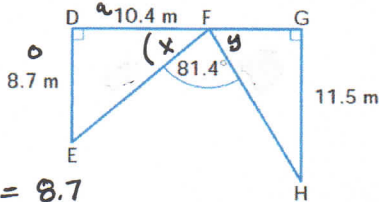


HOMEWORK TAKE-UP (Pg. 273)

7. Find FH, to the nearest tenth of a metre.



$$\tan x = \frac{8.7}{10.4}$$

$$x = \tan^{-1}\left(\frac{8.7}{10.4}\right)$$

$$x = 40^\circ$$

$$4y = 180^\circ - 40^\circ - 81.4^\circ$$

$$4y = 58.6^\circ$$

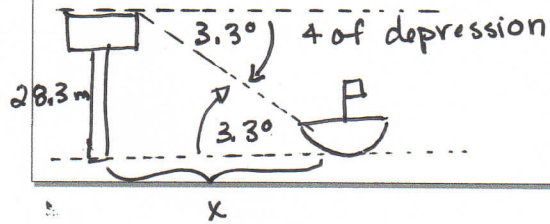
$$\sin 58.6^\circ = \frac{11.5}{FH}$$

$$FH = 13.5 \text{ m}$$

$\therefore FH$ is 13.5 m.

HOMEWORK TAKE-UP (Pg. 274)

16. **Application** From 1857 to 1860, Great Britain financed the construction of ten lighthouses in British North America. They were built because obsolete navigational aids were hindering economic growth. The lighthouses are called the *Imperial Lights*. Four of them were built along the approaches to the Saint Lawrence, and six were built on the eastern shore of Lake Huron. The Point Clark lighthouse, on Lake Huron, is 28.3 m tall. From the top of the lighthouse, the angle of depression of a ship is 3.3° . How far is the ship from the lighthouse, to the nearest metre?



$$\tan 3.3^\circ = \frac{28.3}{x}$$

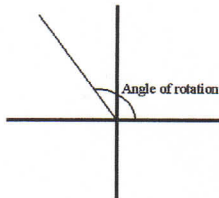
$$x = 49 \text{ m}$$

\therefore ship is approx. 49 m away.

UNIT #5: Trigonometry
Sine, Cosine, Tangent in QI and QII

Learning Goal:

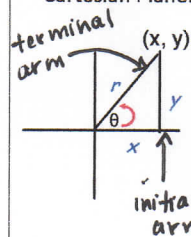
I will learn how to find the angle in QI or QII when provided a given point on the terminal arm.



Lesson: Sine, Cosine, Tangent for Angles $0^\circ \leq \theta \leq 180^\circ$

So far, we have defined trig ratios in terms of the sides of a right triangle. (SOH CAH TOA)

We can also relate trig ratios in term of the **angle of rotation**, θ , and a point (x, y) on the terminal arm of the Cartesian Plane.



Terminal Arm in Standard Position

- θ is the angle of rotation counterclockwise for positive angles
- vertex of the angle is at the origin $(0,0)$
- draw a line from the end of the terminal arm to the horizontal axis

The trig ratios can be defined as:

$$\sin \theta = \frac{y}{r} \qquad \cos \theta = \frac{x}{r} \qquad \tan \theta = \frac{y}{x}$$

In QI, the trig ratios are **all positive** since x , y , and r are positive.

Sine, Cosine, Tangent, Q1 and Q2 (Lesson).notebook

Example 1: Terminal Arms in Quadrant I (Angles less than 90°)
 P(3, 4) lies on the terminal arm in standard position. Find $\sin\theta$, $\cos\theta$, $\tan\theta$. Sketch a diagram.

$\sin\theta = \frac{4}{5} = 0.8$
 $\cos\theta = \frac{3}{5} = 0.6$
 $\tan\theta = \frac{4}{3} = 1.33$

$r^2 = 4^2 + 3^2$
 $r^2 = 16 + 9$
 $r = 5$

* All ratios are positive

$r = 5$ in Q1.

Example 2: Terminal Arms in Quadrant II (Angles Greater Than 90°)
 P(-3, 4) lies on the terminal arm. Find $\sin\theta$, $\cos\theta$, $\tan\theta$.

$\sin\theta = \frac{4}{5} = 0.8$
 $\cos\theta = \frac{-3}{5} = -0.6$
 $\tan\theta = \frac{4}{-3} = -1.33$

$r^2 = 4^2 + (-3)^2$
 $r^2 = 16 + 9$
 $r = 5$

* \sin is positive, \cos and \tan ratios are negative.

ratios are negative.

* CAST RULE *
 SLIDE

Example 3 — acute

a) Find $\sin 62^\circ = 0.8829$

b) Find $\sin 118^\circ = 0.8829$
 — obtuse
 ↳ called supplementary obtuse angle.

Example 4
 If $\sin A = 0.4226$, find angle A (two answers).

$\angle A = \sin^{-1}(0.4226)$
 $= 25^\circ$
 $\angle A = 180^\circ - 25^\circ$
 $= 155^\circ$

(supplementary obtuse \angle)

Example 5: P(-8, 6) is on the terminal arm of angle A. Find angle A.

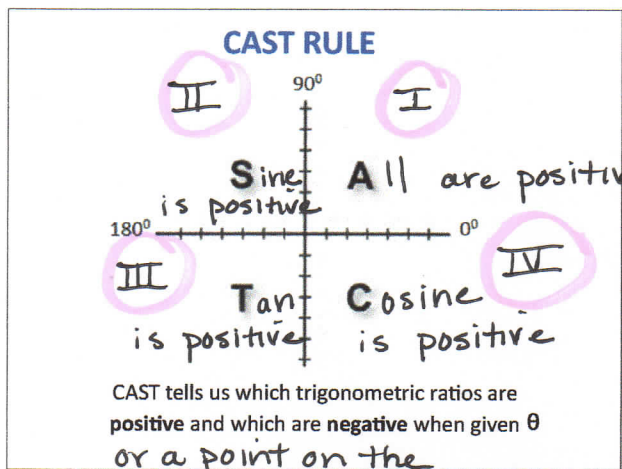
$\tan x = \frac{6}{-8}$

$\angle x = \tan^{-1}\left(\frac{6}{-8}\right)$

$\angle x = 37^\circ$

$\angle A = 180^\circ - \angle x$

$= 180^\circ - 37^\circ = 143^\circ$



terminal arm.

- Examples: Evaluate to 4 decimals
- II a) $\cos 132^\circ = -0.6691$ I e) $\sin 78^\circ = 0.9781$
 - II b) $\sin 147^\circ = 0.5446$ I f) $\tan 32^\circ = 0.6249$
 - II c) $\tan 178^\circ = -0.0349$
 - I d) $\cos 18^\circ = 0.9510$

SUMMARY

Properties of supplementary angles
Given an acute angle, A, and its supplementary obtuse angle $(180^\circ - A)$:

- $\sin A = \sin (180^\circ - A)$
- $\cos A = -\cos (180^\circ - A)$
- $\tan A = -\tan (180^\circ - A)$

Examples :

a) $\sin 50^\circ = 0.7660$
 $\sin (180^\circ - 50^\circ) = \sin 130^\circ = 0.7660$ QI or II

b) $\cos 50^\circ = 0.6428$
 $\cos (180^\circ - 50^\circ) = \cos 130^\circ = -0.6428$
 (neg. QII)

c) $\tan 50^\circ = 1.1918$
 $\tan (180^\circ - 50^\circ) = \tan 130^\circ = -1.1918$
 (neg. QII)

UNIT 5: Trigonometry
Sine, Cosine, Tangent in QI and QII

Learning Goal:
 I will learn how to find the angle in QI or QII when provided a given point on the terminal arm.

Success Criteria:
 To be successful, I must be able to...

- describe how $\sin \theta$, $\cos \theta$, and $\tan \theta$ changes as the value of θ increases from 0° to 180°
- Find the trig ratio or angle measure of θ when given a point on the terminal arm

Practice Work
 p. 281 #1 - 4, 6, 10