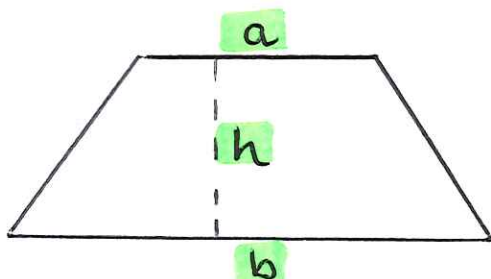


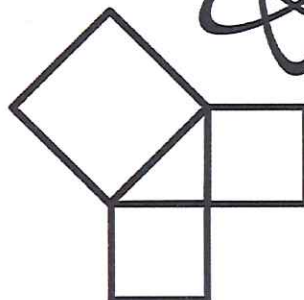
## GCSE TOPIC BOOKLET AREA OF A TRAPEZIUM

SOLUTIONS

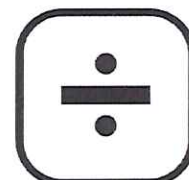
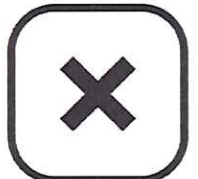
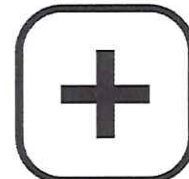
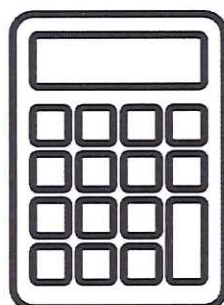
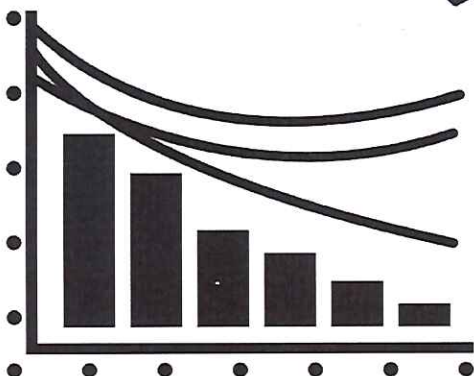
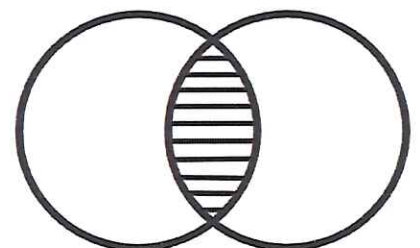
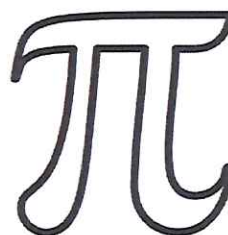
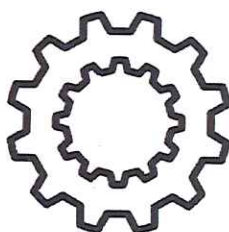
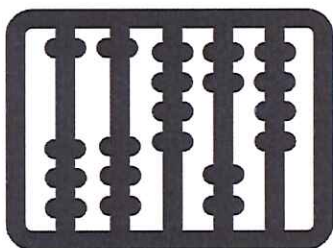
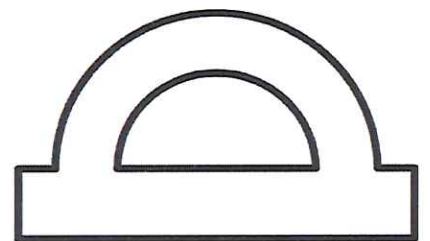
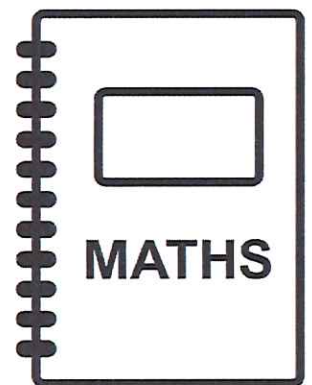


Area of a trapezium

$$= \frac{1}{2} (a+b) \times h$$



$$a^2 = b^2 + c^2$$



1. a)

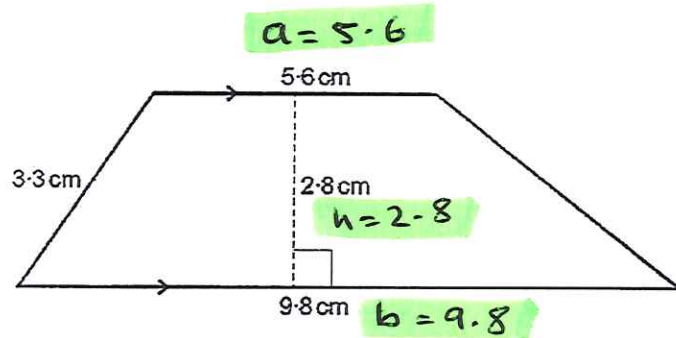


Diagram not drawn to scale

Calculate the area of the trapezium.  
Give the units for your answer.

[3]

$$\text{area} = \frac{1}{2} (a+b) \times h$$

$$= \frac{1}{2} (5.6 + 9.8) \times 2.8$$

$$= \frac{1}{2} (15.4) \times 2.8$$

$$= 7.7 \times 2.8$$

$$= \underline{\underline{21.56 \text{ cm}^2}}$$

b)

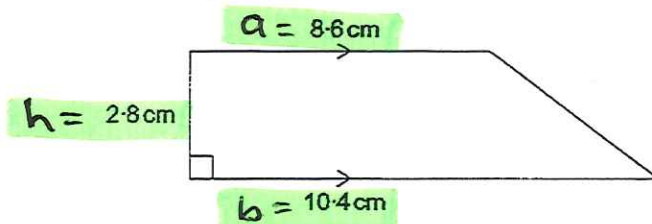


Diagram not drawn to scale

Calculate the area of the trapezium.

[2]

$$\text{area} = \frac{1}{2} (a+b) \times h$$

$$= \frac{1}{2} (8.6 + 10.4) \times 2.8$$

$$= \frac{1}{2} (19) \times 2.8$$

$$= 9.5 \times 2.8 = \underline{\underline{26.6 \text{ cm}^2}}$$

2.

The diagram shows a sail.

The top part of the sail is a triangle with perpendicular height  $x$  metres.

The bottom part of the sail is a trapezium with perpendicular height  $x$  metres.

The area of the triangle is  $12 \text{ m}^2$ .

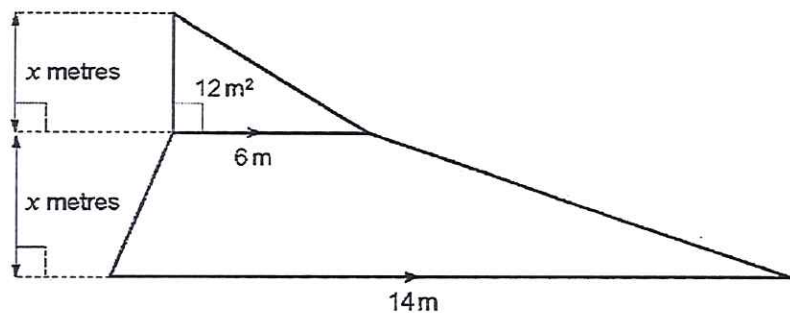


Diagram not drawn to scale

Calculate the area of the trapezium.

[4]

$$\text{Area triangle} = \frac{1}{2} (b \times h) = 12$$

$$b \times h = 24$$

$$6 \times h = 24$$

$$h = 4 \text{ m}, \quad x = 4$$

$$\text{Area trapezium} = \frac{1}{2} (a + b) \times h$$

$$= \frac{1}{2} (6 + 14) \times 4$$

$$= \frac{1}{2} (20) \times 4$$

$$= 40 \text{ m}^2$$

3.

A company sponsoring a sports event intends to spray-paint its logo onto the pitch.

The logo is in the shape of a semicircle on top of a trapezium as shown below.

$AB = 10\text{m}$ ,  $CD = 16\text{m}$  and the height of the trapezium is  $4\text{m}$ .

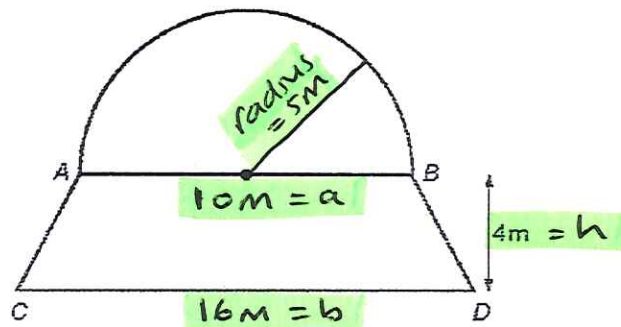


Diagram not drawn to scale

The company has bought enough paint to cover an area of  $125\text{m}^2$ .

What percentage of this paint will be required to cover the area of the logo?

[6]

$$\begin{aligned} \text{area circle with radius } 5\text{m} &= \pi r^2 = \pi \times 5^2 \\ &= 78.5398 \dots \end{aligned}$$

$$\begin{aligned} \text{area of semi circle} &= 78.5398 \div 2 = 39.2699 \dots \\ &= 39.27\text{m}^2 \end{aligned}$$

$$\begin{aligned} \text{area of trapezium} &= \frac{1}{2}(a+b) \times h \\ &= \frac{1}{2}(10+16) \times 4 = \frac{1}{2}(26) \times 4 \\ &= 52\text{m}^2 \end{aligned}$$

$$\text{Total area} = 52 + 39.27 = 91.27\text{m}^2$$

$$\begin{aligned} \% \text{ of paint required} &= \frac{91.27}{125} \times 100 \\ &= 73.016 \\ &= 73\% \end{aligned}$$

4.

The dimensions of a playing field  $ABCDEF$  are shown on the diagram below.

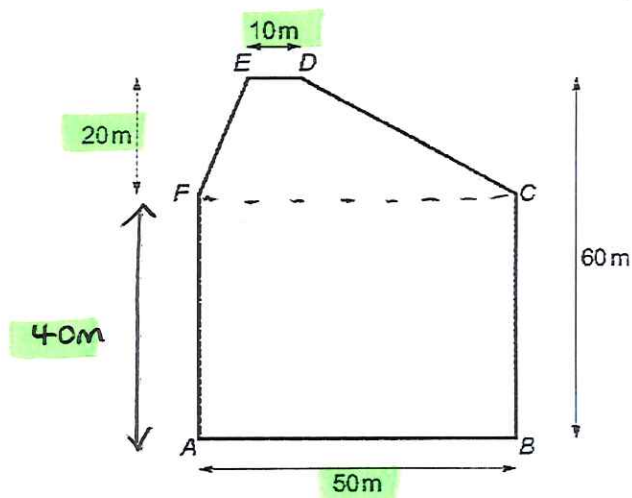


Diagram not drawn to scale

$ABCF$  is a rectangle and sides  $AB$  and  $ED$  are parallel.

Calculate the area of the playing field.

[4]

$$\text{Area of a rectangle} = L \times W = 50 \times 40 = 2000 \text{ m}^2$$

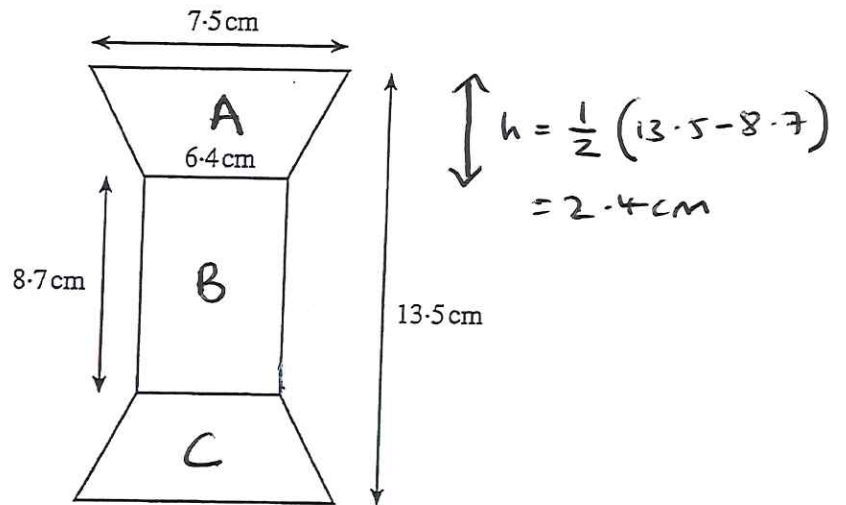
$$\text{Area of a trapezium} = \frac{1}{2}(a+b) \times h$$

$$= \frac{1}{2}(10 + 50) \times 20$$

$$= \frac{1}{2}(60) \times 20 = 600 \text{ m}^2$$

$$\text{Area of playing field} = 2000 + 600 = 2600 \text{ m}^2$$

5. The diagram represents the uniform cross-section of a girder. It consists of a rectangle of dimensions 6.4 cm by 8.7 cm, with a trapezium on each end. The two trapezia are congruent shapes with parallel sides of length 6.4 cm and 7.5 cm. The overall height of the girder is 13.5 cm.



Calculate the area of the cross-section of the girder.

area rectangle B =  $L \times W = 8.7 \times 6.4 = 55.68 \text{ cm}^2$

area trapezium A =  $\frac{1}{2} (a+b) \times h = \frac{1}{2} (7.5 + 6.4) \times 2.4$   
 $= 16.68 \text{ cm}^2$

area trapezium B = area trapezium A =  $16.68 \text{ cm}^2$

Area of cross section of girder

$= 16.68 \times 2 + 55.68 = 89.04 \text{ cm}^2$

[4]

6.

A plot of land labelled  $ABCD$  is shown below.  
 $AB$  is parallel to  $DC$  and  $BC$  is perpendicular to  $AB$ .  
 $AB = 100$  metres and  $DC = 40$  metres.

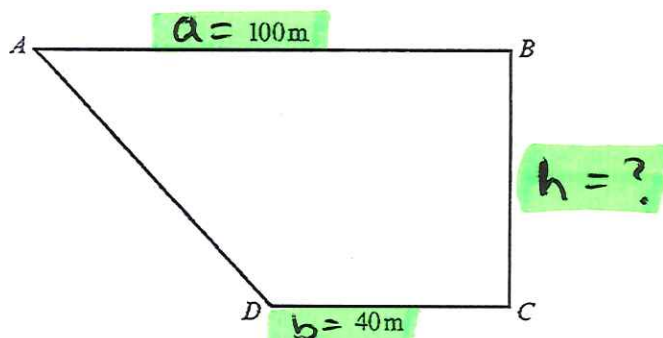


Diagram not drawn to scale

The area of this plot of land is  $3500\text{m}^2$ .

A cable is to be laid from point  $B$  to point  $C$ .

Calculate the length of this cable.

$$\text{area} = \frac{1}{2}(a+b) \times h$$

$$3500 = \frac{1}{2}(100+40) \times h$$

$$7000 = 140 \times h$$

$$\frac{7000}{140} = h$$

$$h = 50\text{m}$$

$$\underline{\underline{\text{length of cable} = 50\text{m}}}$$

[4]

7. The diagram shows a trapezium.

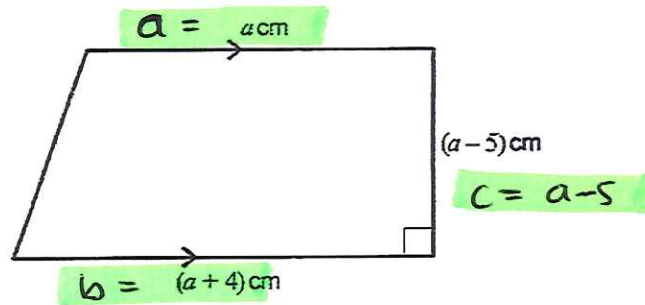


Diagram not drawn to scale

- (a) Show that the area of the trapezium is  $(a^2 - 3a - 10) \text{ cm}^2$ .  
You must show all your working.

[4]

$$\begin{aligned}
 \text{area} &= \frac{1}{2}(a+b) \times h \\
 &= \frac{1}{2}(a+a+4) \times (a-5) \\
 &= \frac{1}{2}(2a+4)(a-5) \\
 &= (a+2)(a-5) \\
 &= a^2 + 2a - 5a - 10 \\
 &= \underline{a^2 - 3a - 10}
 \end{aligned}$$

- (b) The area of the trapezium is  $30 \text{ cm}^2$ .  
Use an algebraic method to calculate the height of the trapezium.

[5]

$$\begin{aligned}
 a^2 - 3a - 10 &= 30 \\
 a^2 - 3a - 40 &= 0 \\
 (a-8)(a+5) &= 0 \\
 a &= 8 \text{ or } a = -5
 \end{aligned}$$

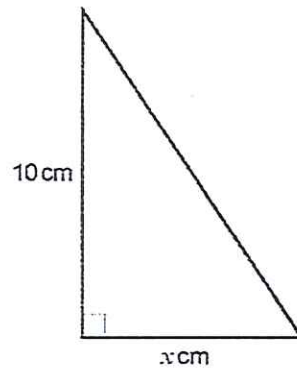
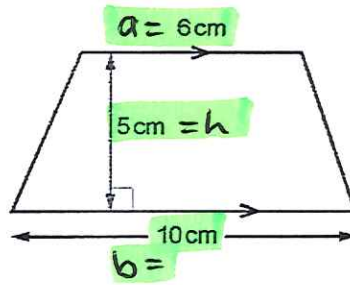
discard  $a = -5$  as cannot have a negative length

$$a = 8$$

$$\begin{aligned}
 \underline{\text{height of trapezium}} &= a - 5 \\
 &= 8 - 5 \\
 &= \underline{3 \text{ cm}}
 \end{aligned}$$

8.

The area of the trapezium is equal to the area of the right-angled triangle.



Diagrams not drawn to scale

Calculate the value of  $x$ .

[4]

$$\text{area of trapezium} = \frac{1}{2}(a+b) \times h$$

$$= \frac{1}{2}(6+10) \times 5$$

$$= \frac{1}{2}(16) \times 5 = 40\text{ cm}^2$$

$$\text{area triangle} = 40\text{ cm}^2$$

$$\frac{1}{2}(b \times h) = 40$$

$$b \times h = 80$$

$$x \times 10 = 80$$

$$x = \frac{80}{10}$$

$$x = 8\text{ cm}$$

9.

You will be assessed on the quality of your written communication in this question.

Rhodri has a tile in the shape of a trapezium.

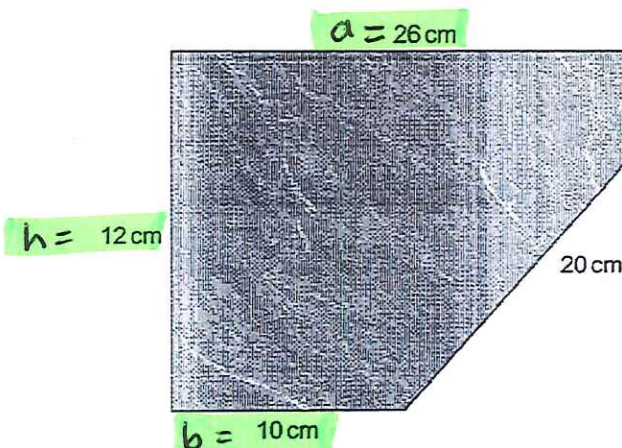


Diagram not drawn to scale

↓  
you must show  
all of your  
workings

Rhodri decides to cover the tile with gold leaf.

Gold leaf is bought as a book of sheets that can be cut to size without any waste.

Each sheet of gold leaf measures 2.7 cm by 4 cm.

A book of 5 sheets of gold leaf costs £15.50.



Calculate the cost of the gold leaf used to cover Rhodri's tile.

You must show all your working.

[7]

$$\begin{aligned} \text{Area of tile} &= \text{Area of trapezium} \\ &= \frac{1}{2}(a+b) \times h \end{aligned}$$

$$= \frac{1}{2}(26+10) \times 12 = 216 \text{ cm}^2$$

$$\text{Area of gold leaf} = L \times W = 2.7 \times 4 = 10.8 \text{ cm}^2$$

$$\text{Number of sheets needed} = 216 \div 10.8 = 20$$

$$\text{Sheets sold in books of 5. } \therefore 20 \div 5 = 4 \text{ books needed}$$

$$\text{Price} = 15.50 \times 4 = £62$$