

Unit 4: Trigonometric Functions

Activity 1: Review of sine and cosine functions and Radian Measure

Homework/Formative Assessment

- Determine the length of the arc subtended by an angle of $\frac{\pi}{3}$ radians around a circle with a radius of 4cm.
- Express the angle that the second hand on a watch turns in 25 s, in radian measure in exact form, and in approximate form, to the nearest hundredth of a radian.
- Determine the exact value of each angle in radian measure:
 - 135°
 - 200°
 - 400°
- Determine the measure of each angle in degrees:
 - $\frac{5\pi}{6}$
 - $\frac{11\pi}{12}$
 - 8
- A small electric motor turns at 1500 revolutions/min. Express the angular velocity, in radians per second, in exact form.
 50π rad/s.
- The Earth has a radius of approximately 6400 km.
 - How many radians per second is the Earth rotating at the equator?
 - What is the speed of the Earth, in kilometres per second?
 - If the Earth rotates 2° , how many kilometres has it rotated along the surface of the earth?

Homework/Formative Assessment - SOLUTIONS

1. Determine the length of the arc subtended by an angle of $\frac{\pi}{3}$ radians around a circle with a radius of 4 cm.

$$a = r\theta$$

$$a = (4)\left(\frac{\pi}{3}\right)$$

$$a = \frac{4\pi}{3}$$

$$a \approx 4.19$$

The length of the arc is approximately 4.19 cm.

2. Express the angle that the second hand on a watch turns in 25 s, in radian measure in exact form, and in approximate form, to the nearest hundredth of a radian.

$$\frac{25}{60} \times 2\pi$$

$$= \frac{50\pi}{60}$$

$$= \frac{5\pi}{6}$$

$$\approx 2.62$$

3. Determine the exact value of each angle in radian measure:

a) 135°

b) 200°

c) 400°

$$= \frac{3\pi}{4}$$

$$= \frac{10\pi}{9}$$

$$= \frac{20\pi}{9}$$

4. Determine the measure of each angle in degrees:

a) $\frac{5\pi}{6}$

b) $\frac{11\pi}{12}$

c) 8

$$= 150^\circ$$

$$= 165^\circ$$

$$458.4^\circ$$

5. A small electric motor turns at 1500 revolutions/min. Express the angular velocity, in radians per second, in exact form.

$$1500 \frac{\text{rev}}{\text{min}} \times \frac{\text{min}}{60 \text{sec}} \times \frac{2\pi \text{ rad}}{1 \text{ rev}}$$

$$= 50\pi \frac{\text{rad}}{\text{sec}}$$

6. The Earth has a radius of approximately 6400 km.

a) How many radians per second is the Earth rotating at the equator?

$$24 \text{hrs} = 1440 \text{min} = 86400 \text{sec}$$

$$\frac{1 \text{rev}}{24 \text{hours}} \times \frac{2\pi \text{ rad}}{1 \text{rev}} \times \frac{24 \text{hours}}{86400 \text{ sec}}$$

$$= \frac{\pi}{43200} \text{ rad / sec}$$

b) What is the speed of the Earth, in kilometres per second?

$$C = 2\pi r$$

$$C = 2\pi(6400)$$

$$C = 12800\pi \text{ km}$$

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{12800\pi \text{ km}}{86400 \text{s}}$$

$$\text{Speed} = 0.465 \text{ km/s}$$

c) If the Earth rotates 2° , how many kilometres has it rotated along the surface of the earth?

$$\frac{\text{distance}}{\text{Circumference}} = \frac{\theta}{360^\circ}$$

$$\text{distance} = \frac{2^\circ}{360^\circ} \times 12800\pi \text{ km}$$

$$= 223.4 \text{ km}$$