

Exercise walk-through

C5.5

Compound shapes and parts of shapes

IGCSE Mathematics

You must be able to

- Split or subtract regions to find a compound area
- Count only exposed boundaries and surfaces
- Combine volumes without counting shared faces as outside area

1

The method

Method — Key knowledge: Compound shapes and parts of shapes

Split a compound region into familiar shapes and add their areas, or subtract a missing region from a larger one. Perimeter uses only the outside boundary, not internal joins. Add volumes of nonoverlapping solids; subtract a cavity's volume. For exposed surface area, remove the faces hidden at joins and include any exposed cavity walls. Keep exact π until rounding.

Exercises 2.1·2.3

2.1 A 9×7 cm rectangle has a 3×2 cm corner cut out. Find the remaining area. [2]

2.2 A circle of radius 2 cm is cut from a square of side 6 cm. Find the remaining area in terms of π . [2]

2.3 Two cuboids of volumes 36 and 54 cm^3 are joined without overlap. Find the total

Exercises 2.1·2.3

2.1 A 9×7 cm rectangle has a 3×2 cm corner cut out. Find the remaining area. [2]

2.1

- $A = 9(7) - 3(2) = \mathbf{57 \text{ cm}^2}$.

2.2 A circle of radius 2 cm is cut from a square of side 6 cm. Find the remaining area in terms of π . [2]

2.2

- $A = s^2 - \pi r^2 = 36 - 4\pi \text{ cm}^2$; the full answer is $(36 - 4\pi) \text{ cm}^2$.

2.3 Two cuboids of volumes 36 and 54 cm^3 are joined without overlap. Find the total

2.3

- $V = V_1 + V_2 = 36 + 54 = \mathbf{90 \text{ cm}^3}$.

Exercise 2.4

2.4 Find the volume of half a sphere of radius 6 cm in terms of π . [2]

3 Exam-style questions

Exercise 2.4

2.4 Find the volume of half a sphere of radius 6 cm in terms of π . [2]

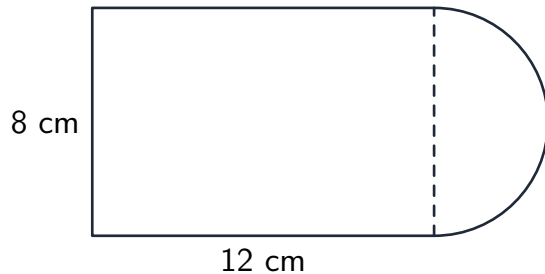
3 Exam-style questions

2.4

- $V = (1/2)(4\pi r^3/3) = (1/2)(4\pi(6)^3/3) = \mathbf{144\pi \text{ cm}^3}$.

Exercise 3.1 (a)

3.1 Apply the compound shapes and parts of shapes methods below. Show working and include units where appropriate.

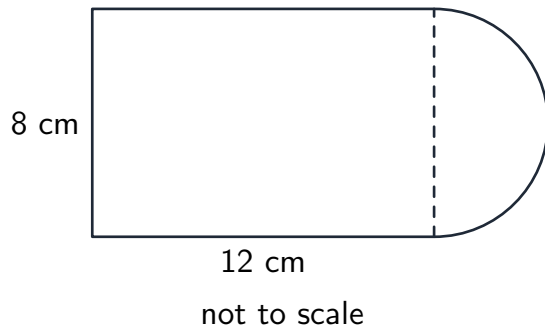


not to scale

(a) A 12×8 cm rectangle has a semicircle attached along an 8 cm side. Find the total area in terms of π . [2]

Exercise 3.1 (a)

3.1 Apply the compound shapes and parts of shapes methods below. Show working and include units where appropriate.



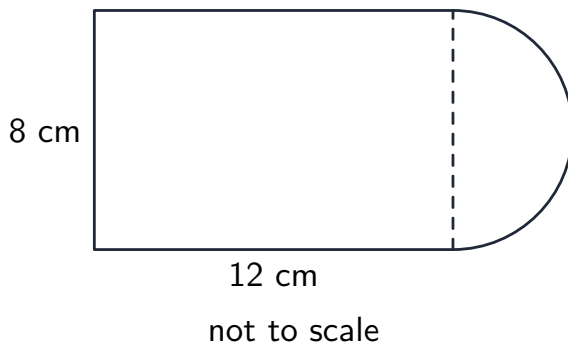
(a) A 12×8 cm rectangle has a semicircle attached along an 8 cm side. Find the total area in terms of π . [2]

(a)

- $r = 8/2 = 4$; $A = 12(8) + \frac{1}{2}\pi(4)^2 = \mathbf{96 + 8\pi \text{ cm}^2}$.

Exercise 3.1 (b)

3.1 Apply the compound shapes and parts of shapes methods below. Show working and include units where appropriate.

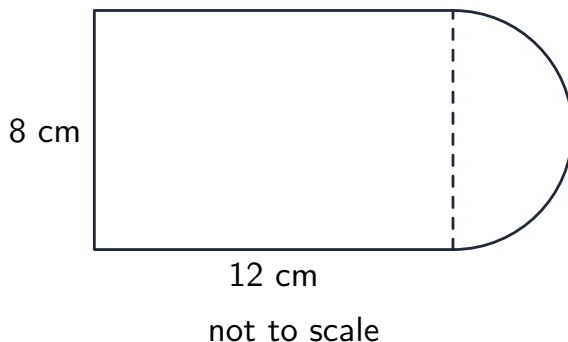


(b) Find the outside perimeter in terms of π .

[2]

Exercise 3.1 (b)

3.1 Apply the compound shapes and parts of shapes methods below. Show working and include units where appropriate.



(b) Find the outside perimeter in terms of π .

[2]

(b)

- $P = 2(12) + 8 + \pi(4) = \mathbf{32 + 4\pi}$ cm.

Exercise 3.1 (c)

3.1 Apply the compound shapes and parts of shapes methods below. Show working and include units where appropriate.

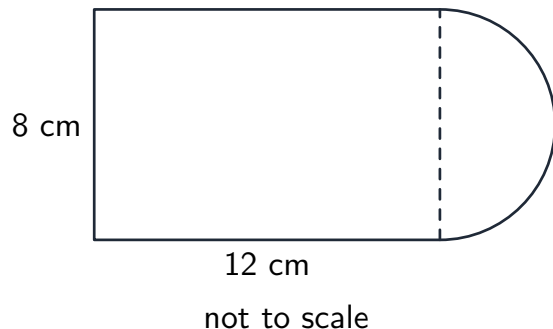


not to scale

(c) Two cubes of edge 3 cm are joined face to face. Find their combined exposed surface area. [2]

Exercise 3.1 (c)

3.1 Apply the compound shapes and parts of shapes methods below. Show working and include units where appropriate.



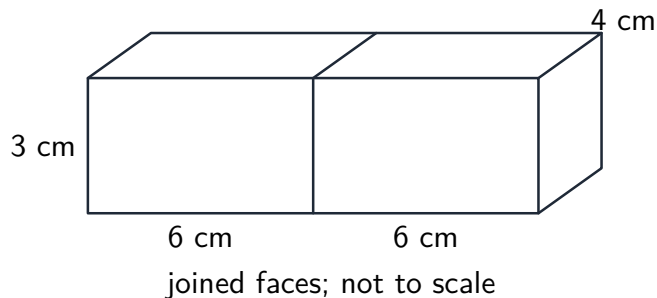
(c) Two cubes of edge 3 cm are joined face to face. Find their combined exposed surface area. [2]

(c)

- Two of the 12 faces are hidden: $S = (12 - 2)3^2 = \mathbf{90 \text{ cm}^2}$.

Exercise 3.2 (a)

3.2 Two cuboids each measure 6 cm by 4 cm by 3 cm. They join along their 4 cm by 3 cm faces to make one longer cuboid.

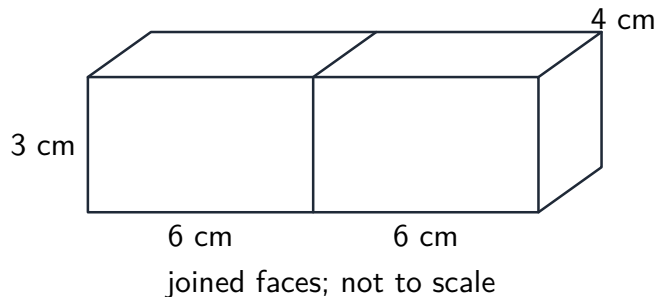


(a) Find the combined volume and state the dimensions of the new cuboid.

[3]

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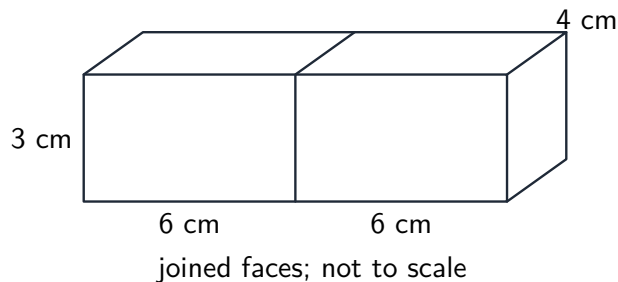
[3]

(a)

- Each volume is $V = lwh = 6(4)(3) = 72 \text{ cm}^3$.
- Combined $V_T = 2(72) = \mathbf{144 \text{ cm}^3}$.
- New dimensions are $\mathbf{12 \times 4 \times 3 \text{ cm}}$.

Exercise 3.2 (b)

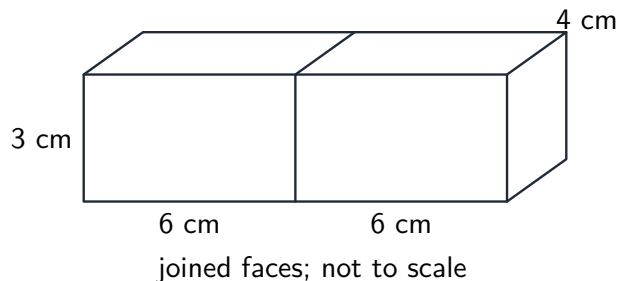
3.2 Two cuboids each measure 6 cm by 4 cm by 3 cm. They join along their 4 cm by 3 cm faces to make one longer cuboid.



(b) Find the exposed surface area by removing the joined faces from the two original surface areas. Check with the dimensions of the new cuboid. [3]

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(b) Find the exposed surface area by removing the joined faces from the two original surface areas. Check with the dimensions of the new cuboid. [3]

(b)

- Each surface is $S = 2(6 \times 4 + 6 \times 3 + 4 \times 3) = 108 \text{ cm}^2$.
- Exposed $S_T = 2(108) - 2(4 \times 3) = \mathbf{192 \text{ cm}^2}$.
- Check $S_T = 2(12 \times 4 + 12 \times 3 + 4 \times 3) = 192 \text{ cm}^2$.