Euclidean Geometry

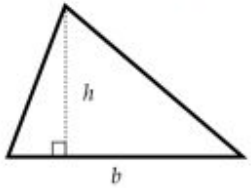
Bur Oak Math Club • November 6th 2024

01

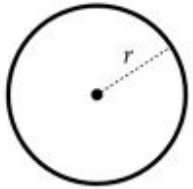
Useful Formulas

- $A_{\text{Rectangle}} = l \times w$

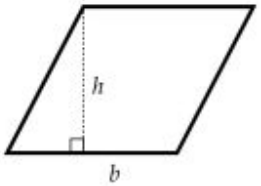
- $A_{\text{Triangle}} = \frac{1}{2}(b \times h)$



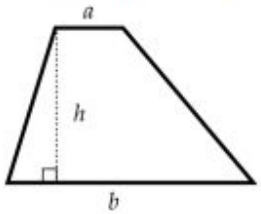
- $A_{\text{Circle}} = \pi r^2$



- $A_{\text{Parallelogram}} = b \times h$



- $A_{\text{Trapezoid}} = \frac{1}{2}(a + b)h$

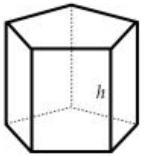


Note: The perimeter of a circle is $2\pi r$.

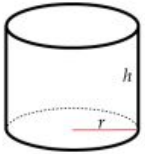
- The area of an equilateral triangle of side length s is $\frac{\sqrt{3}s^2}{4}$.
- Heron's formula - The area of a triangle with side lengths a, b, and c is $\sqrt{s(s-a)(s-b)(s-c)}$ where $s = \frac{a+b+c}{2}$.

Volume

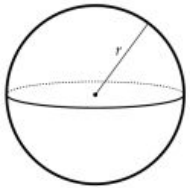
- $V_{\text{Prism}} = A_{\text{Base}} \times h$



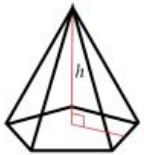
- $V_{\text{Cylinder}} = \pi r^2 h$



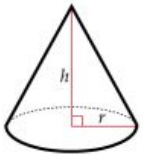
- $V_{\text{Sphere}} = \frac{4}{3}\pi r^3$



- $V_{\text{Pyramid}} = \frac{1}{3}A_{\text{Base}} \times h$



- $V_{\text{Cone}} = \frac{1}{3}\pi r^2 \times h$

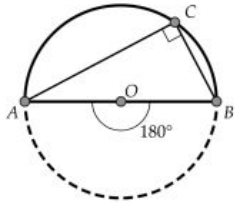


02

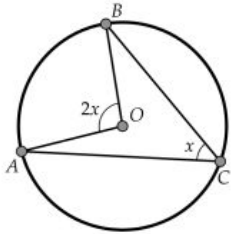
Circle Properties

Circle Properties

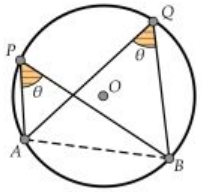
- The area of the sector formed by a central angle of θ° is given by $A_{\text{sector}} = \dfrac{\theta}{360}\pi r^2$, where r is the radius of the circle. The arc formed has length $s = \dfrac{\theta}{360}2\pi r$.
- The angle inscribed in a semicircle is a right angle.



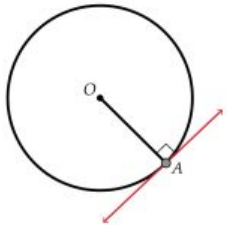
- When an arc subtends an inscribed angle and a central angle, the measure of the central angle is twice the measure of the inscribed angle.



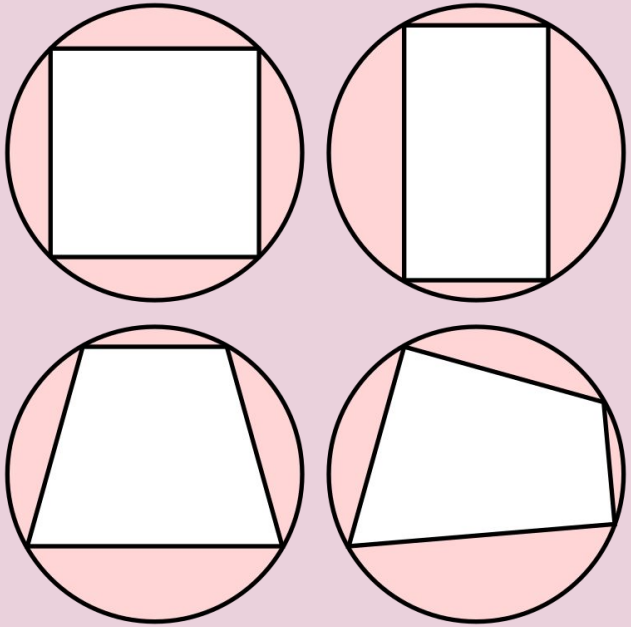
- Angles subtended by the same arc are equal.



- A tangent to a circle and the radius drawn to the point of tangency meet at 90°.



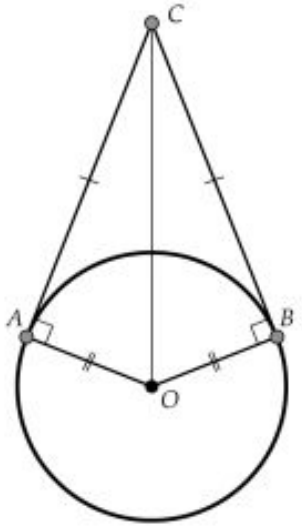
Cyclic quadrilateral



Properties

In Euclidean geometry, a cyclic quadrilateral or inscribed quadrilateral is a quadrilateral whose vertices all lie on a single circle.

- Tangent segments from an external point to a circle are equal.

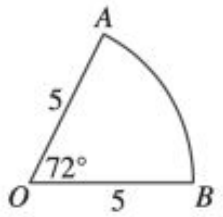


02

Questions

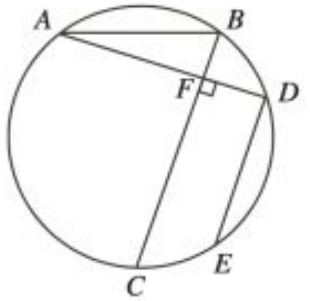
Questions

1. In the diagram, a sector of a circle with centre O, a radius of 5 and $\angle AOB = 72°$ is shown. What is the perimeter of the sector?



Questions

2. In the diagram, AB and BC are chords of the circle with $AB < BC$. If D is the point on the circle such that AD is perpendicular to BC and E is the point on the circle such that DE is parallel to BC, prove that $\angle EAC + \angle ABC = 90°$.



Questions

3. In the isosceles trapezoid $ABCD$, $AB = CD = x$. The area of the trapezoid is 80. A circle with centre O is drawn inside the trapezoid such that it is tangent to all four sides of the trapezoid. Given that the radius of the circle is 4, determine the value of x.