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Practice paper: mark scheme

GCSE Maths Higher, practice paper 3 (calculator) (AQA style)

In the style of AQA GCSE Mathematics (8300) Paper 3 Higher

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This mark scheme was written by cookie with its practice paper. Each row gives the answer, the marks and how they are given; where an answer is worded differently but means the same, give the mark.

Key

- M method marks, for a correct method
- A accuracy marks, which depend on the method mark before them
- B marks for a correct answer or step, independent of method
- P process marks, for a correct step in solving a problem
- C communication marks
- ft follow through from an earlier error; oe or equivalent; cao correct answer only

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Question	Answer and marking	Marks
01	**Answer: 0.061 (C)** B1 for 0.061	**1**
02	**Answer: 4n + 3 (B)** B1 for 4n + 3	**1**
03	**Answer: $x^2 + y^2 = 9$ (B)** B1 for $x^2 + y^2 = 9$	**1**
04	**Answer: 1.2 (B)** B1 for 1.2	**1**
05.1	**Answer: $2^2 \times 3^2 \times 5 \times 7$** M1 for a correct method that finds at least three of the prime factors, e.g. a factor tree or repeated division with at most one error A1 for $2^2 \times 3^2 \times 5 \times 7$ (factors in any order) *$2 \times 2 \times 3 \times 3 \times 5 \times 7$ (not in index form) scores M1 A0. Accept $2^2 \times 3^2 \times 5^1 \times 7^1$.*	**2**
05.2	**Answer: 12 600** M1 for $2^3 \times 3^2 \times 5^2 \times 7$ (ft their part (a)), or a correct Venn diagram of the prime factors, or lists of multiples reaching 12 600 A1 for 12 600 cao *60 (the HCF) scores M0 A0. 756 000 (1260 × 600) scores M0 A0.*	**2**
06	**Answer: Medium (71.1p a roll; Small 75p, Large 74.7p)** M1 for a correct comparable value for one pack, e.g. 4.50 ÷ 6 = 0.75 or 6 ÷ 4.50 = 1.33… rolls per pound M1 for correct comparable values for all three packs, e.g. 75p, 71.1p (71.11…), 74.7p (74.66…), or the price of a common number of rolls (90 rolls: £67.50, £64, £67.20) A1 for Medium, with correct supporting values *Medium with no working, or with incorrect values, scores 0. Allow values rounded or truncated, e.g. 71p and 74p, if the comparison is still correct.*	**3**
07.1	**Answer: $245 \leq m < 255$** B1 for 245 and 255 as the bounds B1 for $245 \leq m < 255$ *$245 \leq m \leq 255$ or $245 < m < 255$ scores B1 B0.*	**2**
07.2	**Answer: $7.4 \leq t < 7.5$** B1 for $7.4 \leq t < 7.5$ *$7.35 \leq t < 7.45$ (rounding, not truncation) scores B0.*	**1**
08	**Answer: 46.1%** M1 for 32 × 45 (= 1440) or 8 × 30 (= 240) M1 for 1440 + 240 (= 1680) and a subtraction of 1150 (= 530), or 1680 ÷ 1150 (= 1.46…) M1 for 530 ÷ 1150 × 100 (oe), or (1.4608… − 1) × 100 A1 for 46.1 (46.08…) *530 ÷ 1680 × 100 = 31.5% (profit as a percentage of the selling price) scores M1*	**4**

M1 M0 A0.

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09 **Answer: 420 kg** **4**

M1 for one correct comparison, e.g. 140 ÷ 2.5 (= 56) or 230 ÷ 4 (= 57.5), or the sand needed for 60 kg of cement (150 kg)
M1 for identifying sand as the limiting ingredient, e.g. 56 compared with 60 and 57.5
M1 for 56 × (1 + 2.5 + 4), or 56 + 140 + 224
A1 for 420 cao
450 kg (cement as the limit) scores M1 M0 M1 A0 if 60 × 7.5 is seen. 430 kg (adding all the materials) scores 0.

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10 **Answer: 16** **3**

M1 for x + 7x = 180 (oe), or the exterior angle = 180 ÷ 8
M1 for 360 ÷ 22.5, or 360 ÷ their exterior angle
A1 for 16 cao
Using an interior angle of 157.5° with (n − 2) × 180 = 157.5n is an equally valid method.

11.1 **Answer: 1.75** **3**

M1 for at least three correct products of goals × frequency, e.g. 12, 20, 18
M1 for 70 ÷ 40, or (0 + 12 + 20 + 18 + 20) ÷ 40
A1 for 1.75 cao
70 ÷ 5 = 14 scores M1 M0 A0.

11.2 **Answer: 2** **1**

B1 for 2
Do not accept 10 (the middle frequency) or 1 (the mode).

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12 **Answer: 28.2 m/s** **3**

M1 for 186 000 m or 6600 s, or 186 ÷ 1.833… (= 101.45… km/h)
M1 for 186 000 ÷ 6600 (oe), or their km/h × 1000 ÷ 3600
A1 for 28.2 (28.18…)
Using 1.5 hours or 1.50 hours for 1 hour 50 minutes (186 ÷ 1.5 = 124 km/h, 34.4 m/s) scores M0 M1 A0.

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13 **Answer: r = 3** **3**

M1 for 2251.02 ÷ 2000 (= 1.12551), or a trial of a rate, e.g. 2000×1.02^4 (= 2164.86…)
M1 for the fourth root of 1.12551 (= 1.03), or $2000 \times 1.03^4 = 2251.02$ seen
A1 for 3 cao
r = 3.14 (3.137…) from a simple-interest method (251.02 ÷ 4 ÷ 2000 × 100) scores M0 M0 A0. An answer of 1.03 scores M1 M1 A0.

14.1 **Answer: y = −2x + 3** **3**

M1 for the gradient (−5 − 7) ÷ (4 − (−2)) (= −2)
M1 for substituting a point into y = their m x + c, e.g. 7 = −2 × −2 + c
A1 for y = −2x + 3

14.2 **Answer: y = 1/2 x + 1/2** **3**

B1 for the midpoint (1, 1)
M1 for the gradient of L = 1/2 (ft −1 ÷ their gradient from part (a))
A1 for y = 1/2 x + 1/2 (oe, e.g. 2y = x + 1 or x − 2y + 1 = 0)
A line through A or B with gradient 1/2 scores B0 M1 A0.

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15 **Answer: $2n^2 - n + 3$** **3**

M1 for second differences of 4, or $2n^2$ seen
M1 for subtracting $2n^2$ from the terms: 2, 1, 0, −1 (…), or for three correct equations in a, b and c from $an^2 + bn + c$
A1 for $2n^2 - n + 3$ (oe)

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16 **Answer: (2, −2)** **2**

M1 for (−2, −3) after the rotation
A1 for (2, −2)
A rotation anticlockwise gives (2, 3) then (6, 4): M0 A0. Accept (2, −2) from (−2, −3) shown or implied.

17.1 **Answer: x = 35** **3**

M1 for (2x + 10) + (3x − 5) = 180 (oe)
A1 for x = 35
B1 for the reason 'opposite angles of a cyclic quadrilateral add up to 180°' (oe)
The reason must use the words 'cyclic quadrilateral' and 'opposite'. 'Angles in a quadrilateral add up to 360°' is not the reason here and scores B0.

17.2 **Answer: 160°** **2**

B1ft for 160 (ft 2 × their (2x + 10), provided it is less than 180)
B1 for the reason 'the angle at the centre is twice the angle at the circumference' (oe)
200 (the reflex angle, from 2 × angle ADC) scores B0 for the angle but the reason may still earn B1.

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18 **Answer: 1960 cm^3 (624π)** **4**

M1 for the radius of the smaller cone = 3 cm (by similarity: 9 × 8/24)
M1 for the volume of the large cone: 1/3 × π × 9^2 × 24 (= 648π or 2035.75…)
M1 for subtracting the volume of the smaller cone: their 648π − 1/3 × π × 3^2 × 8 (= 24π or 75.39…)
A1 for 1960 (1960.3…)
Accept 624π. A volume scale factor method (648π × (1 − $(1/3)^3$)) is equally valid: M1 M1 M1 for 648π × 26/27. A cylinder formula scores 0.

19.1 **Answer: 0.18** **3**

M1 for 0.2 × 0.7 (= 0.14) or 0.8 × 0.05 (= 0.04)
M1 for 0.2 × 0.7 + 0.8 × 0.05
A1 for 0.18 (oe)
0.7 + 0.05 = 0.75 scores 0. A correct tree diagram with all six probabilities is evidence of the first M1 only when a correct product is also seen.

19.2 **Answer: 7/9 (0.778)** **2**

M1 for 0.14 ÷ 0.18 (ft their part (a) answer)
A1 for 7/9 or 0.777… or 0.778 (accept 0.78)
0.14 (the probability of both events) scores M0 A0.

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20 **Answer: 26.6°** **3**

M1 for the diagonal of the bottom face: $\sqrt{(8^2 + 6^2)}$ (= 10)
M1 for $\tan^{-1}(5/10)$ (oe), or $\sin^{-1}(5/\sqrt{125})$ or $\cos^{-1}(10/\sqrt{125})$
A1 for 26.6 (26.56…)
$\tan^{-1}(5/8) = 32.0°$ or $\tan^{-1}(5/6) = 39.8°$ (using an edge of the base) scores M0 M0 A0.

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21 **Answer: x = 23.6° or x = 156.4°** **3**

M1 for $\sin^{-1}(0.4)$ (= 23.57…)
A1 for 23.6
A1 for 156.4 (from 180 − 23.57…)
Extra solutions in the range (e.g. 203.6 or 336.4) lose the final A1.

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22 **Answer: a = 20, b = 1.5** **4**

M1 for $ab^2 = 45$ and $ab^5 = 151.875$
M1 for $b^3 = 151.875 \div 45$ (= 3.375)
A1 for b = 1.5
A1 for a = 20
Dividing the equations the wrong way round ($b^3 = 45 \div 151.875$, b = 2/3) scores M1 M0 A0 A0.

23.1 **Answer: (2, 2)** **1**

B1 for (2, 2)

23.2 **Answer: (−2, 5)** **1**

B1 for (−2, 5)
(2, −5) (a reflection in the x-axis) scores B0.

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24 **Answer: $(n - 1)^2 + n^2 + (n + 1)^2 = 3n^2 + 2$, which is 2 more than a multiple of 3** **3**

M1 for three consecutive integers in algebraic form and the sum of their squares, e.g. $(n - 1)^2 + n^2 + (n + 1)^2$, or $n^2 + (n + 1)^2 + (n + 2)^2$
M1 for a correct simplification: $3n^2 + 2$, or $3n^2 + 6n + 5$
A1 for a correct conclusion, e.g. '$3n^2$ is a multiple of 3, so $3n^2 + 2$ is 2 more than a multiple of 3 and is never a multiple of 3', or $3n^2 + 6n + 5 = 3(n^2 + 2n + 1) + 2$ with the same conclusion
Numerical examples only score 0. $3n^2 + 6n + 5$ with the conclusion '5 is not a multiple of 3' alone is not enough: M1 M1 A0.

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25 **Answer: 19.2 cm** **5**

M1 for $1/2 \times 12 \times 9 \times \sin P = 40$ (oe)
M1 for $\sin^{-1}(40/54)$ or $\sin^{-1}(0.7407…)$ (= 47.79…°)
A1 for angle QPR = 132.2° (132.20…), from 180 − 47.79…
M1 for $12^2 + 9^2 - 2 \times 12 \times 9 \times \cos$(their obtuse angle)
A1 for 19.2 (19.23…)
Using the acute angle 47.8° gives QR = 8.94: M1 M1 A0 M1 A0. Accept $\cos P = -\sqrt{(1 - (40/54)^2)}$ as an exact route to the cosine rule.

Total: 80 marks