Name _____ Period _____ Date _____

CHAPTER 2 | FORCES

Math Support

Using *F = ma*

In the formula $F = ma$, F = force, measured in newtons (N); m = mass, measured in kilograms (kg); and a = acceleration, measured in meters per second squared (m/s^2). One newton = 1 kilogram meter per second squared; 1 N = 1 kg•m/s^2

SAMPLE PROBLEM

How much force is needed if the mass is 10 kg and the acceleration is $100m/50s^2$?

Formula	$F = ma$
What do you know?	m = 10 kg, $a = 2\ m/s^2$
Substitute.	$F = 10\ kg \cdot 2\ m/s^2$
Calculate.	$F = 20\ kg \cdot m/s^2$ or 20 N
Check units.	Force is measured in newtons (N).

EXERCISES

Solve for force.

1. $m = 75$ kg, $a = 3\ m/s^2$

Formula _____

Substitute. _____

Calculate. _____

Check units. _____

2. $m = 4$ kg, $a = 6\ m/s^2$

Formula _____

Substitute. _____

Calculate. _____

Check units. _____

Solve for mass.

3. $F = 45$ N, $a = 39\ m/s^2$

Rearrange formula. _____

Substitute. _____

Calculate. _____

Check units. _____

Solve for acceleration.

4. $F = 45$ N, $m = 6$ kg

Rearrange formula. _____

Substitute. _____

Calculate. _____

Check units. _____

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CHAPTER 2 | FORCES

Math Practice

Finding Force, Acceleration, and Mass

Solve each equation. Use correct units. Remember to show all work.

1. $m = 5$ kg, $a = 8$ m/s^2

Solve for force. _____

2. $F = 75$ N, $a = 5$ m/s^2

Solve for mass. _____

3. $m = 15$kg, $F = 60$ N

Solve for acceleration. _____

4. $F = 12$ N, $a = 6$ m/s^2

Solve for mass. _____

5. $F = 220$ N, $a = 11$ m/s^2

Solve for mass. _____

6. $m = 7$ kg, $a = 5$ m/s^2

Solve for force. _____

7. $m = 42$ kg, $a = 25$ m^2

Solve for force. _____

8. $m = 75$ kg, $F = 425$ N

Solve for acceleration. _____

9. $m = 27$ kg, $F = 108$ N

Solve for acceleration. _____

Write and solve an equation to find the missing quantity.

10. A bowling ball with a mass of 7 kg leaves your hand with an acceleration of 63 m/s^2. What size force did you apply?

_____

11. How much does a 5 kg cart accelerate when you lift it with exactly 45 N of force?

_____

12. Suppose you and a classmate push a cart loaded with bricks to demonstrate force. You apply a force of 500 N, and the cart accelerates at a rate of 0.5 m/s^2. What mass does the cart have?

_____

13. You push a merry-go-round on which your friend is riding. Your friend weighs 45 kg, and the merry-go-round weighs 163 kg. The merry-go-round leaves your hand with an acceleration of 52 m/s^2. What size force was applied?

_____

14. It takes a force of about 45 N to lift your backpack. You lift it with an acceleration of 3 m/s^2. What is the mass of the backpack?

_____

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CHAPTER 2 | FORCES

Vocabulary

force	Newton's second law	collision
net force	centripetal force	conservation of momentum
Newton's first law	Newton's third law	
inertia	momentum	

A. WHO AM I?

1. I'm a force that keeps an object moving in a circle.

_____

2. I'm the overall force acting on an object when all forces are combined.

_____

3. I'm a situation in which two objects in close contact exchange energy and momentum.

_____

4. I'm the resistance of an object to a change in the speed or the direction of its motion.

_____

5. I'm the measure of mass in motion.

_____

6. I state that every time one object exerts a force on another object, the second object exerts a force that is equal in size and opposite in direction.

_____

7. I state that objects at rest remain at rest, and objects in motion remain in motion, unless acted upon by an unbalanced force.

_____

8. I state that the acceleration of an object increases with increased force and decreases with increased mass.

_____

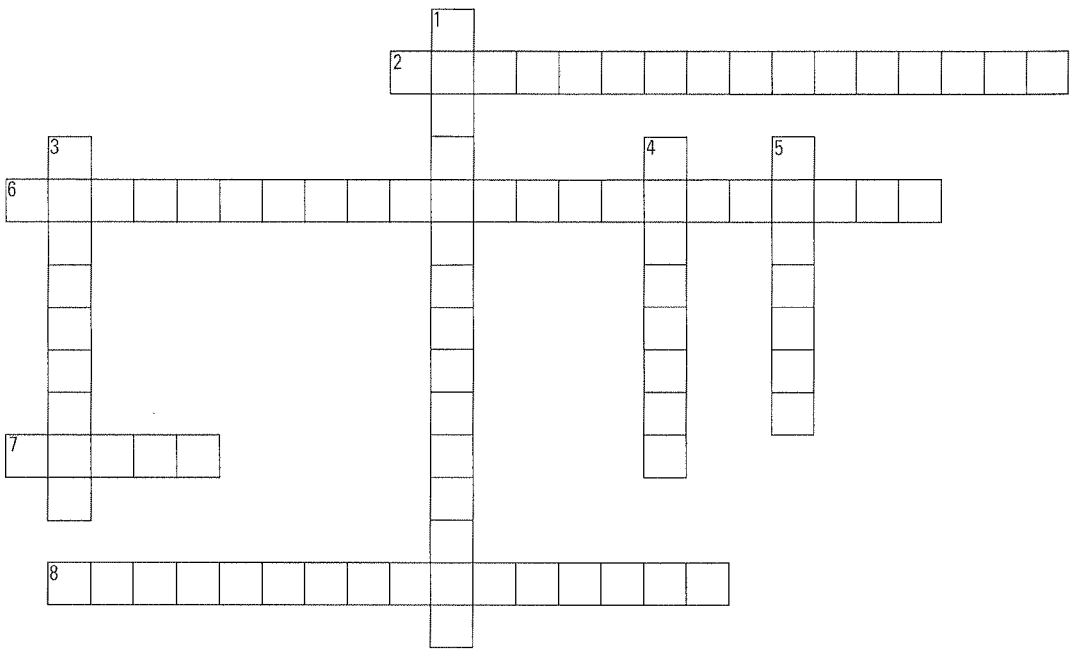
9. I'm a push or a pull.

_____

10. I state that the total momentum of a system of objects does not change as long as there are no outside forces acting on them.

B. CROSSWORD PUZZLE

Read the clues below. Then complete the puzzle using vocabulary words.



ACROSS

2. An object accelerates in the same direction of the force.

6. Without an outside force, the total momentum before and after a collision is the same.

7. Use this to change the motion of objects.

8. Without this, objects could not move in a circle.

DOWN

1. Forces always act in pairs.

3. The exchange of momentum and energy between two objects.

4. The product of an object's mass and velocity.

5. Resistance of an object to change its motion.