EXPRESSWALA ACADEMY

Maths 1A: Heights and Distances

MCQ Test, Set 08

Time: 30 minutes | Maximum marks: 25

Name: _____ Class: _____ Date: _____

1. There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
2. Each correct answer carries 1 mark. There is no negative marking.
3. The key sheet and worked solutions are at the end of this test.

1. From a point 54 m away from the foot of a pole, the angle of elevation of its top is 30°. Its height is

A. $27\ \text{m}$ **B.** $18\sqrt{3}\ \text{m}$ **C.** $54\sqrt{3}\ \text{m}$ **D.** $27\sqrt{3}\ \text{m}$

2. A tree is 48 m high. From a point $48\sqrt{3}$ m from its foot, the angle of elevation of its top is

A. 60° **B.** 45° **C.** 30° **D.** 75°

3. A water tank is 21 m high. By how much is its shadow longer when the sun's elevation is 15° than when it is 45°?

A. $21(\sqrt{3}-1)\ \text{m}$ **B.** $21(\sqrt{3}+3)\ \text{m}$
C. $21(\sqrt{3}+1)\ \text{m}$ **D.** $\frac{21(\sqrt{3}-1)}{2}\ \text{m}$

4. From a point 75 m away from the foot of a chimney, the angle of elevation of its top is 75°. Its height is

A. $\frac{75(\sqrt{6}-\sqrt{2})}{4}\ \text{m}$ **B.** $\frac{75(\sqrt{6}+\sqrt{2})}{4}\ \text{m}$
C. $75(2-\sqrt{3})\ \text{m}$ **D.** $75(\sqrt{3}+2)\ \text{m}$

5. From the top of a hill 84 m high, the angle of depression of a hut is 45°. The distance of the hut from the foot of the hill is

A. $84\ \text{m}$ **B.** $84\sqrt{2}\ \text{m}$ **C.** $42\ \text{m}$ **D.** $42\sqrt{2}\ \text{m}$

6. From the top of a bridge 24 m high, the angles of depression of two boats on the same side of it, in line with its foot are 45° and 75°. The distance between them is

A. $24(\sqrt{3}+1)\ \text{m}$ **B.** $24(\sqrt{3}+3)\ \text{m}$
C. $24(3-\sqrt{3})\ \text{m}$ **D.** $24(\sqrt{3}-1)\ \text{m}$

7. From the top of a bridge 21 m high, the angle of depression of a boat is 75°. The distance of the boat from the foot of the bridge is

A. $\frac{21(\sqrt{6}+\sqrt{2})}{4}\ \text{m}$ **B.** $21(\sqrt{6}-\sqrt{2})\ \text{m}$
C. $21(\sqrt{3}+2)\ \text{m}$ **D.** $21(2-\sqrt{3})\ \text{m}$

8. Two points 42 m apart lie on opposite sides of a tower, in line with its foot. The top is seen from both at an elevation of 30°. The height of the tower is

A. $42\sqrt{3}\ \text{m}$ **B.** $7\sqrt{3}\ \text{m}$ **C.** $21\sqrt{3}\ \text{m}$ **D.** $14\sqrt{3}\ \text{m}$

9. Two points 33 m apart on level ground lie on opposite sides of a building, in line with its foot. The angles of elevation of its top from them are 45° and 75°. Its height is

A. $\frac{33(\sqrt{3}+3)}{2}$ m **B.** $\frac{11(3-\sqrt{3})}{2}$ m
C. $\frac{11(\sqrt{3}+3)}{2}$ m **D.** $\frac{33(\sqrt{3}+1)}{2}$ m

10. Two points 12 m apart on level ground lie on opposite sides of a temple gopuram, in line with its foot. The angles of elevation of its top from them are 45° and 75°. Its height is

A. $6(\sqrt{3}+1)$ m **B.** $2(\sqrt{3}+3)$ m
C. $6(\sqrt{3}+3)$ m **D.** $2(3-\sqrt{3})$ m

11. The angle of elevation of the top of a water tank is 30°. After walking 90 m towards it, it is 75°. How far is the observer now from the foot of the water tank?

A. 180 m **B.** $60(\sqrt{3}+3)$ m
C. $\frac{45(\sqrt{3}-1)}{2}$ m **D.** $45(\sqrt{3}-1)$ m

12. The angle of elevation of the top of a chimney from a point on level ground is 30°. After walking 25 m towards it, the angle becomes 45°. The height of the chimney is

A. $\frac{25(\sqrt{3}+1)}{2}$ m **B.** $\frac{25(3-\sqrt{3})}{3}$ m
C. $25(\sqrt{3}-1)$ m **D.** $\frac{25(\sqrt{3}-1)}{2}$ m

13. The angle of elevation of the top of a pole is 45°. After walking 21 m towards it, it is 60°. How far is the observer now from the foot of the pole?

A. $21(\sqrt{3}+1)$ m **B.** $21(\sqrt{3}-1)$ m
C. $7(\sqrt{3}+3)$ m **D.** $\frac{21(\sqrt{3}+1)}{2}$ m

14. From the foot of a building the angle of elevation of the top of a tower is 60°, and from the top of the building, 54 m high, it is 15°. The height of the tower is

A. $\frac{27(\sqrt{3}+7)}{2}$ m **B.** $\frac{27(3-\sqrt{3})}{2}$ m
C. $\frac{27(\sqrt{3}-1)}{2}$ m **D.** $\frac{27(\sqrt{3}+3)}{2}$ m

15. From the foot of a building the angle of elevation of the top of a tower is 30°, and from the top of the building, 120 m high, it is 15°. The height of the tower is

A. 60 m **B.** $60(\sqrt{3}+2)$ m
C. $60(\sqrt{3}+4)$ m **D.** $60\sqrt{3}$ m

16. The angle of depression of a point P seen from Q is 63°. The angle of elevation of Q seen from P is

A. 117° **B.** 27° **C.** 126° **D.** 63°

17. A flagstaff 6 m long stands on a tower. From a point on the ground, the angles of elevation of the foot and the top of the flagstaff are 60° and 75°. The height of the tower is

A. $3\sqrt{3}$ m **B.** $3(2\sqrt{3}+3)$ m
C. $6\sqrt{3}$ m **D.** $3(\sqrt{3}+2)$ m

18. A flagstaff 9 m long stands on a tower. From a point on the ground, the angles of elevation of the foot and the top of the flagstaff are 15° and 75°. The height of the tower is

A. $\frac{3(2\sqrt{3}-3)}{2}$ m **B.** $\frac{3(2\sqrt{3}+3)}{2}$ m
C. $3(2\sqrt{3}-3)$ m **D.** $\frac{3\sqrt{3}}{2}$ m

---

19. A tower is 60 m high and a flagstaff stands on it. From a point on the ground the elevations of the top of the tower and the top of the flagstaff are 60° and 75°. The length of the flagstaff is

A. $20(2\sqrt{3}+3)$ m **B.** 120 m
C. $40\sqrt{3}$ m **D.** $40(2\sqrt{3}-3)$ m

---

20. From a point 12 m above a lake, the angle of elevation of a cloud is 45° and the angle of depression of its reflection is 75°. The height of the cloud above the lake is

A. $12\sqrt{3}$ m **B.** $4\sqrt{3}$ m
C. $12(\sqrt{3}-1)$ m **D.** $12(\sqrt{3}+1)$ m

---

21. From a point 15 m above a lake, the angle of elevation of a cloud is 15° and the angle of depression of its reflection is 30°. The height of the cloud above the lake is

A. $15(\sqrt{3}+1)$ m **B.** $15(\sqrt{3}+2)$ m
C. $15\sqrt{3}$ m **D.** $\frac{15(\sqrt{3}-1)}{2}$ m

---

22. From P the elevation of the top T of a tower is 45°. Walking up a path inclined at 15° towards the tower to Q, the elevation becomes 60°. In triangle PQT, $\angle PQT$, at the point reached is

A. 60° **B.** 45° **C.** 135° **D.** 165°

---

23. The elevation of the top of a tower from a point is 45°. After walking 75 m up a slope inclined at 30° towards it, the elevation is 75°. The height of the tower is

A. $\frac{75}{2}$ m **B.** 75 m
C. $\frac{75(\sqrt{3}+1)}{2}$ m **D.** 150 m

---

24. In triangle ABC, D is the midpoint of AB, $\angle ACD = 15^\circ$ and $\angle DCB = 45^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

A. $\frac{-(\sqrt{3}+1)}{2}$ **B.** $\frac{\sqrt{3}+1}{2}$
C. $\frac{\sqrt{3}+3}{2}$ **D.** $\sqrt{3}+1$

---

25. In triangle ABC, D is the midpoint of AB, $A = 75^\circ$ and $B = 60^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

A. $\frac{3-\sqrt{3}}{3}$ **B.** $\frac{2\sqrt{3}-3}{3}$
C. $\frac{3-2\sqrt{3}}{3}$ **D.** $\frac{2(3-2\sqrt{3})}{3}$

Key sheet

1. B	**2.** C	**3.** C	**4.** D	**5.** A
6. D	**7.** D	**8.** B	**9.** C	**10.** B
11. C	**12.** A	**13.** D	**14.** D	**15.** B
16. D	**17.** A	**18.** A	**19.** C	**20.** A
21. A	**22.** C	**23.** B	**24.** B	**25.** C

Solutions

1. From a point 54 m away from the foot of a pole, the angle of elevation of its top is 30°. Its height is

$\tan 30^\circ = \frac{h}{54}$

$h = 54 \tan 30^\circ = 54 \times \frac{1}{\sqrt{3}} = 18\sqrt{3}$ m

Ans: (B) $18\sqrt{3}$ m

---

2. A tree is 48 m high. From a point $48\sqrt{3}$ m from its foot, the angle of elevation of its top is

$\tan\theta = \frac{48}{48\sqrt{3}} = \frac{1}{\sqrt{3}}$

$\theta = 30^\circ$

Ans: (C) 30°

---

3. A water tank is 21 m high. By how much is its shadow longer when the sun's elevation is 15° than when it is 45°?

Shadow length $= h\cot(\text{elevation})$.

$21\cot 15^\circ - 21\cot 45^\circ = 21((2+\sqrt{3}) - 1)$

$= 21(\sqrt{3}+1)$ m

Ans: (C) $21(\sqrt{3}+1)$ m

---

4. From a point 75 m away from the foot of a chimney, the angle of elevation of its top is 75°. Its height is

$\tan 75^\circ = \frac{h}{75}$

$h = 75\tan 75^\circ = 75 \times (2+\sqrt{3}) = 75(\sqrt{3}+2)$ m

Ans: (D) $75(\sqrt{3}+2)$ m

---

5. From the top of a hill 84 m high, the angle of depression of a hut is 45°. The distance of the hut from the foot of the hill is

The angle of elevation of the top from the hut is also 45°.

$x = 84\cot 45^\circ = 84 \times 1 = 84$ m

Ans: (A) 84 m

---

6. From the top of a bridge 24 m high, the angles of depression of two boats on the same side of it, in line with its foot are 45° and 75°. The distance between them is

distances from the foot: $24\cot 45^\circ = 24,\ 24\cot 75^\circ = 24(2-\sqrt{3})$

Same side: subtract.

distance $= 24(\sqrt{3}-1)$ m

Ans: (D) $24(\sqrt{3}-1)$ m

---

7. From the top of a bridge 21 m high, the angle of depression of a boat is 75°. The distance of the boat from the foot of the bridge is

The angle of elevation of the top from the boat is also 75°.

$x = 21\cot 75^\circ = 21 \times (2-\sqrt{3}) = 21(2-\sqrt{3})$ m

Ans: (D) $21(2-\sqrt{3})$ m

---

8. Two points 42 m apart lie on opposite sides of a tower, in line with its foot. The top is seen from both at an elevation of 30°. The height of the tower is

The angles are equal, so the foot is midway: each point is 21 m from it.

$h = 21\tan 30^\circ = 7\sqrt{3}\ \text{m}$

Ans: (B) $7\sqrt{3}\ \text{m}$

---

9. Two points 33 m apart on level ground lie on opposite sides of a building, in line with its foot. The angles of elevation of its top from them are 45° and 75°. Its height is

$h = \frac{d}{\cot\alpha + \cot\beta} = \frac{33}{1+(2-\sqrt{3})}$

$= \frac{11(\sqrt{3}+3)}{2}\ \text{m}$

Ans: (C) $\frac{11(\sqrt{3}+3)}{2}\ \text{m}$

---

10. Two points 12 m apart on level ground lie on opposite sides of a temple gopuram, in line with its foot. The angles of elevation of its top from them are 45° and 75°. Its height is

$h = \frac{d}{\cot\alpha + \cot\beta} = \frac{12}{1+(2-\sqrt{3})}$

$= 2(\sqrt{3}+3)\ \text{m}$

Ans: (B) $2(\sqrt{3}+3)\ \text{m}$

---

11. The angle of elevation of the top of a water tank is 30°. After walking 90 m towards it, it is 75°. How far is the observer now from the foot of the water tank?

$h = \frac{90}{\sqrt{3}-(2-\sqrt{3})} = \frac{45(\sqrt{3}+1)}{2}$

$\text{distance} = h\cot 75^\circ = \frac{45(\sqrt{3}+1)}{2} \times (2-\sqrt{3}) = \frac{45(\sqrt{3}-1)}{2}\ \text{m}$

Ans: (C) $\frac{45(\sqrt{3}-1)}{2}\ \text{m}$

---

12. The angle of elevation of the top of a chimney from a point on level ground is 30°. After walking 25 m towards it, the angle becomes 45°. The height of the chimney is

$h\cot 30^\circ - h\cot 45^\circ = 25$

$h = \frac{25}{\sqrt{3}-1} = \frac{25(\sqrt{3}+1)}{2}\ \text{m}$

Ans: (A) $\frac{25(\sqrt{3}+1)}{2}\ \text{m}$

---

13. The angle of elevation of the top of a pole is 45°. After walking 21 m towards it, it is 60°. How far is the observer now from the foot of the pole?

$h = \frac{21}{1-\frac{1}{\sqrt{3}}} = \frac{21(\sqrt{3}+3)}{2}$

$\text{distance} = h\cot 60^\circ = \frac{21(\sqrt{3}+3)}{2} \times \frac{1}{\sqrt{3}} = \frac{21(\sqrt{3}+1)}{2}\ \text{m}$

Ans: (D) $\frac{21(\sqrt{3}+1)}{2}\ \text{m}$

---

14. From the foot of a building the angle of elevation of the top of a tower is 60°, and from the top of the building, 54 m high, it is 15°. The height of the tower is

$h = x\tan 60^\circ,\ h - 54 = x\tan 15^\circ$

$h = \frac{d\cot\alpha}{\cot\alpha - \cot\beta} = \frac{54\times(2+\sqrt{3})}{(2+\sqrt{3})-\frac{1}{\sqrt{3}}}$

$= \frac{27(\sqrt{3}+3)}{2}\ \text{m}$

Ans: (D) $\frac{27(\sqrt{3}+3)}{2}\ \text{m}$

---

15. From the foot of a building the angle of elevation of the top of a tower is 30°, and from the top of the building, 120 m high, it is 15°. The height of the tower is

$h = x\tan 30^\circ,\ h - 120 = x\tan 15^\circ$

$h = \frac{d\cot\alpha}{\cot\alpha - \cot\beta} = \frac{120\times(2+\sqrt{3})}{(2+\sqrt{3})-\sqrt{3}}$

$= 60(\sqrt{3}+2)$ m

Ans: (B) $60(\sqrt{3}+2)$ m

---

16. The angle of depression of a point P seen from Q is 63°. The angle of elevation of Q seen from P is

The horizontals through P and Q are parallel; the line PQ makes equal alternate angles with them. So the elevation is 63°.

Ans: (D) 63°

---

17. A flagstaff 6 m long stands on a tower. From a point on the ground, the angles of elevation of the foot and the top of the flagstaff are 60° and 75°. The height of the tower is

$h = x\tan 60^\circ,\ h + 6 = x\tan 75^\circ$

$h = \frac{d\cot\beta}{\cot\alpha - \cot\beta} = \frac{6\times(2-\sqrt{3})}{\frac{1}{\sqrt{3}}-(2-\sqrt{3})}$

$= 3\sqrt{3}$ m

Ans: (A) $3\sqrt{3}$ m

---

18. A flagstaff 9 m long stands on a tower. From a point on the ground, the angles of elevation of the foot and the top of the flagstaff are 15° and 75°. The height of the tower is

$h = x\tan 15^\circ,\ h + 9 = x\tan 75^\circ$

$h = \frac{d\cot\beta}{\cot\alpha - \cot\beta} = \frac{9\times(2-\sqrt{3})}{(2+\sqrt{3})-(2-\sqrt{3})}$

$= \frac{3(2\sqrt{3}-3)}{2}$ m

Ans: (A) $\frac{3(2\sqrt{3}-3)}{2}$ m

---

19. A tower is 60 m high and a flagstaff stands on it. From a point on the ground the elevations of the top of the tower and the top of the flagstaff are 60° and 75°. The length of the flagstaff is

$x = 60\cot 60^\circ = 20\sqrt{3}$

$60 + l = x\tan 75^\circ = 20\sqrt{3}\times(2+\sqrt{3}) = 20(2\sqrt{3}+3)$

$l = 40\sqrt{3}$ m

Ans: (C) $40\sqrt{3}$ m

---

20. From a point 12 m above a lake, the angle of elevation of a cloud is 45° and the angle of depression of its reflection is 75°. The height of the cloud above the lake is

$h = \frac{d\sin(\beta+\alpha)}{\sin(\beta-\alpha)} = \frac{12\sin 120^\circ}{\sin 30^\circ}$

$= 12\sqrt{3}$ m

Ans: (A) $12\sqrt{3}$ m

---

21. From a point 15 m above a lake, the angle of elevation of a cloud is 15° and the angle of depression of its reflection is 30°. The height of the cloud above the lake is

$h = \frac{d\sin(\beta+\alpha)}{\sin(\beta-\alpha)} = \frac{15\sin 45^\circ}{\sin 15^\circ}$

$= 15(\sqrt{3}+1)$ m

Ans: (A) $15(\sqrt{3}+1)$ m

---

22. From P the elevation of the top T of a tower is 45°. Walking up a path inclined at 15° towards the tower to Q, the elevation becomes 60°. In triangle PQT, $\angle PQT$, at the point reached is

The angle at Q is $180^\circ - (\gamma - \beta)$.

$= 135^\circ$

Ans: (C) 135°

---

23. The elevation of the top of a tower from a point is 45°. After walking 75 m up a slope inclined at 30° towards it, the elevation is 75°. The height of the tower is

$h = \frac{d\sin(\gamma-\beta)\sin\alpha}{\sin(\gamma-\alpha)} = \frac{75\sin 45^\circ \sin 45^\circ}{\sin 30^\circ}$

$= 75$ m

Ans: (B) 75 m

---

24. In triangle ABC, D is the midpoint of AB, $\angle ACD = 15^\circ$ and $\angle DCB = 45^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

$(m+n)\cot\theta = m\cot\alpha - n\cot\beta,\ m = n = 1$

$2\cot\theta = (2+\sqrt{3}) - 1 \Rightarrow \cot\theta = \frac{\sqrt{3}+1}{2}$

Ans: (B) $\frac{\sqrt{3}+1}{2}$

---

25. In triangle ABC, D is the midpoint of AB, $A = 75^\circ$ and $B = 60^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

$(m+n)\cot\theta = n\cot A - m\cot B,\ m = n = 1$

$2\cot\theta = (2-\sqrt{3}) - \frac{1}{\sqrt{3}} \Rightarrow \cot\theta = \frac{3-2\sqrt{3}}{3}$

Ans: (C) $\frac{3-2\sqrt{3}}{3}$
