CHAPTER

24

# Area

**Vocabulary:**

formula

**Chapter Outcomes:**

- Demonstrate an understanding of area of regular and irregular plane shapes.
- Develop and use proficiently formula to calculate area in problem solving.

Measuring the area of spaces is a skill that you can use in many careers like architecture, gardening, construction, interior design and engineering. One day when you have your own home you will want to remodel or decorate it. If you can measure area, it will help you to purchase the necessary decorative pieces to beautify your home.

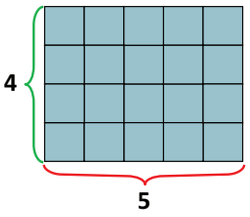
## Getting Ready for Chapter 24

**Complete the related multiplication sentence for the addition sentence below.**

**1.** 5 + 5 + 5 + 5 = 20

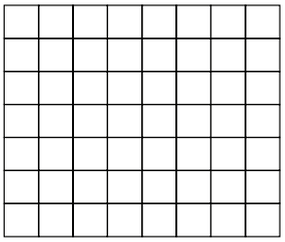
☐ × ☐ = ☐

**Use the area model to multiply.**




**2.** 5 × 4 = ☐

**3.** Shade an array to show 4 × 3 on the grid below.



**4.** Which figure shown below is the best for measuring the area of a rectangle?

## Measure Area

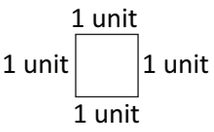
### Teaching Point 1:

*How do you measure area?*

**Area** is the number of square units needed to cover a region.

A **square unit** is a square with a side length of 1 unit. It has an **area** of 1 **square unit**.

Square Unit

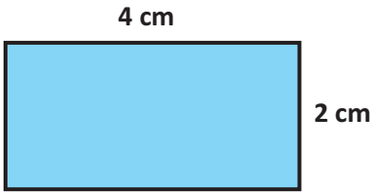



Area

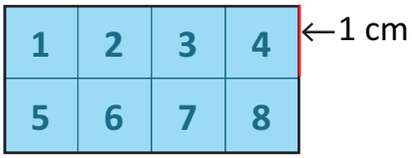
1 square unit

You can count the number of square units inside a figure to find its area in square units.

What is the area of the rectangle below?



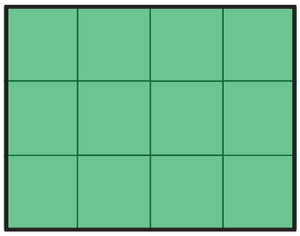

You can measure the area of the figure with **1-cm square tiles**. Then **count** the **square units** to find the area of the figure.

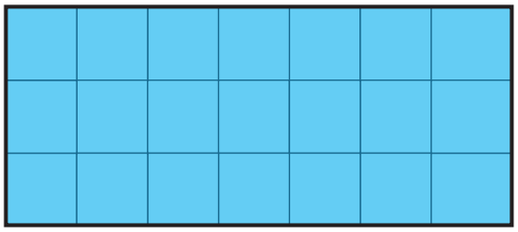


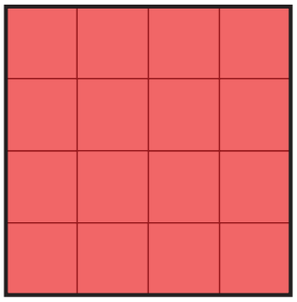

**Area** = 8 square centimetres or 8 $cm^2$

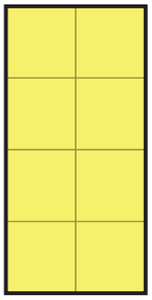
## Activity 1:

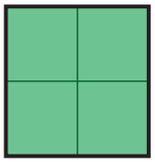
**Calculate the area of the figures below. Each shape is covered by 1 cm square tiles.**

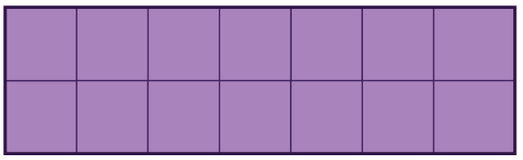
1. 

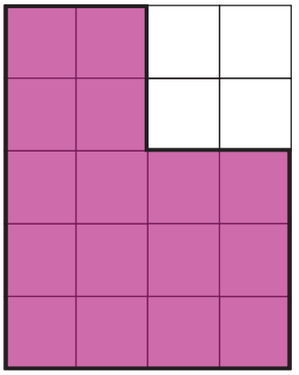
2. 

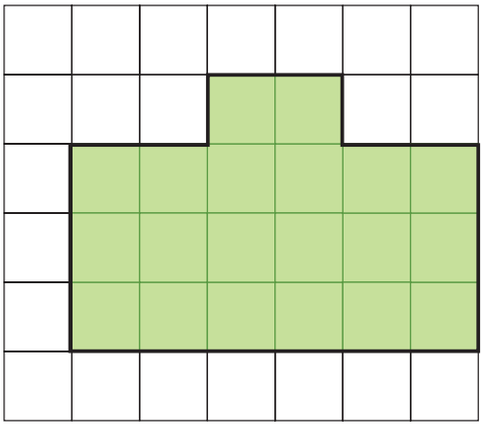
3. 

4. 

5. 

6. 

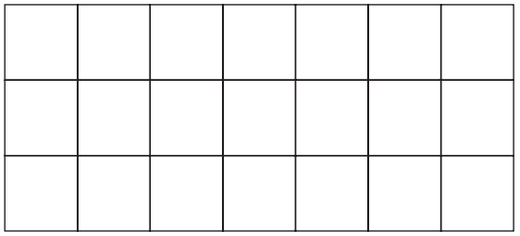
7. 

8. 

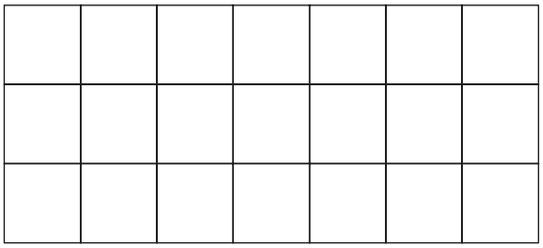
## Activity 2:

**Draw and shade figures on each grid to match the given area.**

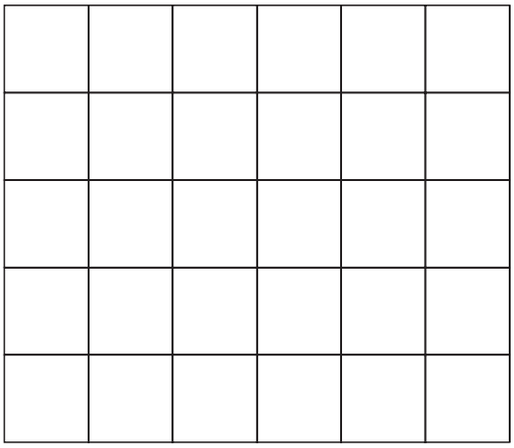
1. Area = 12 $cm^2$



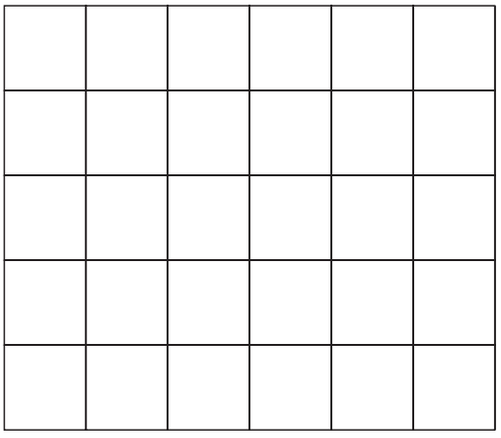
**2.** Area = 9 $cm^2$



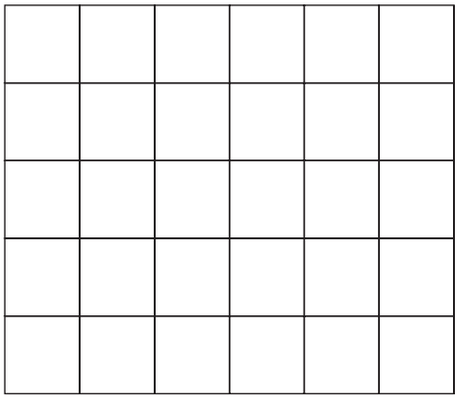
**3.** Area = 18 $cm^2$



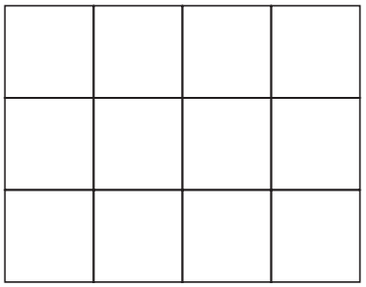
**4.** Area = 24 $cm^2$



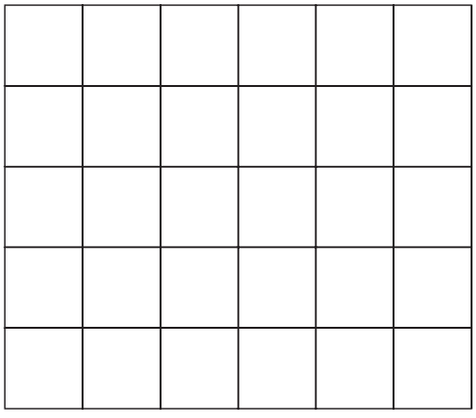
**5.** Area = 21 $cm^2$



**6.** Area = 4 $cm^2$



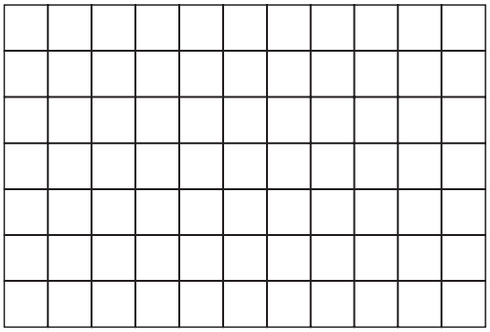
**7.** Area = 15 $cm^2$



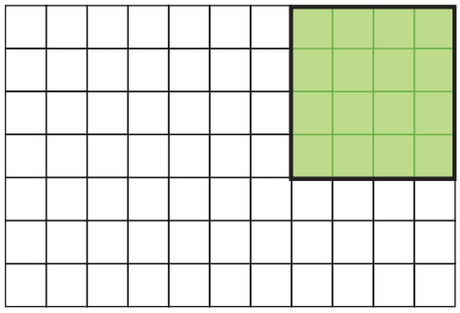
## Activity 3:

**Solve.**

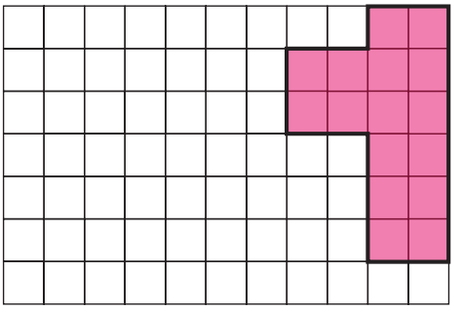
1. Draw a rectangle that has an area of 24 $cm^2$ and a perimeter of 22 cm. Assume the length of each square is 1 cm.



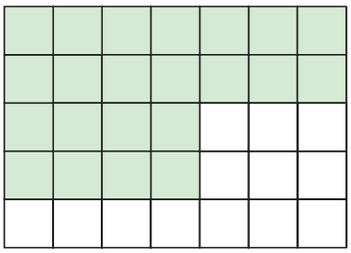
2. Draw a rectangle that has the same area as the square.



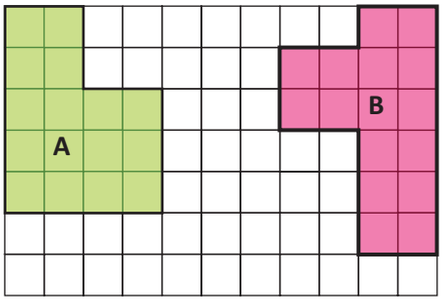
3. Draw a square that has the same area as the figure.



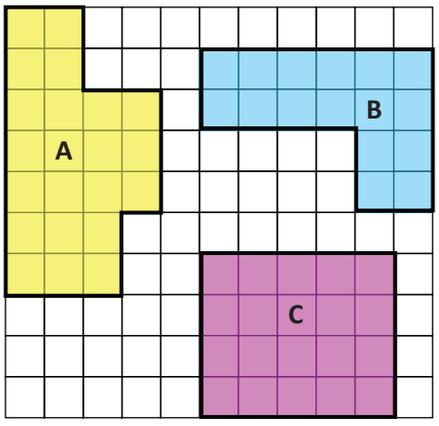
4. Angel is covering a sheet of paper with 1 cm square tiles. The green squares are completed. What area of the paper is still left to be covered?



5. Write <, > or = to compare the area of Shape A to Shape B.




6. Order the figures in the diagram below from greatest to least area.

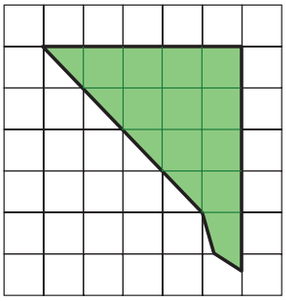


# Approximate Area of Surfaces

## Teaching Point 1:

*How can you approximate area?*

What is the area of shaded figure?



Use **rounding** to approximate the area of the figure.

1 square unit = 1 square unit

$\frac{1}{2}$ square unit = $\frac{1}{2}$ square unit

more than $\frac{1}{2}$ square unit = 1 square unit

less than $\frac{1}{2}$ square unit = 0 square unit

**Step 1: Count the different types of units.**

**Whole** square units → 10 square units

**More than** $\frac{1}{2}$ square unit → 1 square unit

$\frac{1}{2}$ square units → $\frac{1}{2} \times 4 = 2$ square units

**Step 1: Add the units.**

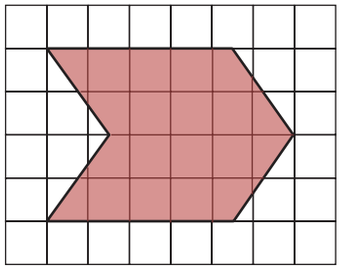
10 + 1 + 2 = 13 square units

So, the area of the shaded figure is 13 square units.

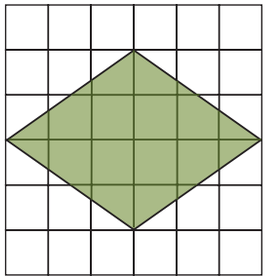
## Activity 1:

**Approximate the area of each shape. Each square in each grid is 1 cm².**

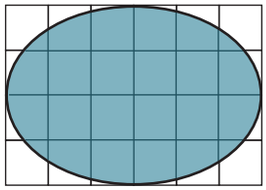
**1.**



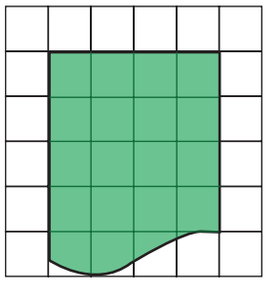
**2.**



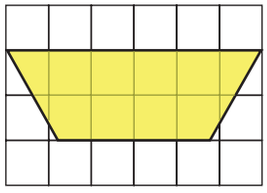
**3.**



**4.**



**5.**

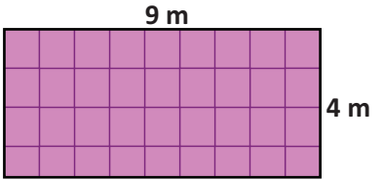


## Use Area Models to find Area

### Teaching Point 1:

*How do you use multiplication to find area of squares and rectangles?*

What is the area of the rectangular car park below?




There are 4 rows of square units.

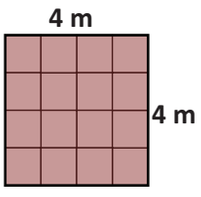
Each row has 9 squares units.

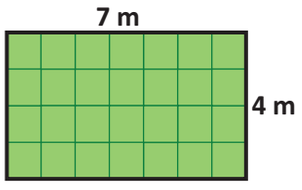
$9 + 9 + 9 + 9 = 36\ m^2$

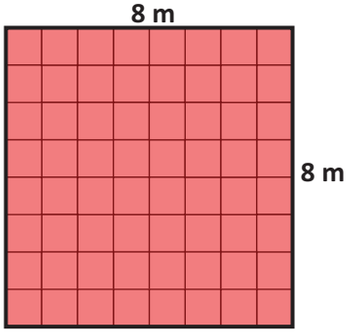
$9 \times 4 = 36\ m^2$

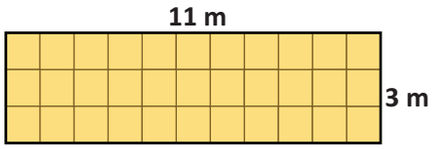
### Activity 1:

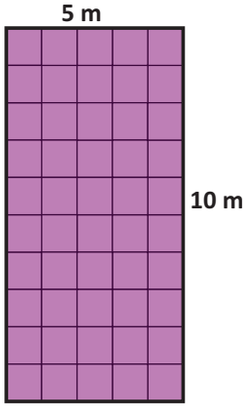
**Use repeated addition or multiplication to find each area.**

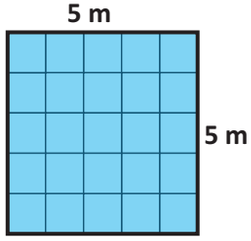
1. 


2. 

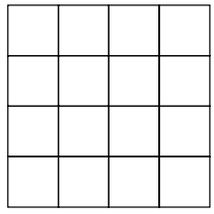

3. 


4. 

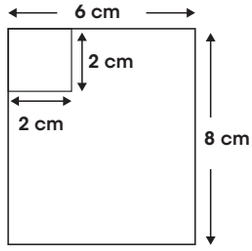

5. 


6. 


7. Leroy draws this diagram of his porch. Each square is 1 square metre. He wants to add 8 square metres to the porch. What will be the area of the new porch?



8. A rectangular piece of paper is 16 centimetres by 8 centimetres. How many squares each with a side length of 4 centimetres can be cut from the piece of paper?




9. Miss Charles wants to cut 2 cm squares from a rectangular sheet of paper measuring 6 cm by 8 cm, to make tickets.

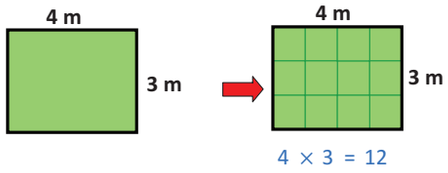
How many tickets can she cut from the paper?

## Use a Formula to Find Area

### Teaching Point 1:

*How can you find the area using a formula?*

What is the area of the rectangle?




Length = 4 m

Width = 3 m

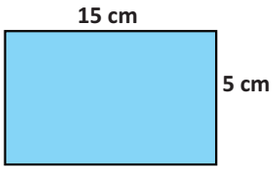
Area of rectangle = Length × Width

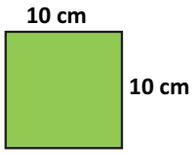
Area = 4 m × 3 m

= 12 $m^2$

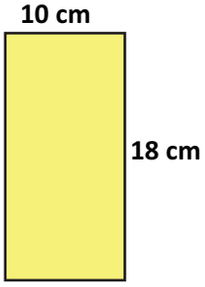
### Activity 1:

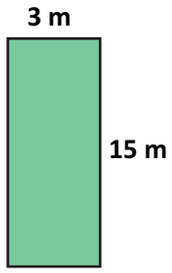
**Find the area of the rectangles and squares.**

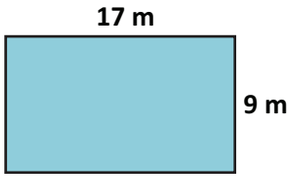
1. 

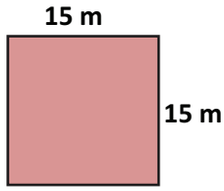

2. 


3. 


4. 


5. 


6. 


7. 


**Solve.**

8. The length of a rectangular porch is 15 metres and the width is 10 metres. Half of the porch is tiled. What is the area of the tiled region.

9. A square has a perimeter of 24 cm. What is the area of the square?

10. A table at the park is 6 metres long and 2 metres wide. What is the area of the rectangular surface of the table?

11. A rectangle has an area of 96 square metres. If the length of the rectangle is 12 metres, what is the width of the rectangle?

12. The area of a square is 64 sq cm. What is the perimeter of the square?

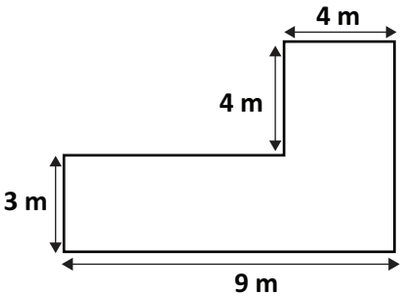
13. Joshua's room has a rectangular floor. He covers the floor with 45 square metres of carpet. If the width of the room is 9 metres, what is the perimeter of the room?

# Area of Compound Shapes

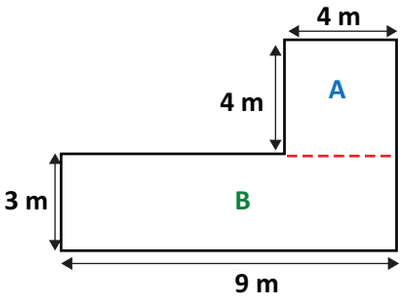
## Teaching Point 1:

*How can you break apart a compound shape to find the area?*

What is the area of the figure?




**Step 1:** **Break apart the figure into rectangles and squares.**




**Step 2:** **Find the area of both shapes.**

Area of A = 4 m × 4 m = 16 $cm^2$

Area of B = 9 m × 3 m = 27 $cm^2$

**Step 3:** **Combine the areas.**

Area of A + Area of B = Area of Figure

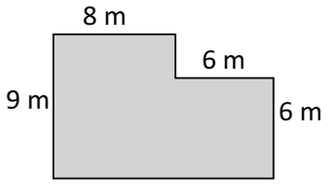
16 $m^2$ + 27 $m^2$ = 43 $m^2$

So, the area of the figure is 43 $m^2$.

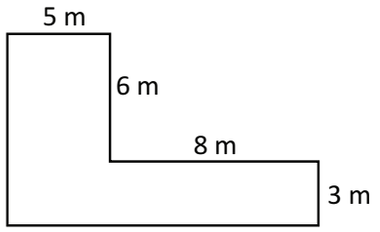
## Activity 1:

**Find the area of the compound shapes.**

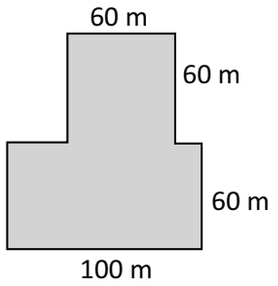
**1.**



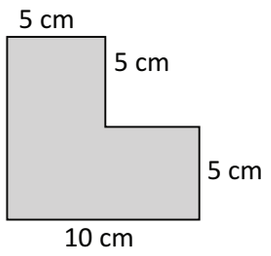

**2.**



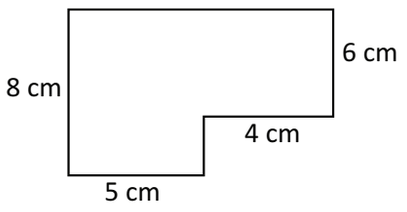

**3.**



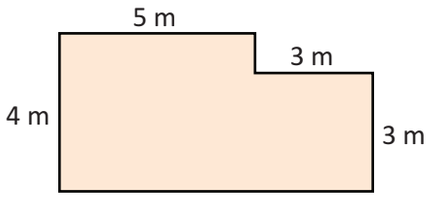

**4.**




**5.**




**6.**



# Multi-Step Problems Involving Area

## Teaching Point 1:

*How can you use area to solve problems?*

Follow the problem solving steps.

**Read the Problem**

What do I need to find?

What Information am I given?

**Plan you Strategy**

What is my strategy?

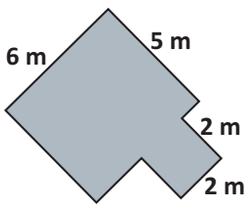
What conversions do I have to do?

**Solve the Problem**

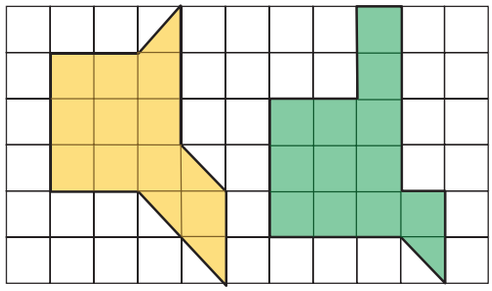
**Remember:**

If a problem has different sizes of measurement units, perform your conversions when solving the problem.

1. Mr. Smith is carpeting a room. The size of the room is shown in the diagram. How many square metres of carpet does Mr. Smith need?



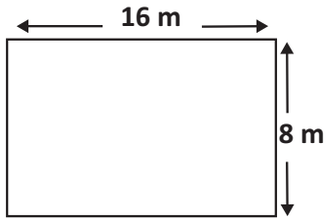

2. Calculate the difference between the areas of the two shapes below.



**1-cm grid**

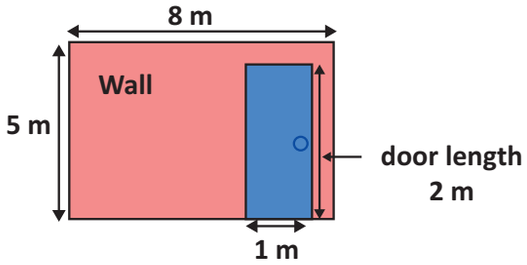
3. A photographer is covering two pictures with glass. Picture 1 is 12 cm by 8 cm and Picture 2 is 10 cm by 10 cm. How many square centimetres of glass does he need altogether?

4. A rectangular garden of length 16 m and width 8 m is divided into rectangular plant beds 3 m by 2 m.



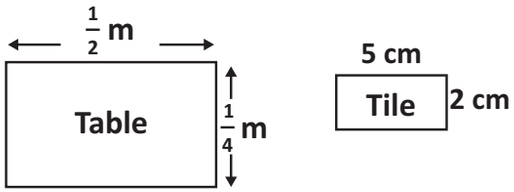

What is the largest number of plant beds that can be made in the garden?

5. Father is painting a wall, as shown in the diagram. He will paint the whole wall except for the doorway. How many square metres of wall will he paint?



6. A rectangular field is 80 metres long and 36 metres wide. A tent that is 18 metres long and 16 metres wide covers part of the field. How many square metres of the field are NOT covered by the tent?

7. A carpenter wants to cover a small table with rectangular tiles. The length of the table is $\frac{1}{2}$ metre and the width $\frac{1}{4}$ metre.




(a) How many tiles will he need to cover the table?

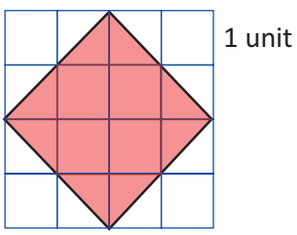
(b) If each tile costs $6.00, how much money will the carpenter spend on tiles?

8. Mr. Charles is building a rectangular fence around a part of his garden. The total length of his fencing is 42 metres. How much fencing should he use along the length and width to fence the largest possible area?

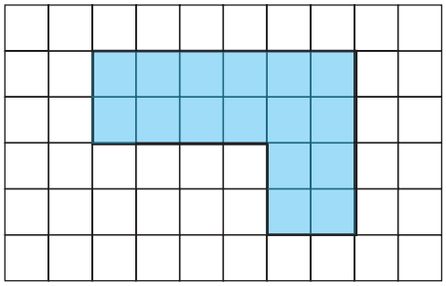
## Chapter Review

**Answer the questions.**

1. What is the approximate area of the shape in the grid below.




2. In the diagram below each small square has an area of 4 $cm^2$.

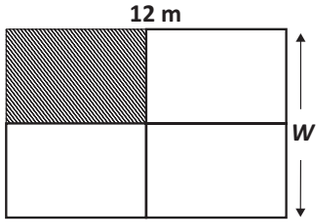


Area ▭ = 4 $cm^2$

Calculate the area of the shaded area.

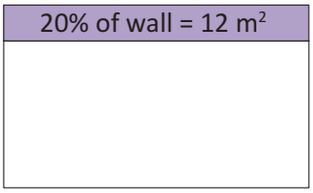
3. The area of a square rug is 144 $cm^2$. What is the length of EACH side of the rug?

4. One quarter of the rectangle is shaded. The area of the shaded part of the rectangle below is 24 $m^2$. The length of the rectangle is 12 metres.




Find the width of the rectangle.

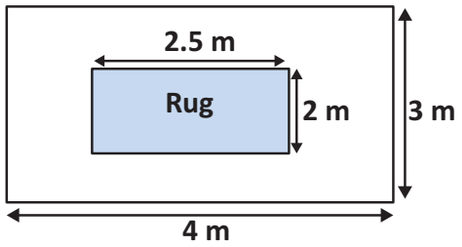
5. The painted area of 20% of the wall shown below is 12 $m^2$.



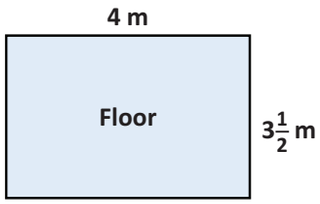

(a) What is the area of the unpainted part of the wall?

(b) If the width of the wall is 5 m, what is the length of the wall?

**6.** A rectangular floor is 4 metres long and 3 metres wide. A rug that is 2.5 metres long and 2 metres wide covers part of the floor as shown below.



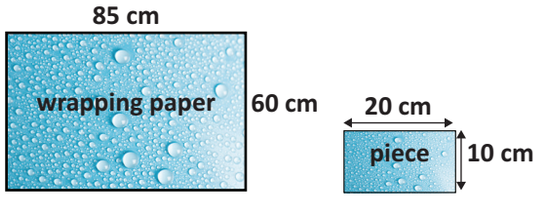

How many square metres of the floor are NOT covered by the rug?




**(a)** Calculate the area of the floor.

**(b)** If carpet is sold at \$30 per $m^2$, what is the cost of the carpet needed to cover the floor completely?

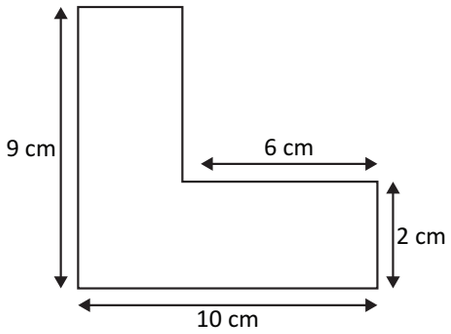
**7.** Miss has a sheet of wrapping paper as shown below. She cuts the paper into rectangular pieces of length 20 cm and width 10 cm to wrap gifts.



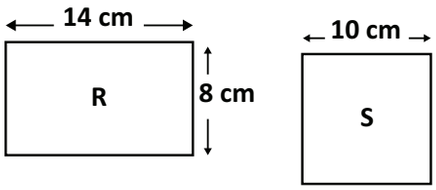

**(a)** What is the greatest number of pieces that can be cut from the sheet of paper?

**(b)** Miss wants to wrap 100 gifts. How many sheets of wrapping paper will she need?

**8.** Find the area of the figure below.

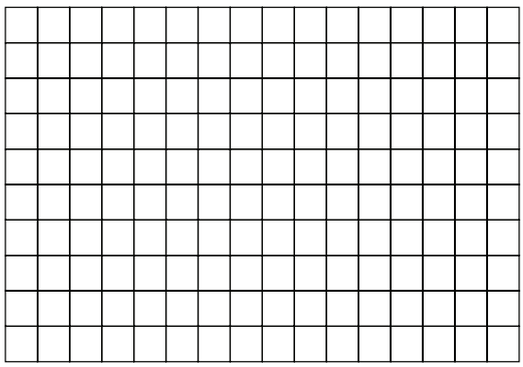



**9.** A rectangle R and a square S are shown below?




Which shape has the greater area? Show how you arrived at your answer.

**10.** Ali drew two rectangles on a grid. Each rectangle had an area of 24 $cm^2$. Rectangle A had a perimeter of 20 cm and Rectangle B had a perimeter of 22 cm.



1-cm grid

Draw Ali's rectangles.

**11.** A rectangular field has a perimeter of 90 metres. Its length is 4 times its width. Find the area of the field.