Commentary on candidate evidence

The candidate evidence has achieved the following marks for each question of this course assessment component.

Question 1

Response 1
The candidate was awarded **3/3 marks.**

✓•1 equivalent to correct multiplier (year by year method)
✓•2 equivalent to correct power
✓•3 correct calculations

Response 2
The candidate was awarded **2/3 marks.**

✓•1 correct multiplier
✓•2 correct power
×•3 incorrect calculation

Response 3
The candidate was awarded **2/3 marks**; see note 2 and commonly observed response (COR) 1 of the marking instructions.

×•1 incorrect multiplier
✓•2 correct power
✓•3 follow through working met the criterion for this mark

Response 4
The candidate was awarded **0/3 marks**; see COR 6 of the marking instructions.

×•1 incorrect multiplier
×•2 incorrect power
×•3 mark not available; calculation eased

Comments on candidates' performance

Most candidates achieved full marks and used an efficient method to obtain the answer. There was little evidence of candidates using a year by year approach.

Question 2

Response 5
The candidate was awarded **1/2 marks**; see note 2 of the marking instructions.

✓•1 process started correctly; benefit of doubt is given that the candidate knows that $(-18)^2 = 18^2$
×•2 incorrect calculation

Response 6
The candidate was awarded **1/2 marks**; see note 3 of the marking instructions.

✓•1 process started correctly
×•2 incorrect calculation

Response 7
The candidate was awarded **0/2 marks.**

×•1 incorrect process
×•2 mark not available; calculation eased

Comments on candidates' performance

Most candidates achieved full marks but some incorrectly calculated $\sqrt{6^2 + 27^2 + (-18)^2}$ as $\sqrt{36 + 729 - 324} = \sqrt{441} = 21$.

Question 3

Response 8
The candidate was awarded **1/2 marks.**

✓•1 correct substitution into area of triangle formula
×•2 incorrect calculation

Response 9
The candidate was awarded **0/2 marks**; see note 4 of the marking instructions.

×•1 substitution into incorrect formula (cosine rule)
×•2 mark not available where cosine rule is used

Comments on candidates' performance

Most candidates achieved full marks but a few used the cosine rule to calculate the length of side QR.

Question 4

Response 10
The candidate was awarded **1/2 marks**; see COR 3 of the marking instructions.

×•1 incorrect method
✓•2 follow through working met the criterion for this mark; see note 6 of the marking instructions

Response 11
The candidate was awarded **1/2 marks.**

×•1 incorrect method
✓•2 follow through working met the criterion for this mark; see note 6 of the marking instructions

Response 12
The candidate was awarded **0/2 marks**; see COR 4(b) of the marking instructions.

×•1 incorrect method
×•2 incorrect calculation

Response 13
The candidate was awarded **1/2 marks.**

×•1 incorrect method
✓•2 follow through working met the criterion for this mark; see note 6 of the marking instructions

Comments on candidates' performance

Many candidates achieved full marks. Most candidates were able to carry out a scientific notation calculation but some candidates dropped marks mainly because they did not know how to calculate 8% of a quantity.

Common incorrect responses included:

- $3 \cdot 6 \times 10^{-6} \div 8 = 4 \cdot 5 \times 10^{-7}$
- $3 \cdot 6 \times 10^{-6} \div 8 \times 100 = 4 \cdot 5 \times 10^{-5}$
- $3 \cdot 6 \times 10^{-6} \div 108 \times 100 = 3 \cdot 3\ldots \times 10^{-6}$
- $3 \cdot 6 \times 10^{-6} \times 0 \cdot 92 = 3 \cdot 312 \times 10^{-6}$
- $3 \cdot 6 \times 10^{-6} \times 0 \cdot 8 = 2 \cdot 88 \times 10^{-6}$

Question 5

Response 14
The candidate was awarded **1/2 marks**; see note 4 and COR 2(a) of the marking instructions.

×•[1] incorrect coordinates for A
✓•[2] consistent coordinates for B

Response 15
The candidate was awarded **0/2 marks**; see note 4 of the marking instructions.

×•[1] incorrect coordinates for A
×•[2] incorrect coordinates for B

Comments on candidates' performance

Many candidates achieved full marks. Some responses were given as 2D coordinates and in some cases brackets were omitted.

Question 6

Response 16
The candidate was awarded **2/3 marks.**

✓•[1] correct substitution into quadratic formula
✓•[2] correct evaluation of discriminant
×•[3] incorrect rounding

Response 17
The candidate was awarded **2/3 marks.**

×•[1] incorrect substitution into quadratic formula
✓•[2] correct follow through of evaluation of discriminant
✓•[3] follow through working met the criterion for this mark (similar to COR 5 of the marking instructions)

Response 18
The candidate was awarded **1/3 marks**; see COR 3 of the marking instructions.

×•[1] incorrect substitution into quadratic formula
×•[2] mark not available; calculation eased
✓•[3] follow through working met the criterion for this mark

Response 19
The candidate was awarded **1/3 marks**; see COR 1 of the marking instructions.

×•1 partial substitution into quadratic formula
✓•2 correct evaluation of discriminant
×•3 no attempt to calculate roots

Comments on candidates' performance
Many candidates achieved full marks. Almost all used the quadratic formula. Where marks were lost it was usually for incorrect:

- substitution into the formula eg $\frac{-9 \pm \sqrt{9^2 - 4 \times 3 \times 2}}{6}$ or $-9 \pm \frac{\sqrt{9^2 - 4 \times 3 \times (-2)}}{6}$
- calculation of the discriminant eg $\sqrt{9^2 - 4 \times 3 \times (-2)} = 57$
- calculation of the roots eg $\frac{-9 \pm \sqrt{105}}{6} = -10 \cdot 7, -7 \cdot 3$

Question 7

Response 20
The candidate was awarded **2/3 marks.**

✓•1 correct substitution into cosine rule to find angle Z
×•2 incorrect calculation of cos Z
✓•3 follow through working met the criterion for this mark

Response 21
The candidate was awarded **3/3 marks**; see note 2(a) of the marking instructions.

✓•1 correct alternative strategy
✓•2 correct evaluation of cos Y
✓•3 correct calculation of all three angles and smallest angle identified

Response 22
The candidate was awarded **2/3 marks**; see COR 2 of the marking instructions.

×•1 incorrect substitution into cosine rule: candidate has chosen to calculate angle X instead of angle Z
✓•2 correct calculation of cos X
✓•3 follow through working met the criterion for this mark

Response 23
The candidate was awarded **1/3 marks**; see COR 2 of the marking instructions.

×•[1] incorrect substitution into cosine rule: the candidate has chosen to calculate angle Y instead of angle Z
✓•[2] correct calculation of cos Y
×•[3] no attempt to calculate angle

Comments on candidates' performance
Many candidates achieved full marks although a significant number did not realise that the smallest angle was opposite the shortest side and worked out two or all three of the angles before selecting the smallest one. Some of the candidates simply calculated the size of one of the larger angles.

Question 8

Response 24
The candidate was awarded **4/5 marks**; see note 5(b) of the marking instructions.

✓•[1] correct substitution into formula for volume of sphere
✓•[2] correct substitution into formula for volume of cylinder
✓•[3] evidence of addition of volume of hemisphere to volume of cylinder
✓•[4] correct calculation
×•[5] intermediate calculations show premature rounding to three significant figures

Response 25
The candidate was awarded **3/5 marks**; see COR 5 of the marking instructions.

✓•[1] correct substitution into formula for volume of sphere
✓•[2] correct substitution into formula for volume of cylinder
×•[3] no evidence of calculation of volume of hemisphere
✓•[4] follow through working met the criterion for this mark
×•[5] units not stated in final answer

Response 26
The candidate was awarded **3/5 marks**.

×•[1] incorrect substitution into formula for volume of sphere
×•[2] incorrect substitution into formula for volume of cylinder
✓•[3] evidence of addition of volume of hemisphere to volume of cylinder
✓•[4] follow through working met the criterion for this mark
✓•[5] correct rounding of calculated answer and correct units stated

Response 27
The candidate was awarded **1/5 marks.**

✓•[1] correct substitution into formula for volume of sphere
×•[2] incorrect substitution into formula for volume of cylinder
×•[3] no evidence of calculation of volume of hemisphere
×•[4] mark not available: volume of cylinder calculation does not involve π
×•[5] incorrect rounding of calculated answer

Comments on candidates' performance
Many candidates were unable to recall the formula for the volume of a cylinder and although most achieved three or more marks, few candidates scored full marks.

Where other marks were dropped it was usually for:
- incorrectly substituting height = 70 or 46 into the volume of a cylinder formula
  incorrectly substituting diameters instead of radii into the volume formulae
- leaving the final answer in unrounded form
- omitting the units in the final answer

Question 9

Response 28
The candidate was awarded **2/3 marks.**

✓•[1] evidence of 102·5% = £977.85
✓•[2] begin valid strategy
×•[3] incomplete calculation

Response 29
The candidate was awarded **2/3 marks.**

✓•[1] evidence of 102·5% = £977.85
✓•[2] begin valid strategy
×•[3] incorrect calculation

Response 30
The candidate was awarded **1/3 marks.**

✓•[1] evidence of 102·5% = £977.85
×•[2] invalid strategy
×•[3] mark not available, invalid strategy used

Response 31
The candidate was awarded **0/3 marks.**

×•1 no evidence of 102·5% = £977.85
×•2 invalid strategy
×•3 mark not available: invalid strategy used

Comments on candidates' performance
This question was slightly more demanding this year as candidates had to work back from 102·5% to find 2·5% rather than 100%. There was a slight fall in attainment as some candidates stopped after finding 100% = £954. There were still a significant number of candidates who simply worked out 2·5%

Question 10

Response 32
The candidate was awarded **1/2 marks.**

✓•1 correct bracket with square
×•2 incorrect calculation of q

Response 33
The candidate was awarded **1/2 marks**; see COR 2(a) of the marking instructions.

×•1 no square symbol in final answer
✓•2 correct calculation of q

Response 34
The candidate was awarded **0/2 marks.**

×•1 incorrect bracket
×•2 incorrect calculation of q

Comments on candidates' performance
Performance in this question was similar to that of previous years. Most candidates achieved one or two marks.

Question 11

Response 35
The candidate was awarded **3/4 marks**; see note 4(b) of the marking instructions.

×•1 250 has been obtained using Pythagoras' theorem
✓•2 correct evaluation of cos B using method 2
✓•3 correct calculation of angle B
✓•4 correct conclusion with reason

Response 36
The candidate was awarded **2/4 marks**; see note 4(b) of the marking instructions.

×•1 incorrect angle selected to calculate (method 2)
✓•2 correct follow through working to calculate cos A
✓•3 follow through working met the criterion for this mark
×•4 conclusion does not state comparison with right angle

Response 37
The candidate was awarded **2/4 marks**; see note 3(a) of the marking instructions.

×•1 250 has been obtained using Pythagoras' theorem
✓•2 correct evaluation of $600^2 + 250^2$ and 650^2 (method 1)
✓•3 explicit comparison stated
×•4 conclusion does not state angle is right-angled

Response 38
The candidate was awarded **1/4 marks**; see note 3(a) of the marking instructions.

×•1 mark not available; candidate has started with statement of $600^2 + 250^2 = 650^2$
✓•2 correct evaluation of $600^2 + 250^2$ and 650^2 (method 1)
×•3 mark not available
×•4 conclusion does not state angle is right-angled

Comments on candidates' performance

Few candidates achieved full marks, in many cases this was because they started by **assuming** that the triangle was right-angled.
Some started with $BC^2 = 650^2 - 600^2 \rightarrow BC = 250$.
Even when 250 was correctly obtained by using the perimeter of the triangle, some then stated that $600^2 + 250^2 = 650^2$, before they had calculated the values of $600^2 + 250^2$ and 650^2.

Candidates who used the cosine rule tended to achieve more marks than those who attempted to use the converse of Pythagoras' theorem.

Question 12

Response 39
The candidate was awarded **1/3 marks** for part (a); see COR 1 of the marking instructions and **2/3 marks** for part (b).

✓•1 correct linear scale factor
×•2 no attempt to square linear scale factor
×•3 eased calculation (does not include a power of the linear scale factor)
✓•4 correct expression for sector area
×•5 incorrect strategy: use of answer to part (a) instead of 2750 (similar to COR 2 of the marking instructions)
✓•6 follow through working met the criterion for this mark

Response 40
The candidate was awarded **3/3 marks** for part (a) and **1/3 marks** for part (b).

✓•1 correct linear scale factor
✓•2 correct strategy
✓•3 correct calculation
✓•4 correct expression for sector area
×•5 incorrect rearrangement: square root instead of square of 50
×•6 incorrect calculation

Response 41
The candidate was awarded **2/3 marks** for part (a); see COR 2 of the marking instructions and **0/3 marks** for part (b).

✓•1 correct linear scale factor
×•2 linear scale factor cubed instead of squared
✓•3 follow through working met the criterion for this mark
×•4 no response
×•5 no response
×•6 no response

Comments on candidates' performance

In part (a) most candidates achieved the first mark for stating a linear scale factor but did not square it therefore obtaining an answer of 1650 cm^2.

There were a significant number of 'no responses' to part (b).

Some candidates used πd instead of πr^2 or used $A = \frac{1}{2}ab\sin C$.

Candidates who started with $\frac{\text{angle}}{360} \times \pi r^2 = 2750$ were often unable to rearrange the equation to find the correct angle.

Candidates who started with $\frac{\text{angle}}{360} = \frac{2750}{\pi r^2}$ had much more success in finding the correct angle since the resulting rearrangement was more straightforward.

Question 13

Response 42
The candidate was awarded **2/3 marks.**

✓•1 correct substitution into gradient formula
✓•2 correct factorisation of numerator using difference of two squares
×•3 incorrect factorisation of denominator

Response 43
The candidate was awarded **1/3 marks.**

✓•1 correct substitution into gradient formula
×•2 no attempt to factorise numerator
×•3 incorrect simplification

Comments on candidates' performance

Most candidates achieved the first mark for $\frac{4p^2 - 9}{4p - 6}$ but could not proceed correctly from that point.

A lot of invalid cancelling was in evidence, eg $\frac{4p^2 - 9^3}{4p - 6^2} = \frac{p - 3}{-2}$.

Another common response was $\frac{4p^2 - 9}{4p - 6} = \frac{-5p^2}{-2p} = 2 \cdot 5p$

Question 14

Response 44
The candidate was awarded **2/3 marks.**

✓•1 correct re-arrangement of equation
✓•2 correct calculation of first value of x
×•3 incorrect calculation of second value of x

Response 45
The candidate was awarded **1/3 marks**; see note 5(c) of the marking instructions.

×•1 incorrect re-arrangement of equation
×•2 mark not available (eased calculation)
✓•3 follow through working met the criterion for this mark

Response 46
The candidate was awarded **1/3 marks**; see note 5(c) and COR 1 of the marking instructions.

×•1 incorrect re-arrangement of equation
×•2 mark not available (eased calculation)
✓•3 follow through working met the criterion for this mark

Comments on candidates' performance
Most candidates achieved the first two marks. Some stopped after finding one value for x.

A common response was $\cos^{-1}\left(-\frac{1}{5}\right) = 101 \cdot 5 \rightarrow x = 78 \cdot 5, 281 \cdot 5$.

Question 15

Response 47
The candidate was awarded **2/3 marks.**

✓•1 correct denominator
✓•2 correct numerator (see note 2 in the marking instructions)
×•3 incorrect re-arrangement of numerator

Response 48
The candidate was awarded **1/3 marks.**

✓•1 correct denominator
×•2 incorrect numerator
×•3 mark not available

Comments on candidates' performance
Most candidates achieved the first two marks for $\frac{4(x+5)-3(x-2)}{(x+5)(x-2)}$ but then made subsequent errors, eg

- incorrect simplification of the numerator $\frac{x+14}{(x+5)(x-2)}$

- incorrect (and unnecessary) expansion of the denominator $\frac{x+26}{x^2-10}$
- invalid cancelling $\frac{x+26}{x^2+3x-10}=\frac{13}{x+3x-5}=\frac{13}{4x-5}$

Question 16

Response 49
The candidate was awarded **1/3 marks.**

✓•1 correct application of index rule to obtain $3a^5$
×•2 no evidence of application of fractional index rule
×•3 incorrect simplification of expression

Response 50
The candidate was awarded **1/3 marks.**

✓•1 correct application of index rule to obtain $3a^6$
×•2 no evidence of application of fractional index rule
×•3 mark not available: eased working

Comments on candidates' performance

Most candidates achieved the first mark only. Few knew to convert $\sqrt{a}$ to $a^{\frac{1}{2}}$.
A common response was $\frac{a^4\times 3a}{\sqrt{a}}\times\frac{\sqrt{a}}{\sqrt{a}}=\frac{3a^5\times\sqrt{a}}{a}=3a^4\times\sqrt{a}$.

Question 17

Response 51
The candidate was awarded **0/2 marks**; see COR 1 of the marking instructions.

×•1 incorrect expansion of brackets
×•2 mark not available: eased working

Response 52
The candidate was awarded **0/2 marks**.

×•1 incorrect expansion of brackets: see note 5 of the marking instructions
×•2 incorrect simplification of expression

Comments on candidates' performance

Most candidates made little progress towards a solution.
A common response from those who attempted to expand the bracket was $\sin x^2 + \sin x \cos x + \cos x \sin x + \cos x^2$.

Question 18

Response 53
The candidate was awarded **3/4 marks.**

✓•1 evidence of correct right angle; see note 2 of the marking instructions
✓•2 correct Pythagoras statement
✓•3 correct calculation of radius of larger circle
×•4 incorrect calculation of CD

Response 54
The candidate was awarded **3/4 marks.**

✓•1 evidence of correct right angle; see note 2 of the marking instructions
✓•2 correct Pythagoras statement
×•3 incorrect calculation of radius of larger circle
✓•4 follow through working met the criterion for this mark

Response 55
The candidate was awarded **2/4 marks.**

×•1 incorrect right angle shown
✓•2 consistent Pythagoras statement
✓•3 correct follow-through calculation of radius of larger circle
×•4 incorrect calculation of height: for consistency candidate should have added 30 onto calculation of radius (similar to COR 1 of the marking instructions)

Comments on candidates' performance

Candidates found this question more challenging than questions on this topic from previous years. Many candidates failed to identify a valid right-angled triangle but those who did usually achieved full marks. A significant number of candidates added 15 to the circumference of the smaller circle or calculated the sum of the circumferences of the two circles.

Question 19

Response 56
The candidate was awarded **5/5 marks.**

✓•1 correct substitution into sine rule (method 2)
✓•2 correct re-arrangement of formula
✓•3 correct calculation of BM
✓•4 correct substitution into trig formula to calculate height
✓•5 correct calculation involving trig (and Pythagoras' theorem)

Response 57
The candidate was awarded **3/5 marks.**

✓•1 correct substitution into sine rule (both methods)
✓•2 correct re-arrangement of formula
✓•3 correct calculation of BK (and BM)
×•4 no attempt to substitute into trig formula to calculate height
×•5 mark not available

Response 58
The candidate was awarded **2/5 marks**; see COR 2 of the marking instructions.

×•1 incorrect substitution into sine rule
✓•2 correct re-arrangement of formula
✓•3 correct calculation
×•4 invalid strategy (substitution into Pythagoras' theorem and no further trig formula used to calculate height)
×•5 mark not available: invalid strategy

Comments on candidates' performance

Responses were relatively good for what was expected to be a challenging question. Most candidates achieved the first three marks for calculating the length of BK or BM. Some stopped at this point believing that they had found the height, some were unable to make further valid progress but a significant number continued to achieve full marks.

Alternative methods used to achieve the final two marks included:

- equating alternative expressions for the area of triangle BKM

  eg $\frac{1}{2} \times 350 \times 196 \cdot 2 \times \sin 52^\circ = \frac{1}{2} \times 350 \times \text{height}$

- using SOHCAHTOA and Pythagoras' theorem

  eg in right-angled triangle with hypotenuse BK, $\cos 52^\circ = \frac{a}{196 \cdot 2}$

  followed by $\text{height} = \sqrt{196 \cdot 2^2 - a^2}$.