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STUDY GUIDE

Chapter 2

Describing Motion

In each of the following statements, a term has been scrambled. Unscramble the term and write it on the line provided.

- 1. When something moves, it changes its POSITION (LOCATION).
- 2. Motion can be described as a change in MOTION.
- 3. Speed is the RATE OF CHANGE in position.
- 4. INSTANTANEOUS SPEED is the rate of motion at any given instant.
- 5. A speed that doesn't vary is called a CONSTANT SPEED.
- 6. The total distance traveled divided by the total time of travel is called the AVERAGE SPEED.
- 7. A TIME-DISTANCE graph makes it possible to "see" the motion of an object over a period of time.

Now find each unscrambled term in the hidden word puzzle below. The terms can be written horizontally, vertically, or diagonally and forward or backward. Circle each term as you find it

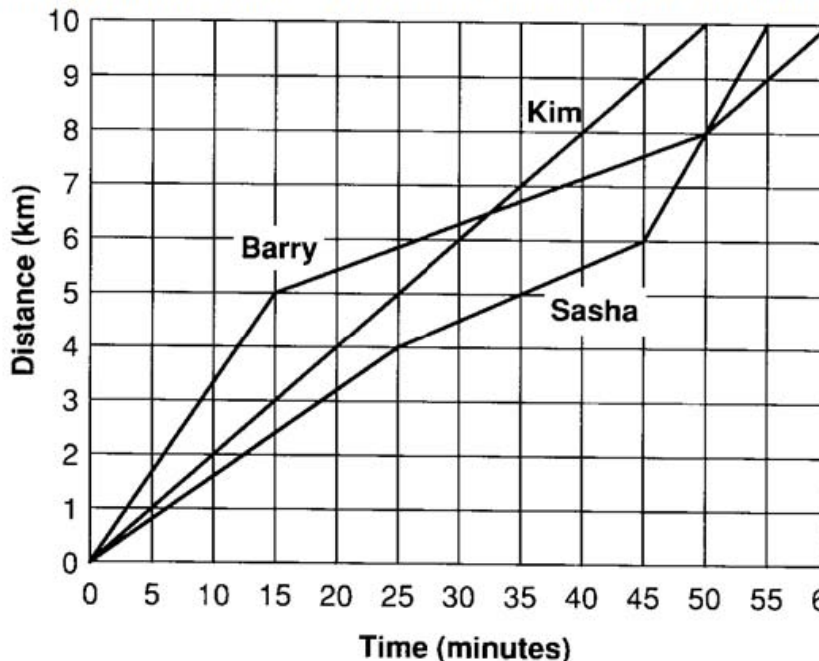
H Z I P L Q E F O N T Q S B D
 C O N S T A N T S P E E D Z B
 P B S R F P A Z A C G Y B F X
 M O T I O N O A C E B X G D A
 R O A M G T O S Z R H A G F Y
 G O N N E I N H I A X F B Z D
 G T T Q H M O L B T B X C B A
 L Y A Z M E G S O E I I E I S
 T C N Y P D B B I O M O A C X
 M P E L P I I F M F B D N J J
 Q C O C I S M I Q C I K P C X
 O F U B N T P M C H P O M B A
 C P S P O A F P F A O S N N G
 E L S F C N C C N N D V A O E
 F L P O J C J G A G D G I S T
 D E E P S E G A R E V A E O S
 G S E F B N L O O N Q T H P Q
 Z R D G K C D N B G C E A L R

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REINFORCEMENT Describing Motion

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Sasha, Kim, and Barry decided to have a 10-km bicycle race after school. They asked the coach to show them how far 10 km was on the school track. They then had their race on the track. Their race results are shown on the time-distance graph below. Use this graph to fill in the table of race results, calculate average speeds, and answer the questions.



$$s = \frac{d}{t}$$

Race Results			
Cyclist	Total distance	Total time	Average speed
Kim	10 km	50 min.	0.2 km/min
Sasha	10 km	55 min.	0.18 km/min
Barry	10 km	60 min.	0.16 km/min

- Which cyclist kept a constant speed during the entire race? What was this Speed? Kim - 0.20 km/min
- Which cyclist won the race? What was the winning time? Kim - 50 min
- Which cyclist placed second in the race? What was second place time? Sasha - 55 min
- Which cyclist placed last? What was last place time? Barry - 60 min
- Which cyclist started off fastest? Barry - STEEP SLOPE

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Velocity and Acceleration

Use the terms below to fill in the blanks.

acceleration	direction	meters per second squared (m/s ²)	slowing down
$a = \frac{v_f - v_i}{t} = \frac{\Delta v}{t}$	divide	meters per second (m/s)	subtract
change	increasing speed	positive	time interval
	negative	seconds(s)	velocity

DELTA MEANS CHANGE

Speed is the rate of motion of an object. VELOCITY describes an object's speed and direction. The velocity of an object can CHANGE even if the speed of the object remains constant. This would occur if the DIRECTION of the object's motion changes.

The rate of change of velocity is called ACCELERATION. The size of an acceleration depends on both the change in velocity and the TIME INTERVAL of the change.

To calculate acceleration, DIVIDE the change in velocity by the time interval. To find the change in velocity, SUBTRACT the initial velocity (v_i) from the final velocity (v_f). The equation for acceleration is $a = \frac{v_f - v_i}{t} = \frac{\Delta v}{t}$. Final velocity will be less than initial velocity if an object is SLOWING DOWN and acceleration will have a NEGATIVE value. Final velocity will be greater than initial velocity if an object is INCREASING SPEED and acceleration will have a POSITIVE value.

The units for velocity are $\frac{m}{s}$. The unit for time is

Sec. Therefore, the units for acceleration are

$\frac{m}{s^2}$ OR $\frac{m}{s \cdot s}$

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REINFORCEMENT Velocity and Acceleration

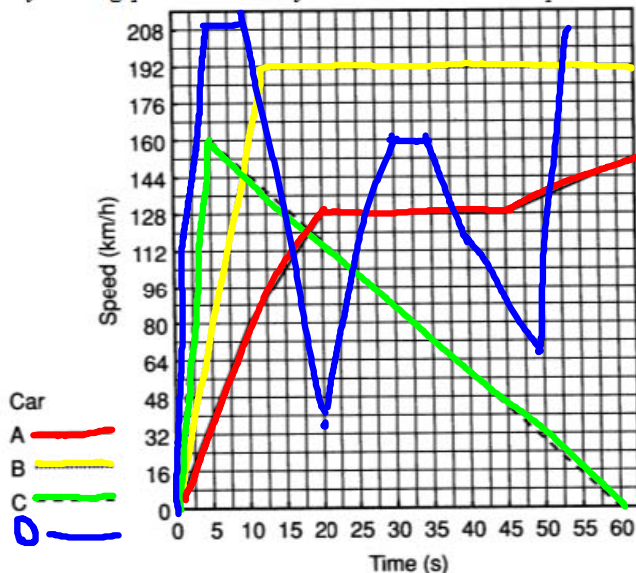
Chapter 2

THE CAR RACE

The graph below represents three cars during the first minute of a race. Using the following information, draw another curve on the grid representing the motion of Car D.

Car D accelerates from a rest position at 0 seconds to a speed of 208 km/h at 5 seconds and maintains this speed for 5 seconds. The car decelerates to 32 km/h at 20 seconds. It then accelerates to a speed of 160 km/h at 30 seconds and maintains this speed for 5 seconds. Car D then decelerates to 112 km/h at 40 seconds, decelerates to 64 km/h at 50 seconds, and accelerates to 208 km/h at 55 seconds.

Use your graph to answer the following questions. Write your answers on the lines provided.



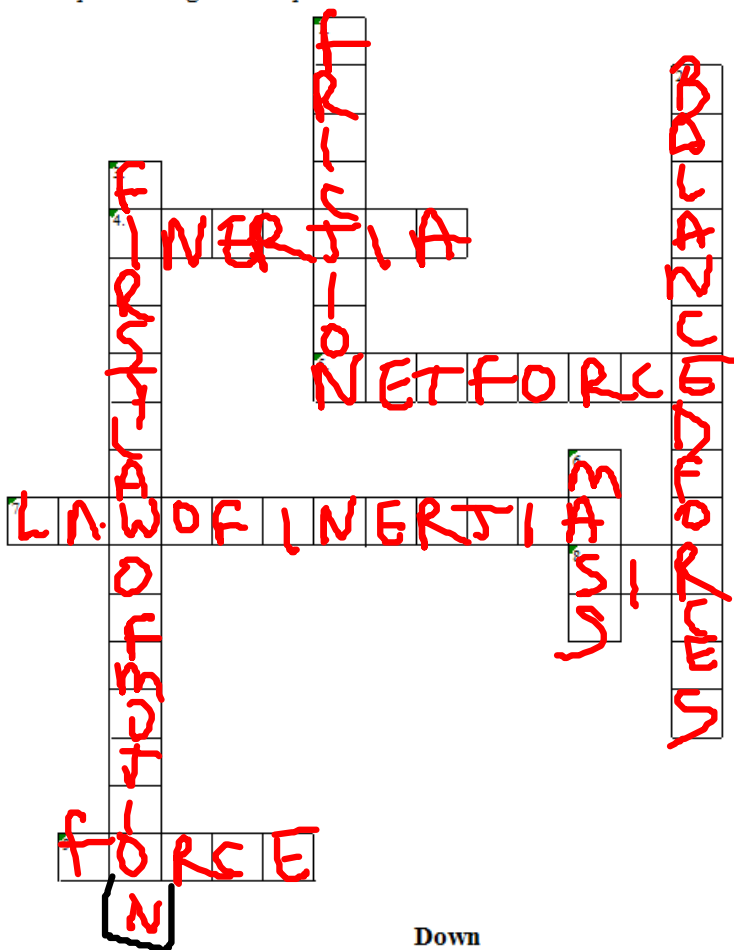
1. Over which time period is Car B's acceleration the greatest? 0-15 sec
2. What is Car B's speed at 10 seconds? 144 km/h
3. When is Car B's acceleration at zero? 15 sec - 60 sec
4. When is Car C's acceleration at zero? 5 sec
5. Which car(s) have a negative acceleration during the race? C, D
6. Which car has traveled the farthest at the end of one minute? B
7. Which car may have had a reckless driver? Explain. D SPEEDS UP - SLOWS DOWN!

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Force and Motion

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Solve the following crossword puzzle using the clues provided.



Across

4. The tendency of an object to resist any change in its motion
5. If this acts on an object the object will change speed, change direction, or both. (2 words)
7. Another name for Newton's first law of motion (3 words)
8. A title before Isaac Newton's name
9. A push or pull that one body exerts on another body

Down

1. The force that opposes motion between two surfaces that are touching each other
2. Forces that are equal in size and opposite in directions (2 words)
3. Newton's law that says "an object at rest stays at rest unless a net force acts on it" and "an object moving at constant velocity continues at that velocity unless a net force acts on it." (4 words)
6. The more of this an object has, the greater the object's inertia.

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REINFORCEMENT

Force and Motion

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Listed below are answers. Write a question for each answer. The first one has been done as an example.

1. push or pull What is a force?

2. net force **WHAT CHANGES OBJECTS SPEED, DIRECTION, OR BOTH?**

3. balanced forces **WHAT ARE EQUAL IN SIZE AND OPPOSITE IN DIRECTION**

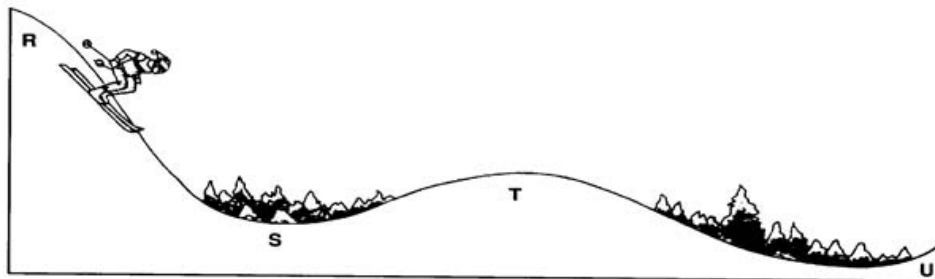
4. friction **WHAT FORCE OPPOSES MOTION BETWEEN 2 SURFACES**

5. inertia **WHAT IS THE TENDANCY TO RESIST A CHANGE IN MOTION**

6. Newton's first law of motion

WHAT IS THE LAW OF INERTIA

Study the diagram below. Then answer the following questions by circling the letter that best answers each question.



7. A person skis downhill from point R to point U. The speed of the skier increases in going from point R to point S because

- a. only balanced forces act on the skier
 b. an unbalanced force acts on the skier
 c. only inside forces act on the skier
 d. no forces act on the skier

8. The skier is able to coast between points S and T even though it is uphill because of

- a. gravity
 b. centripetal force
 c. cohesive force
 d. inertia

9. The force that opposes motion between the skier's skis and the surface of the snow is

- a. net
 b. balanced
 c. friction
 d. inertia