# Egg Crash Vehicle Worksheet

Name: _____

1. What is a force?

   _____

   _____

2. Give 3 examples of when you have used or encountered a force.

   a. _____

   b. _____

   c. _____

3. What are the 2 categories of forces?

   a. _____

   b. _____

4. Find the NET FORCE for to following situations and identify if they are balanced or unbalanced. (Show work)
   a. A boy and a girl are pushing on a box. The boy is pushing with 50 N right and the girl is pushing with 50 N right.

   b. A boy and a girl are pushing on a box. The boy is pushing with 50 N right and the girl is pushing with 50 N left.

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c. A boy and a girl are pushing on a box. The boy is pushing with 50 N right and the girl is pushing with 70 N left.

5. Complete the following table.

| Force 1 (N) | Force 2 (N) | Force 3 (N) | Net Force (N) |
|---|---|---|---|
| 6 up | 45 down | | |
| 35 up | | 33 down | 22 down |
| 12 right | 9 left | | 6 right |
| 125 left | 12 left | | 137 left |

6. State Newton's Laws of motion.

a. 1$^{st}$ Law: _____

_____

_____

_____

b. 2$^{nd}$ Law: _____

_____

_____

_____

c. 3$^{rd}$ Law: _____

_____

_____

_____

7. Which of Newton's Laws is also called the Law of Inertia? Explain why it is also called this.

_____

_____

_____

8. Explain HOW a <u>seat belt</u> keeps you safe in during a head on collision. (Your answer should have something to do with TIME)

_____

_____

_____

_____

_____

9. Explain HOW a <u>bumper</u> keeps you safe in during a head on collision. (Your answer should have something to do with TIME)

_____

_____

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_____

_____

10. Write down the equation that represents Newton's 2$^{nd}$ Law.

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**Using Newton's 2$^{nd}$ Law equation, solve the following problems.**

**Write down the equation (and the manipulations)**

11. Assume you catch a baseball and exert a force of -68.0 N to stop the ball. If the baseball has a mass of 0.155 kg, what is its acceleration as it is being caught?

12. A girl on roller skates is pushed with a 150 N force. If she accelerates at a rate of 2.5 m/s$^2$, what is her mass (in kg)?

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13. A squirrel is running along a branch and knocks an acorn loose which causes the acorn to fall. If the acorn accelerates at a rate of 9.8 $m/s^2$ and strikes the ground with a force of 0.0147 Newtons, what is the mass of the acorn (in grams)?

14. A 30 kg dog is running down the street and jumps on a 3 kg skateboard. If the dog applies a 112 Newton force to the skateboard, what will be the acceleration of the skateboarding dog?

15. An 8 kg watermelon is thrown off the top of a building. If the watermelon strikes the top of a car and undergoes an acceleration of -3.4 $m/s^2$, what force does the watermelon apply to the car's roof?

16. What force is needed to accelerate a 45000 g skater 3 $m/s^2$?

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17. What is the difference between mass and weight?

_____

_____

_____

18. What is the value for gravity on Earth (in m/s$^2$)?

19. You have a box full of pudding. If you take this box of pudding to the moon, explain how the mass would change as well as how the weight would change.

_____

_____

_____

20. True or False: When the mass of an object increases, the weight MUST increase.

21. What is the mass of an object, on Earth, with a weight of 600 N?

22. What is the weight of a 6000 g brick?

23. Identify the action and reaction forces in the following situations:
    a. You push on a box.
    b. A string pulls a piano off the ground
    c. A horse pulls a sleigh

24. True or False: Action-reaction forces are equal and result in a balanced force.

25. Define momentum.

    _____

    _____

    _____

26. Circle the object with the higher momentum and give an explanation
    a. Train                    Car
       Explanation:

    b. Rolling baseball         Rolling watermelon
       Explanation:

    c. Car moving at 0.3 m/s    Bird moving at 70 m/s
       Explanation:

27. What is the weight of a 150 kg astronaut on Jupiter? (Jupiter's acceleration due to gravity if 2.5 times larger than Earth's)

28. Write the equation for momentum.

29. What is the momentum of a 4000 g object that has a velocity of 45 m/s?

30. What is the mass of a ball (in grams) that is rolling on the floor with a velocity of 3.5 m/s north and a momentum of 7 kg*m/s north?

31. The velocity of a rolling skateboard is 1.3 m/s east. If the skateboard has a mass of 2.6 kg, what is its momentum?

32. A running dog has a momentum of 500 kg*m/s north. If the dog has a 40 kg, what is the velocity of the dog?

33. A boulder is rolling down a hill with a momentum of 1125 kg*m/s downward and a speed of 2.5 m/s. What is the mass of the boulder?

34. Complete the following table.

| Mass (kg) | Speed (m/s) | Momentum (kg*m/s) |
|-----------|-------------|-------------------|
| 50 | 9.3 | |
| 12 | | 72 |
| | 2.6 | 9.88 |
| 250 | | 1000 |