

Area of a Triangle.

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Differentiate and Assess

Not every student will be ready to investigate this concept at this Level and so we will need to differentiate to ensure every student is learning at their leading edge. Select the Differentiate button on this screen.

Integrate

Every mathematical concept is integrally related to other mathematical concepts. Teaching and learning related concepts simultaneously develops deep relational understanding. Select the Integrate button on this screen.

Intervene

Some students may not yet be ready to investigate this concept at any Level, and so we will need to provide some intervention. Select the Intervention button on this screen.

AREA OF A TRIANGLE.

EXPLICIT TEACHING PLAN OVERVIEW PAGE

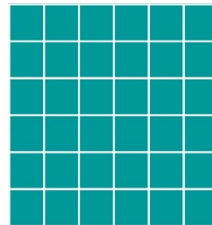
THIS PAGE IS A SUMMARY OF THE EXPLICIT TEACHING PLAN, INCLUDING STRATEGIC QUESTIONS, AND DESCRIBING THE SEQUENCE WHICH WILL OCCUR OVER MULTIPLE LESSONS.

RESOURCES: RESOURCES: SQUARE CENTIMETRE GRID PAPER, RULER, PENCIL, PAPER

WHAT COULD WE DO?

Children:

- Identify the 2 dimensions in a square.
- Measure the area of a square by multiplying the number of square centimetres in 1 row by the number of rows.
- Identify that the length of this side in centimetres, is the same as the number of square centimetres in this row and the length of this side in centimetres, is the same as the number of rows of square centimetres.
- Calculate the area of the square by multiplying length by width.
- Fold the square along a diagonal from one vertex to the opposite vertex to create a triangle / fold the square from each vertex on the end of one side of the square to a place on the opposite side.



- Identify that the area of the triangle is half of the area of the square.
- Identify that the length of the square is the base of the triangle.
- Identify that the width of the square is the height of the triangle.
- Identify that the area of the triangle is half of the base times the height.

WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

Children

- ask one another questions about area of triangles, for example:
 - ▶ When we measure area, how many dimensions are we measuring?
 - ▶ How could we measure the area of this square?
 - ▶ If there are 6 square centimetres in each row, and there are 6 rows, how many square centimetres altogether?
 - ▶ Is the length of this side in centimetres, the same as the number of square centimetres in this row? Is the length of this side in centimetres, the same as the number of rows of square centimetres?
 - ▶ Could we multiply length times width to calculate the area of the square?
 - ▶ Let's fold the square along a diagonal from one vertex to the opposite vertex to create a triangle / fold the square from each vertex on the end of one side of the square to a place on the opposite side.
 - ▶ Is the area of the triangle half of the area of the square?
 - ▶ Is the length of the square the base of the triangle?
 - ▶ Is the width of the square the height of the triangle?
 - ▶ Is the area of the triangle half of the base times the height?

AREA OF A TRIANGLE.

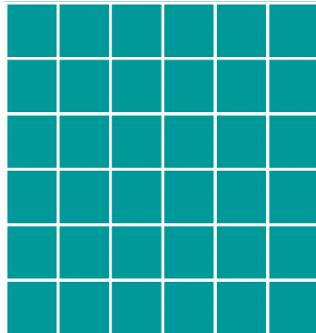
EXPLICIT TEACHING PLAN

FULL EXPLICIT TEACHING PLAN, EMBEDDING DEEP RELATIONAL UNDERSTANDING, METALANGUAGE, AND QUESTIONS THAT MAY BE USED OVER MULTIPLE LESSONS.

WHAT COULD WE DO?

Children think about, talk and listen to a friend about, then have the opportunity to share what they already know.

Display a square cut out of square centimetre grid paper, [for example](#),



WHAT LANGUAGE COULD WE USE TO EXPLAIN AND ASK QUESTIONS?

- ▶ Today brings an investigation about area.
- ▶ What do you know about area?
- ▶ Talk about area with a friend.
- ▶ Is anyone ready to share what they are thinking about area?

- ▶ When we measure area, how many dimensions are we measuring?
- ▶ Are we measuring 2 dimensions?
- ▶ Are we measuring how much space a shape or surface takes up in 2 dimensions?

- ▶ Here we have a shape.
- ▶ What shape is this?
- ▶ Is this shape a square?
- ▶ We've investigated squares and we found that squares are rectangles because a square has the same properties as rectangles – opposite sides equal and all angles right angles.
- ▶ How many dimensions does the square have?
- ▶ Does the square have 2 dimensions?
- ▶ Are we looking at the third dimension where it goes front to back a tiny bit? Or

Children count the number of square centimetres in 1 row.

Children count the number of rows.

Children calculate that 6 rows of 6 square centimetres = 36 square centimetres.

Children work out the length of one side.

Children work out the length of the adjacent side.

are we just looking at the 2 dimensions on the surface?

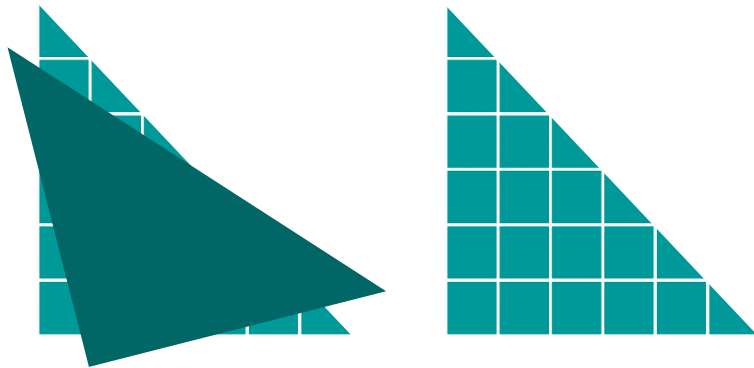
- ▶ How could we measure the area of the square?

- ▶ Could we count the number of square centimetres in 1 row?
- ▶ How many square centimetres in 1 row?
- ▶ In 1 row, are there 6 square centimetres?
- ▶ How many rows? Are there 6 rows?
- ▶ If there are 6 square centimetres in each row, and there are 6 rows, how many square centimetres altogether?
- ▶ Are there 36 square centimetres?
- ▶ Is the area of the square, 36 square centimetres?
- ▶ Does the square take up the space of 36 square centimetres?

- ▶ How else could we work out the area of the square?
- ▶ What is the length of this side?
- ▶ Is the length of this side, 6 centimetres?
- ▶ Is the length of this side in centimetres, the same as the number of square centimetres in this row?
- ▶ What is the length of this adjacent side?
- ▶ Is the length of this adjacent side, 6 centimetres?

- ▶ Is the length of this side in centimetres, the same as the number of rows of square centimetres?

Fold the square along a diagonal from one vertex to the opposite vertex, for example,



Children count the number of square centimetres in the triangle.

Children count the number of half square centimetres in the triangle.

Children calculate that $15 \text{ square centimetres} + 6 \text{ half square centimetres} = 18 \text{ square centimetres}$.

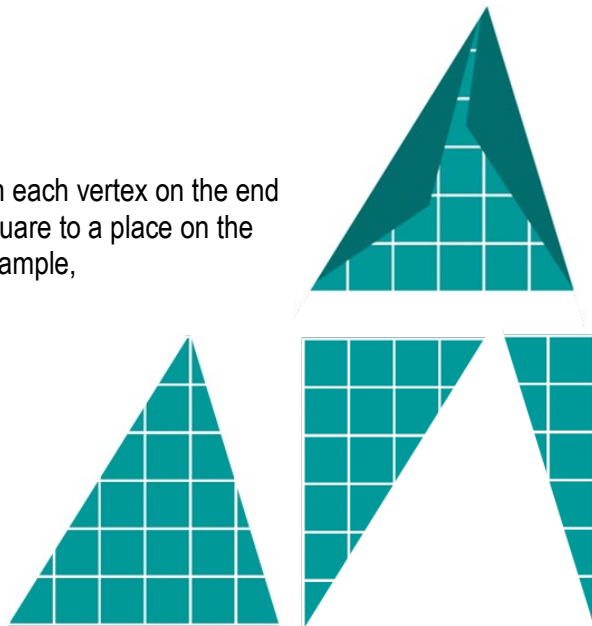
- ▶ Because the length of each side in square centimetres is the same as the number of square centimetres in each row and the number of rows of square centimetres, could we multiply the length of a side by the length of the adjacent side to find the area of the square?
- ▶ What is 6 times 6?
- ▶ Is 6 times 6, 36?
- ▶ Do we have a quick way to calculate the area of a rectangle?
- ▶ So the area of the square is 36 square centimetres.
- ▶ Let's fold the square along a diagonal from one vertex to the opposite vertex.
- ▶ What shape have we created?
- ▶ Have we created a triangle?

- ▶ What do you estimate is the area of the triangle?
- ▶ How could we measure the area of the triangle?
- ▶ Could we count the full square centimetres?
- ▶ Could we count the half square centimetres?
- ▶ How many square centimetres does the triangle take up the space of?
- ▶ Does the triangle take up the space of 18 square centimetres?
- ▶ Why?
- ▶ What was the area of the square?
- ▶ Was the area of the square, 36 square centimetres?

Children discuss the relationship between the area of the rectangle, explaining that the triangle is half of the rectangle.

Fold the square from each vertex on the end of one side of the square to a place on the opposite side, for example,

Cut out the triangle, for example,



- ▶ What is the area of the triangle?
- ▶ Is the area of the triangle, 18 square centimetres?

- ▶ What fraction of the square is the triangle?
- ▶ Is the triangle half of the square?
- ▶ Did we fold the square in half to create the triangle?
- ▶ Is the area of the triangle half of the area of the square?
- ▶ So we worked out the area of the triangle that we created by dividing a square in half.

- ▶ How else could we create a triangle from a square?
- ▶ Could we fold the square from each vertex on the end of one side of the square to a place on the opposite side?

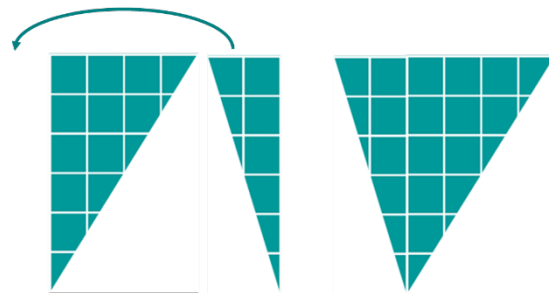
- ▶ Let's cut out the triangle.

- ▶ What do you estimate is the area of the triangle?
- ▶ How could we measure the area of the triangle?

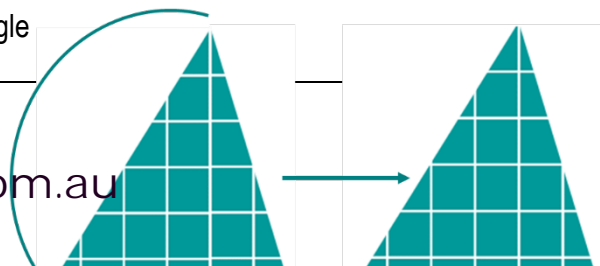
Children identify that the area of the triangle is 18 square centimetres.

Children identify that the triangle must be half of the square.

Children place the 2 triangles in the other half of the square together to make one triangle, for example,



Children superimpose the triangle formed by the other 2 triangles,



- ▶ Could we count the full square centimetres?
- ▶ Could we count the fractions of square centimetres?
- ▶ How many square centimetres does the triangle take up the space of?
- ▶ Does the triangle take up the space of 18 square centimetres?
- ▶ Why?
- ▶ What was the area of the square?
- ▶ Was the area of the square, 36 square centimetres?
- ▶ What is the area of the triangle?
- ▶ Is the area of the triangle, 18 square centimetres?
- ▶ What fraction of the square must the triangle be?
- ▶ Is the triangle half of the square?
- ▶ If the triangle is half of the square, the other 2 triangles must also be half of the square.

- ▶ Let's place them together to make a triangle.

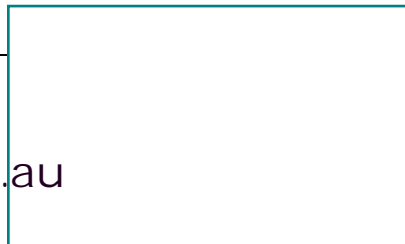
- ▶ Let's superimpose the triangle formed by the other 2 triangles, on the first triangle.

on the first triangle, for example,

Children identify that the area of the other 2 triangles is the same as the area of the first triangle.

Children identify that the area of a triangle is half of the area of the rectangle that it was formed from.

Draw a rectangle, for example,



width
h

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- ▶ Is the area of the other 2 triangles the same as the area of the first triangle?
- ▶ When we cut a square from adjacent vertices to a point on the opposite side, do we divide the square in half?
- ▶ When we cut a square from adjacent vertices to a point on the opposite side, do we create a triangle that is half the area of the square?
- ▶ How could we use this to work out the area of a triangle?
- ▶ Could we say that the area of this triangle is half the area of the rectangle it was formed from?
- ▶ Do you think this would be the same for all triangles?
- ▶ Do you think it matters where on the opposite side of the rectangle is the third vertex of the triangle?

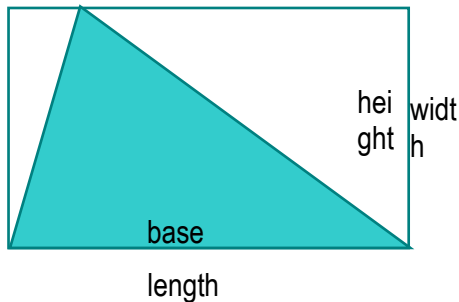
- ▶ So we calculate the area of a rectangle by multiplying the number of square centimetres in adjacent rows.
- ▶ This means we are multiplying the lengths of adjacent sides.
- ▶ Could we name one side 'length'?

Label one side 'length'
and an adjacent side 'width',
for example,

Record area of rectangle = length x width

Draw a triangle inside the rectangle so that each vertex in the 'length' of the rectangle is a vertex in the triangle, and the third vertex of the triangle is a point on the opposite side of the rectangle, for example,

Label the side of the triangle
along the 'length' of the rectangle,
'base' and next to the an adjacent
side 'width', height, for example,



Record area of triangle = $\frac{1}{2}$ x length x width

- ▶ Could we name the adjacent side 'width'?
- ▶ Does it matter which of these sides we name 'length' and which if these sides we name 'width'?
- ▶ Is multiplication commutative?
- ▶ So could we record how we could calculate the area of a rectangle as length times width?

- ▶ How could we calculate the area of a triangle that is formed from the rectangle?
- ▶ Would the area of the triangle be half of the area of the rectangle?
- ▶ Could we calculate the area of the rectangle, and then halve it?
- ▶ Is the length of the rectangle, the base of the triangle?
- ▶ Is the width of the rectangle, the height of the triangle?

- ▶ If we could calculate the area of the rectangle by multiplying length times width, could we calculate the area of the triangle by multiplying base times height, and then halving the product?
- ▶ Could we record how we could calculate the area of a triangle as half of the base times height?

Square on square centimetre grid paper ([back](#))

