

Read 2.5-2.6

USE CLICKERS TODAY
(POINTS DO NOT COUNT)

H.W #1 Available on webassign

math sheets on class web page

my office hours

Due to a new conflict

Wednesdays

switch between

9:30-10:30

or

10:30-11:30

next Wednesday 10:30-11:30

% uncertainty

What is % uncertainty of the area of a circle with radius $= 1 \pm .1 \text{ m}$?

$$\begin{aligned} \text{\% uncertainty of radius} &= \\ \frac{.1}{1} &= 10\% \end{aligned}$$

Is this the % uncertainty for Area?

$$r = 1 \pm .1 \text{ m} \Rightarrow \begin{aligned} r &= 1.1 \text{ m} \\ r &= 0.9 \text{ m} \end{aligned}$$

$$r = 1.1 \text{ m} : A = \pi (1.1 \text{ m})^2 = 3.80 \text{ m}^2$$

$$r = 1 \text{ m} : A = \pi (1 \text{ m})^2 = 3.14 \text{ m}^2$$

$$r = .9 \text{ m} : A = \pi (.9 \text{ m})^2 = 2.54 \text{ m}^2$$

$$\text{\% uncertainty (r = 1.1 m)} : \frac{3.80 \text{ m}^2 - 3.14 \text{ m}^2}{3.14 \text{ m}^2} = 21\%$$

$$\text{\% uncertainty (r = .9 m)} : \frac{3.14 - 2.54}{3.14} = 19\%$$

$$\text{Average of } 21\% \text{ \& } 19\% \Rightarrow \boxed{20\%}$$

$$r = 1 \pm 0.1 \quad \text{radius uncertainty}$$

$$\frac{0.1}{1} = 10\%$$

$$C = 2\pi r \quad \% \text{unc on } C = 10\%$$

$$A = \pi r^2 \quad \% \text{unc on } A = 20\%$$

$$V = \frac{4}{3}\pi r^3 \quad \% \text{unc on } V = 30\% \quad (\text{show this})$$

Pattern

r^{power}

power =	1	C
	2	A
	3	V

$$\% \text{ uncertainty} = \% \text{unc on } r \times \text{power}$$

$$\text{if } T = x g j m r^5$$

$$\% \text{unc on } T = 5 \cdot \% \text{unc on } r$$

Dimensional Analysis

1) Check Answer

2) Determine equation

- if you were solving for speed and got $4.0 \text{ m}^2/\text{s}$ you would know this is wrong by looking at the units

Interactive Question

If x is a distance, v is a velocity, and t is a time, which of the following could possibly be a correct equation according to dimensional analysis?

A) $x = vt^2$

B) $x = v^2t$

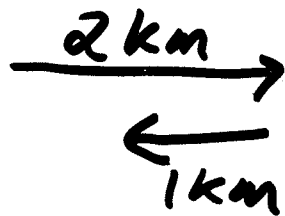
C) $x = vt$

D) $x = vt/2$

E) either C or D

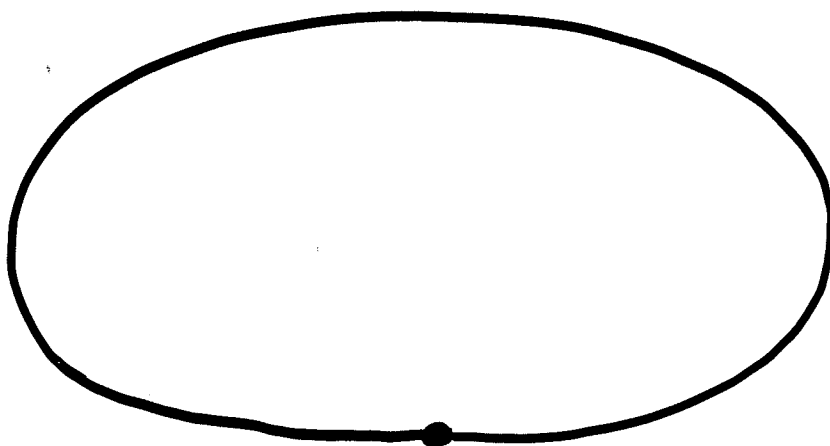
Distance - Total length object moved

Displacement: $\Delta x = x_f - x_i$



Distance: 3 km

Displacement: 1 km (can be positive or negative)



travel around in a circle

Interactive Question

An object goes from one point in space to another. After it arrives at its destination, its *displacement* is:

- A) either greater than or equal to
- B) always greater than
- C) always equal to
- D) either smaller than or equal to
- E) always smaller than

the *distance* it traveled.

Average speed

$$S_{avg} = \frac{\text{Distance}}{\text{time}}$$

magnitude only

Velocity

$$V_{avg} = \frac{x_f - x_i}{t_f - t_i} = \frac{\Delta x}{\Delta t}$$

magnitude and
direction

$$V = \lim_{\Delta t \rightarrow 0} \frac{\Delta x}{\Delta t}$$

instantaneous
velocity

- absolute value of the magnitude of the instantaneous velocity is the instantaneous speed

speedometer of car
instantaneous speed
not
instantaneous velocity

when discussing velocity and speed we will always mean instantaneous velocity or speed, unless explicitly stated otherwise

EX) A car travels 1609 m in one direction, turns around and comes back. What is average velocity for each pass?

1st pass: 4.74 s

2nd pass: 4.69 s

$$V_{avg} = \frac{x_f - x_i}{t_f - t_i}$$

$$x_i = 0$$

$$x_f = 1609 \text{ m}$$

$$t_i = 0$$

$$t_f =$$

$$1) V_{avg} = \frac{1609 \text{ m} - 0}{4.74 \text{ s} - 0} = \underline{\underline{339 \text{ m/s}}}$$

$$2) V_{avg} = \frac{-1609 \text{ m}}{4.69 \text{ s}} = \underline{\underline{-343 \text{ m/s}}}$$

- what is average speed for each pass?

339 m/s

343 m/s

- average velocity for both passes?

0 m/s

- average speed for both passes?

$$s_{avg} = \frac{\text{distance}}{\text{time}}$$

$$\frac{1609\text{ m} + 1609\text{ m}}{4.745 + 4.695} = \underline{\underline{341.25\text{ m/s}}}$$

~~$$\frac{339\text{ m/s} + 343\text{ m/s}}{2} =$$~~

EX: for a trip of 2km, you want to average 2km/hr. For the first half of the trip, you travel at 1km/h. How fast must you go for the second half?