1. Convert $135^\circ$ to radians. Give your answer as a fraction involving $\pi$.

2. Convert $\frac{\pi}{15}$ radians to degrees.

3. The hour hand of a clock is 8 inches long and moves from 12 to 2 o’clock. How far (in inches) does the tip of the hour hand move?

4. The radius of a wheel rolling on the ground is 80 centimeters. If the wheel rotates through an angle of $60^\circ$, how many centimeters does it move? Express your answer in terms of $\pi$.

5. The planet Venus completes one rotation on its axis every 243 Earth days. Through what angle (measured in degrees) does it rotate in one Earth day?
6. Consider the following right triangle:

(a) What is $\sin \theta$?
(b) What is $\cos \theta$?
(c) What is $\tan \theta$?
(d) What is $\sec \theta$?
(e) What is $\csc \theta$?
(f) What is $\cot \theta$?

7. Consider the following right triangle:

Determine the value of $\theta$ measured in radians.
8. Consider the following right triangle:

Write an equation expressing the relationship between $a$ and $\theta$.

9. Consider the following right triangle:

(a) If $\theta = \frac{\pi}{6}$ radians, what is $a$?

(b) If $a = 2$, what is $\theta$? Give your answer in radians.
10. A stick casts a shadow as shown in the following picture:

![Diagram of a stick casting a shadow]

If the stick is 5 feet tall, and the shadow is 2 feet long, what is the angle $\alpha$ in degrees?

11. A 5 mile straight segment of a road climbs a 4000-ft hill. Determine the angle (measured in degrees) that the road makes with the horizontal.
12. King Kong is on top of a building as in the following picture:

If King Kong is 20 ft. tall, determine the height of the building.
13. An airplane flies directly over an observer standing on the ground. The following picture shows the position of the plane a short while later:

![Diagram of an airplane flying at a constant altitude]

The plane maintains a constant altitude of two miles, and a constant forward speed of 500 mph.

(a) Find a formula for the angle \( \theta \) in terms of the distance \( x \).

(b) If it has been \( t \) minutes since the plane passed over the observer, what is the angle \( \theta \) (in terms of \( t \)?)