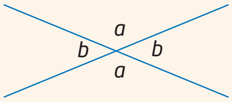
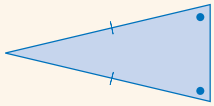
Get Ready

Angle Properties

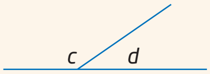
When two lines intersect, the **opposite angles** are equal.



The angles opposite the equal sides of an isosceles triangle are equal.

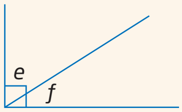


Supplementary angles sum to 180°.



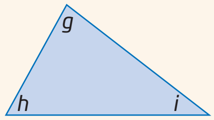
$c + d = 180°$

Complementary angles sum to 90°.



$e + f = 90°$

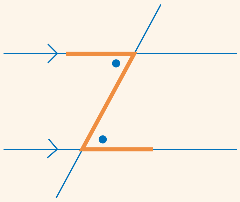
The sum of the interior angles in a triangle is 180°.



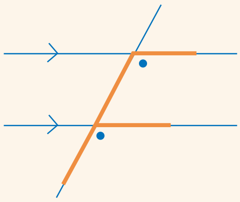
$g + h + i = 180°$

When a transversal crosses parallel lines, many pairs of angles are related.

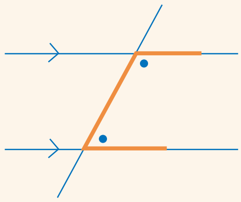
alternate angles are equal



corresponding angles are equal

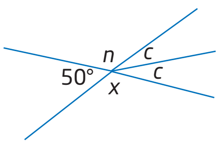


co-interior angles are supplementary

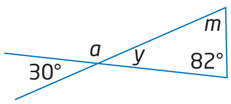


1. Find each unknown angle.

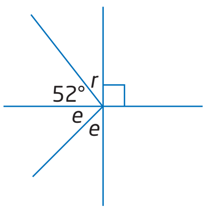
a)



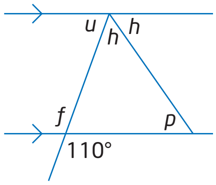
b)



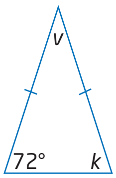
c)



d)

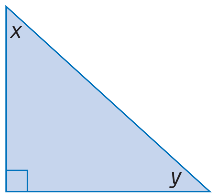


e)

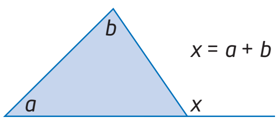


2. Prove that each interior angle of an equilateral triangle measures 60°.

3. Prove that for any right triangle, the two acute angles are complementary.



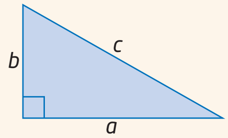
4. The exterior angle theorem states that the exterior angle of a triangle is equal to the sum of the two opposite interior angles.



Prove the exterior angle theorem.

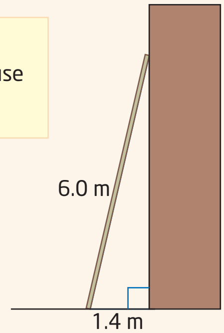
Pythagorean Theorem

The three side lengths of a right triangle are related by the equation $c^2 = a^2 + b^2$.



How far up the wall will the ladder reach?

Substitute the known values into the Pythagorean theorem.



$$\begin{aligned} c^2 &= a^2 + b^2 \\ 6.0^2 &= 1.4^2 + b^2 \\ 36 &= 1.96 + b^2 \\ 36 - 1.96 &= b^2 \\ 34.04 &= b^2 \\ \sqrt{34.04} &= \sqrt{b^2} \\ 5.83 &\doteq b \end{aligned}$$

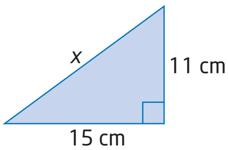
I have to substitute carefully in the Pythagorean theorem. The square of the length of the hypotenuse usually appears alone on one side of the equation.

Subtract 1.96 from both sides of the equation.

The ladder will reach approximately 5.8 m up the wall.

5. Find the unknown side length in each triangle. Round your answers to the nearest tenth of a unit.

a)



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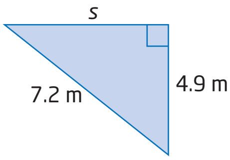
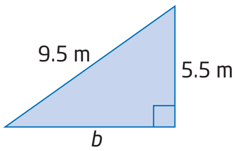
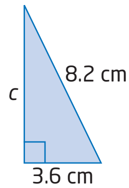


6. Find the unknown side length in each triangle. Round your answers to the nearest tenth of a unit.

a)



b)

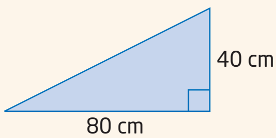


Slope

The slope of a line or line segment is the ratio of its rise to its run. The letter m is often used to indicate slope.

The slope of the ramp can be found by calculating this ratio.

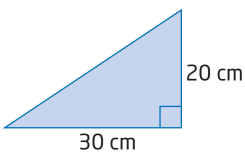
$$\begin{aligned} m &= \frac{\text{rise}}{\text{run}} \\ &= \frac{40}{80} \\ &= \frac{1}{2} \text{ or } 0.5 \end{aligned}$$



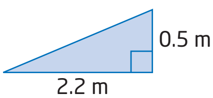
Slope can be expressed as a fraction in lowest terms or as a decimal.

7. Find the slope of each ramp.

a)

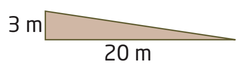


b)

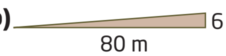


8. For safety reasons, a ramp should have a slope of not more than $\frac{1}{12}$. Determine whether each ramp is safe.

a)

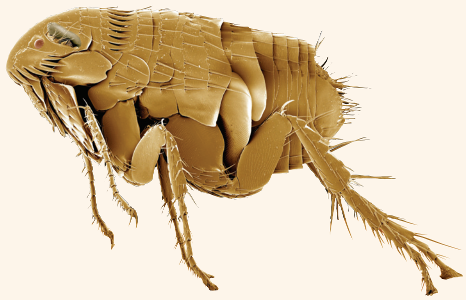


b)



Equivalent Ratios

A ratio compares two quantities with the same units. For example, the photograph of a flea has been magnified 30 times.



The ratio 1:30 describes the relationship between the actual size and the image size of the flea. You can write this as a fraction:

$$\frac{1}{30} \begin{array}{l} \leftarrow \text{actual size} \\ \leftarrow \text{image size} \end{array}$$

The image length of the flea is 45 mm. Using equivalent ratios, you can find the actual length, L, of the flea.

$$\frac{\text{actual}}{\text{image}} = \frac{1}{30}$$

$$\frac{L}{45} = \frac{1}{30}$$

$$L = 45\left(\frac{1}{30}\right) \quad \text{Multiply both sides by 45.}$$

$$L = 1.5$$

The actual length of the flea is 1.5 mm.

9. Solve each proportion.

a) $\frac{x}{6} = \frac{1}{2}$

b) $\frac{3}{y} = \frac{2}{3}$

c) $\frac{a}{2} = \frac{2}{a}$

d) $\frac{x + 2}{2} = \frac{4}{x}$

10. Pick two parts of your choice on the flea. Measure their image lengths. Use equivalent ratios to find their actual lengths.

11. Chapter Problem Before looking at your first clue and beginning the race, you need to understand how to read distances on your map. Look at the scale in the bottom right corner.

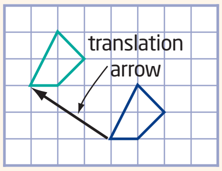
a) Write a ratio to describe the relationship between map distance and actual distance.

b) Measure the map distances for the following. Then, find the actual distances, to the nearest 100 km.
- Moosonee to Ottawa
- Toronto to Miami

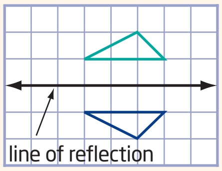
c) Pick two other points on the map. Determine how far apart they are.

Transformations

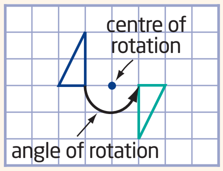
The diagrams illustrate the images produced when a shape is transformed in different ways.



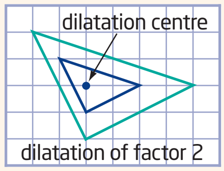
A **translation** is a slide along a fixed distance and direction.



A **reflection** is a flip across a mirror line, or line of reflection.



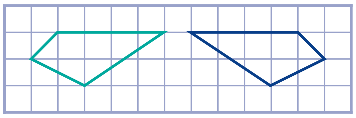
A **rotation** is a turn about a centre point, or centre of rotation.



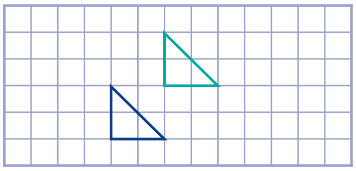
A **dilatation** is an enlargement or reduction by a fixed factor, measured from a centre point.

12. Identify the type of transformation in each case.

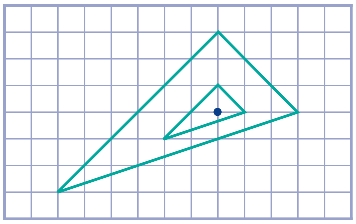
a)



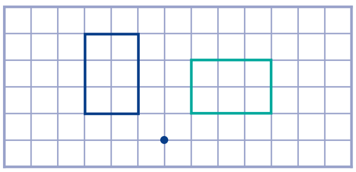
b)



c)



d)



13. Draw a right triangle and label its vertices. Draw a triangle that is

a) a rotated image of the original

b) a dilated image of the original

c) a reflected image of the original

d) a translated image of the original

14. Draw an acute triangle and label its vertices. Draw a triangle that is

a) a rotated image of the original

b) a dilated image of the original

c) a reflected image of the original

d) a translated image of the original