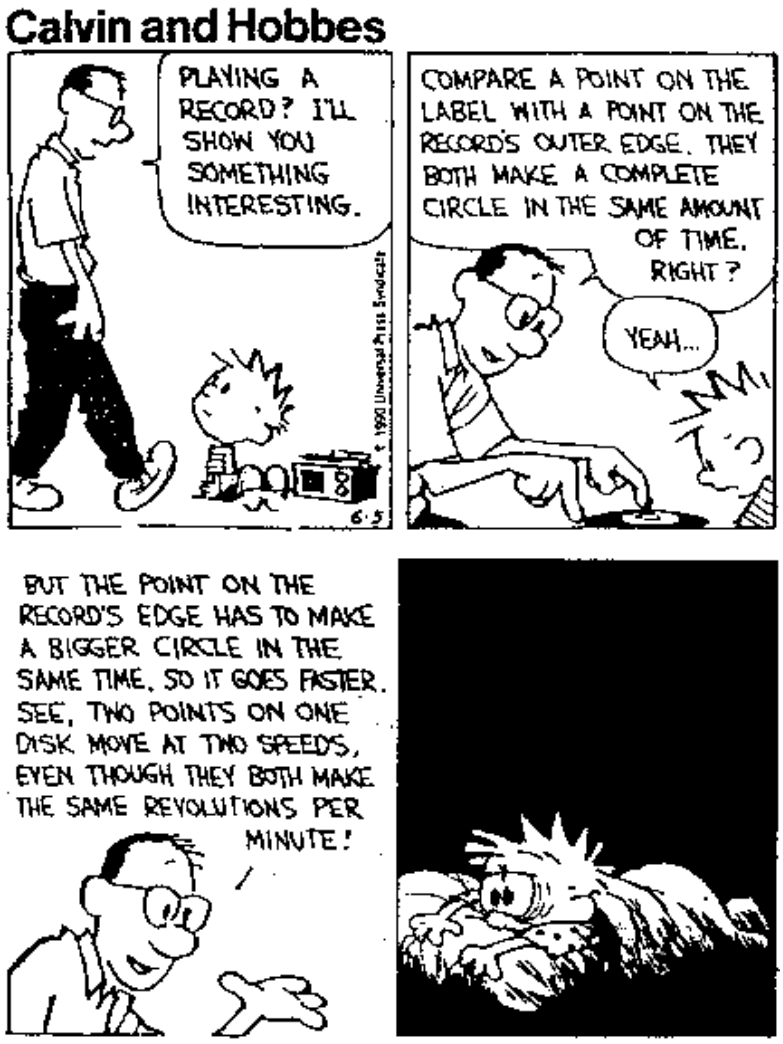
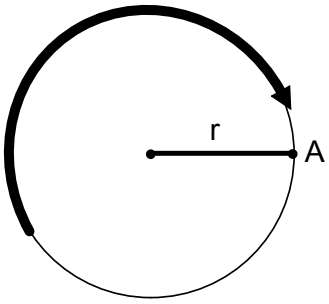
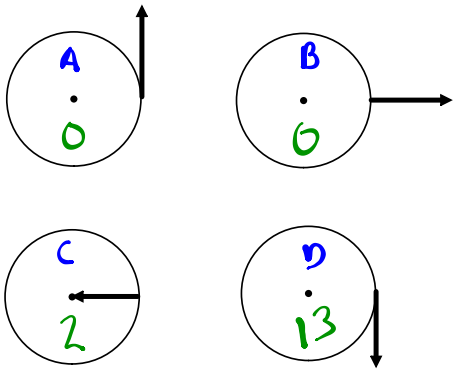
L06 - Period, Frequency, Speed



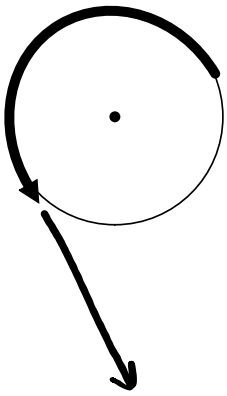
Circular Motion and Velocity

If an object is moving clockwise, what is the direction of it's velocity at point A?





Video proof?



Outside Activity

Pinwheel Walk

- Period
- Frequency
- Speed as a function of Radius

Circular Motion and Velocity

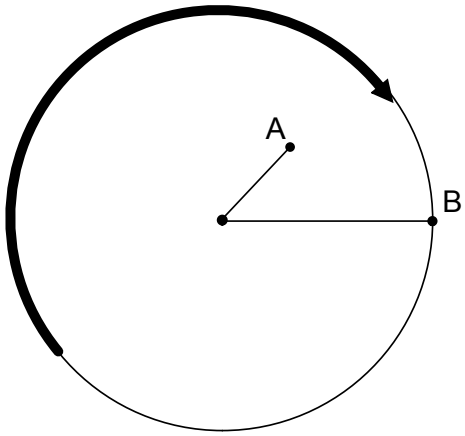
How fast is the object moving?

$v = \frac{d}{t}$ full circle $d = 2\pi r$

One "period" T not t

$v = \frac{2\pi r}{T}$

Bigger radius in same amount of time, we need to move faster.



Period: The time required for an object to make one complete cycle, measured in seconds per cycle (s/cycle).

Frequency: Number of cycles per second measured in Hertz (Hz).

If an object has a Frequency of 2 cycles/sec, what is its Period (number of seconds per cycle)?

$f = 2\ Hz$ $T = \frac{1}{2}\ s$

If an object has a Period of 5 sec/cycle, what is its Frequency (number of cycles per second)?

$T = 5\ s$ $f = \frac{1}{5}\ Hz$

$\approx 0.2\ Hz$

Frequency and Period Equations

$T = \frac{1}{f} \leftrightarrow f = \frac{1}{T}$

$\times f \quad \times f$

$Tf = 1$

$\div T \quad \div T$

$f = \frac{1}{T}$

Speed of Circular Motion Equations

$\vec{v} = \frac{\Delta \vec{d}}{\Delta t} = \frac{2\pi r}{T}$

Examples

Use the following information to answer Q1-Q2:

A 5.0 m diameter *merry-go-round* is rotating at 45 rpm.

Q1: The period of the *merry-go-round* is _____s.

*(Record your **three digit** answer in the Numerical Response boxes below)*

1	.	3	3

$\frac{45 \text{ rotations}}{\text{min}} = \frac{45 \text{ cycles}}{60 \text{ sec}} = 0.75 \text{ cycles/s}$

$= 0.75 \text{ Hz}$

$T = \frac{1}{f} = \frac{1}{0.75} = 1.3333\ldots$

$\approx 1.33 \text{ s}$

Q2: A 40kg boy is at the very edge of the *merry-go-round*. The boy's speed is ***a.bc*** x 10^{d} m/s, where ***a, b, c,*** and ***d*** are ___, ___, ___, and ___.

*(Record your **four digit** answer in the Numerical Response boxes below)*

1	1	8	1

$v = \frac{2\pi r}{T} = \frac{2(3.14159265358\ldots)(2.5)}{(1.\bar{3})}$

Unrounded

$v = 11.780972451 \text{ m/s}$

$v \approx 1.178\ldots \times 10^{1} \text{ m/s}$

$v \approx 1.18 \times 10^{1} \text{ m/s}$

Practice

Pg 250, Practice Problems #1-3

Pg 251, Practice Problems #1-2

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