Learning Objective: To use trigonometric ratios to find unknown lengths and angles.
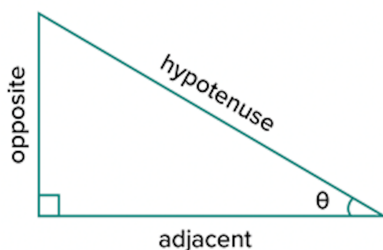
Using Trigonometric Ratios to Find Unknown Lengths

The definitions of the trigonometric ratios are:

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

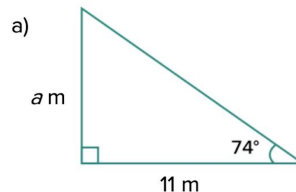$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

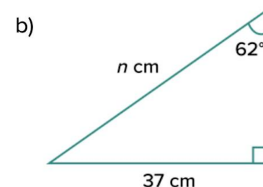**SOH CAH TOA** can be used to remember these definitions.

Example

Find the unknown sides using trigonometric ratios

a)

$$\tan 74° = \frac{a}{11}$$

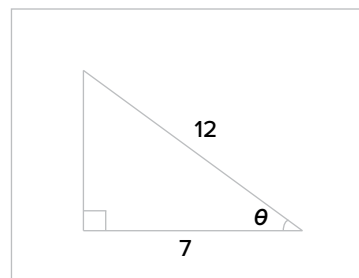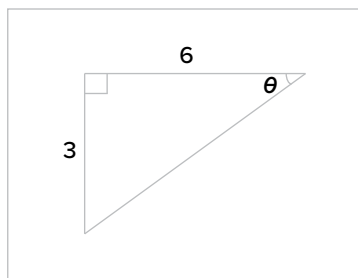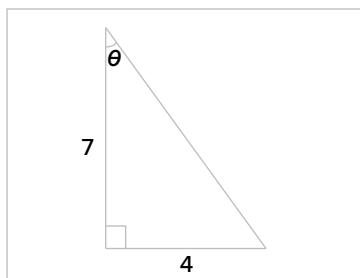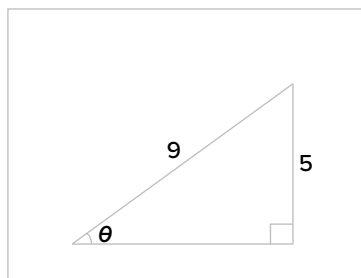$$a = 11 \times \tan 74°$$

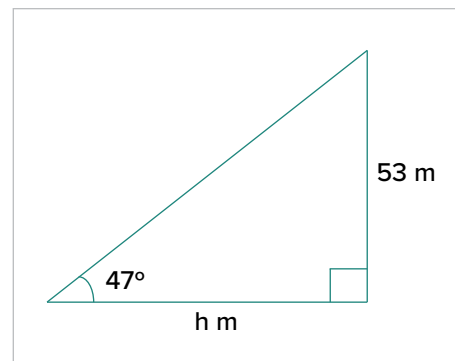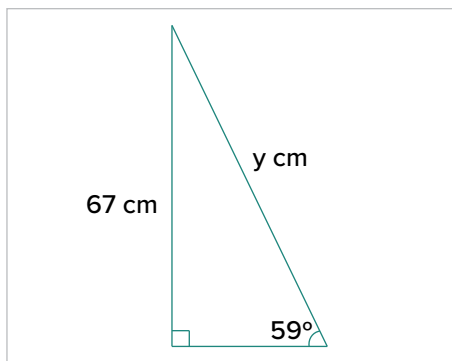$$\therefore a = 38.4 \text{ m (to 1 d.p)}$$

b)

$$\sin 62° = \frac{37}{n}$$
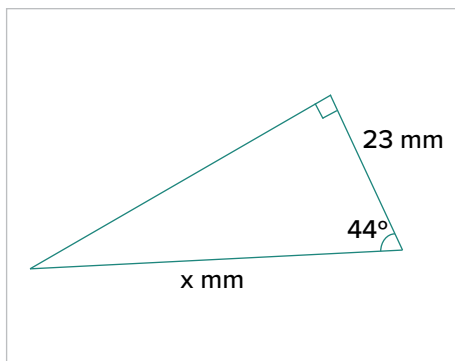
$$n = \frac{37}{\sin 62°}$$

$$\therefore n = 134 \text{ cm (to the nearest cm)}$$

Find the size of the angle marked θ, correct to the nearest degree.

Find the pronumeral, correct to one decimal place.

💡 **Learning Objective:** To use trigonometric ratios to find unknown lengths and angles.
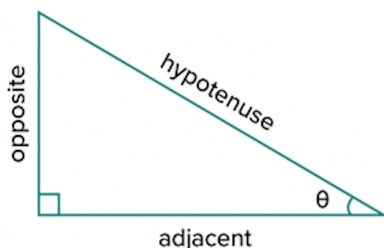
Using Trigonometric Ratios to Find Unknown Lengths

The definitions of the trigonometric ratios are:

$$\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$$

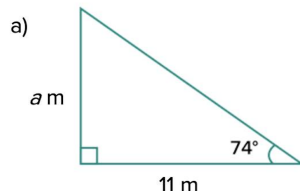$$\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$$

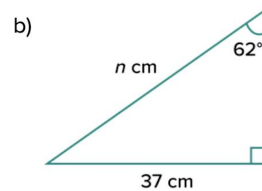**SOH CAH TOA** can be used to remember these definitions.

Example

Find the unknown sides using trigonometric ratios

a)

$$\tan 74° = \frac{a}{11}$$

$$a = 11 \times \tan 74°$$
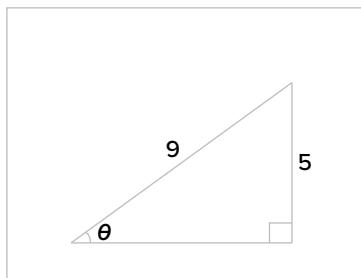
$$\therefore a = 38.4 \text{ m (to 1 d.p)}$$

b)

$$\sin 62° = \frac{37}{n}$$

$$n = \frac{37}{\sin 62°}$$

$$\therefore n = 134 \text{ cm (to the nearest cm)}$$

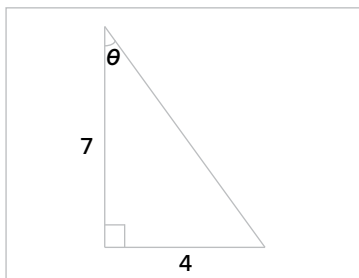### Find the size of the angle marked θ, correct to the nearest degree.

$$\sin \theta = \frac{5}{9}$$
$$\theta = \sin^{-1}\left(\frac{5}{9}\right)$$
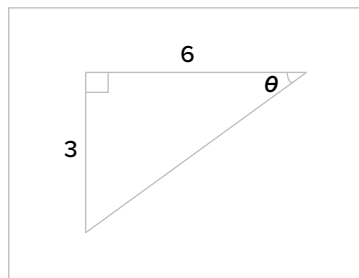$$\theta = 34°$$
(to the nearest degree)

$$\tan \theta = \frac{4}{7}$$
$$\theta = \tan^{-1}\left(\frac{4}{7}\right)$$
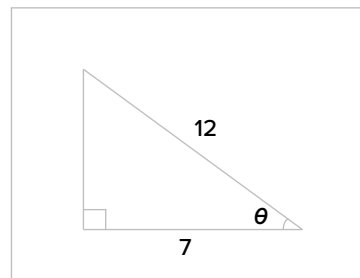$$\theta = 30°$$
(to the nearest degree)

$$\tan \theta = \frac{3}{6}$$
$$\theta = \tan^{-1}\left(\frac{3}{6}\right)$$
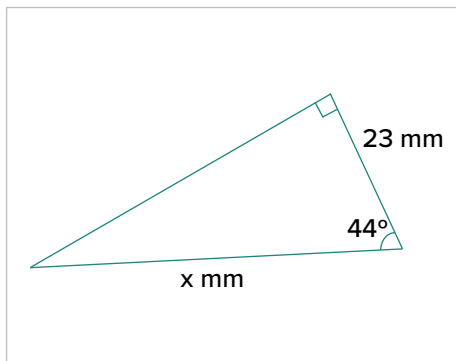$$\theta = 27°$$
(to the nearest degree)

$$\cos \theta = \frac{7}{12}$$
$$\theta = \cos^{-1}\left(\frac{7}{12}\right)$$
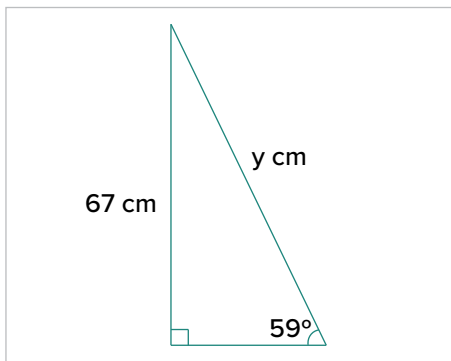$$\theta = 54°$$
(to the nearest degree)

Find the pronumeral, correct to one decimal place.

$$\cos 44° = 23 / x$$
$$x = 23 / \cos 44°$$
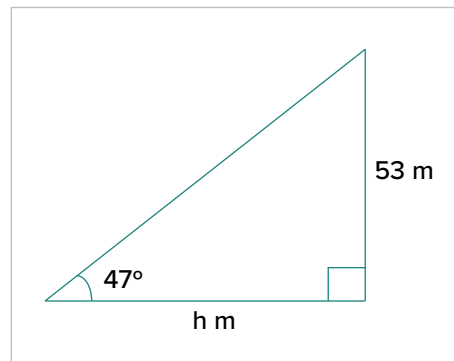$$x = 32.0 \text{ mm}$$

$$\sin 59° = 67 / y$$
$$y = 67 / \sin 59°$$
$$y = 78.2 \text{ cm}$$

$$\tan 47° = 53 / h$$
$$h = 53 / \tan 47°$$
$$h = 49.4 \text{ m}$$