![AlphaPlus logo]

# Examination Report

## Refraction Certificate Examination

## December 2020

Matthew Turner, Ben Smith, David Budzynski

# Contents

Commercial-in-Confidence                    12 February 2021

# 1 Introduction

There were 141 candidates for the December 2020 sitting of the Refraction Certificate. The examination consisted 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:

1. Simulated retinoscopy (SR1)
2. Simulated retinoscopy (SR2)
3. Simulated retinoscopy (SR3)
4. Simulated retinoscopy (SR4)
5. Simulated retinoscopy (SR5)
6. Simulated retinoscopy (SR6)
7. Simulated retinoscopy (SR7)
8. Simulated retinoscopy (SR8)
9. Simulated retinoscopy (SR9)
10. Lens neutralisation (LN)

Commercial-in-Confidence

12 February 2021

## 2        Summary

This sitting of the refraction certificate had 10 OSCE stations.  The reliability of the examination is above the desired acceptable level (Cronbach's alpha 0.81, desired level >0.8).

The Hofstee method of standard setting was used to identify the pass mark for this examination, which was 105.4/150 (70.3 per cent).  No stations returned high mean scores.  The station with the lowest mean score was station 10. The overall pass rate was 57 per cent with a higher pass rate in OST at 72 per cent. Candidates in training appear to be better prepared for the exam than their non-trainee counterparts (achieving a 72 per cent compared with a 37 per cent pass rate).

## 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 per cent
- The maximum credible pass rate for the examination = 70 per cent
- The minimum credible pass mark for the examination = 60 per cent
- The minimum credible pass rate for the examination = 30 per cent

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.

The Hofstee pass mark for this examination was 105.4/150 (70.3 per cent).

# 4    Results

*Table 1:    Results summary*

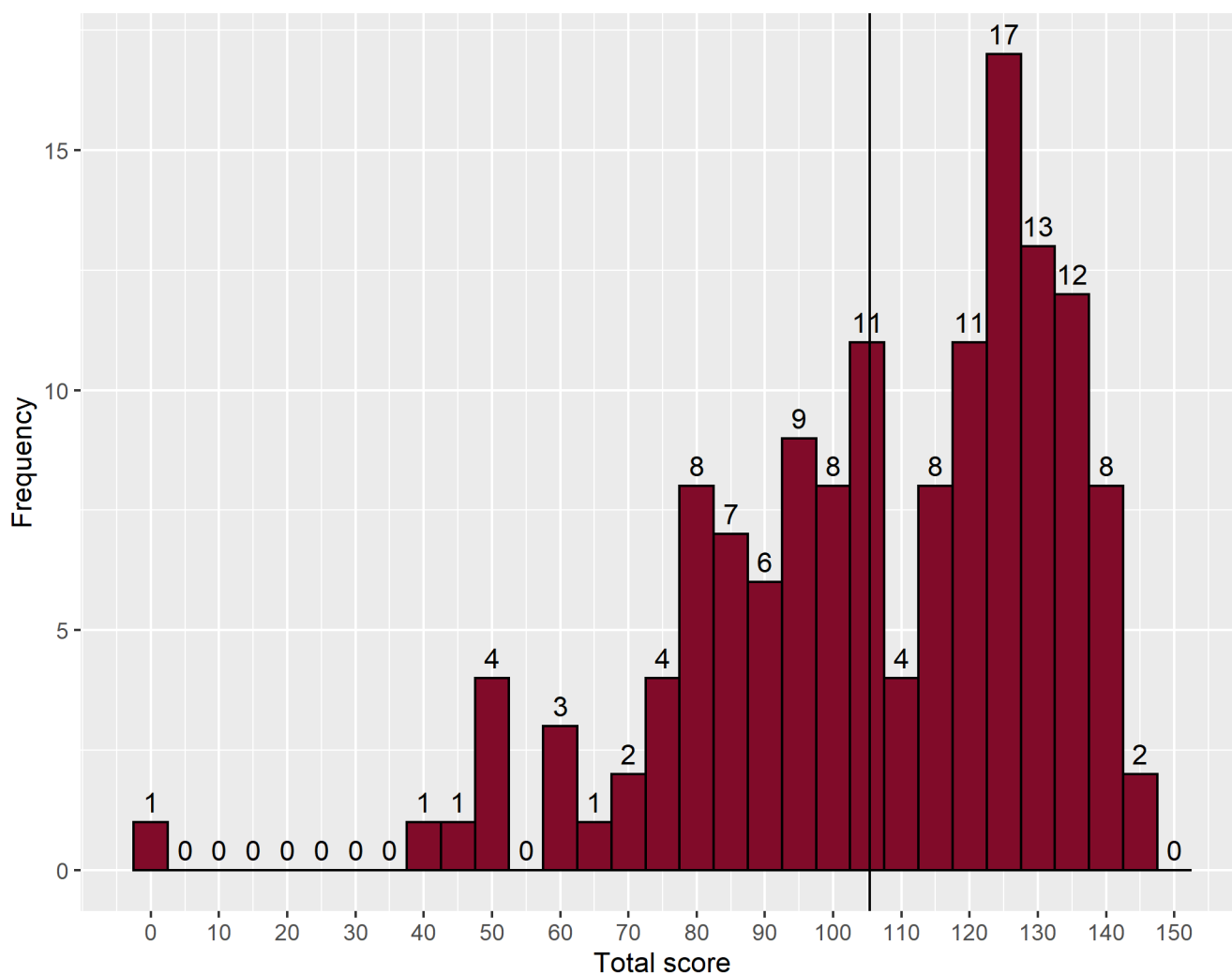| Statistic | Value | Percentage |
|---|---|---|
| Number of candidates | 141 | |
| Maximum possible mark | 150 | |
| Mean candidate mark | 107.02 | 71.3% |
| Median candidate mark | 114.00 | 76.0% |
| Standard deviation | 26.09 | 17.4% |
| Highest candidate mark | 144 | 96.0% |
| Lowest candidate mark | 0 | 0.0% |
| Reliability | 0.81 | |
| Standard error of measurement (SEM) | 11.29 | 7.5% |
| Hofstee pass mark | 105.4/150 | 70.3% |
| Pass rate | 80/141 | 56.7% |
| Pass rate in OST | 57/79 | 72.2% |

*Figure 1:    Distribution of marks*

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

Commercial-in-Confidence
12 February 2021

Table 2:   Station summary

| Station | Category | Mean | Median | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|
| 1 | SR1 | 11.27 | 13.00 | 3.41 | 1 | 15 |
| 2 | SR2 | 10.75 | 13.00 | 4.55 | 0 | 15 |
| 3 | SR3 | 11.08 | 12.00 | 3.81 | 0 | 15 |
| 4 | SR4 | 11.09 | 12.00 | 4.13 | 1 | 15 |
| 5 | SR5 | 9.98 | 11.00 | 4.47 | 0 | 15 |
| 6 | SR6 | 10.75 | 13.00 | 4.15 | 0 | 15 |
| 7 | SR7 | 11.95 | 14.00 | 3.79 | 0 | 15 |
| 8 | SR8 | 11.21 | 13.00 | 3.88 | 1 | 15 |
| 9 | SR9 | 11.53 | 13.00 | 3.74 | 1 | 15 |
| 10 | LN | 9.93 | 11.00 | 3.95 | 0 | 15 |

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 | 9 | 90% | 13 |
| Other | 1 | 10% | 13 |

Table 4:   Correlation between stations

| | SR1 | SR2 | SR3 | SR4 | SR5 | SR6 | SR7 | SR8 | SR9 |
|---|---|---|---|---|---|---|---|---|---|
| SR2 | 0.36 | | | | | | | | |
| SR3 | 0.22 | 0.42 | | | | | | | |
| SR4 | 0.22 | 0.43 | 0.51 | | | | | | |
| SR5 | 0.44 | 0.35 | 0.29 | 0.31 | | | | | |
| SR6 | 0.25 | 0.28 | 0.21 | 0.22 | 0.31 | | | | |
| SR7 | 0.25 | 0.21 | 0.28 | 0.34 | 0.34 | 0.29 | | | |
| SR8 | 0.26 | 0.22 | 0.31 | 0.30 | 0.23 | 0.19 | 0.37 | | |
| SR9 | 0.22 | 0.34 | 0.44 | 0.45 | 0.29 | 0.22 | 0.39 | 0.32 | |
| LN | 0.13 | 0.25 | 0.14 | 0.16 | 0.15 | -0.01 | 0.22 | 0.19 | 0.11 |

All negative correlations are highlighted in red.  The median correlation between the simulated refraction stations was 0.30.  There was moderate correlation all pairs of simulated refraction stations, except SR6 and SR8.  The best correlation was between SR3 and SR4 (0.51).  The poorest correlation between any station was -0.01.

Table 5:   Correlation between each station and the total score

| Station | SR1 | SR2 | SR3 | SR4 | SR5 | SR6 | SR7 | SR8 | SR9 | LN |
|---|---|---|---|---|---|---|---|---|---|---|
| Correlation with total score | 0.55 | 0.66 | 0.63 | 0.64 | 0.64 | 0.51 | 0.62 | 0.56 | 0.63 | 0.39 |

# 5 Breakdown of results

*Table 6: Breakdown of results by training*

| Training | Failed | Passed | Pass rate (%) | Total |
|---|---|---|---|---|
| In OST | 22 | 57 | 72.2 | 79 |
| Not in OST | 39 | 23 | 37.1 | 62 |
| Total | 61 | 80 | 56.7 | 141 |

*Table 7: Breakdown of results by deanery*

| Country | Deanery | Failed | Passed | Total |
|---|---|---|---|---|
| UK | East Midlands | 1 | 5 | 6 |
| | East of England | 1 | 3 | 4 |
| | KSS (Kent, Surrey and Sussex) | 2 | 6 | 8 |
| | London | 4 | 13 | 17 |
| | Mersey | 2 | 3 | 5 |
| | North Western | 0 | 3 | 3 |
| | Northern | 3 | 1 | 4 |
| | Northern Ireland | 0 | 1 | 1 |
| | Oxford | 1 | 2 | 3 |
| | Peninsula (South West) | 0 | 2 | 2 |
| | Severn | 1 | 0 | 1 |
| | Wales | 4 | 7 | 11 |
| | Wessex | 1 | 3 | 4 |
| | West Midlands | 2 | 1 | 3 |
| | West of Scotland | 0 | 3 | 3 |
| | Yorkshire | 0 | 4 | 4 |
| | Total | 22 | 57 | 79 |

*Table 8: Breakdown of results by stage of training*

| Training | Failed | Passed | Pass rate (%) | Total |
|---|---|---|---|---|
| OST1 | 1 | 1 | 50.0 | 2 |
| OST1* | 0 | 1 | 100.0 | 1 |
| OST2 | 9 | 19 | 67.9 | 28 |
| OST3 | 12 | 31 | 72.1 | 43 |
| OST4 | 0 | 5 | 100.0 | 5 |
| Total | | 57 | 72.2 | 79 |

# 6    Comparison to previous examinations

*Table 9:   Comparison to previous years' exams*

| Date | Candidates | Pass mark | Pass rate | Pass rate in OST | Per cent of candidates in OST | Reliability | SEM | Hofstee pass mark |
|---|---|---|---|---|---|---|---|---|
| Nov 2010 | 53 | 74% | 42% | 44% | 68% | 0.6 | 7 (7%) | 71% |
| Apr 2011 | 57 | 71% | 35% | 47% | 63% | 0.6 | 6 (6%) | 67% |
| Jul 2011 | 41 | 67% | 66% | 72% | 71% | 0.4 | 6 (6%) | 71% |
| Nov 2011 | 69 | 65% | 71% | 75% | 70% | 0.6 | 8 (8%) | 68% |
| Mar 2012 | 54 | 73% | 54% | 66% | 57% | 0.6 | 8 (8%) | 72% |
| Jul 2012 | 44 | 71% | 59% | 67% | 64% | 0.5 | 9 (9%) | 71% |
| Dec 2012* | 71 | 69% | 75% | 77% | 55% | 0.6 | 11 (6%) | 72% |
| Apr 2013 | 64 | 74% | 61% | 64% | 64% | 0.8 | 11 (6%) | 74% |
| Jul 2013 | 42 | 72% | 74% | 90% | 48% | 0.7 | 10 (6%) | 74% |
| Dec 2013 | 75 | 72% | 67% | 76% | 65% | 0.7 | 10 (6%) | 71% |
| Apr 2014 | 56 | 73% | 84% | 89% | 66% | 0.6 | 9.5 (5%) | 75% |
| Jul 2014 | 34 | 74% | 62% | 55% | 65% | 0.4 | 11 (6%) | 74% |
| Dec 2014* | 63 | 71% | 68% | 77% | 68% | 0.6 | 12 (7%) | 71% |
| Apr 2015* | 57 | 77% | 65% | 73% | 65% | 0.4 | 11 (7%) | 77% |
| Jun 2015* | 33 | 69% | 58% | n/a^ | n/a^ | 0.73 | 10 (6%) | 69% |
| Jul 2015* | 31 | 66% | 58% | 55% | 65% | 0.65 | 9.4 (5%) | 66% |
| Jan 2016* | 70 | 70% | 60% | 60% | 81% | 0.8 | 10 (6%) | 70% |
| Mar 2016* | 57 | 77% | 81% | 83% | 70% | 0.9 | 7.7 (4%) | 77% |
| Jun 2016* | 23 | 70% | 57% | n/a^ | n/a^ | 0.7 | 11 (6%) | 70% |
| Jul 2016* | 64 | 70% | 64% | 67% | 67% | 0.6 | 12 (7%) | 70% |
| Jan 2017* | 62 | 72% | 63% | 64% | 90% | 0.6 | 10 (6%) | 72% |
| Apr 2017* | 63 | 73% | 67% | 69% | 62% | 0.7 | 11 (6%) | 73% |
| Jul 2017* | 62 | 72% | 61% | 68% | 60% | 0.7 | 12 (6%) | 72% |
| Dec 2017* | 63 | 71% | 56% | 59% | 65% | 0.72 | 11 (6%) | 71% |
| Apr 2018* | 60 | 75% | 68% | 73% | 75% | 0.55 | 10 (6%) | 75% |
| Jun 2018* | 39 | 75% | 74% | n/a^ | n/a^ | 0.69 | 10 (5%) | 75% |
| Jul 2018* | 64 | 75% | 67% | 77% | 55% | 0.74 | 11 (6%) | 75% |
| Dec 2018* | 68 | 72% | 54% | 70% | 63% | 0.7 | 11 (6%) | 72% |
| Apr 2019* | 87 | 72% | 59% | 68% | 51% | 0.54 | 12 (6%) | 72% |
| Jun 2019* | 40 | 70% | 57% | n/a | n/a | 0.73 | 11 (7%) | 70% |
| Jun 2019* | 52 | 74% | 67% | n/a^ | n/a^ | 0.76 | 9 (6%) | 74% |
| Dec 2020* | 141 | 70% | 57% | 72% | 56% | 0.81 | 11 (8%) | 70% |

\* Hofstee pass mark used for these examinations
^ Examination held in Kuching, Malaysia

*Table 10: Performance of candidate by deanery for all examinations to date, where deanery is known*

| Country | Deanery | Total passes | Total candidates | Pass rate % |
|---|---|---|---|---|
| UK | East Midlands | 36 | 50 | 72.0 |
| | East of England | 43 | 63 | 68.3 |
| | KSS (Kent, Surrey and Sussex) | 33 | 42 | 78.6 |
| | London | 171 | 229 | 74.7 |
| | Mersey | 40 | 54 | 74.1 |
| | North Western | 12 | 15 | 80.0 |
| | Northern | 27 | 38 | 71.1 |
| | Northern Ireland | 17 | 24 | 70.8 |
| | Oxford | 19 | 26 | 73.1 |
| | Peninsula (South West) | 21 | 49 | 42.9 |
| | Severn | 20 | 34 | 58.8 |
| | Wales | 30 | 56 | 53.6 |
| | Wessex | 29 | 45 | 64.4 |
| | West Midlands | 58 | 84 | 69.0 |
| | West of Scotland | 12 | 13 | 92.3 |
| | Yorkshire | 57 | 80 | 71.2 |
| | East of Scotland | 12 | 16 | 75.0 |
| | North of Scotland | 4 | 4 | 100.0 |
| | North Scotland | 8 | 9 | 88.9 |
| | North West | 28 | 38 | 73.7 |
| | South East of Scotland | 7 | 8 | 87.5 |
| | South East Scotland | 14 | 17 | 82.4 |
| | West Scotland | 19 | 29 | 65.5 |
| Overseas | Eire | 1 | 2 | 50.0 |
| | Europe and Overseas | 2 | 7 | 28.6 |
| | Total | 720 | 1032 | 69.8 |