Learning Target: I can read passages about the practical applications of the electromagnetic spectrum and then use the information gathered to answer comprehension questions.

FSI 8th Grade Science Reading for Meaning – The Relationship Between Speed & Distance

In a recent class experiment, students used a computer simulation called *The Moving Man* to explore how speed and distance are related. In the simulation, a man walks, jogs, or runs across a straight track while a position-time graph shows his motion.

Part 1: The Experiment

Students conducted three trials where the man moved for 10 seconds at different speeds.

Trial	Speed (m/s)	Time (s)	Distance (m)
1	1 m/s	10	10
2	2 m/s	10	20
3	3 m/s	10	30

The students observed that the man's **distance increased at a constant rate** in each trial. When they doubled the speed, the total distance after 10 seconds also doubled. This helped them conclude that **distance is directly proportional to speed when time remains constant.**

Part 2: Testing Predictions

Next, the students predicted what would happen if time changed instead of speed. They kept the speed at 2 m/s but changed the time in each trial.

Trial	Speed (m/s)	Time (s)	Distance (m)
4	2	5	10
5	2	15	30
6	2	20	40

They found that **distance increases proportionally with both speed and time.** When the man walked twice as long, his distance doubled.

Part 3: Real-Life Connection

To connect this to real-world motion, students compared their results to driving a car. If a car travels at 60 miles per hour, it moves 60 miles in one hour. At that same rate, in half an hour, it would move 30 miles. This shows a **linear relationship** between speed, time, and distance — expressed mathematically as: **Distance = Speed x Time**

However, in real life, **speed can change** due to factors like friction, acceleration, and obstacles. When speed varies, the relationship is no longer a straight line, and scientists must analyze the slope of a curve on a distance-time graph to find **average speed**. The students concluded that by analyzing motion graphs and tables, they could predict how far an object travels based on its speed and how long it moves, an essential skill for engineers, athletes, and even self-driving car designers.

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Multiple Choice Questions (DOK 3–4)

Standard: *S8P3.a — Analyze and interpret data to identify patterns in the relationships between speed and distance.*

1. (DOK 3)
Based on the first data table, what pattern can be identified between speed and distance when time is constant?
A. Distance increases at an unpredictable rate.
B. Distance decreases as speed increases.
C. Distance doubles when speed doubles.
D. Distance remains constant regardless of speed.

2. (DOK 3)
If the man continued walking at 3 m/s for 15 seconds, what distance would he cover?
A. 30 m
B. 45 m
C. 50 m
D. 60 m

3. (DOK 3)
Which graph shape best represents the relationship between distance and time for an object moving at a constant speed?
A. A flat horizontal line
B. A straight line increasing at a constant slope
C. A curved line that levels off
D. A zigzag line

4. (DOK 3)
In the second set of trials, what variable is being changed and what is being kept constant?
A. Distance changes; time constant
B. Speed changes; time constant
C. Time changes; speed constant
D. Both time and speed change

5. (DOK 3)
Which conclusion from the investigation best supports the mathematical relationship Distance = Speed × Time?
A. Distance increases only if acceleration changes.
B. Distance and speed have no measurable connection.
C. Doubling either time or speed doubles distance.
D. Time and speed are inversely related.

6. (DOK 4)
If friction causes the man to slow down halfway through a 10-second run from 3 m/s to 1.5 m/s, how would this appear on a distance-time graph?
A. The slope would remain constant.
B. The line would curve and flatten as he slows down.
C. The line would suddenly drop below the x-axis.
D. The slope would steepen sharply.

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7. (DOK 4)
A car travels 60 km/h for the first half of a trip and 30 km/h for the second half. Which conclusion can be drawn about the total average speed?
A. It equals 45 km/h because speed was averaged.
B. It is less than 45 km/h because slower speeds take more time.
C. It is greater than 45 km/h because the car still reached the same distance.
D. It cannot be determined without the total distance.

8. (DOK 4)
A student claims, "If I triple the time and double the speed, I will travel six times as far." Is this claim supported by data patterns?
A. Yes, because $3 \times 2 = 6$.
B. No, because speed and time are independent.
C. Yes, because distance is directly proportional to both variables.
D. No, because increasing both variables reduces acceleration.

9. (DOK 4)
Which scenario would produce a non-linear distance-time graph?
A. A runner sprinting at a steady speed
B. A train traveling at constant speed on a track
C. A car speeding up after stopping at a red light
D. A person walking at a uniform pace

10. (DOK 4)
A student concludes that "faster speed always means greater distance." Why might this statement need revision?
A. Because distance depends on both speed and time.
B. Because faster speed reduces time automatically.
C. Because distance only depends on acceleration.
D. Because faster speeds make motion graphs flat.

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