EXERCISE 6L

In these questions, give answers involving angles to the nearest degree.

1 A ladder, 6 m long, rests against a wall. The foot of the ladder is 2.5 m from the base of the wall. What angle does the ladder make with the ground?

2 The ladder in question **1** has a "safe angle" with the ground of between 60° and 70°. What are the safe limits for the distance of the foot of the ladder from the wall?

3 Another ladder, of length 10 m, is placed so that it reaches 7 m up the wall. What angle does it make with the ground?

4 Yet another ladder is placed so that it makes an angle of 76° with the ground. When the foot of the ladder is 1.7 m from the foot of the wall, how high up the wall does the ladder reach?
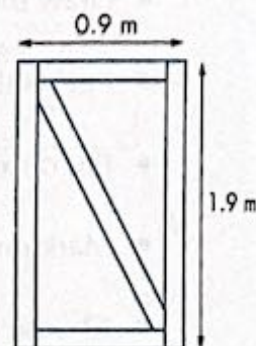
5 Calculate the angle that the diagonal makes with the long side of a rectangle which measures 10 cm by 6 cm.
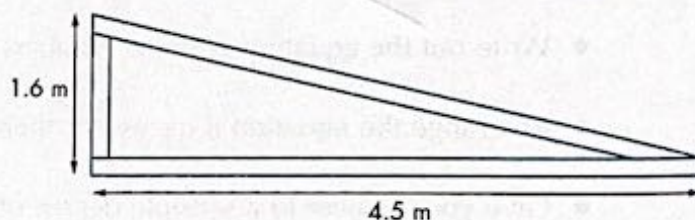
6 This diagram shows a frame for a bookcase.

 a What angle does the diagonal strut make with the long side?

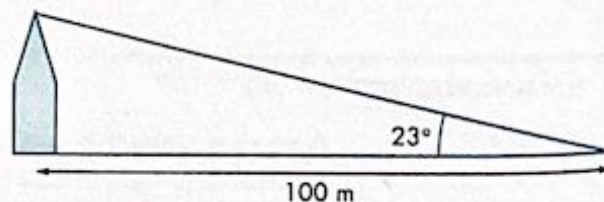 b Use Pythagoras' theorem to calculate the length of the strut.

0.9 m

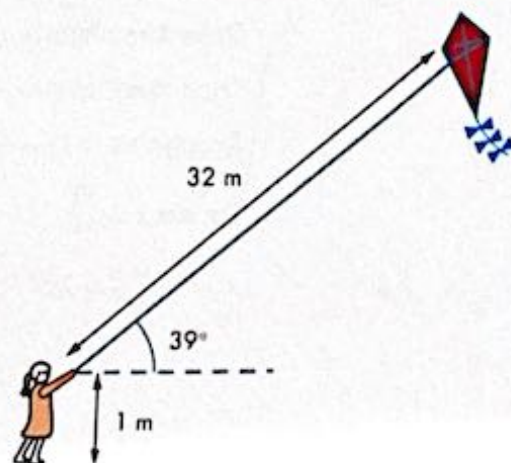1.9 m

7 This diagram shows a roof truss.

 a What angle will the roof make with the horizontal?

 b Use Pythagoras' theorem to calculate the length of the sloping strut.

1.6 m

4.5 m

8 Alicia paces out 100 m from the base of a church. She then measures the angle to the top of the spire as 23°. How high is the church spire?
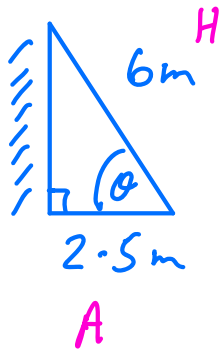

23°

100 m

9 A girl is flying a kite on a string 32 m long. The string, which is being held at 1 m above the ground, makes an angle of 39° with the horizontal. How high is the kite above the ground?

32 m

39°

1 m

Solutions

1 A ladder, 6 m long, rests against a wall. The foot of the ladder is 2.5 m from the base of the wall. What angle does the ladder make with the ground?
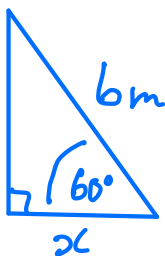
$$\cos = \frac{A}{H}$$

$$\cos\theta = \frac{2.5}{6}$$

$$\theta = \cos^{-1}\left(\frac{2.5}{6}\right)$$

$$\theta = 65.4$$

$$\theta = 65° \qquad \text{to nearest degree}$$

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2 The ladder in question 1 has a "safe angle" with the ground of between 60° and 70°. What are the safe limits for the distance of the foot of the ladder from the wall?

$$\cos 60° = \frac{x}{6}$$

$$6\cos 60° = x$$

$$x = 3m$$

$$\cos 70° = \frac{x}{6}$$
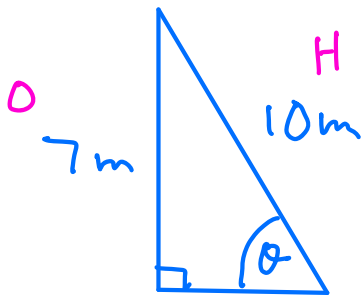
$$6 \cos 70° = x$$

$$x = 2.05 \, m$$

For safe operation $2.05m \leq x \leq 3m$

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3 Another ladder, of length 10 m, is placed so that it reaches 7 m up the wall. What angle does it make with the ground?
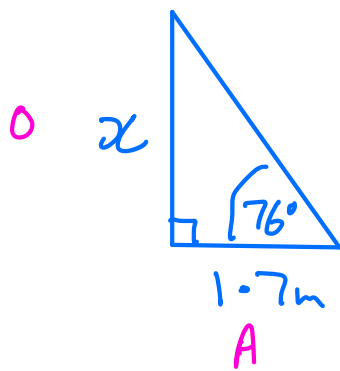
$$\sin = \frac{O}{H}$$

$$\sin \theta = \frac{7}{10}$$

$$\theta = \sin^{-1}\left(\frac{7}{10}\right)$$

$$\theta = 44.4°$$

$$\theta = 44° \quad \text{to nearest degree}$$

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4 Yet another ladder is placed so that it makes an angle of 76° with the ground. When the foot of the ladder is 1.7 m from the foot of the wall, how high up the wall does the ladder reach?
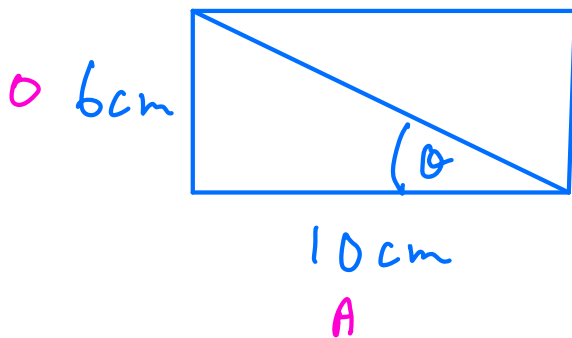
$$\tan = \frac{O}{A}$$

$$\tan 76° = \frac{x}{1.7}$$

$$1.7 \tan 76° = x$$

$$x = 6.82m$$

Reaches 6.82m up wall

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5 Calculate the angle that the diagonal makes with the long side of a rectangle which measures 10 cm by 6 cm.
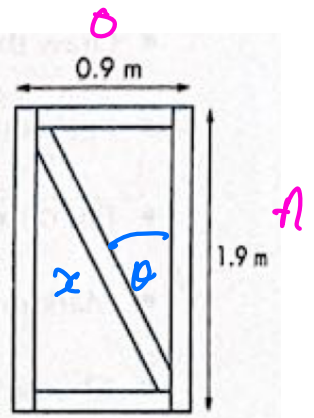

$$\tan = \frac{O}{A}$$

$$\tan\theta = \frac{6}{10}$$

$$\theta = \tan^{-1}\left(\frac{6}{10}\right)$$

$$\theta = 30.96°$$

$$\theta = 31° \quad \text{to nearest degree}$$

6 This diagram shows a frame for a bookcase.

a What angle does the diagonal strut make with the long side?

b Use Pythagoras' theorem to calculate the length of the strut.

$$\tan = \frac{O}{A}$$

a) $$\tan \theta = \frac{0.9}{1.9}$$

$$\theta = \tan^{-1}\left(\frac{0.9}{1.9}\right)$$

$$\theta = 25.3°$$

$$\theta = 25°$$

to nearest degree

b) By Pythagoras

$$0.9^2 + 1.9^2 = x^2$$

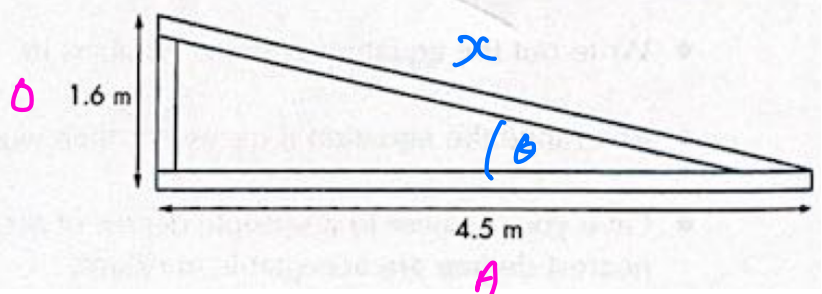$$4.42 = x^2$$

$$x = \sqrt{4.42}$$

$$x = 2.10 \text{ m}$$

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7 This diagram shows a roof truss.

a What angle will the roof make with the horizontal?

b Use Pythagoras' theorem to calculate the length of the sloping strut.

a) $$\tan = \frac{O}{A}$$

$$\tan \theta = \frac{1.6}{4.5}$$

$$\theta = \tan^{-1}\left(\frac{1.6}{4.5}\right)$$

b) By Pythagoras

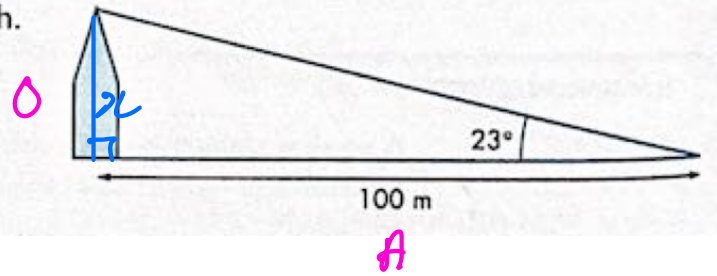$$1.6^2 + 4.5^2 = x^2$$

$$22.81 = x^2$$

$\theta = 19.57°$

$\theta = 20°$ to nearest degree

$x = \sqrt{22.81}$

$x = 4.78\,m$

strut $= 4.78\,m$

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8 Alicia paces out 100 m from the base of a church. She then measures the angle to the top of the spire as 23°. How high is the church spire?
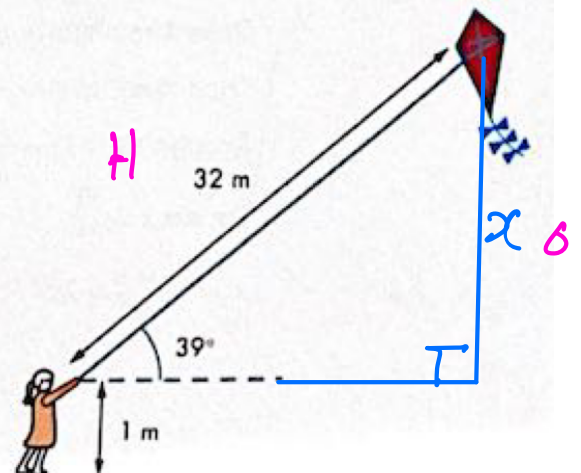

$$\tan = \frac{O}{A}$$

$$\tan 23° = \frac{x}{100}$$

$$100 \tan 23° = x$$

$$x = 42.4\,m \quad = \text{height of spire}$$

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9 A girl is flying a kite on a string 32 m long. The string, which is being held at 1 m above the ground, makes an angle of 39° with the horizontal. How high is the kite above the ground?

$$\sin = \frac{O}{H}$$

$$\sin 39° = \frac{x}{32}$$

$32 \sin 39° = x$

$x = 20.1 \text{ m}$

Height above ground $= x + 1 \text{ m}$

$= 21.1 \text{ m}$