Notes 11.5
Know when to use the Law of Cosines
Solve triangles using the Law of Cosines
Applications of the Law of Cosines

Know when to use the Law of Cosines

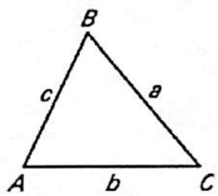
LAW OF COSINES

If $\triangle ABC$ has sides of length a, b, and c as shown, then:

$a^2 =$

$b^2 =$

$c^2 =$



Solve triangles using the Law of Cosines

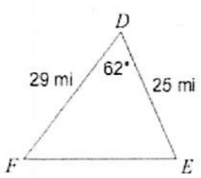
Solving a SAS triangle:

Step 1-

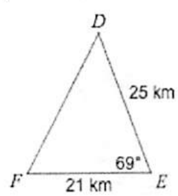
Step 2-

Step 3-

2)



3)



6) In $\triangle QRP$, $r = 14$ cm, $m\angle Q = 126.4°$, $p = 24$ cm

8) In $\triangle KHP$, $m\angle K = 121°$, $p = 27$ mi, $h = 12$ mi

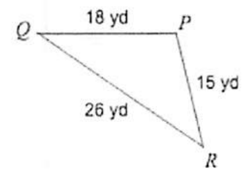
Solving a SSS triangle:

Step 1-

Step 2-

Step 3-

1)



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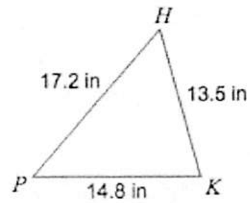


5) In $\triangle XYZ$, $y = 24$ ft, $x = 28$ ft, $z = 22$ ft

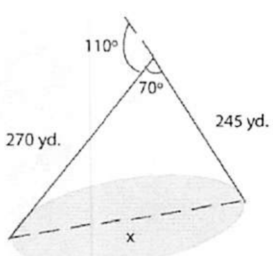
7) In $\triangle EFD$, $d = 14$ mi, $f = 6$ mi, $e = 9$ mi

Applications of the Law of Cosines

9) Two sides and a diagonal of a parallelogram are 5, 10, and 13 in respectively. Find the measures of the angles of the parallelogram.

10) A scuba diver looks up 20° and sees a turtle 9 feet away. She looks down 40° and sees a blue parrotfish 12 feet away. How far apart are the turtle and the parrotfish?

To approximate the length of a lake, a surveyor starts at one end of the lake and walks 245 yards. He then turns 110° and walks 270 yards until he arrives at the other end of the lake. Approximately how long is the lake?



Notes 11.5
Know when to use the Law of Cosines
Solve triangles using the Law of Cosines
Applications of the Law of Cosines

Know when to use the Law of Cosines

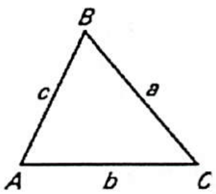
LAW OF COSINES

If $\triangle ABC$ has sides of length a, b, and c as shown, then:

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

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

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



Solve triangles using the Law of Cosines

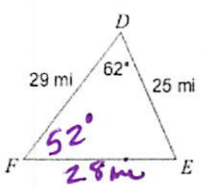
Solving a SAS triangle:

Step 1- Use Law of Cosines to find the side opposite the given angle.

Step 2- Use Law of Sines to find angle opposite shorter of the two given sides

Step 3- Find third angle by subtracting from 180°

2)



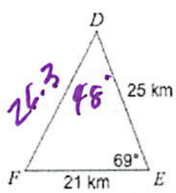
$\frac{\sin 62}{28} = \frac{\sin F}{25}$

$\boxed{F = 52^\circ \quad E = 66^\circ}$

$d^2 = 29^2 + 25^2 - 2(29)(25)\cos 62$

$\boxed{d = 28 \text{ mi}}$

3)



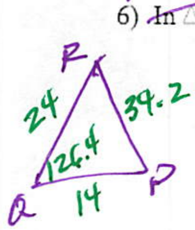
$\frac{\sin 69}{26.3} = \frac{\sin D}{21}$

$\boxed{D \approx 48^\circ \quad F \approx 63^\circ}$

$e^2 = 21^2 + 25^2 - 2(21)(25)\cos 69$

$\boxed{e \approx 26.3 \text{ Km}}$

6) In $\triangle QRP$, $r = 14$ cm, $m\angle Q = 126.4°$, $p = 24$ cm



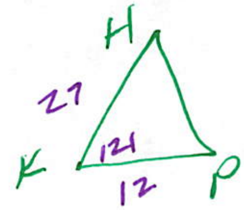
$q^2 = 24^2 + 14^2 - 2(24)(14)\cos 126.4$

$q \approx 34.2$ cm

$\frac{\sin 126.4}{34.2} = \frac{\sin R}{14}$

$R \approx 19.2°$
$P = 34.4°$

8) In $\triangle KHP$, $m\angle K = 121°$, $p = 27$ mi, $h = 12$ mi



$K \approx 34.7$ mi
$H \approx 17.2°$
$P \approx 41.8°$

Solving a SSS triangle:

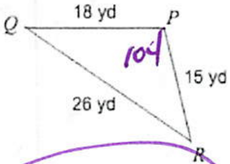
Step 1- Use the Law of Cosines to find angle opposite longest side.

Step 2- Use the law of Sines to find another angle

Step 3- Subtract angles from 180°

$26^2 = 18^2 + 15^2 - 2(18)(15)\cos P$

1)



$-0.23 \approx \cos P$

$P \approx 104°$

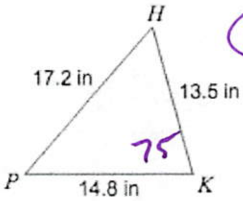
$\frac{\sin 104}{26} = \frac{\sin Q}{15}$

$R \approx 42°$

$Q = 34°$

$17.2^2 = 14.8^2 + 13.5^2 - 2(14.8)(13.5)\cos K$

4)



$0.26 = \cos K$

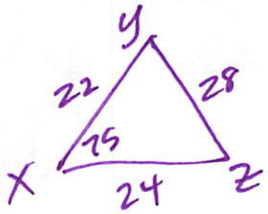
$K = 75°$

$\frac{\sin 75}{17.2} = \frac{\sin H}{14.8}$

$H \approx 56°$

$F = 49°$

5) In $\triangle XYZ$, $y = 24$ ft, $x = 28$ ft, $z = 22$ ft



$28^2 = 22^2 + 24^2 - 2(22)(24)\cos X$

$0.26 = \cos X$

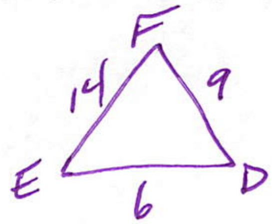
$X = 75°$

$y = 124°$

$\frac{\sin 75}{28} = \frac{\sin z}{22}$

$z = 49°$

7) In $\triangle EFD$, $d = 14$ mi, $f = 6$ mi, $e = 9$ mi



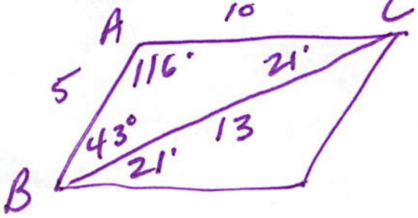
$D = 137°$

$E = 26°$

$F = 17°$

Applications of the Law of Cosines

9) Two sides and a diagonal of a parallelogram are 5, 10, and 13 in respectively. Find the measures of the angles of the parallelogram.



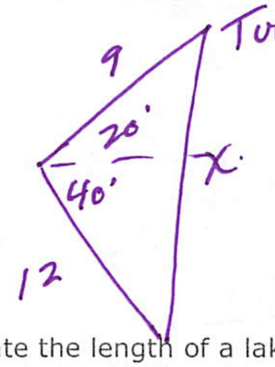
$13^2 = 5^2 + 10^2 - 2(5)(10)\cos A$

$A = 116°$

$\frac{\sin 116}{13} = \frac{\sin B}{10}$

$116° ; 64°$

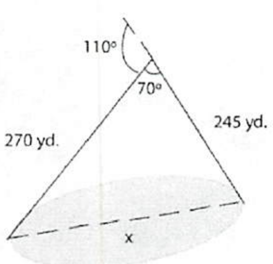
10) A scuba diver looks up 20° and sees a turtle 9 feet away. She looks down 40° and sees a blue parrotfish 12 feet away. How far apart are the turtle and the parrotfish?



$x^2 = 9^2 + 12^2 - 2(9)(12)\cos 60°$

$x \approx 10.8$ ft

To approximate the length of a lake, a surveyor starts at one end of the lake and walks 245 yards. He then turns 110º and walks 270 yards until he arrives at the other end of the lake. Approximately how long is the lake?



$x^2 = 270^2 + 245^2 - 2(270)(245)\cos 70°$

$x \approx 296$ yd