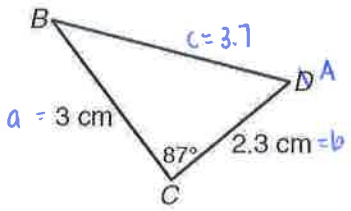
Pre-Calculus (A)
Law of Cosines and Applications HW

Name : Key
Date : _____

Use the Law of Cosines to solve each triangle in exercises 1 – 4.

1)



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

$c^2 = (3)^2 + (2.3)^2 - 2(3)(2.3)\cos 87°$

$c^2 = 14.29 - .7344$

$c^2 = 13.5678$

$c = 3.7$ cm

$m\angle C = 54.6°$

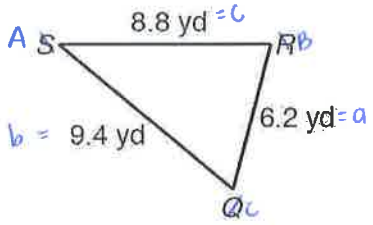
$\frac{\sin A}{3} = \frac{\sin B}{2.3} = \frac{\sin 87}{3.7}$

$3.7\sin B = 2.3\sin 87$

$\sin B = .6208$

$m\angle B = 38.4°$

2)



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

$(9.4)^2 = (6.2)^2 + (8.8)^2 - 2(6.2)(8.8)\cos B$

$88.36 = 115.88 - 109.12\cos B$

$-27.52 = -109.12\cos B$

$0.2522 = \cos B$

R $m\angle B = 75.4°$

$\frac{\sin A}{6.2} = \frac{\sin 75.4}{9.4} = \frac{\sin C}{8.8}$

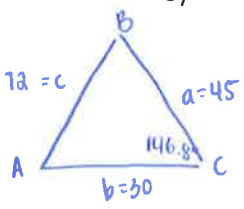
$9.4\sin A = 6.2\sin 75.4$

$\sin A = .6383$

S $m\angle A = 39.7°$

Q $m\angle C = 64.9°$

3) $a = 45, b = 30, c = 72$



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

$(72)^2 = (30)^2 + (45)^2 - 2(30)(45)\cos C$

$5184 = 2925 - 2700\cos C$

$2259 = -2700\cos C$

$-.8367 = \cos C$

$m\angle C = \cos^{-1}(-.8367)$

$m\angle C = 146.8°$

$\frac{\sin A}{45} = \frac{\sin B}{30} = \frac{\sin 146.8}{72}$

$72\sin B = 30\sin 146.8$

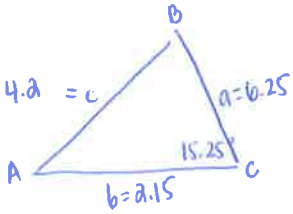
$\sin B = 0.2282$

$m\angle B = 13.2°$

$m\angle C = 20°$

4) $m\angle C = 15°15', a = 6.25, b = 2.15$

$15.25°$



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

$c^2 = (6.25)^2 + (2.15)^2 - 2(6.25)(2.15)\cos 15.25$

$c^2 = 43.685 - 25.9287$

$c^2 = 17.7563$

$c = 4.2$

$\frac{\sin A}{6.25} = \frac{\sin B}{2.15} = \frac{\sin 15.25}{4.2}$

$4.2\sin B = 2.15\sin 15.25$

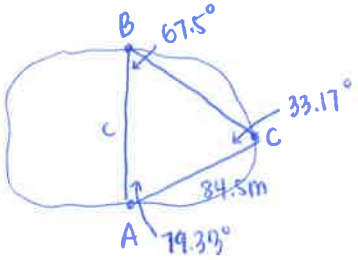
$\sin B = 0.1346$

$m\angle B = 7.7°$

$m\angle A = 157.05°$

Use either the Law of Sines or the Law of Cosines to solve the following problems.

5) Points A and B are on opposite sides of a lake. A point C is 84.5 meters from A. The $m\angle BAC$ is 79°20', and the $m\angle ACB$ is determined to be 33°10'. Find the distance between points A and B to the nearest meter.



$\frac{\sin 79.33}{a} = \frac{\sin 67.5}{84.5} = \frac{\sin 33.17}{c}$

$c\sin 67.5 = 84.5\sin 33.17$

$c = 50\text{m}$

$\boxed{AB = 50\text{m}}$

*** 6) You are seeding a triangular courtyard. One side of the courtyard is 52 feet long and another side is 46 feet long. The angle opposite the 52-foot side is 65 degrees. If one bag of grass seed covers an area of 50 square feet, how many bags of grass seed will you need to cover the courtyard?

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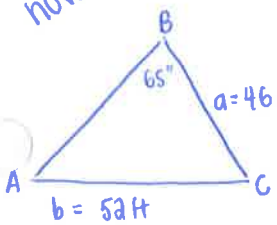


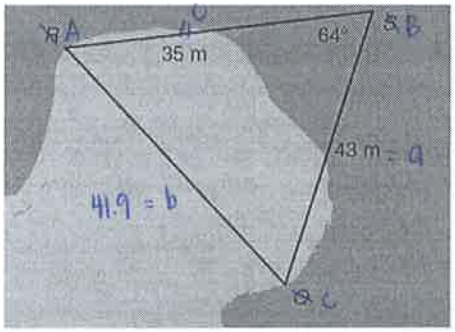
$\frac{\sin A}{46} = \frac{\sin 65}{52} = \frac{\sin C}{c}$

$52\sin A = 46\sin 65$

$\sin A = 0.8017$

$\boxed{m\angle A = 53.3}$

7) To find the distance across a bay, a surveyor locates points Q, R, and S as shown.



a) What is the distance across the bay? Round to the nearest tenth of a meter.

$\boxed{41.9\text{m}}$

b) What is the measure of angle Q to the nearest degree?

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

$b^2 = 43^2 + 35^2 - 2(43)(35)\cos 64$

$b^2 = 3074 - 1319.4972$

$b^2 = 1754.5$

$b \approx 41.9$

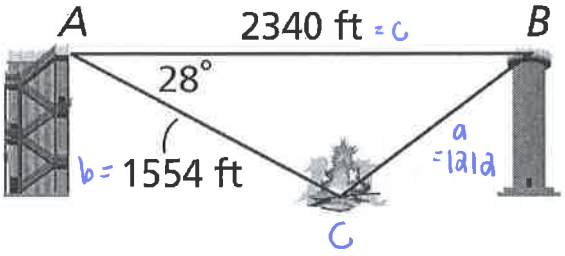
b) $\frac{\sin A}{43} = \frac{\sin 64}{41.9} = \frac{\sin C}{35}$

$35\sin 64 = 41.9\sin C$

$0.7508 = \sin C$

$m\angle C = 48.7 \approx \boxed{49°}$

8) An observer in tower *A* sees a fire 1554 ft away at an angle of depression of 28°. To the nearest foot, how far is the fire from an observer in tower *B*? To the nearest degree, what is the angle of depression to the fire from tower *B*?



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

$a^2 = (1554)^2 + (2340)^2 \cos(28)$

$a^2 = 1469086.382$

$a = 1212.1 \approx \boxed{1212 \text{ ft}}$

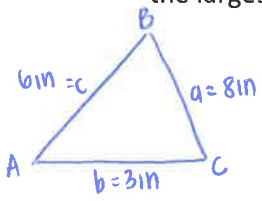
b) $\frac{\sin 28}{1212} = \frac{\sin B}{1554}$

$1212 \sin B = 1554 \sin 28$

$\sin B = 0.6019$

$\boxed{m\angle B = 37°}$

9) The edges of a triangular cushion measure 8 inches, 3 inches, and 6 inches. What is the measure of the largest angle of the cushion to the nearest degree?



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

$8^2 = 3^2 + 6^2 - 2(3)(6)\cos A$

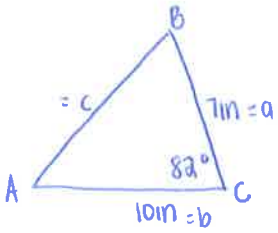
$64 = 45 - 36\cos A$

$19 = -36\cos A$

$-0.5278 = \cos A$

$m\angle A = 121.9° \approx \boxed{122°}$

10) What is the best estimate for the perimeter of a triangle if the two sides measure 7 inches and 10 inches, and the included angle between the two sides is 82°?



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

$c^2 = 7^2 + 10^2 - 2(7)(10)\cos(82°)$

$c^2 = 149 - 19.4842$

$c^2 = 129.5158$

$c = 11.4$

$P = 10 + 7 + 11.4$

$\approx \boxed{28.4\text{in}}$