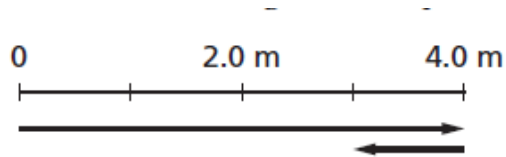


### Physics Final Exam Review Fall 2013

The lines on the graph represent displacement vectors for the route along which a person moves. Use the figure to answer problems 1 – 2.



1. What is the total distance traveled?
2. What is the person's displacement for the trip?

In a laboratory, a scientist applied pushes and pulls to a 1 kg block using devices that measured the applied force. Sensors recorded the motion of the block each second for 4 sec, as shown in Table 1, and a computer calculated the average velocity for each 1-sec period.

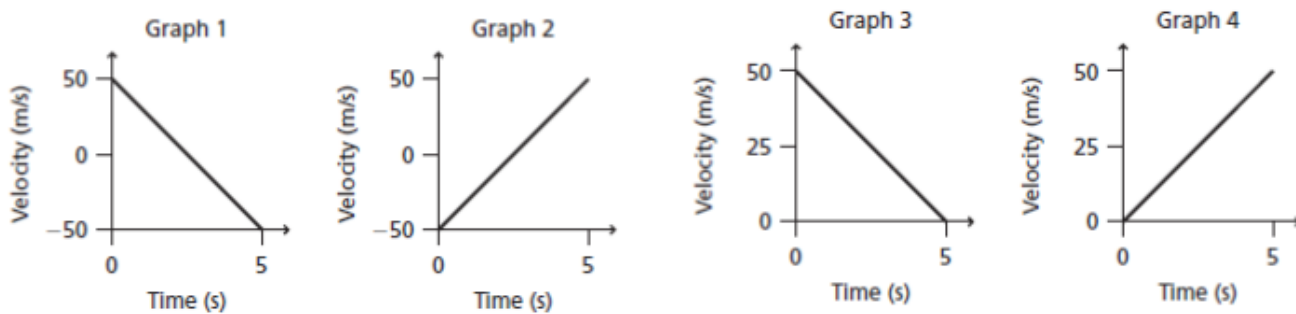
**Table 1**

Motion of Block		
Time (sec)	Position (m)	Velocity (m/sec)
0.0	0.0	0.0
1.0	1.0	2.0
2.0	4.0	4.0
3.0	9.0	6.0
4.0	16.0	8.0

3. Analyze the data in Table 1, and determine the acceleration of the block during the experiment.
4. A curious kitten pushes a ball of yarn at rest with its nose, displacing the ball of yarn 17.5 cm in 2.00 s. Calculate the acceleration of the ball of yarn.
5. A man hikes 6.6 km north along a straight path with an average velocity of 4.2 km/h to the north. He rests at a bench for 15 min. Then, he hikes 3.8 km north with an average velocity of 5.1 km/h to the north. Calculate how long does the total hike last?
6. If a sprinter accelerates from rest at a constant rate of  $2.0 \text{ m/s}^2$ , characterize how fast her speed will be after 4.0 s?
7. Acceleration due to gravity is also described as:
8. The baseball catcher throws a ball vertically upward and catches it in the same spot as it returns to the mitt. Distinguish at what point in the ball's path does it experience zero velocity and nonzero acceleration at the same time?

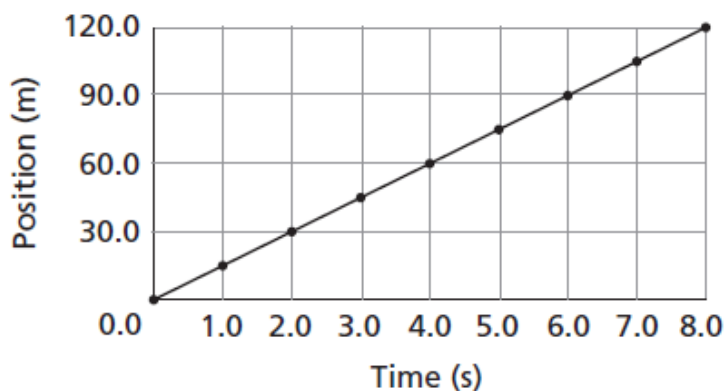
9. A pebble falls from a bridge into the river below. If the pebble falls for 1.20 s, evaluate its velocity when it hits the water?
10. A coin released at rest from the top of a tower hits the ground after falling 1.5 s. Calculate the speed of the coin as it hits the ground? (Disregard air resistance.)
11. When there is no air resistance, objects of different masses...
12. Analyze which item would hit the ground first if dropped from the same height in a vacuum, a feather or a metal bolt?

Use the following graphs to answer questions 13 and 14



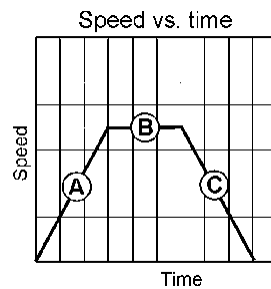
13. Which graph might characterize the acceleration of a jet plane moving down a runway from a rest position?
14. Which graph might show the velocity of a ball that is thrown straight up into the air and allowed to fall freely to the ground?

The position-time graph represents part a car trip along a straight road.

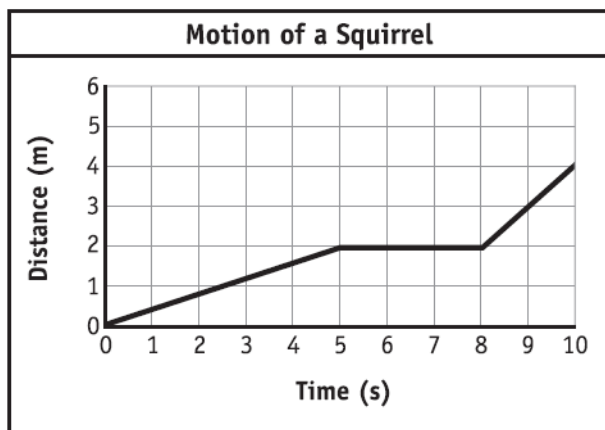


15. Calculate the average velocity of the car for the first 8.0s.

16. In this speed vs. time graph, the describe the motion of the object at point **C**:



The graph below shows the data collected by a student as she watched a squirrel running on the ground. The reference point for motion was a large tree and all of the motion was in the same direction. Use the following graphs to answer questions 17 and 18

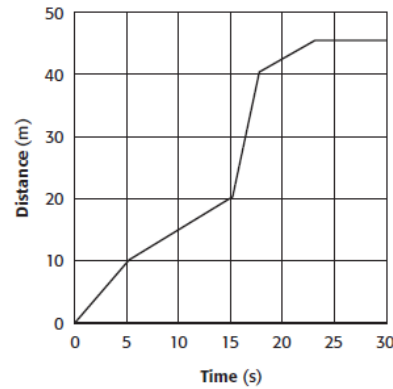


17. Which conclusion about the motion of the squirrel between 5 s and 8 s is communicated by the graph?

18. Calculate is the average velocity of the squirrel in the time interval between 1 s and 9 s?

The following graph shows the distance an object traveled along a straight path as a function of time. Use the graph to answer questions 19 and 20.

**Distance Versus Time**

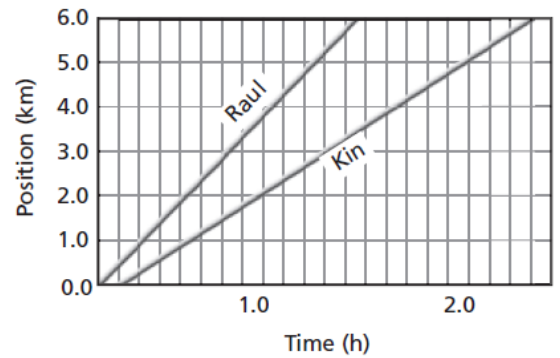


19. During which of the following time periods did the object travel at a constant velocity?

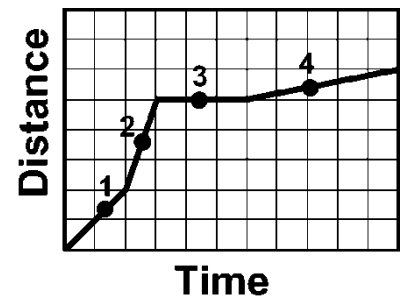
20. Make an inference about which of the following statements best describes the object's motion between the time periods of 22.5 s to 30 s?

Interpret the graph to determine during which time period the average velocity was the greatest.

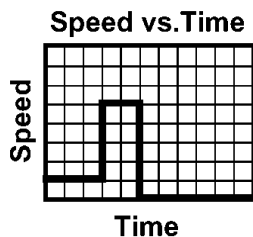
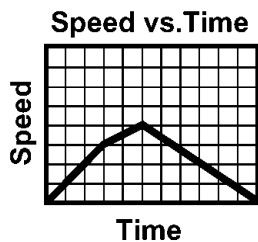
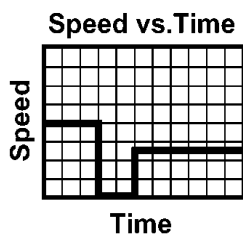
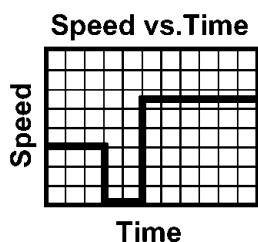
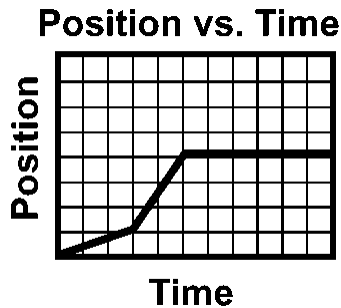
21. The position-time graph represents two walkers. Select the best answer that identifies and explains which walker is faster?



22. Examine the following the graph, identify which points demonstrates where is the speed the greatest.



23. Which speed vs. time graph correctly demonstrates the given information in the position vs. time graph.



24. Classify the following quantities as scalar or vector: the weight of an apple, the time it takes to walk a mile, the velocity of falling rocks.

25. A bowling ball was dropped from the same height and at the same time that a softball was thrown horizontally. Neglecting air resistance, examine the following statements and determine which one is true?

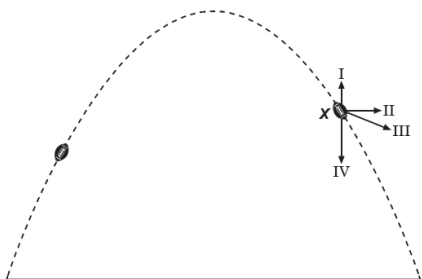
26. If a ball is thrown with a velocity of 25 m/s at an angle of  $37^\circ$  above the horizontal, evaluate the projectile for its horizontal component of the velocity?

27. If a ball is thrown with a velocity of 25 m/s at an angle of  $37^\circ$  above the horizontal, evaluate the projectile for its vertical component of the velocity?

28. If you walk 6.0 km in a straight line in a direction north of east and you end up 2.0 km north and several kilometers east. Explain how far north of east have you walked in degrees?

29. A runner runs halfway around a circular path of radius 10 m. What is the displacement of the jogger?

30. The path of a kicked football is shown in the diagram. The dashed line shows the path of the ball if the air resistance is neglected. Point **X** is a point along the path.



Which arrow points best communicates the direction of the acceleration?

31. A baseball is thrown across a field. Neglecting air resistance, which **best** describes the horizontal components of the ball's velocity and acceleration while it is in the air?

32. A ball is thrown horizontally. Which factor will increase the flight time of the ball?

33. A projectile was launched horizontally with a velocity of 468 m/s, 1.86 m above the ground. Calculate how long did it take the projectile to hit the ground?

34. A stone is thrown horizontally with an initial speed of 10 m/s from the edge of a cliff. A stop watch measures the stone's trajectory time from the top of the cliff to the bottom to be 4.3 s. What is the height of the cliff?

35. For the winter, a duck flies 10.0 m/s due south against a gust of wind with a velocity of 2.5 m/s. What is the resultant velocity of the duck?

36. A piece of chalk is dropped by a teacher walking at a speed of 1.5 m/s. From the teacher's perspective, describe how the chalk appears to fall.

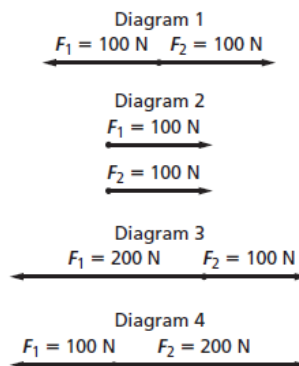
37. A robot that is exploring the surface of Mars has a mass of 136 kg. If the gravitational force acting on the robot is 504.6 N downward, calculate the robot's free-fall acceleration?

38. The following table shows forces on an object.

FORCES ACTING ON AN OBJECT		
Type of force	Amount of force	Direction of force
Wind	23N	backward
Friction	14N	backward
Pushing	32N	forward
Pushing	37N	forward

Based on the data in the table, calculate is the net force on the object?

39. According to Newton's Third Law, when two objects exert forces on each other, the forces are equal in magnitude and opposite in direction. Suppose you witnessed a head-on car accident in which a small electric car collided with a large SUV. Based on Newton's laws of motion, assess do you know about the forces and accelerations felt by the drivers of the vehicles?
40. Two dogs play tug-of-war with a rope toy that has a mass of 0.50 kg. If one dog pulls on the toy with a force of 140.0 N, and the other dog pulls in the opposite direction with a force of 138.0 N, what is the horizontal acceleration of the toy?
41. The free-body diagrams below show four ways that two different forces could be exerted on an object.

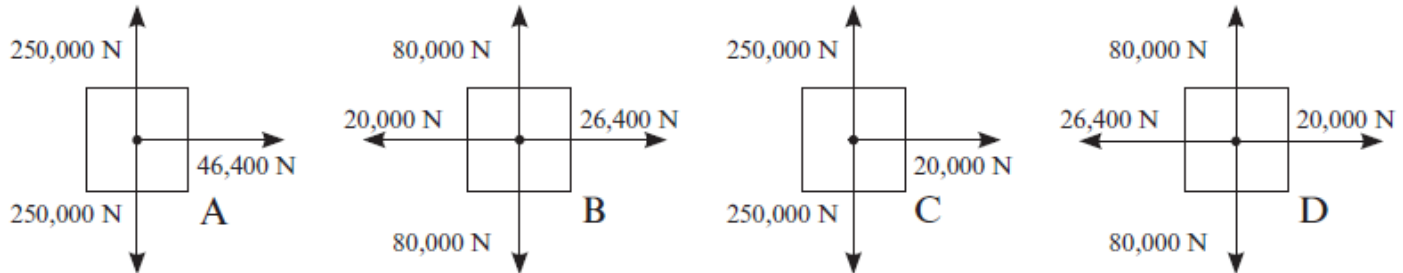


Distinguish which diagram is the object in equilibrium?

42. State is the force of gravity on a person who has a mass of 80.0 kg?
43. Two restaurant employees push a 730 kg wheeled dumpster along a horizontal surface. After they push the dumpster a distance of 5.5 m starting from rest, its speed is 0.75 m/s. Determine is the magnitude of the net force on the dumpster?

Use the following text and free-body diagrams to answer questions 44 and 45.

A truck pulls a trailer on a flat stretch of road. The forces acting on the trailer are the force due to gravity (250,000 N downward), the force exerted by the road (250,000 N upward), and the force exerted by the cable connecting the trailer to the truck (20,000 N to the right). The forces acting on the truck are the force due to gravity (80,000 N downward), the force exerted by the road (80,000 N upward), the force exerted by the cable (20,000 N to the left), and the force causing the truck to move forward (26,400 N to the right).



44. Using your knowledge of free-body diagrams, which diagram (A–D) above communicates the correct development of a free-body diagram in which all of the forces acting on the truck are represented?
45. Using your knowledge of free-body diagrams, which diagram (A–D) above communicates the correct development of a free-body diagram in which all of the forces acting on the trailer are represented?

Use the following figure to answer questions 46 and 47.



46. The figure shows a bucket hanging motionless from a rope. Assume that the rope has no mass. Calculate the net force on the bucket?
47. Evaluate the figure to find the tension on the rope?
48. Which property of two objects is directly proportional to the force of attraction between them as defined by?