Physics Gravity Project

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Formulas and Units

- $F=mg$
- $PE_G=-GMm/r$
- $F_G=GMm/r^2$
- $F_C=mv^2/r$
- $L=mr^2/\omega=mvr$
- $v=2\pi r/T$
- $G=6.67 \times 10^{-11} Nm^2/kg^2$
- $M_E=5.97 \times 10^{24} kg$
- $R_E=6.37 \times 10^6 m$

$$v_{esc} = \sqrt{2GM/R}$$

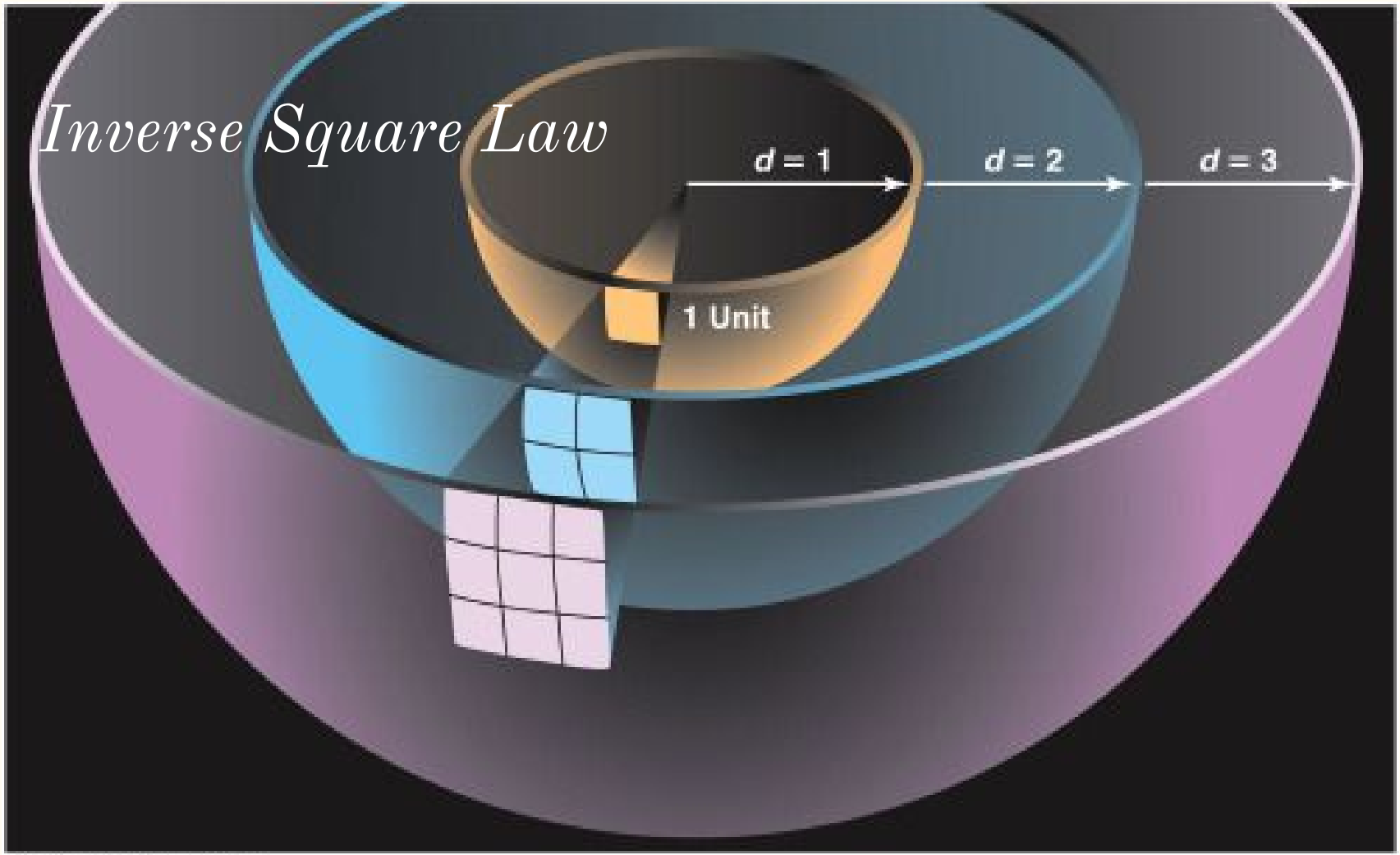
Common Mistakes

- Orbital motion doesn’t involve constant velocity because of the changing direction, but it does have constant speed. The force of gravity always pulls objects towards each other, because it’s attractive.

Common Mistakes (cont.)

- The gravity on earth equals $9.81 m/s^2$ so when solving an equation that takes place on another planet such as Mars for example, make sure that you change the gravity equation to what the gravity is on that planet in this case it would be $3.711\ m/s^2$
- The orbit of Earth is not a perfect circle; it is an ellipse.

Inverse Square Law



Practice Problem #1

A Ball with a mass of 60 grams is dropped from 20,000 meters above the surface of the Earth. With the mass of the Earth being 5.97×10^{24}kg and the radius of Earth being 6.37×10^{6}m, what is the force being imposed on the ball?

Practice Problem #1

F=.588806439 N

Practice Problem #2

What is the difference in the force due to gravity on a person standing on at sea level and the same man standing in La Canada, 360 meters above sea level?

A. Twice as strong
B. Half as strong
C. A fourth as strong
D. None of the Above

Practice Problem #2

The Answer is: D; None of The Above

Practice Problem #3

Aram spins a fidget spinner with a mass of 9. grams. The radius of the spinner is 2.5 centimeters and a centripetal force of 6 N. What is the velocity of the fidget?

a) 1.29 m/s
b) 1.67 m/s
c) 15.0 m/s
d) 4.64 m/s

Practice Problem #3 Solution

$$F_c = \frac{mv^2}{r}$$

F_c= 6. N

m= 9. g

r= 2.5 cm
v= ?

6. N = $\frac{(9.g)(v^2)}{2.5cm}$

a) v= 1.29 m/s

Practice Problem #4

An anvil weighs 90000 g. It weighs 882.9 N on Earth. What does it weigh on Venus given the acceleration due to gravity is 8.87 m/s?

a) 830. N
b) 798.3 N
c) 678.4 N
d) 123.4 N

Practice Problem #4

b) $F_G = 798.3$

Practice Problem #5

What is the velocity needed on an object with a mass of 1,200 kg to escape the surface of Mars?

$M_M = 6.42 \times 10^{23} kg$

$R_M = 3.40 \times 10^{6} m$

a) 272 m/s
b) 3.64 m/s
c) 2.72 m/s
d) 267. m/s

Practice Problem #5

$v_{esc} = \sqrt{2GM/R}$

c) $V_{esc} = 2.72 m/s$

Practice Problem # 6

1 mole of iron weighs 55 g. The same mole weighs 539 N on Earth. How much would this mole of iron weigh on the moon, given that the acceleration due to gravity is 1.6/m/s^2?

a)143 N

b) 126 N

c) 88 N

d) 110 N

Practice Problem # 6

c) 88 N