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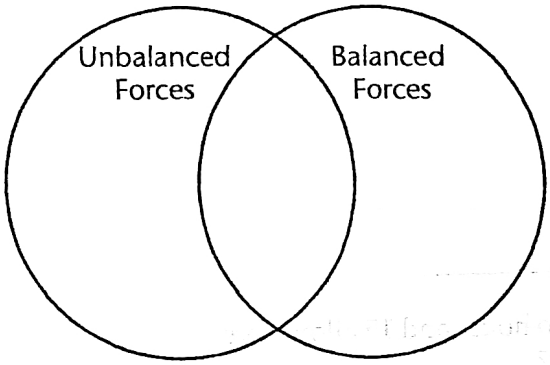
# The Nature of Force

## Understanding Main Ideas

*Write the phrases listed below in the Venn diagram. Write the characteristics shared by unbalanced and balanced forces in the area of overlap.*

change an object's motion
do not change an object's motion
net force = 0
push or pull
have direction
net force does not equal 0

1.




*Answer the following question in the space below.*

2. Describe how to combine unequal forces acting in opposite directions.

_____

_____

_____

## Building Vocabulary

*Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.*

___ 3. newton
___ 4. force
___ 5. unbalanced forces
___ 6. balanced forces
___ 7. net force

**a.** the SI unit for force
**b.** sum of all forces acting on an object
**c.** push or pull
**d.** can change an object's motion
**e.** will not change an object's motion

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# Math Skills

*For the problems below, show your calculations. If you need more space, use another sheet of paper. Write the answers for the problems on the lines below.*

## Calculating Speed

1. Speed = $\frac{32\text{ m}}{8\text{ s}}$ = _____

2. A car travels 66 kilometers in 3 hours. What is its speed?

   Answer: _____

3. Average Speed = $\frac{200\text{ km}}{5\text{ h}}$ = _____

4. Suppose a car travels 60 kilometers the first two hours and 15 kilometers the next hour. What is the car's average speed?

   Answer: _____

5. Suppose you ride your bicycle into the countryside on a bike path. You travel 6 kilometers the first hour, 3 kilometers the second hour, and 6 kilometers the third hour. What is your average speed for the whole ride?

   Answer: _____

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# Motion

## Multiple Choice

*Write the letter of the correct answer on the line at the left.*

____ 1. Speed measurements are given in units of

**a.** distance/time. **b.** time$^2$/distance.
**c.** distance/time$^2$. **d.** time/distance.

____ 2. Measurements of acceleration are given in units of

**a.** distance/time. **b.** time$^2$/distance.
**c.** distance/time$^2$ **d.** time/distance.

____ 3. An airplane that moves 50 meters in one second has a speed of

**a.** 500 cm/s. **b.** 1,800 km/h.
**c.** 180,000 m/h. **d.** 5,000 m/h.

____ 4. How many centimeters are in a kilometer?

**a.** 100 **b.** 100,000
**c.** 1,000 **d.** 1,000,000

____ 5. A car traveling at 25 m/s speeds up to 40 m/s over a period of 15 seconds. The average acceleration of the car is

**a.** 1 m/s$^2$.
**b.** 15 km/s$^2$.
**c.** 15 m/s$^2$.
**d.** cannot be calculated from the information given

____ 6. A rider finishes a 120-km bicycle trip in 3 hours. The average speed of the rider is

**a.** 360 km/h. **b.** 3.6 m/s.
**c.** 40 km/h. **d.** 4 m/s$^2$.

____ 7. The trunk of a certain tree is 50 cm thick. Each year it gets thicker by 1 cm. How thick will the tree trunk be in 50 years?

**a.** 50 cm **b.** 2,500 cm
**c.** 5,000 cm **d.** 100 cm

____ 8. It can be important to know the velocity of an object, not just its speed, because

**a.** velocity also tells acceleration.
**b.** speed is always an average.
**c.** velocity also tells direction.
**d.** speed is only useful for fast-moving objects.

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____ **9.** A runner starts a 5-km race at 10:15 a.m. and finishes at 10:35 a.m. Given this information, you can calculate the runner's
- **a.** velocity.
- **b.** average speed.
- **c.** acceleration.
- **d.** reference point.

____ **10.** An airplane flies 80 km in 10 minutes and then flies 100 km in 20 minutes. The average speed of the airplane is
- **a.** 60 km/h.
- **b.** 360 km/h.
- **c.** 8 km/h.
- **d.** none of the above

## Completion

*Fill in the line to complete each statement.*

**11.** An object is in motion if it is moving relative to a(n) _____.

**12.** To calculate the acceleration of an object moving in a straight line, divide the change in _____ by the time during which the acceleration occurs.

**13.** The velocity of an object gives both its speed and _____.

**14.** You can calculate an average _____ if you know both the total distance and the total time of a trip.

## True or False

*If the statement is true, write* true. *If it is false, change the underlined word or words to make the statement true.*

_____ **15.** An object <u>cannot</u> be accelerating if it has a constant speed.

_____ **16.** The information needed for describing <u>velocity</u> is distance, time, and direction.

_____ **17.** To determine the speed of an object, divide distance by <u>acceleration</u>.

_____ **18.** An object is in motion only if its distance from a reference point is <u>stationary</u>.

_____ **19.** If you know the <u>speed</u> of an object, you also know the direction of movement.