



## MATHS

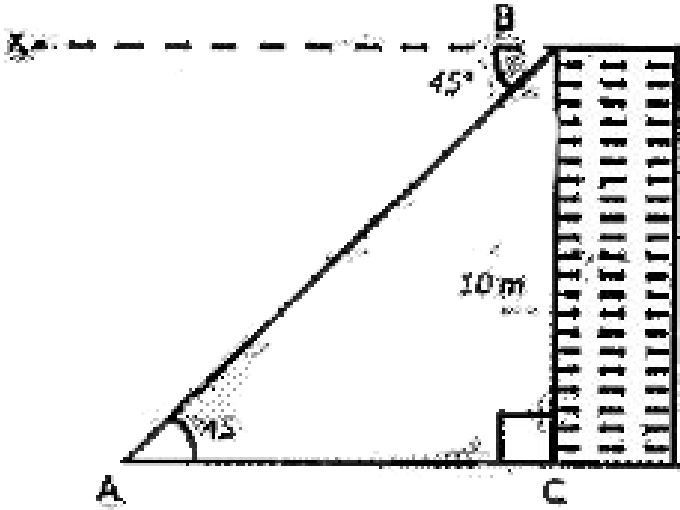
### BOOKS - EDUCART PUBLICATION

# INTRODUCTION TO TRIGNOMETRY AND ITS APPLICATIONS

#### Examples

1. Suppose angle of depression from top of the tower to point A is  $45^\circ$  and height of tower is 10 m. What is the

distance of point A from the building?



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2. The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower, is  $30^\circ$ . Find the height of the tower.

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## Objective Type Questions Multiple Choice Questions

1. If  $\tan A = \frac{4}{3}$ , the value of  $\sin A$  is:

A.  $\frac{4}{5}$

B.  $\frac{3}{4}$

C.  $\frac{5}{3}$

D.  $\frac{7}{5}$

**Answer: A**



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2. If  $3 \tan A = 4$ , then the value of

$\frac{3 \sin A + 2 \cos A}{3 \sin A - 2 \cos A}$  is:

A. 4

B.  $\frac{11}{15}$

C.  $\frac{7}{15}$

D. 3

**Answer: D**



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3. If  $\sin \theta + \cos \theta = \sqrt{2} \cos \theta$ , ( $\theta \neq 90^\circ$ ) then value of  $\tan \theta$  is

A.  $\sqrt{2} - 1$

B.  $\sqrt{2} + 1$

C.  $\sqrt{2}$

D.  $-\sqrt{2}$

**Answer: A**



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4. Given that  $\sin \alpha = \frac{\sqrt{3}}{2}$  and  $\cos \beta = 0$ , then the value of  $\beta - \alpha$  is

A.  $0^\circ$

B.  $90^\circ$

C.  $60^\circ$

D.  $30^\circ$

**Answer: D**

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5. If  $\sin(A + B) = \cos(A - B) = 1$ , then

A.  $A = B = 0$

B.  $A = B = 45^\circ$

C.  $A = 60^\circ, B = 30^\circ$

D. None of these

**Answer: B**

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6. If  $\cos A = \frac{5}{13}$ , find the value of  $\tan A + \cot A$

A.  $\frac{169}{60}$

B.  $\frac{12}{13}$

C. 1

D.  $\frac{60}{169}$

**Answer: D**



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7. If  $5x = \sec \theta$  and  $\frac{5}{x} = \tan \theta$ , find the value of  $5\left(x^2 - \frac{1}{x^2}\right)$ .

A. 5

B.  $\frac{1}{5}$

C.  $\frac{2}{5}$

D. 0

**Answer: B**



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8. If  $\sin \theta + \sin^2 \theta = 1$ , then the value of  $\cos^2 \theta + \cos^4 \theta$  is

A. 1

B.  $\frac{1}{2}$

C. 2

D. 3



**Answer: A**

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9. The value of  $(1 + \cos \theta)(1 - \cos \theta)\operatorname{cosec}^2 \theta =$

A. 0

B. 1

C.  $\cos^2 \theta$

D.  $\sin^2 \theta$

**Answer: B**

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10. If  $\sin \theta - \cos \theta = 0$ , then the value of  $\sin^4 \theta + \cos^4 \theta$  is

A. 1

B.  $\frac{3}{4}$

C.  $\frac{1}{2}$

D.  $\frac{1}{4}$

**Answer: C**



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11. if  $\theta = 45^\circ$  then  $\sec \theta \cot \theta - \operatorname{cosec} \theta$  is:

A. 0

B. 1

C. 2

D. 3

**Answer: A**



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**12.** If  $x = a \sin \theta$  and  $y = a \cos \theta$  then find the value of  $x^2 + y^2$

A. a

B.  $a^2$

C. 1

D.  $b^2$

**Answer: B**

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13.  $4 \tan^2 A - 4 \sec^2 A$  is equal to:

A. 2

B. 3

C. 4

D.  $-4$

**Answer: D**

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14. If  $3 \cos \theta = 1$ , then  $\operatorname{cosec} \theta$  is equal to:

A.  $2\sqrt{2}$

B.  $\frac{3}{2\sqrt{2}}$

C.  $\frac{2\sqrt{3}}{3}$

D.  $\frac{4}{3\sqrt{2}}$

**Answer: B**



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15. If  $\operatorname{cosec} \theta - \cot \theta = \frac{1}{3}$ , then the value of  $\operatorname{cosec} \theta + \cot \theta$

is:

A. 1

B. 2

C. 3

D. 4

**Answer: C**



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**16.** If  $2 \sin 2\theta = \sqrt{3}$  then  $\theta = ?$

A.  $90^\circ$

B.  $30^\circ$

C.  $60^\circ$

D.  $45^\circ$

**Answer: B**



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**17.** If the height and length of the shadow of a man are the same, then the angle of elevation of the sun is:

- A.  $45^\circ$
- B.  $60^\circ$
- C.  $90^\circ$
- D.  $120^\circ$

**Answer: A**



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## Objective Type Questions Write True False

1. If a man standing on a platform 3 m above the surface of a lake observes a cloud and its reflection in the lake at this time the height of reflection of cloud in lake is  $(h+3)$  because in lake platform height is also added to reflection of cloud.

So, angle of depression is different in the lake from the angle of elevation of the cloud is equal to the angle of depression of its reflection.



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2.  $\cos \theta = \frac{a^2 + b^2}{2ab}$ , where  $a$  and  $b$  are two distinct numbers such that  $ab > 0$ .





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3. The angle of elevation of the top of a tower is  $30^\circ$ . If the height of the tower is doubled, then the angle of elevation of its top will also be doubled.



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4. If the height of a tower and the distance of the point of observation from its foot, both are increased by 10%, then the angle of elevation of its top remains unchanged.



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## Objective Type Questions Fill In The Blanks

1. Simplest form of  $(1 + \tan^2 A) / (1 + \cot^2 A)$  IS



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2. If  $\tan A = 1$ , then  $2 \sin A \cos A =$  \_\_\_\_\_



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3. In Fig. 12.58, what are the angles of depression from the observing positions  $O_1$  and  $O_2$  of the object at  $A$  ?

(FIGURE)



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4. What is the value of  $\sin^2 \theta + \frac{1}{1 + \tan^2 \theta}$  ?

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5. Simplest form of  $(1 - \cos^2 A)(1 + \cot^2 A)$  is .....

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6. If  $3 \sec \theta - 5 = 0$ , then  $\cot \theta = \dots\dots\dots$

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7. If  $\sin \theta - \cos \theta = 0$ ,  $0 \leq \theta \leq 90^\circ$  then the value of  $\theta$  is \_\_\_\_\_.

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8.  $\cos 1^\circ \cos 2^\circ \cos 3^\circ \dots \cos 180^\circ \dots$

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9. If  $\tan \theta = \sqrt{3}$ , then  $\sec \theta \dots$

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10. The maximum value of  $\frac{1}{\cos e\theta}$  is



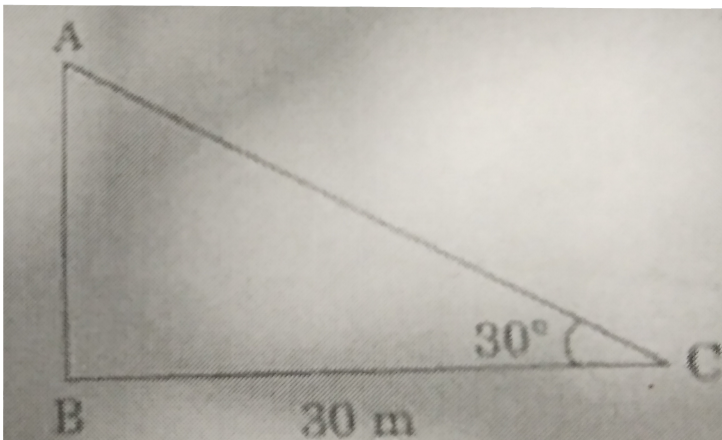
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11. If  $\tan \theta + \cot \theta = 2$  then the value of  $\tan^2 \theta + \cot^2 \theta$  is



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## Objective Type Questions Very Short Answer Type Questions



1.

If figure, the angle of elevation of the top of a tower from

a point C on the ground which is 30 m away from the foot of the tower, is  $30^\circ$ . Find the height of the tower.

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2. Write the value of  $\sin^2 30^\circ + \cos^2 60^\circ$ .

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3. If  $\sin x + \cos y = 1$ ,  $x = 30^\circ$  and  $y$  is an acute angle.

Find the value of  $y$

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4.  $\sin^2 60^\circ + 2\tan 45^\circ - \cos^2 30^\circ$

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5. If  $\sin A = \frac{3}{4}$ , calculate  $\sec A$ .

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6. If  $(1 + \cos A)(1 - \cos A) = \frac{3}{4}$ , find the value of  $\sec A$ .

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7. The angle of elevation of the top of a tower at a point on the ground, 50 m away from the foot of the tower, is

60°. Find the height of the tower.



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8. A ladder 15m long makes an angle of  $60^\circ$  with the wall.

Find the height of the point , where the ladder touches the wall.



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9. If a tower 30 m high, casts a shadow  $10\sqrt{3}$  m long on the ground, then what is the angle of elevation of the sun

?



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10. If  $\tan A = 1 (0^\circ < A < 90^\circ)$  and  $\cos B = \frac{1}{\sqrt{2}} (0^\circ < B < 90^\circ)$ , then find  $\cos(A + B)$

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11. Evaluate :

$$2\sec 30^\circ \times \tan 60^\circ$$

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## Short Answer Sa I Type Questions

1. The length of a vertical rod and its shadow are in the ratio  $1 : \sqrt{3}$ . The angle of elevation of the sun is



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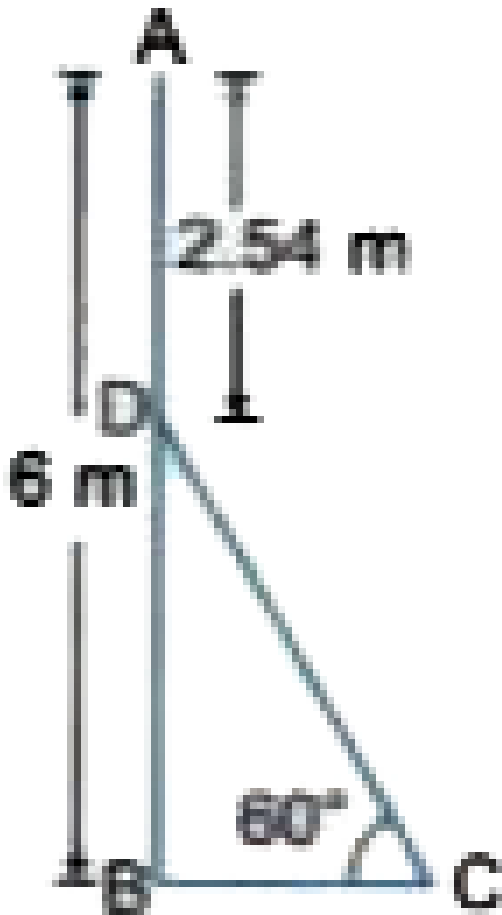
2. When the shadow of a pole 'h' metres high is  $\frac{\sqrt{3}h}{3}$  metres, what is the angle of elevation of the sun at that time ?



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3. In fig AB is a 6m high pole and CD is a ladder inclined at an angle of  $60^\circ$  to the horizontal and reaches up to a point D of pole. If  $AD=2.54\text{m}$ , find the length of the ladder.

(use  $\sqrt{3} = 1.73$ )



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4. Prove that :  $1 + \frac{\cot^2 \alpha}{1 + \operatorname{cosec} \alpha} = \operatorname{cosec} \alpha$



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5. Prove that :

$$\tan^4 \theta + \tan^2 \theta = \sec^4 \theta - \sec^2 \theta$$



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6. Find  $A$  and  $B$ , if  $\sin(A + 2B) = \frac{\sqrt{3}}{2}$ , and  $\cos(A + B) = \frac{1}{2}$



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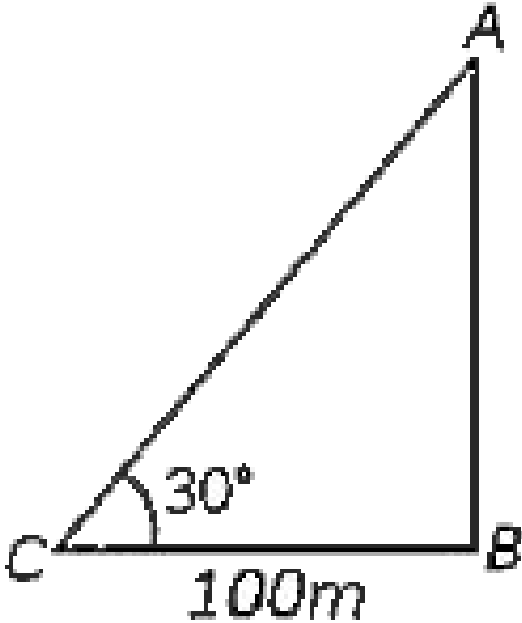
7. A ladder is placed along a wall of a house such that its upper end is touching the top of the wall. The foot of the

ladder is 2m away from the wall and the ladder is making an angle of  $60^\circ$  with the level of the ground. Determine the height of the wall.

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**8.** A vertical flagstaff stands on a horizontal plane. From a point 100 m from its foot, the angle of elevation the its

top is  $30^\circ$ . Find the height of the flagstaff.



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9. If  $x \cos \theta - y \sin \theta = a$ ,  $x \sin \theta + y \cos \theta = b$ , prove that:

$$x^2 + y^2 = a^2 + b^2.$$

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10. If  $x = a \cos^3 \theta$  and  $y = b \sin^3 \theta$ , prove that

$$\left(\frac{x}{a}\right)^{2/3} + \left(\frac{y}{b}\right)^{2/3} = 1.$$

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11. The shadow of a 5-m-long stick is 2m long. At the same time, the length of the shadow of a 12.5m high tree is

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12. Evaluate:

$$(\sin^4 60^\circ + \sec^4 30^\circ) - 2(\cos^2 45^\circ - \sin^2 90^\circ)$$

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13. If  $a \cos \theta - b \sin \theta = c$ , prove that  $a \sin \theta + b \cos \theta = \pm \sqrt{a^2 + b^2 - c^2}$ .

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14. Simplify  $(1 + \tan^2 \theta)(1 - \sin \theta)(1 + \sin \theta)$

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15. When the ratio of the height of a telephone pole and the length of its shadow is  $\sqrt{3}:1$ , find the angle of the elevation of sun

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## Short Answer Sa li Type Questions

1. An observer, 1.5m tall, is 28.5 m away from a tower 30m high. Determine the angle of elevation of the top of the tower from his eye.

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2. In  $\triangle ABC$ , right angled at A,  $AC = 1.5m$ ,  $CB = 3m$  and  $\angle ABC = \theta$  find:

(i)  $\tan \theta$  (ii)  $\sec \theta + \operatorname{cosec} \theta$

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3. Prove that

$$\frac{\sin \theta - \cos \theta + 1}{\sin \theta + \cos \theta - 1} = \frac{1}{(\sec \theta - \tan \theta)}.$$



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4. Prove that  $\sqrt{\frac{1 + \sin A}{1 - \sin A}} = \sec A + \tan A$



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5. Prove each of the following identities :

$$\frac{\sin \theta}{(1 + \cos \theta)} + \frac{(1 + \cos \theta)}{\sin \theta} = 2\operatorname{cosec} \theta$$



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6. If  $\sin \theta + \cos \theta = \sqrt{2}$  then prove that  $\tan \theta + \cot \theta = 2$



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7. Prove that

$$\frac{\cot \theta + \operatorname{cosec} \theta - 1}{\cot \theta - \operatorname{cosec} \theta + 1} = \frac{1 + \cos \theta}{\sin \theta}.$$



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8. Prove :  $2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta) + 1 = 0$ .



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9. If  $\sin \theta + \cos \theta = \sqrt{3}$ , then prove that  $\tan \theta + \cot \theta = 1$

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10. Prove that :

$$(\sin^4 \theta - \cos^4 \theta + 1) \operatorname{cosec}^2 \theta = 2$$

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11. Prove that :

$$\frac{2 \cos^2 \theta - \cos \theta}{\sin \theta - 2 \sin^3 \theta} = \cot \theta$$

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12. If  $\tan A = \frac{3}{4}$ , then show that  $\sin A \cos A = \frac{12}{25}$

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13. Prove that:

$$\left( \frac{\tan \theta}{1 - \tan \theta} \right) - \left( \frac{\cot \theta}{1 - \cot \theta} \right) = \frac{\cos \theta + \sin \theta}{\cos \theta - \sin \theta}$$

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14. If  $\cos \theta + \sin \theta = \sqrt{2} \cos \theta$ , show that

$$\cos \theta - \sin \theta = \sqrt{2} \sin \theta.$$

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15. Prove that:  $\frac{\tan A + \tan B}{\cot A + \cot B} = \tan A \tan B$

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16. A ladder 15 metres long just reaches the top of a vertical wall. If the ladder makes an angle of  $60^\circ$  with the wall, find the height of the wall.

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17. Prove that:  $\sqrt{\frac{\sec \theta - 1}{\sec \theta + 1}} + \sqrt{\frac{\sec \theta + 1}{\sec \theta - 1}} = 2\operatorname{cosec} \theta$

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**18.** Prove that

$$(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = (7 + \tan^2 \theta + \cot^2 \theta).$$

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**19.** Prove that:

$$(1 + \cot A - \operatorname{cosec} A)(1 + \tan A + \sec A) = 2$$

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**20.** If  $4 \tan \theta = 3$ , evaluate  $\frac{4 \sin \theta - \cos \theta + 1}{4 \sin \theta + \cos \theta - 1}$

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**21.** A player sitting on the top of a tower of height 20 m observes the angle of depression of a ball lying on the ground as  $60^\circ$ . Find the distance between the foot of the tower and the ball. Take  $\sqrt{3} = 1.732$

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**22.** Using the formula  $\cos 2\theta = 2\cos^2\theta - 1$ , find the value of  $\cos 30^\circ$ , it is being given that  $\cos 60^\circ = \frac{1}{2}$

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**23.** If  $\sin\theta + \cos\theta = \sqrt{3}$ , then prove that  $\tan\theta + \cot\theta = 1$ .



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24. Prove that :  $\frac{\cos A}{1 + \sin A} + \frac{1 + \sin A}{\cos A} = 2 \sec A$

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25. Prove that :  $\sec^2 \theta + \operatorname{cosec}^2 \theta = \sec^2 \theta \cdot \operatorname{cosec}^2 \theta$

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26. If  $2 \sin^2 \theta - \cos^2 \theta = 2$ , then find the value of  $\theta$ .

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27. The shadow of a tower standing on a level plane is found to be 50 m longer when when sun's elevation is  $30^\circ$  than when it is  $60^\circ$ . Find the height of the tower.

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## Long Answer Type Questions

1. From a window 15 metres high above the ground in a street, the angles of elevation and depression of the top and the foot of another house on the opposite side of the street are  $30^\circ$  and  $45^\circ$  respectively show that the height of the opposite house is 23.66 metres ( $take \sqrt{3} = 1.732$ )

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2. A moving boat is observed from the top of a 150 m high cliff moving away from the cliff. The angle of depression of the boat changes from  $60^\circ$  to  $45^\circ$  in 2 minutes. Find the speed of the boat in m/h.

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3. An observer 1.5 m tall is  $20\sqrt{3}$  m away from a chimney. The angle of elevation from the top of the chimney from his eyes is  $30^\circ$  and from bottom is  $45^\circ$ . Find the height of the chimney.

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4. Two men on either side of a 75 m high building and in line with base of building observe the angle of elevation of the top of the building as  $30^\circ$  and  $60^\circ$ . Find the distance between the two men. (Use  $\sqrt{3} = 1.73$ )

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5. The angles of depression of the top and bottom of a 50 m high building from the top of a tower are  $45^\circ$  and  $60^\circ$  respectively. Find the height of the tower and the horizontal distance between the tower and the building. (Use  $\sqrt{3} = 1.73$ ).

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6. A man standing on the deck of a ship, which is 10 m above water level, observes the angle of elevation of the top of a hill as  $60^\circ$  and the angle of depression the base of hill as  $30^\circ$ . Find the distance of the hill from the ship and the height of the hill.



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7. A statue 1.6m tall stands on the top of pedestal. From a point on the ground, the angle of elevation of the top of the statue is  $60^\circ$  and from the same point the angle of elevation of the top of the pedestal is  $45^\circ$ . Find the height of the pedestal.



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8. The angle of elevation of a jet plane from a point  $A$  on the ground is  $60^\circ$ . After a flight of 30 seconds, the angle of elevation changes to  $30^\circ$ . If the jet plane is flying at a constant height of  $3600\sqrt{3}m$ , find the speed of the jet plane.



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9. From the top of a 7m high building, the angle of elevation of the top of a cable tower is  $60^\circ$  and the angle of depression of its foot is  $45^\circ$ . Determine the height of the tower.



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10. The angle of elevation of the top of a tower from a certain point is  $30^\circ$ . If the observer moves 20 m towards the tower, the angle of elevation of the top of the tower increases by  $15^\circ$ . The height of the tower is (a) 17.3 m (b) 21.9 m (c) 27.3 m (d) 30 m



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11. A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of  $30^\circ$ , which is approaching the foot of the tower with a uniform speed. Six seconds later, the angle of depres



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**12.** The angle of elevation of the top of a building from the foot of the tower is  $30^\circ$  and the angle of elevation of the top of tower from the foot of the building is  $60^\circ$ , If the tower is 50 m high, find the height of the building.



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**13.** If  $1 + \sin^2 \theta = 3 \sin \theta \cos \theta$ , then prove that  $\tan \theta = 1$  or  $\frac{1}{2}$ .



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**14.** From a point on the ground the angles of elevation of the bottom and top of a transmission tower fixed at the



top of 20m high building are  $45^\circ$  and  $60^\circ$  respectively. Find the height of the transmission tower.

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**15.** A vertical tower stands on a horizontal land and is surmounted by a vertical flag staff of height 12 metres. At a point on the plane, the angle of elevation of the bottom and the top of the flag staff are respectively  $45^\circ$  and  $60^\circ$ . Find the height of tower.

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**16.** 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  $45^\circ$  and  $60^\circ$  respectively. Find the height of the tower.

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17. A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of  $30^\circ$ . A girl standing on the roof of 20 metre high building, finds the angle of elevation of the same bird to be  $45^\circ$ . Both the boy and the girl are on opposite sides of the bird. Find the distance of bird from the girl.

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**18.** If  $\sin \theta + \cos \theta = p$  and  $\sec \theta + \operatorname{cosec} \theta = q$ , then prove that  $q(p^2 - 1) = 2p$ .



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**19.** The angle of elevation of a jet plane from a point  $A$  on the ground is  $60^\circ$ . After a flight of 30 seconds, the angle of elevation changes to  $30^\circ$ . If the jet plane is flying at a constant height of  $3600\sqrt{3}m$ , find the speed of the jet plane.



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20. Prove that: 
$$\frac{(1 + \cot \theta + \tan \theta)(\sin \theta - \cos \theta)}{\sec^3 \theta - \operatorname{cosec}^3 \theta} = \sin^2 \theta \cos^2 \theta$$

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21. If  $\sec \theta + \tan \theta = m$ , show that 
$$\frac{(m^2 - 1)}{(m^2 + 1)} = \sin \theta.$$

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22. A moving boat is observed from the top of a 150 m high cliff moving away from the cliff. The angle of depression of the boat changes from  $60^\circ$  to  $45^\circ$  in 2 minutes. Find the speed of the boat in m/h.

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**23.** A ladder rests against a vertical wall at inclination  $\alpha$  to the horizontal. Its foot is pulled away from the wall through a distance  $p$  so that its upper end slides  $q$  down the wall and then ladder make an angle  $\beta$  to the horizontal show that  $\frac{p}{q} = \frac{\cos \beta - \cos \alpha}{\sin \alpha - \sin \beta}$ .

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**24.** There are two temples, one on each bank of a river, just opposite to each other. One temple is 50m high. From the top of this temple, the angles of depression of the top and the foot of the other temple are  $30^\circ$  and  $60^\circ$  respectively.

Find the width of the river and the height of the other temple.

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**25.** A boy standing on a horizontal plane finds a bird flying at a distance of 100 m from him at an elevation of  $30^\circ$ . A girl standing on the roof of 20 metre high building, finds the angle of elevation of the same bird to be  $45^\circ$ . Both the boy and the girl are on opposite sides of the bird. Find the distance of bird from the girl.

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26. prove that:

$$\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = 1 + \sec \theta \cos \theta$$

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27. The lower window of a house is at a height of 2m above the ground and its upper window is 4m vertically above the lower window. At certain instant the angles of elevation of a balloon from these windows are observed to be  $60^\circ$  and  $30^\circ$ , respectively. Find the height of the balloon above the ground.

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28. Prove that: 
$$\frac{\sin \theta}{\cot \theta + \operatorname{cosec} \theta} = 2 + \frac{\sin \theta}{\cot \theta - \operatorname{cosec} \theta}$$

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29. Prove that 
$$\frac{\sin A - \cos A + 1}{\sin A + \cos A - 1} = \frac{1}{\sec A - \tan A}$$

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30. A man in a boat rowing away from a light house 100 m high takes 2 minutes to change the angle of elevation of the top of the light house from  $60^\circ$  to  $30^\circ$ . Find the speed of the boat in meters per minute. [Use  $\sqrt{3} = 1.732$ ]

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**31.** Two poles of equal heights are standing opposite each other on either side of the road, which is 80 m wide. From a point between them on the road, the angles of elevation of the top of the poles are  $60^\circ$  and  $30^\circ$ , respectively. Find the height



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**32.** The shadow of a flagstaff is three times as long as the shadow of the flagstaff when the sun rays meet the ground at  $60^\circ$ . Find the angle between the sun rays and the ground at the time of longer shadow



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33. Prove that: 
$$\frac{\sin A - 2 \sin^3 A}{2 \cos^3 A - \cos A} = \tan A$$



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34. A straight highway leads to the foot of a tower. A man standing at the top of the tower observes a car at an angle of depression of  $30^\circ$ , which is approaching the foot of the tower with a uniform speed. Six seconds later, the angle of depression



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35. The angle of elevation of a cloud from a point 10 meters above the surface of a lake is  $30^\circ$  and the angle of

depression of its reflection from that point is  $60^\circ$ . Then the height of the cloud above the lake is

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**36.** From a point A on the ground, the angles of elevation of the top of a 10 m tall building and a helicopter hovering at some height of the building are  $30^\circ$  and  $60^\circ$  respectively. Find the height of the helicopter above the building

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**37.** A 1.5m tall boy is standing at some distance from a 30m tall building. The angle of elevation from his eyes to the

top of the building increases from  $30^\circ$  to  $60^\circ$  as he walks towards the building. Find the distance he walked towards the building.

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**38.** From the top of a 120 m high tower a man observes two cars on the opposite sides of the tower and in straight line with the base of tower with angles of depression as  $60^\circ$  and  $45^\circ$ . Find the distance between the cars.

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**39.** A vertical tower stands on a horizontal plane and is surmounted by a flagstaff of height 5m. From a point on the ground the angles of elevation of the top and bottom of the flagstaff are  $60^\circ$  and  $30^\circ$  respectively. Find the height of the tower and the distance of the point from the tower. (Take  $\sqrt{3} = 1.732$ )



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**40.** From a point 200 m above a lake , the angle of elevation of a cloud is  $30^\circ$  and the angle of depression of its reflection in lake is  $60^\circ$  then the distance of cloud from the point is



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**41.** A bird is sitting on the top of a 80 m high tree. From a point on the ground, the angle of elevation of the bird is  $45^\circ$ . The bird flies away horizontally in such a way that it remained at a constant height from the ground. After 2 seconds, the angle of elevation of the bird from the same point is  $30^\circ$ . Find the speed of flying of the bird. (Take  $\sqrt{3} = 1.732$ ).



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**42.** As observed from the top of a 100 m high light house from the sea level, the angles of depression of two ships are  $30^\circ$  and  $45^\circ$ . If one ship is exactly behind the other

one on the same side of the light house, find the distance between the two ships.



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