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GCSE MATHEMATICS • GEOMETRY

Area and Perimeter

Worked Solutions

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • Calculator allowed

Full worked solutions for the free Area and Perimeter worksheet, GCSE and iGCSE Maths



Tap a section to jump straight to it

Full worked solutions for every question on the Area and Perimeter worksheet, in the same order and with the same question numbers.

How to mark your work. Tick each step you got right, not just the final answer. In the exam, method marks are given for correct working even when the final answer is wrong. If you lost marks, find the *first* line where your working is different from ours. That is the thing to fix.

In Section E: **M** = method mark, **P** = process mark, **A** = accuracy mark, **B** = independent mark, **C** = communication mark.

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Page 1 of 6

A**Your turn answers**

Compare each line of your working with the solution.

FOUNDATION

A1 $\frac{1}{2}(6+10) \times 7 = \boxed{56} \text{ cm}^2$

A2 Area = $12 \times 9 - 5 \times 4 = \boxed{88} \text{ cm}^2$ Missing sides 4 and 7 cm. Perimeter = $12 + 5 + 5 + 4 + 7 + 9 = \boxed{42} \text{ cm}$

A3 $r = 6$ $C = 12\pi \approx \boxed{37.7} \text{ cm}$ $A = 36\pi \approx \boxed{113.1} \text{ cm}^2$

HIGHER

A4 $\frac{140}{360} \times 2\pi \times 9 = 7\pi \approx \boxed{22.0} \text{ cm}$

A5 $\frac{72}{360} \times \pi \times 100 = 20\pi \approx \boxed{62.8} \text{ cm}^2$

A6 $\frac{\theta}{360} \times 36\pi = 15\pi$, so $\frac{\theta}{360} = \frac{15}{36}$ $\theta = \boxed{150}^\circ$

A7 Square $8 \times 8 = 64$. Quarter circle $\frac{1}{4} \times \pi \times 8^2 = 16\pi$ $\boxed{64 - 16\pi} \text{ cm}^2$

B**Fluency solutions**One mark for each correct part. The notes in *italics* explain why each sequence was chosen.**FOUNDATION**

B1 (a) $\boxed{28} \text{ cm}^2$ (b) $\frac{1}{2} \times 8 \times 5 = \boxed{20} \text{ cm}^2$ (c) $9 \times 6 = \boxed{54} \text{ cm}^2$ (d) $\frac{1}{2}(4+10) \times 5 = \boxed{35} \text{ cm}^2$

Always use the perpendicular height, never a slanted side.

B2 (a) $15 - 9 = \boxed{6} \text{ cm}$ (b) side 7: $\boxed{28} \text{ cm}$ (c) width 5: $\boxed{34} \text{ cm}$ (d) $\boxed{9} \text{ cm}$

B3 (a) $6\pi \approx \boxed{18.8} \text{ cm}$ (b) $9\pi \approx \boxed{28.3} \text{ cm}^2$ (c) $10\pi \approx \boxed{31.4} \text{ cm}$ (d) $r = 5$: $25\pi \approx \boxed{78.5} \text{ cm}^2$



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B4 (a) $8\pi \approx 25.1 \text{ cm}^2$ (b) $9\pi \approx 28.3 \text{ cm}^2$ (c) $5\pi + 10 \approx 25.7 \text{ cm}$ (d) $3\pi + 12 \approx 21.4 \text{ cm}$

A perimeter includes the straight edges as well as the arc.

B5 (a) $1 \text{ m}^2 = 10\,000 \text{ cm}^2$: $30\,000 \text{ cm}^2$ (b) 4.5 m^2 (c) $1 \text{ cm}^2 = 100 \text{ mm}^2$: 250 mm^2

B6 (a) $2 \times 24 \div 8 = 6 \text{ cm}$ (b) $2 \times 45 \div 18 = 5 \text{ cm}$ (c) $31.4 \div 2\pi \approx 5 \text{ cm}$ (d) $\sqrt{50.3 \div \pi} \approx 4 \text{ cm}$

HIGHER

B7 (a) $2\pi \text{ cm}$ (b) $6\pi \text{ cm}$ (c) $20 + 2.5\pi \approx 27.9 \text{ cm}$ (d) $4\pi \text{ cm}$

B8 (a) 12π (b) 10π (c) 30π (d) 60π (all cm^2)

B9 (a) $\frac{5\pi}{20\pi} \times 360 = 90^\circ$ (b) $\frac{1}{6}\pi r^2 = 24\pi$, $r^2 = 144$: 12 cm (c) $\frac{110}{360} \times 2\pi r = 11\pi$: 18 cm (d) arc = 4π : 72°

B10 (a) $100 - 25\pi$ (b) $49\pi - 16\pi = 33\pi$ (c) $24 + 8\pi \text{ cm}$ (d) $36 + 4.5\pi$ (areas in cm^2)

C

Reasoning solutions

Your wording can be different. Check that your reason makes the same point.

FOUNDATION

C1 $2\pi r$ is the circumference. The area is $\pi r^2 = 25\pi \approx 78.5 \text{ cm}^2$

C2 He used the diameter. The radius is 4 cm , so the area is $\pi \times 4^2 = 16\pi$

C3 The two edges of the cut-out corner are the same lengths as the parts of the rectangle's sides that were removed, just moved inwards, so the total length is unchanged.

C4 $\frac{1}{2}(6+8) \times 5 = \frac{1}{2} \times 14 \times 5 = 35 \text{ cm}^2$, as required



HIGHER

C5 The whole circumference is $2\pi r$ for 360° . A sector of angle θ is the fraction $\frac{\theta}{360}$ of the circle, so its arc is that fraction of $2\pi r$

C6 The area is multiplied by 4, because the area depends on r^2 and $2^2 = 4$

C7 $P: \frac{80}{360} \times 36\pi = 8\pi$ $Q: \frac{180}{360} \times 16\pi = 8\pi$ Both are $8\pi \text{ cm}^2$

C8 (a) Perimeter $= 2r + \frac{\theta}{360} \times 2\pi r$. Area $= \frac{\theta}{360} \times \pi r^2$. Set them equal and divide by r : $2 + \frac{\pi\theta}{180} = \frac{\pi\theta r}{360}$

Multiply by $\frac{360}{\pi\theta}$: $r = \frac{720}{\pi\theta} + 2$, as required

(b) $\frac{720}{90\pi} + 2 = \frac{8}{\pi} + 2 \approx 4.55 \text{ cm}$

D

Problem solving solutions

There is often more than one correct method. Any complete, correct method scores full marks.

FOUNDATION

D1 Area $= 5 \times 2.4 - 1.5 \times 1.2 = 12 - 1.8 = 10.2 \text{ m}^2$ $10.2 \div 4 = 2.55$, so 3 tins $3 \times 12 = \text{£}36$

D2 Fence $= 12 + 12 + 8 + \frac{1}{2} \times \pi \times 8 = 32 + 4\pi \approx 44.6 \text{ m}$ $44.6 \div 5 = 8.9 \dots$, so 9 lengths

D3 Split into 14×4 and 9×6 : $56 + 54 = 110 \text{ cm}^2$

D4 One turn $= 60\pi \approx 188.5 \text{ cm}$ $100\,000 \div 188.5 \approx 530.5$ 530 complete turns

HIGHER

D5 (a) $200 + 60\pi \approx 388.5 \text{ m}$ (b) $100 \times 60 + \pi \times 30^2 = 6000 + 900\pi \approx 8827.4 \text{ m}^2$

D6 Quarter circle 16π , triangle $\frac{1}{2} \times 8 \times 8 = 32$ $16\pi - 32 \approx 18.3 \text{ cm}^2$



D7 Square: side 10, area 100. Circle: $r = \frac{40}{2\pi} = \frac{20}{\pi}$, area $\frac{400}{\pi} \approx 127.3$ The circle, by about **27.3** cm²

D8 (a) Square $4x^2$; two semicircles of radius x make a circle, πx^2 . So $4x^2 + \pi x^2 = 100$, i.e. $x^2(4 + \pi) = 100$

(b) $x = \frac{10}{\sqrt{4 + \pi}} \approx 3.742$. Perimeter = $2x + 2x + 2\pi x = (4 + 2\pi)x \approx 38.5$ cm

E**Exam practice solutions**

Marks are shown on the right of each line.

FOUNDATION

Foundation and Higher crossover

E1 $\frac{1}{2}(7 + 13) \times 6$ M1 M1
 = **60** cm² A1

E2 (a) $2 \times \pi \times 7$ M1
 = **44.0** cm A1
 (b) $\pi \times 49 \approx$ **153.9** cm² B1

E3 Split: $15 \times 6 = 90$ and $10 \times 5 = 50$ M1 M1
 $90 + 50 =$ **140** cm² A1

E4 Arc = $\frac{1}{2} \times \pi \times 16 = 8\pi$ M1
 Add the diameter: $8\pi + 16$ M1
 $\approx$ **41.1** cm A1

E5 $450 \div 30 = 15$ and $330 \div 30 = 11$ M1 M1
 $15 \times 11 =$ **165** tiles A1

HIGHER

E6 Arc = $\frac{75}{360} \times 2\pi \times 12 = 5\pi$ M1
 Perimeter = $24 + 5\pi$ M1
 $\approx$ **39.7** cm A1



E7 $\frac{\theta}{360} \times 81\pi = 27\pi$ M1

$\frac{\theta}{360} = \frac{1}{3}$ M1

$\theta = 120^\circ$ A1

E8 Each quarter circle has area 25π M1

The two quarter circles overlap in the shaded part: $25\pi + 25\pi - 100$ M1 M1

$= 50\pi - 100 \text{ cm}^2$ A1

E9 (a) $\text{Area} = \frac{\theta}{360} \pi r^2 = \frac{1}{2}r \times \frac{\theta}{360} 2\pi r = \frac{1}{2}r \times \text{arc}$ B1

(b) $\text{Arc} = 22 - 2r$, so $\frac{1}{2}r(22 - 2r) = 30$ M1

$r^2 - 11r + 30 = 0$, $(r - 5)(r - 6) = 0$ M1

$r = 5$ or $r = 6$ A1

(c) $r = 6$: $\text{arc} = 10$. $\theta = \frac{10}{12\pi} \times 360 \approx 95.5^\circ$ B1

