Problem Set 7.2

1. $\sin B = \dfrac{b \sin A}{a}$

$= \dfrac{40 \sin 30^\circ}{10} = 2$

Since $\sin B$ can never be greater than 1, no triangle exists.

3. $\sin B = \dfrac{b \sin A}{a}$

$= \dfrac{20 \sin 120^\circ}{30}$

$= 0.5774$

$B = 35^\circ$

Only one triangle is possible because there can only be one obtuse angle in a triangle.

5. $\sin B = \dfrac{b \sin A}{a}$

$= \dfrac{18 \sin 60^\circ}{16}$

$= 0.9743$

$B = 77^\circ$ or $B' = 180^\circ - 77^\circ = 103^\circ$

Since $a < b$, there are 2 possible triangles.

7. $\sin B = \dfrac{b \sin A}{a}$

$= \dfrac{54 \sin 38^\circ}{41}$

$= 0.8109$

$B = 54^\circ$ or $B^1 = 180^\circ - 54^\circ = 126^\circ$

Since $a < b$, there are 2 possible triangles.

$C = 180^\circ - (38^\circ + 54^\circ) = 88^\circ$

$c = \dfrac{a \sin C}{\sin A}$

$= \dfrac{41 \sin 88^\circ}{\sin 38^\circ} = 67$ ft

$C' = 180^\circ - (38^\circ + 126^\circ) = 16^\circ$

$c' = \dfrac{a \sin C'}{\sin A}$

$= \dfrac{41 \sin 16^\circ}{\sin 38^\circ} = 18$ ft

9. $\sin B = \dfrac{b \sin A}{a}$

$= \dfrac{22.3 \sin 112.2^\circ}{43.8}$

$= 0.4714$

$B = 28.1^\circ$

There is only one triangle possible, because there can only be one obtuse angle in a triangle.

$C = 180^\circ - (112.2^\circ + 28.1^\circ)$

$= 180^\circ - 140.3^\circ = 39.7^\circ$

$c = \dfrac{a \sin C}{\sin A}$

$= \dfrac{43.8 \sin 39.7^\circ}{\sin 112.2^\circ}$

$= 30.2$ cm

11. $\sin B = \dfrac{b \sin C}{c}$

$= \dfrac{425 \sin 27°50'}{347}$

$= 0.5719$

$B = 34°50'$ or $B' = 180° - 34°50' = 145°10'$ There are two triangles possible because c < b.

$A = 180° - (34°50' + 27°50')$

$= 180° - 62°40' = 117°20'$

$a = \dfrac{c \sin A}{\sin C}$

$= \dfrac{347 \sin 117°20'}{\sin 27°50'}$

$= 660 \text{ m}$

$A' = 180° - (145°10' + 27°50')$

$= 180° - 173° = 7°$

$a' = \dfrac{c \sin A'}{\sin C}$

$= \dfrac{347 \sin 7°}{\sin 27°50'}$

$= 90.6 \text{ m}$

13. $\sin C = \dfrac{c \sin B}{b}$

$= \dfrac{1.12 \sin 45°10'}{1.79}$

$= 0.4437$

$C = 26.3°$ or $C' = 180° - 26.3°$

$C = 26°20'$ $C' = 153.7°$

This is impossible because $45.2° + 153.7° = 198.9°$.

$A = 180° - (45°10' + 26°20') = 108°30'$

$a = \dfrac{b \sin A}{\sin B}$

$= \dfrac{1.79 \sin 108°30'}{\sin 45°10'}$

$= 2.39 \text{ in}$

15. $\sin A = \dfrac{a \sin B}{b}$

$= \dfrac{0.92 \sin 118°}{0.68}$

$= 1.1946$

Since sin A can never be greater than 1, no triangle exists.

17. $\sin B = \dfrac{b \sin A}{a}$

$= \dfrac{2.9 \sin 142°}{1.4}$

$= 1.2753$

Since sin B can never be greater than 1, no triangle exists.

19. $\sin B = \dfrac{b\sin C}{c}$

$= \dfrac{36.8\sin 26.8^\circ}{36.8}$

$= 0.4509$

$B = 26.8^\circ$

Only one triangle is possible because $b = c$. This is an isosceles triangle.

$A = 180^\circ - (26.8^\circ + 26.8^\circ) = 126.4^\circ$

$a = \dfrac{c\sin A}{\sin C}$

$= \dfrac{36.8\sin 126.4^\circ}{\sin 26.8^\circ} = 65.7$ km

21. $\sin C = \dfrac{c\sin A}{a}$

$= \dfrac{50\sin 58^\circ}{44}$

$= 0.9637$

$C = 75^\circ$ or $C' = 105^\circ$

$B = 180^\circ - (58^\circ + 75^\circ)$

$= 180^\circ - 133^\circ = 47^\circ$

$b = \dfrac{44\sin 47^\circ}{\sin 58^\circ}$

$= 38$ feet

$B' = 180^\circ - (58^\circ + 105^\circ)$

$= 180^\circ - 163^\circ = 17^\circ$

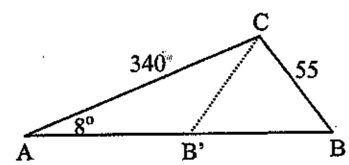
$b' = \dfrac{44\sin 17^\circ}{\sin 58^\circ}$

$= 15$ feet

27. $\sin B = \dfrac{340\sin 8^\circ}{55}$

$= 0.8603$

$B = 59^\circ$ or $B' = 121^\circ$



There are two triangles possible.
We want to find c and c':

$C = 180^\circ - (59^\circ + 8^\circ)$

$= 180^\circ - 67^\circ = 113^\circ$

$c = \dfrac{55\sin 113^\circ}{\sin 8^\circ}$

$= 360$ mph

$C' = 180^\circ - (121^\circ + 8^\circ)$

$= 180^\circ - 129^\circ = 51^\circ$

$c' = \dfrac{55\sin 51^\circ}{\sin 8^\circ}$

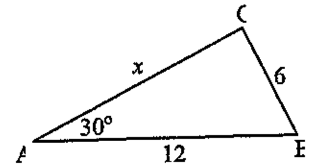
$= 310$ mph

29. $\sin C = \dfrac{12\sin 30^\circ}{6}$

$= 1$

$C = 90^\circ$

This is a 30°-60°-90° right triangle.
Therefore, $x = 6\sqrt{3}$ or 10 mph.



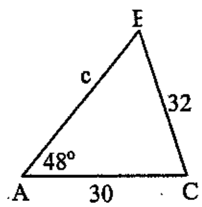
31. $\sin B = \dfrac{30\sin 48^\circ}{32}$

$= 0.5772$

$B = 44^\circ$ *or* $B' = 136^\circ$

This is impossible

$C = 180^\circ - \left(48^\circ + 44^\circ\right) = 88^\circ$



33. $4\sin\theta - \csc\theta = 0$

$4\sin\theta - \dfrac{1}{\sin\theta} = 0$

$4\sin^2\theta - 1 = 0, \quad \sin\theta \neq 0$

$(2\sin\theta - 1)(2\sin\theta + 1) = 0$

$2\sin\theta - 1 = 0$ or $2\sin\theta + 1 = 0$

$\sin\theta = \dfrac{1}{2}$ $\qquad$ $\sin\theta = -\dfrac{1}{2}$

$\theta = 30^\circ$ or 150° $\qquad$ $\theta = 210^\circ$ or 330°

35. $2\cos\theta - \sin 2\theta = 0$

$2\cos\theta - 2\sin\theta\cos\theta = 0$

$2\cos\theta(1 - \sin\theta) = 0$

$2\cos\theta = 0$ or $1 - \sin\theta = 0$

$\cos\theta = 0$ $\qquad$ $\sin\theta = 1$

$\theta = 90^\circ$ or 270° $\qquad$ $\theta = 90^\circ$

37. $18\sec^2\theta - 17\tan\theta\sec\theta - 12 = 0$

$18\left(\dfrac{1}{\cos^2\theta}\right) - 17\left(\dfrac{\sin\theta}{\cos\theta}\right)\left(\dfrac{1}{\cos\theta}\right) - 12 = 0$

$18 - 17\sin\theta - 12\cos^2\theta = 0, \quad \cos\theta \neq 0$

$18 - 17\sin\theta - 12\left(1 - \sin^2\theta\right) = 0$

$18 - 17\sin\theta - 12 + 12\sin^2\theta = 0$

$12\sin^2\theta - 17\sin\theta + 6 = 0$

$12\sin^2\theta - 17\sin\theta + 6 = 0$

$(4\sin\theta - 3)(3\sin\theta - 2) = 0$

$(4\sin\theta - 3)(3\sin\theta - 2) = 0$

$4\sin\theta - 3 = 0$ or $3\sin\theta - 2 = 0$

$\sin\theta = \dfrac{3}{4}$ $\qquad$ $\sin\theta = \dfrac{2}{3}$

$\theta = 48.6^\circ$ or 131.4° $\qquad$ $\theta = 41.8^\circ$ or 138.2°

39. $2\cos x - \sec x + \tan x = 0$

$$2\cos x - \frac{1}{\cos x} + \frac{\sin x}{\cos x} = 0$$

$$2\cos^2 x - 1 + \sin x = 0, \quad \cos x \neq 0$$

$$2(1-\sin^2 x) - 1 + \sin x = 0$$

$$2 - 2\sin^2 x - 1 + \sin x = 0$$

$$2\sin^2 x - \sin x - 1 = 0$$

$$(2\sin x + 1)(\sin x - 1) = 0$$

$\sin x - 1 = 0$ or $2\sin x + 1 = 0$

$\sin x = 1$ $\qquad$ $\sin x = -\frac{1}{2}$

$x = \frac{\pi}{2} + 2k\pi$ $\qquad$ $x = \frac{7\pi}{6} + 2k\pi$ or $\frac{11\pi}{6} + 2k\pi$

This answer doesn't check.

41. $\sin x + \cos x = 0$

$$\sin x = -\cos x$$

$$\frac{\sin x}{\cos x} = -1, \quad \cos x \neq 0$$

$$\tan x = -1$$

$\hat{x} = \frac{\pi}{4}$ and x is in QII or QIV

$$x = \frac{3\pi}{4} + 2k\pi \text{ or } x = \frac{7\pi}{4} + 2k\pi$$

Problem Set 7.3

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

$$= (120)^2 + (66)^2 - 2(120)(66)\cos 60^\circ$$

$$= 10{,}836$$

$c = 100$ inches (rounded to 2 significant digits)

3. $\cos C = \frac{c^2 - a^2 - b^2}{-2ab}$

$$= \frac{26^2 - 22^2 - 24^2}{-2(22)(24)}$$

$$= 0.3636$$

$C = 69^\circ$ (The largest angle is opposite the longest side)

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

$$= (4.2)^2 + (6.8)^2 - 2(4.2)(6.8)\cos 116^\circ$$

$$= 88.92$$

$a = 9.4$ meters

7. $\cos A = \frac{a^2 - b^2 - c^2}{-2bc}$

$$= \frac{38^2 - 10^2 - 31^2}{-2(10)(31)}$$

$$= -0.6177$$

$A = 128^\circ$