## EXERCISE # 1

- Q.1 The ratio of the length of a rod and its shadow is  $1 : \sqrt{3}$ . Then find the angle of elevation of the sun.
- Q.2 Find the angle of elevation of the moon when the length of the shadow of a pole is equal to its height.
- **Q.3** If the length of shadow of a pole on a level ground is twice the length of that pole, then find the angle of elevation of the sun.
- Q.4 The angle of elevation of a tower from a distance 100 m from its foot is 30°. Find the height of the tower.
- **Q.5** In a rectangle, if the angle between a diagonal and a side is 30° and the length of diagonal is 6 cm, then find the area of the rectangle.
- **Q.6** The angles of elevation of an aeroplane flying vertically above the ground as observed from two consecutive stones 1 km apart are 45° and 60°. Find the height of the aeroplane above the ground in km.
- Q.7 On the level ground, the angle of elevation of a tower is 30°. On moving 20 m nearer, the angle of elevation is 60°. Then find the height of the tower.
- **Q.8** The length of a string between a kite and a point on the ground is 90 m. The string makes an angle of 60° with the level ground. If there is no slack in the string. Find the height of the kite.

- Q.9 A, B, C are three collinear points on the ground such that B lies between A and C and AB = 10 m. If the angles of elevation of the top of a vertical tower at C are respectively 30° and 60° as seen from A and B, then find the height of the tower.
- **Q.10** If the angles of elevation of a tower from two points distant a and b (a > b) from its foot and in the same straight line from it are 30° and 60°, then find the height of the tower.
- **Q.11** A vertical tower stands on a horizontal plane and is surmounted by a vertical flagstaff of height h. At a point on the plane, the angle of elevation of the bottom of the flagstaff is  $\alpha$  and that of the top of the flagstaff is  $\beta$ . Find the height of the tower.
- **Q.12** A straight tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle of 30° with the ground. The distance from the foot of the tree to the point where the top touches the ground is 10 metres. Find the height of the tree.
- **Q.13** From the top of a light house, the angles of depression of two ships on the opposite sides of it are observed to be  $\alpha$  and  $\beta$ . If the height of the light house be h metres and the line joining the ships passes through the foot of the light house, find the distance between the ships.

## **ANSWER KEY**

<b>1.</b> 30°	<b>2.</b> 45°	<b>3.</b> 90°	4.1 $\frac{100}{\sqrt{3}}$ m	5.13 $\sqrt{\frac{h(\tan\alpha + \tan\beta)}{3 \operatorname{cm} \tan\alpha \tan\beta}}$ 6. $\frac{3 + \sqrt{3}}{2}$			
<b>7.</b> $10\sqrt{3}$ m	<b>8.</b> 45√3 m	<b>9.</b> 5√3 m	<b>10.</b> $\sqrt{ab}$	11. $\frac{h \tan \beta}{\tan \beta - \tan \alpha}$			
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## EXERCISE # 2

- Q.1 The angle of elevation of a jet plane from a point A on the ground is 60°. After a flight of 15 seconds, the angle of elevation changes to 30°. If the jet plane is flying at a constant height of  $1500\sqrt{3}$  m, find the speed of the jet plane.
- Q.2 Determine the height of a mountain if the elevation of its top at an unknown distance from the base is 45° and at a distance 10 km further off from the mountain, along the same line, the angle of elevation is 30°.

(Use  $\tan 30^\circ = 0.5774$ ).

- Q.3 The angles of elevation of the top of a rock from the top and the foot of a 100 m high tower are 30° and 45° respectively. Find the height of the rock.
- Q.4 A man on the deck of a ship is 16m above water level. He observes that the angle of elevation of the top of a cliff is 45° and the angle of depression of the base is 30°. Calculate the distance of the cliff from the ship and the height of the cliff.
- Q.5 From the top of a cliff 50 m high, the angles of depression of the top and bottom of a tower are observed to be 30° and 45° respectively. Find the height of the tower.
- Q.6 An aeroplane, when 3000m high, passes vertically above another aeroplane at an instant when the angles of elevation of the two aeroplanes from the same point on the ground are 60° and 45° respectively. Find the vertical distance between the aeroplanes at that instant.
- **Q.7** The angle of elevation of the top of a hill at the foot of a tower is 60° and the angle of elevation of the top of the tower from the foot of the hill

is 30°. If the tower is 50m high, what is the height of the hill ?

- Q.8 A pole 5 m high is fixed on the top of a tower. The angle of elevation of the top of the pole observed from a point A on the ground is 60° and the angle of depression of the point A from the top of the tower is 45°. Find the height of the tower.
- Q.9 An electric pole is 10 metres high. If its shadow is 10  $\sqrt{3}$  metres in length, find the elevation of the sun.
- Q.10 The angle of elevation of the top of a tower, from a point on the ground and at a distance of 30 m from its foot, is 30°. Find the height of the tower.
- Q.11 From a point P on the level ground, the angle of elevation of the top of a tower is 30°. If the tower is 100 m high, how far is P from the foot of tower? Take  $\sqrt{3} = 1.732$
- **Q.12** A kite is flying at a height of 60 metres from the level ground, attached to a string inclined at 60° to the horizontal. Find the length of the string.
- **Q.13** A circus artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole, if the angle made by the rope with the ground level is 30°.
- Q.14 If the length of a shadow cast by a pole be  $\sqrt{3}$  times the length of the pole, find the angle of elevation of the sun.
- Q.15 A river is 60 m wide. A tree of unknown height is on one bank. The angle of elevation of the top of the tree from the point exactly opposite

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to the foot of the tree, on the other bank, is 30°. Find the height of the tree.

Q.16 An electrician has to repair an electric fault on a pole of height 5 m. He needs to reach a point 1.3 m below the top of the pole to undertake the repair work (as shown in the adjoining figure). What should be the length of the ladder that he should use which, when inclined at an angle of  $60^{\circ}$  to the horizontal, would enable him to reach the required position? Also, how far from the foot of the pole should he place the foot of the ladder? Take  $\sqrt{3} = 1.73$ 



Q.17 A bridge across a river makes an angle of 45° with the river bank. If the length of the bridge across the river is 200 metres, what is the breadth of the river?



Q.18 The upper part of a tree broken by wind, falls to the ground without being detached. The top of the broken part touches the ground at an angle of 30° at a point 8 m from the foot of the tree. Calculate (i) the height at which the tree is broken. (ii) the original height of the tree.

- Q.19 The horizontal distance between two towers is 140 m. The angle of elevation of the top of the first tower when seen from the top of the second tower is 30°. If the height of the second tower is 60 m, find the height of the first tower.
- Q.20 A girl, 1.6 m tall, is 20 m away from a tower and observes that the angle of elevation of the top of the tower is 60°. Find the height of the tower. Take  $\sqrt{3} = 1.73$
- **Q.21** An observer 1.5 m tall is 28.5 m away from a chimney. The angle of elevation of the top of the chimney from his eye is 45°. What is the height of the chimney?
- Q.22 From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower.
- **Q.23** From a point P on the ground the angle of elevation of the top of a 10 m tall building is 30°. A flag is hoisted at the top of the building and the angle of elevation of the top of the flagstaff from P is 45°. Find the length of the flagstaff and the distance of the building from the point P. (Take  $\sqrt{3} = 1.732$ )
- Q.24 A statue, 1.6 m tall, stands on the top of a pedestal. From a point on the ground, the angle of elevation of the top of the statue is 60° and from the same point the angle of elevation of the top of the pedestal is 45°. Find the height of the pedestal.
- Q.25 From a point P on the ground, the angle of elevation of the top of a 10 m tall building and a helicopter, hovering over the top of the building, are 30° and 60° respectively. Find the height of the helicopter above the ground.

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- **Q.26** The angle of elevation of the top of a building from the foot of a tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 50 m high, find the height of the building.
- Q.27 A T.V. tower stands vertically on a bank of a canal. From a point on the other bank directly opposite the tower, the angle of elevation of the top of the tower is 60°. From another point 20 m away from this point on the line joining this point to the foot of tower, the angle of elevation of the top of the tower is 30°. Find the height of the tower and the width of the canal.
- Q.28 The angle of elevation of the top of a tower from a point A (on the ground) is 30°. On walking 50 m towards the tower, the angle of elevation is found to be 60°. Calculate: (i) the height of the tower (correct to one decimal place), (ii) the distance of the tower from A.
- Q.29 As observed from the top of a 75 m high lighthouse from the sea-level, the angles of depression of two ships are 30° and 45°. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships.
- Q.30 From the top of a cliff 150 m high, the angles of depression of two boats are 60° and 30°. Find the distance between the boats, if the boats are (i) on the same side of cliff. (ii) on the opposite sides of the cliff.
- Q.31 The shadow of a tower standing on a level ground is found to be 40 m longer when the sun's altitude is 30° than when it is 60°. Find the height of the tower.
- **Q.32** The shadow of a vertical tower on level ground increases by 10 m, when the altitude of the sun changes from 45° to 30°. Using the given figure, find the height of the tower correct to
  - $\frac{1}{10}$  of a metre.







- **Q.33** Two pillars of equal height stand on either side of a roadway which is 80 m wide. At a point in the road between pillars, the elevations of the pillars are 60° and 30°. Find the height of the pillars and the position of the point.
- Q.34 In the adjoining figure, from the top of a building AB, 60 metres high, the angles of depression of the top and the bottom of a vertical lamp post CD are observed to be 30° and 60° respectively. Find (i) the horizontal distance between AB and CD. (ii) the height of the lamp post CD.



- Q.35 The angles of depression of the top and the bottom of an 8 m tall building from the top of a multi-storied building are 30° and 45° respectively. Find the height of the multi-storied building and the distance between the two buildings.
- **Q.36** The angle of elevation of the top of an unfinished tower at a point distant 120 m from its base is 45°. How much higher must the tower be raised so that its angle of elevation at the same point may be 60°?
- Q.37 From the top of a 7 m high building, the angle of elevation of the top of a cable tower is 60° and the angle of depression of its foot is 45°. Determine the height of the tower.

- Q.38 A window in a building is at a height of 10m from the ground. The angle of depression of a point P on the ground from the window is 30°. The angle of elevation of the top of the building from the point P is 60°. Find the height of the building.
- Q.39 The angle of elevation of the top of a tower from a point on the same level as the foot of the tower is 30°. On advancing 150 meters towards the foot of the tower, the angle of elevation becomes 60°. Find the height of the tower.
- Q.40 A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of 30°. A girl standing on the roof of 20 metre high building finds the angle of elevation of the same bird to be 45°. Both the boy and the girl are on opposite sides of the bird. Find the distance of the bird from the girl.

1. 720 km/hr	<b>2.</b> 13.66 km	<b>3.</b> 236.6 m	<b>4.</b> 27.712m ; 43.712 m	<b>5.</b> 21.13 m				
<b>6.</b> 1268 m	<b>7.</b> 150 m	<b>8.</b> 6.83 m	<b>9.</b> 30°	<b>10.</b> $10\sqrt{3}$				
<b>11.</b> 173.2 m	<b>12.</b> $40\sqrt{3}$	<b>13.</b> 10 m	<b>14.</b> 30°	<b>15.</b> $20\sqrt{3}$ m				
<b>16.</b> 4.28 m ; 2.14 m	<b>17.</b> 141.4 m	<b>18.</b> (i) $\frac{8}{3}\sqrt{3}$ m; (ii) 8	3√3 m	<b>19.</b> 140.83 m				
<b>20.</b> 36.2 m	<b>21.</b> 30 m	<b>22.</b> $20(\sqrt{3}-1)$ m	<b>23.</b> 7.32 m ; 17.32 m	<b>24.</b> $0.8(\sqrt{3}+1)$ m				
<b>25.</b> 30 m	<b>26.</b> $16\frac{2}{3}$ m	<b>27.</b> 10√3 m ; 10 m	<b>28.</b> (i) 43.3 m ; (ii) 75 m	<b>29.</b> 50√3 m				
<b>30.</b> (i) 173.2 m ; (ii)	346.4 m	<b>31.</b> 20√3 m	<b>32.</b> 13.7 m					
<b>33.</b> $20\sqrt{3}$ m, 20 m fr	rom the pillar whose a	ingle of elevation is 6	0°					
<b>34.</b> (i) 34.64 m ; (ii)	40 m	<b>35.</b> $4(3+\sqrt{3})$ m; 4(	$3 + \sqrt{3}$ )	<b>36.</b> 87.84 m				
<b>37.</b> 7 $(\sqrt{3} + 1)$ m	<b>38.</b> 30 m	<b>39.</b> 75√3 m	<b>40.</b> $30\sqrt{2}$ m					

## **ANSWER KEY**