CONCEPT: WEIGHT FORCE AND GRAVITATIONAL ACCELERATION

● All objects near Earth are affected by **gravity.** Gravity produces a **Force**, which produces an **acceleration. (_____)**

● **GRAVITY**

- Conceptual phenomena which says that objects with mass attract each other

● **FORCE due to Gravity (a.k.a. _____)**

____ = ____ =_____ UNITS: ____

- Always points towards Earth's center (usually pointing down)

● **ACCELERATION due to GRAVITY (a.k.a. Gravitational Acceleration)**

____ = ____ =_____ *(near Earth)* UNITS: ____

- NOT constant, varies by location: For example, g_{Earth} = ____, g_{Moon} = ____

● The term **"WEIGHT"** is used incorrectly in everyday language.

- Scales don't measure **WEIGHT.** Instead, they measure _____.
  - Mass [____] = Quantity of matter, **[DOES | DOESN'T]** change at different locations
  - Weight [___] = Force due to gravity, **[DOES | DOESN'T]** change at different locations (just like ___)

EXAMPLE: You step on a bathroom scale and it measures your "weight" to be 70kg. What is your REAL weight on Earth's surface?

EXAMPLE: If an object has mass 10kg on the Earth, what is its mass on the Moon? What is its weight on the Earth? What is its weight on the Moon if g_{moon}=1.62 m/s^2?

PROBLEM**:** The Mars Rover Perseverance weighed about 10,000 N while on Earth**.** After it reached the surface of Mars, it weighed about 3790 N**.** What is the gravitational acceleration on Mars?

A) $g_{Mars} = 0.039\ m/s^2$
B) $g_{Mars} = 0.27\ m/s^2$
C) $g_{Mars} = 3.7\ m/s^2$
D) $g_{Mars} = 26\ m/s^2$

CONCEPT: VERTICAL FORCES AND ACCELERATION IN THE Y-AXIS

● You'll need to solve problems where vertical forces cause objects to accelerate in the Y-axis**.**

FORCES
1) Draw FBD**: W,F_A,T,N,f**
2) Write $\boldsymbol{\Sigma F = ma}$
3) Solve

EXAMPLE**:** A 5.1 kg block is in the air, being pulled vertically by a (massless) string**.** Find the block's acceleration for each of the following Tension forces**.**

a) T = 70N

- If $|F_{up}|$ $|F_{down}|$ ⇒ a = [**positive | negative | 0 | -g**]

b) T = 30N

- If $|F_{up}|$ $|F_{down}|$ ⇒ a = [**positive | negative | 0 | -g**]

c) T = 50N

- If $|F_{up}|$ $|F_{down}|$ ⇒ a = [**positive | negative | 0 | -g**]

d) T = 0N

- If $|F_{up}|$ ⇒ a = [**positive | negative | 0 | -g**]

(Assuming no other forces)

PROBLEM**:** A 3-kg bucket is being pulled upwards by a cord**.** The tension in the cord is 35 N**.** What is the acceleration of the bucket? (The mass of the cord is negligible, which means you can assume m_{cord} = 0.)

A) 25 m/s^2
B) 1.9 m/s^2
C) 21 m/s^2
D) 8.4 m/s^2

FORCES
1) Draw FBD**: W,F$_A$,T,N,f**
2) Write $\boldsymbol{\Sigma F = ma}$
3) Solve

PROBLEM**:** A 100-kg load of bricks is being lowered down on a cable at a speed of 5 m/s. If the load takes 2 s to slow from that speed to a stop, what is the tension in the supporting cable during that time interval?

A) 1230 N
B) 730 N
C) 1480 N
D) 980 N

FORCES
1) Draw FBD**: W,F$_A$,T,N,f**
2) Write $\boldsymbol{\Sigma F = ma}$
3) Solve