Extra Practice for Section I: Chapter 8

1. Find the exact value of all six trig functions for the angles A and B in the triangle in Fig. 1. (The triangle may not be drawn to scale.)

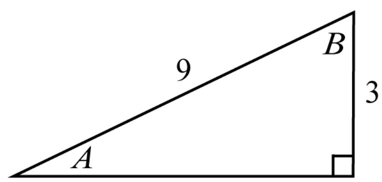

Figure 1

Click here to see the solution to **1.**

2. Find the values of c, A, and B in the triangle in Figure 2. You should approximate the values (in degrees for the angles) and denote your approximations correctly.
(The triangle may not be drawn to scale.)

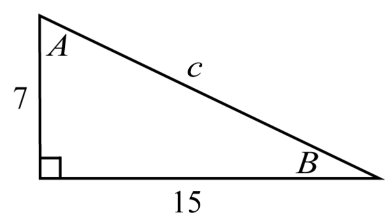

Figure 2

Click here to see the solution to **2.**

3. Find the values of b, A, and B in the triangle in Figure 3. You should approximate the values (in degrees for the angles) and denote your approximations correctly.
(The triangle may not be drawn to scale.)

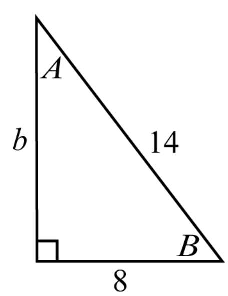

Figure 3

Click here to see the solution to **3.**

Solution to **1.**

1. Find the exact value of all six trig functions for the angles A and B in the triangle in Fig. 1. (The triangle may not be drawn to scale.)

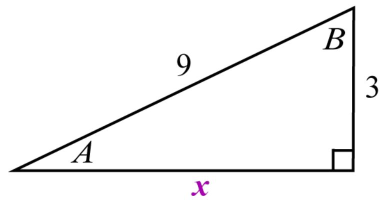

Figure 1

First let's use the Pythagorean Theorem to find the length of the side labeled $\boldsymbol{x}$ in Figure 1:

$$\begin{aligned} & x^2 + 3^2 = 9^2 \\ \Rightarrow\ & x^2 + 9 = 81 \\ \Rightarrow\ & x^2 = 72 \\ \Rightarrow\ & x = \sqrt{72} \\ \Rightarrow\ & x = 6\sqrt{2} \end{aligned}$$

Now, let's find the value of all six trig functions for the angle A:

$\sin(A) = \frac{\text{OPP}}{\text{HYP}} = \frac{3}{9} = \frac{1}{3}$	$\cos(A) = \frac{\text{ADJ}}{\text{HYP}} = \frac{6\sqrt{2}}{9} = \frac{2\sqrt{2}}{3}$	$\tan(A) = \frac{\text{OPP}}{\text{ADJ}} = \frac{3}{6\sqrt{2}} = \frac{1}{2\sqrt{2}}$
$\csc(A) = \frac{1}{\sin(A)} = \frac{1}{\frac{1}{3}} = 3$	$\sec(A) = \frac{1}{\cos(A)} = \frac{1}{\frac{2\sqrt{2}}{3}} = \frac{3}{2\sqrt{2}}$	$\cot(A) = \frac{1}{\tan(A)} = \frac{1}{\frac{1}{2\sqrt{2}}} = 2\sqrt{2}$

Finally, let's find the value of all six trig functions for the angle B:

$\sin(B) = \frac{\text{OPP}}{\text{HYP}} = \frac{6\sqrt{2}}{9} = \frac{2\sqrt{2}}{3}$	$\cos(B) = \frac{\text{ADJ}}{\text{HYP}} = \frac{3}{9} = \frac{1}{3}$	$\tan(B) = \frac{\text{OPP}}{\text{ADJ}} = \frac{6\sqrt{2}}{3} = 2\sqrt{2}$
$\csc(B) = \frac{1}{\sin(B)} = \frac{1}{\frac{2\sqrt{2}}{3}} = \frac{3}{2\sqrt{2}}$	$\sec(B) = \frac{1}{\cos(B)} = \frac{1}{\frac{1}{3}} = 3$	$\cot(B) = \frac{1}{\tan(B)} = \frac{1}{2\sqrt{2}}$

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Solution to **2.**

2. Find the values of c, A, and B in the triangle to the right. You should approximate the values (in degrees for the angles) and denote your approximations correctly.
(The triangle may not be drawn to scale.)

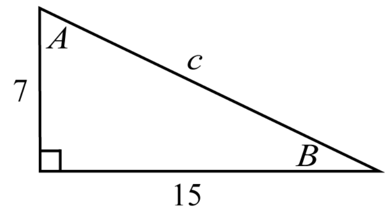

Figure 2

First let's use the Pythagorean Theorem to find the length of the side c in Figure 2:

$$\begin{aligned} & c^2 = 7^2 + 15^2 \\ \Rightarrow\ & c^2 = 49 + 225 \\ \Rightarrow\ & c^2 = 274 \\ \Rightarrow\ & c = \sqrt{274} \approx 16.55 \end{aligned}$$

Now we can use the tangent function to get an equation involving angle B and then solve the equation for B:

$$\begin{aligned} & \tan(B) = \tfrac{7}{15} \\ \Rightarrow\quad & B = \tan^{-1}\left(\tfrac{7}{15}\right) \approx 25.02^\circ \end{aligned}$$

Note that we've chosen to use tangent (instead of sine or cosine) to find B since that allows us to use the given side-lengths. If we use sine or cosine, we would need to use the value for c that we found above but it's possible that we made a mistake so, whenever possible, it's more sensible rely on the given information rather than on information that we've found ourselves.

Finally, we can use the rule that the sum of the angles in a triangle is always 180° to find angle A:

$$\begin{aligned} & A + B + 90^\circ = 180^\circ \\ \Rightarrow\ & A + 25.02^\circ + 90^\circ \approx 180^\circ \\ \Rightarrow\ & A \approx 180^\circ - 90^\circ - 25.02^\circ \\ \Rightarrow\ & A \approx 64.98^\circ \end{aligned}$$

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Solution to **3.**

3. Find the values of c, A, and B in the triangle to the right. You should approximate the values (in degrees for the angles) and denote your approximations correctly.
(The triangle may not be drawn to scale.)

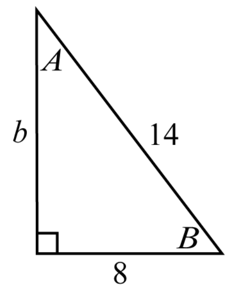

Figure 3

First let's use the Pythagorean Theorem to find the length of the side b in Figure 2:

$$b^2 + 8^2 = 14^2$$
$$\Rightarrow \quad b^2 = 196 - 64$$
$$\Rightarrow \quad b^2 = 132$$
$$\Rightarrow \quad b = \sqrt{132} \approx 11.49$$

Now we can use the cosine function to get an equation involving angle B and then solve the equation for B:

$$\cos(B) = \frac{8}{14}$$
$$\Rightarrow \quad B = \cos^{-1}\left(\frac{8}{14}\right) \approx 55.15^\circ$$

Note that we've chosen to use cosine (instead of sine or tangent) to find B because that allows us to use the given side-lengths. If we use sine or tangent, we would need to use the value for b that we found above but it's possible that we made a mistake so, whenever possible, it's more sensible rely on the given information rather than on information that we've found ourselves.

Finally, we can use the rule that the sum of the angles in a triangle is always 180° to find angle A:

$$A + B + 90^\circ = 180^\circ$$
$$\Rightarrow \quad A + 55.15^\circ + 90^\circ \approx 180^\circ$$
$$\Rightarrow \quad A \approx 180^\circ - 90^\circ - 55.15^\circ$$
$$\Rightarrow \quad A \approx 34.85^\circ$$

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