

Geometry

Name: _____

Date: _____

Concepts

- Angles of Depression and Elevation
- Equivalent Figures
- Equivalent Solids
- Finding Missing Measurements in Plane Figures Using a 2nd Degree Equation
- Geometry (theory)
- Methods to Decompose Figures
- Metric Relations in a Circle
- Missing Measurements in Solids (theory)
- Solids with the Same Area
- Tetrahedrons
- The Angles of a Circle

Angles of Depression and Elevation

1. From an observation deck of a lighthouse, 46 m above sea level, the angle of depression to a moored kayak is 12° . How far is the kayak from the foot of the lighthouse, horizontally? Round to the nearest tenth of a metre.

Equivalent Figures

2. A rhombus-shaped kite panel has diagonals measuring 18 cm and 12 cm. A circular panel is to be cut with exactly the same area. What is the radius of the circular panel, to the nearest hundredth of a centimetre?

Equivalent Solids

3. A solid metal cone with base radius 10 cm and height 5 cm is melted down and recast, without loss, as a solid sphere. Find the radius of the sphere.

Finding Missing Measurements in Plane Figures Using a 2nd Degree Equation

4. The length of a rectangular label is 3 cm more than twice its width, and its area is 65 cm^2 . Find its dimensions.

Geometry

5. Three words are used constantly in this topic and are easy to confuse: *congruent*, *similar* and *equivalent*. Define each in one sentence, then give a concrete numerical example showing that

- a) two equivalent figures need not be congruent;
- b) two similar figures need not be equivalent.

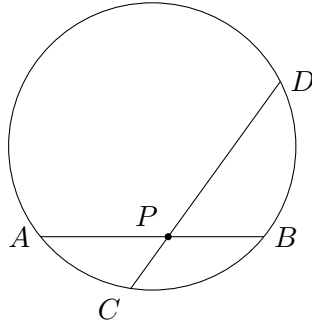
Finally, state the only condition under which two similar figures *are* equivalent.

Methods to Decompose Figures

6. The floor of a bicycle shelter is a rectangle 14 m long and 9 m wide with a semicircular apron attached to one of its 9 m sides, the diameter of the semicircle being that side. Find the total area of the floor, to the nearest hundredth of a square metre.

Metric Relations in a Circle

7. Two chords $\overline{AB}$ and $\overline{CD}$ of a circle meet at an interior point P , with $\overline{AP} = 8$ cm, $\overline{PB} = 6$ cm and $\overline{CP} = 4$ cm. Find $\overline{PD}$.



8. An archaeologist recovers a fragment of a circular stone wheel. The fragment's straight edge is 48 cm long, and the greatest distance from the midpoint of that straight edge to the curved rim is 8 cm.

a) Find the diameter of the complete wheel.

b) To display the fragment, a straight rod is fixed at a point P lying on the line of the straight edge, 10 cm beyond one of its ends, and its other end just touches the reconstructed rim (the rod is tangent to the circle). How long is the rod, to the nearest hundredth of a centimetre?

Missing Measurements in Solids

9. Explain why the height of a right circular cylinder can be isolated directly from its volume and radius, whereas finding its radius from its volume and height requires solving a second-degree equation. Then find the radius of a cylinder of volume $1000\pi \text{ cm}^3$ and height 40 cm, and explain why only one of the two solutions of that equation is kept.

Solids with the Same Area

10. A cube with edge 6 cm and a sphere have the same total surface area. Find the sphere's radius, to the nearest hundredth of a centimetre.

Tetrahedrons

11. A tetrahedron has for base a right triangle whose legs measure 9 cm and 12 cm, and its apex lies 10 cm directly above the vertex of the right angle. Find its volume.

The Angles of a Circle

12. Two chords of a circle intersect inside it and form an angle of 74° . One of the two arcs intercepted by that angle and its vertical angle measures 96° . What is the measure of the other intercepted arc?

Synthesis — drawing on several sheets in this topic

13. The cross-section of a road tunnel is the region between a straight roadway and a circular arc: the roadway is a chord 12 m wide and the highest point of the arch is 4 m above the middle of the roadway.

- a) Find the radius of the circle the arch belongs to.
- b) Find the area of the cross-section of the tunnel opening, to the nearest hundredth of a square metre.
- c) A transporter is 5.0 m wide and 3.7 m tall, and drives centred in the tunnel. Does it pass? Justify with a computation, not with the height of the arch alone.

Want the harder problems and the worked solutions?

The *Challenge Problems* set and the *Answer Keys* for Geometry — with the reasoning written out in full — are available at tutorinmontreal.ca.