Worked answer 1

Compound area and paint coverage

Source: Pearson Edexcel GCSE Mathematics, June 2024, 1MA1/1H, Question 3. 5 marks.

(a) Find the floor area

Enclosing rectangle = $10 \times 8 = 80$ m². Missing corner = $(10 - 6)(8 - 5) = 12$ m². Floor area = $80 - 12 = 68$ m².

Compare paint coverage

Available paint = $3 \times 2.5 = 7.5$ litres. Coverage = $7.5 \times 10 = 75$ m². Since $75 > 68$, Petra has enough paint.

(b) Change the coverage rate

Coverage becomes $7.5 \times 11 = 82.5$ m². No, the decision does not change: she still has enough paint.

Answer: Yes in (a); no change in (b).

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 2

Sector area from arc length

Source: Pearson Edexcel GCSE Mathematics, June 2024, 1MA1/1H, Question 15. 4 marks.

Find the circle fraction

Full circumference = $2\pi \times 6 = 12\pi$ cm. The arc is 5π cm, so the fraction is $5\pi/(12\pi) = 5/12$.

Calculate sector area

Full area = $\pi \times 6^2 = 36\pi$ cm². Sector area = $(5/12) \times 36\pi = 15\pi$ cm².

Answer: 15π cm²

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 3

Triangle area with a scale drawing (Topic 43 link)

Source: Pearson Edexcel GCSE Mathematics, June 2024, 1MA1/2H, Question 8. 3 marks.

Convert the area scale

1 cm represents 5 m, so 1 cm² represents 25 m². Real area = 28 × 25 = 700 m².

Use the perpendicular sides

700 = ½ × PQ × 40, hence PQ = 700/20 = 35 m.

Check

On the drawing QR = 8 cm, so PQ = 2 × 28/8 = 7 cm. The real length is 7 × 5 = 35 m.

Answer: 35 m

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 4

Triangle area with sine rule (Topics 54–55 links)

Source: Pearson Edexcel GCSE Mathematics, June 2024, 1MA1/3H, Question 18. 5 marks.

Find the shared side AC

$54 = \frac{1}{2} \times 17 \times AC \times \sin 35°$. Therefore $AC = 108/(17 \sin 35°) = 11.0760149\ldots$ cm.

Find AD

Angle $CAD = 180° - 48° - 57° = 75°$. By the sine rule, $AD = AC \times \sin 48°/\sin 57° = 9.8144415\ldots$ cm.

Calculate the required area

Area $ACD = \frac{1}{2} \times AC \times AD \times \sin 75° = 52.5004352\ldots$ cm². Keep unrounded values until the final answer.

Answer: 52.5 cm² (3 significant figures)

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 5

Circle and polygon perimeter proof

Source: Pearson Edexcel GCSE Mathematics, June 2024, 1MA1/3H, Question 21. 4 marks.

Inner hexagon

Its six central triangles have angles of 60° and sides r, so each is equilateral. Each inner side is r and the inner perimeter is 6r.

Outer hexagon

A radius to a tangent side meets it at 90°. Half a side = r tan 30° = r/√3. Outer perimeter = 6 × 2r/√3 = 4√3 r.

Compare perimeters

The inscribed regular hexagon has smaller perimeter than the circle, and the circumscribed hexagon has larger perimeter. Thus $6r < 2\pi r < 4\sqrt{3}\, r$. Divide by 2r, which is positive.

Answer: $3 < \pi < 2\sqrt{3}$

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 6

Semicircle areas and Pythagorean proof

Source: Pearson Edexcel GCSE Mathematics, June 2022, 1MA1/1H, Question 13. 3 marks.

Name the diameters

Let a be the diameter of region A, and b and c the diameters of B and C. The right-angled triangle gives $a^2 = b^2 + c^2$.

Write each area

A semicircle of diameter d has area $\frac{1}{2}\pi(d/2)^2 = \pi d^2/8$. Hence the three areas are $\pi a^2/8$, $\pi b^2/8$ and $\pi c^2/8$.

Complete the proof

Multiply $a^2 = b^2 + c^2$ by $\pi/8$. This gives $\pi a^2/8 = \pi b^2/8 + \pi c^2/8$, so area A = area B + area C.

Answer: Area A = area B + area C, proved for all such triangles.

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 7

Circle segments and shaded area

Source: Pearson Edexcel GCSE Mathematics, June 2022, 1MA1/1H, Question 21. 5 marks.

Find the angles

Join adjacent centres to either intersection point of their circles. All three sides are 4 cm, so each triangle is equilateral. Each lens has two sectors of angle 120°.

Calculate one overlap lens

One sector has area $(120/360)\pi \times 4^2 = 16\pi/3$. Its triangle has area $\frac{1}{2} \times 4 \times 4 \times \sin 120° = 4\sqrt{3}$. One lens therefore has area $2(16\pi/3 - 4\sqrt{3}) = 32\pi/3 - 8\sqrt{3}$.

Subtract both lenses

The shaded regions are the parts of the middle circle outside the two lenses. Area $= 16\pi - 2(32\pi/3 - 8\sqrt{3}) = 16\sqrt{3} - 16\pi/3$ cm².

Answer: $(16\sqrt{3} - 16\pi/3)$ cm²

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 8

Circle area from circumference

Source: Pearson Edexcel GCSE Mathematics, Nov 2023, 1MA1/1H, Question 10. 3 marks.

Find the radius

$2\pi r = 10$, so $r = 5/\pi$ metres.

Calculate area

$A = \pi r^2 = \pi(5/\pi)^2 = 25/\pi$ m². The answer is exact.

Answer: $25/\pi$ m²

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 9

Area per person and square-unit conversion

Source: Pearson Edexcel GCSE Mathematics, June 2022, 1MA1/2H, Question 4. 5 marks.

(a) Find both areas per person

Festival A: 80000/425 = 188.235294… m² per person. Festival B field area = 700 × 2000 = 1400000 m². Area per person = 1400000/6750 = 207.407407… m².

Compare

Difference = 207.407407… − 188.235294… = 19.172113… m², which rounds to 19 m².

(b) Explain the conversion

An area conversion involves two lengths: 1 m² = 100 × 100 = 10000 cm². Divide by 10000, not 100. Thus 300 cm² = 0.03 m².

Answer: (a) 19 m² greater; (b) divide by 10000.

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 10

An equation from triangle and rectangle areas

Source: Pearson Edexcel GCSE Mathematics, June 2023, 1MA1/2H, Question 5. 4 marks.

Write both areas

Triangle area = ½ × 8 × 6x = 24x. Rectangle area = 5(4x − 1) = 20x − 5.

Use the difference

24x = (20x − 5) + 10. Therefore 4x = 5 and x = 1.25.

Check

The triangle area is 30 cm² and the rectangle area is 25 − 5 = 20 cm². The difference is 10 cm².

Answer: x = 1.25

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 11

Circumference using a rectangle diagonal

Source: Pearson Edexcel GCSE Mathematics, June 2023, 1MA1/2H, Question 12. 4 marks.

Find the diameter

The rectangle diagonal passes through the centre and is the circle diameter. By Pythagoras, $d = \sqrt{(8^2 + 10^2)} = \sqrt{164}$ cm.

Calculate circumference

$C = \pi d = \pi\sqrt{164} = 40.232016...$ cm. Round only the final value.

Answer: 40.2 cm (3 significant figures)

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 12

Compound area with regular octagons and surds

Source: Pearson Edexcel GCSE Mathematics, June 2023, 1MA1/2H, Question 24. 5 marks.

Split the shaded region

Split it into the central square and the four outward-pointing right-angled isosceles triangles. A regular octagon has interior angle 135°, which gives the 45° angles in these triangles.

Find the component areas

Each small triangle has perpendicular sides a and a, so area = $a^2/2$. The central square has side $a + a + \sqrt{(a^2 + a^2)} = (2 + \sqrt{2})a$.

Add and simplify

Total area = $[(2 + \sqrt{2})a]^2 + 4(a^2/2) = (6 + 4\sqrt{2})a^2 + 2a^2 = 4(2 + \sqrt{2})a^2$. Thus p = 4.

Answer: $4(2 + \sqrt{2})a^2$

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 13

Triangle area from two sides and their included angle

Source: Pearson Edexcel GCSE Mathematics, Nov 2022, 1MA1/2H, Question 18. 2 marks.

Choose the formula

The included angle between the 11.2 cm and 4.3 cm sides is 118°. Use A = ½ab sin C.

Substitute and round

A = ½ × 11.2 × 4.3 × sin 118° = 21.261378... cm².

Answer: 21.3 cm² (3 significant figures)

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 14

Triangle area using parallel lines and the sine rule

Source: Pearson Edexcel GCSE Mathematics, Nov 2023, 1MA1/2H, Question 16. 4 marks.

Find diagonal BD

In triangle ABD, BD/sin 112° = 7.9/sin 42°. Therefore BD = 7.9 sin 112°/sin 42° = 10.946670… cm.

Find the included angle

AD is parallel to BC, so angle DBC equals angle ADB = 42° by alternate angles.

Calculate area BCD

Area = ½ × BD × 15.3 × sin 42° = 56.034356… cm². Use the unrounded diagonal.

Answer: 56.0 cm² (1 decimal place)

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 15

Perimeter, algebra and isosceles triangle area

Source: Pearson Edexcel GCSE Mathematics, Nov 2024, 1MA1/2H, Question 7. 5 marks.

Find x

Perimeter: $(2x + 11) + (4x - 4) + (2x + 5) = 72$. Thus $8x + 12 = 72$ and $x = 7.5$.

Find the side lengths and height

AC = BC = 26 cm and AB = 20 cm. The perpendicular from C bisects AB, so half the base is 10 cm. Height = $\sqrt{(26^2 - 10^2)} = \sqrt{576} = 24$ cm.

Calculate area

Area = ½ × 20 × 24 = 240 cm². Check: 26 + 26 + 20 = 72 cm.

Answer: 240 cm²

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 16

Trapezium area expressed algebraically

Source: Pearson Edexcel GCSE Mathematics, June 2022, 1MA1/3H, Question 7. 3 marks.

Find the parallel sides

The full top width equals SV = 3x + 5. Hence QU = (3x + 5) − 2x = x + 5. The other parallel side RV = 5.

Apply the trapezium formula

Height = 4x. A = ½[(x + 5) + 5] × 4x = 2x(x + 10) = $2x^2 + 20x$.

Answer: A = $2x^2 + 20x$, as required.

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 17

Sector area using a radius found by the cosine rule

Source: Pearson Edexcel GCSE Mathematics, June 2023, 1MA1/3H, Question 14. 4 marks.

Find radius OB

In triangle AOB, $OB^2 = 9^2 + 6^2 - 2 \times 9 \times 6 \times \cos 35° = 28.531579...$ cm².

Calculate the sector area

Area OBC = $(80/360)\pi \times OB^2 = (80/360)\pi \times 28.531579... = 19.918799...$ cm².

Answer: 19.9 cm² (3 significant figures)

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 18

Area of a triangle in a regular heptagon

Source: Pearson Edexcel GCSE Mathematics, Nov 2022, 1MA1/3H, Question 26. 5 marks.

Find the vertex angle

Angle GAB = (7 − 2) × 180°/7 = 900°/7 = 128.571428...°.

Use the given area

Let AB = AG = s. Then 30 = ½s² sin(900°/7), so s = √[60/sin(900°/7)] = 8.760301... cm.

Find GB

Bisect the isosceles triangle. GB = 2s sin[(900°/7)/2] = 15.785517... cm. Retain full values until rounding.

Answer: 15.8 cm (3 significant figures)

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 19

Angle of a major sector from its area

Source: Pearson Edexcel GCSE Mathematics, Nov 2023, 1MA1/3H, Question 12. 2 marks.

Use the shaded sector

The marked angle x is the reflex angle inside the shaded region. $(x/360)\pi \times 6.2^2 = 82.6$.

Rearrange

$x = 82.6 \times 360/(\pi \times 6.2^2) = 246.234723...°$. This exceeds 180°, as expected for the major sector.

Answer: 246° (3 significant figures)

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 20

Sector angle from perimeter

Source: Pearson Edexcel GCSE Mathematics, Nov 2024, 1MA1/3H, Question 11. 3 marks.

Find arc length

Perimeter includes two radii. Arc length = $34.3 - 2 \times 4.7 = 24.9$ m.

Find the angle

$\theta/360 = 24.9/(2\pi \times 4.7)$. Hence $\theta = 24.9 \times 360/(9.4\pi) = 303.545725...°$. This is the requested reflex angle.

Answer: 304° (nearest degree)

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 21

Trapezium area using similar triangles

Source: Pearson Edexcel GCSE Mathematics, Nov 2024, 1MA1/3H, Question 13. 3 marks.

Find AB

Triangles ABE and ACD are similar. AB/AC = BE/CD = 4.2/6.3 = 2/3. AB = 10.8 × 2/3 = 7.2 cm.

Find the trapezium height

BC = AC − AB = 10.8 − 7.2 = 3.6 cm. The right angles show BC is perpendicular to the parallel sides BE and CD.

Calculate area

Area BCDE = ½(4.2 + 6.3) × 3.6 = 18.9 cm².

Answer: 18.9 cm²

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 22

Triangle area from three side lengths

Source: Pearson Edexcel GCSE Mathematics, Nov 2024, 1MA1/3H, Question 17. 4 marks.

Find angle A using the cosine rule

$\cos A = (14.6^2 + 7.9^2 - 18.2^2)/(2 \times 14.6 \times 7.9) = -0.241329\ldots$. Hence $A = 103.965050\ldots°$.

Calculate area

Area $= \frac{1}{2} \times 14.6 \times 7.9 \times \sin A = 55.965454\ldots$ cm². Keep the obtuse angle and full calculator precision.

Answer: 56.0 cm² (3 significant figures)

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 23

Circle and semicircle area comparison

Source: AQA GCSE Mathematics, June 2019, 8300/1H, Question 9. 4 marks.

Find the two areas

Circle area = $\pi \times 10^2 = 100\pi$ cm². The semicircle diameter is 8 cm, so radius = 4 cm. Shaded area = $\frac{1}{2}\pi \times 4^2 = 8\pi$ cm².

Find the unshaded area

Unshaded area = $100\pi - 8\pi = 92\pi$ cm².

Compare

Unshaded ÷ shaded = $92\pi/(8\pi) = 11.5$. The unshaded area is 11.5 times the shaded area.

Answer: 11.5 times

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 24

Rectangle area with Pythagoras and a ratio

Source: AQA GCSE Mathematics, June 2019, 8300/2H, Question 7. 4 marks.

Find the rectangle height

Triangle ABC is right-angled at B. AB = $\sqrt{(17^2 - 8^2)} = \sqrt{225} = 15$ cm.

Find its width

BC : CD = 1 : 2 and BC = 8 cm, so CD = 16 cm. BD = 8 + 16 = 24 cm.

Calculate area

Area ABDE = $15 \times 24 = 360$ cm².

Answer: 360 cm²

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 25

Triangle areas sharing a side

Source: AQA GCSE Mathematics, June 2019, 8300/2H, Question 16. 4 marks.

Find AC

Triangle ACD is right-angled. $80.5 = \frac{1}{2} \times 14 \times AC$, hence $AC = 11.5$ cm.

Use the included angle in ABC

Area ABC $= \frac{1}{2} \times BC \times AC \times \sin BCA = \frac{1}{2} \times 19 \times 11.5 \times \sin 36° = 64.215538...$ cm².

Answer: 64.2 cm² (3 significant figures)

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 26

Trapezium area using a trigonometric height

Source: AQA GCSE Mathematics, June 2019, 8300/2H, Question 19. 4 marks.

Find the height

The difference between the parallel sides is 15 − 11 = 4 cm. In the right triangle on the left, tan 64° = h/4. Hence h = 4 tan 64° = 8.201215… cm.

Calculate area

A = ½(15 + 11) × h = 52 tan 64° = 106.615799… cm². The question gives no rounding instruction, so a suitable decimal approximation is shown.

Answer: Approximately 106.6 cm²

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Worked answer 27

Algebraic comparison of sector areas

Source: AQA GCSE Mathematics, June 2019, 8300/3H, Question 16. 2 marks.

Sector A

Area A = $(x/360)\pi(1.5r)^2 = (2.25x/360)\pi r^2 = \pi x r^2/160$.

Sector B

Area B = $(2x/360)\pi r^2 = \pi x r^2/180$.

Compare like quantities

For positive x and r, 1/160 > 1/180. Therefore sector A is larger. Equivalently A/B = 180/160 = 9/8 = 1.125. Tick Sector A.

Answer: Sector A

Checked against the corresponding official mark scheme. Explanations are written by QLS; alternative valid methods may earn marks.

Sources and coverage

27 Higher Tier questions, totalling 103 marks. Questions 1–5 retain the numbering of the earlier batch. Questions 6–27 add 22 distinct questions. No Foundation questions were needed for this set.

Each selected question and diagram was inspected, and each worked solution was checked against its corresponding official mark scheme. Question wording and diagrams are extracted from the original papers; QLS supplies the new numbering, presentation and worked explanations.

Source search for this set: Edexcel Higher Papers 1, 2 and 3 from June and November 2022, 2023 and 2024; AQA Higher Papers 1, 2 and 3 from June 2019. The references under the questions identify the exact sources used.

This is a completed 27-question practice set, not a claim of exhaustive coverage of every accessible paper. Older Edexcel sessions and other AQA sessions remain outside this set’s checked question coverage. An OCR folder was not located in the search.

Topic 45 is Areas and Perimeters in the supplied 71-topic syllabus. Some questions also require algebra, similarity, Pythagoras, trigonometry or proof. Surface-area and volume questions, pressure questions, and area-under-graph questions have been excluded because their principal skills belong elsewhere.

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