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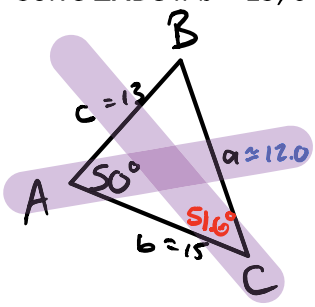
APPLICATION 12.2

1. Solve **ΔABC** if b = 15, c = 13 and A = 50°



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

$a^2 = (15)^2 + (13)^2 - 2(15)(13)\cos 50°$

$a^2 = 225 + 169 - 390\cos 50°$

$a^2 = 394 - 390\cos 50°$

$a = \pm\sqrt{394 - 390\cos 50°}$

$a \approx 12.0$

$\frac{\sin 50°}{12} = \frac{\sin C}{13}$

$\frac{13\sin 50°}{12} = \sin C$

$\sin^{-1}\left(\frac{13\sin 50°}{12}\right) = C$

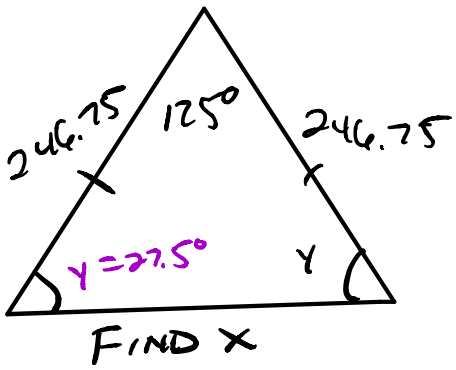
$56.1° \approx C$

$51.6° + 50° + m\angle B = 180°$

$101.6° + m\angle B = 180°$

$m\angle B = 78.4°$

2. The Vietnam Veterans' Memorial in Washington, D.C. is in the shape of an unenclosed isosceles triangle (that is, V-shaped) with equal sides of length 246.75 feet and the angle between these sides measuring 125°. Find the distance between the ends of the two equal sides.



$125 + y + y = 180°$

$125 + 2y = 180°$

$2y = 55°$

$y = 27.5°$

$\frac{\sin 27.5°}{246.75} = \frac{\sin 125°}{x}$

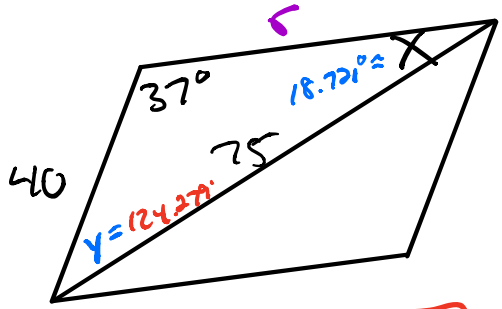
$x\sin 27.5° = 246.75\sin 125°$

$x = \frac{246.75\sin 125°}{\sin 27.5°}$

$x \approx 437.7$

The distance between the ends is about 437.7 feet.

3. A parallelogram has a side of length 40 and a diagonal of length 75. If the angle between these two is 37°, find the length of the other side of the parallelogram.



① $\frac{\sin 37°}{75} = \frac{\sin x}{40}$

$\frac{40\sin 37°}{75} = \sin x$

$\sin^{-1}\left(\frac{40\sin 37°}{75}\right) = x$

$18.721° \approx x$

② $37° + 18.721° + y = 180°$

$55.721 + y = 180°$

$y = 124.279°$

③ $\frac{\sin 37°}{75} = \frac{\sin 124.279°}{r}$

$r\sin 37° = 75\sin 124.279°$

$r = \frac{75\sin 124.279°}{\sin 37°}$

$r \approx 103.0$

The length of the other side is 103.0 units

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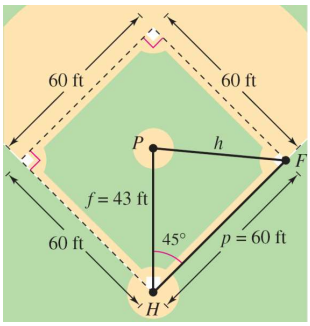
4. The pitcher's mound on a women's softball field is 43 feet from home plate and the distance between the bases is 60 feet, as shown below. (The pitcher's mound is not halfway between home plate and second base.) How far is the pitcher's mound from first base?



$h^2 = f^2 + p^2 - 2fp\cos H$

$h^2 = (43)^2 + (60)^2 - 2(43)(60)\cos 45°$

$h^2 = 1849 + 3600 - 5160\cos 45°$

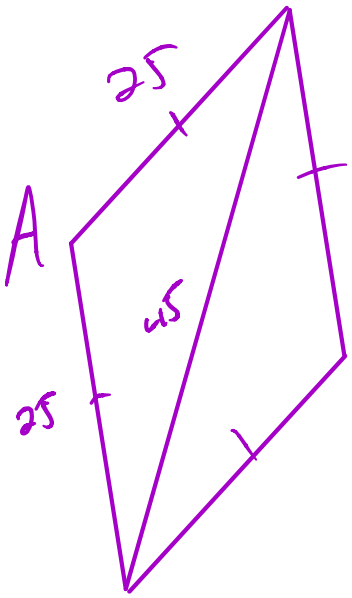
$h^2 = 5449 - 5160\cos 45°$

$h = \pm\sqrt{5449 - 5160\cos 45°}$

$h \approx 42.4$

The pitcher's mound is about 42.4 feet from 1st base.

5. A rhombus has side lengths of 25 inches. The diagonal opposite the obtuse angles is 45 inches. What is the measure of the obtuse angle to the nearest degree?



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

$(45)^2 = (25)^2 + (25)^2 - 2(25)(25)\cos A$

$2025 = 625 + 625 - 1250\cos A$

$2025 = 1250 - 1250\cos A$

$775 = -1250\cos A$

$\frac{775}{-1250} = \cos A$

$\cos^{-1}\left(\frac{775}{-1250}\right) = A$

$103° \approx A$

The obtuse angle is about 103°.