HW SOL 2.4

November 8, 2016 1:30 PM

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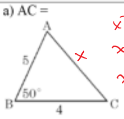
Pre-Calculus 11: HW Section 2.4 Cosine Law

1. Given each triangle, find the value of the indicated side or angle.

a) AC =



$x^2 = 5^2 + 4^2 - 2(5)(4)\cos 50°$

$x^2 = 25 + 16 - 40\cos(50°)$

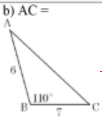
$x^2 = 41 - 40\cos(50°)$

$x^2 = 41 - 25.711504$

$x^2 = 15.28849$

$\boxed{x = 3.91}$ //

b) AC =



$AC^2 = 6^2 + 7^2 - 2(6)(7)\cos 110°$

$AC^2 = 36 + 49 - 84\cos 110°$

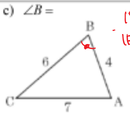
$AC^2 = 85 - 84\cos 110$

$AC^2 = 85 - (-28.729)$

$AC^2 = 113.729$

$AC = 10.66$ //

c) $\angle B$ =



ISOLATE SIDE AC IF YOU'RE FINDING $\angle B$.

$7^2 = 6^2 + 4^2 - 2(6)(4)\cos\angle B$

$49 = 36 + 16 - 48\cos\angle B$

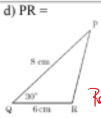
$-3 = -48\cos\angle B$

$\frac{1}{16} = \cos\angle B$

$\cos^{-1}\left(\frac{1}{16}\right) = \angle B$

$\angle B = \underline{86.42°}$

d) PR =



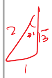
$PR^2 = 8^2 + 6^2 - 2(8)(6)\cos 30°$

$PR^2 = 64 + 36 - 96\left(\frac{\sqrt{3}}{2}\right)$

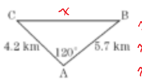
$PR^2 = 100 - 48\sqrt{3}$

$PR^2 = \underline{16.86156}$

$PR = 4.106$



e) $\angle B$ =



① FIND $\overline{CB}$ FIRST

$x^2 = 4.2^2 + 5.7^2 - 2(4.2)(5.7)\cos 120°$

$x^2 = 50.13 + 23.93999...$

$x = \underline{8.60639}$

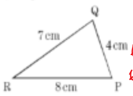
② USE SINE LAW TO FIND $\angle B$

$\frac{\sin\angle B}{4.2} = \frac{\sin 120°}{8.60639}$

$\sin\angle B = \frac{4.2(\sin 120)}{8.60639297}$

$\angle B = \sin^{-1}(0.422628) = 25°$ //

f) $\angle Q$ =



① ISOLATE $\overline{PR}$ TO FIND $\angle Q$.

$8^2 = 7^2 + 4^2 - 2(7)(4)\cos\angle Q$.

$64 = 49 + 16 - 56\cos\angle Q$.

$64 = 65 - 56\cos\angle Q$.

$-1 = -56\cos\angle Q$

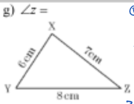
$\frac{1}{56} = \cos\angle Q$

$\cos^{-1}\left(\frac{1}{56}\right) = \angle Q$

$\underline{88.98°} = \angle Q$

NOTE: MAKE SURE YOU USE BEDMAS WHEN SOLVING FOR THE ANGLE!

g) $\angle z$ =



① ISOLATE THE SIDE opp. OF THE ANGLE THAT YOU'RE TRYING TO FIND.

$6^2 = 7^2 + 8^2 - 2(7)(8)\cos\angle Z$.

$36 = 49 + 64 - 112\cos\angle Z$.

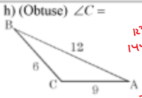
$36 - 105 = -112\cos\angle Z$

$\frac{-69}{-112} = \cos\angle Z$

$\cos^{-1}\left(\frac{69}{112}\right) = \angle Z$

$\underline{51.97°} = \angle Z$

h) (Obtuse) $\angle C$ =



$12^2 = 6^2 + 9^2 - 2(6)(9)\cos\angle C$

$144 = 36 + 81 - 108\cos\angle C$

$144 = 117 - 108\cos\angle C$

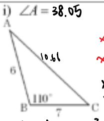
$\frac{27}{-108} = \cos\angle C$

$-\frac{1}{4} = \cos\angle C$

$\cos^{-1}\left(-\frac{1}{4}\right) = \angle C$

$104.48° = \angle C$

i) $\angle A$ = 38.05 AC = 10.66



$x^2 = 6^2 + 7^2 - 2(6)(7)\cos 110°$

$x^2 = 36 + 49 - (-28.72969204)$

$x^2 = 113.729692$

$x = 10.66$

$7^2 = 6^2 + (10.66)^2 - 2(6)(10.66)\cos A$

$49 = 36 + 113.73 - 127.92\cos A$

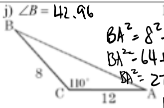
$49 - 36 - 113.73 = -127.92\cos A$

$-100.73 = -127.92\cos A$

$\frac{-100.73}{-127.92} = \cos A = 0.787445783$

$\cos^{-1}$ $= 38.05$

j) $\angle B$ = 42.96 BA = 16.54



$BA^2 = 8^2 + 12^2 - 2(8)(12)\cos 110$

$BA^2 = 64 + 144 - (-65.66786752)$

$BA^2 = 273.6678675$

$BA = 16.54$

$12^2 = 8^2 + 16.54^2 - 2(8)(16.54)\cos B$

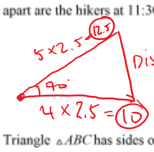
$144 = 64 + 273.67 - 264.64\cos B$

$-193.67 = -264.64 \times \cos B$

$\frac{-193.67}{-264.64} = \cos B = \underline{0.731824365}$

$\cos^{-1}$ $= 42.96$

2. Two hikers start out from the same place at 9:00am. The first hiker walks at 4km/h and the second hiker walks at 5km/h. If the angle between the two hikers is 70° then, to 3 decimal places, how far apart are the hikers at 11:30am?



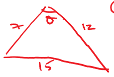
$D^2 = 10^2 + 12.5^2 - 2(10)(12.5)\cos 70°$

$D^2 = 100 + 156.25 - 250\cos 70°$

$D^2 = 256.25 - 250\cos 70°$

$D =$

3. Triangle $\triangle ABC$ has sides of length 7, 12, and 15cm. To the nearest degree, what is the measure of the largest angle of the triangle?



① THE LARGEST ANGLE IS THE OPPOSITE OF THE LARGEST SIDE.

$15^2 = 7^2 + 12^2 - 2(15)(7)\cos\theta$.

$225 = 49 + 144 - 210\cos\theta$.

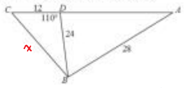
$225 = 193 - 210\cos\theta$

$\frac{-32}{-210} = \cos\theta$

$\cos^{-1}\left(\frac{32}{210}\right) = \theta$

$= \theta$

4. Find the measure of angle "A"



① Find $\overline{CB}$

$x^2 = 12^2 + 24^2 - 2(12)(24)\cos 110°$

$x^2 = \underbrace{144 + 196}_{\text{ADD FIRST!!}} - \underbrace{196\cos 110°}_{\text{MULTIPLY}}$

$x^2 =$

$x =$ ______

② Find $\angle C$ (sine law)

$\frac{\sin 110°}{x} = \frac{\sin \angle C}{24}$

$\frac{24(\sin 110°)}{x} = \sin\angle C$

______ $= \angle C$

③ Find $\angle A$.

$\frac{\sin A}{x} = \frac{\sin \angle C}{28}$

$\sin A = \frac{x(\sin\angle C)}{28}$

$\sin A = \frac{\cancel{x}\left(\frac{24\cdot\sin 110°}{\cancel{x}}\right)}{28}$

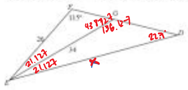
$\sin A = \frac{24\cdot\sin 110°}{28}$

$A = \sin^{-1}\left(\frac{24\cdot\sin 110°}{28}\right)$

$\angle A =$ ______

NOTE: IF YOUR ALGEBRA SKILLS ARE GOOD, YOU ONLY NEED STEPS ② + ③ 'x' CANCELS OUT.

5. Given that line GE bisects angle "E", find the length of ED



① Find $\angle FGE$.

$\frac{\sin\theta}{26} = \frac{\sin 115°}{34}$

$\sin\theta = \frac{26\cdot\sin 115°}{34}$

$\theta_1 = \sin^{-1}\left(\frac{26\cdot\sin 115°}{34}\right)$

$\theta_1 = 43.8727°$

② Find $\angle EGD$.

$\angle EGD = 180° - \theta$

$\theta_2 = 136.127°$

$\angle FEG = 180 - 115 - 43.8727°$

$= 21.127°$

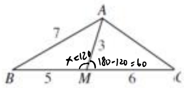
$\angle FED = 42.25°$ $\angle FDE = 22.745°$.

③ $\frac{\sin 22.745}{26} = \frac{\sin 115°}{x}$

$x = \frac{26\sin 115°}{\sin 22.745}$

$\boxed{x = 60.947}$

6. In ΔABC, M is a point on BC such that $BM = 5$ and $MC = 6$. If $AM = 3$ and $AB = 7$, determine the exact value of AC.



$7^2 = 3^2 + 5^2 - 2(3)(5)\cos x$

$49 = 9 + 25 - 30\cos x$

$15 = -30\cos x$

$\frac{-1}{2} = \cos x$

$x = 120$

$AC^2 = 3^2 + 6^2 - 2(3)(6)\cos 60$

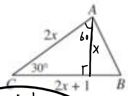
$AC^2 = 9 + 36 - 36\cos 60$

$AC^2 = 27$

$AC = 3\sqrt{3}$

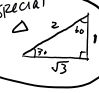
$\boxed{\text{Ans} = 3\sqrt{3}}$

7. In the diagram, $AC = 2x$, $BC = 2x + 1$ and $\angle ACB = 30°$. If the area of ΔABC is 18, what is the value of x?



$\frac{(2x+1)x}{2} = \frac{2x^2 + x}{2} = 18$

Special △



Don't mind the spelling !! :)

$2x^2 + x = 18 \times 2$

$2x^2 + x = 36$

$2x^2 + x - 36 = 0$

criss cross method

$1x \quad -4$

$2x \quad 9$

$(x-4)(2x+9) = 0$

$x = 4, -4.5$

$\boxed{\text{Ans} = 4}$

