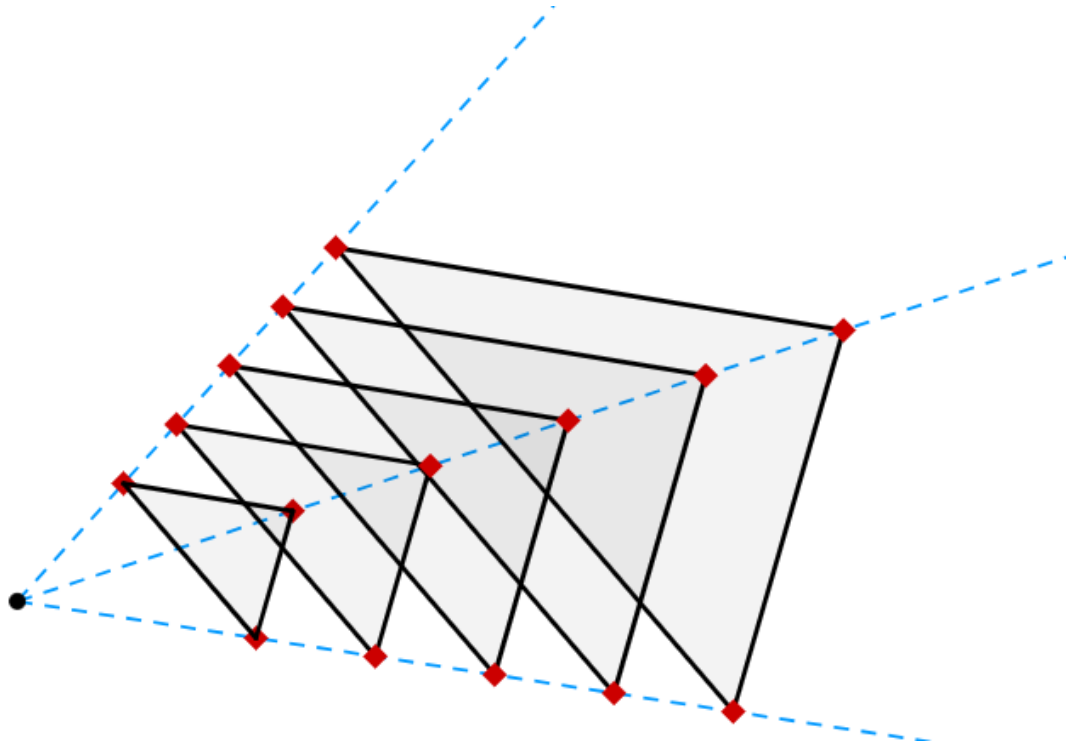
Grade 9 Core

Geometry

Spring 2026

NAME:



Geometry	**Numeracy**
Properties of Triangles	Adding to 90, 180, 360
The Pythagorean Theorem	Factors of 360
Properties of Polygons	Equivalent Ratios
Similar Triangles and shapes	Equivalent Fractions
Scale Diagrams	Km to m to cm conversions

VOCABULARY

G9 U2 Lesson 1 Triangle Properties.

Write these types of triangles along with their definitions in the vocabulary page (page 2):

Right Triangle	Isosceles Triangle	Scalene Triangle
Obtuse Triangle	Equilateral Triangle	Acute Triangle

https://www.mathsisfun.com/triangle.html

Use a ruler and a protractor to accurately draw one of each on coloured paper.

Cut and stick your triangles here on pages 5 & 6.

- Label each angle with its value. Your angles should add to 180 degrees.
- Measure all three sides of your triangles.
- Calculate the *perimeter* of your triangles. Add the word 'perimeter' to the vocabular page.

Grade 9 Core U2 Geometry Lesson 2: SQUARE ROOT

Every number has a square root. Perfect squares have whole number (integer) square roots.

$$6 \times 6 = 36$$

The square root of 36 is 6.

The square root symbol:

$$\sqrt{}$$

The square root symbol was invented by a German mathematician called Christopher Rudolff in 1525. Pretty much exactly 500 years ago. If you want to invent something that will last a long time - invent some math notation.

$$\sqrt{36} = 6$$

Christopher Rudolff's idea stuck because it's easy to write. You can write it with one stroke of the pen. It is good math notation because it is easy to write and to read and it soon becomes easy to remember what it means.

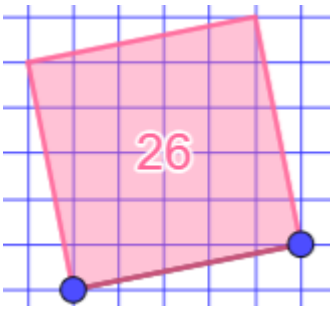
Write the value of the square root:	
$\sqrt{49} =$	$\sqrt{16} =$
$\sqrt{100} =$	$\sqrt{36} =$
$\sqrt{1} =$	$\sqrt{64} =$
$\sqrt{4} =$	$\sqrt{81} =$
$\sqrt{0} =$	$\sqrt{144} =$
$\sqrt{9} =$	$\sqrt{16} =$
$\sqrt{25} =$	$\sqrt{49} =$
$\sqrt{121} =$	$\sqrt{100} =$

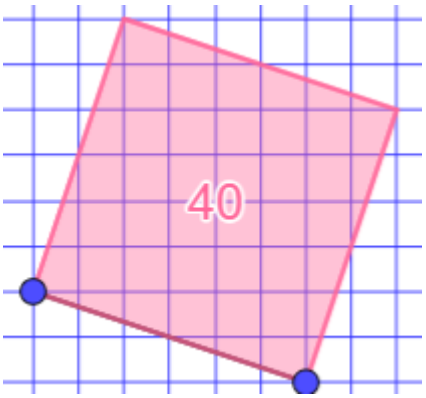
Write the 'radicand' under the 'radical'	
$\sqrt{} = 0$	$\sqrt{} = 7$
$\sqrt{} = 1$	$\sqrt{} = 9$
$\sqrt{} = 2$	$\sqrt{} = 6$
$\sqrt{} = 5$	$\sqrt{} = 4$
$\sqrt{} = 8$	$\sqrt{} = 12$
$\sqrt{} = 10$	$\sqrt{} = 20$
$\sqrt{} = 11$	$\sqrt{} = 15$
$\sqrt{} = 3$	$\sqrt{} = 13$

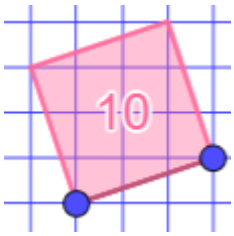
These two mistakes are very common. Explain what is wrong:

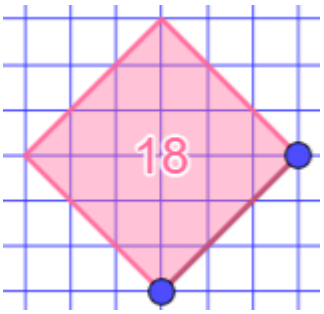
$\sqrt{100} = 50$ What's wrong here?	$5^2 = 10$ What's wrong here?

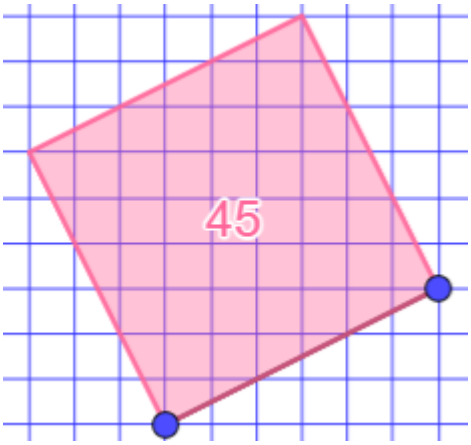
The area is written on these squares. Write on the side length, correct to one decimal place:

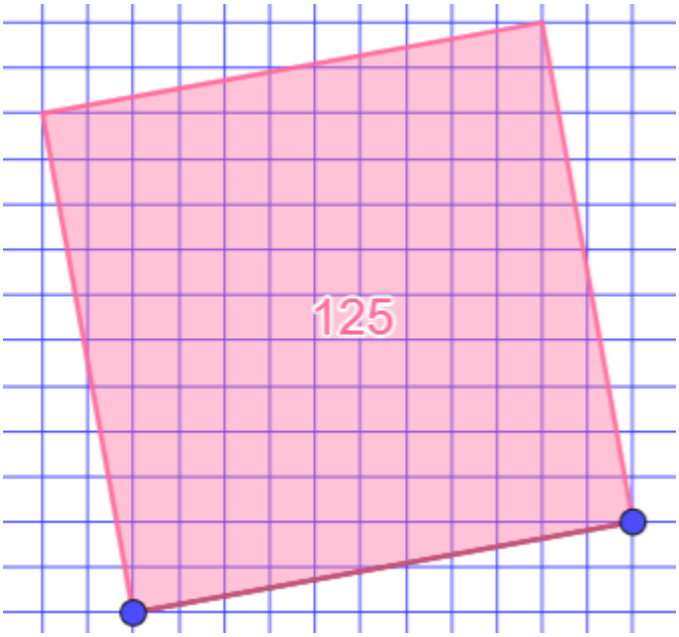


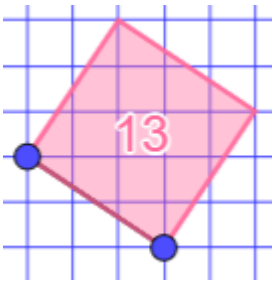


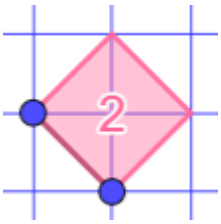








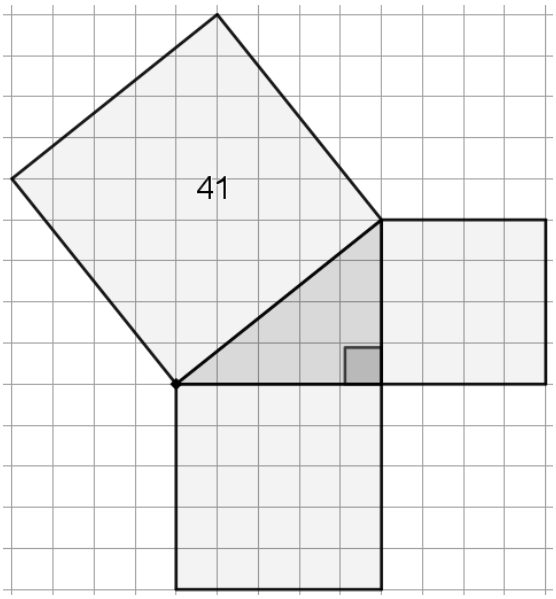


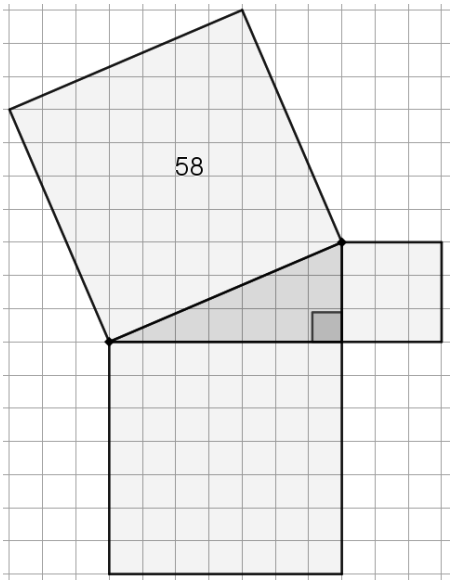


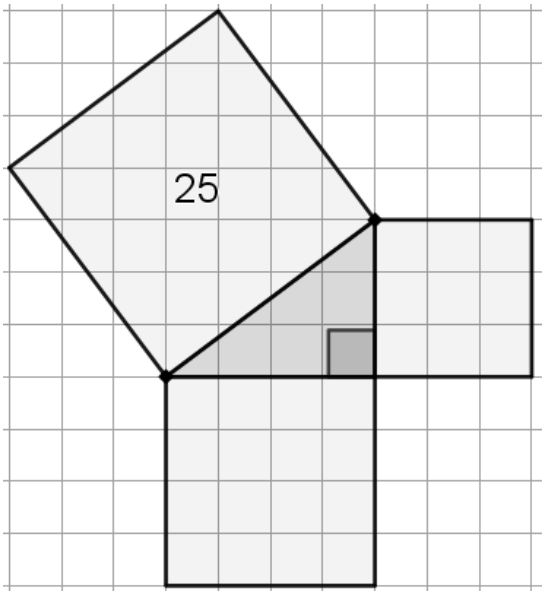
The Very Special Pythagorean Property Regarding Squares and Right-Angle Triangles

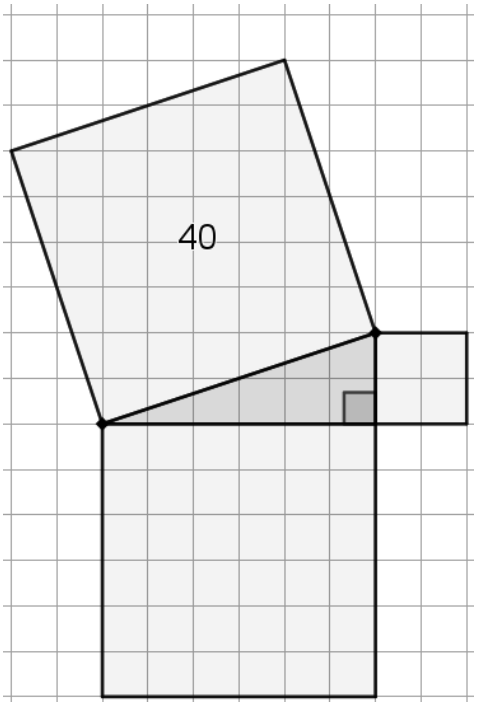
The area of the large square on the hypotenuse of each triangle has been calculated.

Write the areas on each square attached to the shorter sides of each triangle. Add these two areas.





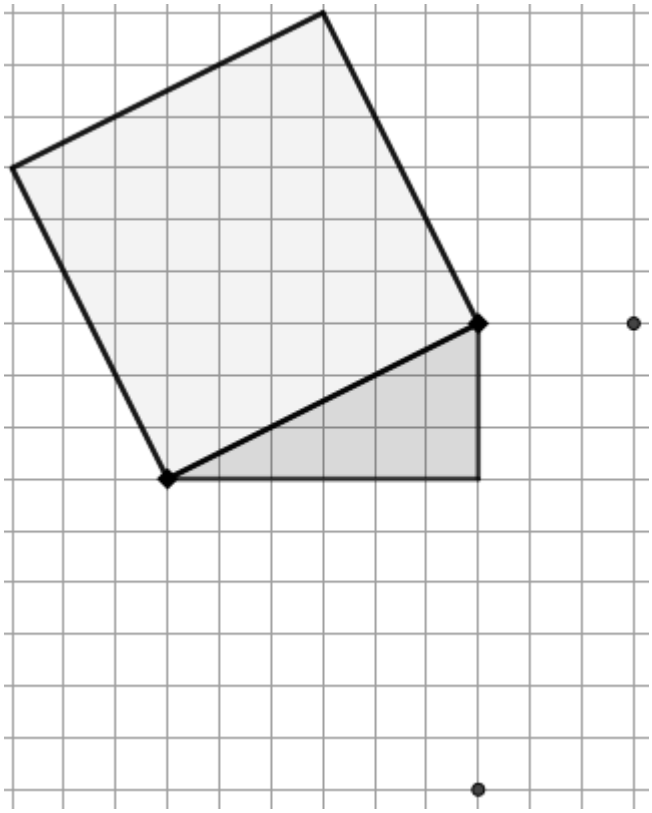


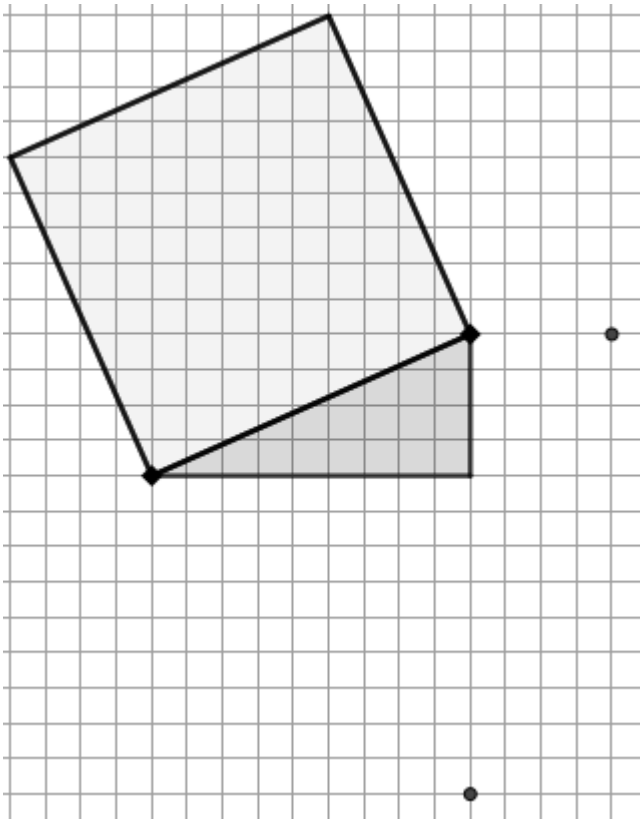


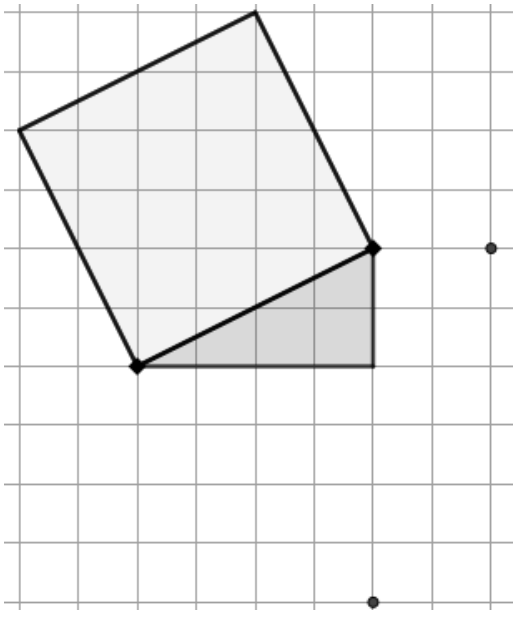
1. Draw the two small squares on these triangles.

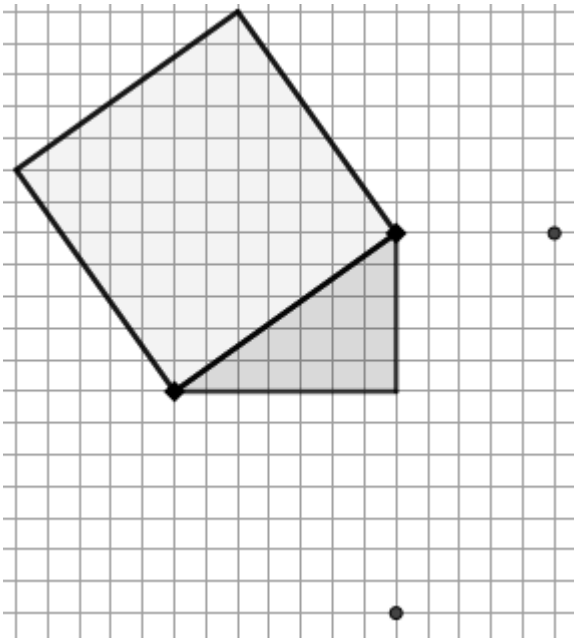
2. Add up the areas. Write the total on the biggest square.

3. Use the square root button to calculate the length of the biggest square.





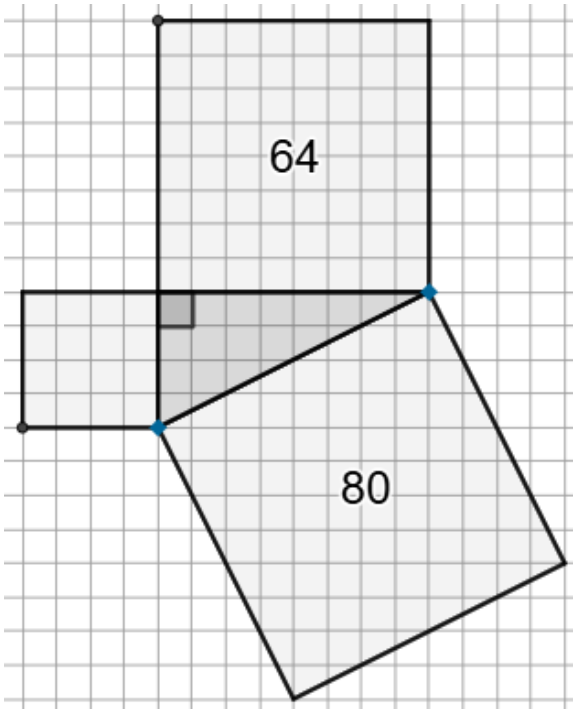


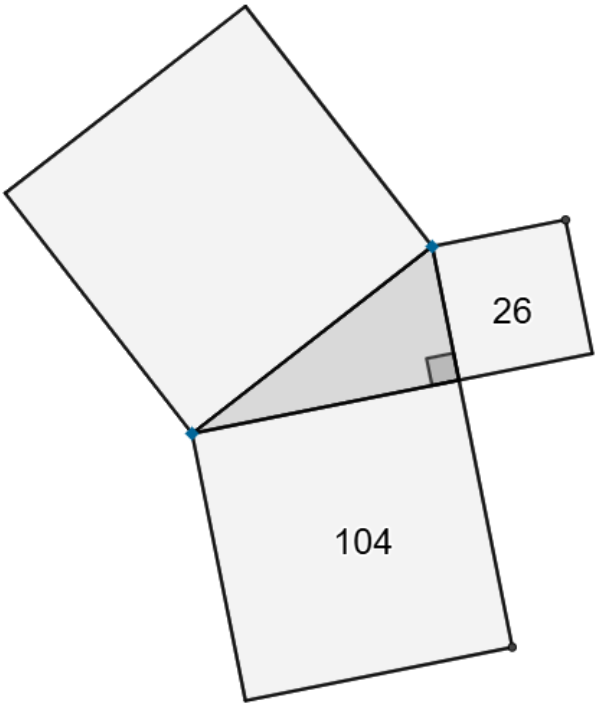


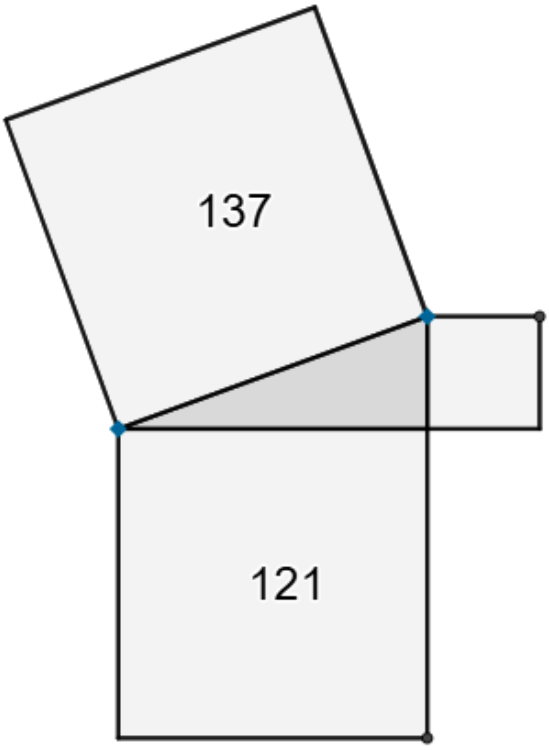
Go to the lesson on Pythagorean Theorem on the Chrome Book.

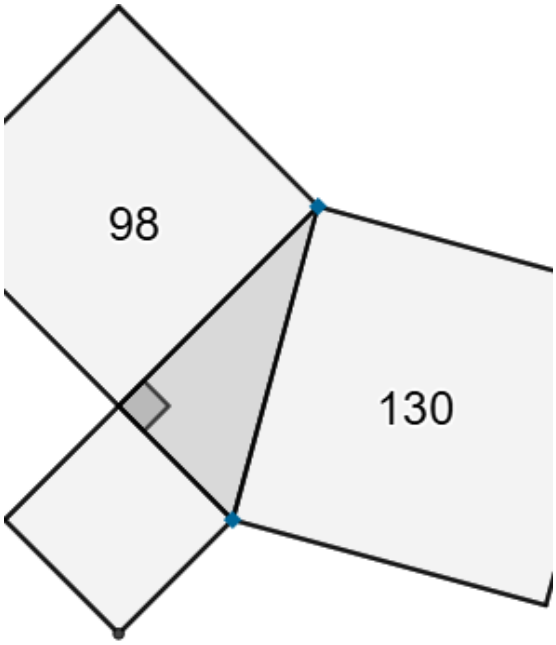
Grade 9 Core U2 Geometry Lesson 3: Using the Pythagorean Theorem

On these square diagrams, calculate the area of the third square. Use the square root to find the side lengths of all three sides of the right-angled triangle.



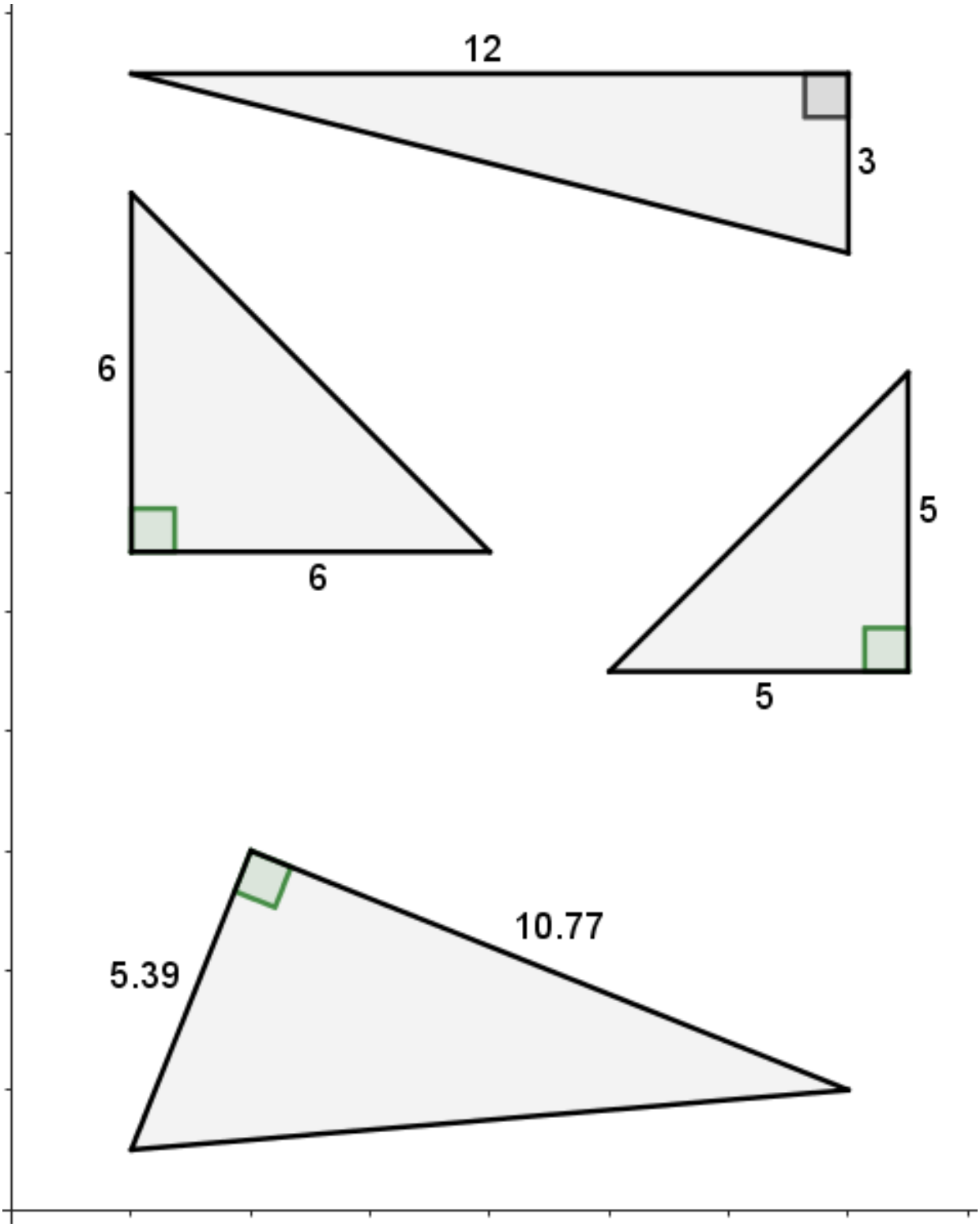






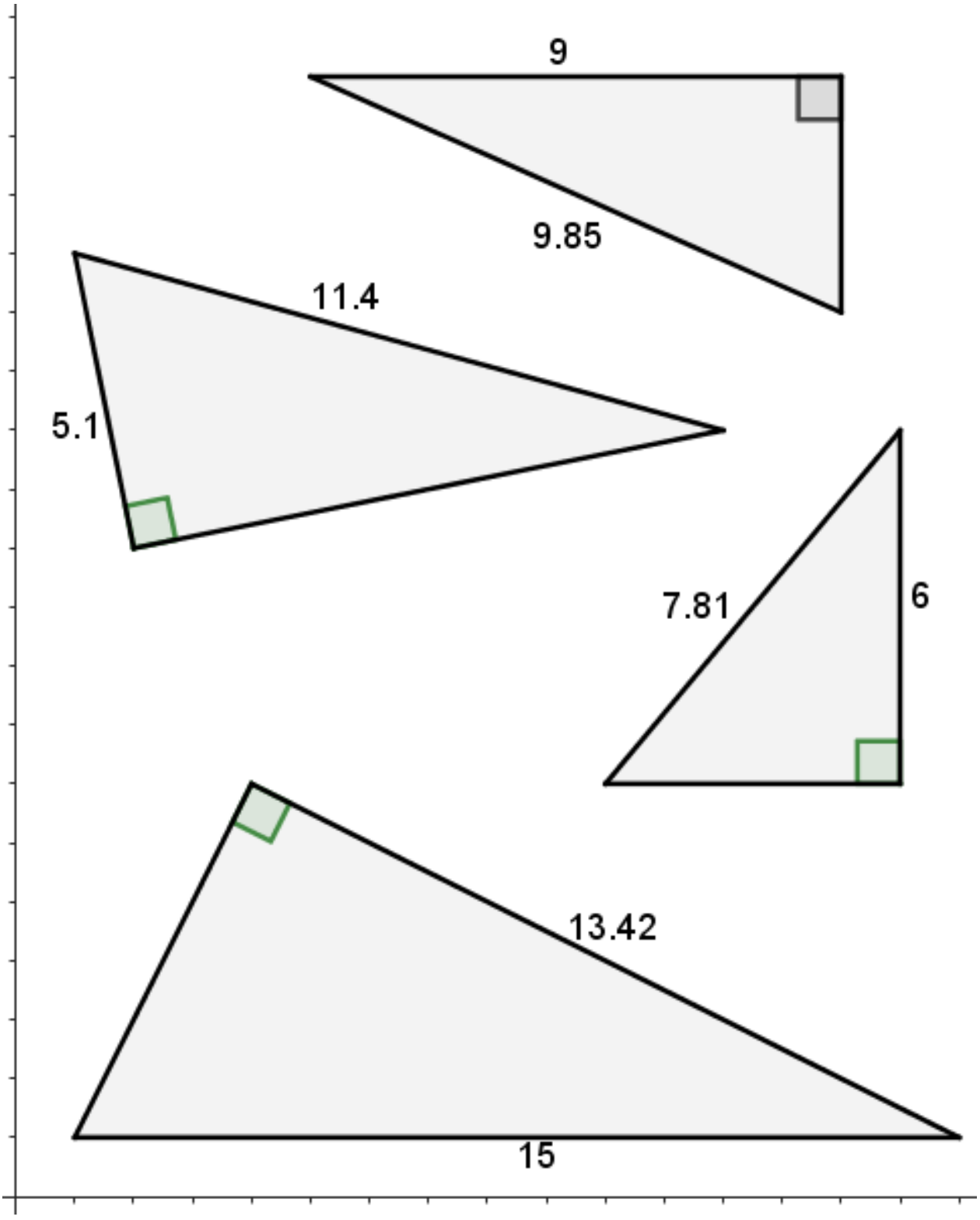
Visualize the squares.

The Pythagorean Theorem is more about the triangle than it is about the squares. Visualize the squares on these triangles. Calculate their areas. Use the square root to find the third side of each triangle.



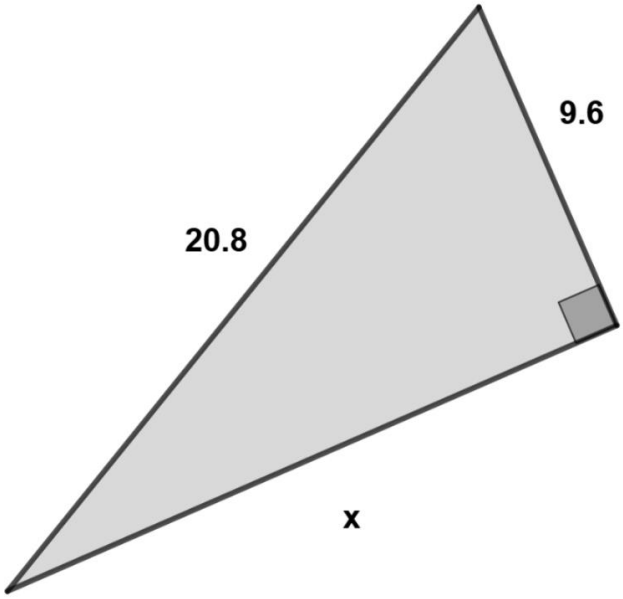
Calculate the third side on these triangles. Notice that the side missing is a shorter side.

After calculating, measure to check your answer.

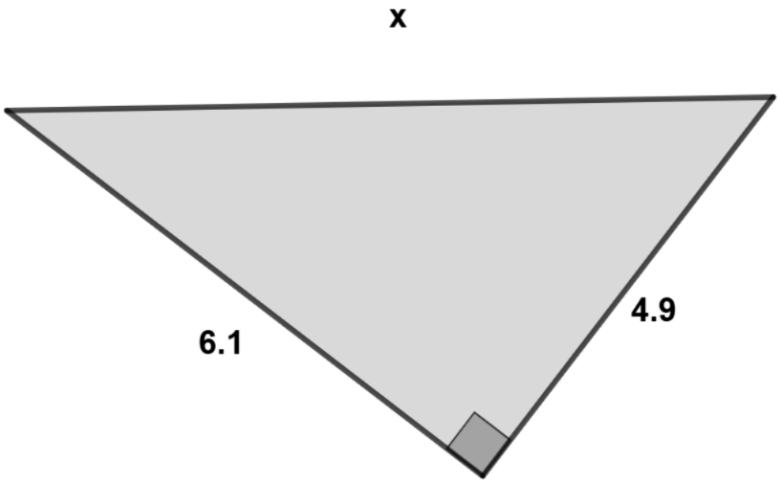


Mixed Triangle Problems. Solve for the side labelled x. Practice clear communication.

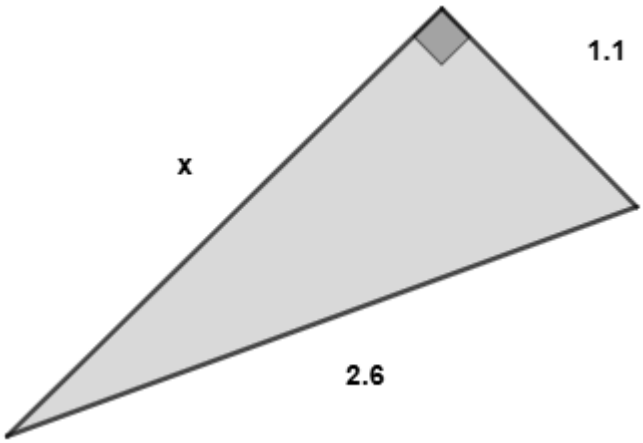
1.



2.

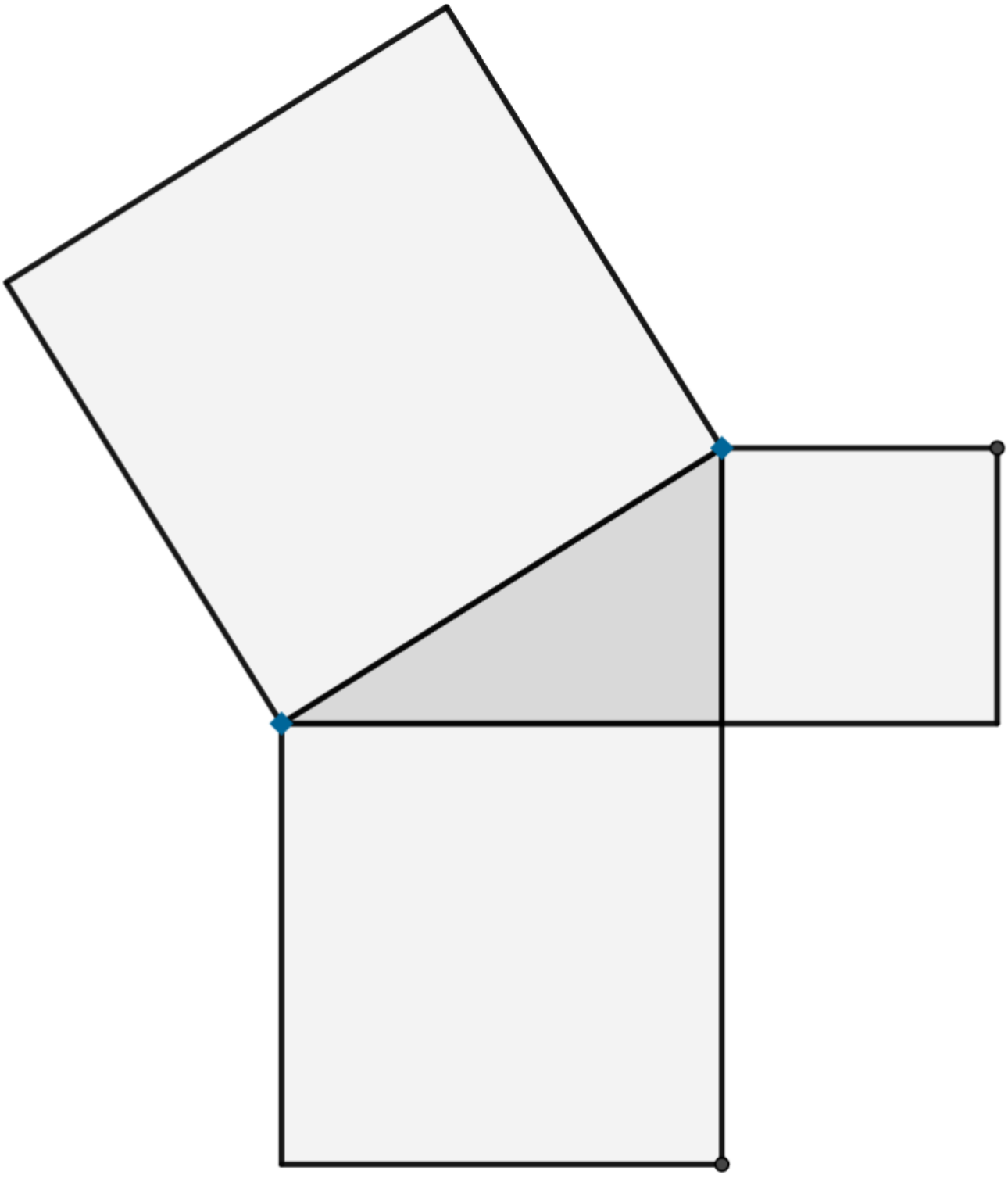


3.



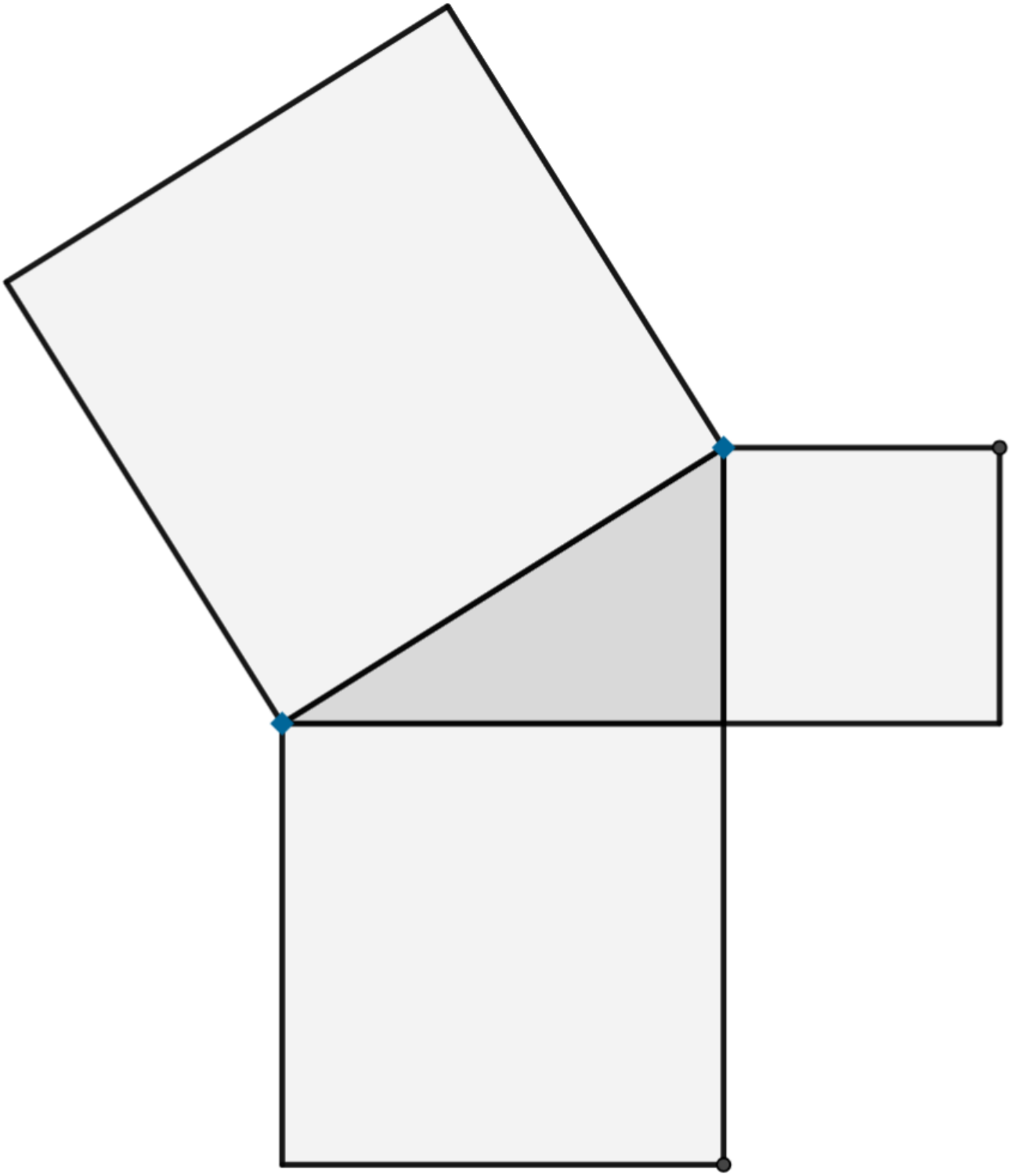
Grade 9 Core U2 Geometry Lesson 4: Validating the Pythagorean Theorem by adding square areas

Use the extra printout of this diagram with the in-class instructions to cut the two smaller squares to fit the largest square. Stick your five pieces onto this template.



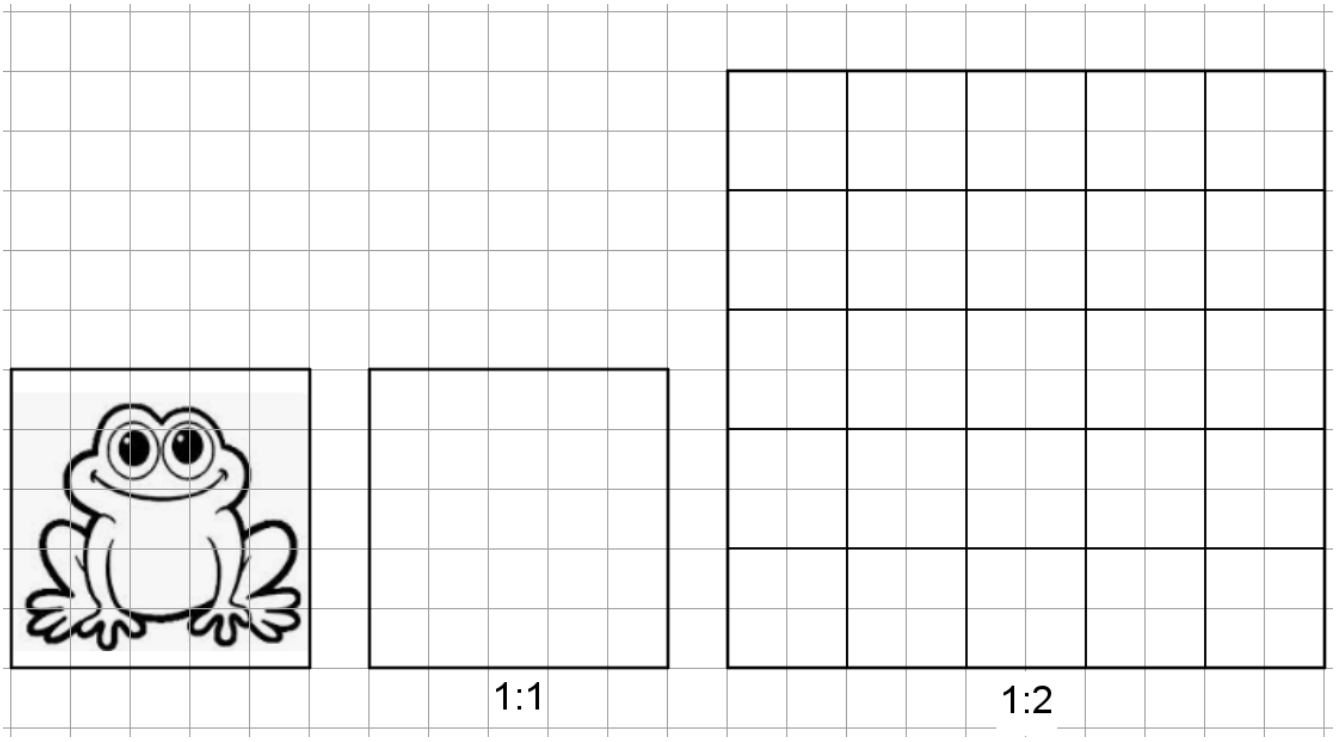
Now make your own right angled triangle on coloured paper.

1. Use a ruler and protractor to construct squares on the two shorter edges.
2. Make the squares on the two shorter sides.
3. Cut the middle size square into four congruent quadrilaterals as shown in class.
4. Stick your triangle on this page.
5. Fit your five 'puzzle pieces' to make a square on the hypotenuse of your triangle.
6. Stick all the pieces onto this page.
7. Write a sentence about what this construction shows.

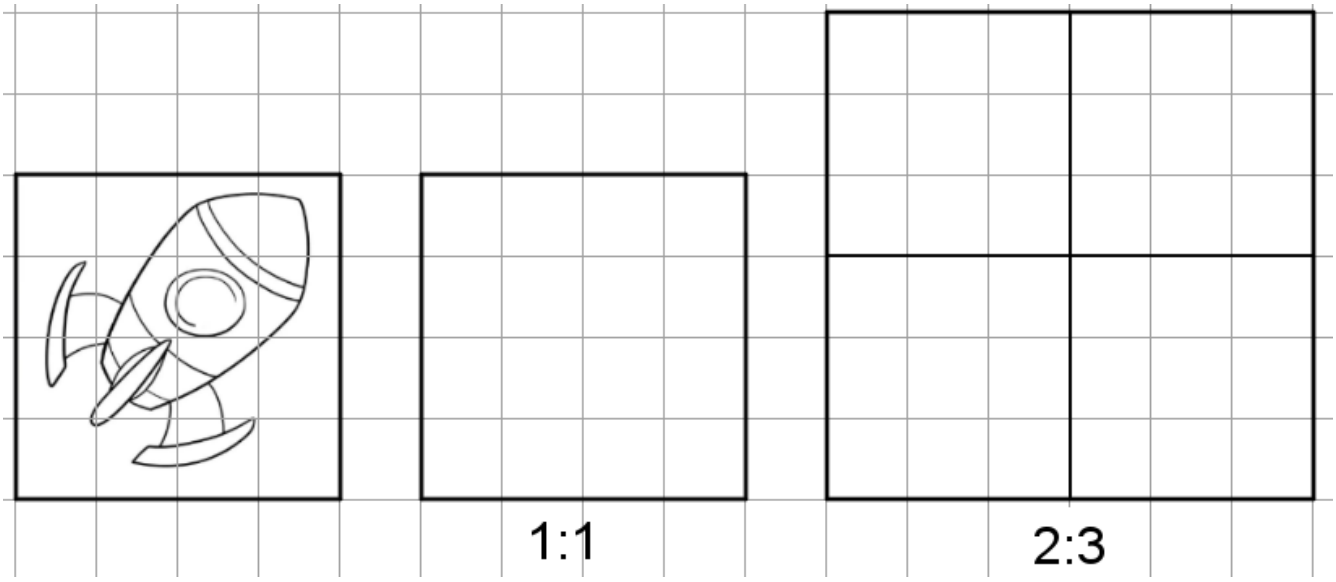


Grade 9 Core U2 Geometry Lesson 5: Drawing with Ratios

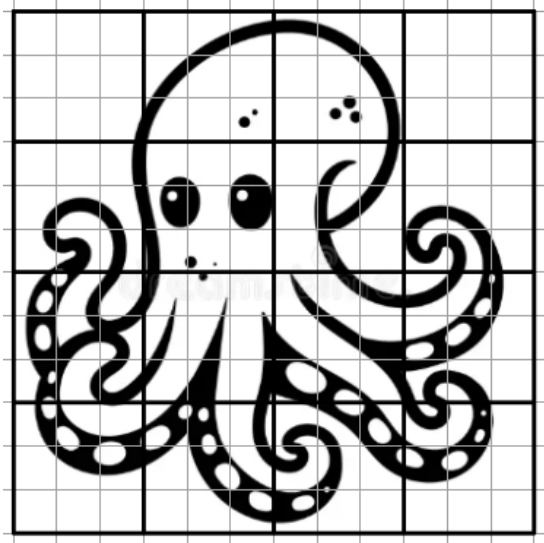
Copy the frog using a 1:1 ratio, then enlarge the image with a 1:2 ratio.



Copy the space rocket with the ratio 1:1 then enlarge the image with a ratio of 2:3

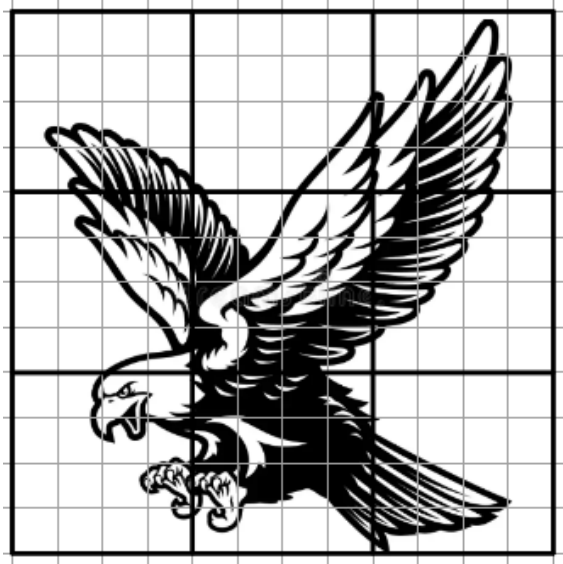


Enlarge the image of the octopus with a ratio of 3:4



3:4

Enlarge the image of the eagle with a ratio of 4:5



4:5

The Bahamas Flag

The Bahamas flag is constructed on a rectangle with width:length ratio 1:2.

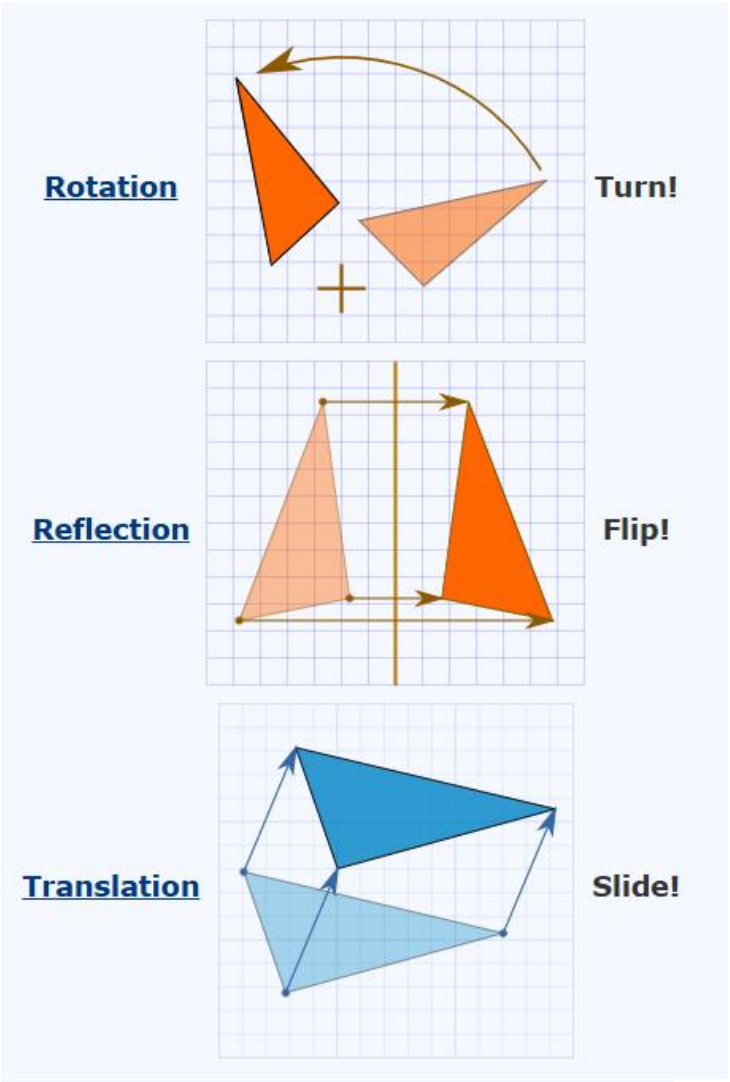
Draw two different versions of the flag.

- Version 1 should be 6 boxes high.
- Version 2 should be 24 boxes long.
- The black triangle is equilateral. Position the location of each vertex accurately by calculation (Pythagoras Theorem) or by using a protractor.

The national flag of Guyana

The ratio of the Guyana flag is 3:5. The vertex of the black triangle is at the center of the flag.

Construct two different sized, large, accurate versions of this flag on the grid below.



To rotate a shape we need to define:
To reflect a shape we need to define:
To translate a shape we need to define:
To enlarge a shape we need to define:

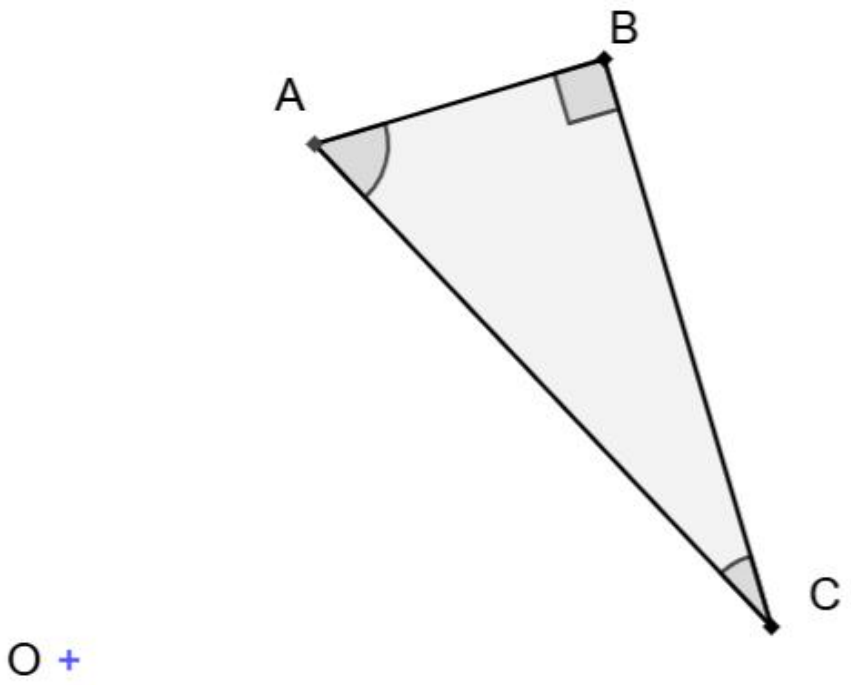
Rotate a triangle

Draw three construction lines with a ruler: OA, OB and OC.

Measure the lengths OA, OB and OC.

Choose an angle.

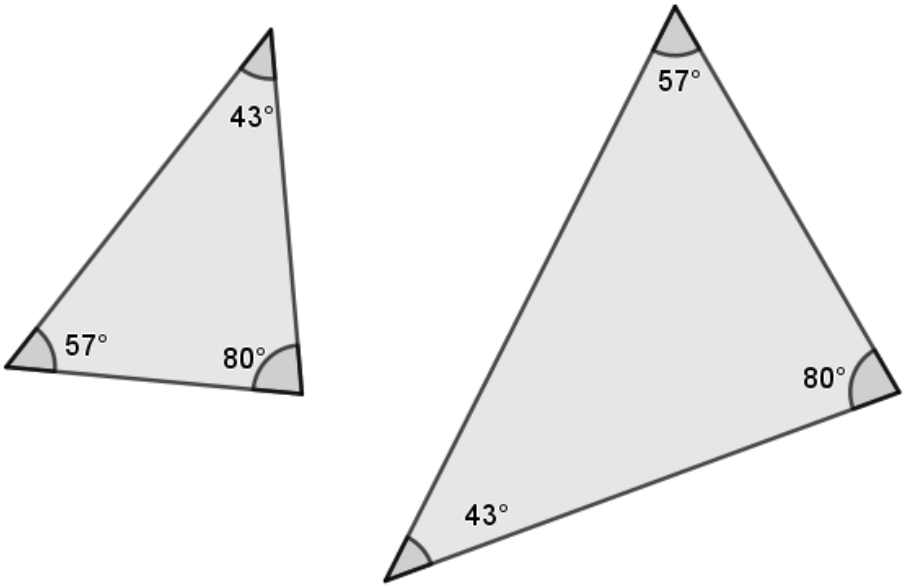
Construct three rays with your angle. Measure OA', OB', OC'.



Grade 9 Core U2 Geometry Lesson 10: Parallel Lines and Triangle Transformations

Vocabulary:

Add the terms: 'Parallel Lines' and 'Transversal' to your vocabulary list.



Similar Triangles:

Label the angles on the triangles above A, B, C and P, Q, R.

If the set of angles $\{\angle A, \angle B, \angle C\}$ is equal to the set of angles $\{\angle P, \angle Q, \angle R\}$ then we say:

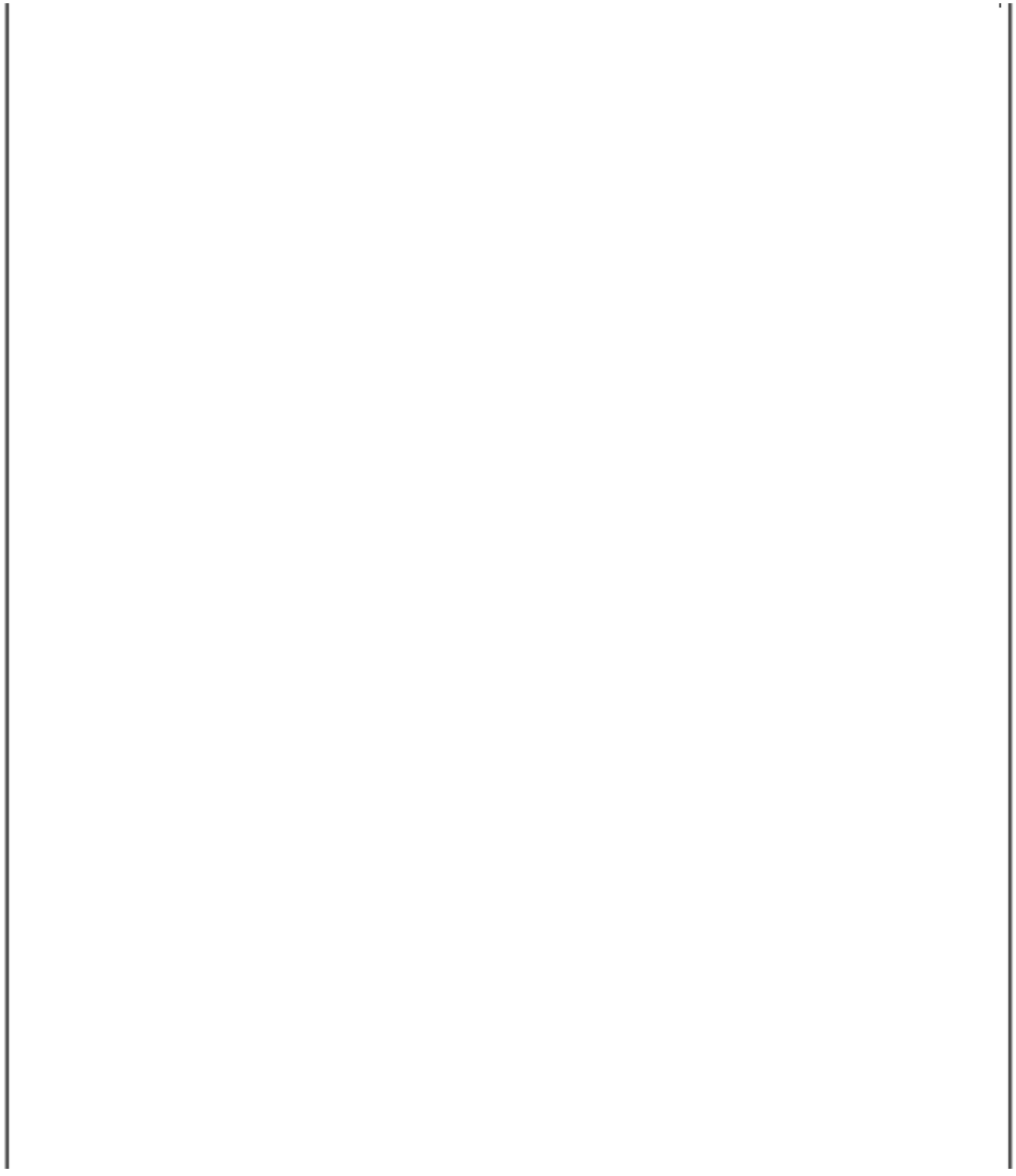
Measure two sides on the first triangle and two sides on the second triangle.

Calculate the scale factor of enlargement.

Calculate the lengths of the remaining two sides.

Measure the remaining two sides to check your calculation.

Constructing Two Similar Triangles with Parallel Lines

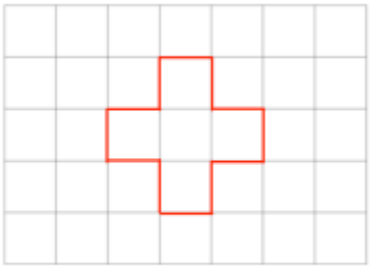


Grade 9 Core U2 Geometry Lesson 7: Enlarge shapes with a center of enlargement, using a grid.

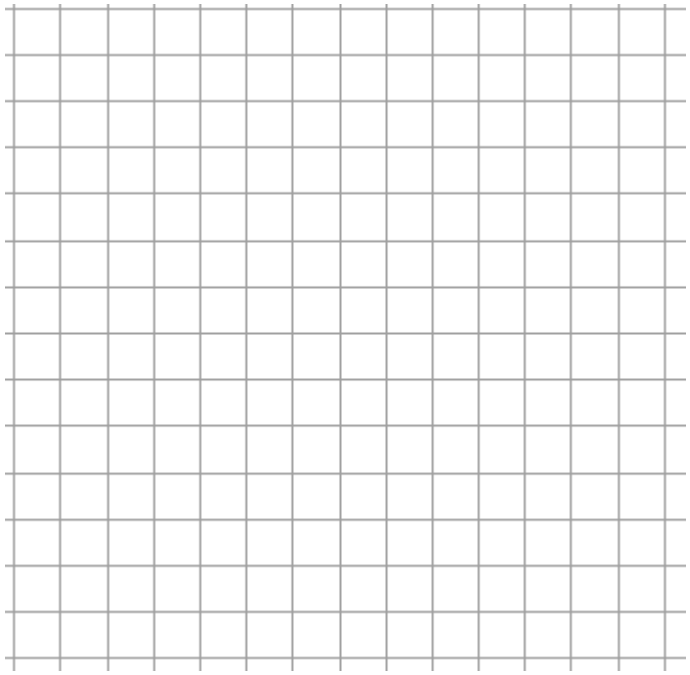
Englarging 2D shapes using a scale factor:

Example 1:

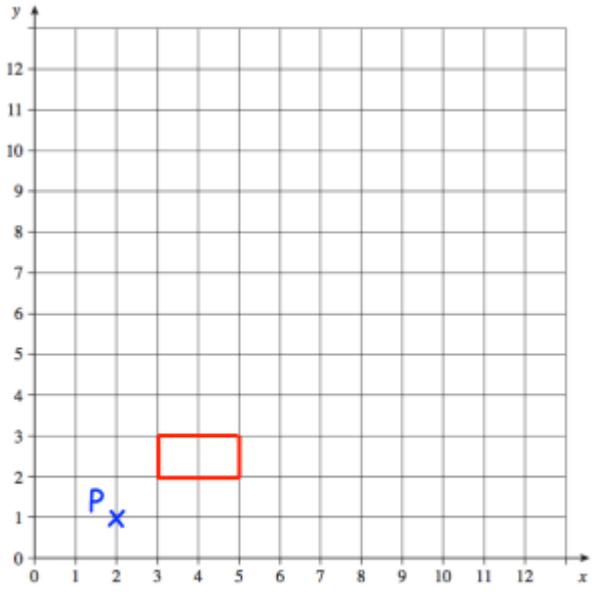
Enlarge, no specified center



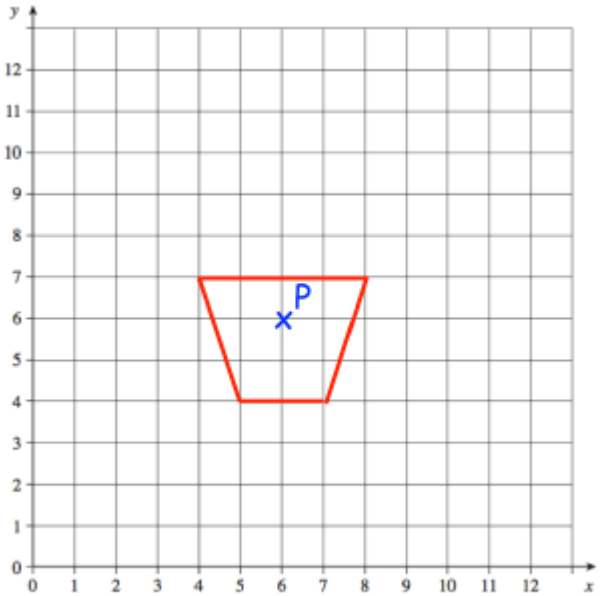
Enlarge by scale factor 4



Examples 2, 3: Using a center of enlargement

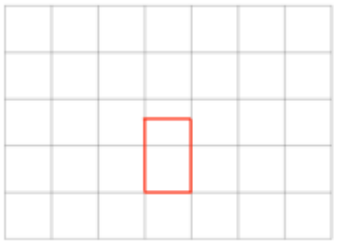


Enlarge by scale factor 3

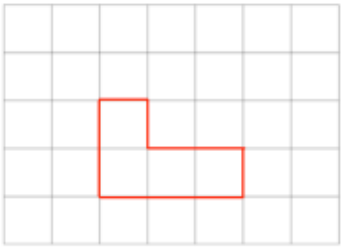


Enlarge by scale factor 3

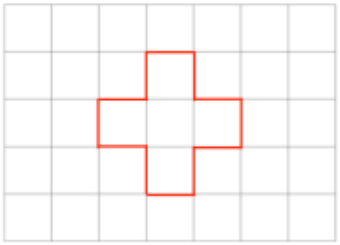
Use the grid to draw enlargements of these shapes, with the specified scale factor. Colour code the original with its enlarged shape.



Enlarge by scale factor 4



Enlarge by scale factor 2



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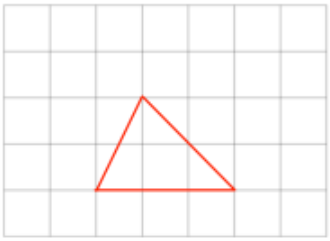
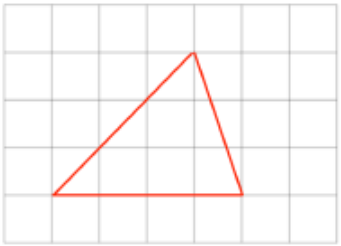


Enlarge by scale factor 2



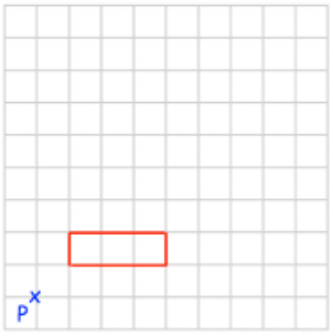
Enlarge by scale factor 3

Enlarge by scale factor 2

Enlargements: Centre of Enlargement

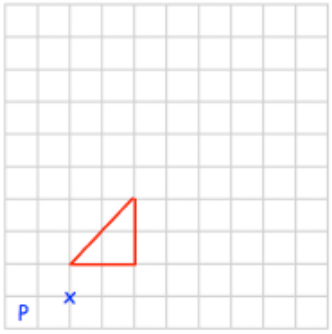
Video 104a on www.corbettmaths.com

(a)



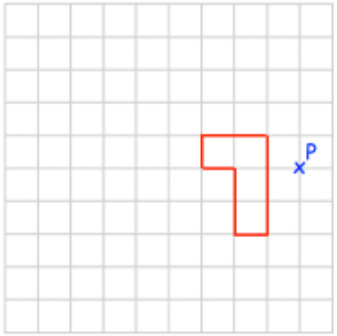
Enlarge by scale factor 2

(b)



Enlarge by scale factor 3

(c)

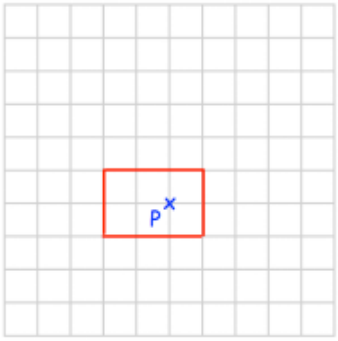


Enlarge by scale factor 2

(d)

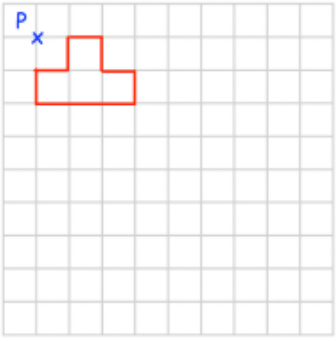
Enlarge by scale factor 4

(e)



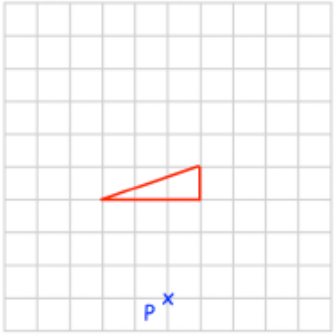
Enlarge by scale factor 2

(f)



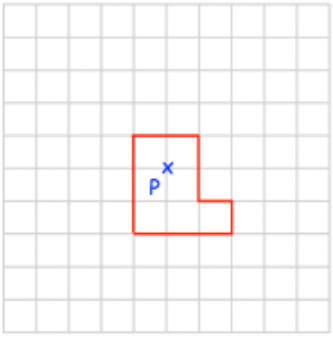
Enlarge by scale factor 3

(g)

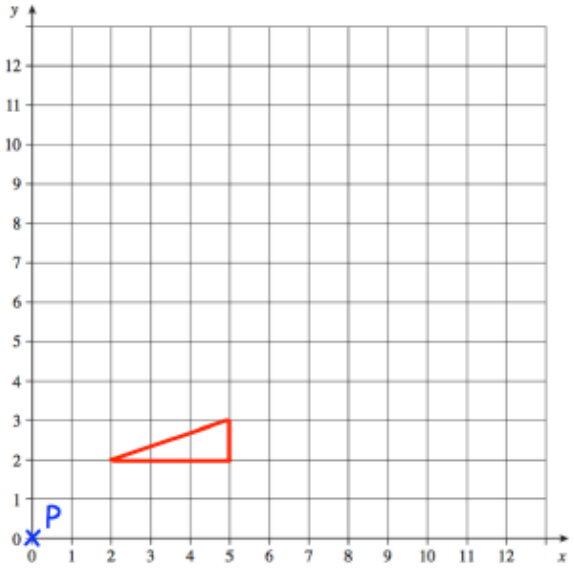


Enlarge by scale factor 2

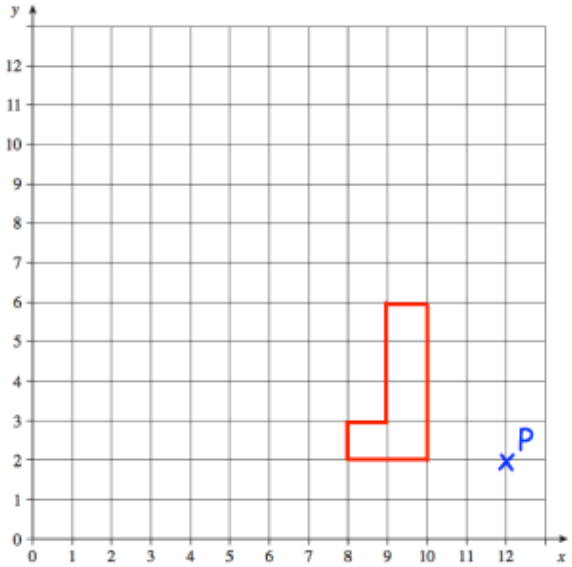
(h)



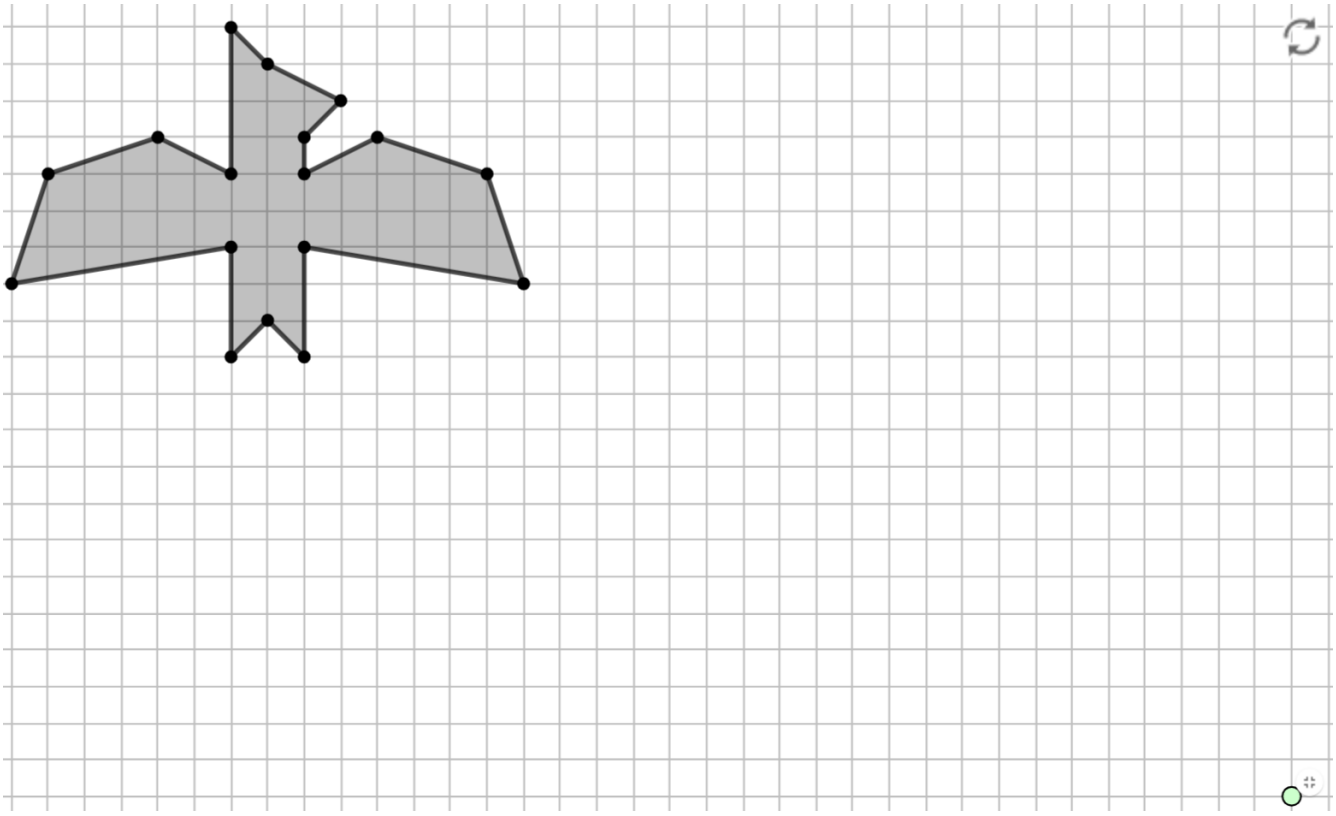
Enlarge by scale factor 2



Enlarge by scale factor 2



Enlarge by scale factor 2



Enlarge, by scale factor 2.

Corbett maths

Similar Shapes: Sides 1

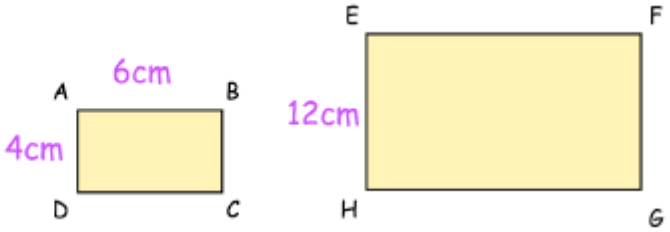
Video 292 on www.corbettmaths.com

When two shapes are similar, one scale factor has been used to enlarge all sides.

- Use division to determine the scale factor of enlargement
- Calculate the missing length.

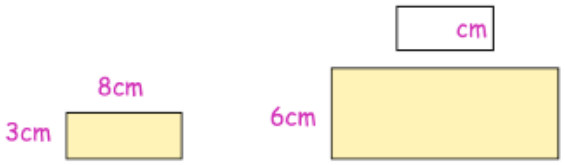
Example:

Work out the size of EF

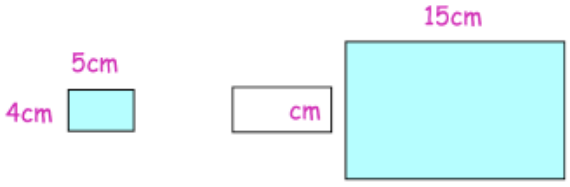


Question 1: Below are pairs of similar shapes.
Find the missing lengths.

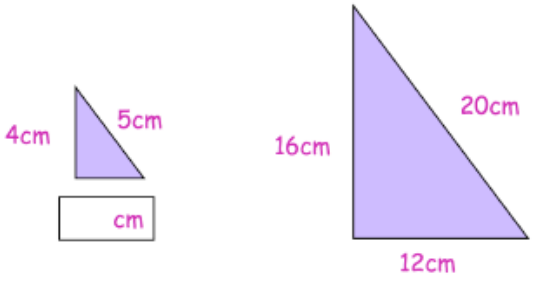
(a)



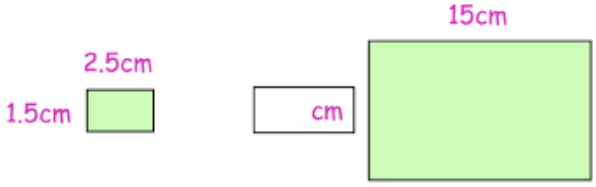
(b)



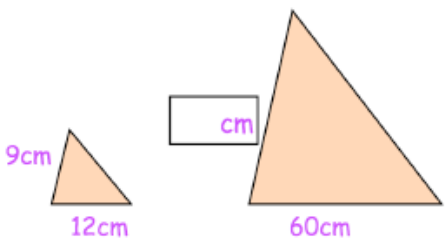
(c)



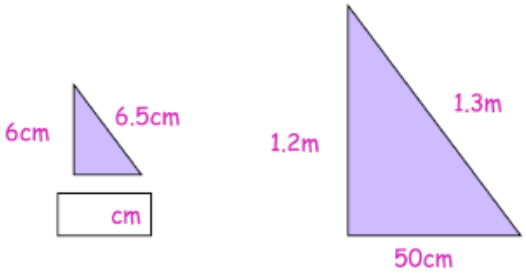
(d)



(e)

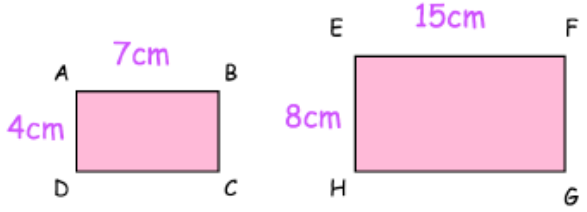


(f)

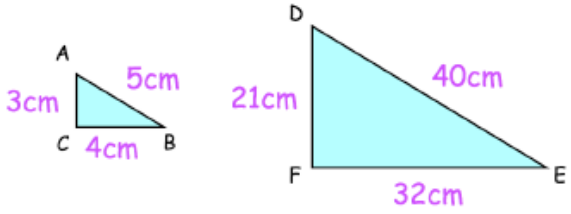


Question 2: These pairs of shapes are **not** similar.
Explain why.

(a)



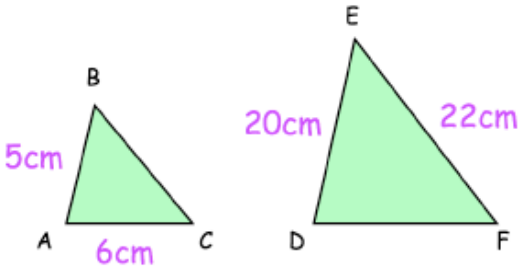
(b)



Question 4: Triangles ABC and DEF are similar.

(a) Work out the length of DF

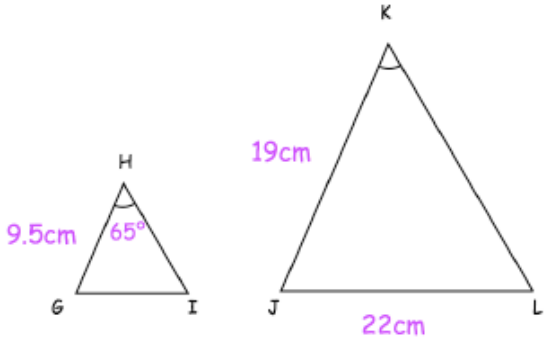
(b) Work out the length of BC



Question 5: Triangles GHI and JKL are similar.

(a) Write down the size of angle JKL

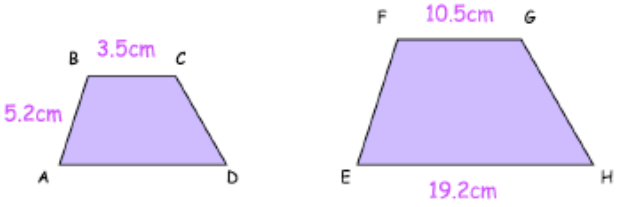
(b) Work out the length of GI



Question 6: Trapezium ABCD and trapezium EFGH are similar.

(a) Work out the length of EF

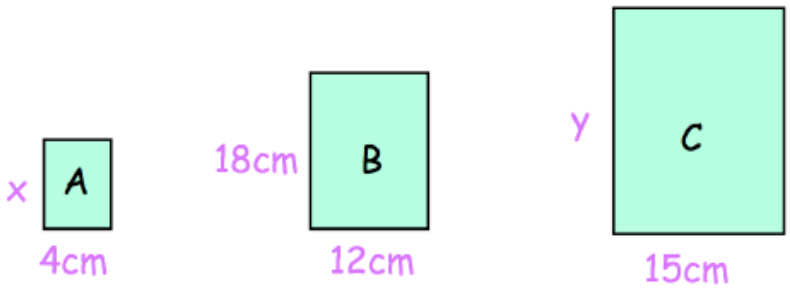
(b) Work out the length of AD



Question 9: The diagram shows three similar rectangles.

(a) Work out the size of x

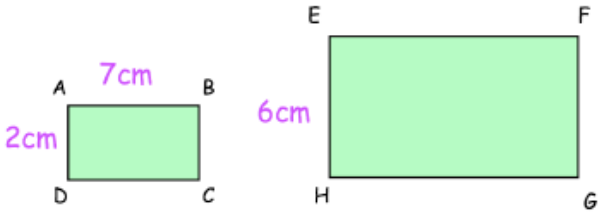
(b) Work out the size of y



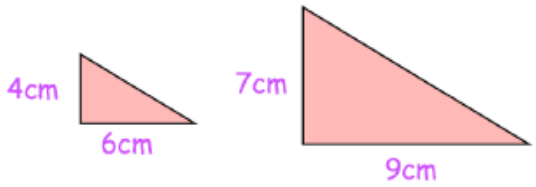
APPLY

Question 1: Rectangles ABCD and EFGH are similar

Find the area of rectangle EFGH



Question 2: Here are two triangles



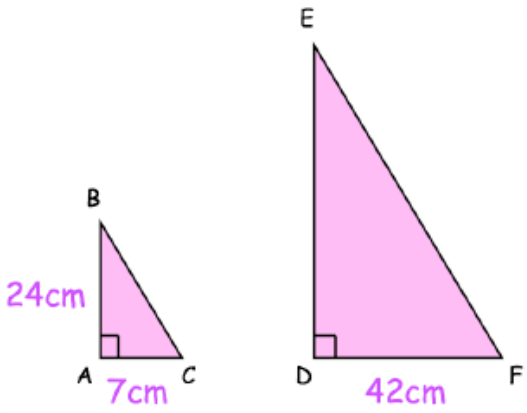
Finley says "the two triangles are similar because 3cm has been added to both the height and base of the smaller triangle."

Explain why Finley is incorrect.

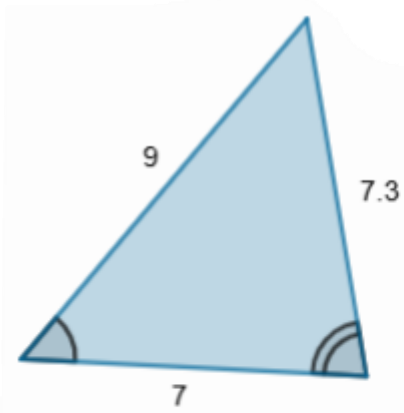
Question 3: ABC and DEF are similar right angled triangles.

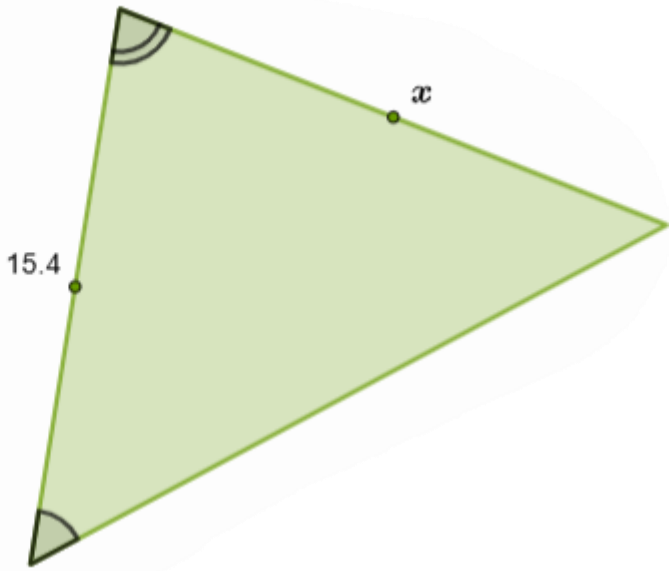
AB = 24cm AC = 7cm DF = 42cm

Work out the length of EF.



Question 4: Calculate the length of the side marked 'x'.



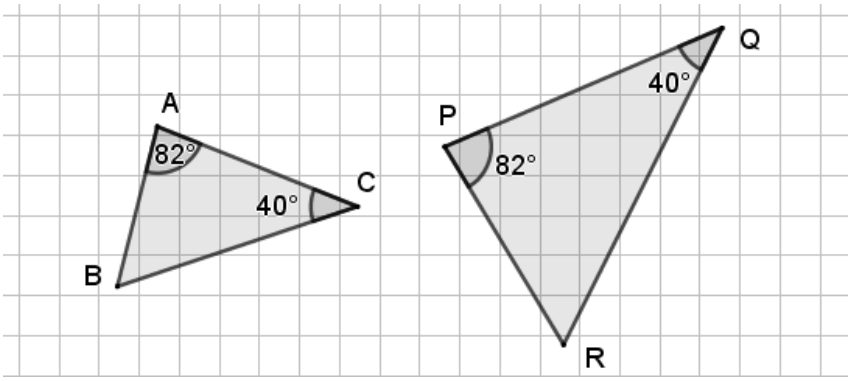


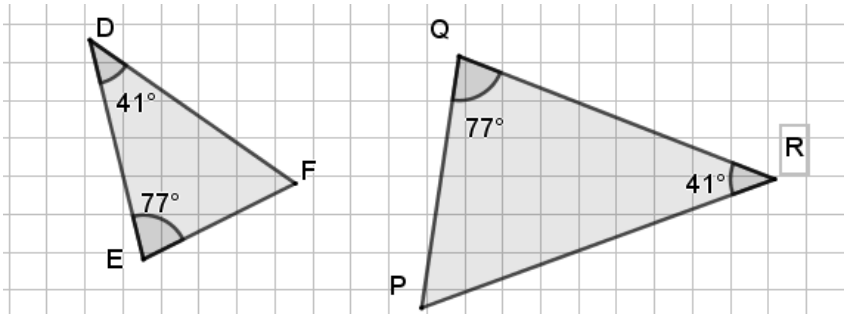
Grade 9 Core U2 Geometry Lesson 9: Similar Triangles

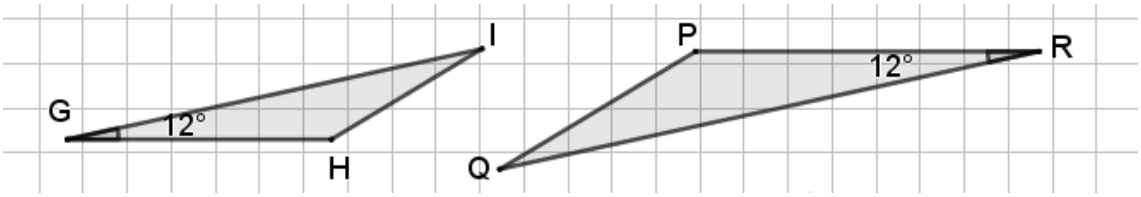
A. You need a copy of the similar triangles print out. Cut our the six triangles. Make three pairs of similar triangles. Colour code matching angles. Stick them in your notes. Label the vertices of the smaller triangle A, B, C. Label the vertices of the enlarged triangle A', B', C'. The angles A and A' should be equal.

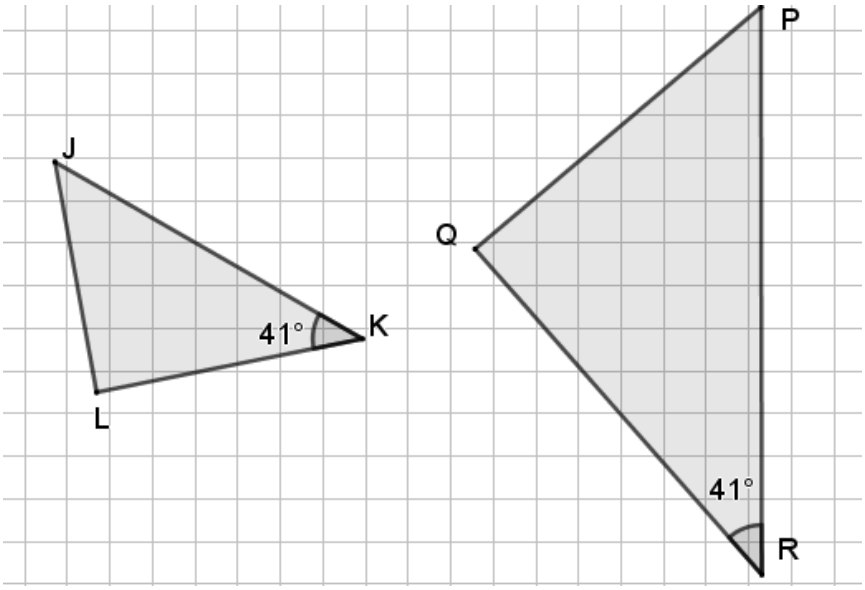
B. Here are four pairs of similar triangles.

Use the upper case letter notation with the ~ symbol to show similarity. The vertices need to be in the correct order to correspond to the same angle on each triangle.





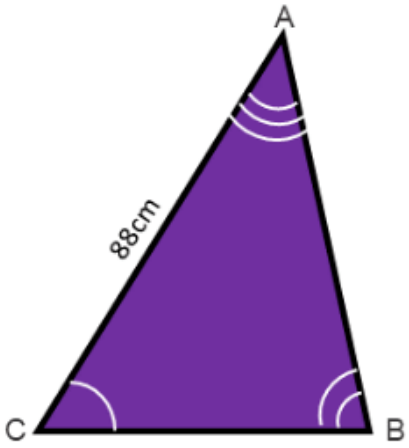




Grade 9 Core U2 Geometry Lesson 10: Similar Triangle Diagrams, using fractions

Similar triangle problems are easiest to solve when the triangles are drawn side by side with the angles positioned in the same orientation. In these problems, identify the two triangles then draw them side by side.

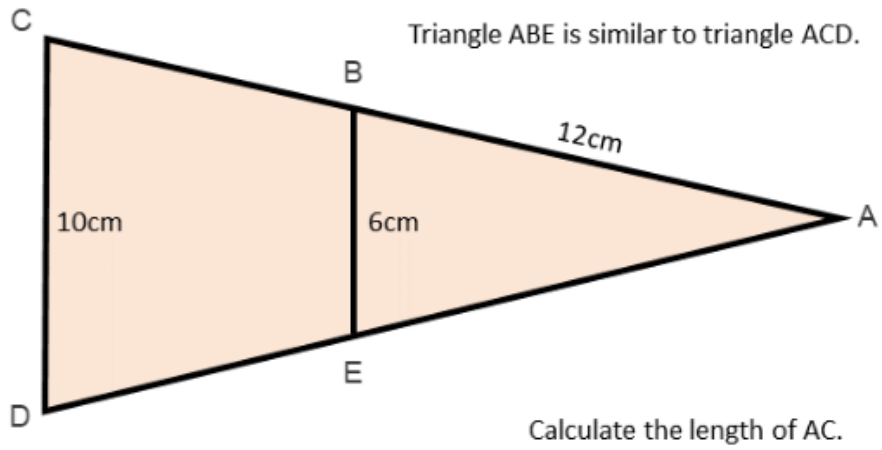
Problem 1



Calculate the length of AB.

Sketch these two triangles again below, so that they are presented in the same orientation. Label the vertices (with letters) and sides (with lengths). Explain how to calculate the length AB.

Problem 2

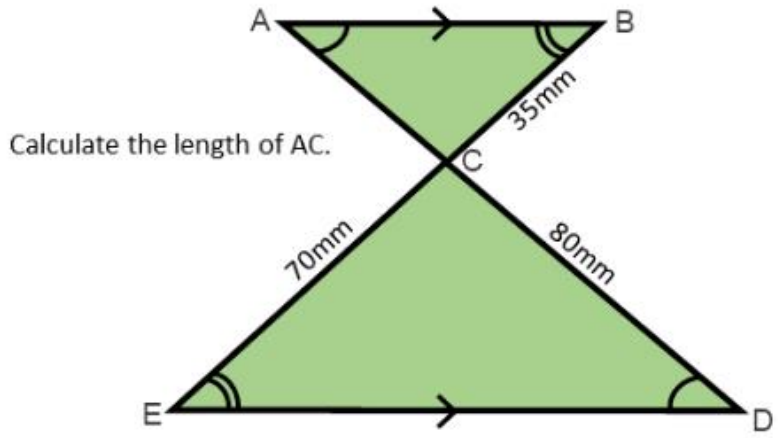


Triangle ABE is similar to triangle ACD.

Calculate the length of AC.

Draw triangle ABE and triangle ACD separately below, in the same orientation. Label the vertices (with letters) and sides (with lengths). Explain how to calculate the length AC.

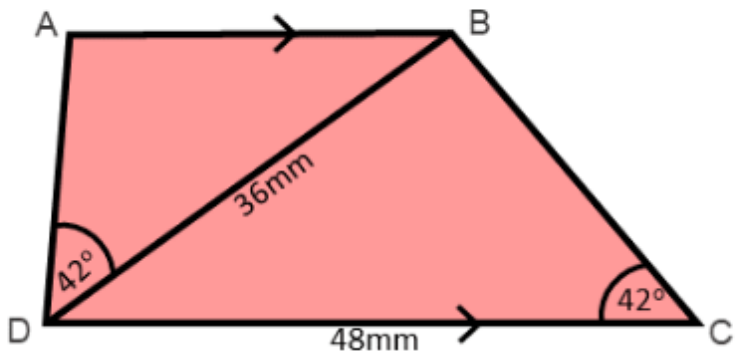
Problem 3



Draw triangles ABC and DEC below, presented in the same orientation. Label the vertices (with letters) and sides (with lengths). Explain how to calculate the length AC.

Problem 4

Calculate the length of AB.



Draw triangles ABD and DBC below, presented in the same orientation. Label the vertices (with letters) and sides (with lengths). Explain how to calculate the length AB.

Grade 9 Core Unit 2 Geometry: Review

Section 1: Use the Pythagorean Theorem (review class notes pages 11 – 16)

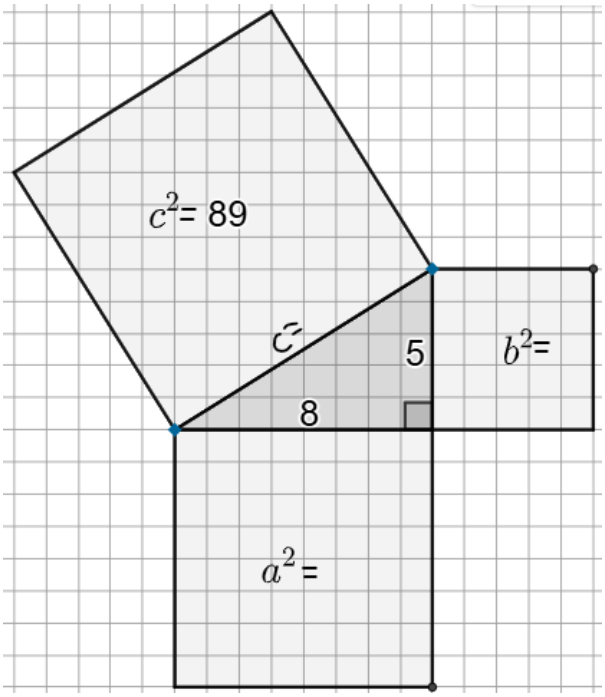
a) Which is the correct value for the following sentence: 100, 60, 360, 180 or 90?

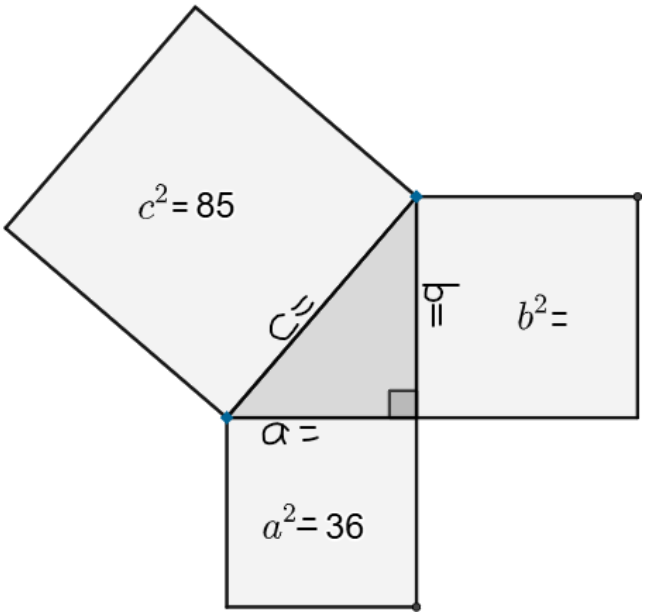
The sum of angles in a triangle is ..... degrees.

b) Which word best fits the following sentence: isosceles, scalene, right angled or obtuse angled?

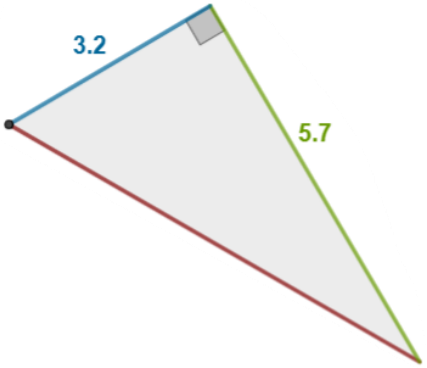
The Pythagorean Theorem can be applied only to triangles that are .....

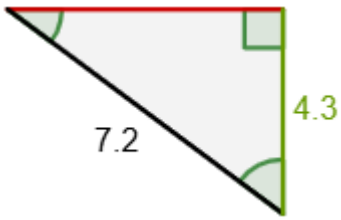
c) Write the missing values on each diagram.





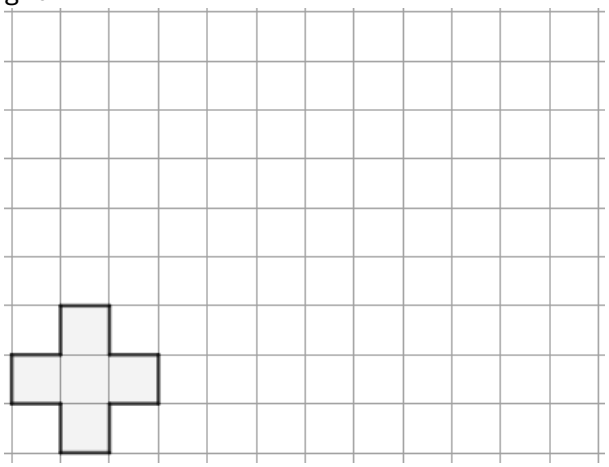
d) Use the Pythagorean Theorem to calculate the length of the third side on each triangle. Use estimation to check your answer.



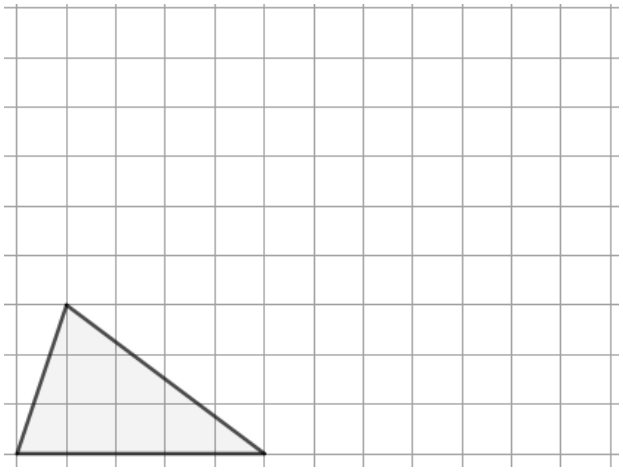


Section 2: Drawing with a scale factor on a grid (pages 37 – 40)

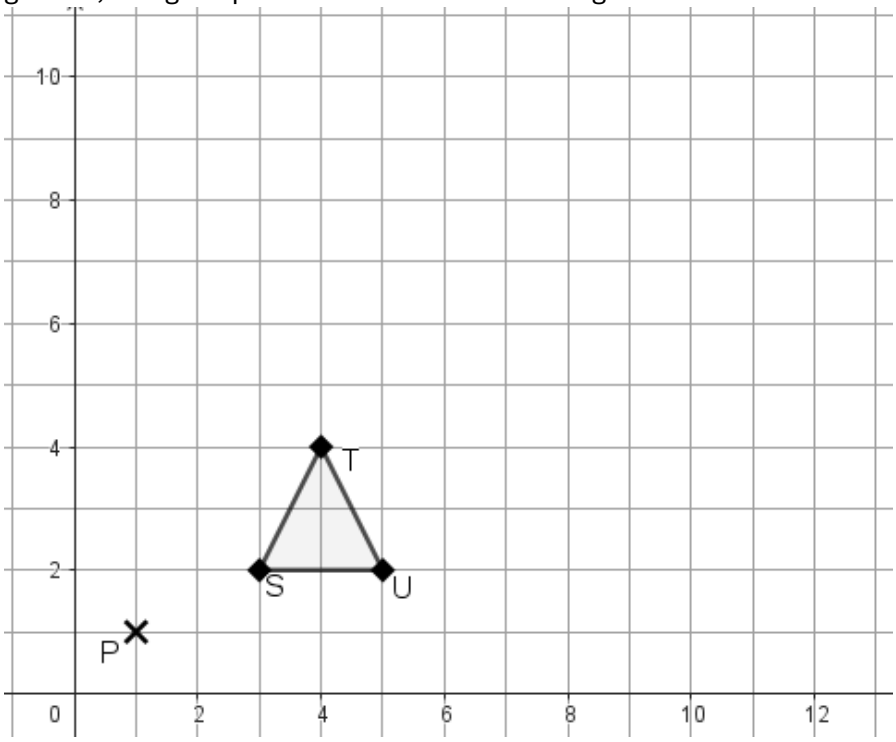
On the grid, draw an enlargement of the shape using scale factor 3. Your shape should fit on the grid.



On the grid, draw an enlargement of the shape using scale factor 2.

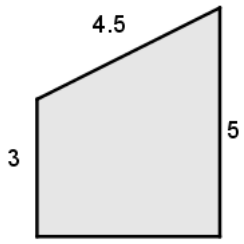


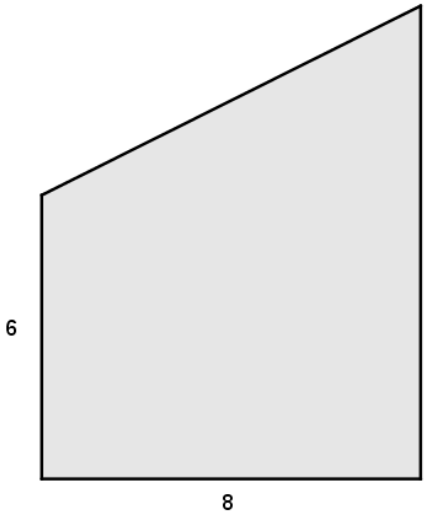
Enlarge the triangle STU, using the point P as the center of enlargement and scale factor 3.

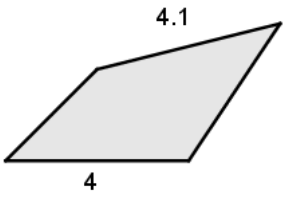


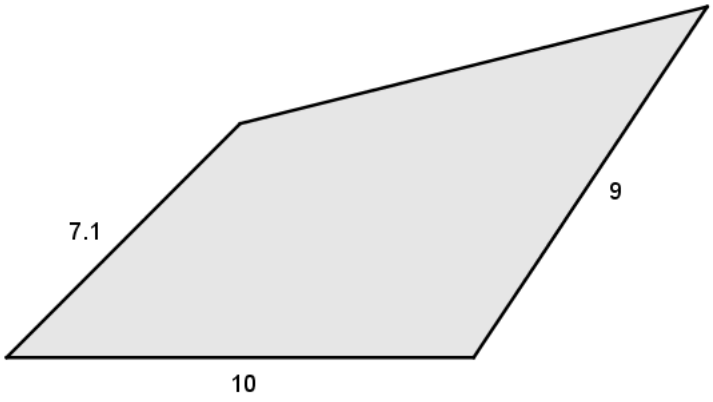
Section 3: Calculating a scale factor and a missing side (pages 45 – 48)

Determine the scale factor of enlargement on each pair of similar shapes. Calculate the lengths of all missing sides.

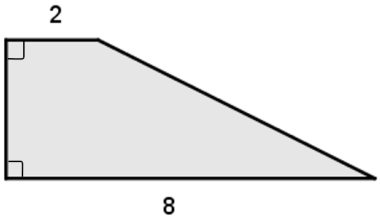


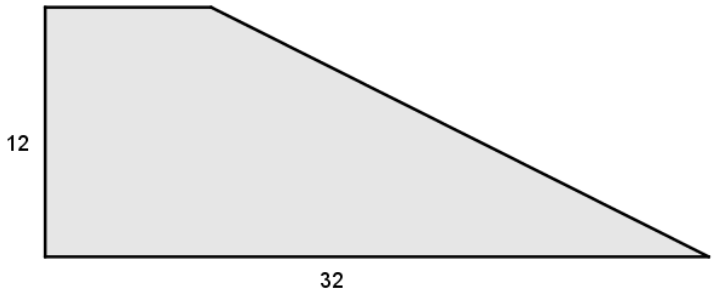






(you will need to use the Pythagorean theorem too on this problem).

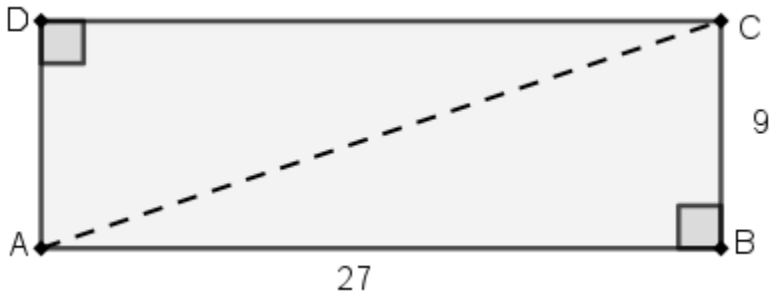




Section 4: Problem solving with the Pythagorean Theorem and Similar Triangles

Question 1

The rectangle ABCD has dimensions 9 cm by 27 cm.

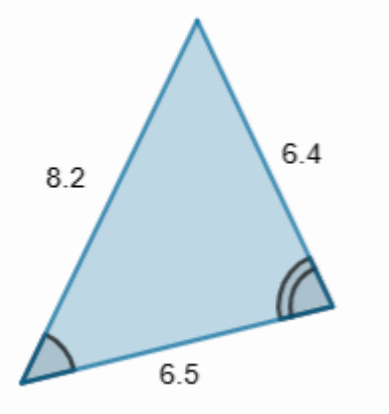


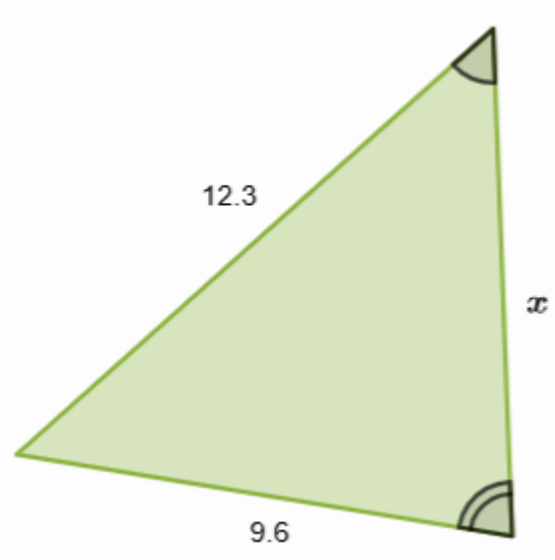
(a) Calculate the length of its diagonal AC.

(b) Explain how you know that triangle ABC is congruent to triangle CDA. That is, $ABC \cong CDA$

Question 2

The triangle on the right is an image of the triangle on the left. It has been reflected, rotated, translated and enlarged.





(a) Use three colour pens to colour code corresponding sides.

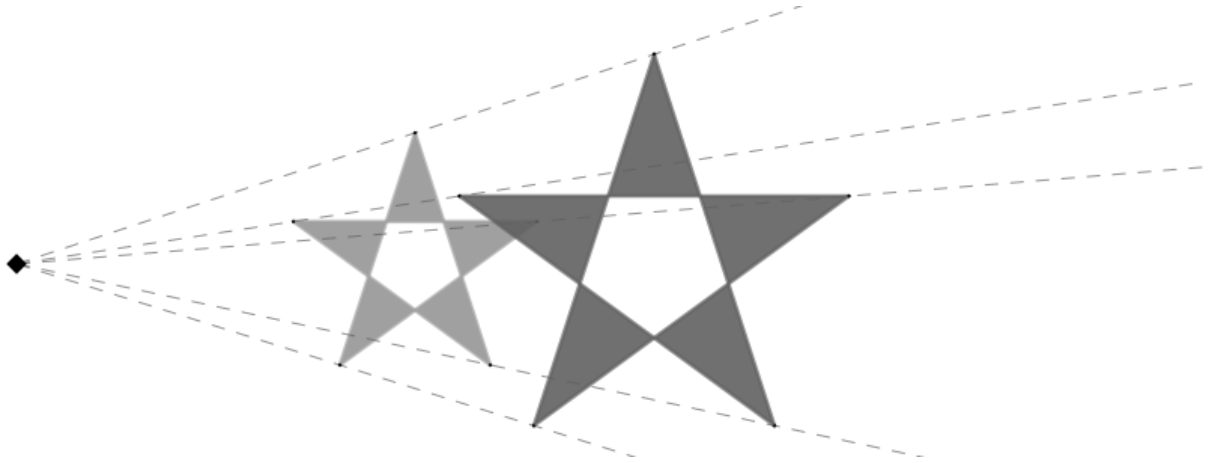
(b) Determine the scale factor of enlargement.

(c) Calculate the length of the side labelled x.

Grade 9 Geometry self assessment and evidence of learning NAME:

Knowledge: Reflect on these statements *without* referring to notes/a friend or other sources of knowledge. Put a mark at place on the no to yes arrow that reflects your answer, or circle no or yes:

I can identify various kinds of triangle including equilateral, isosceles, right-angled, scalene, obtuse, acute	no yes
I can explain the meaning of 'area'	no yes
I can explain the meaning of 'perimeter'	no yes
I can recognize and recall the first 12 square numbers.	no yes
I can explain when the Pythagorean Theorem can be applied	no yes
I can state what the Pythagorean theorem says about right-angled triangles	no yes
I can explain what is meant by 'scale factor'	no yes
I can explain what is meant by 'similar triangles' or 'similar shapes'	no yes
I know that the concept of similarity is present in many cultures and methods of calculation depend on the context	no yes
I can recognize and name each of the four transformations on a 2D shape (reflection, rotation, translation and resizing (or enlarging)).	no yes



Doing: Reflect on each of these statements. Circle a proficiency level that is represented by your work in this booklet, the GeoGebra lessons or your numeracy quiz:

I can use mathematical reasoning and processes to:

calculate the area of squares, rectangles and all kinds of triangles	E D P
calculate the hypotenuse of a right-angled triangle	E D P
calculate a shorter leg of a right-angled triangle	E D P
use the Pythagorean theorem to calculate the perimeter of a variety of shapes	E D P
enlarge a shape on a grid using a scale factor	E D P
enlarge a shape on a grid using a scale factor and a center of enlargement	E D P
enlarge a shape using rays, a center of enlargement and a scale factor	E D P
use proportional reasoning to calculate unknown sides on similar triangles/shapes	E D P
locate similar triangle in complex diagrams and apply proportional reasoning	E D P

Understand: Explain what each of these statements means with an example.

2D shapes have area and perimeter that can be described, measured and compared.

2D shapes can be categorised into types using their properties. Properties include: number of sides, sizes of angles.

Two or more 2D shapes of the same category may be similar. If two shapes are similar, then their sides have a proportional relationship that can be used to measure and compare the two shapes.

Grade 9 Core Unit 2 Project: Flag Construction

The objective of this project is to practice using ratios and constructing 2D shapes accurately, both on paper and using GeoGebra.

Outline of the task:

- Choose one of the suggested flags.
- Research the country or the background to the flag.
- Construct the flag on graph paper accurately, using pencil, ruler & protractor if required.
- Construct the flag on GeoGebra.

Structure: Google slides – note slide #9 please.

Slide 1: Title slide. This slide will have the title of your project, an image of your chosen flag, your name, the date and a sentence that describes the objective of the project.

Slide 2: A world map image showing the location of the country your flag represents. Either write a few sentences about why you chose this flag, or research and write three things about this country that you didn't already know. In your own words please – you should be able to recall these three facts for at least a week after you submit the project.

Slide 3: An image of the flag, the year the flag was designed, who designed it and a description of what each colour used in the flag design represents.

Slide 4: The construction diagram of this flag (image from the web), the 'aspect ratio' of the flag in its simplest form.

Slide 5: An image of your paper and pencil graphing using the first scale factor.

Slide 6: A screenshot of your GeoGebra construction along with a link to your GeoGebra file.

Slide 7: An explanation of the methods, tools and calculations you used to construct the flag using GeoGebra. Include any observations on what made the drawings easy or challenging.

Slide 8: An organized list of all websites you draw information from for this project.

Grading: You will be given three grades for this work based on the following:

Reflecting and Connecting	P: I created either personal or geographical context for the flag study and reflected meaningfully on the math process. (slides 2, 3, 7)
Communication	P: I have used google slides to effectively present the content and the math clearly, demonstrating that I am thinking of the audience when I choose image layout, background, font size etc. (all slides)
Math Reasoning	P: I have constructed two mathematically accurate representations of the flag. I have labelled axes and key points. (slides 5, 6, 7 & your paper flag)

Suggested timeline:

Day 1: Research and decide which flag. Slides # 1-4

Day 2: Slide #5, the paper and pencil accurate, mathematical construction

Day 3: Slide #6, the GeoGebra construction

Day 4: Slides 7, 8.

Suggested flags:

Faroe Islands
Bahamas
Seychelles
Antigua and Barbuda
Greece
Vietnam
Timor-Leste
Sweden or Norway, Denmark, Iceland…
Rwanda
North Macedonia
Kuwait

World Map:

Aspect ratio list on wiki: https://en.wikipedia.org/wiki/List_of_national_flags_of_sovereign_states

Three pairs of similar triangles. Cut them out. Colour code matching angles. Stick them in your notes. Label the vertices of the smaller triangle A, B, C. Label the vertices of the enlarged triangle A', B', C'. The angles A and A' should be equal.