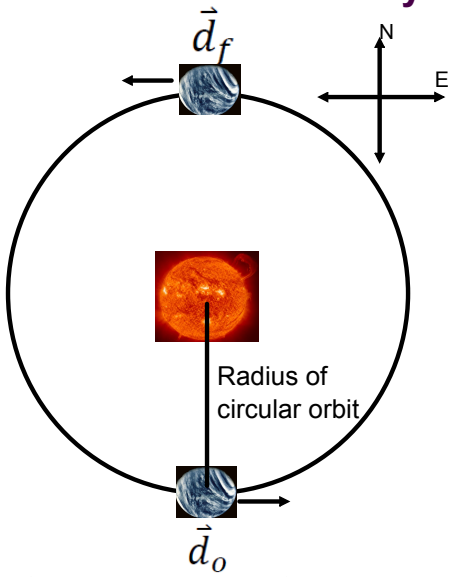
Guided Displacement and Velocity Problems

Note how we approach physics problems using the handbook

2 a) Calculate the average velocity, in m/s, of Venus the instant it has traveled half of its circular orbit around the Sun.

Sketch a diagram → ***Determine quantities needed***

Create a coordinate system



$\vec{v}_{avg} = \frac{\vec{d}}{t}$ required

$\vec{d}$ = ? t = ?

Use learned & prior knowledge

$\vec{d}$ = change in position

$\vec{d}$ = diameter of circle

t = time to change position

t = ½ a Venus year (seconds)

Obtain values from handbook

Venus distance from Sun, the radius = ~~108 million km~~ 1.1×10^{11} m, so diameter is ~~216 million km.~~ 2.2×10^{11} m [N] ← $\vec{d}$

~~$\vec{d}$ = 216 x 10^6 km [N] x 10^3 m/km $\vec{d}$ = 216 x 10^9 m [N]~~

t = ½ x 225 days x 24 h/day x 60 min/h x 60 s/min

t = 9.72 x 10^6 s

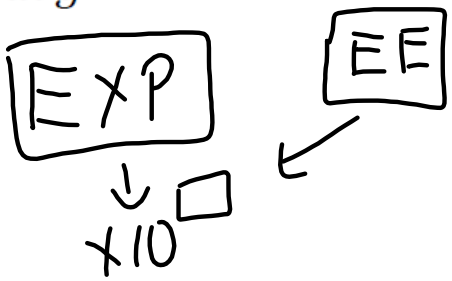
Complete Problem

$$\vec{v}_{avg} = \frac{\vec{d}}{t}$$

2.2×10^{11} m [N]

$$\vec{v}_{avg} = \frac{\text{~~216 x } 10^9 \text{ m [N]~~}}{9.72 \times 10^6 \text{ s}}$$

$$\vec{v}_{avg} = 2.22 \times 10^4 \text{ m/s [N]}$$

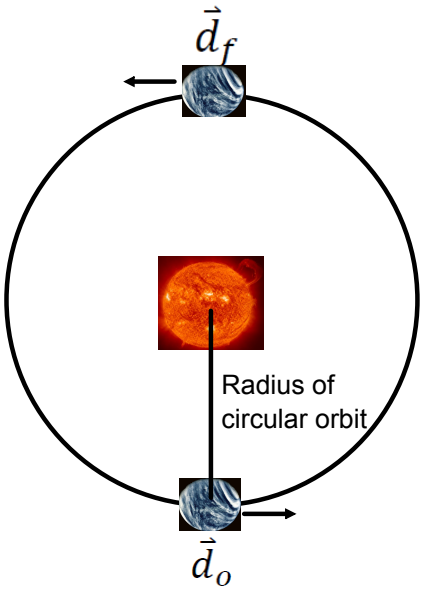


Guided Displacement and Velocity Problems

Note how we approach physics problems using the handbook

2 b) Calculate the average speed, in m/s, of Venus the instant it has traveled half of its circular orbit around the Sun.

Sketch a diagram ⟶ ***Determine quantities needed***



$v_{sp} = \frac{d}{t}$ > required

d = ? t = ?

Use learned & prior knowledge

d = length of path

d = ½ circumference of circle

t = time to travel distance

t = ½ a Venus year (seconds)

Obtain values from handbook

Venus distance from Sun, the radius = ~~108 million km~~ 1.1×10^{11} m

d = ½ x 2πr, where r = ~~108 x 10^6 km x 10^3 m/km = 108 x 10^9 m~~ 1.1×10^{11} m

d = (3.14)(~~108 x 10^9 m~~ 1.1×10^{11} m)

d = 3.39 x 10^{11} m

t = ½ x 225 days x 24 h/day x 60 min/h x 60 s/min

t = 9.72 x 10^6 s

Complete Problem

Practice 12-15, 17, 16

$v_{sp} = \frac{d}{t}$

$v_{sp} = \frac{3.39 \times 10^{11} \text{ m}}{9.72 \times 10^6 \text{ s}}$

v_{sp} = 3.49 x 10^4 m/s