Arc Length, Radius and Angle

Arc Length \( S \) = Radius \( R \) x Angle \( \theta \) when \( \theta \) is expressed in radians.

\[
S = R \theta
\]

Note that \( R = S \) when \( \theta = 1 \) radian. Also

- 1 radian = approx. 57°
- \( \theta = 3.14 \) radians for a half circle
- \( S = 2 \pi R \) for a full circle

The area of a sector can be calculated by setting up a ratio. The area of a full circle = \( \pi r^2 \), the area of a half circle = \( \frac{1}{2} \pi r^2 \), the area of a quarter circle = \( \frac{1}{4} \pi r^2 \), …

Triangles

The area \( A \) of a triangle is \( A = \frac{1}{2} b h \)

The sum of the three angles inside a triangle = 180°.

The lengths of the sides of a right triangle (the leftmost triangle above) are related to the angles inside a triangle by trigonometric functions. The inverse trigonometric functions are pronounced “arc-sine”, “arc-cosine” and “arc-tangent”.

\[
\sin \theta = \frac{opp}{hyp} \quad \theta = \sin^{-1} \frac{opp}{hyp}
\]

\[
\cos \theta = \frac{adj}{hyp} \quad \theta = \cos^{-1} \frac{adj}{hyp}
\]

\[
\tan \theta = \frac{opp}{adj} \quad \theta = \tan^{-1} \frac{opp}{adj}
\]

The lengths of the sides and the internal angle of any triangle are related by the:

- law of cosines: \( c^2 = a^2 + b^2 - 2ab \cos \theta \)