## Trigonometry



## TRIGONOMETRY 1

Read each question carefully, then draw a diagram.

1. Pat wants to know the height of a tree in her yard. She observes that from a distance of 20 m from the tree, the angle of elevation to the top of the tree is $32^{\circ}$. What is the height of the tree to the nearest tenth of a metre?
2. From a lighthouse 16 m above sea level, the angle of depression to a small boat is $12^{\circ}$. How far from the foot of the lighthouse is the boat to the nearest metre?
3. A kite is 40 m high when 210 m of string is used. What angle does the kite make with the horizontal to the nearest degree?
4. Marianne wants to know how far it is across a river. She notices a tree at point X straight across from point $Y$. She walks 10 m along the river bank to point $Z$ and observes that the angle to the tree is $65^{\circ}$. What is the distance across the river from point $X$ to point $Y$ to the nearest hundredth of a metre?

5. A plot of land has the shape of a right triangle. The longest side is 37 m and lies at an angle of $53^{\circ}$ to the shortest side. Find the area of the plot to the nearest square metre.

## ANSWER KEY

1. 12.5 m
2. 75 m
3. $11^{\circ}$
4. 21.45 m
5. $329 \mathrm{~m}^{2}$

Source: Government of BC used with permission.

## TRIGONOMETRY 2

Read each question carefully, then draw a diagram.

1. A painter is using a ladder to paint a high factory wall. The ladder is 5 m long and for safety, must never be used at an angle to the vertical of less than $15^{\circ}$ or more than $40^{\circ}$. If he can reach 1 m above the top of the ladder, what is the maximum height to the nearest tenth of a metre that he can paint? (Hint: what angle would give the painter the greatest height?)
2. Raj is building a garden shed of his own design. It has a simple sloping roof. The two walls on which the roof will rest are 3.2 m apart and one wall is 0.5 m higher than the other. Allowing 0.25 m for overhang at either end, how long (to the nearest hundredth) will the roof beams have to be? What will the slope of the roof be to the nearest degree with respect to the horizontal?

3. Joan is welding a piece of modern sculpture. Part of the design includes an A-frame structure. Joan wants the two thin bars that make up the sides of the frame to form an angle of $54^{\circ}$ at the top and she wants the frame to be 2.2 m high. How long will each bar have to be to the nearest thousandth? (Hint: you need a right triangle to use a trigonometric ratio.)
4. A new ski-lift is being built at the slopes. The base of the lift is at an elevation of 2500 m , but the elevation of the top station is not accurately known. A survey of the site shows the base and the top station are 2450 m apart in horizontal distance and a line of sight to the top station angles up at $38^{\circ}$. Find the length of steel cable (to the nearest 10 m ) that will be needed for the endless loop on which the chairs will hang. Allow for an additional 5\% of the total length for sags, joining, etc.
5. The roof of a small pup tent is made of a rectangular piece of material. If the tent is to be 2.2 m long, the roof sloping up at $48^{\circ}$ to the horizontal and with the poles 1.4 m high, how many square metres of material will be needed to make the tent to the nearest hundredth?

## ANSWER KEY

1. 4.2 m
2. roof beams are 3.73 m long, slope is $9^{\circ}$
3. 2.469 m
4. 6530 m
5. $8.27 \mathrm{~m}^{2}$

## TRIGONOMETRY 3

1. Given that the property line is halfway between the two houses on the plan below, what is the distance between the two houses to the nearest tenth of a metre?

2. How far is the corner of house $B$ from the survey post to the nearest tenth of a metre?
3. A carpenter is instructed to cut a right-angled wooden wedge 25 cm long in the base with an angle of $12^{\circ}$. How long will the sloping surface of the wedge be to the nearest millimetre?
4. From a ladder, Wayne looks at a building 35 m away. He notes that the angle of elevation to the top of the building is $19^{\circ}$ and the angle of depression to the bottom of the building is $7^{\circ}$. How high is the building?
5. A slide in the Water Park is 9 m high. If the actual length of the slide is 14 m , what angle does the slide make with the horizontal?

## ANSWER KEY

1. 28.2 m
2. 24.1 m
3. 256 mm
4. 16.3 m
5. $40^{\circ}$

Source: Government of BC used with permission.

## TRIGONOMETRY 4

1. Find the following. Round answers to 4 decimal places.
a. $\cos 82^{\circ}$ $\qquad$
b. $\tan 5.6^{\circ}$ $\qquad$
c. $\sin 0.77^{\circ}$ $\qquad$
2. Find $\angle \mathrm{A}$ (in degrees) for each of the following. Round to one decimal place.
a. $\sin \angle A=0.9321$ $\qquad$
b. $\tan \angle A=2.563$ $\qquad$
c. $\cos \angle A=0.089$ $\qquad$
3. Find $\angle \mathrm{x}$ or side x in each of the following. Round answers to one decimal place.
a.
b.

a. $\qquad$
b. $\qquad$
c.

d.

c. $\qquad$
e.

95

f.

e. $\qquad$
f. $\qquad$
4. Solve $\triangle \mathrm{ABC}$. Round your answers to one decimal place.

$\overline{\mathrm{AC}}=$ $\qquad$
$\overline{\mathrm{AB}}=$ $\qquad$
$\angle A=$ $\qquad$
5. Vicki estimates the distance from a large rock to the base of a vertical cliff to be 43 m . Standing by the large rock, the angle between the ground and her line of sight to the top of the cliff is about $57^{\circ}$. Estimate the height of the cliff.

Height of the cliff = $\qquad$
6. What angle does a 7.5 m ladder make with a wall if the top of the ladder is 6 m above the ground?
$\qquad$

## ANSWER KEY

1. a. 0.1392
b. 0.0981
c. 0.0134
2. a. $68.8^{\circ}$
b. $68.7^{\circ}$
C. $84.9^{\circ}$
3. a. $54.9^{\circ}$
b. 28.6
c. 39.0
d. 9.0
e. 54.2
f. $54.3^{\circ}$
4. a. 21.1
b. 28.4
C. $42^{\circ}$
5. 66.2 m
6. $36.9^{\circ}$

## TRIGONOMETRY 5

1. Find the following: Round your answers to 4 decimal places.
a. $\sin 16^{\circ}$
b. $\tan 80.5^{\circ}$
c. $\cos 0.3^{\circ}$
$\qquad$
$\qquad$
2. Find $\angle \mathrm{A}$ (in degrees) for each of the following. Round your answer to one decimal place.
a. $\tan \angle \mathrm{A}=1.093$
b. $\sin \angle A=0.5555$
$\qquad$
c. $\cos \angle A=0.065$
3. Find $\angle \mathrm{x}$ or side x in each of the following. Round your answers to one decimal place.
a.

c.

d.

c. $\qquad$
e.

f.

e. $\qquad$
f. $\qquad$
4. Solve $\triangle \mathrm{ABC}$. Round your answers to one decimal place.


$$
\begin{aligned}
& \overline{\mathrm{AB}}= \\
& \overline{\mathrm{BC}}= \\
& \angle \mathrm{B}= \\
& \hline
\end{aligned}
$$

5. A 6.5 m ladder makes an angle of $22^{\circ}$ with a wall. How high up the wall does the ladder reach? Round your answers to one decimal place.

Height of the ladder = $\qquad$
6. Bill is in an apartment building 58 m above the ground. In the distance he can see a tall tree.

The angle between the building and his line of sight to the base of the tall tree is $85.5^{\circ}$. How far is the tree from the foot of the building?
$\qquad$

## ANSWER KEY

1. a. 0.2756
b. 5.9758
c. 1.0000
2. a. $47.5^{\circ}$
b. $33.7^{\circ}$
c. $86.3^{\circ}$
3. a. 21.5
b. $41.4^{\circ}$
c. 39.3
d. 2.4
e. 30.3
f. $36^{\circ}$
4. $18.3,10.5,55^{\circ}$
5. 6 m
6. 737
