Newton's 2nd Law Practice Problems

Name: _____

F = ma

Date: _____

Use Newton's second law to solve for force, mass, and acceleration. Give the equation used for each problem and show all work.

1. <u>What net force</u> is required to accelerate a car at a rate of <u>2 m/s²</u> if the car has a mass of <u>3,000 kg</u>?

F = ?

m = 3000 kg

a = 2 m/s²

2. A<u>10 kg</u> bowling ball would require <u>what force</u> to accelerate down an alleyway at a rate of <u>3 m/s²</u>?

F = ?

m = 10 kg

a = 3 m/s²

3. Sally has a car that accelerates at 5 m/s². If the car has a mass of 1000 kg, how much force does the car produce?

F=_____

m=_____

a=_____

4. What is the mass of a falling rock if it produces a force of 147 N?

F=_____

m=_____

a=_____

5. What is the mass of a truck if it produces a force of 14,000 N while accelerating at a rate of 5 m/s² ?

F=_____

m=_____

a=_____

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Newton's 2nd Law Practice Problems Name:_____

Date:_____

6. What is the acceleration of softball if it has a mass of 0.5 kg and hits the catcher's glove with a force of 25 N?

F=_____

m=_____

a=_____

7. Your own car has a mass of 2000 kg. If your car produces a force of 5000 N, how fast will it accelerate?

8. Sally challenges you to a race. On the first turn you run off the course and your car strikes a large bale of hay. Your car still produces 5000 N of force, but now it accelerates at only 2 m/s^2. What is the mass of your car now that the bale of hay is stuck to it?

9. Even though she is way ahead of you, Sally switches her car to run on nitrous oxide fuel. The nitrous oxide allows her car to develop 10,000 N of force. What is Sally's acceleration if her car has a mass of 500 kg?

Newton's 2nd Law Practice Problems   Name: _____ **KEY**

F = ma   Date: _____

Use Newton's second law to solve for force, mass, and acceleration. Give the equation used for each problem and show all work.

1. What net force is required to accelerate a car at a rate of 2 m/s² if the car has a mass of 3,000 kg?

F = ?
m = 3000 kg
a = 2 m/s²

$$F = ma$$

$$= \frac{3000 \text{ kg}}{} \cdot \frac{2 \text{ m}}{s^2} \cdot \frac{1 N}{1 \text{ kg} \cdot m} \cdot \frac{s^2}{} = \boxed{6000 \text{ N}}$$

2. A 10 kg bowling ball would require what force to accelerate down an alleyway at a rate of 3 m/s²?

F = ?
m = 10 kg
a = 3 m/s²

$$F = ma = \frac{10 \text{ kg}}{} \cdot \frac{3 \text{ m}}{s^2} \cdot \frac{1 N}{1 \text{ kg} \cdot m} \cdot \frac{s^2}{} = \boxed{30 \text{ N}}$$

3. Sally has a car that accelerates at 5 m/s². If the car has a mass of 1000 kg, how much force does the car produce?

F = _____ N
m = 1000 kg
a = 5 m/s²

$$F = ma$$

$$= \frac{1000 \text{ kg}}{} \cdot \frac{5 \text{ m}}{s^2} \cdot \frac{1 N}{1 \text{ kg} \cdot m} \cdot \frac{s^2}{} = \boxed{5000 \text{ N}}$$

4. What is the mass of a falling rock if it produces a force of 147 N?

F = 147 N
m = _____ kg
a = 9.8 m/s²

↓ gravity

$$F = ma$$
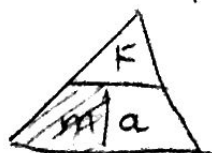
$$m = \frac{F}{a} = \frac{147 N}{9.8 \text{ m}} \cdot \frac{s^2}{} \cdot \frac{1 \text{ kg} \cdot m}{1 N} \cdot \frac{}{s^2}$$
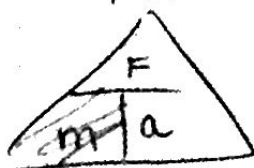
$$= \boxed{15 \text{ kg}}$$

5. What is the mass of a truck if it produces a force of 14,000 N while accelerating at a rate of 5 m/s²?

F = 14,000 N
m = _____ kg
a = 5 m/s²

$$F = ma$$

$$m = \frac{F}{a} = \frac{14,000 N}{5 \text{ m}} \cdot \frac{s^2}{} \cdot \frac{1 \text{ kg} \cdot m}{1 N} \cdot \frac{}{s^2}$$

$$= \boxed{2800 \text{ kg}}$$

1

Date: _____

6. What is the acceleration of softball if it has a mass of 0.5 kg and hits the catcher's glove with a force of 25 N?

F= __25 N__

m= __0.5 kg__

a= _____ m/s²

$F = ma$

$$a = \frac{F}{m} = \frac{25\,N}{0.5\,kg} \left| \frac{1\,kg \cdot m}{s^2} \right| \frac{1}{1\,N}$$

$$= 50\ m/s^2$$

7. Your own car has a mass of 2000 kg. If your car produces a force of 5000 N, how fast will it accelerate?

F = 5000 N

m = 2000 kg

a = _____ m/s²

$F = ma$

$$a = \frac{F}{m} = \frac{5000\,N}{2000\,kg} \left| \frac{1\,kg \cdot m}{1\,N} \right| \frac{1}{s^2}$$

$$= 2.5\ m/s^2$$

8. Sally challenges you to a race. On the first turn you run off the course and your car strikes a large bale of hay. Your car still produces 5000 N of force, but now it accelerates at only 2 m/s². What is the mass of your car now that the bale of hay is stuck to it?

F = 5000 N

a = 2 m/s²

m = _____ kg

$$m = \frac{F}{a} = \frac{5000\,N}{2\,m} \left| \frac{s^2}{1} \right| \frac{1\,kg \cdot m}{1\,N \cdot s^2}$$

$$= 2500\ kg$$

9. Even though she is way ahead of you, Sally switches her car to run on nitrous oxide fuel. The nitrous oxide allows her car to develop 10,000 N of force. What is Sally's acceleration if her car has a mass of 500 kg?

F = 10,000 N

m = 500 kg

a = _____ m/s²

$F = ma$

$$a = \frac{F}{m} = \frac{10,000\,N}{500\,kg} \left| \frac{1\,kg \cdot m}{1\,N} \right| \frac{1}{s^2}$$

$$= 20\ m/s^2$$

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