CR4	9.9	66	10	67	3.7	1	15
6	LN	11.0	73	11.5	77	3.5	2	15
7	NCR1	12.0	80	13	87	3.0	0	15
8	NCR2	9.5	63	9	60	3.4	0	15
9	VA	12.0	80	12.5	83	2.4	6	15
10	SRS	10.4	69	10.5	70	2.0	5	13
11	BB	9.7	65	10.5	70	3.2	0	14
12	NA	12.4	83	13	87	2.4	4	15

The relative weights for each skill in refraction (based upon the number of stations is:

Clinical skill	Number of stations	Contribution to total marks
Retinoscopy	6	50%
Subjective	3	25%
Other	3	25%

Correlation between stations (Table 4)

	CR1&2	SRC	CR1	CR2	LN	NCR1	NCR2	VA	SRS	BB	NA
CR1	0.64	0.02	0.29	0.39	0.03	-0.06	0.31	0.35	0.15	0.22	-0.08
CR2		0.10	0.28	0.33	-0.06	0.20	0.28	0.28	0.33	0.33	0.30
SRC			-0.23	0.08	0.26	-0.06	0.09	-0.13	0.14	0.26	0.33
CR3				0.67	-0.06	0.29	0.00	0.20	0.06	0.12	0.23
CR4					-0.01	0.39	0.21	0.13	0.25	0.22	0.21
LN						-0.06	-0.03	0.16	0.14	0.26	0.26
NCR1							0.02	-0.08	0.18	0.15	0.41
NCR2								0.15	0.04	0.03	-0.21
VA									-0.01	0.07	-0.01
SRS										0.54	0.25
BB											0.26

Median correlation between the cycloplegic refraction stations = 0.36

Correlation between non-cycloplegic refraction stations = 0.02

Best correlation between 2 cycloplegic refraction stations (CR3 & 4)

Worst correlation between SRC and CR

Correlation between each station and the total score (Table 5)

CR1	CR2	SRC	CR3	CR4	LN	NCR1	NCR2	VA	SRS	BB	NA
0.58	0.68	0.35	0.51	0.70	0.33	0.40	0.35	0.34	0.48	0.58	0.48

Item discrimination and facility

33% item discrimination has a value between -1.00 and +1.00. If the candidates who score well in the examination overall score well in the station, the item discrimination index will be close to +1.00. If the candidates who score poorly in the examination overall score well in the station, the item discrimination index will be close to -1.00. Ideally the station item discrimination value should be greater than 0.400. The facility of each station estimates how easy the candidates found the task to complete.

Utility of each question (Table 6)

Pass or fail on marks for each station

	Station	33% item discrimination	Item facility
1.	Cycloplegic Retinoscopy 1 (CR1)	0.429	76
2.	Cycloplegic Retinoscopy 2 (CR2)	0.500	83
3.	Subjective Refraction Cylinder (SRC)	0.071	79
4.	Cycloplegic Retinoscopy 3 (CR3)	0.429	76
5.	Cycloplegic Retinoscopy 4 (CR4)	0.714	67
6.	Lens Neutralisation (LN)	0.143	74
7.	Non Cycloplegic Retinoscopy 1 (NCR1)	0.357	76
8.	Non Cycloplegic Retinoscopy 2 (NCR2)	0.286	60
9.	Visual acuity and IPD measurement (VA)	0.429	76
10.	Subjective Refraction Sphere (SRS)	0.214	88
11.	Binocular balance (BB)	0.714	69
12.	Near Addition (NA)	0.071	90

Standard setting and global judgments for each station (Table 7)

		Pass	Borderline	Fail	% Pass	BCM mark*	%
1	CR1	26	10	6	62	11	73
2	CR2	30	8	4	71	10	67
3	SRC	27	9	6	64	10	67
4	CR3	28	10	4	67	10	67
5	CR4	18	18	6	43	9	60
6	LN	21	17	4	50	10	67
7	NCR1	25	11	6	60	11	73
8	NCR2	11	24	7	26	9	60
9	VA	21	21	0	50	11	73
10	SRS	25	15	2	60	9	60
11	BB	20	15	7	48	9	60
12	NA	35	5	2	83	11	73

*BCM mark = median mark for borderline candidates for each station.

5. Breakdown of results

Breakdown of results by training (Table 8)

	Failed	Passed	Total
In OST	2	18	20
Not in OST	9	13	22
Total	11	31	42

Unknown for 1 candidate

These differences are statistically significant ($p = 0.035$)

Breakdown of results by deanery (Table 9)

Deanery	Failed	Passed	Total
East Midlands	0	0	0
East of England	0	0	0
East of Scotland	0	1	1
KSS	0	1	1
London	0	5	5
Mersey	0	1	1
North Scotland	0	0	0
North West	0	0	0
Northern	0	0	0
Northern Ireland	0	1	1
Oxford	0	1	1
Peninsula	1	0	1
Severn	0	1	1
South Scotland	0	0	0
Wales	1	0	1
Wessex	0	0	0
West Scotland	0	0	0
West Midlands	0	4	4
Yorkshire	0	3	3
Total	2	18	20

Breakdown of results by stage of training (Table 10)

Stage (includes FTSTA)	Failed	Passed	Total
ST1	1	2	3
ST2	0	10	10
ST3	1 (LAT)	5	6
ST4	0	0	0
Total*	2	17	19

*Level at examination unknown for 1 candidate

Breakdown of results by gender (Table 11)

	Failed	Passed	Total
Female	6	17	23
Male	5	13	18
Total*	11	30	41

Gender unknown for 1 candidate

These differences are not statistically significant ($p = 1$)

Breakdown of results by country of qualification (Table 12)

	Failed	Passed	Total
UK	0	17	17
Outside UK	11	14	25
Total	11	31	42

These differences are statistically significant ($p = 0.003$)

Breakdown of results by first language (Table 13)

	Failed	Passed	Total
English	3	23	26
Not English	7	5	12
Total*	10	28	38

Unknown for 4 candidates

These differences are statistically significant ($p = 0.005$)

Breakdown of results by stated ethnicity (Table 14)

	Failed	Passed	Total
Non-white	9	19	28
White	1	9	10
Unknown	1	3	4
Total	11	31	42

Unknown for 4 candidates

These differences are not statistically significant ($p = 0.24$)

Breakdown of results by number of previous attempts (Table 15)

Attempts	Failed	Passed	Total
1 (First)	6	19	25
2	0	11	11
3	4	1	5
4	1	0	1
Any resit	5	12	17
Total	11	31	42

6 Comparison to previous examinations (Table 16)

Date	Candidates	Pass mark	Pass rate	Pass rate in OST	% Candidates in OST	Reliability	SEM	Hofstee pass mark
Mar 10	43	69%	47%	58%	67%	0.6	9 (9%)	68%
July 10	47	75%	53%	60%	70%	0.6	8 (8%)	72%
Nov 10	53	74%	42%	44%	68%	0.6	7 (7%)	71%
Apr 11	57	71%	35%	47%	63%	0.6	6 (6%)	67%
July 11	41	67%	66%	72%	71%	0.4	6 (6%)	71%
Nov 11	69	65%	71%	75%	70%	0.6	8 (8%)	68%
Mar 12	54	73%	54%	66%	57%	0.6	8 (8%)	72%
July 12	44	71%	59%	67%	64%	0.5	9 (9%)	71%
Dec 12	71	69%	75%	77%	55%	0.6	11(6%)	72%
Apr 13	64	74%	61%	64%	64%	0.8	11(6%)	74%
July 13	42	72%	74%	90%	48%	0.7	10(6%)	74%

Performance of candidate by deanery for all examinations to date, where deanery is known (Table 17)

Deanery	Total passes	Total candidates	Pass rate
East of Scotland	6	6	100
North Scotland	3	3	100
Oxford	3	3	100
KSS	3	3	100
East Midlands	10	13	77
London	59	79	75
Mersey	11	15	73
South Scotland	5	7	71
West Scotland	7	10	70
Northern Ireland	5	8	63
Northern	8	13	62
Yorkshire	19	31	61
East of England	11	18	61
West Midlands	17	28	61
Wales	7	12	58
North West	11	19	58
Wessex	5	9	56
Severn	4	8	50
Peninsula	5	16	31
TOTAL	199	301	66

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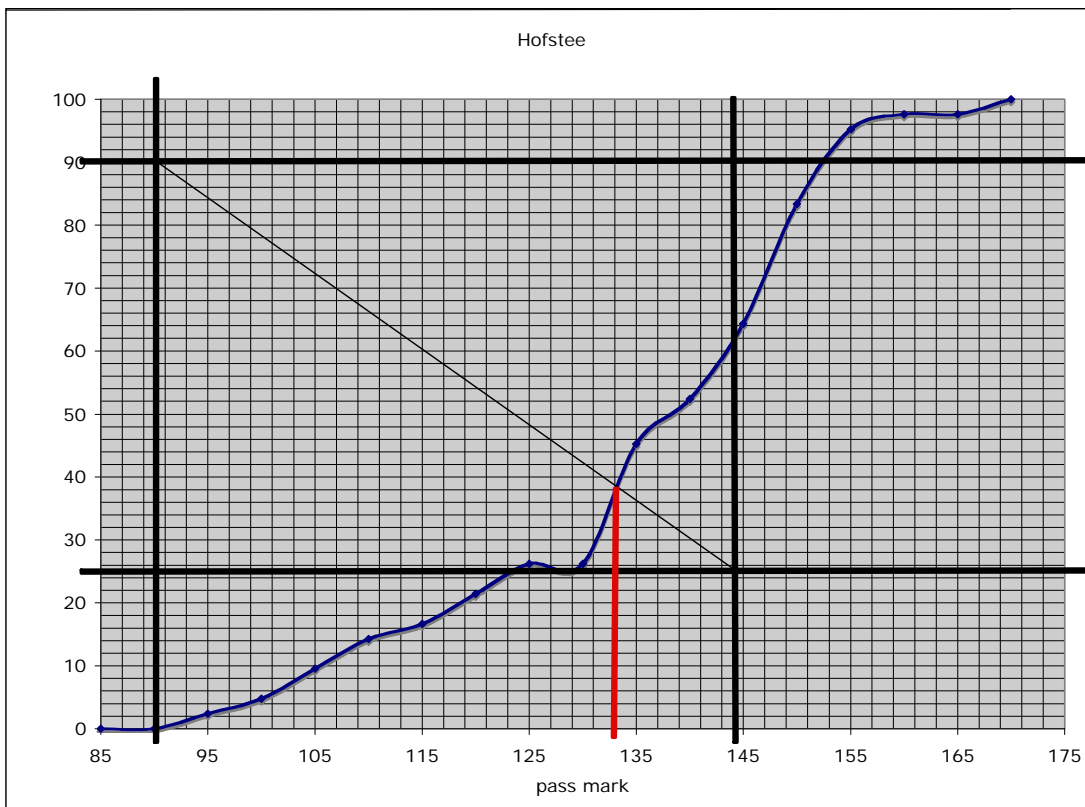
Hofstee method

In advance of the examination, members of the College's Examinations Committee were asked to nominate the values for the following:

1. The maximum credible pass mark for the examination 144/180 (80%)
2. The maximum credible pass rate for the examination (75%)
3. The minimum credible pass mark for the examination 90/180 (50%)
4. The minimum credible pass rate for the examination (10%)

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 co-ordinates intersects the cumulative function curve is used to identify the pass mark.

The Hofstee pass mark for this examination was 133/180 (74%), which is slightly higher than the BCM + 1 SEM pass mark. Using this pass mark the pass rate would have been 27/42 (64%)



**July 13 - Refraction Certificate
Candidate Evaluation**

OSCE stations

Were you treated in a courteous manner by the examiners in this examination?

**Yes 9/9
No 0/9**

Comments

- The examiners were exceptionally polite, nice and professional.
- I found all my examiners extremely kind and courteous.
- Very friendly examiners made every effort to make sure I knew how to use the equipment and kept to timings.
- Examiners appeared to be well organised.
- All the examiners were so friendly and I personally was treated as a colleague not as a candidate

Were the patients you were asked to examine appropriate for the examination?

**Yes 8/9
No 1/9**

Comments

- Except in one of the stations the patient went out before the time was up and was not instructed by the examiner
- Most of the pts were appropriate. It becomes a bit difficult when pts give contradicting signals – say accepting -0.25 cyl on JCC and not accepting it when placed.... Helps to loose precious time in a very stressful situation.
- Considering this is a time pressure examination some of the patients were inconsistent with their responses, slow to read the snellen chart, etc.
- All the instructions were so clear

The OSCE overall

Was the OSCE well organized?

**Yes 9/9
No 0/9**

Comments

- It was well organised except the visual acuity charts were very confusing.

Were you given clear instructions about the OSCE?

**Yes 9/9
No 0/9**

Comments

- It was quite clear what to do during the rotations as the examiners took their time to explain.

Did you feel that the OSCE was a fair assessment of your knowledge?

Yes 6/9

No 3/9

Comments

- More time and stations will be more fair
- Especially in the subjective stations, the speed of the patient's response is quite important. I found it difficult to finish everything I was supposed to, partly because the patient took a while to decide which lens was better, etc. So, although I knew exactly what I had to do, I simply didn't have enough time to do all of it! And ofcourse, in real life, for subjective tests, the time taken by each pt varies...I wish the same flexibility of time were there in the exam too...
- The timings were very restrictive and can be reviewed in my opinion. I felt rushed and barely had time to record my findings ... I know that I know more than what I may have demonstrated ☺ .
- As above, with patients giving slow response did not get a chance to perform some of the tests as efficiently as I would have liked for an exam situation.

Exam Preparation

Who helped you to develop competence in refraction? (Please tick the answer as appropriate)

- | | | |
|--------------------------|---|---|
| <input type="checkbox"/> | Optometrist | 7 |
| <input type="checkbox"/> | Consultant ophthalmologist | 1 |
| <input type="checkbox"/> | Fellow trainee | 1 |
| <input type="checkbox"/> | Self-taught | 4 |
| <input type="checkbox"/> | Other (please list)_____Staff Grade, attended Course_____ | |

Question 2

Approximately how many complete refractions (retinoscopy + subjective modification) did you carry out in your preparation for the examination?

- 30-40
- Around 100
- 50
- At least 100, if not more
- No enough....
- 70
- 60-70 approx
- Over 100
- 40 complete refractions

Question 3

Please provide any other advice that you would like to share with future candidates.

- Practice, practice, practice. There is no substitute for practice.
- Try to practice under the time and allow a minute or two to write down the answer. The unfamiliar and foreign examination room may slow your work down especially when you are trying to look for the instruments! Try to familiarize with the environment FAST.
- Apply early so that you have plenty of time to practice. Ask for help of your fellow trainee and optometrist.
- There's no substitute for practice.
- The Refraction Pack on the RCOphth website is very helpful, and tells you exactly what each of the stations will be, and how best to tackle each station. The marksheets are also available on the College website which means that you can be familiar with the set-up on the day. I went on two courses (WOPEC, and Dunstone Optics & Refraction for Ophthalmologists) which helped get the basics in place in a time-efficient way. In spite of this, there is NO SUBSTITUTE for practice, practice and more practice! I worked closely with our hospital optometry department and found them to be excellent teachers! I attended the exam in Glasgow and found it was a very well-organised centre and would definitely recommend!
- Try to practice full refractions and retinoscopy as much as possible. I found this most useful at a local optometry practice. Stay calm through exam and if you need more time setting up for a station, i.e – loading lenses, then inform the coordinator.

Please write any other comments you have about the Refraction Certificate Exam below.

- I did my exam at Glasgow Caledonian University and I am extremely disappointed in the visual acuity chart presented to us. We were told (by the College) to familiarise ourselves with LOGMAR chart. i.e If it was a LOGMAR chart that was presented to us. This made it very confusing to convert.
- I think it is a great experience though it is very tough to perform under such a short time. I think a bit more time allocation would help. I find the examiners and patients were great.
- Although the OSCEs were very crisp and well organized, it felt a little frustrating not to be able to finish. It would have been nice if the subjective stations could have been given more time. Is it possible to hold the exam in India? (Or at least, somewhere nearby, like the Middle East or Malaysia!) I know a lot of my colleagues from India hesitate to take this exam because of the expense involved in traveling and staying in the UK...