Forces & Motions Reading Sheet

The **position** of an object can be identified by using a reference point. The terms, such as, "above", "below", "inside of", "underneath", and "on top of" can be used to describe an objects relative location to another object. These words are how we are able to locate an object and understand its location within its environment. So simple put, **position** is the location of an object. If you wanted to explain to your mom where your homework was, you might want to use sentences like "inside of my homework binder" or "on top of the kitchen counter". Your mom will know the location of your homework because of your use of positional words. It wouldn't be helpful to use sentences like "over there" or "inside of it" because they don't compare two objects for a reference point.

Position:

1. What is position? the location of an object using positional words

2. How is position important in reference to an object? the reference point gives a location

3. What are the terms used to referring to an object's position?

A) above / below
B) beside / inside of
C) around
D) underneath / on top of
E) behind / in front of

black square

4. Look at the diagrams below. *Label them correctly to explain the ~~circle's~~ location in reference to the rectangle.* The reference point is the rectangle.

a. on top of or above

b. inside

c. underneath or below

d. above

e. beside or to the left of

When an object moves, it changes its position, or location. An object stays in motion as long as its position keeps changing. Think about when you ride in car. As long as the car keeps moving down the road, it is in motion. The position of the car changes as you ride along. Now suppose you stop at a red light. The motion of the car stops. The position of the car does not change as long as you are stopped at the red light. Put yourself in that same car again. You are moving along. When you look out the window of the car, it seems like everything around you is moving. Except for other moving cars, you are the only one that is really moving. Everything around you stays in place. You see a store on the road ahead of you. You ride by the store. Now the store is behind you. The position of an object depends on where you are located at the time. You can describe position by comparing where you are to another object.

Distance is another way to explain an object's position. It uses measurement to establish location. **Distance** is the length between two objects or positions (locations). The distance of a specific object to another object can be measured using meter tapes, yard or meter sticks, or rulers. The distance can be recorded in meters or centimeters. When trying to find the distance between larger positions, you would want to use larger units of measure such as kilometers, miles, meters, feet or yards. When you are trying to find the distance between smaller positions, you would want to use smaller units of measure such as inches, centimeters or millimeters.

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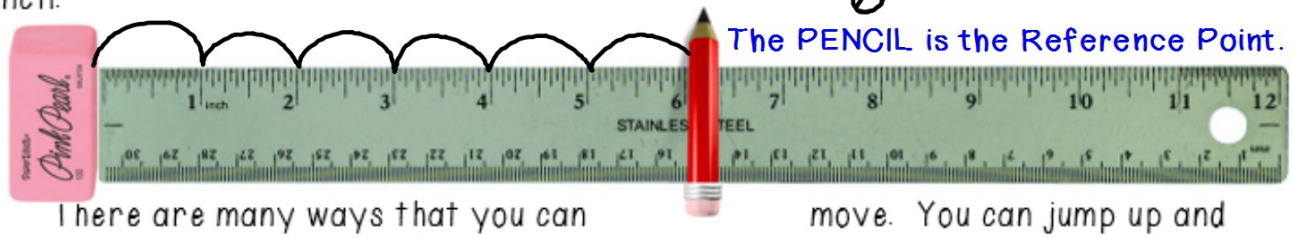
You could say, "The school is 60 feet from here." Or you could say, "The boy is 4 feet to the right of the slide." Look at the picture below. How would you describe the position of the eraser. You might say, "The eraser is 6 inches to the left of the pencil."



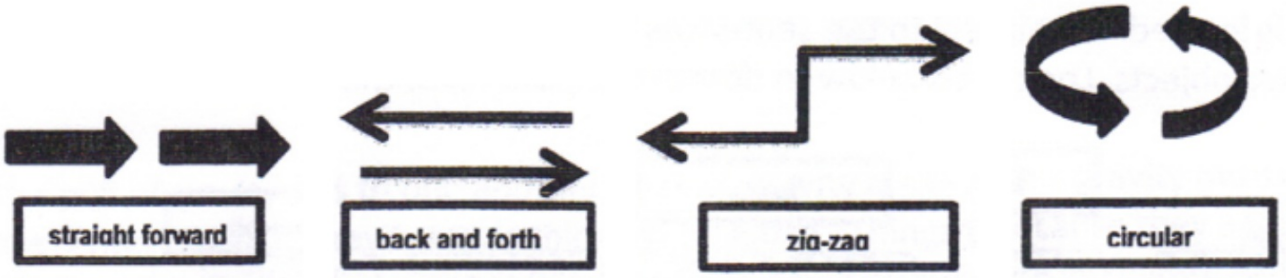
There are many ways that you can move. You can jump up and down. You can step to the side and back. When something moves, the movement is called motion. **Motion** can be described in terms of speed and direction. Objects in motion have both speed and are moving in a specific direction. The motion that object can travel in may be either in a straight forward pattern, back and forth, fast or slow, zigzag, and circular.

Distance:

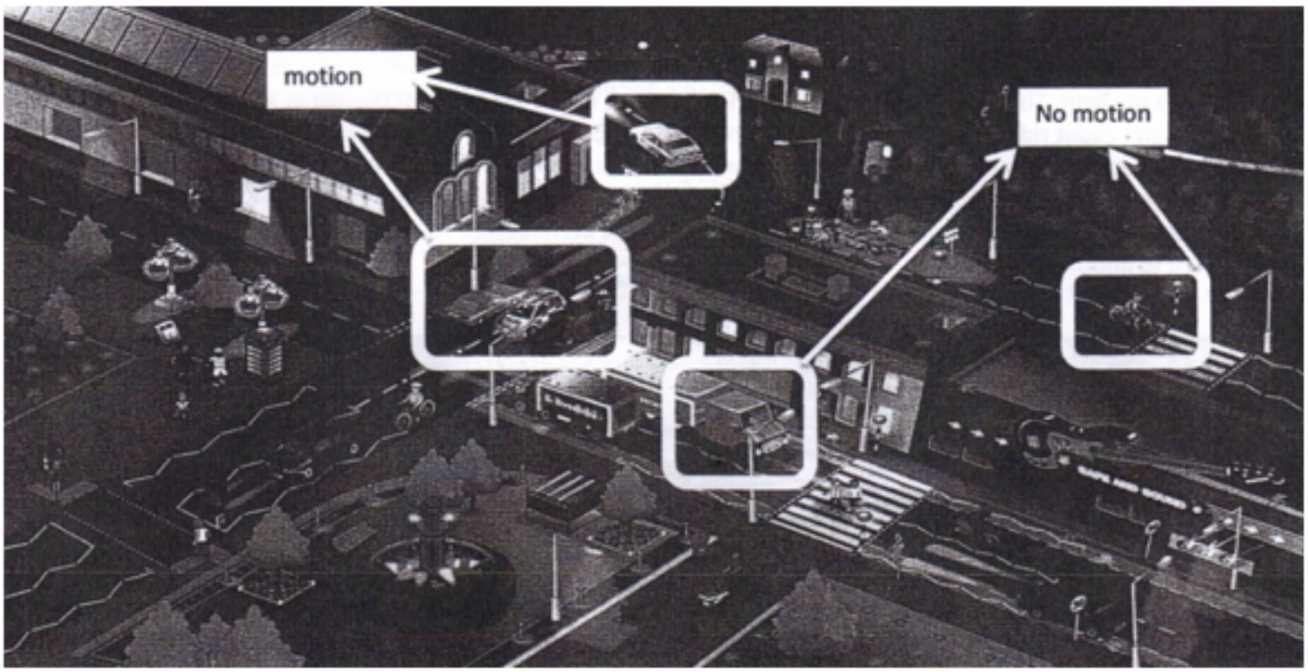
1. What is distance? Distance is the length between two objects or positions (locations)

2. How is distance important to learning an object's location or position? It is another way to explain an object's position.

3. What are the two units of measurements that can be used to measure distance?
customary units and metric units



Motion is when an object changes its position. You can move up, down, to the right, or to the left. You are in motion when you ride your bicycle down the street. Sometimes you ride your bicycle very slow and sometimes your ride it fast. You might turn your handlebars. This motion changes where you are headed with your bicycle. There are ways to measure the different motions of your bicycle.



4. What are the **customary** units used to measure distance?

A) inches B) feet

C) yards D) miles

12 inches= 1 foot 36 (3 x 12) inches= 1 yard 3 feet = 1 yard 5,280 feet = 1 mile

5. What are the **metric** units used to measure distance?

A) meters B) centimeters C) kilometers

100 centimeters= 1 meter 100,000 centimeters= 1 kilometer 1,000 meters= 1 kilometer

6. What are the different types of tools used to measure distance?

A) meter or yard stick B) measuring tape C) rulers

7. What are the two terms used to describe motion? speed and direction

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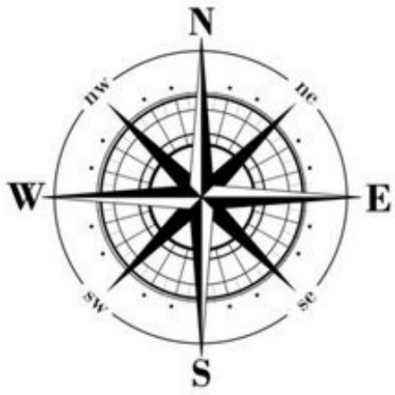


Direction is the path/course along which something is moving. Examples of terms that describe the direction of a moving object relative to another object are "**up**", "**down**", "**left**", "**right**", "**north**", "**south**", "**east**", "**west**". You can also describe position by using words that describe direction. A compass rose is a tool used to measure a direction that a person or object is traveling. The compass rose shows north, northeast, northwest, south, southeast, southwest, west and east. By using these directional words, people can understand the path of motion a person or object is traveling. You know that the sun rises in the east. It sets in the west. The words east and west describe the sun's position.

If you are riding your bicycle, you can change the direction or course that you are riding in. When you turn the handlebars of your bicycle the direction changes. When you change your direction, you also change your position. You might be riding your bicycle north, then turn your handlebars so that now you are heading east.

Direction:

1. What is direction? _____

   the path or course along which something is moving

2. How is direction important to learning an object's location or position? _____

   direction words can also describe and object's position

3. What are the terms used to referring to an object's direction?

   A) left B) right C) up D) down

   E) north F) south G) east H) west

4. Look at the diagrams below. *Label them correctly to explain the star's or smiley face's location in reference to the compass or triangle.*

Diagram 1:

up, north

Diagram 2:

left, west

Diagram 3:

right, east

Diagram 4:

down, south

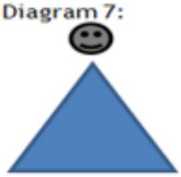
Diagram 5:

right, east

Diagram 6:

down, south

Diagram 7:



up, north

Diagram 8:

left, west

Speed is how fast an object moves or the measure of how far an object changes its position over a certain amount of time. Faster objects move a greater distance than slower objects in a certain period of time. For example, if a toy car moves a greater distance than another toy car in one minute, then its speed is greater. Some objects move at a very fast speed. Jet planes, trains, and race cars can move at very fast speeds. Other objects move at a very slow speed. An insect crawls along slowly. So does a baby. Speed can be measured. You might measure speed by using a stopwatch. Or, you might measure speed according to how far something travels. For example, you could measure how fast you ride your bicycle in miles per hour. You might ride your bicycle at a speed of ten miles per hour. A car has a much faster speed. A car might have a speed of 40 mph (miles per hour).

Speed:

1. What is speed? how fast an object moves or the measure of how far an object changes its position over a certain amount of time

2. Describe the outcome of an object moving fast. a fast moving object goes a greater distance

3. Describe the outcome of an object moving slowly. a slow moving object goes less distance

4. How can time help us to determine which object is moving faster than the other? the faster moving object takes less time to travel the same distance as a slower moving object

5. ***Look at the diagram below.*** (measuring time)

Which car moved the fastest? Car A (more distance)

What car moved the slowest? Car B (less distance)

The strength of a push or pull and the amount of mass of the object can affect the motion of an object at rest. The stronger the push or pull, the faster the object will move. The weaker the push or pull, the slower the object will move. **Mass** is how much matter is in an object. If the strength of the push or pull is the same, an object of greater mass would move slower than an object with a lesser mass. Think about a full desk and a chair. The desk has more mass than the chair. If I push them both with the same **force**, which will move slower?

6. What are the two things that affect the motion of an object at rest?

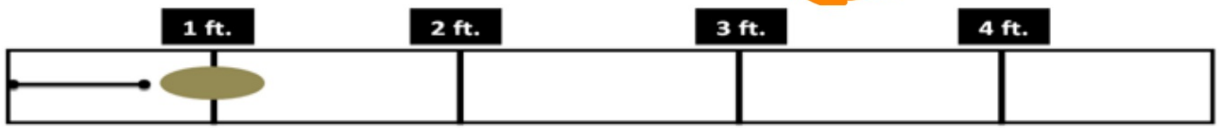
A) how hard or soft the force (push or pull) is on the object

B) the mass of the object (more mass = more force needed)
(less mass = less force needed)

7. What force do you think was applied to the ball? strong or weak

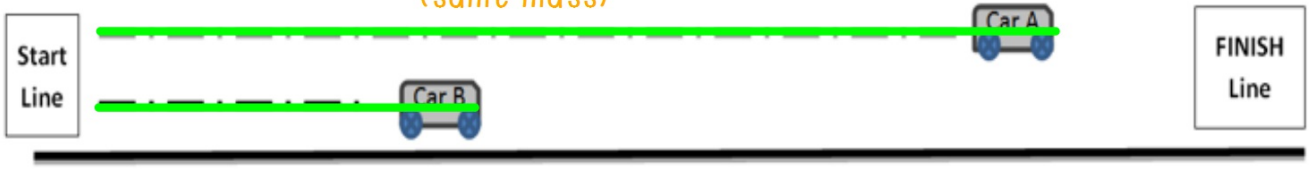
Why do think that type force was applied? it has gone farther than the ball below

8. What force do you think was applied to the ball? strong or weak



Why do think that type force was applied? it didn't roll very far at all

9. ***Look at the diagram below.*** * Which car had the **greater** force applied to it? Car A
(same mass)



10. ***Look at the diagram below.*** * Which car had the **weaker** force applied to it? Car B
(same mass)

Mass & Gravity:

1. What is mass? how much matter is in an object

2. What is the result if the strength of the push or pull is the same on an object with a heavy mass and an object with a lesser mass? two objects of different mass using the same force....

Object A - large mass = it will need a STRONG force to move

Object B - small mass = it will need a WEAKER force to move

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A push can make some things move toward you. For example, you use force to pedal your bicycle. When you push on the pedals, the bicycle moves. The harder you push, the faster it goes. Sometimes forces do not make things move. Look at Figure 1. One force pushes to the right. An equal force pushes to the left. The forces are the same and pushing against each other so the object does not move. These are called **balanced forces**. Balanced forces are forces on an object that are the same, but pushing or pulling in opposite directions of each other.

Figure 1

same force + opposite directions = NO movement

Now look at Figure 2 and Figure 3. The object moves because the forces are not balanced. It moves in the same direction as the strong force. A force that is not balanced can change an object's direction. Also if both forces are pushing or pulling in the same direction, the object will change position or **motion** will occur. Think about a ball rolling towards you. If you kick the ball, your force on the ball is not balanced and the ball will change direction.

Force A is STRONGER than Force B
+ moving in opposite direction
= some movement

Figure 2

Force A is EQUAL to Force B
+ moving in same direction
= greater movement

Figure 3

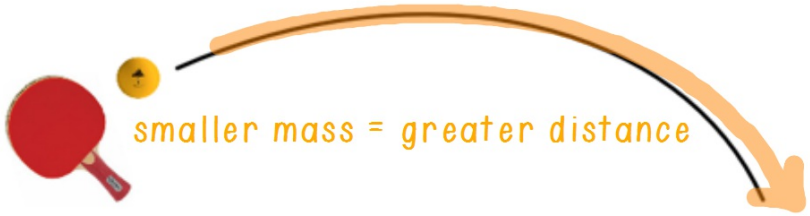
Forces can be strong or weak. A strong force is needed to move a heavy object. A weak force can move an object that is not heavy. You use a strong force to pick up several big books. You only need a weak force to pick up a small book. Think about throwing a ball. If you use a strong force, the ball moves a long distance. If you use a weak force, the ball only moves a short distance.

weak force = short distance

strong force = long distance

The amount of mass in an object affects how a force acts on it. Suppose you hit a table tennis ball with a paddle. The ball has very little mass. The ball travels a great distance. If you tried to hit a bowling ball with the paddle, the ball would hardly move. The bowling ball has much more mass than the table tennis ball so the effect of the force on the bowling ball is not as great as on the table tennis ball.

heavier mass = less distance



The pull of **gravity** attracts objects to one another. The pull of gravity is everywhere. Earth's gravity pulls objects toward the center of the Earth. The pull of gravity holds things down on Earth. Things fall to Earth because they are pulled straight down by Earth's gravity. No matter whether an object is dropped or thrown, it will always fall toward Earth's surface. Without gravity, everything on Earth would float away. Gravity holds Earth in its orbit around the sun too.

The force of gravity depends on the mass of the objects. It also depends on the distance between the two objects. If two objects are close together, the force of gravity is stronger. The farther apart the two objects are, the less the force of gravity. Think about our solar system. You most likely know that Earth is the 3rd planet from the sun. Mars is farther from the sun than the Earth so the force of the sun's pull is greater on Earth than it is on Mars. Look at the diagram of the

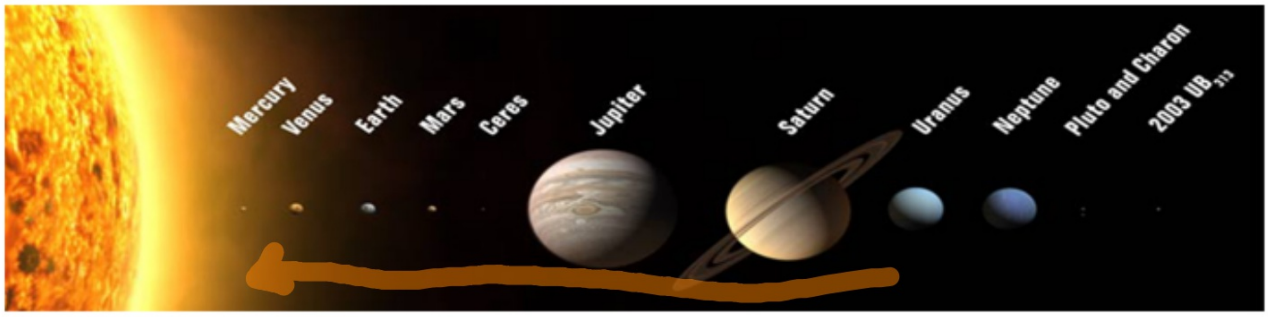
3. What does the pull of gravity do? pulls objects toward each other

4. TRUE or FALSE: ***The pull of gravity is everywhere.***

5. What does Earth's gravity pull objects toward? center of the Earth; to Earth's surface

6. What keeps all these objects in place on Earth's surface? gravity

inner planets of the solar system. On which planet would the sun have the greatest pull?



The force of gravity is very strong between two objects that have a lot of mass. If one object has more mass than the other that object has a great force of gravity. That object will pull the other object toward it. For example, the sun has a much greater mass than Earth. The sun pulls Earth toward it.

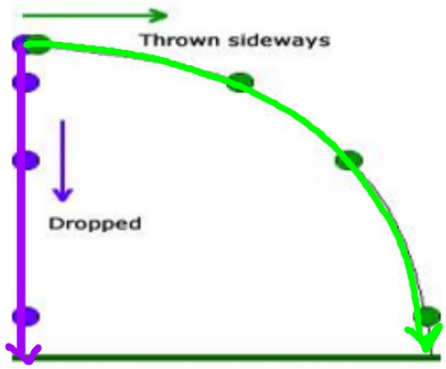
7. CAUSE: The Earth has gravity.

EFFECT: ***Things fall to Earth surface.***

8. ***Look at the diagram.***

What will happen to the dropped and thrown ball?

The dropped ball will fall straight to the ground. The thrown ball will travel a distance, then fall to the ground.

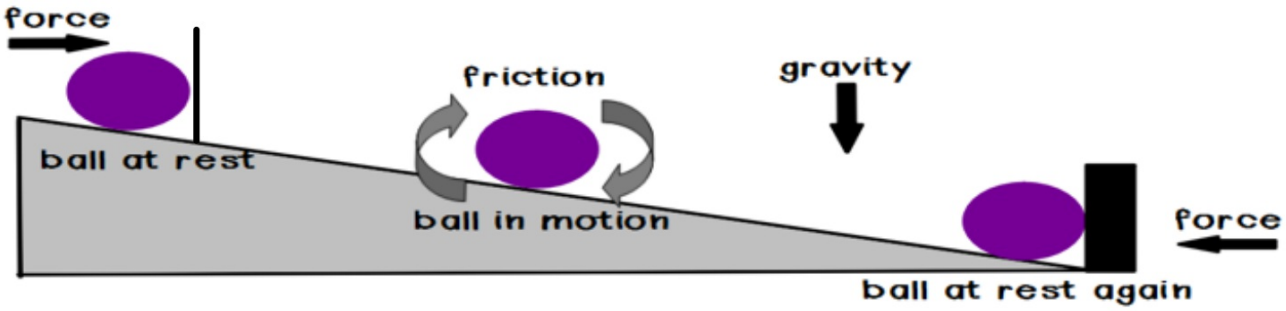


Why? Gravity pulls everything down to Earth's surface.

Gravity and Forces Acting with It

Other forces act on gravity. Think about a ball rolling down a hill. The force of gravity pulls the ball downward. The ball will continue to roll until it is stopped by other forces. Suppose the ball runs into a wall. The wall stops the ball from rolling. Another force that acts on gravity is friction. **Friction** happens when two objects rub against each other. Friction slows down the motion of an object. Think about rolling a ball along a smooth floor. There is little friction between floor and the ball. The ball continues to roll until it runs into a wall. Now, suppose you roll the ball along the carpet. The rough surface of the carpet slows down the ball. The ball moves more slowly than it does along the smooth floor. The friction between the ball and the carpet is greater. The ball slows down and stops.

The diagram below shows the forces that act on a ball. A force starts the ball rolling. Gravity causes the ball to roll down the hill. Friction slows down the motion of the ball. The force of the wall stops the ball from rolling.



Friction acts in the air, too. Imagine hitting a baseball with a bat. The ball goes flying through the air. As it flies, the friction of the air against the ball slows it down. Gravity pulls the ball toward Earth. Soon, the ball falls towards Earth and hits the ground.