Mathematics (National 5): question paper 2

Commentary on candidate evidence

Workshop 2

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 **2/3 marks.**

✓ •[1] correct multipliers.
× •[2] incorrect power.
✓1 •[3] follow through working met the criterion for this mark; see note 2 of the marking instructions.

Response 2

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

× •[1] incorrect multiplier.
✓1 •[2] consistent follow through method.
✓1 •[3] follow through working met the criterion for this mark.

Response 3

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

× •[1] incorrect multiplier.
× •[2] mark not available; see note 5 of the marking instructions.
✓1 •[3] follow through working met the criterion for this mark; see note 5 of the marking instructions.

Comments on candidates' performance

Many candidates achieved full marks but the overall performance in this was not quite as good as in previous years. The appearance of two percentages for the first time seemed to cause issues for some. Most candidates used the correct method, but some applied an incorrect percentage reduction for the final two years. Common incorrect percentage reductions included $20000 \times 0.89 \times 0.83^2$ and $20000 \times 0.89 \times 0.83 \times 0.77$. Most candidates achieved the final two marks irrespective of the percentages used.

Question 2

Response 4

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

✓ •[1] correct method; see note 2(a) of the marking instructions.
× •[2] incorrect evaluation; see note 2(b) of the marking instructions.
× •[3] incorrect rounding.

Response 5

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

× •[1] incorrect method.
✓1 •[2] consistent follow through evaluation.
✓1 •[3] consistent follow through rounding.

Response 6

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

× •[1] incorrect method.
✓1 •[2] consistent follow through evaluation.
× •[3] no rounding.

Response 7

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

× •[1] incorrect method.
× •[2] incorrect evaluation.
✓1 •[3] consistent follow through rounding; see note 3 of the marking instructions and COR 4(b).

Comments on candidates' performance

Most candidates were able to carry out their chosen calculation correctly but many started with an incorrect method. For example, $\left(6.64\times10^{-24}\right)\times300$ and $\left(6.64\times10^{-24}\right)\div300$ were common methods.

Question 3

Response 8

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

✓ •[1] appropriate fraction.
✓ •[2] correct substitution into arc length formula.
✓ •[3] correct calculation.

Please note: if the candidate had not replaced the scored out working then the award would have been 2/3 marks ✓×✓1. See COR 1.

Response 9

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

✓ •[1] appropriate fraction.
✓ •[2] correct substitution into arc length formula; see note 2 of the marking instructions.
× •[3] incorrect calculation; see note 2 of the marking instructions.

Response 10

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

✓ •[1] appropriate fraction.
✓ •[2] correct substitution into arc length formula.
✓ •[3] correct calculation.

Please see note 2 of the marking instructions. Although π is written in the formula, benefit of the doubt was given as the candidate may have used 3.14 which resulted in an answer of 16.92 rounded to two decimal places.

Response 11

The candidate was awarded **2/3 marks.** See COR 2.

✓ •[1] appropriate fraction.
× •[2] incorrect substitution into arc length formula.
✓1 •[3] follow through working met the criterion for this mark.

Note: General Marking Principle (l) – do not penalise omission of (or incorrect) units.

Comments on candidates' performance

Most candidates achieved full marks. A few calculated the area of sector ABC and achieved partial credit.

Question 4

Response 12

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

✓ •[1] correct substitution into sine rule.
× •[2] transcription error.
✓1 •[3] consistent calculation of angle.

Response 13

The candidate was awarded **1/3 marks.** See COR 2.

✓ •[1] correct substitution into sine rule.
× •[2] incorrect rearrangement of equation.
× •[3] mark not available; $\sin^{-1}(165.63)$ does not exist.

Response 14

The candidate was awarded **1/3 marks.** Similar to COR 4(c) but incorrect calculation of angle.

✓ •[1] correct substitution into sine rule.
× •[2] incorrect rearrangement of equation.
× •[3] incorrect calculation of angle.

Response 15

The candidate was awarded **1/3 marks.** See COR 1.

× •[1] incorrect substitution into sine rule.
✓1 •[2] consistent rearrangement of equation.
✓2 •[3] working eased; no need to evaluate $\sin^{-1}$.

Comments on candidates' performance

Many candidates achieved 2 or 3 marks. Most started with the correct substitution but some did not rearrange the equation correctly.

Question 5

Response 16

The candidate was awarded **1/2 marks.** See COR 2.

✓ •1 correct interior angle implied by 72, 72; see note 4(b) of the marking instructions.
× •2 incorrect exterior angle leading to incorrect shaded angle.

Response 17

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

× •1 incorrect interior angle.
✓1 •2 consistent exterior angle leading to consistent shaded angle.

Response 18

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

× •1 no identification of interior or exterior angle.
× •2 mark not available; see note 5 of the marking instructions.

Comments on candidates' performance

A lack of clear, relevant working resulted in some candidates dropping marks. Most candidates performed better when they wrote angle sizes in the diagram. Many could calculate the angle in the triangle at the centre of the decagon, but made mistakes going from here. Some failed to write 36 at the relevant exterior angle on the diagram or explicitly state exterior angle = 36.

Question 6

Response 19

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

✓ •1 evidence that 108% = 94500.
✓ •2 valid strategy started.
✓ •3 correct calculation within valid strategy.

Response 20

The candidate was awarded **1/3 marks.** See note 4(a) of marking instructions.

✓ •1 evidence that 108% = 94500.
× •2 invalid strategy.
× •3 mark not available.

Response 21

The candidate was awarded **0/3 marks.** See note 4(b) of the marking instructions.

✗ •[1] no evidence that 108% = 94500.
✗ •[2] invalid strategy.
✗ •[3] mark not available.

Response 22

The candidate was awarded **2/3 marks.** See COR 2.

✗ •[1] no evidence that 108% = 94500.
✓1 •[2] consistent valid strategy started.
✓1 •[3] correct calculation within consistent valid strategy.

Comments on candidates' performance

Many candidates achieved full marks. A few calculated 108% or 92% of £94500 but there seemed to be less of this than in previous years.

Question 7

Response 23

The candidate was awarded **3/3 marks.** See COR 1(a).

Method 1
✓ •[1] correct addition of r.
✓ •[2] correct division by n.
✓ •[3] correct multiplication by 3.

Response 24

The candidate was awarded **2/3 marks.** See COR 2(b).

Method 2
✗ •[1] incorrect multiplication by 3.
✓1 •[2] consistent addition of r.
✓1 •[3] consistent division by n.

Response 25

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

Method 2

× •[1] incorrect multiplication by 3.
× •[2] incorrect division by n.
× •[3] incorrect addition of r.

Response 26

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

Method 2

× •[1] incorrect multiplication by 3.
× •[2] incorrect division by n.
× •[3] incorrect operation involving r.

Response 27

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

Method 1

× •[1] transcription error; addition of r not possible.
✓2 •[2] multiplication by 3 eased following transcription error.
✓1 •[3] consistent division by n; repeated easing not penalised.

Comments on candidates' performance

Many candidates achieved partial credit but few were able to deal with the $\frac{1}{3}$ correctly. For example, $m = \dfrac{3P + r}{n}$ was a common response.

Question 8

Response 28

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

Method 1

✓ •[1] valid strategy.
✓ •[2] correct evaluation of $7^2 + 4^2$ and 8^2.
× •[3] incorrect comparison of 8.06 and 8.
^ •[4] no reference to a right angle; see note 4 of the marking instructions.

Response 29

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

Method 1

× •[1] mark not available; see note 1 of the marking instructions.
✓ •[2] correct evaluation of $7^2 + 4^2$ and 8^2.
✓ •[3] explicit comparison of 65 and 64.
^ •[4] no reference to a right angle; see note 4 of the marking instructions.

Response 30

The candidate was awarded **3/4 marks.** See COR 2.

Method 1

✓ •[1] valid strategy.
✓ •[2] correct evaluation of $7^2 + 4^2$ and 8^2.
✓ •[3] explicit comparison of 8.06 and 8.
^ •[4] no reference to a right angle; see note 4 of the marking instructions.

Response 31

The candidate was awarded **1/4 marks.**

Method 2

✓ •[1] valid strategy
× •[2] incorrect evaluation of $\sqrt{65}$.
^ •[3] no explicit comparison.
^ •[4] no conclusion with valid reason.

Response 32

The candidate was awarded **3/4 marks.** See COR 2.

Method 3

✓ •[1] valid strategy.
✓ •[2] correct evaluation of cos C.
✓ •[3] correct calculation of angle C.
^ •[4] no reference to 90°; see note 4 of the marking instructions.

Response 33

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

See General Marking Principle (p).
The candidate's conclusion identifies Method 1 as the response to be marked.

× •1 mark not available; see note 1 of the marking instructions.
✓ •2 correct evaluation of $7^2 + 4^2$ and 8^2.
✓ •3 explicit comparison of 65 and 64.
✓ •4 correct conclusion with valid reason.

Comments on candidates' performance

Many candidates achieved partial credit but were often prevented from achieving full marks due to starting with $4^2 + 7^2 = 8^2$ and/or not mentioning a right angle or 90° in their conclusion. Candidates using the cosine rule generally were able to achieve full marks more often than those who used Pythagoras.

Question 9

Response 34

The candidate was awarded **3/4 marks.** See note 3(a) of the marking instructions.

× •1 incorrect substitution of area for small pyramid.
✓1 •2 consistent substitution of area for large pyramid.
✓ •3 knew to subtract volumes.
✓1 •4 consistent calculations and correct units.

Response 35

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

× •1 incorrect substitution of area for small pyramid.
× •2 incorrect substitution of height for large pyramid (despite repeated error for area).
✓ •3 knew to subtract volumes.
✓1 •4 consistent calculations and correct units.

Response 36

The candidate was awarded **1/4 marks.**

× •1 incorrect substitution of area for small pyramid.
× •2 incorrect substitution of height for large pyramid (despite repeated error for area).
× •3 did not know to subtract volumes.
✓1 •4 consistent calculations and correct units.

Response 37

The candidate was awarded **0/4 marks.**

- × •[1] incorrect substitution of area for small pyramid.
- × •[2] incorrect substitution of height for large pyramid (despite repeated error for area).
- × •[3] did not know to subtract volumes.
- × •[4] no units (despite consistent calculations).

Comments on candidates' performance

Most candidates used the correct volume formula but some incorrectly used 60 for the height of the large pyramid and/or used an incorrect value for the area of the base of each pyramid. For example, some used the area of a triangle formula others simply used the length. Many candidates achieved partial credit for follow through working.

Question 10

Response 38

The candidate was awarded **2/3 marks.** See COR 1.

- ✓ •[1] correct denominator.
- ✓ •[2] correct numerator; see note 2 of the marking instructions.
- × •[3] incorrect collection of terms.

Response 39

The candidate was awarded **2/3 marks.** See note 5 of the marking instructions.

- ✓ •[1] correct denominator.
- ✓ •[2] correct numerator.
- × •[3] subsequent incorrect working.

Response 40

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

- × •[1] incorrect denominator.
- ✓ •[2] correct numerator.
- × •[3] incorrect collection of terms.

Response 41

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

✓ •[1] correct denominator.
✗ •[2] incorrect numerator.
✗ •[3] incorrect removal of brackets and collection of terms.

Comments on candidates' performance

Many candidates achieved partial credit for finding the correct denominator and/or numerator but only some multiplied out the bracket in the numerator correctly, obtaining $5x - 6$ instead of $5x + 6$. A few also lost the final mark for subsequent incorrect working where they attempted to further simplify the fraction.

Question 11

Response 42

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

✓ •[1] correct substitution.
✓ •[2] correct rearrangement of equation.
✓ •[3] correct first value of x.
✗ •[4] incorrect second value of x.

Response 43

The candidate was awarded **1/4 marks.**

✓ •[1] correct substitution.
✗ •[2] incorrect rearrangement of equation.
✗ •[3] mark not available; $\cos^{-1}$ not used to calculate first value of x.
^ •[4] no attempt to calculate second value of x.

Response 44

The candidate was awarded **1/4 marks.**

✗ •[1] no substitution.
✗ •[2] mark not available; no equation to rearrange.
✗ •[3] mark not available; $\cos^{-1}$ not used to calculate first value of x.
✓1 •[4] consistent second value of x.

Response 45

The candidate was awarded **0/4 marks.**

× •[1] incorrect substitution
× •[2] mark not available; no need to rearrange equation
× •[3] mark not available; $\cos^{-1}$ not used to calculate first value of x.
^ •[4] no attempt to calculate second value of x.

Comments on candidates' performance

Some candidates started correctly and usually went on to achieve 3 or 4 marks but a few did not attempt this question. Some formed an incorrect equation, failing to realise that they had to substitute h = 150 into the equation. A few substituted values in the wrong place in the equation. When they rearranged their equation, a few obtained values for $\cos x$ which were greater than one or less than negative one and were then unable to find the two required angles.

Question 12

Response 46

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

✓ •[1] correctly factorised numerator.
✓ •[2] correctly factorised denominator.
× •[3] subsequent incorrect working; see note 2 of marking instructions.

Response 47

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

✓ •[1] correctly factorised numerator.
× •[2] incorrectly factorised denominator.
✓1 •[3] consistent cancelling.

Response 48

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

× •[1] incorrectly factorised numerator.
× •[2] incorrectly factorised denominator.
✓1 •[3] consistent cancelling.

Response 49

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

× •[1] numerator not factorised.
× •[2] denominator not factorised.
× •[3] incorrect cancelling.

Comments on candidates' performance

Many candidates factorised both the numerator and denominator correctly but some then lost the third mark due to subsequent incorrect working where they attempted to further simplify the fraction, most commonly to 4/5. Some did not factorise either expression but incorrectly cancelled out the x^2 terms and the constants.

Question 13

Response 50

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

Method 2
✓ •[1] correct expansion.
✓ •[2] correct substitution and simplification.

Response 51

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

See COR 1(b) – no marks available for stating correct answer without working then working backwards.

× •[1] mark not available; working backwards from 'correct answer without working'
× •[2] mark not available; working backwards from 'correct answer without working'

Response 52

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

× •[1] incorrect substitution.
× •[2] incorrect simplification.

See COR 4 – appearance of $\sin^2 x + \cos^2 x = 1$ is not sufficient.

Comments on candidates' performance

Few candidates achieved any marks but the number achieving some marks was slightly more than in previous years. Most candidates didn't realise they had to factorise first and didn't know how to lay out their proof in a structured way.

Question 14

Response 53

The candidate was awarded **0/2 marks** for part (a).

× •[1] no expression given for volume.
× •[2] no construction of equation; see COR 1.

The candidate was awarded **3/4 marks** for part (b).

✓ •[3] correct substitution into quadratic formula.
✓ •[4] correct discriminant (implied by –9.4).
× •[5] one incorrect value of x.
✓1 •[6] consistent selection of positive value of x, rounded to one decimal place.

Response 54

The candidate was awarded **1/2 marks** for part (a).

✓ •[1] correct expression for volume
× •[2] incorrect expansion of brackets and collection of terms

The candidate was awarded **0/4 marks** for part (b); see note 2 of the marking instructions.

× •[3] mark not available; guess and check.
× •[4] mark not available; guess and check
× •[5] mark not available; guess and check.
× •[6] mark not available; guess and check.

Response 55

The candidate was awarded **1/2 marks** for part (a); see note 2 of marking instructions, solution appears in (b).

✓ •[1] correct expression for volume.
× •[2] no construction of equation and rearrangement into required form.

The candidate was awarded **1/4 marks** for part (b); see note 6 of marking instructions – solution appears in (a) and similar to COR 2.

✓ •[3] correct substitution into quadratic formula.
× •[4] incorrect discriminant.
× •[5] mark not available; see note 4 of marking instructions, $b^2 - 4ac < 0$ and in any case the candidate's second root works out to be –6.7
× •[6] positive value of x not selected; both values are underlined.

Response 56

The candidate was awarded **0/2 marks** for part (a); see note 2 of marking instructions – solution appears in (b).

^ •1 incomplete expression for volume.
✗ •2 no rearrangement into required form.

The candidate was awarded **2/4 marks** for part (b); see note 6 of the marking instructions (the solution appears in (a)).

✓ •3 correct substitution into quadratic formula.
✓ •4 correct discriminant.
✗ •5 one incorrect value of x.
✗ •6 positive value of x not selected or rounded to one decimal place.

Comments on candidates' performance

Many candidates achieved 0 marks in either part of this question. Many answered part (b) in part (a) and vice versa but they were given credit for correct working wherever it appeared.

In part (a) some achieved the first mark for finding a correct expression for the volume of the cuboid but few achieved the second mark as they did not equate the expression to 45 and rearrange into the required form. In part (b), common errors included trying to solve the equation as if it was linear, incorrect calculation of the roots of the quadratic equation, obtaining a negative discriminant and still finding roots, and not rejecting the negative root as a solution to the problem.

Question 15

Response 57

The candidate was awarded **4/4 marks.**

✓ •1 correct calculation of angle A using valid strategy; see note 2 of marking instructions.
✓ •2 correct substitution into area of triangle formula
✓ •3 correct formation of equation
✓ •4 correct calculation of AE – see note 3(a) of marking instructions.

Response 58

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

✓ •1 correct calculation of angle A using valid strategy, see note 2 of marking instructions.
✓ •2 correct substitution into area of triangle formula.
✓ •3 correct formation of equation.
✗ •4 incorrect calculation of $12 \times \sin 26$.

Response 59

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

× •[1] incorrect calculation of angle A.
× •[2] mark not available since $2\sqrt{65}$ is a length not an angle.
✓1 •[3] consistent formation of equation.
✓1 •[4] consistent calculation of AE using sin(16.12).

Response 60

The candidate was awarded **0/4 marks.** Similar to COR 1(a).

× •[1] no correct trig. ratio
× •[2] no substitution into formula for area of triangle ADE
× •[3] no equation involving area of triangle formed
× •[4] mark not available; not required to solve valid equation

Comments on candidates' performance

Most candidates found this question challenging and few achieved more than one mark. Many used Pythagoras to calculate the length of the base of triangle ABC and progressed no further. Some achieved the first mark, mostly by using the sine rule to find the size of angle A.

Very few used right-angled triangle trigonometry to find angle A. Thereafter very few made relevant progress by substituting angle A into the area formula and forming an equation.

Many attempted to calculate lengths of other sides and sizes of other angles but did not always link their answers to the area of appropriate triangles. Pythagoras, sine rule or cosine rule were used in shapes that sometimes were not triangles. The very few who achieved full marks mainly did so only after many unnecessary steps of additional working.