

Geometry and Measurement Review

Try each problem first. You don't need to finish everything.

Core path ~55 min · Full sheet ~1 h 50 min

Recommended: K1-K5, then one A and one T problem

K = Knowledge & Understanding · A = Application · T = Thinking · Boss = Challenge



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QUICK REFERENCE

Angle pairs: complementary angles add to 90° , supplementary angles add to 180° . When two lines are **marked parallel**, corresponding and alternate angles are equal and co-interior angles add to 180° .

Pythagorean theorem: $a^2 + b^2 = c^2$, where c is the hypotenuse, opposite the right angle. To find a leg, subtract: $a^2 = c^2 - b^2$.

A height is always **perpendicular** to the base. A slanted edge or slant height is **not** the h in an area or volume formula.

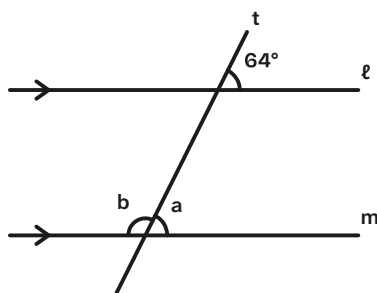
Show your work on separate paper.

Core Skills (K)

Angles · Polygons · Pythagoras · Area · Volume

K1 Angle Pairs

- Find the complement and the supplement of a 38° angle.
- Lines ℓ and m are parallel. Determine the angles a and b .



- In $\triangle PQR$, the exterior angle at R is 131° and $\angle P = 57^\circ$. Determine $\angle Q$ and the interior angle $\angle PRQ$.

K2 Polygon and Circle Angles

- Determine the sum of the interior angles and the sum of the exterior angles of an octagon.
- Each exterior angle of a regular polygon measures 24° . Determine the number of sides and the measure of each interior angle.
- In a circle with centre O , the central angle $\angle AOB = 130^\circ$. Point C lies on the circle, on the major arc. Determine the inscribed angle $\angle ACB$.

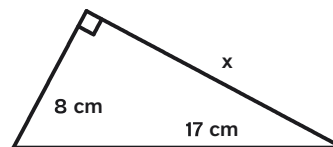
K3 Missing Sides

Find each unknown side length.

Polygons with n sides: the interior angles add to $(n - 2) \times 180^\circ$. The exterior angles always add to 360° , whatever n is.

Formulas: circle $C = 2\pi r$, $A = \pi r^2$; cylinder $SA = 2\pi r^2 + 2\pi rh$, $V = \pi r^2 h$; pyramid or cone $V = \frac{1}{3}Bh$.

- A right triangle has legs 7 cm and 24 cm. Find the hypotenuse.
- Find x in the right triangle below.

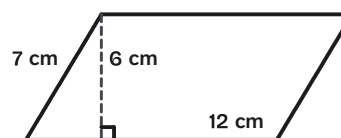


- A right triangle has a hypotenuse of 11 m and one leg of 6 m. Find the other leg, to the nearest tenth of a metre.

K4 Perimeter and Area

Round answers to the nearest tenth where needed.

- A circle has a diameter of 14 cm. Find its circumference and its area.
- Find the perimeter and the area of the parallelogram below.

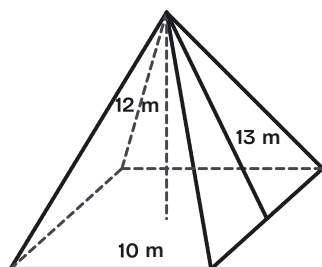


- A window is a semicircle with a diameter of 80 cm. Find its area and its perimeter.

K5 Volume

Round answers to the nearest tenth where needed.

- a) Find the volume of a cylinder with radius 4 cm and height 10 cm.
- b) Find the volume of a cone with the same radius and height as the cylinder in (a).
- c) Find the volume of the square-based pyramid below. Its height is 12 m and the slant height of each face is 13 m.



Real World (A)

Pythagoras in Context · Surface Area · Best Dimensions

A1 Accessible Ramps

An accessibility rule says a wheelchair ramp may rise at most 1 m for every 12 m of horizontal run.



- a) A library entrance is 0.5 m above the sidewalk. Find the shortest horizontal run the rule allows, then the length of the ramp surface, to the nearest hundredth of a metre.
- b) An old ramp has a surface 3.4 m long and a horizontal run of 3.0 m. How high does it rise?
- c) A rink entrance in Sudbury is 0.9 m up, with only 8 m of flat ground in front of it. A student designs a straight ramp of length $\sqrt{8^2 + 0.9^2} \approx 8.05$ m. Can it be built under the rule? What would the rink need instead?

A2 Maple Syrup Can

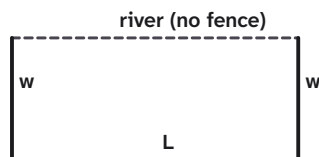
A cylindrical can of maple syrup from a sugar bush near Lanark has a radius of 5 cm and a height of 12 cm. Round answers to the nearest tenth.

- a) A paper label covers the curved side of the can exactly, with no overlap. Find the area of the label.
- b) Find the area of metal needed to make the can, including the top and the bottom.

- c) The designer has label sheets that are 30 cm by 15 cm, an area of 450 cm^2 , more than the label needs. Can one sheet, cut but not taped, make the label? Justify.

A3 Riverside Garden

A farm near Peterborough has 60 m of fencing for a rectangular garden along a river. The river side needs no fence. The width w is perpendicular to the river and the length L runs along it.



w (m)	5	10	15	20	25
L (m)	50				
Area (m^2)	250				

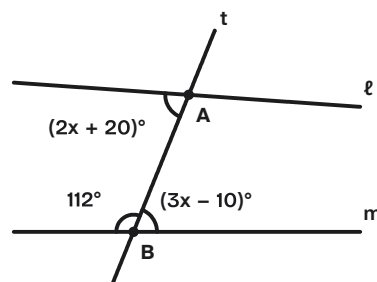
- a) Write L in terms of w . Then complete the table.
- b) A student says the best garden is a square. Find the area of the square garden that uses all 60 m of fencing, and compare it with the best garden in your table.
- c) The straight part of the riverbank is only 24 m long, so $L \leq 24$. State the dimensions that give the largest area now, and that area.

Think It Through (T)

Error Analysis · Explain Why

T1 Spot the Flaw

Lines ℓ and m are cut by the transversal t . Nothing in the diagram says ℓ and m are parallel. A student writes: "Alternate interior angles are equal, so $2x + 20 = 3x - 10$. Then $x = 30$, and both angles measure 80° ."



- a) Use the 112° angle to find the value of x .
- b) Find the angle at A . Are ℓ and m parallel? Explain.
- c) Identify the student's error. How does the 112° angle show that $x = 30$ is impossible?

T2 Glued Cubes

A student claims: "When you glue two solids together, the surface area of the new solid is the sum of their surface areas." Each cube below has edges of 3 cm.

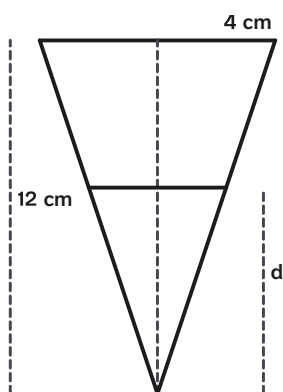
- Two cubes are glued face to face. Find the sum of their surface areas, and the surface area of the new solid.
- Explain why the student's rule overcounts, and by how much in (a).
- Four of these cubes are glued face to face into one solid. Find the smallest possible surface area and describe the arrangement that gives it.

Boss Level

Optional challenge

Half-Full Cup

A cone-shaped paper cup has a top radius of 4 cm and a height of 12 cm. It is held point down. When the water is d cm deep, the water surface is a circle of radius $\frac{d}{3}$ cm.



- Find the volume of the cup, in terms of π .
- The cup is filled to half its height. What fraction of the cup is full?
- Find the depth of water that makes the cup exactly half full, to the nearest tenth of a centimetre.

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