EXPRESSWALA ACADEMY

Maths 1A: Heights and Distances

MCQ Test, Set 10

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 90 m away from the foot of a water tank, the angle of elevation of its top is 30°. Its height is

A. $90\sqrt{3}$ m **B.** $45\sqrt{3}$ m **C.** 45 m **D.** $30\sqrt{3}$ m

2. A temple gopuram is 120 m high. From a point $120\sqrt{3}$ m from its foot, the angle of elevation of its top is

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

3. A minar is 54 m high. By how much is its shadow longer when the sun's elevation is 30° than when it is 75°?

A. $108(\sqrt{3}-1)$ m **B.** 108 m
C. $\frac{27(\sqrt{3}+1)}{2}$ m **D.** $36(\sqrt{3}+3)$ m

4. From a point 45 m away from the foot of a temple gopuram, the angle of elevation of its top is 75°. Its height is

A. $45(2-\sqrt{3})$ m **B.** $45(\sqrt{3}+2)$ m
C. $\frac{45(\sqrt{6}-\sqrt{2})}{4}$ m **D.** $\frac{45(\sqrt{6}+\sqrt{2})}{4}$ m

5. From the top of a hill 21 m high, the angle of depression of a hut is 15°. The distance of the hut from the foot of the hill is

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

6. From the top of a tower 30 m high, the angles of depression of two cars on the same side of it, in line with its foot are 15° and 60°. The distance between them is

A. $20(\sqrt{3}+3)$ m **B.** 60 m
C. $20(2\sqrt{3}+3)$ m **D.** $60(\sqrt{3}-1)$ m

7. From the top of a building 150 m high, the angle of depression of a scooter is 75°. The distance of the scooter from the foot of the building is

A. $150(2-\sqrt{3})$ m **B.** $150(\sqrt{3}+2)$ m
C. $\frac{75(\sqrt{6}+\sqrt{2})}{2}$ m **D.** $150(\sqrt{6}-\sqrt{2})$ m

8. Two points 90 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. $45\sqrt{3}\ \text{m}$ **B.** $30\sqrt{3}\ \text{m}$ **C.** $90\sqrt{3}\ \text{m}$ **D.** $15\sqrt{3}\ \text{m}$

9. Two points 48 m apart on level ground lie on opposite sides of a chimney, in line with its foot. The angles of elevation of its top from them are 15° and 60°. Its height is

A. $24(2\sqrt{3}-3)\ \text{m}$ **B.** $12(3-\sqrt{3})\ \text{m}$

C. $24\ \text{m}$ **D.** $48\ \text{m}$

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

A. $\frac{45(\sqrt{3}+1)}{2}\ \text{m}$ **B.** $\frac{15(\sqrt{3}+3)}{2}\ \text{m}$

C. $\frac{15(3-\sqrt{3})}{2}\ \text{m}$ **D.** $\frac{45(\sqrt{3}+3)}{2}\ \text{m}$

11. The angle of elevation of the top of a minar is 30°. After walking 48 m towards it, it is 45°. How far is the observer now from the foot of the minar?

A. $24(\sqrt{3}+3)\ \text{m}$ **B.** $48(\sqrt{3}+1)\ \text{m}$

C. $16(3-\sqrt{3})\ \text{m}$ **D.** $24(\sqrt{3}+1)\ \text{m}$

12. The angle of elevation of the top of a building from a point on level ground is 60°. After walking 72 m towards it, the angle becomes 75°. The height of the building is

A. $18(\sqrt{3}+3)\ \text{m}$ **B.** $48(2\sqrt{3}-3)\ \text{m}$

C. $36(2\sqrt{3}+3)\ \text{m}$ **D.** $144\ \text{m}$

13. The angle of elevation of the top of a chimney is 30°. After walking 84 m towards it, it is 60°. How far is the observer now from the foot of the chimney?

A. $112\sqrt{3}\ \text{m}$ **B.** $42\ \text{m}$ **C.** $56\sqrt{3}\ \text{m}$ **D.** $84\ \text{m}$

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, 27 m high, it is 30°. The height of the tower is

A. $\frac{27\sqrt{3}}{2}\ \text{m}$ **B.** $\frac{27}{2}\ \text{m}$

C. $\frac{135}{2}\ \text{m}$ **D.** $\frac{81}{2}\ \text{m}$

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, 90 m high, it is 30°. The height of the tower is

A. $45\sqrt{3}\ \text{m}$ **B.** $45\ \text{m}$ **C.** $135\ \text{m}$ **D.** $225\ \text{m}$

16. The angle of depression of a point P seen from Q is 57°. The angle of elevation of Q seen from P is

A. 123° **B.** 33° **C.** 57° **D.** 114°

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 30° and 60°. The height of the tower is

A. $3\sqrt{3}\ \text{m}$ **B.** $3\ \text{m}$ **C.** $6\ \text{m}$ **D.** $9\ \text{m}$

18. A flagstaff 4 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. $2\ \text{m}$ **B.** $2\sqrt{3}\ \text{m}$ **C.** $6\ \text{m}$ **D.** $4\ \text{m}$

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19. A tower is 64 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 30° and 75°. The length of the flagstaff is

A. $128(\sqrt{3}-1)\ \text{m}$ **B.** $\frac{128(\sqrt{3}+3)}{3}\ \text{m}$

C. $128(\sqrt{3}+1)\ \text{m}$ **D.** $64(2\sqrt{3}+3)\ \text{m}$

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20. From a point 25 m above a lake, the angle of elevation of a cloud is 30° and the angle of depression of its reflection is 60°. The height of the cloud above the lake is

A. $\frac{25}{2}\ \text{m}$ **B.** $75\ \text{m}$ **C.** $25\ \text{m}$ **D.** $50\ \text{m}$

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21. From a point 21 m above a lake, the angle of elevation of a cloud is 30° and the angle of depression of its reflection is 75°. The height of the cloud above the lake is

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

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

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22. From P the elevation of the top T of a tower is 30°. Walking up a path inclined at 15° towards the tower to Q, the elevation becomes 45°. In triangle PQT, $\angle PTQ$, at the top of the tower is

A. 15° **B.** 30° **C.** 45° **D.** 165°

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23. The elevation of the top of a tower from a point is 30°. After walking 33 m up a slope inclined at 15° towards it, the elevation is 60°. The height of the tower is

A. $\frac{33\sqrt{3}}{2}\ \text{m}$ **B.** $33\sqrt{2}\ \text{m}$

C. $\frac{33\sqrt{2}}{4}\ \text{m}$ **D.** $\frac{33\sqrt{2}}{2}\ \text{m}$

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24. In triangle ABC, D is the midpoint of AB, $\angle ACD = 60^\circ$ and $\angle DCB = 30^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

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

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25. In triangle ABC, D is the midpoint of AB, $A = 15^\circ$ and $B = 60^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

A. $\frac{-(\sqrt{3}+3)}{3}$ **B.** $\frac{\sqrt{3}+3}{3}$

C. $\frac{2(\sqrt{3}+3)}{3}$ **D.** $\frac{2\sqrt{3}+3}{3}$

Key sheet

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

Solutions

1. From a point 90 m away from the foot of a water tank, the angle of elevation of its top is 30°. Its height is

$\tan 30^\circ = \frac{h}{90}$
$h = 90 \tan 30^\circ = 90 \times \frac{1}{\sqrt{3}} = 30\sqrt{3}$ m

Ans: (D) $30\sqrt{3}$ m

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2. A temple gopuram is 120 m high. From a point $120\sqrt{3}$ m from its foot, the angle of elevation of its top is

$\tan\theta = \frac{120}{120\sqrt{3}} = \frac{1}{\sqrt{3}}$
$\theta = 30^\circ$

Ans: (C) 30°

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3. A minar is 54 m high. By how much is its shadow longer when the sun's elevation is 30° than when it is 75°?

Shadow length $= h\cot(\text{elevation})$.
$54\cot 30^\circ - 54\cot 75^\circ = 54(\sqrt{3} - (2-\sqrt{3}))$
$= 108(\sqrt{3}-1)$ m

Ans: (A) $108(\sqrt{3}-1)$ m

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4. From a point 45 m away from the foot of a temple gopuram, the angle of elevation of its top is 75°. Its height is

$\tan 75^\circ = \frac{h}{45}$
$h = 45\tan 75^\circ = 45 \times (2+\sqrt{3}) = 45(\sqrt{3}+2)$ m

Ans: (B) $45(\sqrt{3}+2)$ m

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5. From the top of a hill 21 m high, the angle of depression of a hut is 15°. The distance of the hut from the foot of the hill is

The angle of elevation of the top from the hut is also 15°.
$x = 21\cot 15^\circ = 21 \times (2+\sqrt{3}) = 21(\sqrt{3}+2)$ m

Ans: (B) $21(\sqrt{3}+2)$ m

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6. From the top of a tower 30 m high, the angles of depression of two cars on the same side of it, in line with its foot are 15° and 60°. The distance between them is

distances from the foot: $30\cot 15^\circ = 30(\sqrt{3}+2)$, $30\cot 60^\circ = 10\sqrt{3}$
Same side: subtract.
distance $= 20(\sqrt{3}+3)$ m

Ans: (A) $20(\sqrt{3}+3)$ m

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7. From the top of a building 150 m high, the angle of depression of a scooter is 75°. The distance of the scooter from the foot of the building is

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

$x = 150 \cot 75^\circ = 150 \times (2 - \sqrt{3}) = 150(2 - \sqrt{3})$ m

Ans: (A) $150(2 - \sqrt{3})$ m

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8. Two points 90 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 45 m from it.

$h = 45 \tan 30^\circ = 15\sqrt{3}$ m

Ans: (D) $15\sqrt{3}$ m

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9. Two points 48 m apart on level ground lie on opposite sides of a chimney, in line with its foot. The angles of elevation of its top from them are 15° and 60°. Its height is

$h = \frac{d}{\cot\alpha + \cot\beta} = \frac{48}{(2+\sqrt{3}) + \frac{1}{\sqrt{3}}}$

$= 24(2\sqrt{3} - 3)$ m

Ans: (A) $24(2\sqrt{3} - 3)$ m

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

$h = \frac{d}{\cot\alpha + \cot\beta} = \frac{45}{(2-\sqrt{3}) + 1}$

$= \frac{15(\sqrt{3}+3)}{2}$ m

Ans: (B) $\frac{15(\sqrt{3}+3)}{2}$ m

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11. The angle of elevation of the top of a minar is 30°. After walking 48 m towards it, it is 45°. How far is the observer now from the foot of the minar?

$h = \frac{48}{\sqrt{3}-1} = 24(\sqrt{3} + 1)$

$\text{distance} = h \cot 45^\circ = 24(\sqrt{3} + 1) \times 1 = 24(\sqrt{3} + 1)$ m

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

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12. The angle of elevation of the top of a building from a point on level ground is 60°. After walking 72 m towards it, the angle becomes 75°. The height of the building is

$h \cot 60^\circ - h \cot 75^\circ = 72$

$h = \frac{72}{\frac{1}{\sqrt{3}} - (2-\sqrt{3})} = 36(2\sqrt{3} + 3)$ m

Ans: (C) $36(2\sqrt{3} + 3)$ m

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13. The angle of elevation of the top of a chimney is 30°. After walking 84 m towards it, it is 60°. How far is the observer now from the foot of the chimney?

$h = \frac{84}{\sqrt{3} - \frac{1}{\sqrt{3}}} = 42\sqrt{3}$

$\text{distance} = h \cot 60^\circ = 42\sqrt{3} \times \frac{1}{\sqrt{3}} = 42$ m

Ans: (B) 42 m

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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, 27 m high, it is 30°. The height of the tower is

$h = x\tan 60^\circ,\ h - 27 = x\tan 30^\circ$

$h = \frac{d\cot\alpha}{\cot\alpha - \cot\beta} = \frac{27\times\sqrt{3}}{\sqrt{3}-\frac{1}{\sqrt{3}}}$

$= \frac{81}{2}\ \text{m}$

Ans: (D) $\frac{81}{2}\ \text{m}$

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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, 90 m high, it is 30°. The height of the tower is

$h = x\tan 60^\circ,\ h - 90 = x\tan 30^\circ$

$h = \frac{d\cot\alpha}{\cot\alpha - \cot\beta} = \frac{90\times\sqrt{3}}{\sqrt{3}-\frac{1}{\sqrt{3}}}$

$= 135\ \text{m}$

Ans: (C) $135\ \text{m}$

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16. The angle of depression of a point P seen from Q is 57°. 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 57°.

Ans: (C) 57°

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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 30° and 60°. The height of the tower is

$h = x\tan 30^\circ,\ h + 6 = x\tan 60^\circ$

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

$= 3\ \text{m}$

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

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18. A flagstaff 4 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

$h = x\tan 30^\circ,\ h + 4 = x\tan 60^\circ$

$h = \frac{d\cot\beta}{\cot\alpha - \cot\beta} = \frac{4\times\frac{1}{\sqrt{3}}}{\sqrt{3}-\frac{1}{\sqrt{3}}}$

$= 2\ \text{m}$

Ans: (A) $2\ \text{m}$

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19. A tower is 64 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 30° and 75°. The length of the flagstaff is

$x = 64\cot 30^\circ = 64\sqrt{3}$

$64 + l = x\tan 75^\circ = 64\sqrt{3}\times(2+\sqrt{3}) = 64(2\sqrt{3}+3)$

$l = 128(\sqrt{3}+1)\ \text{m}$

Ans: (C) $128(\sqrt{3}+1)\ \text{m}$

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20. From a point 25 m above a lake, the angle of elevation of a cloud is 30° and the angle of depression of its reflection is 60°. The height of the cloud above the lake is

$h = \frac{d\sin(\beta+\alpha)}{\sin(\beta-\alpha)} = \frac{25\sin 90^\circ}{\sin 30^\circ}$

$= 50$ m

Ans: (D) 50 m

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21. From a point 21 m above a lake, the angle of elevation of a cloud is 30° and the angle of depression of its reflection is 75°. The height of the cloud above the lake is

$h = \frac{d\sin(\beta+\alpha)}{\sin(\beta-\alpha)} = \frac{21\sin 105^\circ}{\sin 45^\circ}$

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

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

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22. From P the elevation of the top T of a tower is 30°. Walking up a path inclined at 15° towards the tower to Q, the elevation becomes 45°. In triangle PQT, $\angle PTQ$, at the top of the tower is

The angle at T is $\gamma - \alpha$.

$= 15^\circ$

Ans: (A) 15°

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23. The elevation of the top of a tower from a point is 30°. After walking 33 m up a slope inclined at 15° towards it, the elevation is 60°. The height of the tower is

$h = \frac{d\sin(\gamma-\beta)\sin\alpha}{\sin(\gamma-\alpha)} = \frac{33\sin 45^\circ \sin 30^\circ}{\sin 30^\circ}$

$= \frac{33\sqrt{2}}{2}$ m

Ans: (D) $\frac{33\sqrt{2}}{2}$ m

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24. In triangle ABC, D is the midpoint of AB, $\angle ACD = 60^\circ$ and $\angle DCB = 30^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

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

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

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

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25. In triangle ABC, D is the midpoint of AB, $A = 15^\circ$ and $B = 60^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

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

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

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