Geometry Fundamentals: Area and Circumference of Circles and Triangles

December 11, 2024

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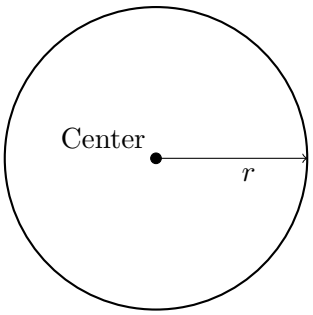
1 Area and Circumference of Circles

1.1 Diagram



1.2 Formulas

The area A and circumference C of a circle can be calculated using the following formulas:

- **Area:** $A = \pi r^2$, where r is the radius of the circle.
- **Circumference:** $C = 2\pi r$, where r is the radius of the circle.

1.3 Examples

Example 1: Find the area and circumference of a circle with radius $r = 5$ cm.

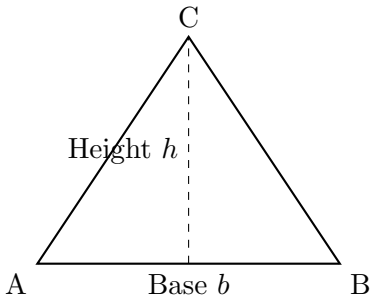
$$\text{Area: } A = \pi r^2 = \pi(5)^2 = 25\pi \approx 78.54 \text{ cm}^2.$$
$$\text{Circumference: } C = 2\pi r = 2\pi(5) = 10\pi \approx 31.42 \text{ cm}.$$

Example 2: Find the area and circumference of a circle with radius $r = 3$ m.

$$\text{Area: } A = \pi r^2 = \pi(3)^2 = 9\pi \approx 28.27 \text{ m}^2.$$
$$\text{Circumference: } C = 2\pi r = 2\pi(3) = 6\pi \approx 18.85 \text{ m}.$$

2 Area of Triangles

2.1 Diagram



2.2 Formulas

The area A of a triangle can be calculated using different methods:

- **Using base and height:** $A = \frac{1}{2} \times \text{base} \times \text{height}$.
- **Using Heron's formula:** For a triangle with sides a, b, and c:

$$s = \frac{a+b+c}{2} \quad \text{(semi-perimeter)}.$$
$$A = \sqrt{s(s-a)(s-b)(s-c)}.$$

2.3 Examples

Example 1: Find the area of a triangle with base $b = 8$ cm and height $h = 5$ cm.

$$A = \frac{1}{2} \times b \times h$$
$$A = \frac{1}{2} \times 8 \times 5 = 20 \text{ cm}^2.$$

Example 2: Find the area of a triangle with sides $a = 5$, $b = 6$, and $c = 7$ cm using Heron's formula.

$$s = \frac{a+b+c}{2} = \frac{5+6+7}{2} = 9 \text{ cm}.$$
$$A = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{9(9-5)(9-6)(9-7)}$$
$$A = \sqrt{9 \cdot 4 \cdot 3 \cdot 2} = \sqrt{216} \approx 14.7 \text{ cm}^2.$$