CHAPTER 5.2

Trigonometry of Right Triangles

Multiple-Choice Old Exam Questions

35 questions • 3 topics • options A–E • two questions per page

Topic 1 | Elevation and Depression: One Right Triangle

Using a single angle of elevation or depression, or a given ratio, to find a height or a distance • Questions 1–12

Q **1**

A man stands 123 feet away from the base of a flagpole. He measures the angle of elevation to the top of the flagpole as $30°$. If his eyes are 5 feet above the ground, then the height of the flagpole is

A) $5 + 41\sqrt{3}$ ft

B) $5 + 123\sqrt{3}$ ft

C) $46\sqrt{3}$ ft

D) $36\sqrt{3}$ ft

E) $\frac{123}{2}$ ft

Q **2**

If a student stands at the top of a cliff and looks down at a $60°$ angle of depression at the base of a tree that is 123 m away from the bottom of the cliff, then the height of the cliff is

A) $123\sqrt{3}$

B) $41\sqrt{3}$

C) 123

D) 41

E) $123 + 41\sqrt{3}$

Q
3

If the angle of elevation from a point 18 feet from the base of a tree to the top of the tree is θ and $\sin\theta = \frac{4}{5}$, then the height of the tree is

A) 24 feet

B) 20 feet

C) 13.5 feet

D) 21 feet

E) 27 feet

Q
4

If the angle of depression from the top of a television tower to a point on the ground 36 meters from the bottom of the tower is $30°$, then the height of the tower is

A) $12\sqrt{3}$ meters

B) $36\sqrt{3}$ meters

C) $36\sqrt{2}$ meters

D) $18\sqrt{2}$ meters

E) 18 meters

Q
5

The angle of depression from the top of a building to a point on the ground is $60°$. How far is the point from the bottom of the building if the building is 300 meters high?

A) $100\sqrt{3}$ m

B) $300\sqrt{3}$ m

C) $600\sqrt{3}$ m

D) $400\sqrt{3}$ m

E) 600 m

Q
6

A 20-ft ladder leans against a building so that the angle between the ground and the ladder is θ. If $\cot\theta = \frac{4}{3}$, then the height at which the ladder reaches on the building is

A) 12 ft

B) 10 ft

C) 5 ft

D) 30 ft

E) 8 ft

Q
7

A 20-ft ladder leans against a building so that the angle between the ground and the ladder is α. If $\tan\alpha = \frac{1}{2}$, how high does the top of the ladder reach on the building?

A) $4\sqrt{5}$

B) 10

C) 4

D) $8\sqrt{5}$

E) 8

Q
8

A helicopter is flying 450 feet above the ground level. If the angle of depression from the helicopter to the base of a flagpole is θ, where $\sin\theta = \frac{5}{13}$, then the horizontal distance the helicopter must fly to be directly over the flagpole is

A) 1080 feet

B) 187.5 feet

C) 1170 feet

D) 173.1 feet

E) 487.5 feet

Q
9

If from the top of a 60-meter tower an observer finds that the angle of depression to the bottom of a building opposite to the tower is α, where $\sec\alpha = 3$, then the distance in meters between the tower and the building is

A) $15\sqrt{2}$

B) $2\sqrt{2}$

C) $30\sqrt{2}$

D) $60\sqrt{2}$

E) $120\sqrt{2}$

Q
10

The angle of depression from the top of a building to a point on the ground is $30°$. How far is the point from the bottom of the building if the building is 252 meters high?

A) $252\sqrt{3}$ m

B) 504 m

C) $\frac{504\sqrt{3}}{3}$ m

D) 126 m

E) $126\sqrt{3}$ m

Q
11

If the angle of elevation from a point 12 feet from the base of a building to the top of the building is θ and $\sec\theta = \frac{5}{4}$, then the height of the building is

A) 9 feet

B) 16 feet

C) $\frac{36}{5}$ feet

D) 8 feet

E) $\frac{48}{5}$ feet

Q
12

From the top of a tower, a man finds that the angle of depression to a car on the ground is $30°$. If the car is 60 meters away from the tower, then the height of the tower in meters is

A) 80

B) $80\sqrt{3}$

C) 20

D) $20\sqrt{2}$

E) $20\sqrt{3}$

Topic 2 | Elevation and Depression: Two Angles or Two Positions

Problems with two angles of elevation or depression, or an object moved from one position to another • Questions 13–24

Q **13**

A 10-meter ladder is placed against a wall and forms an angle of $45°$ with the ground. If the foot of the ladder is moved away from the wall, the angle changes to $30°$. The exact distance moved by the top of the ladder on the wall is

A) $5\sqrt{3}+1$

B) $5\left(\sqrt{2}-1\right)$

C) 5

D) $3\sqrt{5}-1$

E) $5\sqrt{2}$

Q **14**

From a point on the ground $100\sqrt{3}$ ft from the base of a building, an observer finds that the angle of elevation to the top of the building is $30°$ and that the angle of elevation to the top of a flagpole on top of the building is a, with $\tan a = \frac{21}{20\sqrt{3}}$. Find the length of the flagpole.

A) 5 feet

B) 4 feet

C) 6 feet

D) 3 feet

E) 7 feet

Q
15

From a window 20 feet above the street, the angle of elevation to the top of the building across the street is $60°$, and the angle of depression to the base of the building is $20°$. The height of the building across the street is:

A) $20\left(1+\sqrt{3}\cot 20°\right)$

B) $20\sqrt{3}\tan 20°$

C) $20\left(1+\sqrt{3}\tan 20°\right)$

D) $20\sqrt{3}\cot 20°$

E) $20\sqrt{3}$

Q
16

The angle of depression from the top of a building to the bottom of a tower is $30°$ and the angle of elevation from the top of the building to the top of the tower is $60°$. If the distance between the building and the tower is 60 meters, then the height of the tower in meters is:

A) $80\sqrt{3}$

B) $60\left(\sqrt{3}+1\right)$

C) $30\left(\sqrt{3}-1\right)$

D) $45\sqrt{3}$

E) 100

Q
17

A 10-meter ladder is placed against a wall and forms an angle of $30°$ with the ground. If the foot of the ladder is moved toward the wall, the angle changes to $60°$. The exact distance moved by the top of the ladder on the wall is

A) $5(\sqrt{3}-1)$

B) $5(\sqrt{3}-\sqrt{2})$

C) $5(\sqrt{2}-1)$

D) $5\sqrt{2}$

E) $5\sqrt{3}$

Q
18

Mohammad wants to find the height of a tree. From a point on the ground he finds that the angle of elevation to the top of the tree is $60°$. He then moves back 50 meters, and from this second point the angle of elevation to the top of the tree is $45°$. The height of the tree is

A) $75+25\sqrt{3}$

B) $25+25\sqrt{3}$

C) $50+25\sqrt{3}$

D) $50-25\sqrt{3}$

E) $75-25\sqrt{3}$

Q
19

Measurements taken 40 feet from the base of a flagpole show the angle of elevation to the top of the flagpole to be $60°$ and the angle of elevation to the bottom of the flag to be $45°$. Determine the vertical width of the flag.

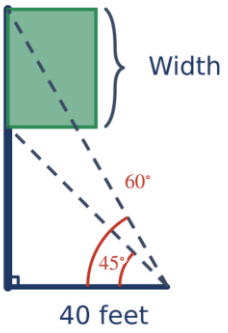
A) $40(\sqrt{3}-1)$ feet

B) $6\sqrt{3}$ feet

C) $\frac{20\sqrt{3}}{3}$ feet

D) 12 feet

E) $\frac{40\sqrt{3}}{3}$ feet



Q
20

From the adjacent figure, $x + t =$

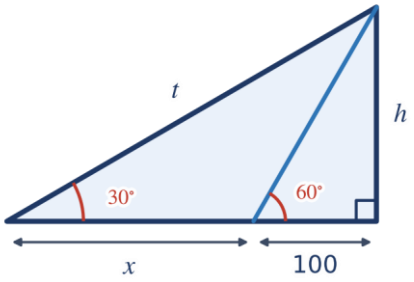
A) $200(\sqrt{3}+1)$

B) 200

C) $100\sqrt{3}$

D) $100(\sqrt{3}+1)$

E) $100(\sqrt{3}-1)$



Q
21

In the adjacent figure, $h =$

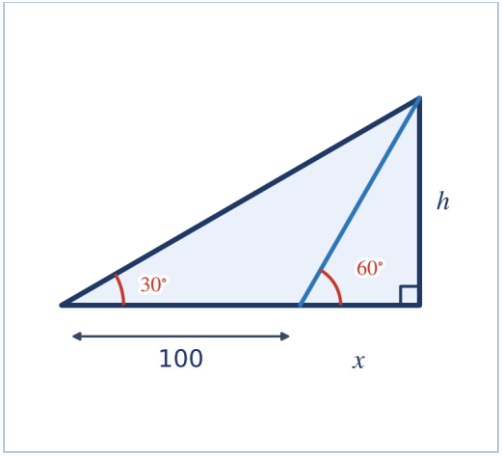
A) 50

B) $50\sqrt{3}$

C) $100\left(\sqrt{3}-1\right)$

D) $100\sqrt{3}$

E) $\frac{50\sqrt{3}}{3}$



Q
22

If from the top of a tower $120\sqrt{3}$ feet high the angles of depression to the top and bottom of a building opposite to the tower are observed to be $30°$ and $60°$ respectively, then the height of the building is

A) $80\sqrt{3}$ ft

B) $60\sqrt{3}$ ft

C) $120\sqrt{3}$ ft

D) $240\sqrt{3}$ ft

E) $40\sqrt{3}$ ft

Q
23

If the angle of elevation from a point 60 meters from the base of a tower to the top of the tower is θ, where $\sec\theta = \frac{2\sqrt{3}}{3}$, how high must the tower be raised so that the angle of elevation from the same point changes to $60°$?

A) $40\sqrt{3}$

B) $20\sqrt{3}$

C) $60\sqrt{3}$

D) $80(\sqrt{3}-1)$

E) $20(\sqrt{3}-1)$

Q
24

In the adjacent figure, if the length of the line $UV = 8$, then $h =$

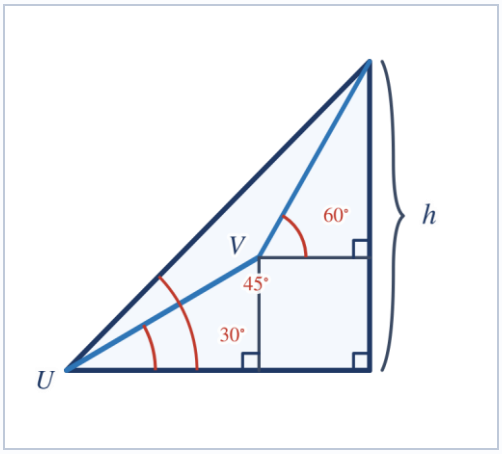
A) $4(\sqrt{3}+1)$

B) $8(\sqrt{3}+1)$

C) $8(\sqrt{3}+2)$

D) $4(\sqrt{3}+2)$

E) $2(\sqrt{3}+2)$



Topic 3 | Right Triangles in Figures and Trigonometric Ratios

Finding lengths and angles in labelled right-triangle figures, and ratios of an acute angle from a given ratio • Questions 25–35

Q **25**

In the adjacent figure, the value of $\frac{x \cdot y}{\sqrt{3}}$ is

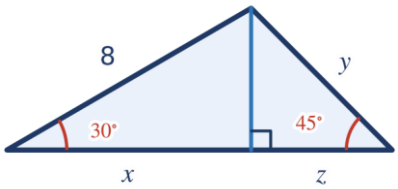
A) $16\sqrt{2}$

B) 32

C) 36

D) 24

E) $24\sqrt{3}$



Q **26**

In the adjacent figure, $p + q =$

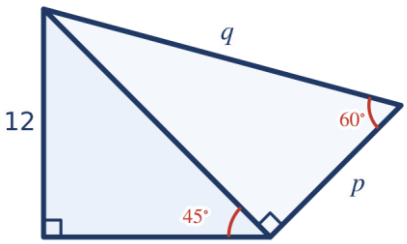
A) $12\sqrt{6}$

B) $4\sqrt{6} + 3\sqrt{2}$

C) $18\sqrt{6}$

D) $6\sqrt{2} + 4\sqrt{3}$

E) $15\sqrt{2}$



Q
27

In the adjacent figure, $x =$

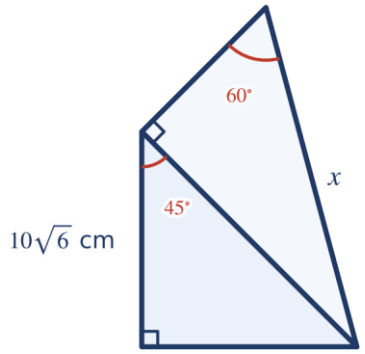
A) 40 cm

B) $40\sqrt{3}$ cm

C) $20\sqrt{3}$ cm

D) 20 cm

E) $20\sqrt{6}$ cm



Q
28

In the following figure, if $\tan\alpha = \frac{2}{3}$, then $\theta =$

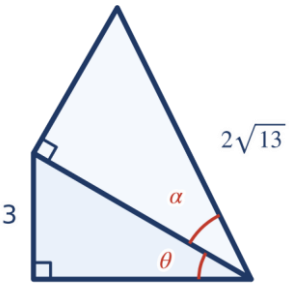
A) $30°$

B) $45°$

C) $15°$

D) $75°$

E) $60°$



Q
29

In the figure below, if $\sin\theta = \frac{4}{5}$, then $S + t =$

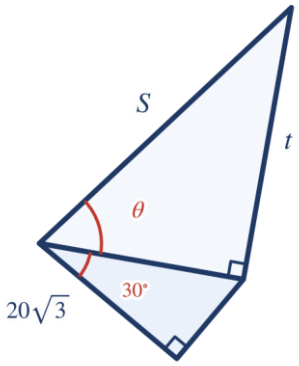
A) 120

B) $\frac{100\sqrt{3}}{3}$

C) $80\sqrt{3}$

D) 100

E) $\frac{80\sqrt{3}}{3}$



Q
30

The angle of elevation from a point P that is 6 meters from the base of a building to the top of the building is α. If $\sin\alpha = \frac{4}{5}$, then the height of the building is

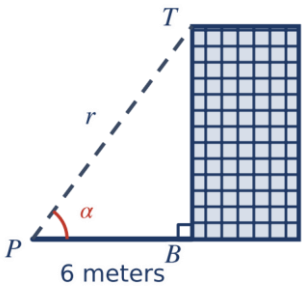
A) 8 meters

B) 3 meters

C) 16 meters

D) 9 meters

E) 64 meters



Q
31

The value of $2a + \frac{b}{\sqrt{3}} - \sqrt{3}c$ in the adjacent figure is

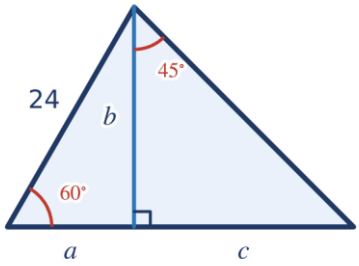
A) 0

B) $12\sqrt{3}$

C) $24\sqrt{3}$

D) $-12\sqrt{3}$

E) 12



Q
32

In the adjacent figure, if $\alpha = \frac{\pi}{3}$, then the value of x is

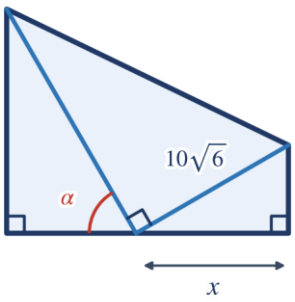
A) $15\sqrt{2}$

B) $5\sqrt{6}$

C) $10\sqrt{3}$

D) $5\sqrt{3}$

E) $10\sqrt{6}$



Q
33

In the adjacent figure, $x =$

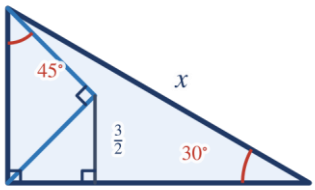
A) $\frac{9}{2}$

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

C) $\frac{5\sqrt{2}}{2}$

D) $\frac{9\sqrt{2}}{2}$

E) 6



Q
34

If $\tan\theta = -\frac{4}{5}$ and $\sin\theta < 0$, then $\sec\theta - \csc\theta =$

A) $\frac{9\sqrt{41}}{20}$

B) $-\frac{9\sqrt{41}}{20}$

C) $\frac{\sqrt{41}}{20}$

D) $-\frac{\sqrt{41}}{20}$

E) $\frac{9\sqrt{41}}{41}$

Q
35

Let θ be an acute angle satisfying the equation $3\sin\theta = 4\cos\theta$. Then $\csc\theta - \sec\theta =$

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

B) $-\frac{1}{5}$

C) $\frac{5}{12}$

D) $\frac{1}{5}$

E) $-\frac{5}{12}$

Answer Key

"Original" shows the question number in the source worksheet.

Q	Original	Ans.	Value
1	1	**A**	$5 + 41\sqrt{3}$ ft
2	2	**A**	$123\sqrt{3}$
3	4	**A**	24 feet
4	5	**A**	$12\sqrt{3}$ meters
5	6	**A**	$100\sqrt{3}$ m
6	7	**A**	12 ft
7	10	**A**	$4\sqrt{5}$
8	14	**A**	1080 feet
9	15	**A**	$15\sqrt{2}$
10	16	**A**	$252\sqrt{3}$ m
11	17	**A**	9 feet
12	19	**E**	$20\sqrt{3}$
13	3	**B**	$5(\sqrt{2} - 1)$
14	8	**A**	5 feet
15	9	**A**	$20(1 + \sqrt{3}\cot 20°)$
16	11	**A**	$80\sqrt{3}$
17	12	**A**	$5(\sqrt{3} - 1)$
18	13	**A**	$75 + 25\sqrt{3}$
19	18	**A**	$40(\sqrt{3} - 1)$ feet
20	24	**A**	$200(\sqrt{3} + 1)$
21	27	**B**	$50\sqrt{3}$
22	31	**A**	$80\sqrt{3}$ ft
23	32	**A**	$40\sqrt{3}$
24	34	**A**	$4(\sqrt{3} + 1)$
25	20	**A**	$16\sqrt{2}$
26	21	**A**	$12\sqrt{6}$
27	22	**A**	40 cm
28	23	**A**	$30°$
29	25	**A**	120
30	26	**A**	8 meters
31	28	**A**	0
32	33	**A**	$15\sqrt{2}$
33	35	**E**	6
34	29	**A**	$\frac{9\sqrt{41}}{20}$
35	30	**E**	$-\frac{5}{12}$