

# The Royal College of Ophthalmologists

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FROM THE EXAMINATIONS DEPARTMENT

## Final Report July 2012 Refraction Certificate Examination

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## **Introduction**

The eighth Refraction Certificate examination in the OSCE format was held in Glasgow on 9<sup>th</sup> and 10<sup>th</sup> July 2012. 44 candidates presented themselves for the examination. The examination consisted of an 8 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**

Eight OSCE stations are selected from a possible 16. Four stations are compulsory (and appear in every examination). Four stations are selected from the remaining twelve.

### **Compulsory stations:**

1. Cycloplegic Retinoscopy
2. Non Cycloplegic Retinoscopy
3. Subjective Refraction Sphere
4. Subjective Refraction Cylinder

### **Remaining stations**

5. Binocular Balance
6. A second Cycloplegic Retinoscopy
7. Focimetry
8. Lens Neutralisation
9. Muscle Balance with Maddox Rod
10. Muscle Balance with Prism Cover Test
11. Near Addition
12. A second non Cycloplegic Retinoscopy
13. Refraction of a Model Eye
14. Trial Frame Fitting and Interpupillary Distance (IPD) Measurement
15. Visual Acuity and Refraction Estimation
16. Visual Acuity Testing of a Child

The stations used in the July 2012 examination were:

1. Cycloplegic retinoscopy
2. Non-cycloplegic retinoscopy
3. Non-cycloplegic retinoscopy
4. Focimetry
5. Subjective refraction-cylinder
6. Visual acuity and refractive estimate
7. Subjective refraction-sphere
8. Near addition

### **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 is identified using the borderline candidate method. In addition the pass mark using the Hofstee method is calculated as a comparison, but not used to decide identify the successful candidates.

### **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 is used to compare the difficulty of successive examinations.

### Results (Table 1)

Maximum possible mark	100
Mean candidate mark	72
Median candidate mark	72
Standard deviation	14.4
Highest candidate mark	98
Lowest candidate mark	39
Range of marks	59
Reliability	0.5
Standard error of measurement (SEM)	9
BCM pass mark	62
Hofstee pass mark	71
Pass mark used (BCM + 1 SEM)	71
Pass rate	26/44 (59%)

### Distribution of marks (Table 2)

Score	Distribution	Total
36-40	/	1
41-45		0
46-50	//	2
51-55	//	2
56-60	/	1
61-65	//// //	8
66-70	///	4
71-75	//// ////	10
76-80	//// //	7
81-85	//	2
86-90	///	3
91-95	//	2
96-100	//	2
Total		44

### Statistics for each station (Table 3)

	Station							
	1	2	3	4	5	6	7	8
	Cyclo Ret	Non Cyclo	Non Cyclo Ret	Focimetry	Sub Cyl:	VA and refraction estimate	Sub Sphere:	Near Add:
Mean	10.0	11.8	12.8	6.5	7.8	4.5	10.5	7.8
Mean %	67	78	85	65	52	91	70	78
Median	12	14	14	7.5	7.5	5	12	8
Median %	80	93	93	75	50	100	80	80
sd	4.67	4.25	2.91	3.11	5.39	0.59	3.86	1.77
Min	1	1	5	0	0	3	2	4
Max	15	15	15	10	15	5	15	10

**Correlation between stations (Table 4)**

		2	3	4	5	6	7	8
		Non Cyclo Ret	Non Cyclo Ret	Focimetry	Sub Cyl	VA & refraction estimate	Sub Sphere	Near Add
1	Cyclo Ret	0.13	0.32	0.14	0.11	0.09	0.13	-0.04
2	Non Cyclo Ret		0.06	-0.08	0.10	-0.14	-0.07	-0.04
3	Non Cyclo Ret			0.38	0.01	0.16	0.14	0.14
4	Focimetry				0.25	0.18	0.33	0.44
5	Sub Cyl					-0.09	-0.18	-0.01
6	VA & estimate						0.19	0.22
7	Sub Sphere							0.36

**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 5)**

Pass or fail on marks for each station

	Station	33% item discrimination	Item facility
1.	<b>Cycloplegic retinoscopy</b>	0.172	0.66
2.	<b>Non-cycloplegic retinoscopy</b>	0.069	0.75
3.	<b>Non-cycloplegic retinoscopy</b>	0.103	0.86
4.	<b>Focimetry</b>	0.241	0.75
5.	<b>Subjective refraction-cylinder</b>	0.207	0.50
6.	<b>VA and refractive estimate</b>	0.034	0.95
7.	<b>Subjective refraction-sphere</b>	0.069	0.77
8.	<b>Near addition</b>	0.000	0.86

### Standard setting and global judgments for each station (Table 6)

	Station (number of candidates)							
	1	2	3	4	5	6	7	8
	Cyclo Ret	Non Cyclo	Non Cyclo Ret	Focimetry	Sub Cyl	VA and ref estimate	Sub Sphere:	Near Add
Pass	24	29	32	23	14	24	27	30
Borderline	5	7	6	11	7	10	10	11
Fail	14	8	6	10	23	0	7	3
% Pass	55	66	73	52	32	55	61	68
BCM mark*	9	10	9	5	9	4	10	6
%	60	67	60	50	60	80	67	60

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

### Breakdown of results by training (Table 7)

	Failed	Passed	Total
In OST	9	19	28
Not in OST	9	7	16
Total	18	26	44

These differences are not statistically significant ( $p = 0.20$ )

### Breakdown of results by deanery (Table 8)

Deanery	Failed	Passed	Total
East Midlands	0	0	0
East of England	0	1	1
East of Scotland	0	0	0
London	3	6	9
Mersey	1	1	2
North Scotland	0	1	1
North West	0	1	1
Northern	0	0	0
Northern Ireland	0	1	1
Oxford	0	0	0
Peninsula	2	0	2
Severn	1	2	3
Wales	0	2	2
Wessex	0	1	1
West Scotland	1	1	2
West Midlands	1	0	1
Yorkshire	0	2	2
Total	9	19	28

**Breakdown of results by stage of training (Table 9)**

Stage (includes FTSTA)	Failed	Passed	Total
ST1	2	0	2
ST2	5	10	15
ST3	2	6	8
ST4	0	0	0
Total*	9	16	25

\*Level at examination unknown for 3 candidates

**Breakdown of results by gender (Table 10)**

	Failed	Passed	Total
Female	8	11	19
Male	10	15	25
Total	18	26	44

These differences are not statistically significant ( $p = 0.82$ )

**Breakdown of results by country of qualification (Table 11)**

	Failed	Passed	Total
UK	5	16	21
Outside UK	13	10	23
Total	18	26	44

These differences are statistically significant ( $p = 0.04$ )

**Breakdown of results by stated ethnicity (Table 12)**

	Failed	Passed	Total
Asian/Black	15	17	32
White	3	8	11
Unknown	0	1	1
Total	18	26	44

These differences are not statistically significant for white/non white candidates ( $p = 0.31$ )

**Breakdown of results by stated ethnicity for candidates in OST (Table 13)**

	Failed	Passed	Total
White	1	8	9
Non-white	8	10	18
Total*	9	18	27

\* Ethnicity unknown for 1 candidate

These differences are not statistically significant for white/non white candidates ( $p = 0.19$ )

**Breakdown of results by number of previous attempts (Table 14)**

Attempts	Failed	Passed	Total
1 (First)	8	16	24
2	6	6	12
3	2	3	5
4	2	1	3
Any resit	10	10	20

**Breakdown of results by OSCE team (Table 15)**

	Failed	Passed	Total
Team 1	9	13	22
Team 2	9	13	22
	18	26	44

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

**Breakdown of results by day of examination (Table 16)**

	Failed	Passed	Total
Monday	11	19	30
Tuesday	7	7	14
	18	26	44

These differences are not statistically significant ( $p = 0.5$ )

**Comparison to previous examinations (Table 17)**

	March 2010	July 2010	Nov 2011	April 2011	July 2011	Nov 2011	March 2012	July 2012
Candidates	43	47	53	57	41	69	54	44
Pass mark	69%	75%	74%	71%	67%	65%	73%	71%
Pass rate	47%	53%	42%	35%	66%	71%	54%	59%
Pass rate in OST	58%	60%	44%	47%	72%	75%	66%	67%
% Candidates in OST	67%	70%	68%	63%	71%	70%	57%	64%
Reliability	0.58	0.6	0.6	0.6	0.42	0.6	0.6	0.5
SEM	9	8	7	6	6	8	8	9
Hofstee pass mark	68%	72%	71%	67%	71%	68%	72%	71%



**Performance of candidate by deanery for all examinations to date, where deanery is known (table 18)**

Deanery	Total candidates	Total passes	Pass rate
East of Scotland	5	5	100
North Scotland	3	3	100
Oxford	1	1	100
Wales	7	7	100
East Midlands	13	10	77
London	62	43	69
Mersey	12	8	67
SE Scotland	6	4	67
East of England	16	10	63
Northern	10	6	60
Northern Ireland	5	3	60
Wessex	7	4	57
Yorkshire	27	15	56
West Midlands	24	12	50
West Scotland	6	3	50
North West	18	8	44
Severn	7	3	43
Peninsula	13	4	31
<b>TOTAL</b>	<b>213</b>	<b>130</b>	<b>61</b>

**Summary**

- The overall pass rate of 59% is slightly higher than the last sitting
- The pass rate in OST is 67%.
- Most trainees take the examination in ST2
- 2 trainees in ST3 failed the examination and will not have been able to proceed to ST4.
- The pass mark derived from the BCM plus 1 SEM was the same as the Hofstee pass mark. It is appropriate to consider using this method of standard setting for future examinations when there will be more stations.
- The reliability remains low. This will improve when the number of stations increases to 12.
- There was poor correlation between the 2 non-cycloplegic retinoscopy stations. There was also a moderate difference in the facility. The complexity of the patients used in the 2 stations may have been different.
- The cycloplegic retinoscopy, cylinder refinement and focimetry stations were the best discriminators between good and poor candidates.
- By virtue of its high facility, the near add station was poorly discriminating.
- There was no statistical difference in performance between different groups of candidates apart from country of qualification.

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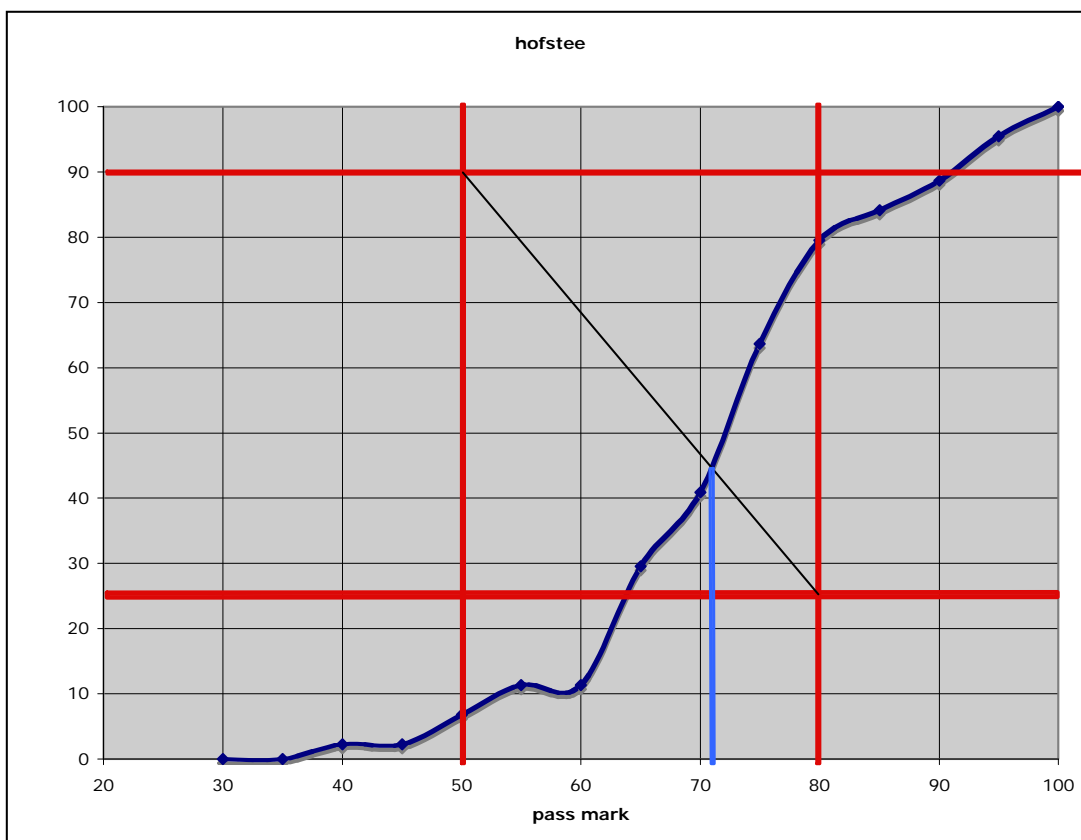
### Hofstee method

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

5. The maximum credible pass mark for the examination (80%)
6. The maximum credible pass rate for the examination (75%)
7. The minimum credible pass mark for the examination (50%)
8. 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 pas mark for this examination was 71%, which is identical to the BCM + 1 SEM pass mark.



## Appendix 2: Candidate evaluation

### OSCE stations

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

**Yes 13/13**

**No 0/13**

#### **Comments**

- Friendly and courteous

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

**Yes 11/13**

**No 2/13**

#### **Comments**

- The cyclo ret appeared to have a scissoring reflex on retinoscopy which I feel is a difficult case to have in this examination. There was no clinical details given as to why this may have been eg. Keratoconus. I felt the other stations were fair.
- Yes - I realize this is unforeseeable, my patient in the subjective cylinder station began to have a coughing fit, and I was required to stop the examination.
- They were compliant
- Found in the subjective sphere station patient was not reliable in her answers, which made it very difficult to obtain her best sphere despite efforts and double checking my actions – on occasion she would accept a change and then immediately reject it once I placed the lenses into the trial frame

### The OSCE overall

**Was the OSCE well organized?**

**Yes 13/13**

**No 0/13**

#### **Comments**

- Ran to time.
- Glasgow Caledonian University: Exam area is cramped, with the candidates and patients in very close proximity to each other.
- Smoothly run
- Instructions were clear

**Were you given clear instructions about the OSCE?**

**Yes 12/13**

**No 1/13**

#### **Comments**

- I felt the instructions were rushed and unclear, for example, Non-Cycloplegic / Focimetry station, I was not told which eye to examine but had to repeatedly

ask to ensure I was refracting the correct eye. Although he was helpful on arriving to the station, I did find this somewhat distracting. Subjective Cylinder station: I made it known that I had my own instruments, and was asked to load the lens in the trial frame. However, the examiner put the frame on the patient. I asked for the correct IPD for the patient, and was told the frame is in place correctly, however it was loose with a wide IPD. I would have preferred to load the lenses and frame myself away from the patient, to avoid the difficulties that did occur. I then proceeded to check for fogging in the fellow eye, but was told by the examiner this was not required as he misunderstood what I had said. Whilst ensuring I had chosen the correct prescription lenses, I had my back to the examiner who was explaining how the visual charts and lighting worked. Unfortunately, this was extremely difficult, as there was a considerable amount of information to absorb in the limited exam station times. This station was extremely rushed and unfortunately it was here, that the patient suffered from a coughing episode, for which we had to stop for a minute or so.

- I was grateful the instructions were inside as well as outside the room

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

**Yes 9/13**

**No 4/13**

### **Comments**

- I think a 5 minute station is inappropriate. A 7 minute station would have been useful as that is more similar to a real life retinoscopy examination.
- 5 Mins is too short a time to display ability to perform a task. At least 10 mins would be appropriate time for candidate to comfortably do whats required.
- Time was very limited for the stations that carry more marks-It would be fair if a station for 15 or 10 marks had more than 5 mins, than the station for 5 marks. It was far too short a time to test Subjective cylinder or sphere, especially when using visual acuity charts that are not commonly used. In the new exam setting- Could the length of each station correlate more with the weighting of each station in relation to marks?
- Very much so
- 5 mins is too short and passes quickly when you're under stressful exam conditions
- I feel it's a fair assessment and I think one should be more acclaimed with the real live exam, especially first time takers. I did not know whether to ask the examiner for the Duochrome test, or he should mention it to me if I needed it due to the short time of 5 minutes only.

### **Exam Preparation**

#### **Who helped you to develop competence in refraction?**

Optometrist	11
Consultant ophthalmologist	0
Fellow trainee	8
Self-taught	8
Other (please list)	Course: WOPEC

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

- Subjective – 35 Cycloplegic – approx 50 +
- 10
- Around 100
- 45
- 50
- 75
- Did lots of retinoscopy as I was in the Paed rotation. But did not routinely do the subjective modification. I also practiced on the model eye and some of the staff in the dept.
- 30
- 103
- 100-120
- 80
- 10 cases retinoscopy , and model eye , we use the Phoropter for refraction , used the loose lens retinoscopy a while ago , getting back on it , it's better for me than Phoropter

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

- The Glasgow Sitting- All the stations visual charts used are not those recommended by the Royal College Guidelines. There were neither Snellen screens or Logmar, but a European Association chart instead, that I have never come across. I found this unfortunate and unfair as this is not mentioned in the exam instructions. This was extremely distracting and disruptive to my train of thought and preparation. Overall, I think it was unfortunate to expect us to convert visions in such a limited amount of time. In all stations requiring a visual chart, except the subjective cylinder/Visual acuity estimation, I was not told the vision charts were anything different to Logmar/Snellen charts.
- Attend some course at least once, before starting to practice. Practice is the key. Do refractions daily at least 2-3 while in the clinic. It is not only refraction, but should also practice other stations.
- Walk with a cloth to clean lenses as fingerprints were present. Bring your own tape measure. Be courteous and smile. Be confident.
- Prepare for the OSCE stations individually even though what you really want to be able to do is refract from start to finish. The OSCE scenario is rather 'false' but it is what you have to do!

**Please provide any other comments you have about the Refraction Certificate Exam.**

- There was some ambiguity as to the axis of some of the given prescriptions as they were hand written. I think it would have put me more at ease if they were in typed font so as it was perfectly clear what the numbers said. I would not like to have failed my exam based on the fact that I couldn't read someone's handwriting!!!
- Overall, patients and staff were friendly and courteous. Setting is very cramped for this exam situation. In future settings, I think it would help that initial patient details (e.g. Age, Visual Acuity/ Initial refraction) be pre-written on the answer sheets, as this could save valuable time and reduce any errors.
- Very reasonable, allowing preparation of equipment before the exam and examiners answered any doubts

- Fees is too much, please consider revising the exam fee. For those who fail the first time and resit the exam, it is really a big setback. Also for overseas candidates, it is a very expensive exam, which many can't afford, although very keen.
- Focimetry station was not very fair. The pair of spectacles was badly scratched and the optical centre for bifocal was so low that it can be hardly seen within the field of the focimeter.
- The modify sphere station again was a problem, the patient was a little unreliable, her UA VA was 6/18 and the scenario had her corrected VA at 6/24: I felt this was rather unrealistic (she was essentially overplussed by at least +4.00DS, which you would not get after a retinoscopy result (unless you are really bad!!). Trying +/-0.50 then +/-1.00 the patient could not give reliable answers and we were dancing around the lenses and in the end I ran out of time trying to work out how to get her to accept more minus. Very frustrating station and felt as if the prescription had been put up to use the most of the 5 mins, rather than giving a realistic refraction scenario. All other stations were absolutely fine.
- The exam was a pretty clear cut , needed to know the basics and manage time properly, for me I guess I was tired and travelling and the bad weather took a toll on me, I did miss important things , But I think if I didn't do well this time , it will be better next time , knowing what to expect.