EXPRESSWALA ACADEMY

Maths 1A: Heights and Distances

MCQ Test, Set 05

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 27 m away from the foot of a tree, the angle of elevation of its top is 30°. Its height is

A. $\frac{27\sqrt{3}}{2}$ m **B.** $9\sqrt{3}$ m
C. $27\sqrt{3}$ m **D.** $\frac{27}{2}$ m

2. A building is 24 m high. From a point $24\sqrt{3}$ m from its foot, the angle of elevation of its top is

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

3. A tree is 150 m high. By how much is its shadow longer when the sun's elevation is 60° than when it is 75°?

A. 300 m **B.** $75(2\sqrt{3}+3)$ m
C. $100(3-\sqrt{3})$ m **D.** $100(2\sqrt{3}-3)$ m

4. From a point 42 m away from the foot of a building, the angle of elevation of its top is 60°. Its height is

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

5. From the top of a building 72 m high, the angle of depression of a scooter is 60°. The distance of the scooter from the foot of the building is

A. $36\sqrt{3}$ m **B.** $24\sqrt{3}$ m **C.** $72\sqrt{3}$ m **D.** $48\sqrt{3}$ m

6. From the top of a lighthouse 27 m high, the angles of depression of two ships on opposite sides of it, in line with its foot are 45° and 75°. The distance between them is

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

7. From the top of a cliff 64 m high, the angle of depression of a boat is 60°. The distance of the boat from the foot of the cliff is

A. $64\sqrt{3}$ m **B.** $32\sqrt{3}$ m
C. $\frac{128\sqrt{3}}{3}$ m **D.** $\frac{64\sqrt{3}}{3}$ m

8. Two points 84 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. $14\sqrt{3}$ m **B.** $28\sqrt{3}$ m **C.** $42\sqrt{3}$ m **D.** $84\sqrt{3}$ m

9. Two points 27 m apart on level ground lie on opposite sides of a pole, in line with its foot. The angles of elevation of its top from them are 45° and 15°. Its height is

A. $\frac{9(3-\sqrt{3})}{2}$ m **B.** $\frac{27(3-\sqrt{3})}{2}$ m
C. $\frac{9(\sqrt{3}+3)}{2}$ m **D.** $\frac{27(\sqrt{3}-1)}{2}$ m

10. Two points 150 m apart on level ground lie on opposite sides of a tree, in line with its foot. The angles of elevation of its top from them are 75° and 60°. Its height is

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

11. The angle of elevation of the top of a minar from a point on level ground is 45°. After walking 66 m towards it, the angle becomes 60°. The height of the minar is

A. $22(3-\sqrt{3})$ m **B.** $33(3-\sqrt{3})$ m
C. $33(\sqrt{3}+3)$ m **D.** $66(\sqrt{3}-1)$ m

12. The angle of elevation of the top of a chimney is 60°. After walking 75 m towards it, it is 75°. How far is the observer now from the foot of the chimney?

A. $\frac{75\sqrt{3}}{2}$ m **B.** 150 m
C. $50(3-\sqrt{3})$ m **D.** $75\sqrt{3}$ m

13. The angle of elevation of the top of a pole from a point on level ground is 15°. After walking 120 m towards it, the angle becomes 30°. The height of the pole is

A. $80(2\sqrt{3}-3)$ m **B.** $30(\sqrt{3}-1)$ m
C. 240 m **D.** 60 m

14. From the foot of a building the angle of elevation of the top of a tower is 75°, and from the top of the building, 72 m high, it is 30°. The height of the tower is

A. $18(\sqrt{3}+1)$ m **B.** $18(\sqrt{3}-1)$ m
C. $18(\sqrt{3}+3)$ m **D.** $18(\sqrt{3}+7)$ m

15. 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, 33 m high, it is 15°. The height of the tower is

A. $\frac{33(\sqrt{3}-1)}{4}$ m **B.** $\frac{33(\sqrt{3}+3)}{4}$ m
C. $\frac{33(\sqrt{3}+7)}{4}$ m **D.** $\frac{33(3-\sqrt{3})}{4}$ m

16. The angle of depression of a point P seen from Q is 48°. The angle of elevation of Q seen from P is

A. 132° **B.** 96° **C.** 48° **D.** 42°

17. A flagstaff 24 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 60°. The height of the tower is

A. $6(\sqrt{3}-1)$ m **B.** $6(\sqrt{3}+3)$ m
C. $6(3-\sqrt{3})$ m **D.** $12(\sqrt{3}-1)$ m

18. A flagstaff 20 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 30° and 60°. The height of the tower is

A. $10\sqrt{3}\ \text{m}$ **B.** $20\ \text{m}$ **C.** $30\ \text{m}$ **D.** $10\ \text{m}$

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19. A tower is 24 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 15° and 60°. The length of the flagstaff is

A. $48(\sqrt{3}-1)\ \text{m}$ **B.** $16(\sqrt{3}+3)\ \text{m}$

C. $24(2\sqrt{3}+3)\ \text{m}$ **D.** $48(\sqrt{3}+1)\ \text{m}$

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20. From a point 18 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. $18(\sqrt{3}+1)\ \text{m}$ **B.** $18\sqrt{3}\ \text{m}$

C. $6\sqrt{3}\ \text{m}$ **D.** $18(\sqrt{3}-1)\ \text{m}$

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21. From a point 24 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. $24\sqrt{3}\ \text{m}$ **B.** $24(\sqrt{3}+2)\ \text{m}$

C. $24(\sqrt{3}+1)\ \text{m}$ **D.** $12(\sqrt{3}-1)\ \text{m}$

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22. From P the elevation of the top T of a tower is 45°. Walking up a path inclined at 30° towards the tower to Q, the elevation becomes 75°. In triangle PQT, $\angle PQT$, at the point reached is

A. 75° **B.** 135° **C.** 45° **D.** 150°

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23. The elevation of the top of a tower from a point is 45°. After walking 90 m up a slope inclined at 15° towards it, the elevation is 60°. The height of the tower is

A. $45(\sqrt{6}+\sqrt{2})\ \text{m}$ **B.** $\frac{45(\sqrt{6}-\sqrt{2})}{2}\ \text{m}$

C. $90(\sqrt{6}+\sqrt{2})\ \text{m}$ **D.** $45(\sqrt{3}+3)\ \text{m}$

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24. In triangle ABC, D is the midpoint of AB, $\angle ACD = 45^\circ$ and $\angle DCB = 60^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

A. $\frac{3-\sqrt{3}}{3}$ **B.** $\frac{\sqrt{3}-3}{6}$ **C.** $\frac{3-\sqrt{3}}{6}$ **D.** $\frac{\sqrt{3}+3}{6}$

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25. In triangle ABC, D is the midpoint of AB, $A = 30^\circ$ and $B = 15^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

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

Key sheet

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

Solutions

1. From a point 27 m away from the foot of a tree, the angle of elevation of its top is 30°. Its height is

$\tan 30^\circ = \frac{h}{27}$

$h = 27 \tan 30^\circ = 27 \times \frac{1}{\sqrt{3}} = 9\sqrt{3}$ m

Ans: (B) $9\sqrt{3}$ m

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2. A building is 24 m high. From a point $24\sqrt{3}$ m from its foot, the angle of elevation of its top is

$\tan\theta = \frac{24}{24\sqrt{3}} = \frac{1}{\sqrt{3}}$

$\theta = 30^\circ$

Ans: (D) 30°

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3. A tree is 150 m high. By how much is its shadow longer when the sun's elevation is 60° than when it is 75°?

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

$150\cot 60^\circ - 150\cot 75^\circ = 150(\frac{1}{\sqrt{3}} - (2-\sqrt{3}))$

$= 100(2\sqrt{3} - 3)$ m

Ans: (D) $100(2\sqrt{3} - 3)$ m

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4. From a point 42 m away from the foot of a building, the angle of elevation of its top is 60°. Its height is

$\tan 60^\circ = \frac{h}{42}$

$h = 42 \tan 60^\circ = 42 \times \sqrt{3} = 42\sqrt{3}$ m

Ans: (A) $42\sqrt{3}$ m

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5. From the top of a building 72 m high, the angle of depression of a scooter is 60°. The distance of the scooter from the foot of the building is

The angle of elevation of the top from the scooter is also 60°.

$x = 72\cot 60^\circ = 72 \times \frac{1}{\sqrt{3}} = 24\sqrt{3}$ m

Ans: (B) $24\sqrt{3}$ m

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6. From the top of a lighthouse 27 m high, the angles of depression of two ships on opposite sides of it, in line with its foot are 45° and 75°. The distance between them is

distances from the foot: $27\cot 45^\circ = 27,\ 27\cot 75^\circ = 27(2-\sqrt{3})$

Opposite sides: add.

distance $= 27(3-\sqrt{3})$ m

Ans: (A) $27(3-\sqrt{3})$ m

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7. From the top of a cliff 64 m high, the angle of depression of a boat is 60°. The distance of the boat from the foot of the cliff is

The angle of elevation of the top from the boat is also 60°.

$x = 64\cot 60^\circ = 64 \times \frac{1}{\sqrt{3}} = \frac{64\sqrt{3}}{3}$ m

Ans: (D) $\frac{64\sqrt{3}}{3}$ m

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8. Two points 84 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 42 m from it.

$h = 42\tan 30^\circ = 14\sqrt{3}\ \text{m}$

Ans: (A) $14\sqrt{3}\ \text{m}$

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9. Two points 27 m apart on level ground lie on opposite sides of a pole, in line with its foot. The angles of elevation of its top from them are 45° and 15°. Its height is

$h = \frac{d}{\cot\alpha + \cot\beta} = \frac{27}{1+(2+\sqrt{3})}$

$= \frac{9(3-\sqrt{3})}{2}\ \text{m}$

Ans: (A) $\frac{9(3-\sqrt{3})}{2}\ \text{m}$

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10. Two points 150 m apart on level ground lie on opposite sides of a tree, in line with its foot. The angles of elevation of its top from them are 75° and 60°. Its height is

$h = \frac{d}{\cot\alpha + \cot\beta} = \frac{150}{(2-\sqrt{3})+\frac{1}{\sqrt{3}}}$

$= \frac{75(\sqrt{3}+3)}{2}\ \text{m}$

Ans: (C) $\frac{75(\sqrt{3}+3)}{2}\ \text{m}$

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11. The angle of elevation of the top of a minar from a point on level ground is 45°. After walking 66 m towards it, the angle becomes 60°. The height of the minar is

$h\cot 45^\circ - h\cot 60^\circ = 66$

$h = \frac{66}{1-\frac{1}{\sqrt{3}}} = 33(\sqrt{3}+3)\ \text{m}$

Ans: (C) $33(\sqrt{3}+3)\ \text{m}$

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12. The angle of elevation of the top of a chimney is 60°. After walking 75 m towards it, it is 75°. How far is the observer now from the foot of the chimney?

$h = \frac{75}{\frac{1}{\sqrt{3}}-(2-\sqrt{3})} = \frac{75(2\sqrt{3}+3)}{2}$

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

Ans: (A) $\frac{75\sqrt{3}}{2}\ \text{m}$

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13. The angle of elevation of the top of a pole from a point on level ground is 15°. After walking 120 m towards it, the angle becomes 30°. The height of the pole is

$h\cot 15^\circ - h\cot 30^\circ = 120$

$h = \frac{120}{(2+\sqrt{3})-\sqrt{3}} = 60\ \text{m}$

Ans: (D) $60\ \text{m}$

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14. From the foot of a building the angle of elevation of the top of a tower is 75°, and from the top of the building, 72 m high, it is 30°. The height of the tower is

$h = x\tan 75^\circ,\ h - 72 = x\tan 30^\circ$

$h = \frac{d\cot\alpha}{\cot\alpha - \cot\beta} = \frac{72\times\sqrt{3}}{\sqrt{3}-(2-\sqrt{3})}$

$= 18(\sqrt{3}+3)\ \text{m}$

Ans: (C) $18(\sqrt{3}+3)\ \text{m}$

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15. 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, 33 m high, it is 15°. The height of the tower is

$h = x\tan 60^\circ,\ h - 33 = x\tan 15^\circ$

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

$= \frac{33(\sqrt{3}+3)}{4}\ \text{m}$

Ans: (B) $\frac{33(\sqrt{3}+3)}{4}\ \text{m}$

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16. The angle of depression of a point P seen from Q is 48°. 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 48°.

Ans: (C) 48°

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17. A flagstaff 24 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 60°. The height of the tower is

$h = x\tan 15^\circ,\ h + 24 = x\tan 60^\circ$

$h = \frac{d\cot\beta}{\cot\alpha - \cot\beta} = \frac{24\times\frac{1}{\sqrt{3}}}{(2+\sqrt{3})-\frac{1}{\sqrt{3}}}$

$= 6(\sqrt{3}-1)\ \text{m}$

Ans: (A) $6(\sqrt{3}-1)\ \text{m}$

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18. A flagstaff 20 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 30° and 60°. The height of the tower is

$h = x\tan 30^\circ,\ h + 20 = x\tan 60^\circ$

$h = \frac{d\cot\beta}{\cot\alpha - \cot\beta} = \frac{20\times\frac{1}{\sqrt{3}}}{\sqrt{3}-\frac{1}{\sqrt{3}}}$

$= 10\ \text{m}$

Ans: (D) $10\ \text{m}$

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19. A tower is 24 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 15° and 60°. The length of the flagstaff is

$x = 24\cot 15^\circ = 24(\sqrt{3}+2)$

$24 + l = x\tan 60^\circ = 24(\sqrt{3}+2)\times\sqrt{3} = 24(2\sqrt{3}+3)$

$l = 48(\sqrt{3}+1)\ \text{m}$

Ans: (D) $48(\sqrt{3}+1)\ \text{m}$

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20. From a point 18 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

$h = \frac{d\sin(\beta+\alpha)}{\sin(\beta-\alpha)} = \frac{18\sin 120^\circ}{\sin 30^\circ}$

$= 18\sqrt{3}\ \text{m}$

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

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21. From a point 24 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

$h = \frac{d\sin(\beta+\alpha)}{\sin(\beta-\alpha)} = \frac{24\sin 45^\circ}{\sin 15^\circ}$

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

Ans: (C) $24(\sqrt{3}+1)$ m

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22. From P the elevation of the top T of a tower is 45°. Walking up a path inclined at 30° towards the tower to Q, the elevation becomes 75°. In triangle PQT, $\angle PQT$, at the point reached is

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

$= 135^\circ$

Ans: (B) 135°

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23. The elevation of the top of a tower from a point is 45°. After walking 90 m up a slope inclined at 15° towards it, the elevation is 60°. The height of the tower is

$h = \frac{d\sin(\gamma-\beta)\sin\alpha}{\sin(\gamma-\alpha)} = \frac{90\sin 45^\circ \sin 45^\circ}{\sin 15^\circ}$

$= 45(\sqrt{6}+\sqrt{2})$ m

Ans: (A) $45(\sqrt{6}+\sqrt{2})$ m

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24. In triangle ABC, D is the midpoint of AB, $\angle ACD = 45^\circ$ and $\angle DCB = 60^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

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

$2\cot\theta = 1 - \frac{1}{\sqrt{3}} \Rightarrow \cot\theta = \frac{3-\sqrt{3}}{6}$

Ans: (C) $\frac{3-\sqrt{3}}{6}$

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25. In triangle ABC, D is the midpoint of AB, $A = 30^\circ$ and $B = 15^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

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

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

Ans: (B) -1
