

4.1.99 Independent transfer: Foundation then Higher

Name: _____ Class: _____ Date: _____

KEY WORDS frustum • cyclic quadrilateral

<!-- Session 2 independent transfer -->

Objective

Apply this topic to unfamiliar Foundation and Higher problems; keep the two scopes distinct. Original questions and local marking guidance.

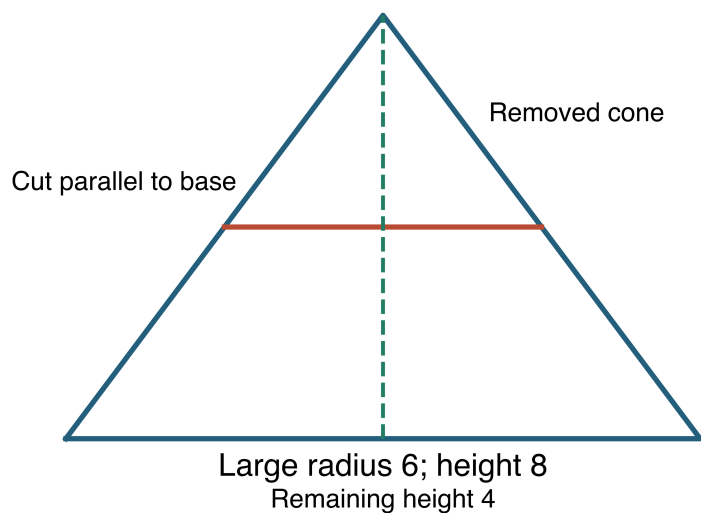
1 Key knowledge and worked examples

A cylinder has volume base area times perpendicular height. Convert cubic centimetres to litres after calculating capacity. Pythagoras requires a right angle. Circle-angle proofs use the diameter or the tangent and chord stated in the problem; specify which of two supplementary tangent angles is requested.

A cone with radius 3 cm and perpendicular height 4 cm has slant height 5 cm. Volume is $12\pi \text{ cm}^3$, curved area $15\pi \text{ cm}^2$ and total closed area $24\pi \text{ cm}^2$. A sphere of radius 3 has volume $36\pi \text{ cm}^3$ and area $36\pi \text{ cm}^2$, with different units. A square pyramid of base side 6 and height 4 has volume $6^2 \times 4 / 3 = 48 \text{ cm}^3$; each triangular face has slant height $\sqrt{(4^2 + 3^2)} = 5$, so lateral area is $4 \times (6 \times 5 / 2) = 60 \text{ cm}^2$ and total area 96 cm^2 . A large cone $r=6, h=8$ loses a similar top cone $r=3, h=4$: frustum volume is $96\pi - 12\pi = 84\pi \text{ cm}^3$. Its slant height is $10 - 5 = 5$; curved area is $60\pi - 15\pi = 45\pi$, and two circular ends add $36\pi + 9\pi$ for total $90\pi \text{ cm}^2$.

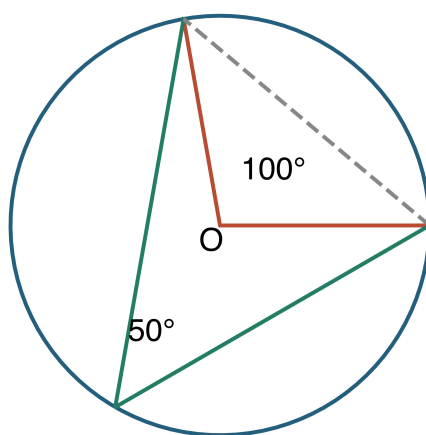
If a central angle is 100° , the corresponding angle at the circumference is 50° . In a cyclic quadrilateral with one angle 112° , its opposite angle is $180 - 112 = 68^\circ$. A radius meeting a tangent gives 90° , even if the drawing looks oblique.

Frustum volume = whole cone – removed similar cone



Prerequisite example; use the transfer task's own data.

The centre angle is twice the circumference angle



Prerequisite example; use the transfer task's own data.

2 Practice

2.1 Foundation: A cylindrical container has internal radius 3 cm and height 10 cm. Find its capacity in cubic centimetres and litres. A rectangular face is 6 cm by 8 cm; find its diagonal, naming the condition for your method.

3 Exam-style questions

3.1 Higher: In a circle, AB is a diameter and C lies elsewhere on the circumference. Angle CAB is 32 degrees. Find angles ACB and ABC. Find the acute angle between the tangent at A and AC, explaining the circle theorem and which side of the tangent you mean.

Solutions

2.1 Cylinder volume $V = \pi r^2 h = \pi(3 \text{ cm})^2(10 \text{ cm}) = 90\pi \text{ cm}^3$. Since 1000 cubic centimetres is one litre, capacity is $0.09\pi \text{ L}$, about 0.283 L. A rectangular face has perpendicular sides. Pythagoras gives $d = \sqrt{a^2 + b^2} = \sqrt{(6 \text{ cm})^2 + (8 \text{ cm})^2} = 10 \text{ cm}$. A diagonal is not an extra edge of the rectangle's perimeter.

3.1 Angle ACB is 90 degrees because an angle in a semicircle is a right angle. Triangle angles give $\angle ABC = 180 - 90 - 32 = 58$ degrees. By the alternate segment theorem, the angle between chord AC and the appropriate tangent ray equals angle ABC, 58 degrees. The other angle on the tangent's straight line is 122 degrees. Naming the acute angle selects 58; the drawing's apparent scale is unnecessary. The diameter and tangent facts are required hypotheses.

Local guidance: select and explain the relationship; calculate every requested result; check units, scope, conditions and completeness. These are authored classroom criteria.