***AAT (IC/HW)-Days 1-2**

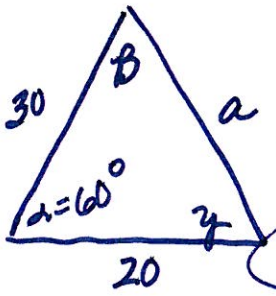
Chapter 8: 8-2 The Law of Cosines

Name Key

Date: _____ Period: _____

Solve △ ABC.

1. $\alpha = 60°$, $b = 20$, $c = 30$



$a^2 = 20^2 + 30^2 - 2(20)(30)\cos 60°$

$a = \sqrt{20^2 + 30^2 - 2(20)(30)\cos 60°}$

$a \approx 26$

$\frac{\sin 60}{26} = \frac{\sin B}{20}$

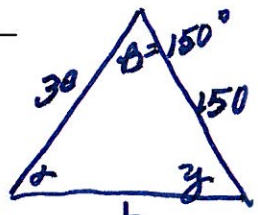
$\angle B \approx 42°$

$m\angle\gamma = 180° - 60° - 42°$

$\gamma \approx 78°$

$m\angle B = 42°$

2. $\beta = 150°$, $a = 150$, $c = 30$



$b = \sqrt{150^2 + 30^2 - 2(150)(30)\cos 150°}$

$b \approx 177$

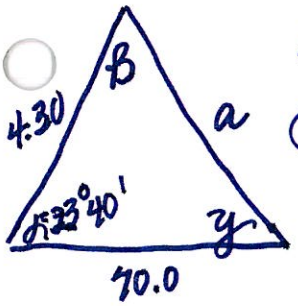
$\frac{\sin 150}{177} = \frac{\sin \gamma}{30}$

$\gamma \approx 5°$

$\alpha = 180 - 150 - 5$

$\alpha \approx 25°$

3. $\alpha = 23°40'$, $c = 4.30$, $b = 70.0$



$a = \sqrt{70^2 + 4.3^2 - 2(70)(4.3)\cos 23°40'}$

$a \approx 66.1$

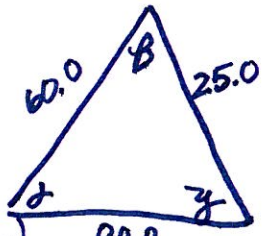
$\frac{\sin 23°40'}{66.1} = \frac{\sin \gamma}{4.3}$

$\gamma \approx 1°30'$

$B = 180° - 23°40' - 1°30'$

$B \approx 154°50'$

4. $a = 25.0$, $b = 80.0$, $c = 60.0$



$80^2 = 60^2 + 25^2 - 2(60)(25)\cos B$

$\frac{80^2 - 60^2 - 25^2}{(-2 \cdot 60 \cdot 25)} = \cos B$

$\angle B \approx 136°30'$

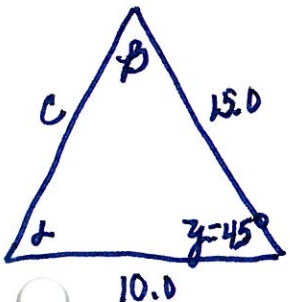
$\frac{\sin 136°30'}{80} = \frac{\sin \alpha}{25}$

$\alpha \approx 12°30'$

$\gamma = 180 - 136°30' - 12°30'$

$\gamma = 31°00'$

5. $\gamma = 45°$, $b = 10.0$, $a = 15.0$



$c = \sqrt{15^2 + 10^2 - 2(15)(10)\cos 45}$

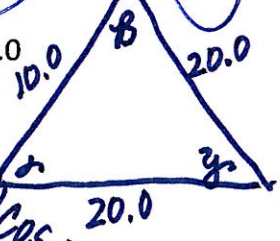
$c \approx 10.6$

$\frac{\sin 45°}{10.6} = \frac{\sin B}{10.0}$

$B \approx 41°40'$

$\alpha \approx 180° - 45° - 41°40' \approx 93°20'$

6. $a = 20.0$, $c = 10.0$, $b = 20.0$



$20^2 = 10^2 + 20^2 - 2(10)(20)\cos \alpha$

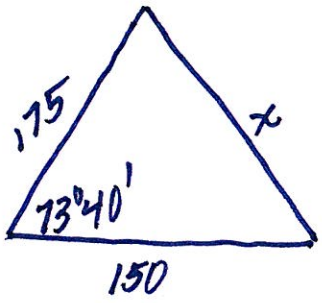
$\frac{20^2 - 10^2 - 20^2}{(-2 \cdot 10 \cdot 20)} = \cos \alpha$

$75°30' \approx \alpha$

$\alpha = B$ so $B \approx 75°30'$

$\gamma = 180 - 75°30' - 75°30' \approx 29°00'$

7. The angle at one corner of a triangular plot of ground is 73°40', and the sides that meet at this corner are 175 feet and 150 feet long. Approximate the length of the third side.

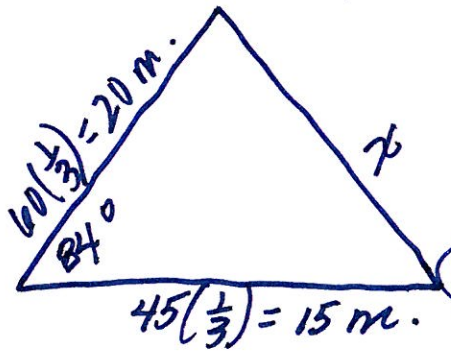


$x = \sqrt{175^2 + 150^2 - 2(175)(150)\cos 73°40'}$

$x \approx 196$ ft.

8. Two automobiles leave a city at the same time and travel along straight highways that differ in direction by 84°. If their speeds are 60 mi/hr and 45 mi/hr, respectively, approximately how far apart are the cars at the end of 20 minutes?

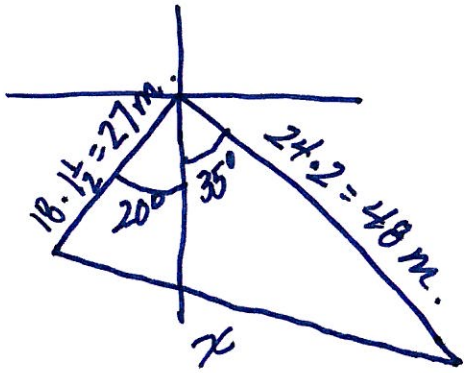
$20\text{ min} = \frac{1}{3}\text{ hr.}$



$x = \sqrt{20^2 + 15^2 - 2(20)(15)\cos 84}$

$x \approx 24$ miles

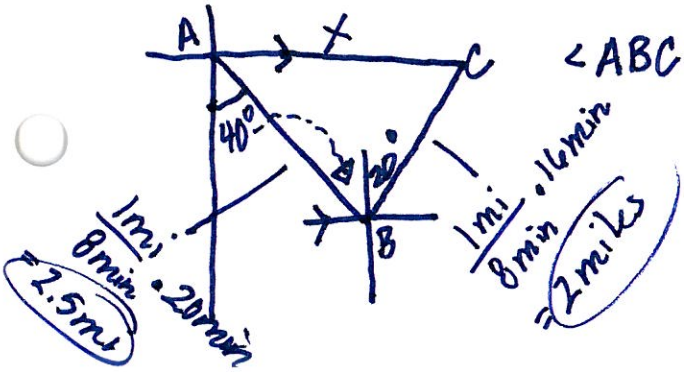
9. A ship leaves port at 1:00 p.m. and travels S35°E at the rate of 24 mi/hr. Another ship leaves the same port at 1:30 p.m. and travels S20°W at 18 mi/hr. Approximately how far apart are the ships at 3:00 p.m.?



$x = \sqrt{27^2 + 48^2 - 2(27)(48)\cos 55°}$

$x \approx 39$ miles

10. A jogger runs at a constant speed of one mile every 8 minutes in the direction S40°E for 20 minutes and then in the direction N20°E for the next 16 minutes. Approximate, to the nearest tenth of a mile, the straight line distance from the endpoint to the starting point of the jogger's course.



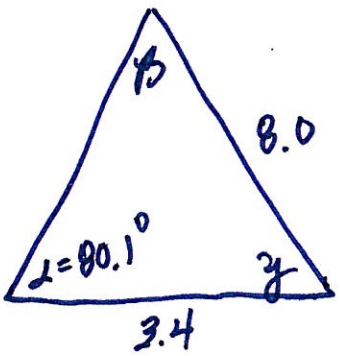
$\angle ABC = 40° + 20° = 60°$

$x \approx \sqrt{2.5^2 + 2^2 - 2(2)(2.5)\cos 60°}$

$x \approx 2.3$ miles

Approximate the area of △ABC.

11. $\alpha = 80.1°$, $a = 8.0$, $b = 3.4$



$\frac{\sin 80.1}{8.0} = \frac{\sin B}{3.4}$

$\angle B = 24.8°$

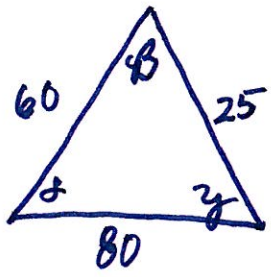
$\angle \gamma \approx 180 - 80.1 - 24.8$

$\gamma \approx 75.1°$

$A = \frac{1}{2}ab\sin\gamma = \frac{1}{2}(8.0)(3.4)\sin 75.1$

$\approx 13.1\ u^2$

12. $a = 25.0$, $b = 80.0$, $c = 60.0$



$80^2 = 60^2 + 25^2 - 2(60)(25)\cos B$

$\frac{80^2 - 60^2 - 25^2}{(-2\cdot 60\cdot 25)} = \cos B$

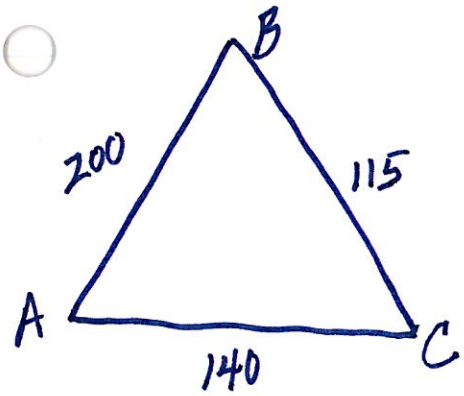
$\angle B \approx 136.47°$

$A = \frac{1}{2}ac\sin B$

$= \frac{1}{2}(25)(60)\sin 136.47$

$\approx 516.6\ u^2$

13. A triangular field has sides of lengths a = 115 yd, b = 140 yd, c = 200 yd. Approximate the number of acres in the field. (1 acre = 4840 yd^2)



$200^2 = 115^2 + 140^2 - 2(115)(140)\cos C$

$\frac{200^2 - 115^2 - 140^2}{(-2\cdot 115\cdot 140)} = \cos C$

$\angle C \approx 102.88°$

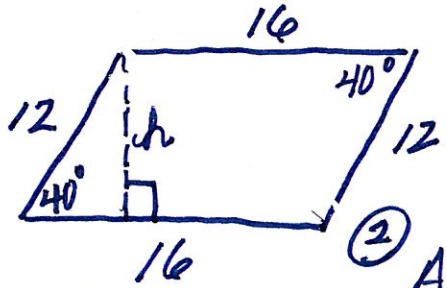
$A = \frac{1}{2}ab\sin C$

$= \frac{1}{2}(115)(140)\sin 102.88°$

$A \approx 7847.5\ yd^2$

$\frac{1a}{4841\ yd^2} = \frac{a}{7847.5\ yd^2}$; $a \approx 1.62$ acres

14. Approximate the area of a parallelogram that has sides of lengths a = 12.0 ft, b = 16.0 ft if one angle at a vertex has measure θ = 40°.



$\sin 40° = \frac{h}{12}$

$h \approx 7.71$

① Area of $1\Delta = \frac{1}{2}(12)(16)\sin 40°$

$= 61.71\ ft^2$

$\times\ 2\ (\Delta's)$

$\approx 123.4\ ft^2$

—or—

② $A_{\square} = b\cdot h$

$= 16(7.71)$

$\approx 123.4\ ft^2$