KEY

Math 20-1

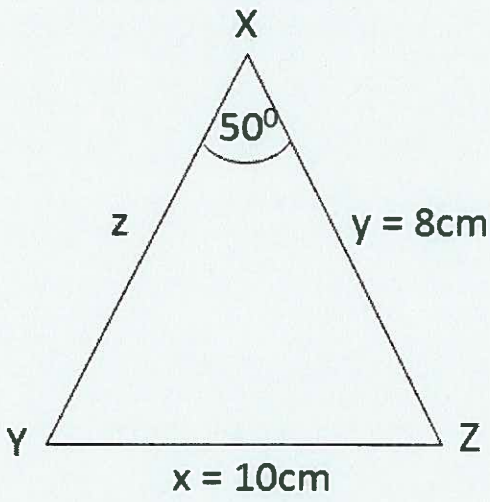
Lxx – Worksheet – 2.4 The Cosine Law

Part 1 – Overview of Sine Law and Cosine Law

Sine Law

You can use this when you have a known angle opposite a known side.

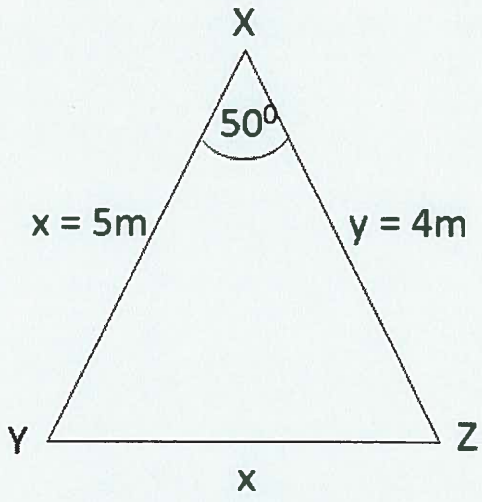
Careful: Don't forget the AmbiguouS caSe of Angle-Side-Side.



Don't forget that interior angles in a triangle add to 180°, so once you know two angles, you know all three.

Cosine Law

You can use this when you have a known Side-Angle-Side. or Side - Side - Side.



Don't forget that interior angles in a triangle add to 180°, so once you know two angles, you know all three.

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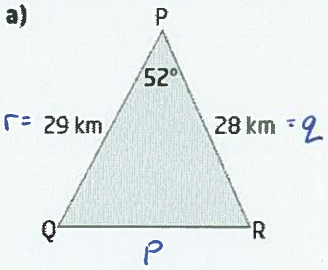
Part 2 – Textbook Questions

Pg 120 #3: Determine the lengths of the unknown sides and the measure of the unknown angles.

a)



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

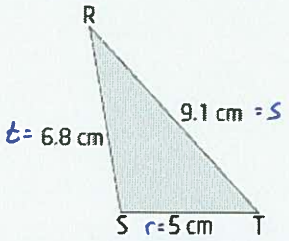
$p^2 = 29^2 + 28^2 - 2(29)(28)\cos 52$

$p = 25.0$

$\frac{\sin P}{p} = \frac{\sin R}{r}$, $\frac{\sin 52}{25} = \frac{\sin R}{29}$

$\angle R = 66.1°$

$\angle Q = 61.9°$



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

$r^2 = t^2 + s^2 - 2ts\cos R$

$5^2 = 6.8^2 + 9.1^2 - 2(6.8)(9.1)\cos R$

$25 = 46.24 + 82.81 - 123.76\cos R$

$-104.05 = -123.76\cos R$

$0.84074 = \cos R$

$\angle R = 32.8°$

$\frac{\sin R}{r} = \frac{\sin T}{t}$

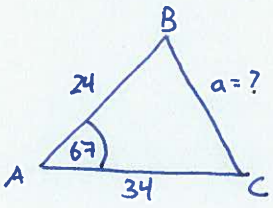
$\frac{\sin 32.8}{5} = \frac{\sin T}{6.8}$

$\angle T = 47.5°$

$\angle S = 99.7°$

Pg 120 #4ace: Make a sketch to show the given information for each ΔABC. Then, determine the indicated value.

AB = 24cm, AC = 34cm, and $\angle A = 67^0$. Determine the length of BC.



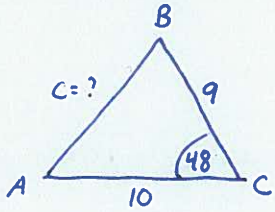
$c^2 = a^2 + b^2 - 2ab\cos C$

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

$a^2 = 24^2 + 34^2 - 2(24)(34)\cos 67°$

$a = 33.1$ cm

AC = 10cm, BC = 9cm, and $\angle C = 48^0$. Determine the length of AB.

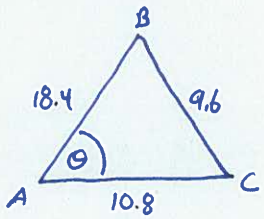


$c^2 = a^2 + b^2 - 2ab\cos C$

$c^2 = 10^2 + 9^2 - 2(10)(9)\cos 48°$

$c = 7.8$cm

AB = 18.4m, BC = 9.6m, and AC = 10.8m. Determine The measure of $\angle A$.



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

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

$9.6^2 = 18.4^2 + 10.8^2 - 2(18.4)(10.8)\cos A$

$92.16 = 338.56 + 116.64 - 397.44\cos A$

$-363.04 = -397.44\cos A$

$0.9134 = \cos A$

$\angle A = 24.0°$

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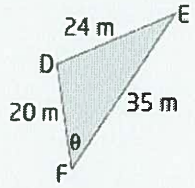
Pg 120 #5: Would you use the sine law or the cosine law to determine each indicated side length or angle measure? Give reasons for your choice.

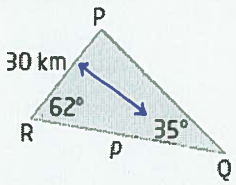
a) $\angle F$



Sin law requires opposite angle + side. Can't use.

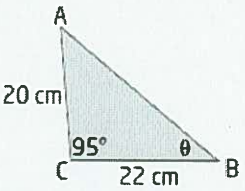
I could use Cosine (S-S-S).

b) p



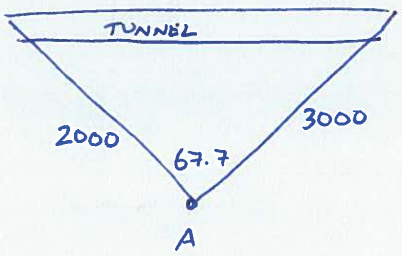
We do have opposite side + angle, so Sine Law would work.

c) $\angle B$



We have S-A-S, so we would use Cosine law.

Pg 120 #8: The longest tunnel in North America could be built through the mountains of the Kicking Horse Canyon, near Golden, British Columbia. The tunnel would be on the Trans-Canada highway connecting the Prairies with the west coast. Suppose the surveying team selected a point A, 3000 m away from the proposed tunnel entrance and 2000 m from the tunnel exit. If $\angle A$ is measured as 67.7^0, determine the length of the tunnel, to the nearest meter.



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

$c^2 = 2000^2 + 3000^2 - 2(2000)(3000)\cos 67.7$

$c = 2906$ km.

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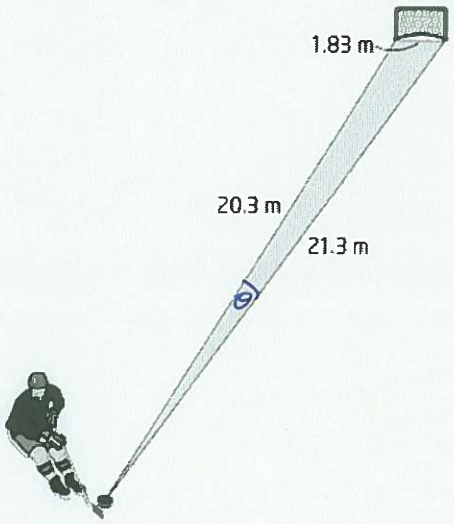
Pg 120 #10: The Canadian women's national ice hockey team has won numerous international competitions, including gold metals at the 2002, 2006, and 2010 Winter Olympics. A player on the blue line shoots a puck towards the 1.83-m-wide net from a point 20.3 m from one goal post and 21.3 m from the other. Within what angle must she shoot to hit the net? Answer to the nearest tenth of a degree.



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

$1.83^2 = 20.3^2 + 21.3^2 - 2(20.3)(21.3)\cos C$

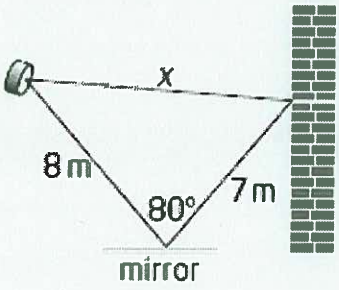
$3.3489 = 412.09 + 453.69 - 864.78\cos C$

$-862.4311 = -864.78\cos C$

$0.9973 = \cos C$

$\angle C = 4.22°$

Pg 120 #15: A spotlight is 8 m away from a mirror on the floor. A beam of light shines into the mirror, forming an angle of 80^0 with the reflected light. The light is reflected a distance of 7 m to shine onto a wall. Determine the distance from the spotlight to the point where the light is reflected onto the wall.



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

$c^2 = 7^2 + 8^2 - 2(7)(8)\cos 80$

$c = 9.7\text{m}$

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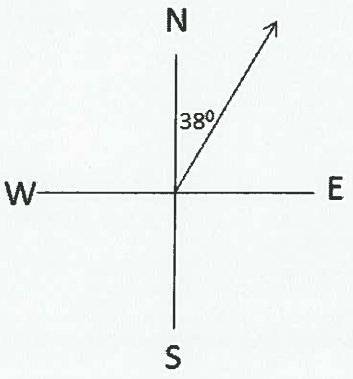
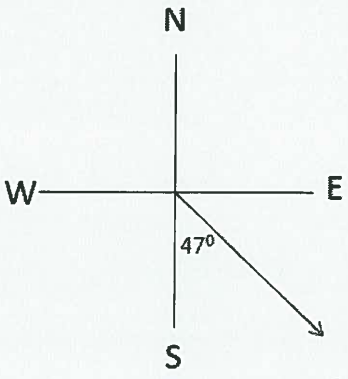
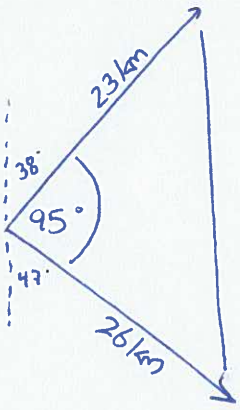
Pg 120 #23: Two ships leave port a 4pm. One is headed N38^{0}E (38^0 E of N) and is travelling at 11.5 km/h. The other is travelling at 13km/h, with a heading S47^{0}E (47^0 E of S). How far apart are the two ships at 6pm?





$\frac{11.5\text{ km}}{\text{h}} \times 2\text{h} = 23\text{km}.$

$\frac{13\text{km}}{\text{h}} \times 2\text{h} = 26\text{ km}$



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

$c^2 = 23^2 + 26^2 - 2(23)(26)\cos 95$

$c = 36.2\text{ km}$