

شكراً لتحميلك هذا الملف من موقع المناهج الإماراتية



شرح الدرس الثاني Angles General of Functions Trigonometric من الوحدة التاسعة

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التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم



روابط مواد الصف الحادي عشر المتقدم على تلغرام

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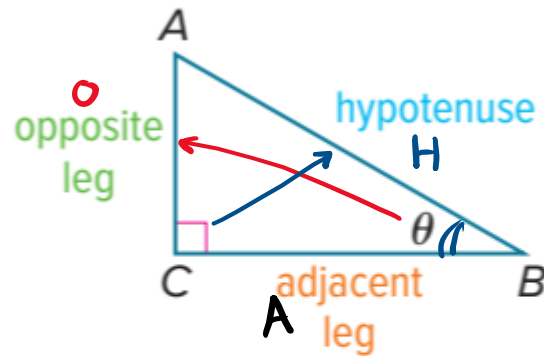
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Key Concepts • Trigonometric Functions in Right Triangle

If θ is the measure of an acute angle of a right triangle, then the trigonometric functions involving the opposite side *opp*, the adjacent side *adj*, and the hypotenuse *hyp* are defined as follows.



SOH CAH TOA

sine: $\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{O}{H}$

cosecant: $\csc \theta = \frac{\text{hyp}}{\text{opp}}$

cosine: $\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{A}{H}$

secant: $\sec \theta = \frac{\text{hyp}}{\text{adj}}$

tangent: $\tan \theta = \frac{\text{opp}}{\text{adj}} = \frac{O}{A}$

cotangent: $\cot \theta = \frac{\text{adj}}{\text{opp}}$

Ex1: Find the exact values of the six trigonometric functions for angle θ .

Using Pythagorean theorem:

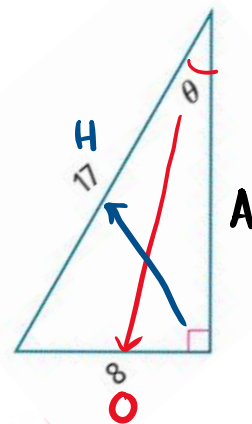
$$O^2 + A^2 = H^2$$

$$8^2 + A^2 = 17^2$$

$$A^2 = 17^2 - 8^2$$

$$A = \sqrt{17^2 - 8^2} = 15$$

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$$\sin \theta = \frac{O}{H} = \frac{8}{17}$$

$$\csc \theta = \frac{17}{8}$$

$$\cos \theta = \frac{A}{H} = \frac{15}{17}$$



$$\sec \theta = \frac{17}{15}$$

$$\tan \theta = \frac{O}{A} = \frac{8}{15}$$

$$\cot \theta = \frac{15}{8}$$

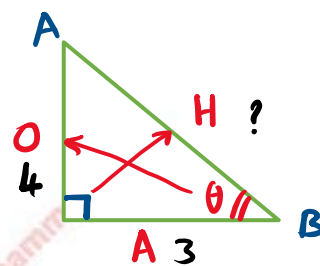
Ex2: In a right triangle, $\angle A$ and $\angle B$ are acute. Find the values of the five remaining trigonometric functions. **SOH CAH TOA**

$$\tan \theta = \frac{4 \rightarrow O}{3 \rightarrow A}$$

$$O^2 + A^2 = H^2$$

$$4^2 + 3^2 = H^2$$

$$H = \sqrt{4^2 + 3^2} = 5$$



$$\sin \theta = \frac{O}{H} = \frac{4}{5}$$

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$$\csc \theta = \frac{5}{4}$$

$$\cos \theta = \frac{A}{H} = \frac{3}{5}$$

\Rightarrow

$$\sec \theta = \frac{5}{3}$$

$$\tan \theta = \frac{O}{A} = \frac{4}{3}$$

$$\cot \theta = \frac{3}{4}$$

Key Concept • Trigonometric Functions of General Angles

Let θ be an angle in standard position, and let $P(x, y)$ be a point on its terminal side. By the Pythagorean Theorem, $r = \sqrt{x^2 + y^2}$, where r is the distance from the origin to point P along the terminal side. Using the coordinates of point P and r , the six trigonometric functions of θ are defined below.

$$\sin \theta = \frac{y}{r}$$

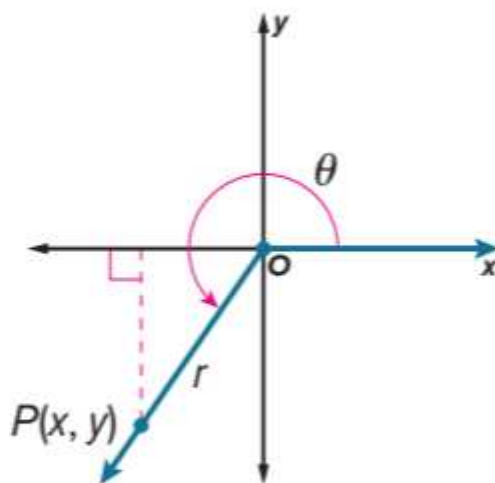
$$\cos \theta = \frac{x}{r}$$

$$\tan \theta = \frac{y}{x}, x \neq 0$$

$$\csc \theta = \frac{r}{y}, y \neq 0$$

$$\sec \theta = \frac{r}{x}, x \neq 0$$

$$\cot \theta = \frac{x}{y}, y \neq 0$$



Rule:

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

Ex3: The terminal side of θ in standard position contains $(-8,6)$ Find the exact values of the six trigonometric functions of θ .

$$r = \sqrt{x^2 + y^2} = \sqrt{(-8)^2 + (6)^2} = 10$$

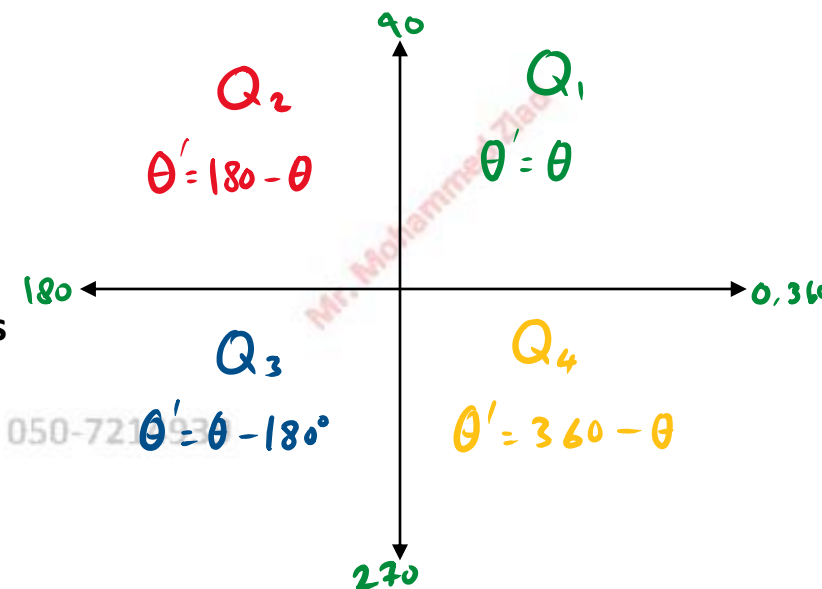
$$\sin \theta = \frac{y}{r} = \frac{6}{10} = \frac{3}{5} \quad \Rightarrow \quad \csc \theta = \frac{5}{3}$$

$$\cos \theta = \frac{x}{r} = \frac{-8}{10} = \frac{-4}{5} \quad \Rightarrow \quad \sec \theta = \frac{-5}{4}$$

$$\tan \theta = \frac{y}{x} = \frac{6}{-8} = \frac{-3}{4} \quad \Rightarrow \quad \cot \theta = \frac{-4}{3}$$

Reference angle (θ')

For a non-quadrantal angle θ in standard position, its reference angle is the acute angle θ' formed by the terminal side and the x-axis



Ex4: find the measure of each reference angle

a) 260°

↓ in Q_3

$$\theta' = 260 - 180 = 80^\circ$$

b) -210°

↓ not between 0 and 360

⇒ Find coterminal angle

$$-210 + 360 = 150 \text{ in } Q_2$$

$$\theta' = 180 - 150 = 30^\circ$$

c) 500°

Find coterminal $500 - 360 = 140^\circ$ in Q_2

$$\theta' = 180 - 140 = 40^\circ$$

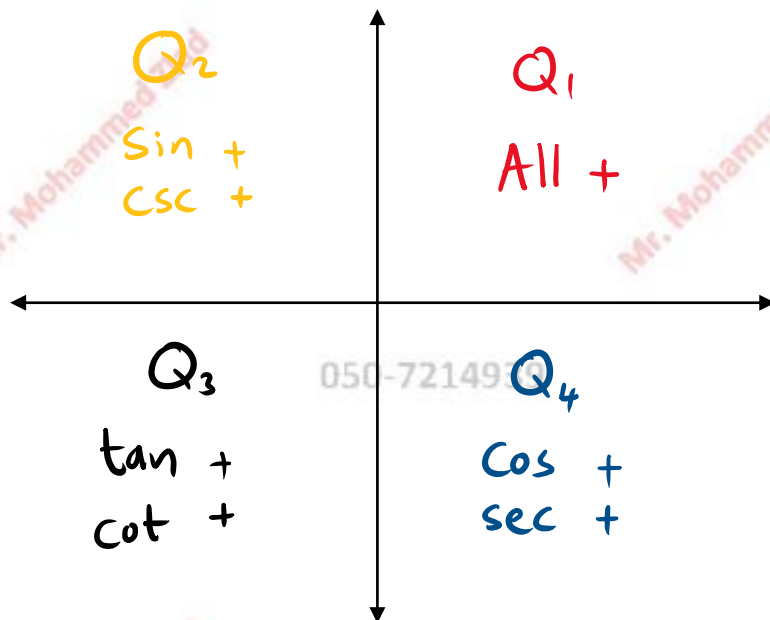
d) $\frac{5\pi}{3}$

Convert to degree : $\frac{5\pi}{3} \times \frac{180}{\pi} = 300^\circ$ in Q_4

$$\theta' = 360 - 300 = 60^\circ$$

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Exact value of a trigonometric function



All Students take care

Ex5: find the exact value of

a) $\sin(210^\circ)$

\downarrow in $Q_3 \Rightarrow \theta' = 210 - 180 = 30^\circ$
sin is -ve

$$\sin(210) = -\sin 30 = -\frac{1}{2}$$

b) $\tan(330^\circ)$

We can use a Calc

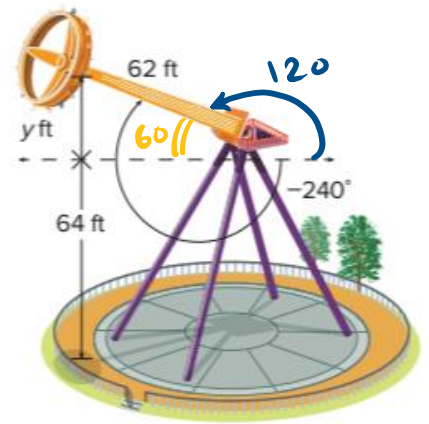
$$\frac{-\sqrt{3}}{3}$$

c) $\sec(600^\circ)$

$$= \frac{1}{\cos(600)} = -2$$

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AMUSEMENT RIDES An amusement park thrill ride swings its riders back and forth on a pendulum that spins. Suppose the swing arm of the ride is 62 feet in length, and the axis from which the arm swings is about 64 feet above the ground. What is the height of the riders above the ground at the peak of the arc? Round to the nearest foot if necessary.



$$\sin 60 = \frac{O}{H}$$

$$\frac{\sin 60}{1} = \frac{y}{62}$$

$$y = 62 \times \sin 60$$

$$y \approx 53.69 \text{ ft}$$

$$\begin{aligned} \text{Height of the raider} &= 64 + 53.69 \\ &= 117.69 \text{ ft} \end{aligned}$$

