EXPRESSWALA ACADEMY

Maths 1A: Heights and Distances

MCQ Test, Set 06

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 21 m away from the foot of a temple gopuram, the angle of elevation of its top is 60°. Its height is

A. $7\sqrt{3}\ \text{m}$ **B.** $21\sqrt{3}\ \text{m}$
C. $\frac{21\sqrt{3}}{2}\ \text{m}$ **D.** $\frac{21}{2}\ \text{m}$

2. A temple gopuram is 96 m high. From a point $32\sqrt{3}$ m from its foot, the angle of elevation of its top is

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

3. A pole is 33 m high. By how much is its shadow longer when the sun's elevation is 30° than when it is 75°?

A. $\frac{33(\sqrt{3}+1)}{4}\ \text{m}$ **B.** $66\ \text{m}$
C. $22(\sqrt{3}+3)\ \text{m}$ **D.** $66(\sqrt{3}-1)\ \text{m}$

4. From a point 66 m away from the foot of a water tank, the angle of elevation of its top is 15°. Its height is

A. $66(\sqrt{3}+2)\ \text{m}$ **B.** $\frac{33(\sqrt{6}-\sqrt{2})}{2}\ \text{m}$
C. $66(2-\sqrt{3})\ \text{m}$ **D.** $\frac{33(\sqrt{6}+\sqrt{2})}{2}\ \text{m}$

5. From the top of a building 54 m high, the angle of depression of a scooter is 60°. The distance of the scooter from the foot of the building is

A. $36\sqrt{3}\ \text{m}$ **B.** $27\sqrt{3}\ \text{m}$ **C.** $54\sqrt{3}\ \text{m}$ **D.** $18\sqrt{3}\ \text{m}$

6. From the top of a bridge 75 m high, the angles of depression of two boats on the same side of it, in line with its foot are 15° and 60°. The distance between them is

A. $150\ \text{m}$ **B.** $50(2\sqrt{3}+3)\ \text{m}$
C. $50(\sqrt{3}+3)\ \text{m}$ **D.** $150(\sqrt{3}-1)\ \text{m}$

7. From the top of a cliff 96 m high, the angle of depression of a boat is 45°. The distance of the boat from the foot of the cliff is

A. $96\ \text{m}$ **B.** $48\sqrt{2}\ \text{m}$ **C.** $96\sqrt{2}\ \text{m}$ **D.** $48\ \text{m}$

8. Two points 132 m apart lie on opposite sides of a tower, in line with its foot. The top is seen from both at an elevation of 60°. The height of the tower is

A. $22\sqrt{3}\ \text{m}$ **B.** $132\sqrt{3}\ \text{m}$ **C.** $44\sqrt{3}\ \text{m}$ **D.** $66\sqrt{3}\ \text{m}$

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9. Two points 64 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 75° and 60°. Its height is

A. $32(2\sqrt{3}+3)\ \text{m}$ **B.** $16(\sqrt{3}+3)\ \text{m}$

C. $64(\sqrt{3}+1)\ \text{m}$ **D.** $16(\sqrt{3}-1)\ \text{m}$

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10. Two points 30 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 75° and 30°. Its height is

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

C. $15(2\sqrt{3}-3)\ \text{m}$ **D.** $10(2\sqrt{3}+3)\ \text{m}$

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11. The angle of elevation of the top of a minar is 15°. After walking 120 m towards it, it is 30°. How far is the observer now from the foot of the minar?

A. $60\sqrt{3}\ \text{m}$ **B.** $80(2\sqrt{3}-3)\ \text{m}$

C. $240(\sqrt{3}+1)\ \text{m}$ **D.** $120\sqrt{3}\ \text{m}$

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12. The angle of elevation of the top of a temple gopuram from a point on level ground is 30°. After walking 24 m towards it, the angle becomes 45°. The height of the temple gopuram is

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

C. $8(3-\sqrt{3})\ \text{m}$ **D.** $12(\sqrt{3}-1)\ \text{m}$

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13. The angle of elevation of the top of a pole is 60°. After walking 90 m towards it, it is 75°. How far is the observer now from the foot of the pole?

A. $90\sqrt{3}\ \text{m}$ **B.** $180\ \text{m}$

C. $60(3-\sqrt{3})\ \text{m}$ **D.** $45\sqrt{3}\ \text{m}$

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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, 75 m high, it is 60°. The height of the tower is

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

C. $\frac{75(\sqrt{3}+2)}{2}\ \text{m}$ **D.** $\frac{75\sqrt{3}}{2}\ \text{m}$

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

A. $\frac{75}{2}\ \text{m}$ **B.** $\frac{125}{2}\ \text{m}$

C. $\frac{25}{2}\ \text{m}$ **D.** $\frac{25\sqrt{3}}{2}\ \text{m}$

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16. The angle of depression of a point P seen from Q is 31°. The angle of elevation of Q seen from P is

A. 62° **B.** 59° **C.** 31° **D.** 149°

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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 15° and 30°. The height of the tower is

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

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

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18. A flagstaff 18 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. $6(2\sqrt{3}-3)\ \text{m}$ **B.** $3(2\sqrt{3}+3)\ \text{m}$

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

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19. A tower is 72 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. $48(2\sqrt{3}-3)\ \text{m}$ **B.** $48\sqrt{3}\ \text{m}$

C. $144\ \text{m}$ **D.** $24(2\sqrt{3}+3)\ \text{m}$

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20. From a point 27 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. $\frac{27(\sqrt{3}+1)}{2}\ \text{m}$ **B.** $27(\sqrt{3}-1)\ \text{m}$

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

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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 75°. The height of the cloud above the lake is

A. $\frac{15\sqrt{3}}{2}\ \text{m}$ **B.** $5(2\sqrt{3}-3)\ \text{m}$

C. $5(2\sqrt{3}+3)\ \text{m}$ **D.** $10\sqrt{3}\ \text{m}$

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22. From P the elevation of the top T of a tower is 45°. Walking up a path inclined at 15° towards the tower to Q, the elevation becomes 75°. In triangle PQT, $\angle TPQ$, at the starting point is

A. 60° **B.** 120° **C.** 150° **D.** 30°

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23. The elevation of the top of a tower from a point is 45°. After walking 24 m up a slope inclined at 15° towards it, the elevation is 75°. The height of the tower is

A. $4\sqrt{6}\ \text{m}$ **B.** $12\sqrt{6}\ \text{m}$

C. $12(\sqrt{3}+1)\ \text{m}$ **D.** $24\sqrt{6}\ \text{m}$

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24. In triangle ABC, D is the midpoint of AB, $\angle ACD = 15^\circ$ and $\angle DCB = 75^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

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

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25. In triangle ABC, D is the midpoint of AB, $A = 75^\circ$ and $B = 15^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

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

Key sheet

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

Solutions

1. From a point 21 m away from the foot of a temple gopuram, the angle of elevation of its top is 60°. Its height is

$\tan 60^\circ = \frac{h}{21}$
$h = 21 \tan 60^\circ = 21 \times \sqrt{3} = 21\sqrt{3}$ m

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

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2. A temple gopuram is 96 m high. From a point $32\sqrt{3}$ m from its foot, the angle of elevation of its top is

$\tan\theta = \frac{96}{32\sqrt{3}} = \sqrt{3}$
$\theta = 60^\circ$

Ans: (A) 60°

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3. A pole is 33 m high. By how much is its shadow longer when the sun's elevation is 30° than when it is 75°?

Shadow length $= h\cot(\text{elevation})$.
$33\cot 30^\circ - 33\cot 75^\circ = 33(\sqrt{3} - (2-\sqrt{3}))$
$= 66(\sqrt{3}-1)$ m

Ans: (D) $66(\sqrt{3}-1)$ m

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4. From a point 66 m away from the foot of a water tank, the angle of elevation of its top is 15°. Its height is

$\tan 15^\circ = \frac{h}{66}$
$h = 66\tan 15^\circ = 66 \times (2-\sqrt{3}) = 66(2-\sqrt{3})$ m

Ans: (C) $66(2-\sqrt{3})$ m

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5. From the top of a building 54 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°.
$x = 54\cot 60^\circ = 54 \times \frac{1}{\sqrt{3}} = 18\sqrt{3}$ m

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

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6. From the top of a bridge 75 m high, the angles of depression of two boats on the same side of it, in line with its foot are 15° and 60°. The distance between them is

distances from the foot: $75\cot 15^\circ = 75(\sqrt{3}+2),\ 75\cot 60^\circ = 25\sqrt{3}$
Same side: subtract.
distance $= 50(\sqrt{3}+3)$ m

Ans: (C) $50(\sqrt{3}+3)$ m

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7. From the top of a cliff 96 m high, the angle of depression of a boat is 45°. The distance of the boat from the foot of the cliff is

The angle of elevation of the top from the boat is also 45°.
$x = 96\cot 45^\circ = 96 \times 1 = 96$ m

Ans: (A) 96 m

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8. Two points 132 m apart lie on opposite sides of a tower, in line with its foot. The top is seen from both at an elevation of 60°. The height of the tower is

The angles are equal, so the foot is midway: each point is 66 m from it.

$h = 66\tan 60^\circ = 66\sqrt{3}\ \text{m}$

Ans: (D) $66\sqrt{3}\ \text{m}$

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9. Two points 64 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 75° and 60°. Its height is

$h = \frac{d}{\cot\alpha + \cot\beta} = \frac{64}{(2-\sqrt{3})+\frac{1}{\sqrt{3}}}$

$= 16(\sqrt{3}+3)\ \text{m}$

Ans: (B) $16(\sqrt{3}+3)\ \text{m}$

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10. Two points 30 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 75° and 30°. Its height is

$h = \frac{d}{\cot\alpha + \cot\beta} = \frac{30}{(2-\sqrt{3})+\sqrt{3}}$

$= 15\ \text{m}$

Ans: (B) $15\ \text{m}$

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11. The angle of elevation of the top of a minar is 15°. After walking 120 m towards it, it is 30°. How far is the observer now from the foot of the minar?

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

$\text{distance} = h\cot 30^\circ = 60 \times \sqrt{3} = 60\sqrt{3}\ \text{m}$

Ans: (A) $60\sqrt{3}\ \text{m}$

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12. The angle of elevation of the top of a temple gopuram from a point on level ground is 30°. After walking 24 m towards it, the angle becomes 45°. The height of the temple gopuram is

$h\cot 30^\circ - h\cot 45^\circ = 24$

$h = \frac{24}{\sqrt{3}-1} = 12(\sqrt{3}+1)\ \text{m}$

Ans: (A) $12(\sqrt{3}+1)\ \text{m}$

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13. The angle of elevation of the top of a pole is 60°. After walking 90 m towards it, it is 75°. How far is the observer now from the foot of the pole?

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

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

Ans: (D) $45\sqrt{3}\ \text{m}$

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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, 75 m high, it is 60°. The height of the tower is

$h = x\tan 75^\circ,\ h - 75 = x\tan 60^\circ$

$h = \frac{d\cot\alpha}{\cot\alpha - \cot\beta} = \frac{75\times\frac{1}{\sqrt{3}}}{\frac{1}{\sqrt{3}}-(2-\sqrt{3})}$

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

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

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

$h = x\tan 60^\circ,\ h - 25 = x\tan 30^\circ$

$h = \frac{d\cot\alpha}{\cot\alpha - \cot\beta} = \frac{25\times\sqrt{3}}{\sqrt{3} - \frac{1}{\sqrt{3}}}$

$= \frac{75}{2}\ \text{m}$

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

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16. The angle of depression of a point P seen from Q is 31°. 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 31°.

Ans: (C) 31°

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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 15° and 30°. The height of the tower is

$h = x\tan 15^\circ,\ h + 6 = x\tan 30^\circ$

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

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

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

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18. A flagstaff 18 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

$h = x\tan 15^\circ,\ h + 18 = x\tan 75^\circ$

$h = \frac{d\cot\beta}{\cot\alpha - \cot\beta} = \frac{18\times(2-\sqrt{3})}{(2+\sqrt{3}) - (2-\sqrt{3})}$

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

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

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19. A tower is 72 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

$x = 72\cot 60^\circ = 24\sqrt{3}$

$72 + l = x\tan 75^\circ = 24\sqrt{3}\times(2+\sqrt{3}) = 24(2\sqrt{3}+3)$

$l = 48\sqrt{3}\ \text{m}$

Ans: (B) $48\sqrt{3}\ \text{m}$

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20. From a point 27 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

$h = \frac{d\sin(\beta+\alpha)}{\sin(\beta-\alpha)} = \frac{27\sin 105^\circ}{\sin 45^\circ}$

$= \frac{27(\sqrt{3}+1)}{2}\ \text{m}$

Ans: (A) $\frac{27(\sqrt{3}+1)}{2}\ \text{m}$

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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 75°. The height of the cloud above the lake is

$h = \frac{d\sin(\beta+\alpha)}{\sin(\beta-\alpha)} = \frac{15\sin 90^\circ}{\sin 60^\circ}$

$= 10\sqrt{3}\ \text{m}$

Ans: (D) $10\sqrt{3}\ \text{m}$

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22. From P the elevation of the top T of a tower is 45°. Walking up a path inclined at 15° towards the tower to Q, the elevation becomes 75°. In triangle PQT, $\angle TPQ$, at the starting point is

The angle at P is $\alpha - \beta$.

$= 30^\circ$

Ans: (D) 30°

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23. The elevation of the top of a tower from a point is 45°. After walking 24 m up a slope inclined at 15° towards it, the elevation is 75°. The height of the tower is

$h = \frac{d\sin(\gamma-\beta)\sin\alpha}{\sin(\gamma-\alpha)} = \frac{24\sin 60^\circ \sin 45^\circ}{\sin 30^\circ}$

$= 12\sqrt{6}\ \text{m}$

Ans: (B) $12\sqrt{6}\ \text{m}$

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24. In triangle ABC, D is the midpoint of AB, $\angle ACD = 15^\circ$ and $\angle DCB = 75^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

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

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

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

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25. In triangle ABC, D is the midpoint of AB, $A = 75^\circ$ and $B = 15^\circ$. If $\theta = \angle CDB$, then $\cot\theta =$

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

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

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