U5D2_T Sine and Cosine Law

Wednesday, April 17, 2019 2:09 PM

U5D2_T
Sine and ...

U5D2 MCR3UI Warm Up: Skill Reflection #1

MCR3UI Unit 5 Skill Reflection # 1 RECORD ALL ANSWERS ON SCRAP PAPER.

Part A: Multiple Choice. Record answers and all work on separate paper.

1. In triangle DEF, d = 8, e = 15, f = 17, F = 90°. Determine sin D . Draw diagram on your answer paper.

a. $\frac{8}{15}$ b. $\frac{15}{17}$ c. $\frac{8}{17}$ d. None of the above.

2. Marc is building a wheelchair ramp for the front door of his house. The ramp needs to have a vertical rise of 75 inches over a horizontal distance of 120 inches. At what angle of elevation should he build the ramp to the nearest degree? Show all work on your answer paper.

a. 39° c. 51°

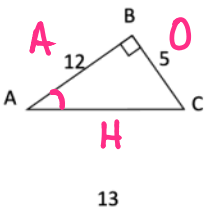
b. 58° d. 32°

Part B: Short Answer. Answer all questions on your answer paper

3. Given △ABC, state the 6 trig ratios for ∠A. Leave your answers in fraction form.

sin A = $\frac{5}{13}$ cos A = $\frac{12}{13}$ tan A = $\frac{5}{12}$

csc A = $\frac{13}{5}$ cot A = $\frac{12}{5}$ sec A = $\frac{13}{12}$



Part C: Full Solution: Draw a diagram and show your work on separate paper.

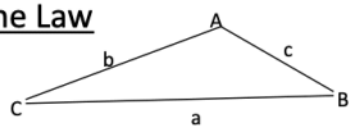
[6] 4. When Beth is sitting in her car in the parking lot at Waterloo-Oxford, the angle of elevation to the top of the cafeteria is 40°. Beth then drives ***further away*** and the angle of elevation to the top of the cafeteria is 25°. If the height of the cafeteria is 17.6 m and her eyes are 1.2m above the ground, determine how far Beth drove to the nearest tenth.

U5D2 MCR3UI

Sine Law and Cosine Law (For Oblique Triangles)

If you do not have a Right-Angle triangle (if the triangle is oblique), you must either use the Sine Law or the Cosine Law to solve the triangle.

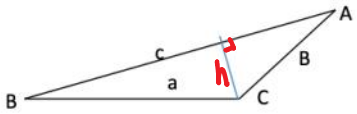
Sine Law



$$\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC} \quad \text{OR} \quad \frac{sinA}{a} = \frac{sinB}{b} = \frac{sinC}{c}$$

Note: You need 1 full ratio and 1 other piece of information to use the Sine Law.

Remember: side labels and corresponding angle labels stay together



Let's develop the Sine Law for the following triangle: (pg. 284)

Let's say that the only knowledge we have is for SOH...we need a 90 degree angle.
You don't need to write out the proof – it is in your textbook.

Example 1:

In $\Delta PQR, P = 105°, p = 26cm, and\ r = 15cm$. Solve the triangle.

complete pair so we can use Sine law.

$\frac{\sin R}{15} = \frac{\sin 105°}{26}$

$\sin R = 15 \times \frac{\sin 105°}{26}$

$R = \sin^{-1}(0.55726)$

$R = 33.86689$

$R \doteq 34°$

$\angle Q = 180° - 105° - 34°$

$\angle Q = 41°$

should keep extra decimals to get an accurate value for side q.

$\frac{q}{\sin 41.133°} = \frac{26}{\sin 105°}$

$q = 17.7cm$

NOTE: If you keep the 33.86689 in your calculator for R when you calculate Q, you will get Q = 41.133° and with that you get the accurate value for q.

Cosine Law

$a^2 = b^2 + c^2 - 2bc\cos A$

$b^2 = a^2 + c^2 - 2ac\cos B$

$c^2 = a^2 + b^2 - 2ab\cos C$

Or to Find an Angle:

$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

$\cos B = \frac{a^2+c^2-b^2}{2ac}$

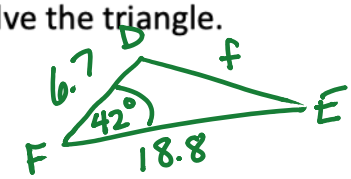
$\cos C = \frac{a^2+b^2-c^2}{2ab}$

Note: To use Cosine Law, you need either:

- 2 sides and the angle between the sides OR
- all 3 sides

What Math property do you think was used to create the Cosine Law? (Proof: Textbook page 286-287)

Example 2: In ΔEFD, e = 6.7 cm, d = 18.8 cm, and F = 42 degrees. Solve the triangle.



$f^2 = d^2 + e^2 - 2de\cos F$

$f^2 = 18.8^2 + 6.7^2 - 2(18.8)(6.7)\cos 42^\circ$

$f^2 = 211.11695\ldots$

$f = 14.52986\ldots$

$f \doteq 14.5\text{ cm}$

$E = \cos^{-1}\left[\frac{(18.8^2 + 14.5^2 - 6.7^2)}{(2 \times 18.8 \times 14.5)}\right]$

$E \doteq 18^\circ$, $\angle D = 120^\circ$

sine law solving for angle E works . . .

$\frac{\sin D}{18.8} = \frac{\sin 42^\circ}{14.5}$

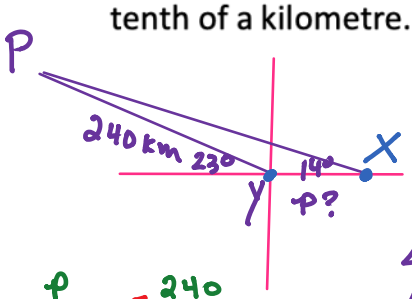
$\sin D = 0.86756\ldots$

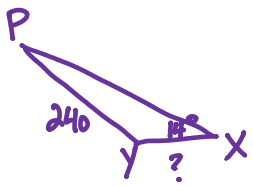
$D \doteq 60^\circ$

Hmmm?

Stay tuned tomorrow for "The Ambiguous Case!"

Example 3: Airport X is due East of Airport Y. An aircraft is 23° North of due West and 240 km from airport Y. The angle of elevation from Airport X to the aircraft is 14°. How far apart are airport X and Airport Y? Round your answer to the nearest tenth of a kilometre.





$\angle Y = 180° - 23°$ (SA)

$\angle Y = 157°$

$\angle P = 180° - 157° - 14°$ (ASTT)

$\angle P = 180° - 171°$

$\angle P = 9°$

$\frac{p}{\sin 9°} = \frac{240}{\sin 14°}$

$p = 155.1917.$

$p \doteq 155.2$

∴ the airports are 155.2 km apart.

U5D2 HW: p. 290 #1bc,2ac,3ac, 4bc, 5a, **16,** p.293 #9,10 (course is measured clockwise from north), worksheet 5-1 #3,5, 6,8,9