

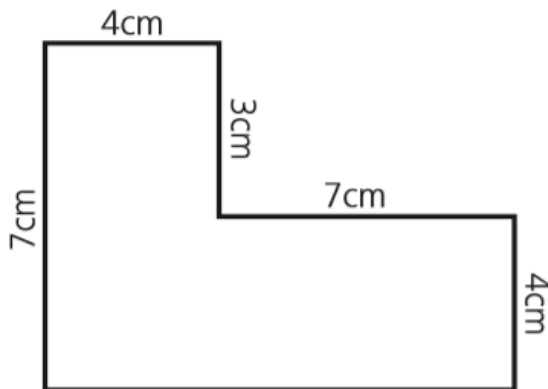
**Problem of the Week: Week 4 (Summer 2): Year 8: Geometry: Formulae for perimeters and areas**

- Calculate and solve problems involving perimeters of 2-d shapes, including circles, areas of circles and composite shapes
- Derive and apply formulae to calculate and solve problems involving perimeter and area of triangles, parallelograms, trapezia and the volume of cuboids (including cubes)

**The solution for each problem is on a new page**

**Find the area**

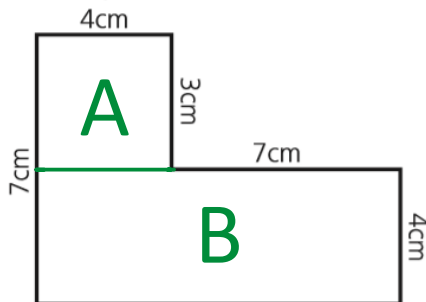
The shape below is not drawn to scale.



Find the area of this shape, and another way and another, and another.  
(below there is a sheet with several copies of the diagram to use)

**Solutions:**

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$$\text{Area of A} = 3 \times 4$$

$$= 12\text{cm}^2$$

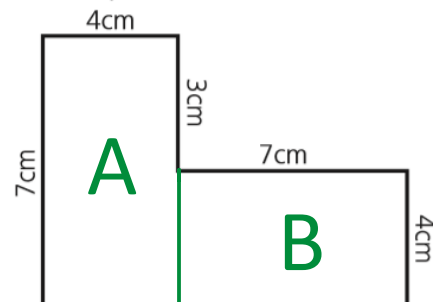
$$\text{Area of B} = 11 \times 4$$

$$= 44\text{cm}^2$$

So the area of the whole shape is

$$12 + 44 = 56\text{cm}^2$$

The shape below is not drawn to scale.



$$\text{Area of A} = 4 \times 7$$

$$= 28\text{cm}^2$$

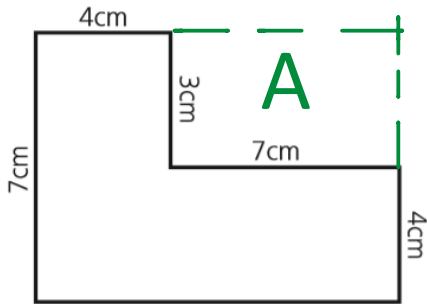
$$\text{Area of B} = 7 \times 4$$

$$= 28\text{cm}^2$$

So, the area of the whole shape is

$$28 + 28 = 56\text{cm}^2$$

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$$\text{Area of A} = 7 \times 3$$

$$= 21\text{cm}^2$$

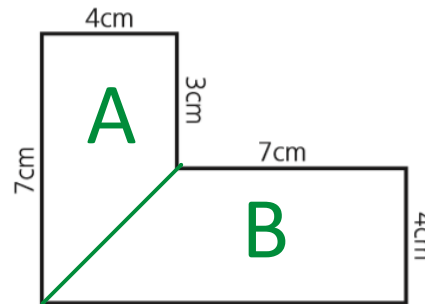
$$\text{Area of large rectangle} = 7 \times 11$$

$$= 77\text{cm}^2$$

So the area of the whole shape is

$$77 - 21 = 56\text{cm}^2$$

The shape below is not drawn to scale.



$$\text{Area of A} = \frac{1}{2} \times 4 \times (3 + 7)$$

$$= 20\text{cm}^2$$

$$\text{Area of B} = \frac{1}{2} \times 4 \times (7 + 11)$$

$$= 36\text{cm}^2$$

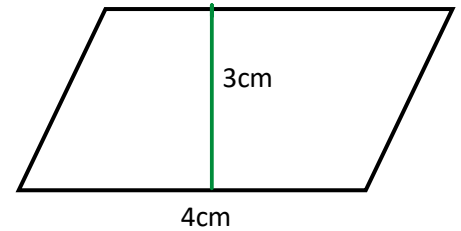
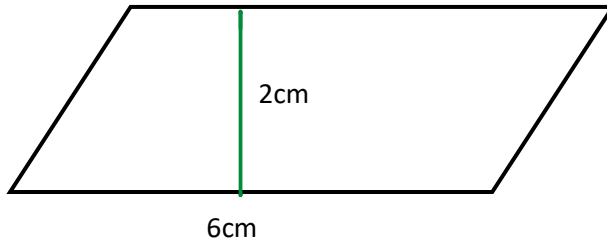
So the area of the whole shape is

$$20 + 36 = 56\text{cm}^2$$

<https://www.ncetm.org.uk/resources/47230> (secondary assessment materials)

**Areas:**

Draw a parallelogram with an area of  $12\text{cm}^2$ . Draw a different parallelogram with an area of  $12\text{cm}^2$ . How can you find out the dimensions of any parallelogram with an area of  $12\text{cm}^2$ ?

**Solutions:**

To find any parallelogram with an area of  $12\text{cm}^2$ , the base and perpendicular height need to multiply together to make 12.

Draw a triangle with an area of  $6\text{cm}^2$ . Draw a different triangle with an area of  $6\text{cm}^2$ . How can you find out the dimensions of any triangle with an area of  $6\text{cm}^2$ ?

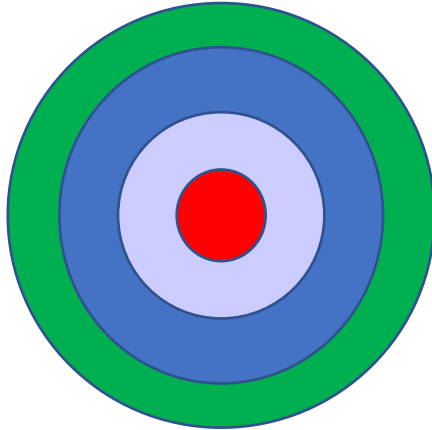
**Solution:**

To find any triangle with an area of  $6\text{cm}^2$ , the base and perpendicular height need to multiply together to make 12. So, a height of 6cm and base of 2cm would give:

$$\frac{1}{2}(6 \times 2) = 6\text{cm}^2$$

Some triangles that give an area of  $6\text{cm}^2$  are:

Base	Height	Calculation
6cm	2cm	$\frac{1}{2}(6 \times 2) = 6\text{cm}^2$
4cm	3cm	$\frac{1}{2}(4 \times 3) = 6\text{cm}^2$
12cm	1cm	$\frac{1}{2}(12 \times 1) = 6\text{cm}^2$
5cm	2.4cm	$\frac{1}{2}(5 \times 2.4) = 6\text{cm}^2$
24cm	0.5cm	$\frac{1}{2}(24 \times 0.5) = 6\text{cm}^2$

**Circles:**

This is made up of a series of circles placed on top of each other.

The diameter of each circle is as follows:

Red = 3cm

Purple = 5cm

Blue = 7cm

Green = 8cm

What fraction of the green circle is the red circle?

What fraction of the green circle are the blue and purple rings?

**Solution:**

Area of the green circle is  $\pi \times 4^2 = 16\pi$

Area of the red circle if  $\pi \times 1.5^2 = 2.25\pi$

Therefore, the red circle is  $\frac{2.25\pi}{16\pi} = \frac{9\pi}{64\pi} = \frac{9}{64}$  of the green circle

The area of the blue ring is the area of the blue circle subtract the area of the purple circle.

So,

Area of blue circle is  $\pi \times 3.5^2 = 12.25\pi$

Area of the purple circle is  $\pi \times 2.5^2 = 6.25\pi$

So, the area of the blue ring is  $12.25\pi - 6.25\pi = 6\pi$

The area of the purple ring is the area of the purple circle subtract the area of the red circle.

So,

Area of the purple circle is  $\pi \times 2.5^2 = 6.25\pi$

Area of the red circle if  $\pi \times 1.5^2 = 2.25\pi$

So, the area of the blue ring is  $6.25\pi - 2.25\pi = 4\pi$

Therefore, the total area of the blue and purple ring is:

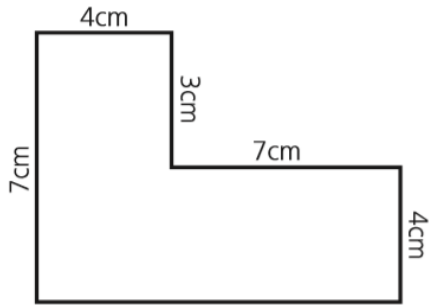
$$6\pi + 4\pi = 10\pi$$

So, the fraction of the green circle that is covered by the blue and purple rings is:

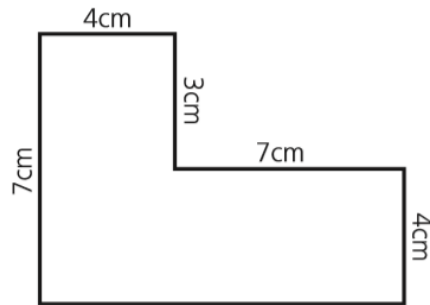
$$\frac{10\pi}{16\pi} = \frac{5\pi}{8\pi}$$

Adapted from: bull's eye <https://nrich.maths.org/780>

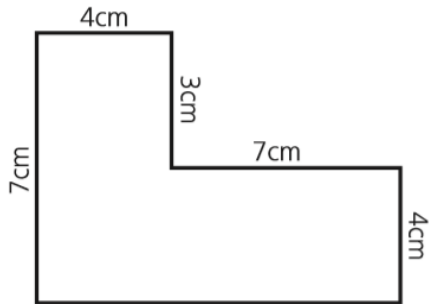
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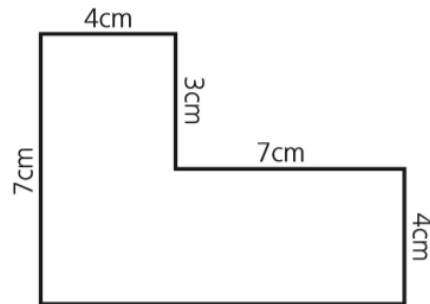
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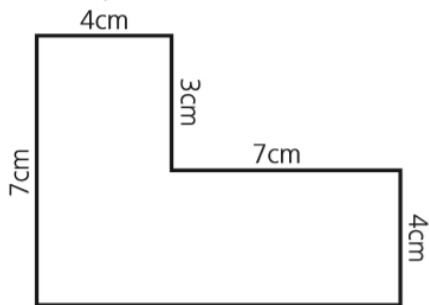
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