Mathematics Mastery

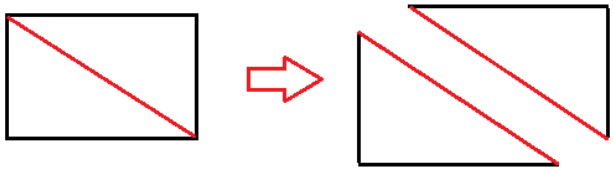
Lesson 22: Area of a triangle

Strategies for calculating the area of a triangle including simple decimal multiplication

Do Now

Using **Task sheet 22a** students start by consolidating the skills required for finding the area of a triangle. Some questions in part 1 include decimal numbers which students may need assistance with (or you may choose to delay this for now).

In part 3 the intention is that students will discover that they can split a rectangle in half with a line from corner to corner, thus creating two identical triangles.



Coach input

Reinforce the concept of **Area** as the **surface covered by a 2-D shape**. Discuss units for area (like square centimetres/cm^2) and why it might be useful to find the area of shapes.

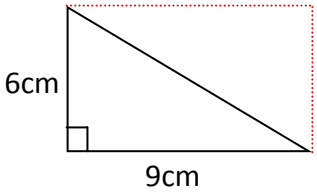
Initially the focus will be on right angled triangles, building on the understanding that the area of a right angled triangle is half the area of the rectangle created from the two perpendicular sides.

"What are the properties of a right-angled triangle?"

"What do we use to show that a triangle is right angled?"

Example:

Use your understanding of the area of a rectangle to find the area of this triangle:



Area of the rectangle = Length x width

= 6 x 9

= 54 cm^2

Area of the triangle = $\frac{\text{Area of the rectangle}}{2}$

= $\frac{54}{2}$

= $\underline{27cm^2}$

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Independent Learning A

Task sheet 22b can be utilised at this stage.

Whilst this is an independent task, coaches should ask students to explain their answers, perhaps choosing one question in section 1 and 2 to discuss. At this stage students do not have a formal technique for finding the area of a triangle. They simply know to find the area of the rectangle surrounding it and then halve it.

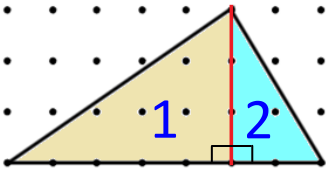
In section 2 the triangles include the length of the hypotenuse and students may require assistance to select which sides to multiply. It is important to embed early that **two sides must be perpendicular** (meet at a right angle) in order to find the area.

Section 3 is likely to be quite challenging and tutors may consider making this a talk task. A hint is included to make the question more accessible .

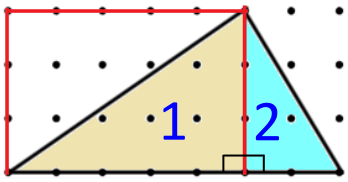
Develop Learning A

The next phase is to introduce finding the area of non-right angled triangles. You could begin by looking at this diagram:

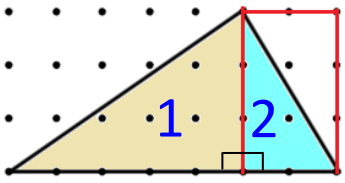
This is **not** a right-angled triangle



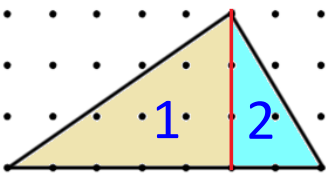
Here it has been split into two right-angled triangles



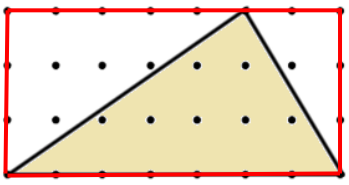
We can find the area of triangle 1 using this rectangle



And find the area of triangle 2 using this rectangle



The sum of the areas of triangles 1 and 2 gives the total area of the original triangle



Notice that the total area is also equal to half the area of a rectangle drawn around the triangle.

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Talk Task

Task sheet 22c can be utilised at this stage.

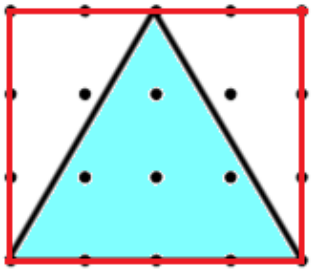
Students must work together to find the area of the triangles given. Encourage them to draw a rectangle around the shape, find the area of the rectangle and then divide it by two. In some of the triangles they will need to change the aspect in order to do this—they should look for the horizontal or vertical side in each case and make it the base.

Students should be encouraged to discuss their work and to explain their methods. Developing language and reasoning skills should be an important theme running through all coaching sessions.

Part 2 is intended to lay the foundations for the formula for the area of a triangle.

Develop Learning B

Returning to the triangles from the **Talk Task** students were informally introduced to the area of a triangle being equal to half the base times the height.



Height = 3cm

Base = 4cm

$$\text{Area} = \frac{\text{Base x Height}}{2}$$

$$= \frac{4 \times 3}{2}$$

$$= \underline{6\text{cm}^2}$$

Discuss how students can be sure that they have the height of the triangle. What angle does the height make with the base? It is crucial that students understand that the height must be **perpendicular** to the base (i.e. meet the base at a right angle).

Independent Learning B

Task sheet 22d can be utilised at this stage.

Whilst this is an independent task, coaches should ask students to explain their answers, perhaps choosing one question in section 1 and 2 to discuss. Encourage students to explain why their method works and ensure that they are using correct units.

For an additional challenge **Task sheet 22e** could be used. It introduces triangles with obtuse angles. The mathematics is the same but students may find identifying which side lengths to use more challenging

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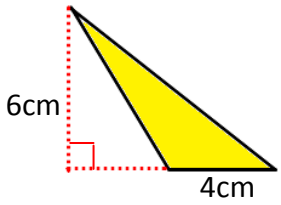
Plenary

Coaches can summarise findings or extend the strategies learnt today by looking at the area of compound shapes and more challenging decimal numbers. They could also look at triangles like the one below:



The area is still half the base times the height, it is just that the perpendicular height is measured from outside the triangle.

A fun task that introduces compound area is for students to design a rocket using only rectangles and triangles and find the area of their design. Add depth by using a variety of different triangles.

Teacher notes: