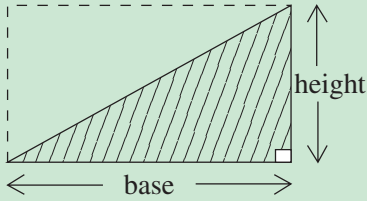


Shahanya wants to paint the two walls shown above. Each tin of paint will cover 11 m^2 . How many tins of paint will she need?

Triangles



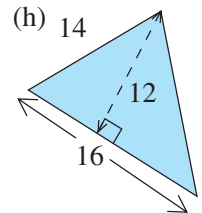
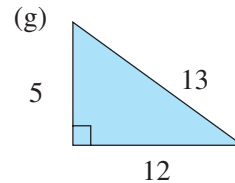
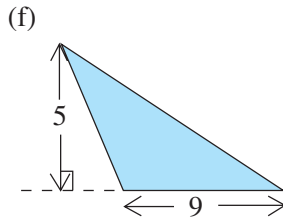
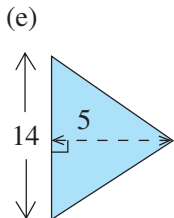
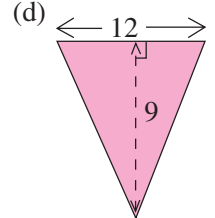
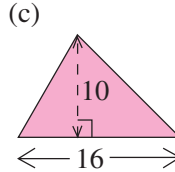
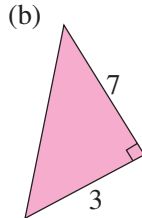
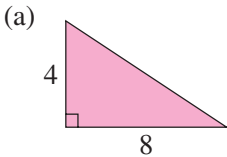
area of rectangle = base \times height

area of triangle = $\frac{1}{2}$ (area of rectangle)

area of triangle = $\frac{1}{2}$ (base \times height)

Exercise 2M

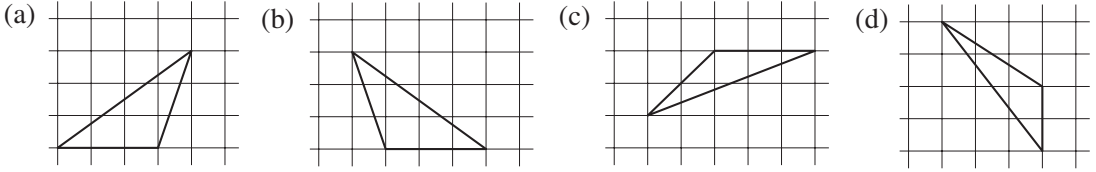
1 Find the area of each triangle. Lengths are in cm.



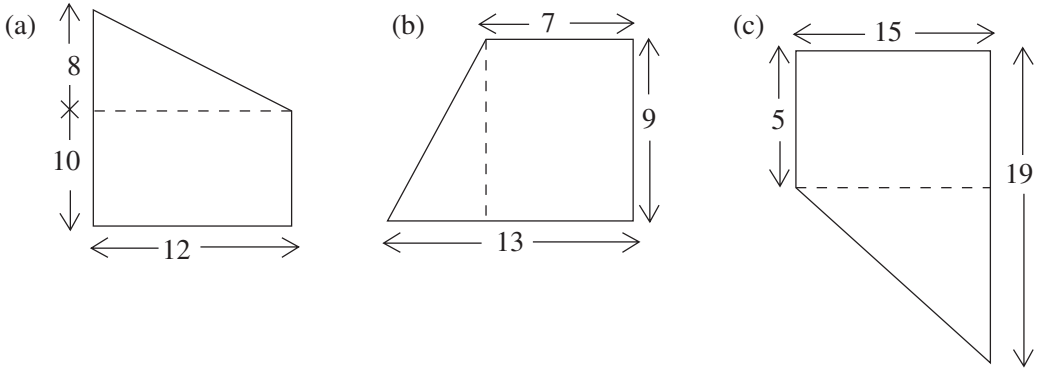
2 Copy and complete this table showing the measurements of triangles.

base	6 cm	8 cm	14 cm		7 cm
height	4 cm			30 cm	
area		36 cm^2	140 cm^2	90 cm^2	105 cm^2

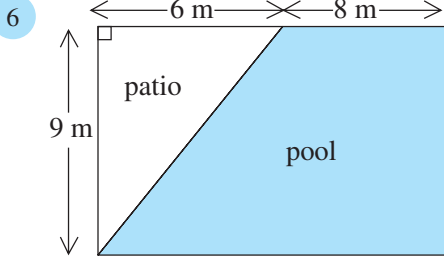
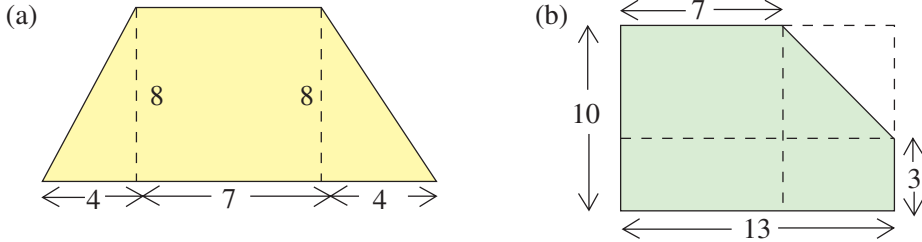
3 Find the area of each triangle. Give each answer in square units.



4 Find the total area of each shape. Lengths are in cm.



5 Find the total area of each shape. Lengths are in cm.



Calculate the area of the pool.

7

The area of the triangle is equal to the area of the rectangle. How long is the base of the triangle?

8 Calculate the length of each side marked x . The area is shown inside the triangle.

(a) (b) (c) (d)

9 Find the area coloured blue. Lengths are in cm.

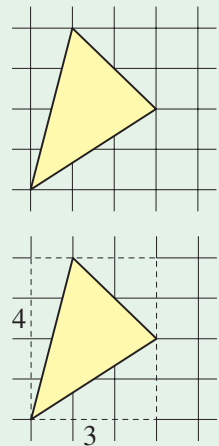
(a) (b)

Irregular shapes

It is not easy to find the exact area of the triangle shown because we do not know either the length of the base or the height.

We could measure both lengths but this would introduce a small error due to the inevitable inaccuracy of the measuring.

- A good method is to start by drawing a rectangle around the triangle. The corners of the triangle lie either on the sides of the rectangle or at a corner of the rectangle. Calculate the area of the rectangle. In this example:
 Area of rectangle = 3×4
 $= 12$ square units.



- Now find the areas of the three triangles marked A, B and C.

This is easy because the triangles each have a right angle.

Use the symbol ' ΔA ' to mean 'triangle A'

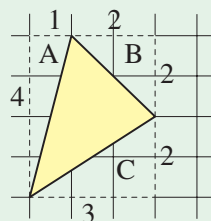
$$\text{Area of } \Delta A = \frac{4 \times 1}{2} = 2 \text{ square units}$$

$$\text{Area of } \Delta B = \frac{2 \times 2}{2} = 2 \text{ square units}$$

$$\text{Area of } \Delta C = \frac{3 \times 2}{2} = 3 \text{ square units}$$

Now we can find the area of the required triangle by subtracting the areas of ΔA , ΔB and ΔC from the area of the rectangle.

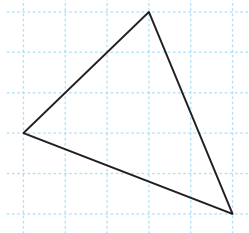
$$\begin{aligned} \text{Area of yellow triangle} &= 12 - [2 + 2 + 3] \\ &= 5 \text{ square units.} \end{aligned}$$



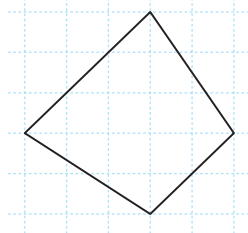
Exercise 2E

- 1 Find the area of each shape.

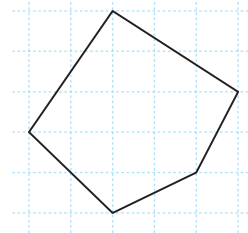
(a)



(b)



(c)



- 2 For each question, draw two axes from 0 to 6. Plot the points given and join them up in order. Find the area of each shape.

(a) (1, 3), (3, 4), (5, 1)

(b) (5, 1), (2, 4), (4, 6), (6, 5)

- 3 Do the same as question 2 with the two axes drawn from 0 to 7.

(a) (1, 7), (5, 5), (5, 2), (2, 3)

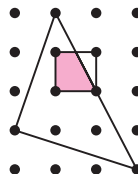
(b) (0, 3), (3, 7), (7, 2), (3, 2), (1, 1)

- 4 Do the same as question 2 with the two axes drawn from 0 to 10.

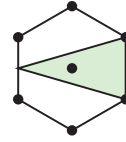
(a) (2, 1), (4, 8), (7, 8), (10, 6), (8, 2), (6, 4)

(b) (0, 2), (2, 4), (0, 8), (9, 7), (10, 2), (6, 4), (4, 1)

- 5 A triangle and a square are drawn on dotty paper with dots 1 cm apart. What is the area of the shaded region?



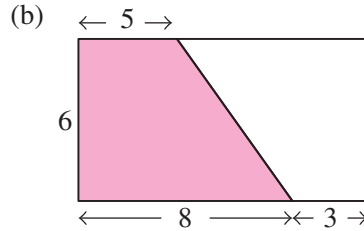
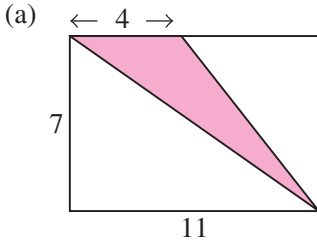
- 6 A triangle is drawn inside a regular hexagon. What is the area of the triangle as a fraction of the area of the hexagon?



Area problems

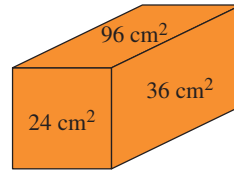
Exercise 3M

- 1 Find each area shaded pink. All the lengths are in cm.



- 2 A rectangle has a perimeter of 34 m and a length of 7.5 m. What is its area?

- 3 The diagram shows the areas of 3 faces of a rectangular box. What are the measurements of the box?



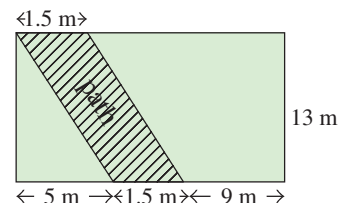
- 4 A floor measures 5 m by 4 m. It is to be covered by rectangular tiles measuring 80 cm by 50 cm. How many tiles are needed?

- 5 A picture measures 12 cm by 7 cm. It is surrounded by a border 3 cm wide. What is the area of the border?

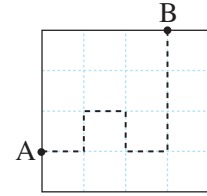


- 6 How many panes of glass 35 cm by 25 cm can be cut from a sheet which is 1 metre square?

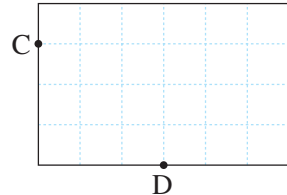
- 7 A path passing through a garden is shown opposite. Find the area of the shaded path.



8 A line starts at A and goes along the dotted lines to B. It divides the area of the rectangle into two halves.



(a) Draw a rectangle like the one below and draw a line from C to D which divides the area of the rectangle into two halves.

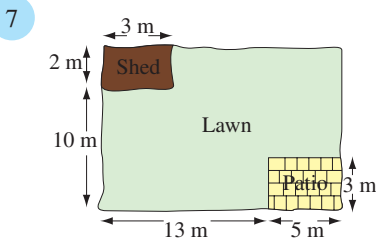
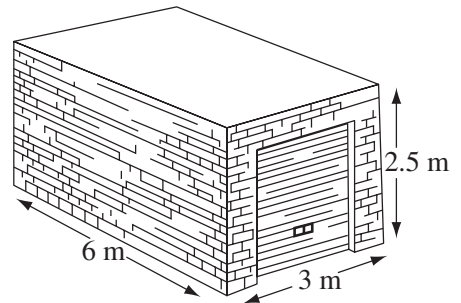


(b) Draw a second rectangle and draw a line from C to D which divides the area of the rectangle into two parts so that one part has *twice* the area of the other part.

Exercise 3E

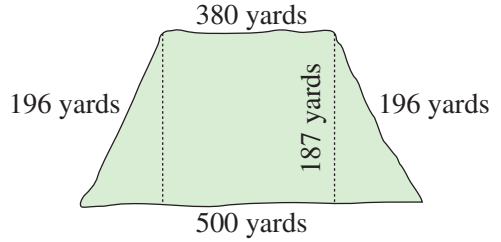
(Note that $10000 \text{ m}^2 = 1 \text{ hectare}$)

- 1 A rectangular field measures 0.8 km by 500 m. Find the area of the field in hectares.
- 2 A rectangular field 500 m long has an area of 7 hectares. Calculate the width of the field.
- 3 A groundsman has enough grass seed to cover 1.5 hectares. A tennis court measures 15 m by 40 m. How many courts can he cover with seed?
- 4 Farmland is sold at £3500 per hectare. How much would you pay for a piece of farmland in the shape of a right angled triangle with base 500 m and height 320 m?
- 5 A rectangular field 280 m long has an area of 3.5 hectares. Calculate the perimeter of the field.
- 6 A waterproofing spray is applied to the outside of the 4 walls, including the door, and the roof of the garage shown.
 - (a) Calculate the total area to be sprayed.
 - (b) The spray comes in cans costing £3.95 and each can is enough to cover 4 m^2 . How much will it cost to spray this garage? (Assume you have to buy full cans)

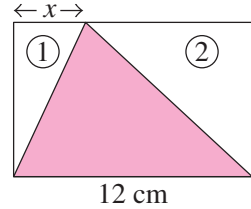


A gardener is using moss killer on his lawn. The instructions say that 4 measures of the mosskiller, in water, will treat 10 m^2 of lawn. The box contains 250 measures and costs £12.50. Find the area of the lawn and hence the cost of the moss killer required.

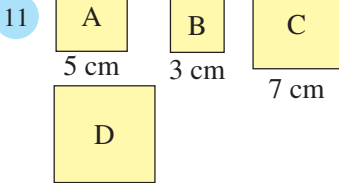
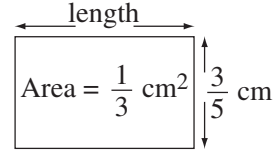
- 8 The field shown is sold at auction for £55 250.
Calculate the price *per acre* which was paid.
[1 acre = 4840 square yards]



- 9 The pink triangle is drawn inside a rectangle with longer side 12 cm.
- (a) If area of triangle (2) = 2 × (area of triangle (1)), find the length x .
- (b) If area of triangle (2) = 3 × (area of triangle (1)), find the length x .

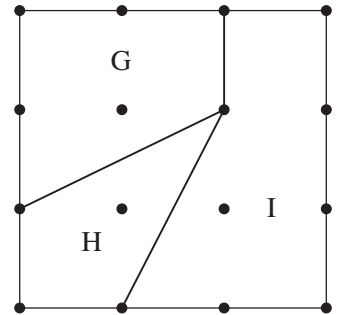
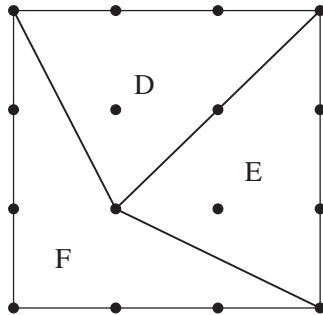
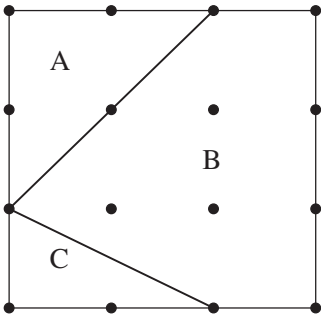


- 10 In a recent major survey of children's mathematical ability only 1 in 20 of fifteen year olds gave the correct answer to the following question:
'Find the length of the rectangle if the area is $\frac{1}{3} \text{ cm}^2$.'
Calculate the length.



The diagrams show squares A, B, C and D.
The sum of the areas of squares A, B, and C is equal to the area of square D.
Calculate the length of the side of square D.

- 12 Work out the areas of A, B, C, ..., I in the shapes below. The dots are 1 cm apart.



Investigation – area and perimeter

You need squared paper. Each side of the rectangles below must be a whole number.

Part A



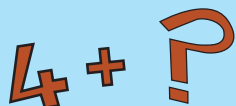
Draw four different rectangles which all have a *perimeter* of 24 cm.

Part B



Draw three different rectangles which all have an *area* of 24 cm^2 .

Part C



Draw at least four rectangles which have a perimeter of 20 cm.

- (1) Work out the area of each rectangle.
- (2) Which of your rectangles has the largest area?

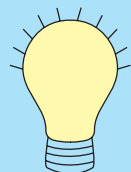
Part D



The perimeter of a new rectangle is 32 cm.

- (1) *Predict* what the sides of the rectangle will be so that it has the largest possible area.
- (2) Check by drawing different rectangles to see if your prediction was correct.

Part E

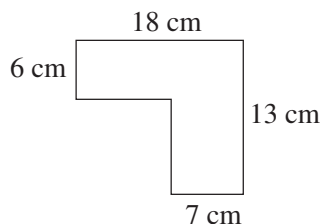


A rectangle has a perimeter of 100 cm. What are the length and width if the rectangle is to have the largest possible area? What is the largest possible area?

CHECK YOURSELF ON SECTION 1.6

1 Finding perimeters

(a) Find the perimeter of this shape



(b) A wall of perimeter 38 m surrounds a rectangular yard of length 12 m. What is the width of the yard?