

NCEA Level Two Mathematics:
Trigonometry

Question 1: Sectors of a Circle

Consider the sector shown in figure 1.

- (a) Suppose that θ is given in radians. Find ρ (the arc length) in terms of the circle radius r and the angle.
- (b) Find the area of the circle segment.
- (c) Repeat (a) and (b) if θ is given in degrees.

Question 2: Triangles

You may assume that all angles are given in radians.

- (a) Find the area of the triangle shown in in figure 2.
- (b) Consider the triangle shown in figure 3.
 - i. Show that

$$\frac{a}{\sin \alpha} = \frac{b}{\sin \beta} = \frac{c}{\sin \gamma}.$$

- ii. Find γ in terms of a , b , and c **only**.

Question 3: The Golden Ratio

Consider the 75-75-36 triangle ABC given in figure 4. The angle α has been bisected into two angles, and the resulting line meets the triangle at D .

- (a) Show that ABC and ABD are similar triangles.
- (b) Hence, or otherwise, show that $\frac{AB}{BD} = \frac{AB+BD}{AB}$.
- (c) Show that the ratio of the long side of the triangle to the short side of the triangle is $\frac{AB}{BD} = \frac{1+\sqrt{5}}{2} = \phi$.
- (d) Show that $\cos 72^\circ = \frac{1}{2\phi}$.
- (e) Find $\sin 36^\circ$ and $\sin 72^\circ$.

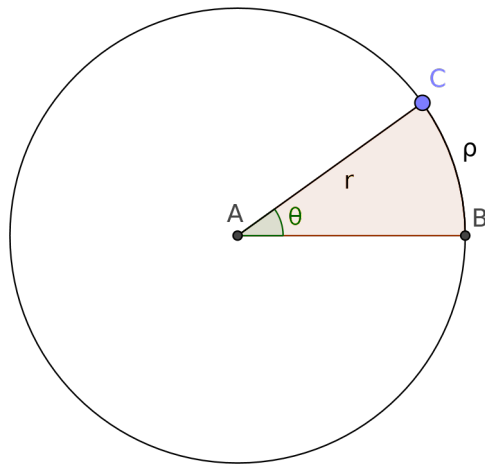


Figure 1: A sector of a circle.

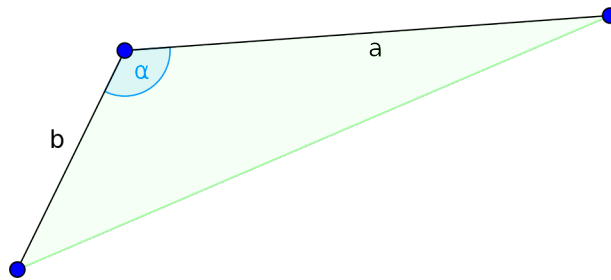


Figure 2: An arbitrary triangle.

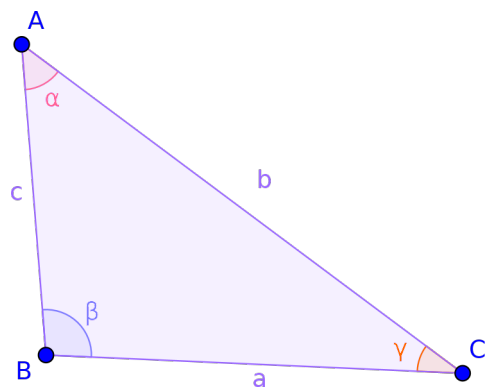


Figure 3: Another arbitrary triangle.

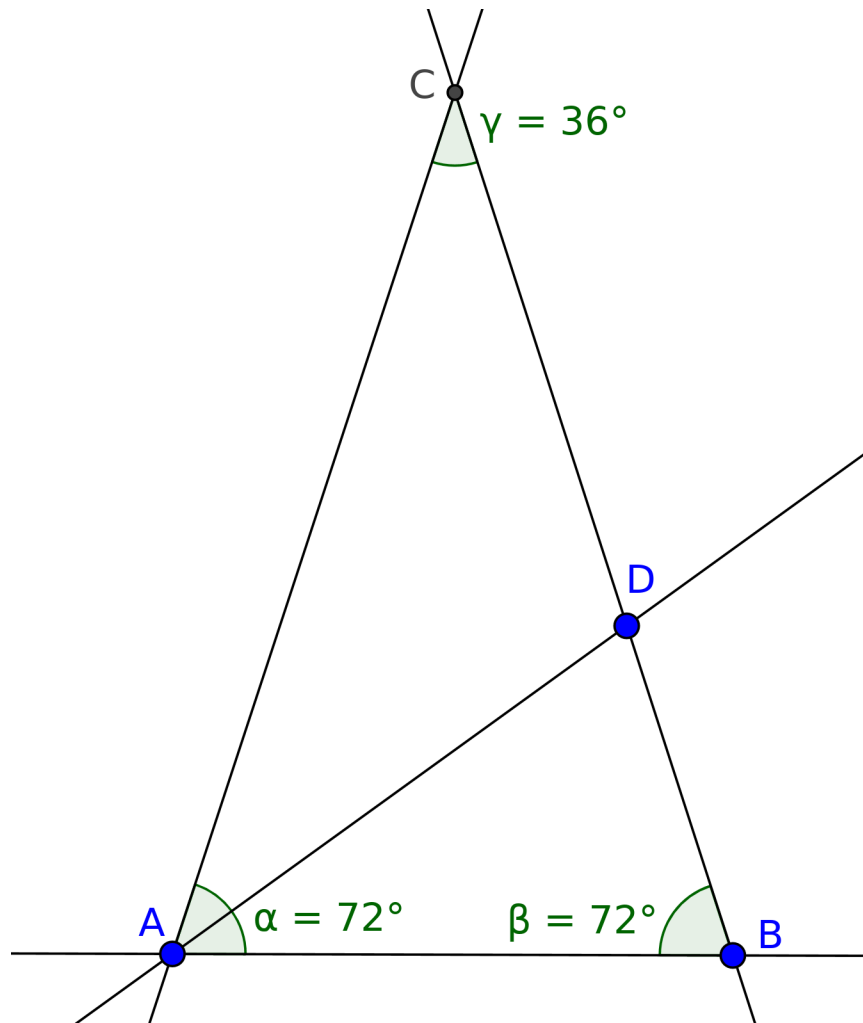


Figure 4: A 72-72-36 triangle with bisected angle.