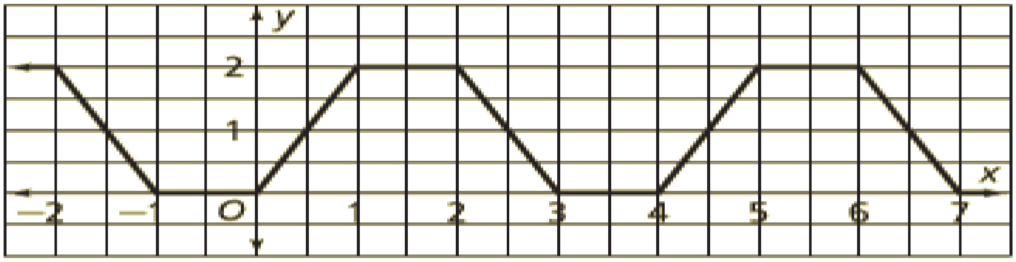
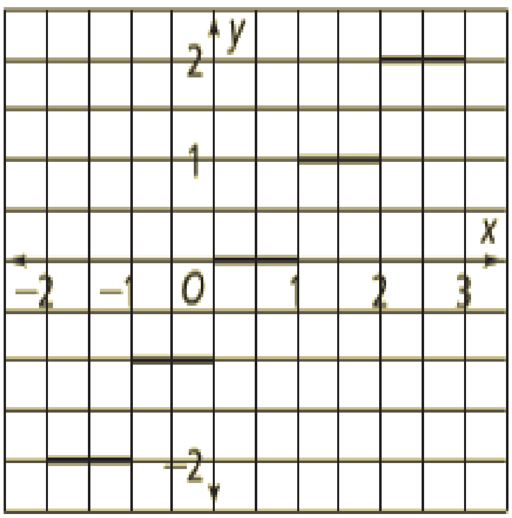
Trigonometry

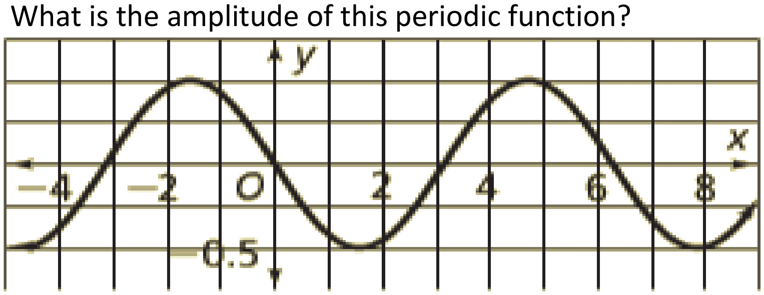
- *Periodic Function*: A function that repeats a pattern of *y*-values at regular intervals.
    - *Cycle*: One complete pattern
    - *Period:* Horizontal length of one cycle
    - *Amplitude*: Half the difference between the maximum and minimum values of the function.
- Examples:
    - Analyze the periodic function below. What is the period of this function?



    - Is the function periodic? If it is periodic, what is its period?

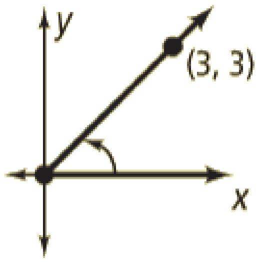


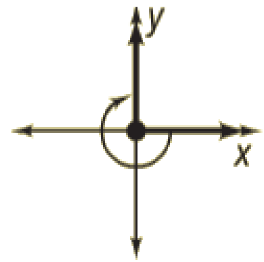
    - What is the amplitude of this periodic function?



- *Angles and Unit Circle*
    - Standard Position
    - Initial/Terminal Side
    - Negative/Positive Measure
    - Coterminal Angles: Two angles that have the same terminal side
    - **Unit Circle**: Circle radius 1 and its center at the original of the coordinate plane.
        - Theta (θ) represents the measure of the angle in standard position.
        - Cosine of θ (cos θ) is the *x* coordinate of the point at which the terminal side of the angle intersects the unit circle. Sine of θ (sin θ) is the *y* coordinate.

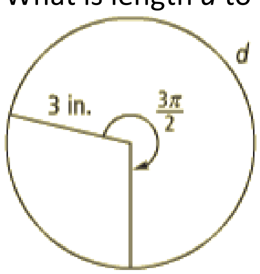
- Examples:
  - What is the measure of each angle?





  - What is the sketch of each angle in standard position?
    - $100°$
    - $-215°$
  - Which of the following angles is not coterminal with the other three?
    - $750°$
    - $-330°$
    - $30°$
    - $-540°$
  - What are $\cos\theta$ and $\sin\theta$ for $\theta = -360°, \theta = 180°, \theta = 450°$
  - What are the cosine and sine of the angle:
    - $135°$
    - $300°$

- *Radian Measure*: Measure of a central angle that intercepts an arc with length equal to the radius of the circle. An angle with a full circle rotation measures 2π radians. Semicircle: π radians.
- *Proportions*:
  - $\frac{d°}{180°} = \frac{r\ radians}{\pi\ radians}$
  - To convert between degrees and radians
    - Degrees to Radians: Multiply by $\frac{2\pi\ radians}{360°}$
    - Radians to Degrees: Multiply by $\frac{360°}{2\pi\ radians}$
- Intercepted Arc Length: For a circle of radius *r* and central angle of measure θ (in radians), the length *s* of the intercepted arc is $s = r\theta$.
- Examples:
  - What is the degree measure of an angle of $-\frac{7\pi}{30}$ radians?
  - What are the exact measures of $\sin\pi$ and $\cos\pi$?
  - What is length *d* to the nearest tenth?



  - A satellite in geosynchronous orbit travels one Earth circumference in a full day. From a point on the ground, the satellite appears stationary overhead. The orbital height for a geosynchronous satellite is about 36,000 km. The radius of Earth is 6400 km. About how far does the satellite travel in 8 hours? Assume the length of an Earth day is exactly 24 hours.