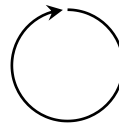


CONCEPT: CIRCUMFERENCE, PERIOD AND FREQUENCY IN UNIFORM CIRCULAR MOTION

- When objects complete a full **ROTATION** a.k.a. **REVOLUTION** a.k.a. **CYCLE**:

- the distance traveled is called the CIRCUMFERENCE ___ = ___



- **Period** (___) → # of ___ per ___; Unit: [___] or [___]

$$\boxed{T = \text{---}} \Leftrightarrow \boxed{f = \text{---}}$$

- **Frequency** (___) → # of ___ per ___; Unit: [___ = ___] or [___]

EXAMPLE: Calculate the period and frequency of your motion if you complete:

a) 4 rotations in 2 seconds

b) 0.5 rotations in 3 seconds

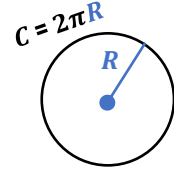
PROBLEM: Modern windmills usually spin at a rate of 20 Revolutions Per Minute (**R.P.M**). At this rate, how long does it take for a windmill blade to complete a full rotation?

Circ. Motion
$a_c = \frac{v_T^2}{R}$
$T = \frac{1}{f} \Leftrightarrow f = \frac{1}{T} = \frac{\text{RPM}}{60}$

- Whenever you're given Revs per Minute (RPMs), to get frequency → $f = \frac{\text{RPM}}{60}$

CONCEPT: MORE EQUATIONS FOR VELOCITY AND ACCELERATION IN UNIFORM CIRCULAR MOTION

- We can combine the circumference, period, and frequency into equations for v_T and a_c :



$$v_T = \frac{\text{distance}}{\text{time}} \Rightarrow v_T = \text{---} = \text{---} \text{ OR } \text{---}$$

$$a_c = \frac{v_T^2}{R} \Rightarrow a_c = \text{---} \text{ OR } \text{---}$$

EXAMPLE: A ball moves in a circle of radius 10m. Calculate:

a) its speed if it takes 60 seconds to complete 100 rotations

b) its centripetal acceleration if it completes 1 rotation every 3 minutes

PROBLEM: A 3kg rock spins horizontally at the end of a 2m string at 90 RPM. Calculate its centripetal acceleration.

Circ. Motion
$a_c = \frac{v_T^2}{R} = \frac{4\pi^2 R}{T^2} = 4\pi^2 R f^2$
$T = \frac{1}{f} \Leftrightarrow f = \frac{1}{T} = \frac{\text{RPM}}{60}$
$v_T = \frac{C}{T} = \frac{2\pi R}{T} = 2\pi R f$

PROBLEM: A big problem for astronauts in space is the lack of gravity! One way to simulate gravity is to build a space ship with spinning rings attached to it. If a cylindrical space station of diameter = 500m is spun about its axis, how fast in revolutions per minute (RPM) must it turn so the astronauts inside feel an acceleration equal to that of Earth (*g*)?

Circ. Motion
$a_c = \frac{v_T^2}{R} = \frac{4\pi^2 R}{T^2} = 4\pi^2 R f^2$
$T = \frac{1}{f} \Leftrightarrow f = \frac{1}{T} = \frac{\text{RPM}}{60}$
$v_T = \frac{C}{T} = \frac{2\pi R}{T} = 2\pi R f$