Name: _____ **Date:** _____

Answer Key: Your Mission to Mars: The Kinematics Flight Path Challenge for 6th Grade

Calculate orbital shifts and rover velocity to ensure your mission lands safely on the Red Planet using advanced motion analysis.

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1. A rover travels 20 meters North to collect a rock sample, then 20 meters South to return to its lander. What is the rover's total displacement?

Answer: B) 0 meters

Displacement measures the change in position from the starting point to the ending point. Since the rover returned to its start, its displacement is zero.

2. A falcon dives at a constant 40 m/s toward its prey. This measurement is considered ____ because it specifies both speed and a specific path.

Answer: C) Velocity

Velocity is a vector quantity that includes both the speed (40 m/s) and the direction (toward the prey).

3. If a satellite is orbiting Earth at a constant speed in a circular path, it is still technically accelerating.

Answer: A) True

Acceleration is any change in velocity. Because velocity includes direction, changing direction in a circle means the object is accelerating even if speed is constant.

4. You observe a graph where the line is perfectly horizontal on a Velocity vs. Time plot. What does this indicate about the object's motion?

Answer: C) The object is moving at a constant velocity with zero acceleration.

A horizontal line on a velocity-time graph means the velocity is staying the same over time, resulting in zero acceleration.

5. An Olympic sprinter increases their speed from 0 m/s to 12 m/s over a span of 3 seconds. Their ____ is 4 m/s^2.

Answer: D) Acceleration

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Acceleration is the change in velocity divided by time (12 m/s - 0 m/s) / 3s = 4 m/s^2.

6. A maglev train travels 300 km West in 2 hours. What is its average velocity?

Answer: B) 150 km/h West

Velocity must include both the magnitude (300/2 = 150) and the direction (West).

7. An object can have a high speed but a velocity of zero if it moves in a complete circle and ends where it started.

Answer: A) True

Average velocity is displacement over time. If displacement is zero (starting and ending at the same spot), average velocity is also zero.

8. The slope of a 'Position vs. Time' graph represents the ____ of the object.

Answer: A) Velocity

The change in position over the change in time is the definition of velocity, which is shown by the slope of a position-time graph.

9. A deep-sea probe is lowered at a rate of 5 meters per second. After 10 seconds, it stops. During the stop, its acceleration was:

Answer: C) Negative (deceleration)

Slowing down to a stop is a decrease in velocity, which is defined as negative acceleration or deceleration.

10. Kinematics focuses on the math of 'how' things move, whereas Dynamics focuses on 'why' (forces) they move.

Answer: A) True

Kinematics is the study of motion parameters like velocity and acceleration without considering the forces like gravity or friction that cause them.