Worksheet: Weight

Weight is a measure of the ___gravitational___ force between the object and the earth. The acceleration of gravity on Earth is ___$9.8\ ms^{-2}$___. Weight is measured in units of ___Newtons___. If one object has more mass than another then it weighs ((more)/ less) than the other object.

As an astronaut goes to the moon, his mass ___stays the same___ but his

weight ___decreases___. This is because as he got further away from the Earth, the acceleration of gravity ___decreases___.

Weight Problems

1. Find the missing value for each set of data below

Force (F) = ? $735N$ $\left(75 \times 9.8\right)$ Force (F) = 490N $\left(\dfrac{490}{9.8}\right)$
Mass (m) = 75 kg   Mass (m) = ? $50\ kg$
Gravity (g) = 9.8 m/s/s   Gravity (g) = 9.8 m/s/s

2. What is the force on a 1 kg ball that is falling freely due to the pull of gravity?

$F = ma = 1 \times 9.8 = 9.8\ N$

3. What is the mass of a person who weighs 500 N?

$F = ma \therefore m = \dfrac{F}{a} = \dfrac{500}{9.8} = 51\ kg$

4. What is the weight of an object (on earth) that has a mass of 45 kg?

$F = ma = 45 \times 9.8 = 441\ N$

5. The value of gravitational pull on the moon is 1.6 m/s/s. What is the weight of a 75 kg astronaut on the moon? $F = ma = 75 \times 1.6$
$= 120\ N$

6. A space ship has a mass of 9000 kg. The space ship is launched from Earth and lands on a distant planet where it has a weight of 390000 N. What is the acceleration of gravity on this planet? $a = \dfrac{F}{m} = \dfrac{390000}{9000} = 43.3\ ms^{-2}$

7. Big Bertha tips the scales at 950 Newtons. What is her mass?
$m = \dfrac{F}{a} = \dfrac{950}{9.8} = 96.9\ kg$

8. If my mass is 100 kilograms, what is my weight?
$F = ma = 100 \times 9.8 = 980\ N$

9. The elevator in the new office building warns that it can safely lift 300 kg at one time. If John (850 N), Betty (530 N), Robert (740 N) and Alice (610 N) all get in the elevator at once, can the elevator safely carry them up to the third floor? Explain why or why not.

$\Sigma F = 850 + 530 + 740 + 610$
$= 2730\ N$
$a = 9.8\ ms^{-2}$

$m = \dfrac{F}{a} = \dfrac{2730}{9.8} = 279\ kg$

Yes it can! Mass of people less than 300kg.