cookie

Practice paper: mark scheme

GCSE Maths Higher, practice paper 5 (non-calculator) (OCR style)

In the style of OCR GCSE (9–1) Mathematics (J560) Paper 5 (Higher Tier)

Practice paper written by cookie in the style of OCR GCSE (9–1) Mathematics (J560) Paper 5 (Higher Tier). Not an OCR paper; not affiliated with or endorsed by OCR.

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

P process marks, for a correct step in solving a problem
M method marks, for a correct method
A accuracy marks, which depend on the method mark before them
B unconditional accuracy marks, independent of method
C communication marks
ft follow through; oe or equivalent; cao correct answer only; isw ignore subsequent working

Do it online, timed and marked:
cookie.education/past-papers/gcse/cookie/maths-ocr-style

Question	Answer and marking	Marks
1(a)	**Answer: 90** B1 for 90	**1**
1(b)	**Answer: 23/30** M1 for both fractions over a correct common denominator, e.g. 48/30 − 25/30 or 96/60 − 50/60 A1 for 23/30 *Do not accept 0.766… or 0.77 for the A mark. An answer of 46/60 scores M1 A0 (not in its simplest form).*	**2**
2	**Answer: Tariff B, by £4.50 (Tariff A costs £184.50; Tariff B costs £180)** M1 for 90 × 45 (= 4050p) or 600 × 24 (= 14 400p), or the same in pounds A1 for 184.50 or 18 450[p] for Tariff A M1 for 600 × 30 (= 18 000p or £180) A1 for Tariff B cheaper by £4.50 oe (450p), with 184.50 and 180 (or 18 450 and 18 000) both seen *Work may be in pence or in pounds throughout. Missing the standing charge (comparing 144 with 180) scores M1 A0 M1 A0. A correct conclusion with no working scores 0: the question says you must show your working.*	**4**
3(a)	**Answer: 10 hours** M1 for 6 × 15 (= 90 [machine-hours]) or 15 × 6/9 oe A1 for 10 *15 × 9/6 = 22.5 scores M0 A0 (direct, not inverse, proportion).*	**2**
3(b)	**Answer: All the machines work at the same constant rate.** B1 for a correct assumption, e.g. 'all the machines work at the same rate', 'the machines work at a constant rate', 'no machine breaks down' *Do not accept 'the machines are identical' (it is given in the question).*	**1**
4(a)	**Answer: 244°** B1 for 244[°]	**1**
4(b)	**Answer: 109.5°** M1 for angle ABC = 89° soi, e.g. 244 − 155 or FT their (a) − 155 M1 for (180 − their 89) ÷ 2 (= 45.5) A1 for 109.5[°] *Angle ABC can also be found as 64 + 25 (the angles either side of the south line at B), or from other correct angle facts; credit any correct method. 64 + 45.5 = 109.5 is the final step. Accept 109½°.*	**3**
5	**Answer: 35 tiles (each 45 cm by 45 cm)** M1 for a method to find the HCF of 315 and 225, e.g. 315 = $3^2 \times 5 \times 7$ and 225 = $3^2 \times 5^2$, or listing common factors A1 for 45 [cm] A1 for 35 *FT for the final A1: (315 ÷ their tile side) × (225 ÷ their tile side) when their side is a common factor of 315 and 225 (e.g. side 15 gives 21 × 15 = 315, M1 A0 A1).* *Working in metres throughout (0.45 m) is fine. The LCM (1575) scores M0.*	**3**

6(a) **Answer: 0.5 (1/2)** **2**

M1 for (1 − 0.2) × 5/8 oe, or 0.8 shared in the ratio 3 : 5
A1 for 0.5 oe
5/8 on its own scores M0 A0.

6(b) **Answer: 8** **2**

M1 for P(red) = 0.3 soi and 12 ÷ 0.3 (= 40), or 12 ÷ 3 × 5 (= 20 blue) and 32 = 0.8 of the total
A1 for 8
FT their (a): M1 for a correct method from their P(blue) if 0 < their P(blue) < 0.8.

---

7 **Answer: 6** **3**

M1 for $12 \times r^3 = 96$ oe, or $r^3 = 8$, where r is the common ratio
A1 for r = 2
A1 for 6
A correct answer from trials (e.g. 6, 12, 24, 48, 96 seen) scores 3 marks. Treating it as an arithmetic sequence (difference 28, first term −16) scores 0.

---

8 **Answer: 38 cm** **5**

M1 for (x + 5)(x + 3) for the new area, or x(x + 7) for the original area
M1 for $x^2 + 8x + 15$ or $x^2 + 7x$ seen (correct expansion)
M1 for $x^2 + 8x + 15 = x^2 + 7x + 21$ oe, e.g. x + 15 = 21
A1 for x = 6
A1 for 38 (FT 2(2 × their x + 7) for a positive x)
Sides 13 cm by 6 cm, or areas 78 and 99, imply A1 for x = 6. A correct answer found by trials, with both areas for x = 6 shown, scores 5 marks; trials without the areas checked score 0. Using the new rectangle's perimeter (2(11 + 9) = 40) scores M1 M1 M1 A1 A0.

---

9 **Answer: 15 km/h** **4**

M1 for 36 ÷ 16 (= 2.25 hours or 2 hours 15 minutes)
M1 for their 2.25 + 1.75 (= 4 hours)
M1 for (36 + 24) ÷ their 4
A1 for 15
Finding the second speed (24 ÷ 1.75) and averaging it with 16 scores 0. Using 1.45 for 1 hour 45 minutes: M1 M0 M1 A0 at most.

10(a) **Answer: 8** **2**

M1 for 4 × 11 − 4 × 9, or 44 and 36 seen
A1 for 8
16 (the number after it was doubled) scores M1 A0 when 44 and 36 are seen.

10(b) **Answer: 7/18** **3**

M1 for two correct recurring decimals that differ by an exact value, e.g. 10x = 3.888… and 100x = 38.888…, or x = 0.3888… and 10x = 3.888…
A1 for 90x = 35 or 35/90 oe, e.g. 3.5/9
A1 for 7/18
Writing 0.3888… = 0.3 + 0.0888… = 3/10 + 4/45 is a correct alternative (M1 for 0.0888… = 8/90 oe). 7/18 with no working scores 0: the question says you must show your working. 38/99 scores M0 A0 A0.

11(a) **Answer: $6xy(2x - 3y^2)$** **2**

B2 for $6xy(2x - 3y^2)$

or B1 for a correct partial factorisation, e.g. $6x(2xy - 3y^3)$, $3xy(4x - 6y^2)$ or $6y(2x^2 - 3xy^2)$

11(b) **Answer: $3x^2 - 12x + 25$** **3**

M1 for $4x^2 - 6x - 6x + 9$ or $4x^2 - 12x + 9$ (allow one error in the four terms)

M1 for $x^2 - 16$

A1 for $3x^2 - 12x + 25$

$3x^2 - 12x - 7$ (from -16 not becoming $+16$) scores M1 M1 A0.

12(a) **Answer: 336** **2**

M1 for $8 \times 7 \times 6$

A1 for 336

$8^3 = 512$ or $8 \times 3 = 24$ scores 0.

12(b) **Answer: 36** **2**

M1 for $3 \times 2 \times 6$ oe, e.g. 6 orders of the two of them in the medal places, each with 6 choices for the other medal

A1 for 36

18 (Amir and Beth treated as interchangeable, 3×6) scores M0 A0. A complete, organised listing that reaches 36 scores both marks.

13(a) **Answer: 108 cm** **3**

M1 for $256 \times 3/4$ (= 192)

M1 for $256 \times (3/4)^3$ oe, or 144 seen

A1 for 108

13(b) **Answer: The 6th bounce (81, 60.75, 45.5625 cm)** **2**

M1 for continuing from their (a): 81 and 60.75 (or 60 3/4) seen, or a value after the 6th bounce of 45.56… soi

A1 for 6th (sixth) with correct working

FT their (a) for M1. An answer of 6 with no working scores 0.

14(a) **Answer: 1.5 m/s²** **1**

B1 for 1.5 oe

14(b) **Answer: 324 m** **3**

M2 for $1/2 \times 8 \times 12 + 20 \times 12 + 1/2 \times 6 \times 12$, or $1/2 \times (20 + 34) \times 12$

or M1 for two of 48, 240 and 36 seen

A1 for 324

Using a total time of 34 s with a rectangle ($34 \times 12 = 408$) scores M0 A0.

15(a) **Answer: 4, 8, 12** **1**

B1 for 4, 8, 12 and no others

15(b) **Answer: 11/20** **2**

M1 for $A \cup B = \{1, 2, 3, 4, 6, 8, 12, 16, 20\}$ or 9 members soi

A1 for 11/20 oe

9/20 (the probability of $A \cup B$) scores M1 A0.

16(a) **Answer: 135 g** **3**

M1 for $m = kr^3$ oe

M1 for $40 = k \times 2^3$, so $k = 5$

A1 for 135

A ratio method, $40 \times (3/2)^3$, scores M2 when seen.

16(b) **Answer: 5 cm** **1**

B1 for 5 (FT their k if the cube root is exact)

17(a) **Answer: 2^6** **2**

M1 for $8^3 = 2^9$ or $4^4 = 2^8$ soi

A1 for 2^6

64 on its own scores M1 A0 (not written as a power of 2).

17(b) **Answer: 27/8** **2**

M1 for 81/16 or 2/3 or 3/2 seen

A1 for 27/8 oe

Accept 3 3/8 or 3.375. 8/27 scores M1 A0.

18(a) **Answer: 30π cm^3** **3**

M1 for $1/2 \times 4/3 \times \pi \times 3^3$ oe (= 18π)

M1 for $1/3 \times \pi \times 3^2 \times 4$ oe (= 12π)

A1 for 30π

Using the whole sphere ($36\pi + 12\pi = 48\pi$) scores M0 M1 A0. Accept 30π with $\pi \times 30$ or equivalent; a decimal answer (94.2…) scores M1 M1 A0.

18(b) **Answer: 33π cm^2** **3**

M1 for $l = \sqrt{(3^2 + 4^2)}$ (= 5)

M1 for $\pi \times 3 \times$ their 5 (= 15π) or $1/2 \times 4 \times \pi \times 3^2$ (= 18π)

A1 for 33π

Adding the circle where the two solids join (9π, giving 42π) scores M1 M1 A0. Using $l = 4$ ($12\pi + 18\pi = 30\pi$) scores M0 M1 A0.

---

19 **Answer: $25\sqrt{3}/2$ cm^2** **4**

M1 for $PQ = 10 \cos 60°$ (= 5)

M1 for $QR = 10 \sin 60°$ or $QR^2 = 10^2 - 5^2$

A1 for $QR = 5\sqrt{3}$

A1 for $25\sqrt{3}/2$ oe

$1/2 \times 10 \times 5 \times \sin 60°$ (using the formula for the area of a triangle with PR and their PQ) is an alternative to the last M1 A1. Accept $(25/2)\sqrt{3}$ or $12.5\sqrt{3}$. A decimal answer (21.6…) scores at most M1 M1 A0 A0.

---

20 **Answer: $x = (3 + \sqrt{11})/2$ or $x = (3 - \sqrt{11})/2$** **3**

M1 for $(6 \pm \sqrt{((-6)^2 - 4 \times 2 \times (-1))}) / (2 \times 2)$ oe

A1 for $(6 \pm \sqrt{44})/4$

A1 for $(3 \pm \sqrt{11})/2$ oe

Accept $3/2 \pm \sqrt{11/2}$. Completing the square, $2(x - 3/2)^2 - 11/2 = 0$, is a correct alternative method. One sign error in the substitution (e.g. $\sqrt{(36 - 8)}$) scores M1 A0 A0.

21(a) **Answer: AB = BC (sides of a square); angle ABP = angle BCQ = 90° (angles of a square); BP = CQ (given); so the triangles are congruent (SAS)** **3**

B1 for AB = BC with a reason (sides of a square)
B1 for angle ABP = angle BCQ (= 90°) with a reason (angles of a square)
B1 dep on B1 B1 for BP = CQ (given) and the conclusion congruent by SAS
Do not accept RHS (the hypotenuses are not known to be equal) or SSS. Condone 'side, angle, side' for SAS.

21(b) **Answer: Let AP and BQ meet at X. Angle BAP = angle CBQ (congruent triangles). Angle ABX = 90° − angle CBQ = 90° − angle BAP, so angle AXB = 180° − angle BAP − (90° − angle BAP) = 90°.** **2**

M1 for angle BAP = angle CBQ (corresponding angles of the congruent triangles) soi
A1 for a complete argument that the angle between AP and BQ is 90°, e.g. using angle ABQ = 90° − angle CBQ and the angle sum of triangle ABX
Using particular values (e.g. taking angle BAP = 30°) can score M1 A0 at most.

---

22 **Answer: $x^2 - 6x + 9 = 0$, i.e. $(x - 3)^2 = 0$, has only one solution, x = 3; so L meets C only at (3, 2) (L is a tangent to C)** **4**

M1 for $x^2 - 4x + 5 = 2x - 4$
M1 for $x^2 - 6x + 9$ [= 0] and $(x - 3)^2$ [= 0], or the discriminant $(-6)^2 - 4 \times 1 \times 9 = 0$
A1 for a repeated root (or discriminant 0) stated as the reason there is only one point, with x = 3
A1 for (3, 2)
Coordinates (3, 2) found by substituting values, with no algebraic argument for 'exactly one point', score B1 only. Coordinates may be given as x = 3, y = 2.

---

23 **Answer: x = 120° or x = 240°** **3**

B1 for cos x = −1/2
B2 for 120 and 240
or B1 for one of 120 or 240
Extra values in the range: deduct 1 from the B2 for each (minimum 0 for that mark). 60° and 300° (from cos x = 1/2) score B0 for the angles.

---

24 **Answer: $(3n + 1)^2 - (n - 1)^2 = 9n^2 + 6n + 1 - (n^2 - 2n + 1) = 8n^2 + 8n = 8n(n + 1)$; n and n + 1 are consecutive integers, so one of them is even and n(n + 1) is even; so 8n(n + 1) is a multiple of 16.** **4**

M1 for $9n^2 + 6n + 1$ or $n^2 - 2n + 1$
A1 for $8n^2 + 8n$
M1 for 8n(n + 1)
A1 for a complete argument: n(n + 1) is even (one of two consecutive integers is even), so 8n(n + 1) is a multiple of 16
Difference of two squares is a correct alternative: (3n + 1 − (n − 1))(3n + 1 + n − 1) = (2n + 2)(4n) = 8n(n + 1) scores M1 A1 M1. Checking particular values of n scores 0. '8n(n + 1) is a multiple of 8' with no further argument scores M1 A1 M1 A0.

---

25 **Answer: $12\pi - 9\sqrt{3}$ cm^2** **4**

M1 for $120/360 \times \pi \times 6^2$ (= 12π)
M1 for $1/2 \times 6 \times 6 \times \sin 120°$
A1 for $9\sqrt{3}$ (from $\sin 120° = \sqrt{3}/2$)
A1 for $12\pi - 9\sqrt{3}$
Splitting triangle AOB into two 30°, 60°, 90° triangles (height 3, half-chord $3\sqrt{3}$) is a

correct alternative for the second M1 and A1. Using sin 120° = −√3/2 or 1/2 scores M1 M1 A0 A0.

Total: 100 marks