Chapter 4: Oblique Triangle Trigonometry

Lesson 4.1: Exploring the Primary Trigonometric Ratios of Obtuse Angles, page 163

1. a) not valid; $180° - 25° \neq 65°$
b) valid; $180° - 70° = 110°$
c) not valid; $\tan 46° = -\tan 134°$
d) valid; $180° - 122° = 58°$
e) not valid; $\cos 135° = -\cos 45°$
f) valid; $180° - 175° = 5°$
2. a) $\sin 15° = 0.2588$; $\sin 165° = 0.2588$
b) $\cos 62° = 0.4695$; $\cos 118° = -0.4695$
c) $\tan 35° = 0.7002$; $\tan 145° = -0.7002$
d) $\sin 170° = 0.1736$; $\sin 10° = 0.1736$
3. a) $\sin\theta = 0.64$
$\sin^{-1}(0.64) = 40°$
$180° - 40° = 140°$
$\theta = 40°$ or $140°$

b) $\sin\theta = \frac{1}{3}$

$\sin^{-1}\left(\frac{1}{3}\right) = 19°$

$180° - 19° = 161°$
$\theta = 19°$ or $161°$
c) $\sin\theta = 0.95$
$\sin^{-1}(0.95) = 72°$
$180° - 72° = 108°$
$\theta = 72°$ or $108°$

d) $\sin\theta = \frac{7}{23}$

$\sin^{-1}\left(\frac{7}{23}\right) = 18°$

$180° - 18° = 162°$
$\theta = 18°$ or $162°$
4. a) $\sin D = \sin K$, $\sin H = \sin M$, $\sin H = \sin N$, $\sin H = \sin O$, $\sin M = \sin N$, $\sin M = \sin O$, $\sin N = \sin O$
b) The cosine and tangent ratios for $\angle D$ and $\angle K$, *and for* $\angle M$ and $\angle H$ are opposites. The other angles have equal cosine and tangent ratios.

Lesson 4.2: Proving and Applying the Sine and Cosine Laws for Obtuse Triangles, page 170

1. a) Reverse $\sin 100°$ and $\sin 32°$.
b) On the left side of the equation change 12 to x; on the right side of the equation, change x to 12.
2. a) sine law; two side lengths and the measure of one opposite angle are known.
b) cosine law; all three side lengths are known.
c) cosine law; two side lengths and the measure of the contained angle are known.
d) sine law; the measures of two angles and one side length are known.
e) neither; none of the side lengths are known

3. a) $\frac{x}{\sin 101°} = \frac{4.0}{\sin 28°}$

$\sin 101°\left(\frac{x}{\sin 101°}\right) = \left(\frac{4.0}{\sin 28°}\right)\sin 101°$

$x = 8.363...$ cm

To the nearest tenth of a centimetre, x is 8.4 cm.
b) $x^2 = 30.0^2 + 24.0^2 - 2(30.0)(24.0)\cos(32.0°)$
$x = \sqrt{254.810...}$
$x = 15.962\ldots$
To the nearest tenth of a centimetre, x is 16.0 cm.
c) $x^2 = 1.4^2 + 2.0^2 - 2(1.4)(2.0)\cos(130.0°)$
$x = \sqrt{9.559...}$
$x = 3.091\ldots$
To the nearest tenth of a centimetre, x is 3.1 cm.

4. a) $\frac{\sin x}{44} = \frac{\sin 118°}{68}$

$44\left(\frac{\sin x}{44}\right) = \left(\frac{\sin 118°}{68}\right)44$

$\sin x = 0.5713...$

$x = \sin^{-1}(0.5713...)$

$x = 34.8409...°$

To the nearest degree, x is 35°.

b) $\cos x = \frac{2^2 + 4^2 - 5^2}{(2)(2)(4)}$

$\cos x = -0.3125$

$x = \cos^{-1}(-0.3125)$

$x = 108.2099...°$

To the nearest degree, x is 108°.

c) $\frac{\sin x}{106} = \frac{\sin 150°}{180}$

$106\left(\frac{\sin x}{106}\right) = \left(\frac{\sin 150°}{180}\right)106$

$\sin x = 0.2944...$

$x = \sin^{-1}(0.2944...)$

$x = 17.1215...°$

To the nearest degree, x is 17°.
5. a) $m^2 = 7.5^2 + 11.2^2 - 2(7.5)(11.2)\cos(105°)$
$m = \sqrt{225.171...}$
$m = 15.005\ldots$
To the nearest tenth of a centimetre, m is 15.0 cm.

$\frac{\sin L}{11.2} = \frac{\sin 105°}{15.0}$

$11.2\left(\frac{\sin L}{11.2}\right) = \left(\frac{\sin 105°}{15.0}\right)11.2$

$\sin L = 0.7212...$

$\angle L = \sin^{-1}(0.7212...)$

$\angle L = 46.1536...°$

To the nearest degree, $\angle L$ is 46°.