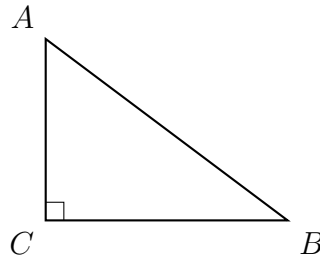


Basic Ratio Definition

- In $\triangle ABC$ shown below, $\angle C$ is a right angle. If $\cos B = \frac{5}{13}$, what is the value of $\sin A$?



1. $\frac{5}{13}$
2. $\frac{12}{13}$
3. $\frac{13}{5}$
4. $\frac{12}{5}$

Correct Answer: A.

In $\triangle ABC$ with right angle C , $\sin A = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{BC}{AB}$. Also, $\cos B = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{BC}{AB}$.
Therefore, $\sin A = \cos B$. Since $\cos B = \frac{5}{13}$, then $\sin A = \frac{5}{13}$.

Complementary Angles

- In a right triangle, if $\sin(x^\circ) = \cos(y^\circ)$, which of the following must be true?

1. $x + y = 180$

2. $x = y$

3. $x + y = 90$

4. $x - y = 90$

Correct Answer: C.

In any right triangle, the two acute angles are complementary ($x + y = 90^\circ$). The cofunction identity states that $\sin(x) = \cos(90 - x)$. Therefore, if $\sin x = \cos y$, then y must be $90 - x$, meaning $x + y = 90$.

Complementary identities with algebra

- If $\sin(3\theta + 10)^\circ = \cos(2\theta + 15)^\circ$, where all angles are acute, what is the value of θ ?

1. 5

2. 13

3. 15

4. 25

Correct Answer: B.

Using the identity $\sin(A) = \cos(B)$ when $A + B = 90$: $(3\theta + 10) + (2\theta + 15) = 90$
 $5\theta + 25 = 90$
 $5\theta = 65 \implies \theta = 13$.

Solving for a side

• A ladder 12 feet long leans against a vertical wall, forming a 60° angle with the ground. How high up the wall, in feet, does the ladder reach?

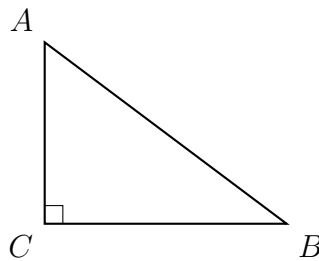
1. 6
2. $6\sqrt{2}$
3. $6\sqrt{3}$
4. $12\sqrt{3}$

Correct Answer: C.

Let h be the height. Using $\sin(60^\circ) = \frac{\text{opposite}}{\text{hypotenuse}}$, we have $\sin(60^\circ) = \frac{h}{12}$. Since $\sin(60^\circ) = \frac{\sqrt{3}}{2}$, then $\frac{\sqrt{3}}{2} = \frac{h}{12} \implies h = 12 \cdot \frac{\sqrt{3}}{2} = 6\sqrt{3}$.

Solving for side with variables

• In $\triangle ABC$, $\angle C = 90^\circ$ and $AC = 10$. If $\tan A = \frac{w}{10}$, what is the length of side BC in terms of w ?



1. w
2. $10w$
3. $\frac{w}{100}$
4. $\sqrt{w^2 + 100}$

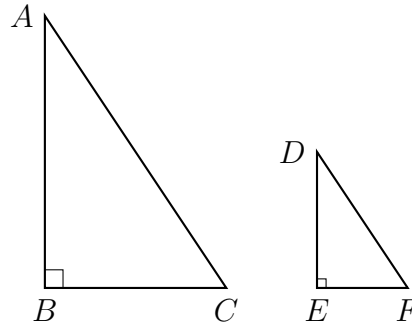
Correct Answer: A.

In $\triangle ABC$ with right angle C , $\tan A = \frac{\text{opposite}}{\text{adjacent}} = \frac{BC}{AC}$. We are given $\tan A = \frac{w}{10}$ and $AC = 10$.

Thus, $\frac{BC}{10} = \frac{w}{10}$, which means $BC = w$.

Similarity and Trig

- In the figure below, $\triangle ABC \sim \triangle DEF$. If $\tan A = 2.4$, what is the value of $\tan D$?



1. 0.42
2. 1.2
3. 2.4
4. 4.8

Correct Answer: C.

Trigonometric ratios depend only on the measure of the angles. Since the triangles are similar, $\angle A = \angle D$. Therefore, $\tan A = \tan D = 2.4$.

Algebraic Trig Relationship

- In a right triangle, one angle measures x° , where $\sin x^\circ = \frac{4}{5}$. What is the value of $\cos(90^\circ - x^\circ)$?
1. $\frac{3}{5}$
 2. $\frac{4}{5}$
 3. $\frac{3}{4}$
 4. $\frac{5}{4}$

Correct Answer: B.

This uses the identity $\cos(90^\circ - x) = \sin x$. Given $\sin x = \frac{4}{5}$, it follows directly that $\cos(90^\circ - x) = \frac{4}{5}$.

Finding Tan from Sin

- In right triangle PQR , $\angle Q = 90^\circ$ and $\sin P = \frac{1}{2}$. What is the value of $\tan R$?

1. $\frac{1}{\sqrt{3}}$
2. $\sqrt{3}$
3. 1
4. 2

Correct Answer: B.

If $\sin P = \frac{1}{2}$ in a right triangle, $\angle P = 30^\circ$. Since $\angle Q = 90^\circ$, then $\angle R = 180 - 90 - 30 = 60^\circ$.
 $\tan R = \tan(60^\circ) = \sqrt{3}$.

Coordinate Geometry / Unit Circle context

- In the xy -plane, the terminal side of an angle θ in standard position passes through the point $(3, 4)$. What is the value of $\cos \theta$?

1. $\frac{3}{4}$
2. $\frac{4}{5}$
3. $\frac{3}{5}$
4. $\frac{5}{3}$

Correct Answer: C.

The distance from the origin (hypotenuse) is $r = \sqrt{3^2 + 4^2} = 5$. Since $\cos \theta = \frac{x}{r}$, then $\cos \theta = \frac{3}{5}$.

Problems adapted from the College Board SAT Question Bank and released SAT practice tests.