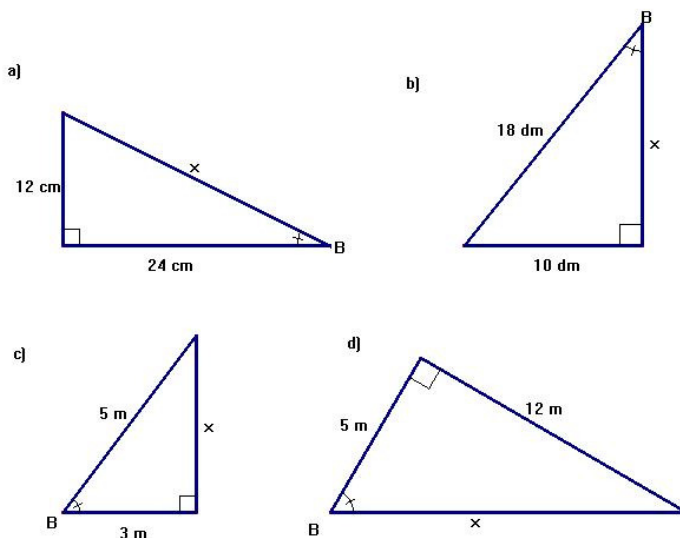


TRIGONOMETRY 1

- Convert the following degree measures to exact radian measures:
 35° , 150° , 220° , 405° , 315°
- Convert the following radian measures to degree measures:
 $\frac{1}{3}\pi$, $\frac{3}{4}\pi$, $\frac{5}{8}\pi$, $\frac{7}{18}\pi$, $\frac{13}{6}\pi$
- A tree 50 m tall casts a shadow 60 m long. Find the angle of elevation of the sun at that time.
- An airship is flying at an altitude of 800 m when it spots a village in the distance with a depression angle of 12° . How far is the village from where the plane is flying over?
- A six-meter-long ladder leans against a building. If the ladder makes an angle of 60° with the ground, how far up the wall does the ladder reach? How far from the wall is the base of the ladder?
- Emily rides a horse 49 meters down a straight slope from the top to the bottom of a hill. The slope makes a 23 degree angle to the flat ground. How many metres tall is the hill?
- Jamie is 172 cm tall. Find the length of her shadow if the angle of elevation of the sun is 35° .
- Calculate the size of the angle marked in each triangle (degrees and minutes). Also calculate the length of the unknown side of each triangle.



SOLUTION

1. Convert the following degree measures to exact radian measures:

$$35^\circ \rightarrow 35 \times \frac{\pi}{180} = \frac{35}{180} \pi = \frac{7}{36} \pi$$

$$150^\circ \rightarrow 105 \times \frac{\pi}{180} = \frac{105}{180} \pi = \frac{7}{12} \pi$$

$$220^\circ \rightarrow 220 \times \frac{\pi}{180} = \frac{220}{180} \pi = \frac{11}{9} \pi$$

$$405^\circ \rightarrow 405 \times \frac{\pi}{180} = \frac{405}{180} \pi = \frac{9}{4} \pi$$

$$315^\circ \rightarrow 315 \times \frac{\pi}{180} = \frac{315}{180} \pi = \frac{7}{4} \pi$$

2. Convert the following radian measures to degree measures:

$$\frac{1}{3} \pi, \frac{3}{4} \pi, \frac{5}{8} \pi, \frac{7}{18} \pi, \frac{13}{6} \pi$$

$$\frac{1}{3} \pi \rightarrow \frac{1}{3} \pi \times \frac{180}{\pi} = \frac{180}{3} = 60^\circ$$

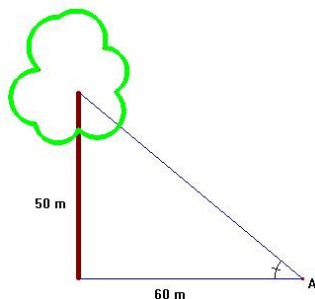
$$\frac{3}{4} \pi \rightarrow \frac{3}{4} \pi \times \frac{180}{\pi} = \frac{3 \times 180}{4} = 135^\circ$$

$$\frac{5}{8} \pi \rightarrow \frac{5}{8} \pi \times \frac{180}{\pi} = \frac{5 \times 180}{8} = 112^\circ 30'$$

$$\frac{7}{18} \pi \rightarrow \frac{7}{18} \pi \times \frac{180}{\pi} = \frac{7 \times 180}{18} = 70^\circ$$

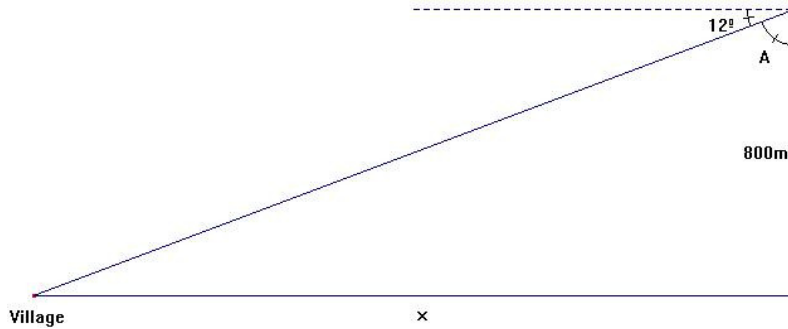
$$\frac{13}{6} \pi \rightarrow \frac{13}{6} \pi \times \frac{180}{\pi} = \frac{13 \times 180}{6} = 390^\circ$$

3. A tree 50 m tall casts a shadow 60 m long. Find the angle of elevation of the sun at that time.



$$\tan A = \frac{50}{60} \rightarrow A = 39^\circ 48'$$

4. An airship is flying at an altitude of 800 m when it spots a village in the distance with a depression angle of 12° . How far is the village from where the plane is flying over?



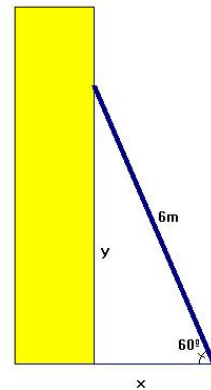
$$A = 90^\circ - 12^\circ = 78^\circ \rightarrow \tan A = \frac{x}{800} \rightarrow \tan 78^\circ = \frac{x}{800}$$

$$800 \times \tan 78^\circ = x \rightarrow x = 3763.70 \text{ metres}$$

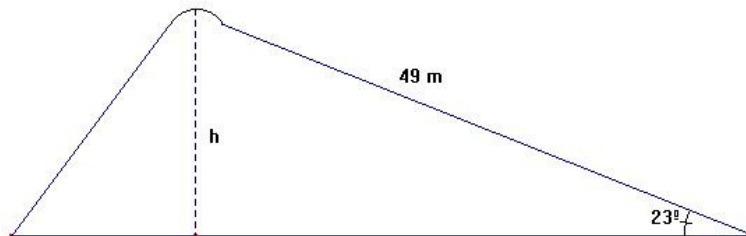
5. A six-meter-long ladder leans against a building. If the ladder makes an angle of 60° with the ground, how far up the wall does the ladder reach? How far from the wall is the base of the ladder?

$$\sin 60^\circ = \frac{y}{6} \rightarrow y = 6 \times \sin 60^\circ = 5.2 \text{ metres}$$

$$\cos 60^\circ = \frac{x}{6} \rightarrow x = 6 \times \cos 60^\circ = 3 \text{ metres}$$



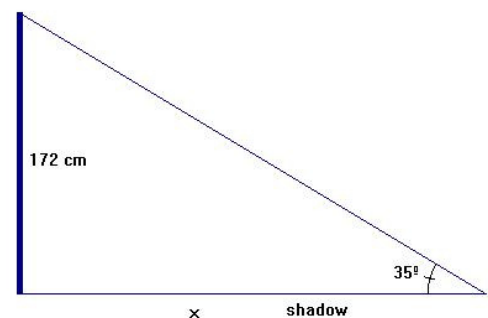
6. Emily rides a horse 49 meters down a straight slope from the top to the bottom of a hill. The slope makes a 23 degree angle to the flat ground. How many metres tall is the hill?



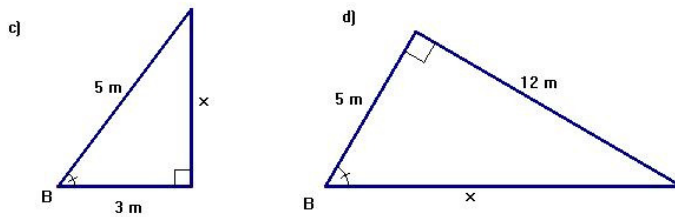
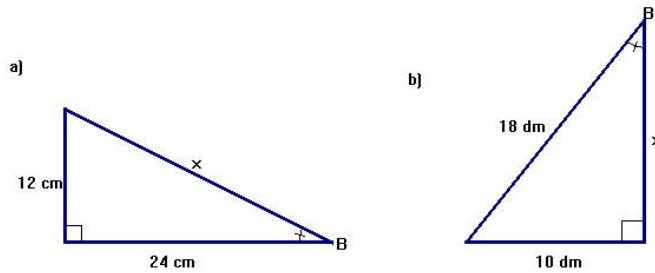
$$\sin 23^\circ = \frac{h}{49} \rightarrow h = 49 \times \sin 23^\circ = 19.15 \text{ metres}$$

7. Julie is 172 cm tall. Find the length of her shadow if the angle of elevation of the sun is 35° .

$$\tan 35^\circ = \frac{172}{x} \rightarrow x = \frac{172}{\tan 35^\circ} = 245.64 \text{ cm}$$



8. Calculate the size of the angle marked in each triangle (degrees and minutes). Also calculate the length of the unknown side of each triangle.



a) $\tan B = \frac{12}{24} \rightarrow B = 26^{\circ}34'$, $x^2 = 12^2 + 24^2 = 720 \rightarrow x = 26.83\text{cm}$

b) $\sin B = \frac{10}{18} \rightarrow B = 33^{\circ}45'$, $x^2 = 18^2 - 10^2 = 224 \rightarrow x = 14.97\text{dm}$

c) $\cos B = \frac{3}{5} \rightarrow B = 53^{\circ}8'$, $x^2 = 5^2 - 3^2 = 16 \rightarrow x = 4\text{m}$

d) $\tan B = \frac{12}{5} \rightarrow B = 67^{\circ}23'$, $x^2 = 12^2 + 5^2 = 169 \rightarrow x = 13\text{m}$