FMath 11

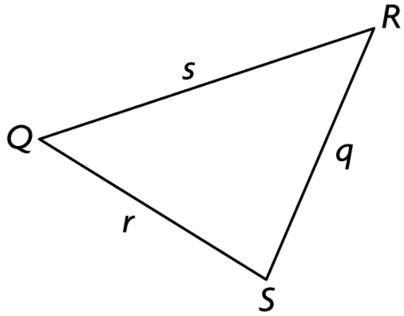
Practice Test - Ch.3
Acute Triangle Trigonometry

Name: ____________
Block: ______

Multiple Choice
Identify the choice that best completes the statement or answers the question.

C

1. Which expression describes the ratios of side-angle pairs in ΔQRS?



Side-Angle pairs are used in the Sine Law:

$$\frac{s}{\sin S} = \frac{q}{\sin Q} = \frac{r}{\sin R}$$

OR

$$\frac{\sin S}{s} = \frac{\sin Q}{q} = \frac{\sin R}{r}$$

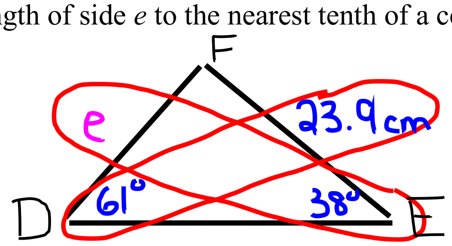
a. $q(\sin Q) = r(\sin R) = s(\sin S)$ ✗
b. $q(\sin R) = r(\sin S) = s(\sin Q)$ ✗
c. $\dfrac{s}{\sin S} = \dfrac{q}{\sin Q} = \dfrac{r}{\sin R}$
d. $\dfrac{q}{\sin S} = \dfrac{r}{\sin Q} = \dfrac{s}{\sin R}$ ✗

(sides are not paired with opposite angles)

A

2. In ΔDEF, $\angle D = 61°$, $d = 23.9$ cm, and $\angle E = 38°$.
Determine the length of side e to the nearest tenth of a centimetre.

a. 16.8 cm
b. 16.0 cm
c. 17.6 cm
d. 18.4 cm



Use Sine Law → finding side length so sides go on top.

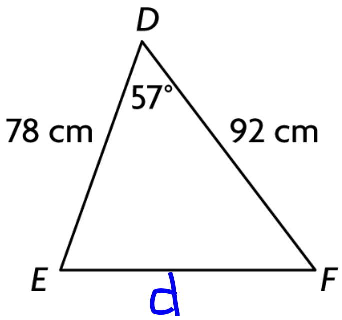
$$\frac{e}{\sin 38} = \frac{23.9}{\sin 61}$$

$$e = \frac{23.9 \times \sin 38}{\sin 61} = 16.823665$$

$$\boxed{= 16.8\text{ cm}}$$

→ Find d

B ___ 3. Determine the length of EF to the nearest centimetre.



We have 2 sides and the angle between so we can use Cosine Law.

$d^2 = e^2 + f^2 - 2ef\cos D$

$d^2 = 92^2 + 78^2 - 2(92)(78)\cos 57$

$d^2 = 8464 + 6084 - (14352)\cos 57$

$d^2 = 14548 - 7816.65943\ldots$

$d^2 = 6731.340569\ldots$

$d = \sqrt{6731.340569}$

use "ANS" button to keep answers accurate.

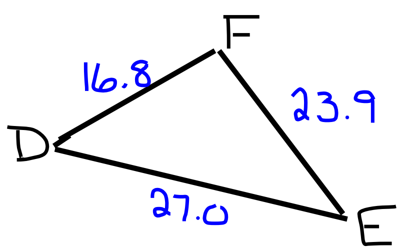
$d = 82.0447$

$\boxed{d = 82\text{ cm}}$

a. 84 cm
b. 82 cm
c. 88 cm
d. 86 cm

D ___ 4. In ΔDEF, $d = 23.9$ cm, $e = 16.8$ cm, and $f = 27.0$ cm. Determine the measure of $\angle D$ to the nearest degree.

a. 54°
b. 64°
c. 58°
d. 61°



Given 3 sides. Since we don't have an angle-side pair we can't use Sine Law.

Cosine Law:

Trying to find ∠D, so d must be first in equation

$d^2 = e^2 + f^2 - 2ef\cos D$

$23.9^2 = 16.8^2 + 27.0^2 - 2(16.8)(27.0)\cos D$

$571.21 = 1011.24 - 907.2\cos D$

$-1011.24 \quad -1011.24$

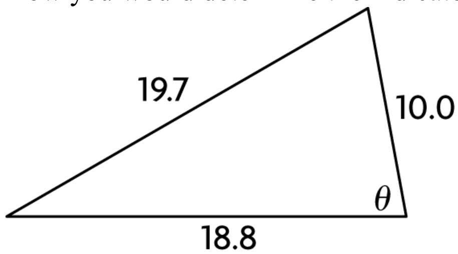
$\dfrac{-440.03}{-907.2} = \dfrac{-907.2\cos D}{-907.2}$

Use "ANS" button for accurate answer

$0.48504\ldots = \cos D \Rightarrow D = \cos^{-1}(0.48504\ldots) = 60.98$

A

5. How you would determine the indicated angle measure, if it is possible?



a. the cosine law
b. not possible
c. primary trigonometric ratios
d. the sine law

We have 3 sides and no angles so the only option we have is the Cosine Law.

$19.7^2 = 10^2 + 18.8^2 - 2(10)(18.8)\cos\theta$

$388.09 = 453.44 - 376\cos\theta$

$-453.44 \quad -453.44$

$\frac{-65.35}{-376} = \frac{-376\cos\theta}{-376}$

$0.173803\ldots = \cos\theta$

$\theta = \cos^{-1}(0.173803\ldots)$

$\theta = 79.99$

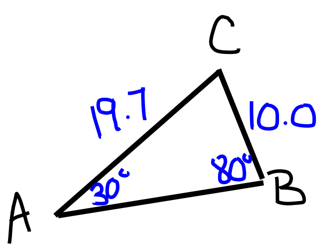
$= 80°$

Short Answer

6. Sketch a triangle that corresponds to the equation.
Then, determine the third angle measure and the third side length.

$$\frac{10.0}{\sin 30°} = \frac{19.7}{\sin 80°}$$

Sine law gives sides and opposite angles



use angle sum of Δ to find ∠C:

$C = 180 - 30 - 80 = 70°$

use sine law OR cosine law to find c.

Sine Law:

$\frac{c}{\sin 70} = \frac{10.0}{\sin 30}$ OR $\frac{c}{\sin 70} = \frac{19.7}{\sin 80}$

$c = \frac{10.0 \times \sin 70}{\sin 30}$ $\qquad c = \frac{19.7 \times \sin 70}{\sin 80}$

$c = 18.8$ $\qquad c = 18.8$

OR

Cosine Law:

$c^2 = 19.7^2 + 10.0^2 - 2(19.7)(10.0)\cos 70$

$c^2 = 488.09 - 394\cos 70$

$c^2 = 353.3340635$

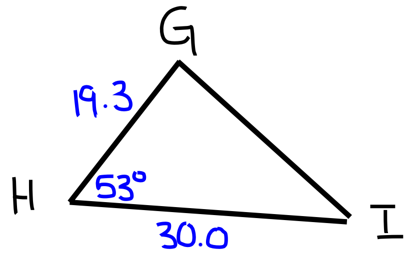
$c = \sqrt{353.3340635}$

$c = 18.8$

Use "ANS" for most accurate answer.

$$\boxed{\begin{matrix}\angle C = 70° \\ c = 18.8\end{matrix}}$$

7. In ΔGHI, $g = 30.0$ cm, $i = 19.3$ cm, and $\angle H = 53°$.
Determine the measure of h to the nearest tenth of a centimetre.

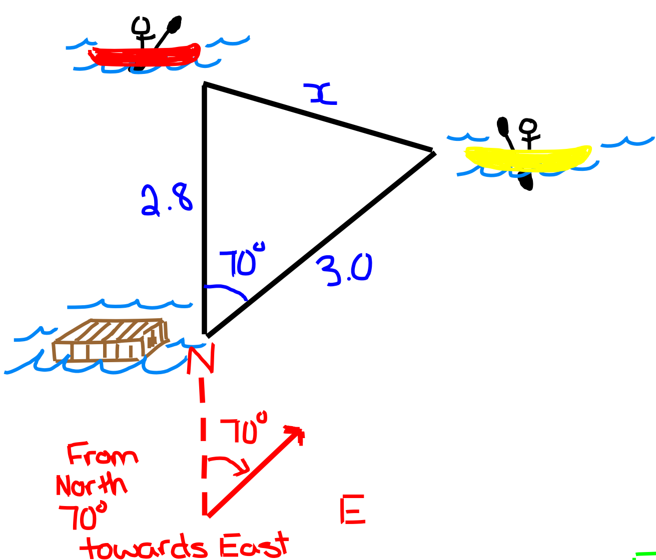


Two sides and the angle between so we must use Cosine Law.

$$h^2 = g^2 + i^2 - 2gi \cos H$$
$$h^2 = 30^2 + 19.3^2 - 2(30)(19.3)\cos 53$$
$$h^2 = 1272.49 - 1158 \cos 53$$
$$h^2 = 575.5882032\ldots$$
$$h = \sqrt{575.5882032\ldots}$$
$$h = 23.9914$$
$$\boxed{h = 24.0\text{ cm}}$$

Use "ANS" button for accurate answers.

8. A kayak leaves a dock on Lake Athabasca, and heads due north for 2.8 km. At the same time, a second kayak travels in a direction N70°E from the dock for 3.0 km.
Determine the distance between the kayaks, to the nearest tenth of a kilometre.



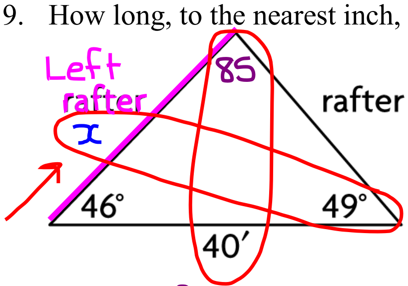
Given 2 sides and the angle between Must use Cosine Law:

$$x^2 = 2.8^2 + 3.0^2 - 2(2.8)(3.0)\cos 70$$
$$x^2 = 16.84 - 16.8 \cos 70$$
$$x^2 = 11.09406159\ldots$$
$$x = \sqrt{11.09406159\ldots}$$
$$x = 3.33077$$
$$x = 3.3\text{ km}$$

Use "ANS" button for most accurate answers.

$$\boxed{\text{The Kayaks are 3.3 km apart}}$$

9. How long, to the nearest inch, is the left rafter in the roof shown?



If we find the top angle we will have a side-angle pair and can use Sine Law.

Top angle = 180 − 46 − 49 = 85°

Looking for side length so sides go on top of fractions

$$\frac{x}{\sin 49} = \frac{40}{\sin 85}$$

$$x = \frac{40 \times \sin 49}{\sin 85}$$

$$x = 30.30369793$$

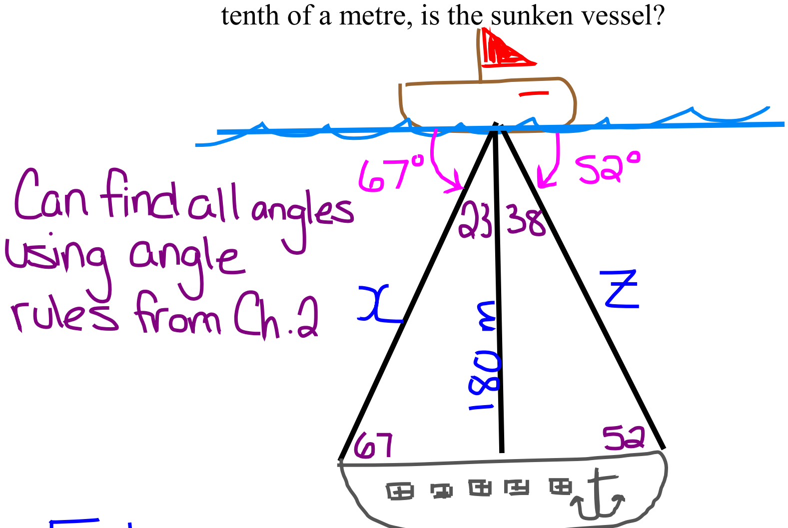
Convert decimal portion to inches:
(Subtract 30 to keep accurate number on Calculator)

$$0.30369793 \text{ ft} \times \frac{12 \text{ in}}{1 \text{ ft}} = 3.644375142$$

$$= 4 \text{ inches}$$

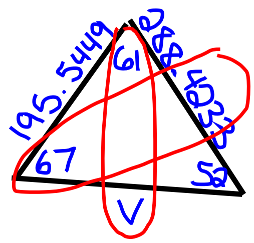
The left rafter is 30 ft 4 in long.

10. A radar operator on a ship discovers a large sunken vessel lying parallel to the ocean surface, 180 m directly below the ship. The length of the vessel is a clue to which wreck has been found. The radar operator measures the angles of depression to the front and back of the sunken vessel to be 52° and 67°. How long, to the nearest tenth of a metre, is the sunken vessel?



Start by finding either x or z (use primary Trigonometry Ratios)

Now we can use the sine law OR cosine law to find the length of the sunken vessel:



Find x:

$$\sin 67 = \frac{opp}{hyp}$$

$$\frac{\sin 67}{1} = \frac{180}{x}$$

$$\frac{x \cdot \sin 67}{\sin 67} = \frac{180}{\sin 67}$$

$$x = 180 \div \sin 67$$

$$x = 195.5449$$

OR Find z:
(use Sin or Cos)

$$\cos 38 = \frac{adj}{hyp}$$

$$\frac{\cos 38}{1} = \frac{180}{z}$$

$$\frac{z \cdot \cos 38}{\cos 38} = \frac{180}{\cos 38}$$

$$z = 180 \div \cos 38$$

$$z = 228.4233$$

$$\frac{v}{\sin 61} = \frac{228.4233}{\sin 67}$$

$$v = \frac{228.4233 \times \sin 61}{\sin 67}$$

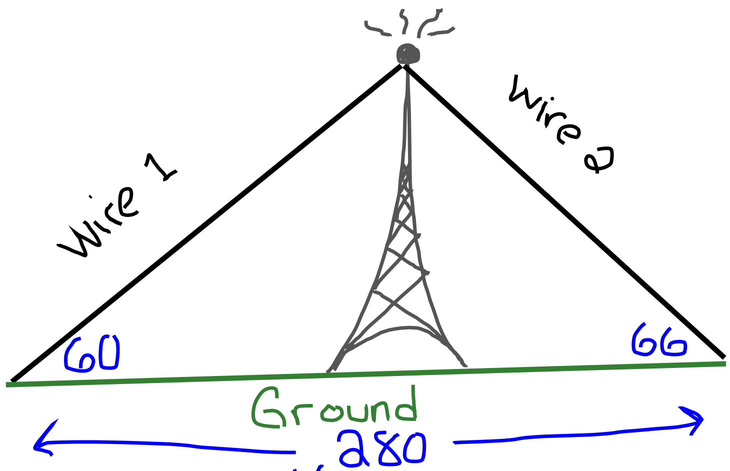
$$v = 217.0369$$

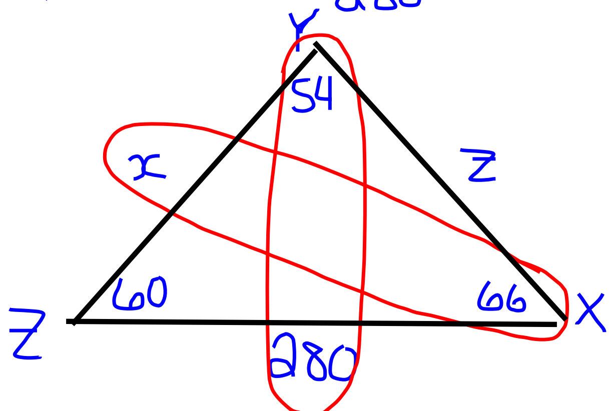
The sunken vessel is 217.0 m long

Problem

11. A radio tower is supported by two wires on opposite sides. On the ground, the ends of the wire are 280 m apart. One wire makes a 60° angle with the ground. The other makes a 66° angle with the ground.

    Draw a diagram of the situation. Then, determine the length of each wire to the nearest metre. Show your work.





Use angle sum of △ to find ∠Y:

$Y = 180 - 60 - 66 = 54$

Use Sine Law to find x:

$$\frac{x}{\sin 66} = \frac{280}{\sin 54}$$

$$x = \frac{280 \cdot \sin 66}{\sin 54}$$

$$x = 316.1772$$

$\boxed{\text{Wire 1 is 316 m long} \quad \text{Wire 2 is 300 m long}}$

Use Sine Law OR Cosine Law to find z:

Sine Law:

$$\frac{z}{\sin 60} = \frac{280}{\sin 54}$$

$$z = \frac{280 \cdot \sin 60}{\sin 54}$$

$$z = 299.7306$$

OR Cosine Law:

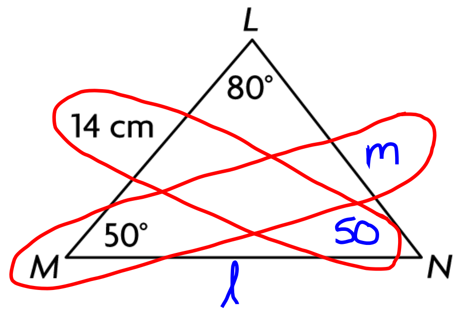
$$z^2 = 316.1772^2 + 280^2 - 2(316.1772)(280)\cos 60$$

$$z^2 = 89838.4058$$

$$z = \sqrt{89838.4058}$$

$$z = 299.7306$$

12. Determine, to the nearest centimetre, the perimeter of the triangle. Show your work.



Find ∠N : $N = 180 - 50 - 80 = 50°$

Use Sine Law to find l or m.

$$\frac{m}{\sin 50} = \frac{14}{\sin 50} \qquad \frac{l}{\sin 80} = \frac{14}{\sin 50}$$

$$m = \frac{14 \cdot \sin 50}{\sin 50} \qquad l = \frac{14 \cdot \sin 80}{\sin 50}$$

Two equal angles mean △LMN is an isosceles triangle. → $m = 14$

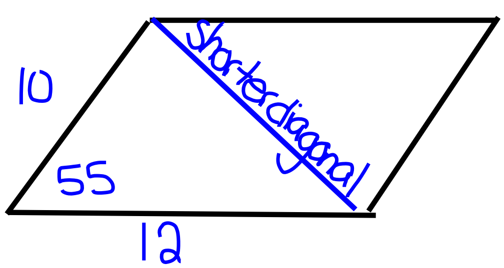
$l = 17.998$

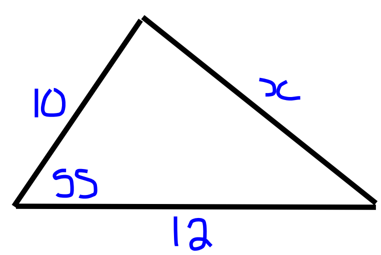
Perimeter is the distance around the triangle:

$$P = 14 + 14 + 17.998 = 45.998$$

$$\boxed{P = 46 \text{ cm}}$$

13. A parallelogram has sides that are 10 cm and 12 cm long.
One of the angles in the parallelogram measures 55°.
Determine the length of the shorter diagonal to the nearest tenth of a centimetre.





Two sides and the angle between → Use Cosine Law to find x:

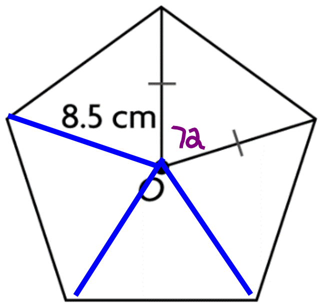
$$x^2 = 10^2 + 12^2 - 2(10)(12)\cos 55$$
$$x^2 = 244 - 240\cos 55$$
$$x^2 = 106.3416553$$
$$x = \sqrt{106.3416553}$$
$$x = 10.3122$$

Use "ANS" button for accurate answer.

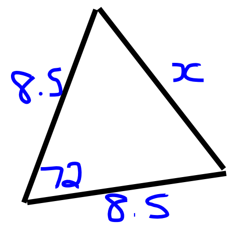
The shorter diagonal is 10.3 cm

All sides & angles equal

14. Determine the perimeter of the regular pentagon to the nearest tenth of a centimetre



Find angle at the centre
360° split into 5 equal sections
means each centre angle is 72°



Find x → use Cosine Law
or Find another angle
(Isosceles △) & use Sine Law.

$x^2 = 8.5^2 + 8.5^2 - 2(8.5)(8.5)\cos 72$

$x^2 = 144.5 - 144.5\cos 72$

$x^2 = 99.84704431$

$x = \sqrt{99.84704431}$ ← Use "ANS" to get accurate answer

$x = 9.992$

Perimeter is the distance around the shape.

A regular pentagon has 5 equal sides.

$P = 5 \times 9.992$

$P = 49.96$

The pentagon has a perimeter of 50.0 cm