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Chapter 3 Newton's First Law

Example Problems

3.1 Mass and Weight

E1. One pound is equal to 0.454 kg, calculate your mass in kilograms.

a) ________________ ← units

E2. Using your mass in kilograms from above, calculate your weight in newtons.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) ________________ ← units

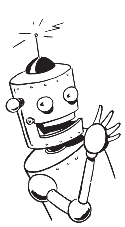
E3. The acceleration of gravity on the surface of the moon is 1.62 m/s^2 , calculate how much you would weight on the surface of the moon in newtons.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =



a) ________________ ← units

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E4. A monkey is standing on a scale that is on the surface of the Earth. If the scale reads 585 N, calculate the mass of the monkey.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) ________________ ⟵ units

E5. A 4 kg sack of coconuts is held by a massless rope attached to the ceiling of a monkeys house, calculate the tension in the rope.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) ________________ ⟵ units

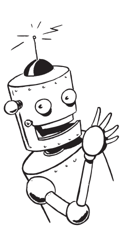
E6. A 58 kg monkey stands on a scale on a distant planet. If the scale reads 1,307.32 N calculate the acceleration of gravity of this planet and convert to Earth g's.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =



a) ________________ ⟵ units b) ________________ ⟵ units

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Chapter 3 Newton's First Law

Student Problems

3.1 Mass and Weight

1. One pound is equal to 0.454 kg, calculate your mass in kilograms and then calculate your weight in newtons.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) ______________ ← units b) ______________ ← units

2. As you move away from the surface Earth the acceleration of gravity decreases. At the top of Mt. Everest the acceleration of gravity is 9.60 m/s^2. Calculate the weight of a 5 kg mass in newtons and pounds at the top of Mt. Everest?

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) ______________ ← units b) ______________ ← units

3. Using your mass in kilograms and the acceleration of gravity at the top of Mt. Everest, calculate your weight in both newtons and pounds at the top of Mt. Everest.

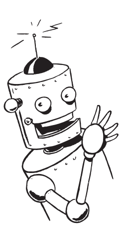
Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) ______________ ← units b) ______________ ← units



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4. A 5 kg mass is placed on a scale located on the surface of Mars. If the scale reads 18.5 N, calculate the acceleration of gravity on the surface Mars.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) __________________ ← units

5. Using your mass and the acceleration of gravity you just calculated for Mars, find your weight in both newtons and in pounds on the surface of Mars.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) __________________ ← units b) __________________ ← units

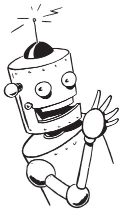
6. A 5 kg mass is placed on a scale located on the surface of Jupiter. If the scale reads 133.5 N, calculate the acceleration of gravity on the surface Jupiter.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =



a) __________________ ← units

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7. Using your mass and the acceleration of gravity you just calculated for Jupiter, find your weight in both newtons and pounds on the surface of Jupiter.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) ____________ ← units b) ____________ ← units

8. A McDonald's quarter pound burger weighs 1.97 N on the surface of the Earth, calculate the mass of a quarter pound burger in kilograms and pounds.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) ____________ ← units b) ____________ ← units

9. In another part of the galaxy there is a planet of monkeys that has a surface acceleration of 15.5 m/s^2. You travel to this planet and place a rock on a scale. If the scale reads 100 N, what is the mass of the rock?

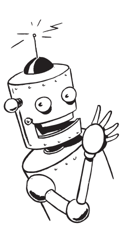
Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =

a) ____________ ← units



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Chapter 3 Newton's First Law

10. The surface gravity of the Sun is 274 m/s². How many Earth g's is this?

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

a) ______________ ← units

11. The planet Mercury has an acceleration of gravity that is 0.37 Earth g's, calculate the acceleration of gravity on Mercury.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

a) ______________ ← units

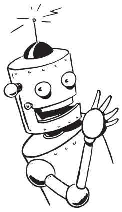
12. During a space shuttle launch an astronaut of mass 65 kg experiences an acceleration of 3.0 Earth g's, calculate the acceleration and the apparent weight of the astronaut.

Record all givens, draw a picture, arrow all vectors, write the formula, substitute and solve

W =

g =

m =



a) ______________ ← units b) ______________ ← units