Unit 1 Test Answers

1. Area 1:

$$(a+b)^2$$
$$(a+b)(a+b)$$
$$a^2+2ab+b^2$$

Area 2: Add up 4 triangles and inner square.

$$4\cdot\frac{1}{2}ab+c^2$$
$$2ab+c^2$$

Set the two equal to each other:

$$a^2+2ab+b^2=2ab+c^2$$
$$a^2+b^2=c^2$$

2. First, find the diagonal of the base. This is a Pythagorean Triple, so the base diagonal is 25 (you could have also done the Pythagorean Theorem if you didn't see this). Now, do the Pythagorean Theorem with the height and the diagonal to get the three-dimensional diagonal.

$$7^2+25^2=d^2$$
$$49+625=d^2$$
$$674=d^2$$
$$\sqrt{674}=d\approx 25.96$$

3.

$$\angle C=90^\circ-23.6^\circ=66.4^\circ$$

$$\sin 23.6=\frac{CA}{25} \qquad \cos 23.6=\frac{AT}{25}$$
$$25\cdot\sin 23.6=CA \qquad 25\cdot\cos 23.6=AT$$
$$10.01\approx CA \qquad 22.9\approx AT$$

4. First do the Pythagorean Theorem to get the third side.

$$7^2+x^2=18^2$$
$$49+x^2=324$$
$$x^2=275$$
$$x=\sqrt{275}=5\sqrt{11}$$

Second, use one of the inverse functions to find the two missing angles.

$$\sin G=\frac{7}{18}$$
$$\sin^{-1}\left(\frac{7}{18}\right)=G$$
$$G\approx 22.89^\circ$$

We can subtract $\angle G$ from 90 to get 67.11°.

5.

$$\begin{aligned} A &= ab\sin C \\ &= 16\cdot 22\cdot \sin 60^\circ \\ &= 352\cdot \frac{\sqrt{3}}{2} \\ &= 176\sqrt{3} \end{aligned}$$

6. Make a right triangle with 165 as the opposite leg and w is the hypotenuse.

$$\begin{aligned} \sin 85^\circ &= \frac{165}{w} \\ w\sin 85^\circ &= 165 \\ w &= \frac{165}{\sin 85^\circ} \\ w &\approx 165.63 \end{aligned}$$

7.

$$\begin{aligned} \cos(90^\circ - x) &= \sin x \\ \sin x &= \frac{2}{7} \end{aligned}$$

8. If $\cos(-x) = \frac{3}{4}$, then $\cos x = \frac{3}{4}$. With $\tan x = \frac{\sqrt{7}}{3}$, we can conclude that $\sin x = \frac{\sqrt{7}}{4}$ and $\sin(-x) = -\frac{\sqrt{7}}{4}$.
9. If $\sin y = \frac{1}{3}$, then we know the opposite side and the hypotenuse. Using the Pythagorean Theorem, we get that the adjacent side is $2\sqrt{2}\left(1^2 + b^2 = 3^2 \rightarrow b = \sqrt{9-1} \rightarrow b = \sqrt{8} = 2\sqrt{2}\right)$. Thus, $\cos y = \pm\frac{2\sqrt{2}}{3}$ because we don't know if the angle is in the second or third quadrant.
10. $\sin\theta = \frac{1}{3}$, sine is positive in Quadrants I and II. So, there can be two possible answers for the $\cos\theta$. Find the third side, using the Pythagorean Theorem:

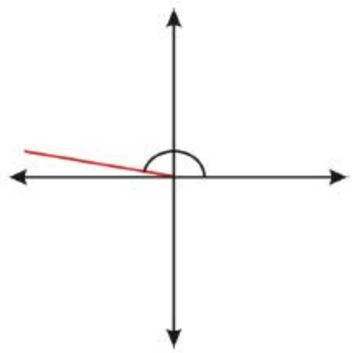
$$\begin{aligned} 1^2 + b^2 &= 3^2 \\ 1 + b^2 &= 9 \\ b^2 &= 8 \\ b &= \sqrt{8} = 2\sqrt{2} \end{aligned}$$

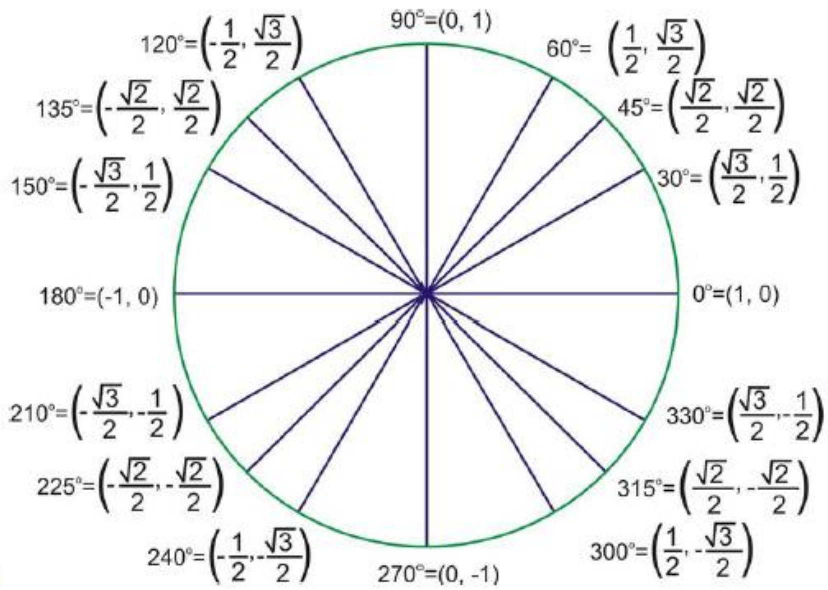
In Quadrant I, $\cos\theta = \frac{2\sqrt{2}}{3}$ In Quadrant II, $\cos\theta = -\frac{2\sqrt{2}}{3}$

11. $\cos\theta = -\frac{2}{5}$ and is in Quadrant II, so from the Pythagorean Theorem :

$$\begin{aligned} a^2 + (-2)^2 &= 5^2 \\ a^2 + 4 &= 25 \\ a^2 &= 21 \\ a &= \sqrt{21} \end{aligned}$$

So, $\sin\theta = \frac{\sqrt{21}}{5}$ and $\tan\theta = -\frac{\sqrt{21}}{2}$
12. If the terminal side of θ is on (3, -4) means θ is in Quadrant IV, so cosine is the only positive function. Because the two legs are lengths 3 and 4, we know that the hypotenuse is 5. 3, 4, 5 is a Pythagorean Triple (you can do the Pythagorean Theorem to verify). Therefore, $\sin\theta = \frac{3}{5}, \cos\theta = -\frac{4}{5}, \tan\theta = -\frac{4}{3}$
13. Reference angle $= 15^\circ$. Possible coterminal angles $= -195^\circ, 525^\circ$




90°=(0, 1)
60°= $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
120°=$\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
45°=$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
135°=$\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
30°=$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
150°=$\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
180°=(-1, 0)
0°=(1, 0)
210°=$\left(-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$
330°=$\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$
225°=$\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$
315°=$\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$
240°=$\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$
300°=$\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$
270°=(0, -1)

14.