

**Q1:** In order to determine an object's **location/Position/Motion**, you need a \_\_\_\_\_.

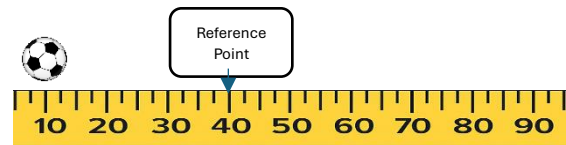
- A) time                      B) reference point                      C) speed                      D) displacement

**Q2:** Imagine you are **giving directions to a friend**. How would you use a **reference point** to help him **find your location**?

- A) Tell them to keep walking until they see you.      B) Use a nearby object as a starting point.  
C) Ask them to guess where you are.                      D) Use your phone's flashlight to signal them.

**Q3:** If a **ball** is placed at the **10 cm** mark and your **reference point is at the 40 cm** mark, how would you describe the ball's position relative to the reference point?

- A) The ball is 30 cm away in a positive direction.  
B) The ball is 30 cm away in a negative direction.  
C) The ball is 50 cm away from the ruler.  
D) The ball is at the reference point.



**Q4:** To determine if an object has **changed position**, you need to **know its position relative to another object**.

- A) True                      B) False

**Q5: Motion** can be described through a change in \_\_\_\_\_.

- A) speed                      B) distance                      C) position                      D) time

**Q6: Distance, a reference point, and a reference \_\_\_\_\_** are all needed to determine the **position** of an object.

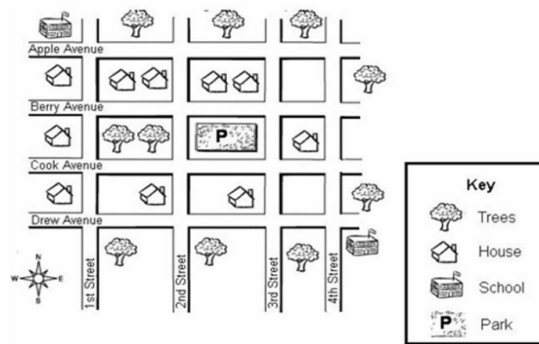
- A) line                      B) direction                      C) motion                      D) distance

**Q7:** Which of the following is the **least useful object to use as a point of reference** for describing the location of the parked car?



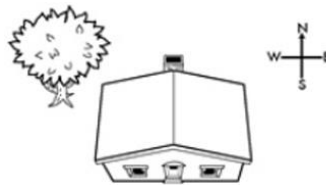
- A) the bird                      B) the streetlight                      C) the store                      D) the tree

**Q8:** What is shown **two blocks west of the park?**



- A) two trees                      B) a house                      C) a school                      D) nothing

**Q9:** A dog buried a bone in the yard just **north of the house**. Where is the bone located with respect to the tree?



- A) north of the tree                      B) east of the tree                      C) west of the tree                      D) south of the tree

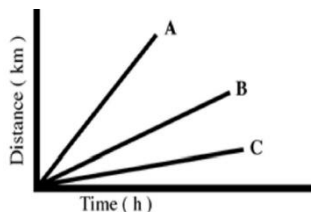
**Q10:** A swimmer swims **20 m in 40 s**. The swimmer's average speed is \_\_\_\_\_ m/s.

- A) 0.25 m/s                      B) 0.5 m/s                      C) 2 m/s                      D) 4 m/s

**Q11:** You are analyzing a distance–time graph. What features would indicate that an object is moving at a **constant speed**?

- A) A straight line with an equal distances                      B) A curved line that going up  
C) A straight line with an unequal distances                      D) A curved line that going down

**Q12:** Which line represents travel at **the fastest speed**?



- A) Line A                      B) Line B                      C) Line C                      D) All lines show the same speed

**Q13:** A driver needs to make a delivery to an office that is **30 km** away. The driver has traveled for **45 minutes** west down a straight road at **50 km/h**. **Has the driver traveled far enough to reach the office?**

- A) 30 km                      B) 37.5 km                      C) 2050 h                      D) 2250 km

**Q14:** A truck driver makes a trip that covers **2,380 km in 28 hours**. What is the driver's **average speed** in km/h?

- A) 80 km/h                      B) 85 km/h                      C) 90 km/h                      D) 95 km/h

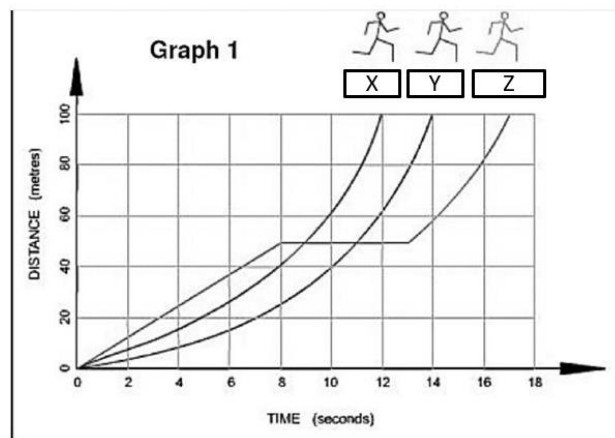
**Q15:** A cyclist travels **60 km in 2 hours**. How would you calculate their **average speed**, what is their average speed?

- A) 60 km/h                      B) 80 km/h                      C) 30 km/h                      D) 10 km/h

**Q16:** **How long** would it take a bus traveling at **52 km/h to travel 130 km**?

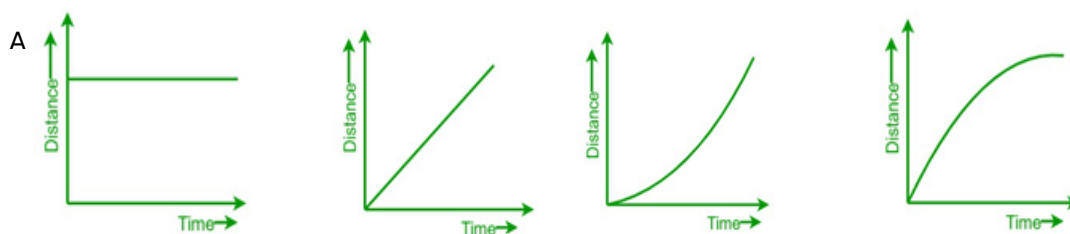
- A) 4 h                      B) 5h                      C) 1 h                      D) 2.5h

**Q17:** The distance–time graph below shows three athletes X, Y, and Z running a 100-meter race. Based on the graph, **which athlete finishes the race first, second, and third**?



- A) X, Z, Y                      B) X, Y, Z                      C) Z, Y, X                      D) Z, X, Y

**Q18:** Which graph represents **constant speed**?



**Q19:** Which of the following shows an **object moving at a constant speed**?

- a) A car moving steadily on a straight highway
- b) A fan spinning at a steady rate
- c) A runner starting to sprint faster
- d) Both a and b

**Q20:** According to **Newton's Second Law**, a **larger force** acting on an object causes a **greater** \_\_\_\_\_ of that object.

- A) speed                      B) mass                      C) acceleration                      D) position

**Q21: Acceleration depends** on which **two** factors?

- A) mass and position                      B) net force and mass  
C) mass and velocity                      D) position and net force

**Q22:** Lizzie is pushing Alex on a scooter. Lizzie pushes with **75 N** of force to the **left**, and Alex helps with **20 N** to the **left**. What is the net force on the scooter?

- A) 95 N to the right                      B) 95 N to the left  
C) 55 N to the right                      D) 55 N to the left

**Q23: Friction** always acts in a direction \_\_\_\_\_ to the direction of motion.

- A) the same                      B) at an angle                      C) opposite                      D) downward

**Q24:Two people** pull on a chain in **opposite** directions with forces of **500 N** and **600 N**. The forces are best described as \_\_\_\_\_.

- A) balanced forces                      B) unbalanced forces  
C) action-reaction forces                      D) gravitational forces

**Q25: A change in motion** is produced by \_\_\_\_\_.

- A) all forces                      B) balanced forces                      C) unbalanced forces                      D) None

**Q26:** A force of **100 N** is applied to an object, giving it an acceleration of **2 m/s<sup>2</sup>**. What is the mass of the object?

- A) 25 kg                      B) 50 kg                      C) 100 kg                      D) 200 kg

**Q27:** What is the acceleration when a force of **2.0 N** is applied to a ball has a mass of **0.60 kg**?

- A) 1.2 m/s<sup>2</sup>                      B) 2.0 m/s<sup>2</sup>                      C) 3.3 m/s<sup>2</sup>                      D) 6.0 m/s<sup>2</sup>

**Q28:** Which surface creates a **larger opposing force**?

- A) Rough sandpaper  
B) Smooth wood ramp  
C) Carpet  
D) Rough cloth



**Q29:** Which of the following is an application of **Newton's First Law**?

- A) The acceleration of an object equals the net force divided by the mass,  $a = \frac{F}{m}$ .  
B) For an object to start moving, a force greater than friction must be applied to it.  
C) The mechanism that makes helicopters and drones work.  
D) In a tug of war game, students are playing by pulling the rope; the only way for a team to win is to have unbalanced forces.

**Q30:** In the free-body diagram, the force to the left (**F<sub>1</sub>**) is **less than the force to the right (F<sub>2</sub>)**. Which **direction** will the object move?



- A) To the left                      B) To the right                      C) It will stay still                      D) It will move in both directions

**Q31:** What **change in motion** will result from the forces modeled?

- A) There will be no change in motion because the forces are in opposite directions.
- B) The object will slow down because of the friction force.
- C) The object will accelerate to the right.
- D) The object will accelerate to the left.



**Q32:** What would a model of the **net force** look like?

- A) The arrow would be to the right at the same length as before.
- B) The arrow would be to the right but shorter than before to account for the friction force.
- C) There would be no net force because the two forces are in opposite directions.
- D) The arrow would be to the left because friction is slowing the object down.

**Q33:** A **train moves** at a **constant speed** down a straight track. Which of the following scientific explanations is true?

- A) No forces act on the train as it moves.
- B) The train moves because no forces are acting against it.
- C) The forces of the train's engine balance the force of friction opposing it.
- D) An unbalanced force keeps the train moving.

**Q34:** What is **friction**?

- A) A push that makes objects move faster
- B) A force that resists motion between two touching surfaces
- C) A pull that increases speed
- D) A type of magnetic force

**Q35:** How does **friction** compare between **smooth and rough** surfaces?

- A) Friction is greater on rough surfaces
- B) Friction is greater on smooth surfaces
- C) Friction is the same on all surfaces
- D) Friction does not depend on the surface

**Q36:** If a **person pushes an object to the right**. What **forces are acting on the person**?



- A) A slightly smaller force to the left because the object is accelerating.
- B) A force equal to the force applied going to the left.
- C) A force to the right to apply the force to the object.
- D) A force to the right because the object is accelerating.

**Q37:** If you **push on a wall** with a force of **60 N**, the **force acting on you from the wall** is which of the following?

- A) 0 N
- B) 60 N
- C) 20 N
- D) 30 N

**Q38:** Which **law** best explains how the **rocket is able to lift off the ground**?

- A) the law of conservation of momentum
- B) Newton's first law
- C) Newton's second law
- D) Newton's third law



**Q39:** The image shows a car crashing into a pole. The average **force exerted by the car** on the pole is **7,000 N to the left**. What is the average **force exerted by the pole** on the car?

- A) The pole exerts an average force of 7,000 N to the right.
- B) The pole exerts an average force of 7,000 N to the left.
- C) The pole exerts an average force of 3,500 N to the left.
- D) The pole exerts an average force of 3,500 N to the right.



**Q40:** Which of the following systems does **NOT** represent a **force pair**?

- A) When you push on a bike's brakes, the friction between the tires and the road increases.
- B) When a diver jumps off a diving board, the board pushes the diver up.
- C) When an ice skater pushes off a wall, the wall pushes the skater off the wall.
- D) When a boy pulls a wagon, the wagon pulls back on the boy.

**Q41:** Kelly sits on a rock in a field. Which of the following correctly **name force pairs**?

- A) Kelly pushes on the rock, and the rock pushes on Earth.
- B) Earth pulls on Kelly, and Kelly pulls on the rock.
- C) The rock pushes on Earth, and Earth pulls on the rock.
- D) Kelly pushes on the rock, and the rock pushes on Kelly

**Q42:** There is a **gravitational force between you and your desk**. This gravitational force is **very small because** \_\_\_\_\_.

- A) the masses are small compared to Earth's mass
- B) it doesn't need to be large
- C) the distance between the objects is small
- D) it is a noncontact force

**Q43:** If the **mass** of one of two spheres **increases**, how does it affect the gravity between the two spheres?

- A) The gravity increases
- B) The gravity decreases
- C) The gravity fluctuates
- D) The gravity is not affected

**Q44:** Gravitational force differs based on two things. It increases with increasing \_\_\_\_\_ and decreases with increasing \_\_\_\_\_.

- A) mass; distance
- B) distance; speed
- C) friction; pressure
- D) force; energy

**Q45:** Which of the following is **NOT true** of **gravitational force**?

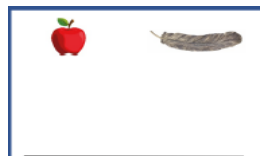
- A) noncontact
- B) depends on mass
- C) depends on speed
- D) depends on distance

**Q46:** What is the **gravitational acceleration on Earth's** surface approximately equal to?

- A)  $8.9 \text{ m/s}^2$
- B)  $9.8 \text{ m/s}^2$
- C)  $10.8 \text{ m/s}^2$
- D)  $9.2 \text{ m/s}^2$

**Q47:** In the figure below, a feather and an apple with two different masses are dropped at the same time in a **vacuum** tube (**no air resistance**). Which of the following statements is **correct**?

- A) The apple will reach the ground first because its mass is higher.
- B) The feather will reach the ground first because there is no air resistance.
- C) They will hit the ground at the same time.
- D) The feather will remain stuck in the air because Earth's acceleration acting on it equals zero.



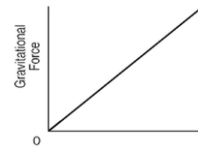
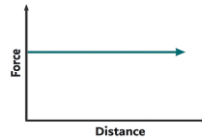
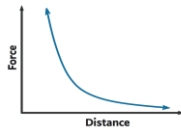
**Q48:** A **10 kg object** is resting on a flat surface. What is its **weight** on Earth?

- A) 9.8 N                      B) 98 N                      C) 10 N                      D) 980 N

**Q49:** A book with a mass of **2 kg** is at rest on **top of a desk**. What is its **weight** on Earth?

- A) 19.6 N                      B) 99 N                      C) 12 N                      D) 18.6 N

**Q50:** Which of the following graphs correctly shows how the **gravitational force** changes with **distance**?



**Q51:** The **oldest rock** layer in an undisturbed rock sequence occurs \_\_\_\_\_.?

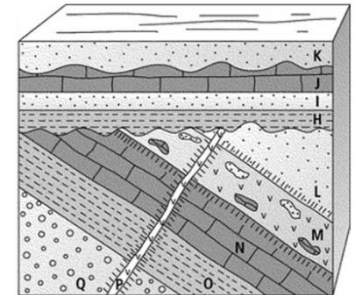
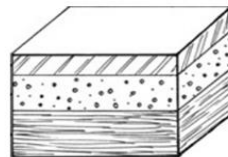
- A) at the bottom of the sequence                      B) below the sedimentary rock layer  
C) below the unconformity                      D) at the top of the sequence

**Q52:** According to the principle of \_\_\_\_\_, Layers **Q, M, O, N, and L** were not deposited at an angle when they first formed.

- A) cross-cutting relationships                      B) superposition  
C) lateral continuity                      D) original horizontality

**Q53:** The principle of **superposition** can be used to determine \_\_\_\_.

- A) the actual age of these rock layers  
B) the relative densities of these rock layers  
C) the actual temperatures of these rock layers  
D) the relative age of these rock layers

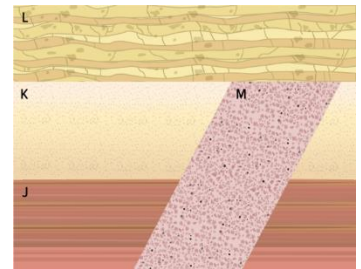


**Q54 :** Order the features in the illustration from **oldest to youngest**.

- A) JKLM                      B) MJKL                      C) JKML                      D) MLKJ

**Q55:** Which geologic **principle** must be assumed to determine the relative age of **M**?

- A) Cross-cutting relationships                      B) Superposition  
C) Original horizontality                      D) Inclusions



**Q56:** **Index fossils** are useful to geologists if the fossils \_\_\_\_\_.

- A) have lived over a short period of time                      B) are not easily recognized  
C) are not widely distributed geographically                      D) are scarce

**Q57:** Geologists organized the **geologic time scale** based on \_\_\_\_\_.

- A) rock record                      B) evenly spaced time segments                      C) fossil record                      D) both A and C

**Q58:** What classification of unconformity occurs when sedimentary rock overlies **igneous** rock?

- A) disconformity                      B) nonconformity                      C) angular unconformity                      D) conformity

**Q59:** When part of the rock record is destroyed, the erosional **gap** that forms is a(n) \_\_\_\_\_.

- A) inclusion                      B) key bed                      C) unconformity                      D) superposition

**Q60:** What is one reason the presence of **iridium** leads scientists to hypothesize that a meteorite impact caused the **mass extinction** of dinosaurs?

- A) There are no fossils of dinosaurs in rocks below the iridium layer.  
B) Iridium is only common on Earth and is never found in meteorites.  
C) All dinosaur fossils contain iridium.  
D) There are no fossils of dinosaurs in rocks above the iridium layer.

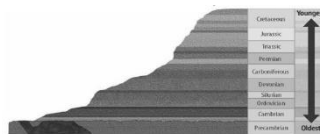


**Q61:** What **pattern** can scientists use to interpret information about the fossils shown in the rock layers.

- A) Rock layers all contain different sets of fossils.  
B) Older fossils are located closest to Earth's surface.  
C) Fossils are younger the closer they are to the surface.  
D) Each fossil is younger than the rock layer in which it is found.



**Q62:** Which is **true** of the rock layers shown below?



- A) Only older rocks contain fossils of complex life forms.  
B) Only younger rocks contain fossils of simple life forms.  
C) Both older and younger rocks contain fossils of the most complex life forms.  
D) Only younger rocks contain fossils of complex life forms.

**Q63:** Which of the following is **correct** regarding fossils?

- A) Fossils found in the oldest layers of rock are more complex organisms.  
B) Fossils of relatively simple organisms appear in younger layers of rock.  
C) Sudden disappearance in the fossil record of organisms marked as marine environment.  
D) Fossils and the rocks they are within can be used to determine what the environment of an area was like long ago.



**Q64:** A scientist finds many **fish fossils** in one area as shown in the image below. What does this evidence suggest about the area's **past environment**?

- a) That area was once a desert.  
b) That area was once a body of water.  
c) That area is still underwater.  
d) That area had no animals at all.



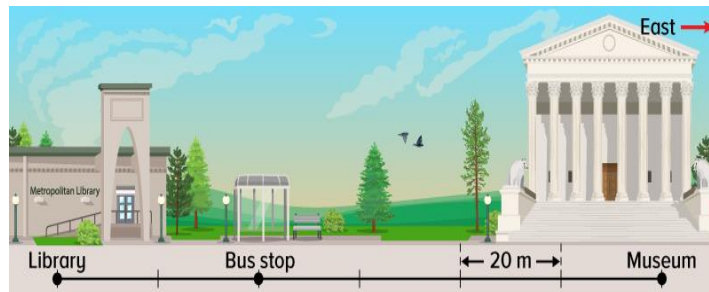
**Q65:** The process of **matching rock layers** from different locations based on their fossils and composition is called \_\_\_\_\_.

- a) Superposition                      b) Unconformity                      c) Correlation                      d) Cross-cutting

**Question**

**1**

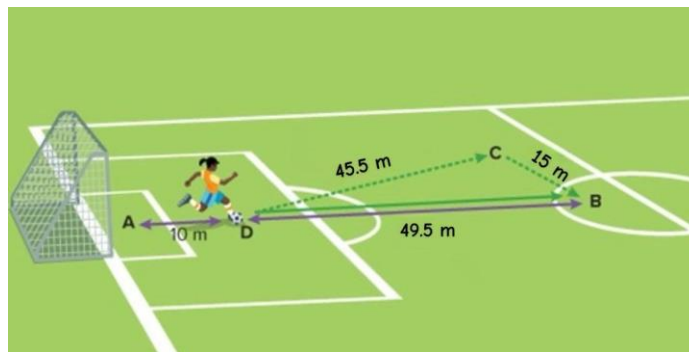
1) The **reference direction** in the image is **East**. Match each of the following to correctly state the direction using these terms: (**positive direction**, **negative direction**, **reference point**)



a) Ahmed walks from the bus stop to the library: .....

b) Suhail runs from the library to the museum: .....

2) The image below shows the position of a player as he runs from **point D to point C** and then **to point B**. Study the image and answer the questions that follow.



a) What is the **total distance** covered by the player: .....

b) What is the magnitude of the **displacement** of the player from positions **D to B**: .....

c) **Define distance**: .....

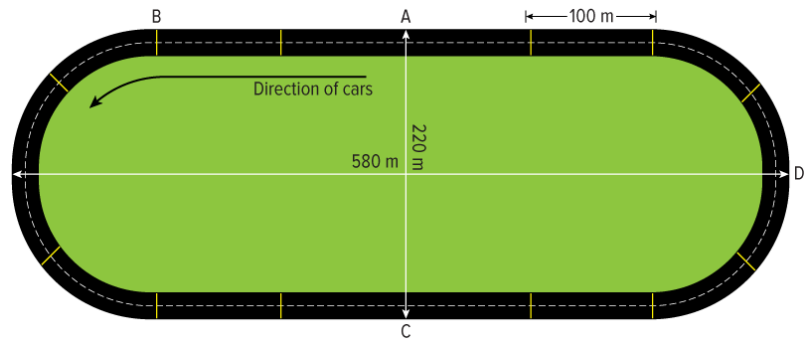
d) **Define Displacement**: .....

3) Use the racetrack model below to determine the **distance** traveled and the **displacement** of a car from point **A** to point **C** .

a) **Distance** = .....

b) **Displacement** = .....

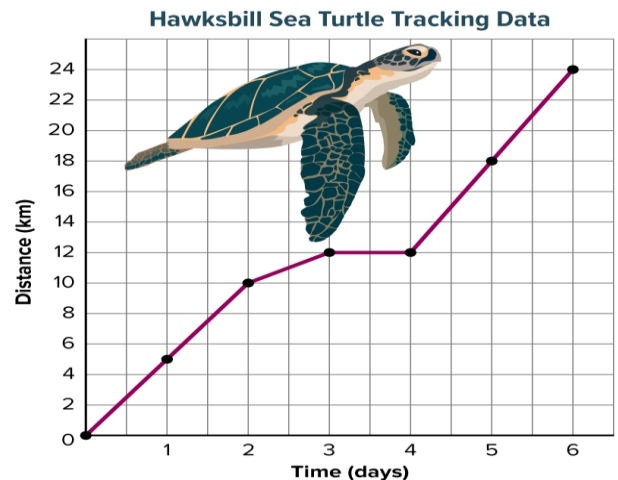
c) What will happen to the **displacement** if the car returns to point **A** (the starting point):  
 .....



4) Study the graph below:

Determine the average **speed** of the sea turtle between day **4** to day **6**.

.....  
 .....

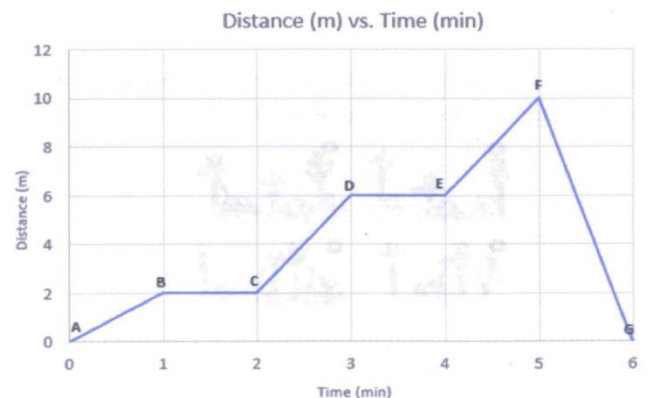


5) The plot below shows the motion of an **elevator**, displaying a distance (m) vs. time (min) graph. Analyze the data on the plot to answer the following questions:

a) Which intervals show the elevator **speeding up** away from the starting point?  
 .....

b) What does the straight **horizontal line** on the graph indicate (e.g., from B to C) ?  
 .....

c) Calculate the average **speed** during the interval **F to G** and explain in words the elevator's motion during that interval.  
 .....



6) Look at the figure of the man fishing.

a) If the **fishing pole** is used as the **reference point**, is the man in motion?

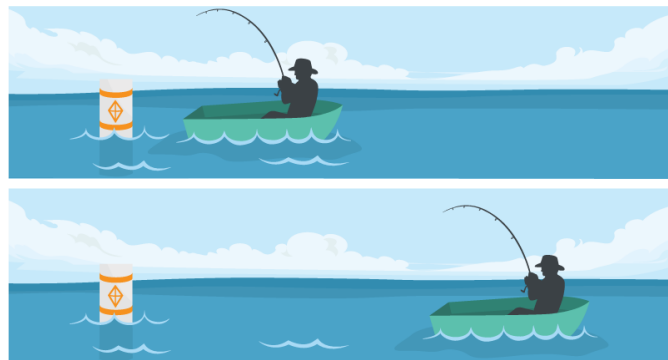
.....

b) If the **buoy** is used as the **reference point**, is the man in motion?

.....

c) What does this situation tell us about **how motion is described**?

.....

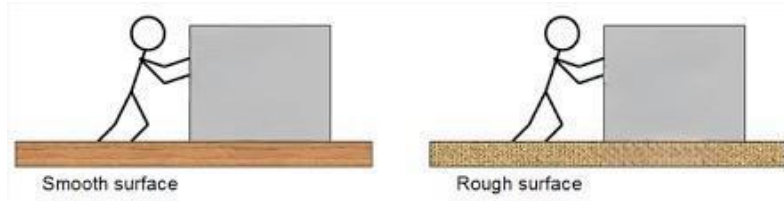


7) A truck driver makes a trip that covers **1,440 km in 20 hours**. What is the driver's **average speed** in km/h?

.....

| Question                                                                                                                                 | True / False   |
|------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 1) To determine if an object has changed <b>position</b> , you must <b>compare it to another object</b> .                                | (True / False) |
| 2) <b>Distance alone is enough</b> to determine an object's <b>position</b> without needing a reference point or direction.              | (True / False) |
| 3) <b>Returning to the exact point</b> where you <b>started</b> means your <b>displacement is the same as the distance</b> you traveled. | (True / False) |
| 4) The <b>reference point can change</b> when describing motion; it is simply the chosen <b>starting point</b> .                         | (True / False) |
| 5) <b>Distance</b> is the <b>total length</b> of the path an object travels, regardless of direction.                                    | (True / False) |

1) Study the images below showing a person pushing a box on a **smooth surface** and on a **rough surface**.



a) How does the **amount of friction** compare between the two surfaces?

.....

b) Describe how friction **affects the motion** of the block on each surface.

.....

2) Caleb is comparing how different surfaces affect the **motion of a wooden block**. He uses three **different surfaces**: **smooth wood**, **carpet**, and **rough sandpaper**.



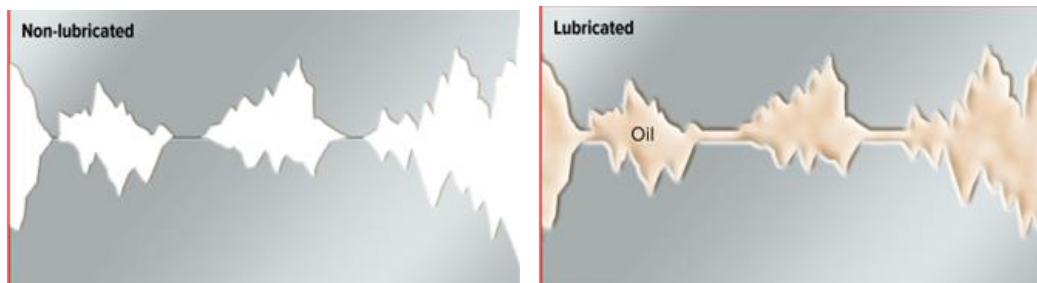
a) On which surface will the wooden block experience the **largest opposing force**? Why?

.....

b) On which surface will the wooden block **move the most easily**, and why?

.....

3) The diagrams show **two surfaces**: one **dry (non-lubricated)** and one **lubricated** with oil. Compare the effects of friction on the dry surface and the lubricated surface.



.....

4) You push on a **crate** with a force of **10 N to the right**, and **your friend** pushes on the crate with a force of **25 N to the left**. Describe and explain the motion of the crate.

.....

5) A force is push or pull. Forces can change the motion of an object. Study the image below:



a) Calculate the net force acting on the block.

.....

b) Given that the **mass** of the block = 5 kg, **calculate the acceleration** of the block.

.....

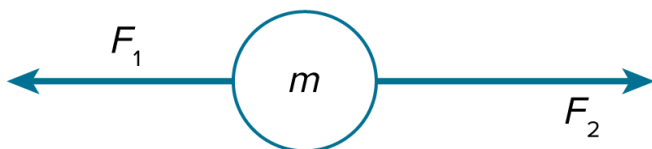
6) An object is pushed to the **right with 10 Newtons** of force and pulled to the **left with 20 Newtons**. **Sketch** a free-body diagram of this **system** and **draw a diagram** with the **net force**. Ignoring friction, identify the direction and motion of the object.

.....

7) How does **Newton's First Law** explain the **motion** of an object when **no force** is applied?

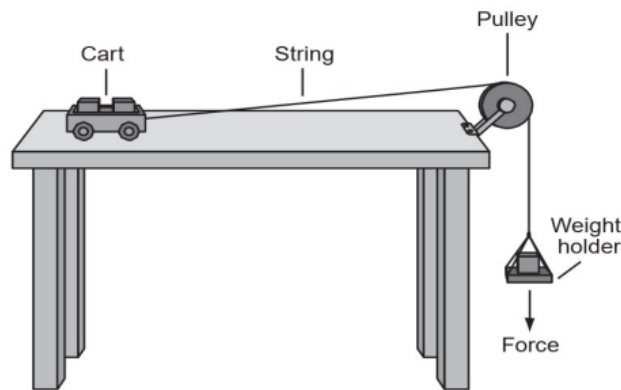
.....

8) In the free-body diagram above, the force to the left ( **$F_1$** ) is **less than** the force to the right ( **$F_2$** ). Which **direction** do you think the object will begin to move?



.....

9) A group of students is investigating how a force applied to an object affects the motion of that object. To create a force, the students add a weight to the weight holder and observe whether the cart moves.



a) Describe **two forces acting on the cart**. Include the **direction** of the force.

.....

b) Make a **claim about the forces** on the cart **when the cart does not move**. Support your claim **using Newton's laws of motion**.

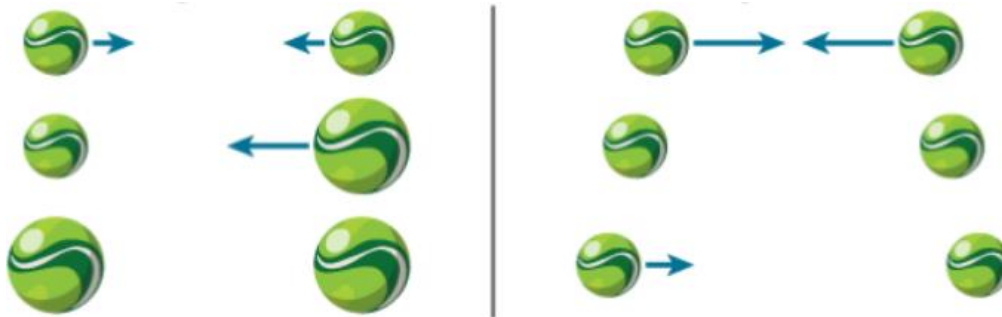
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| Question                                                                                                                     | True / False   |
|------------------------------------------------------------------------------------------------------------------------------|----------------|
| 1) If a <b>net force acts on an object</b> , the object may <b>change speed, change direction, or do neither</b> .           | (True / False) |
| 2) When <b>two forces</b> act in the <b>same direction</b> on an object, the net force is found by <b>adding</b> the forces. | (True / False) |
| 3) <b>Balanced</b> forces acting on an object <b>cause</b> the <b>object to accelerate</b> .                                 | (True / False) |
| 4) <b>Friction</b> always acts in the <b>opposite</b> direction of motion and causes objects to <b>slow down</b> .           | (True / False) |
| 5) The <b>pushing force must be greater than the friction</b> to make a <b>movement</b> .                                    | (True / False) |
| 6) A <b>lubricated surface reduces friction</b> , making it <b>harder</b> for objects to move.                               | (True / False) |

1) Think about what would happen if you dropped a **pencil and a book** at the same time. **Why wouldn't** the pencil and the book **attract each other**? And **both fall to the ground**? Or **why** is the **gravitational** force between **small objects** difficult to observe?



2) On the figure below, **draw arrows** to **model the size and direction** of the **force of gravity** for the missing forces in each system.



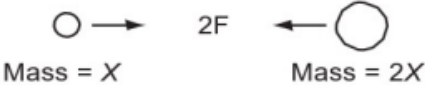
3) A **book** with a mass of **2.5 kg** is at rest on **top of a desk**. Calculate its weight and **draw a free-body diagram of the system**.

4) **Fill** in the blanks:

(Word bank: **distance**, **mass**, **speed**, **gravitational force**)

\_\_\_\_\_ is the force of attraction between two objects. It increases with increasing \_\_\_\_\_ and decreases with increasing \_\_\_\_\_.

5) This diagram shows three models that represent the gravitational force, **F**, between objects. **Effect of Mass on Gravitational Force (F)**

| Effect of Mass on Gravitational Force (F) |                                                                                    |  |
|-------------------------------------------|------------------------------------------------------------------------------------|--|
| Model 1                                   |  |  |
| Model 2                                   |  |  |
| Model 3                                   |  |  |

a) Describe how the **models represent gravitational force** as an attractive force.

.....

b) Make a claim about **the effect of mass on the gravitational force** between objects. Support your claim with **evidence** from the models.

.....

6) Which **planet** would have a **stronger gravitational force** on an object placed at the same distance **Earth, Moon, or Jupiter**? Why?

.....

7) How does the **distance** between two objects influence the **gravitational** pull between them?

.....

8) If **Object X** were moved **closer to Planet B**, how would the **gravitational force between them change**?



.....

1) What does the principle of **uniformitarianism** state?

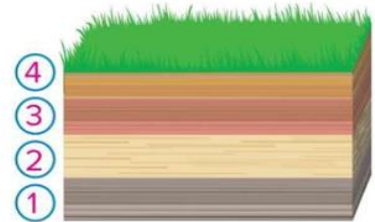
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2) What does the principle of **original horizontality** tell us about sedimentary layers?

.....

3) Study the image below

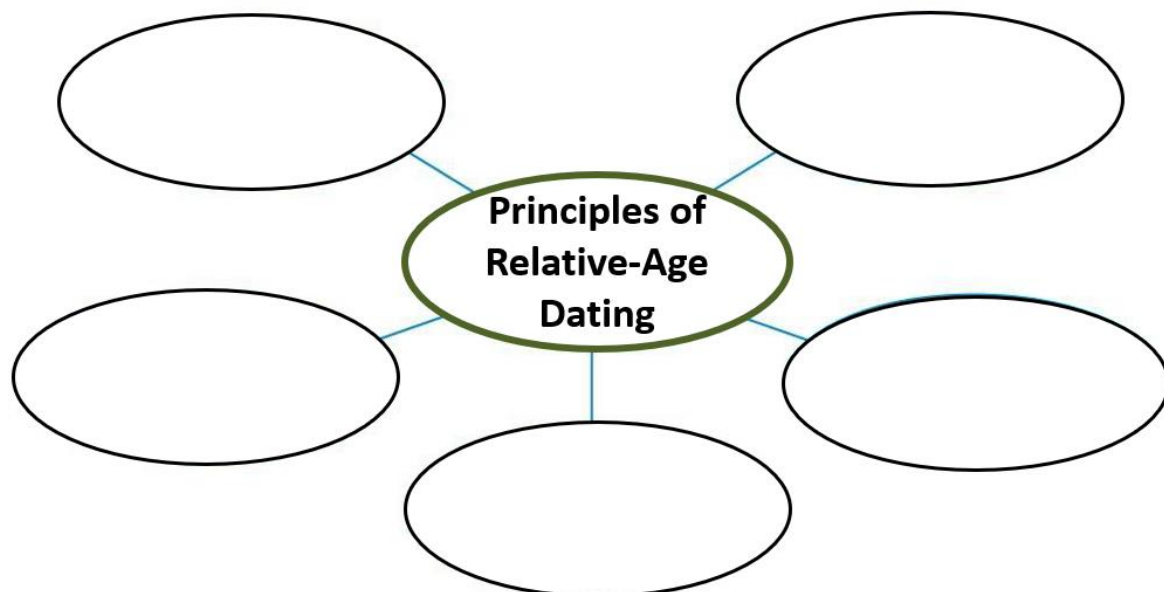
What is the **oldest rock** layer? **why?**



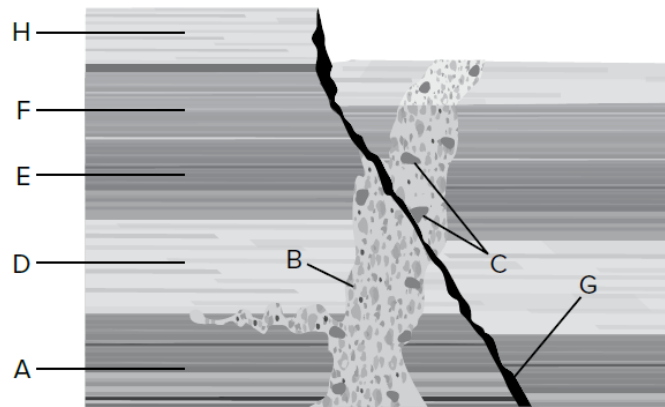
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4) Identify the five (5) **Principles of Relative-Age Dating**.

|               |                    |                   |                        |
|---------------|--------------------|-------------------|------------------------|
| Superposition | Lateral Continuity | Uniformitarianism | Cross-cutting          |
| Inclusions    | Unconformity       | Absolute Age      | Original Horizontality |



5) Imagine you are a geologist, and you have been asked to analyze the following rock formation that formed over millions of years.



a) What are the **relative ages** of the different geologic features (**A–H**) in the formation, **beginning with the oldest** feature?

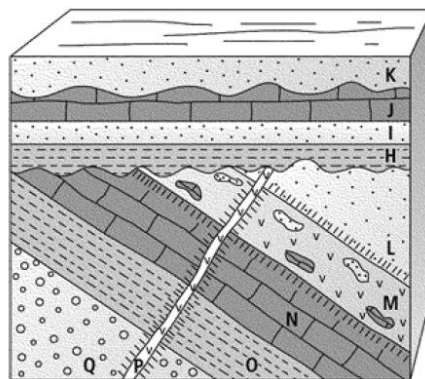
.....

b) How did you apply the **principles of relative age dating** to evidence to determine the relative ages? Include **at least three principles**.

.....

6) **Fill** in the blanks:

(Word bank: **Superposition**, **Original horizontality**, **Lateral continuity**, **Cross-cutting relationship**, **Inclusions**)



a) According to the principle of \_\_\_\_\_, Event **P** is younger than Event **M**.

b) Layer **H** is **deposited on** an \_\_\_\_\_.

c) The \_\_\_\_\_ in **M** are **older than** the rock itself.

d) Relative ages of **H**, **I**, **J**, and **K** can be determined using the principle of \_\_\_\_\_.

7) Do all **rock layers form at the same time**? If not, which layers are the **oldest** and which are the **youngest**? **Why**?



.....  
.....

8) Do the small rock **pieces form at the same time** as the **rock** that holds them? **Which is older**—the pieces or the rock? **Why**?



.....  
.....

9) Do you think the **fault** and the **rock layers formed at the same time**? If not, which is **older and why**?



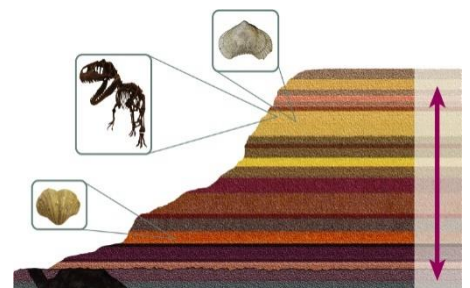
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10) A scientist finds **many fish fossils in mountain rocks**, as shown in the image below. What does this discovery tell us about the **mountain's past environment**?



.....

11) What does the **fossil record** show about the difference between **fossils in older layers** and **fossils in younger layers**



.....  
.....