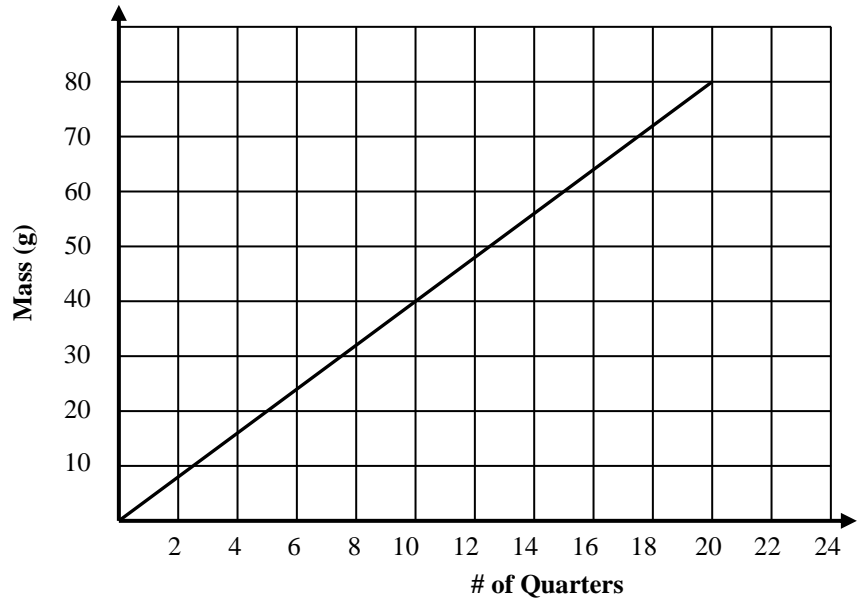


Semester 1 Final Exam Review Answers

A physics student was interested in finding the mass of a penny. To do so she grabbed a bunch of pennies and placed them on a scale. She gathered the following data and plotted the graph below.

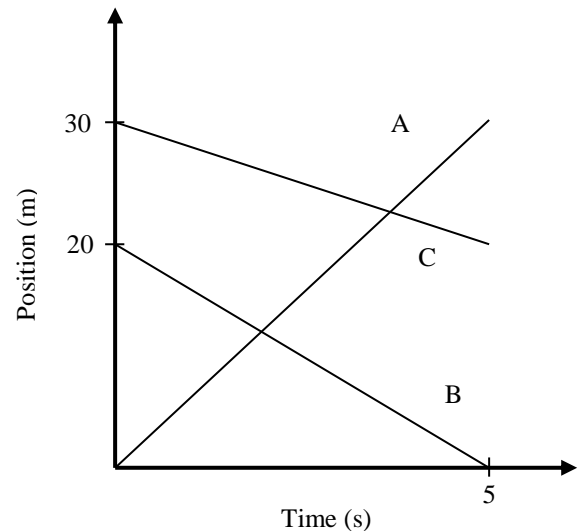
1. What is the value of the slope of the line?
2. What are the units for the slope of the line?
3. Write an appropriate sentence that describes the slope of the line.
4. What is a good estimation for the mass axis intercept (with units)?
5. Write a sentence that describes the mass axis intercept.
6. Write an equation that models the data.
7. What would be the mass of 40 pennies?

# of Pennies	Mass (g)
3	12
5	20
8	32
10	40
20	80



Examine the position vs. time graph at the right that depicts the motion of three cars.

8. Which car has a constant velocity?
9. Which car is the slowest?
10. What is the velocity of car B?
11. Which car is moving to the left?
12. Relative to the zero line, where does car A start?
13. Which of the following is the correct equation for the position car A?

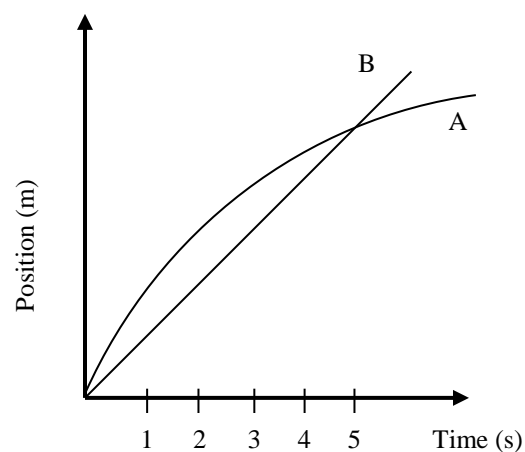


A student starts out from the classroom door, walks 30 meters down the hall and then returns back to the classroom door where he started. The total time for the roundtrip was 10 seconds.

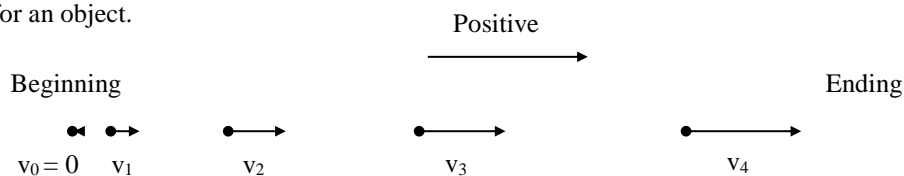
14. What is the total distance traveled and the total displacement of the student?
15. Assuming that on his trip down the hall the displacement was negative, what are the speed and velocity of the student for the first half of the trip?

Two cyclists A and B are in a race. Answer the following questions.

16. Which is moving faster at the start of the race?
17. What happens when the lines cross?
18. Which is moving faster at the end of the race?
19. Is the velocity of cyclist B is increasing, decreasing or staying constant?
20. When do they have the same speed?



Below is a motion map for an object.



21. Is the velocity increasing decreasing or constant?
22. Is the acceleration increasing decreasing or constant?
23. Put acceleration arrows on the motion map.



A Jaguar was traveling along a straight road. The car changed velocity as shown by the graph below.

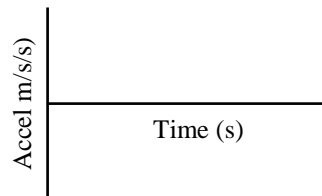
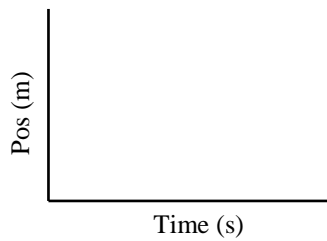
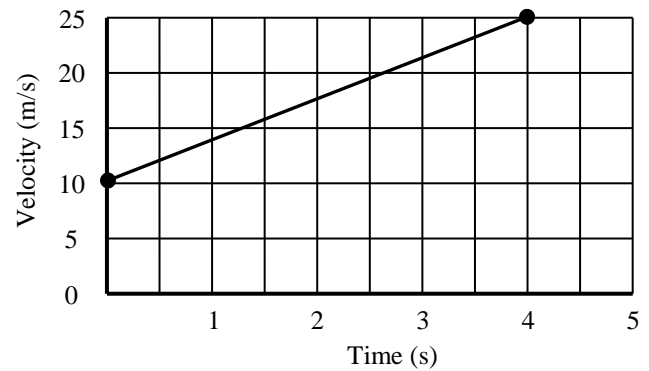
24. What are the initial and final velocities of the car?

25. What is the acceleration of the car?

26. How far did the car travel?

27. Draw a position vs. time graph for the jaguar.

28. Draw an acceleration vs. time graph for the jaguar.



29. Draw a motion map for the jaguar with position dots and velocity arrows.

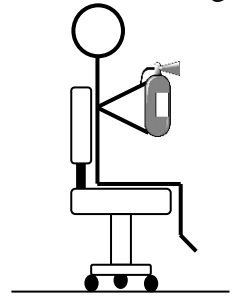


30. Draw a motion map for the jaguar with position dots and acceleration arrows.



Semester 1 Final Exam Review Answers

A physics teacher is sitting in a low friction chair and moving to the right at a constant speed. He happens to be holding a fire extinguisher in his lap. He points the fire extinguisher away from himself and turns it on.

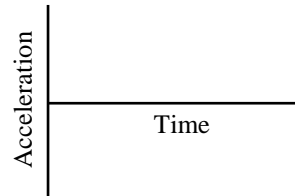
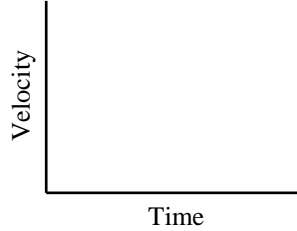
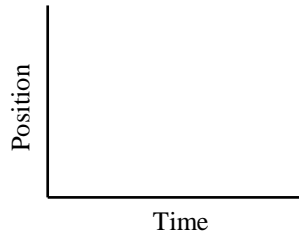


31. What happens to the teacher when the fire extinguisher is on?

32. Draw a position vs. time graph for the teacher.

33. Draw a velocity vs. time graph for the teacher.

34. Draw an acceleration vs. time graph for the teacher.



35. Objects in free fall experience an “acceleration due to gravity” which is also called the free fall acceleration and has a value that is approximately 10 m/s^2 . Write a “for every” statement that describes this free fall acceleration.

A cliff diver steps off a cliff that is 5 meters above the water.

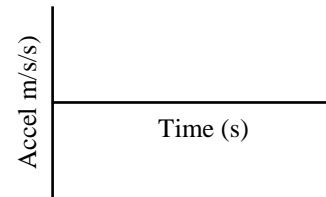
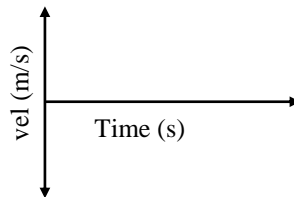
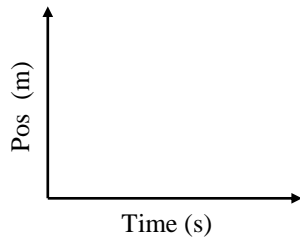
36. How much time is he in the air before hitting the water?

37. How fast is he moving when he hits the water?

38. If the same diver stepped off a platform 9 times as tall (45 meters) what would happen to her time in the air?

A superball is bounced so that it leaves the ground with a straight upward initial velocity of 30 m/s and lands on the ground later.

39. What happens to the speed and acceleration of the ball on its way down?
40. What is the total displacement of the ball?
41. What is the total time in the air of the ball?
42. What is the max height of the ball?
43. What are the speed and velocity of the ball at the instant just before it hits the ground?
44. Draw a position vs. time graph for the ball.
45. Draw a velocity vs. time graph for the ball.
46. Draw an acceleration vs. time graph for the ball.



47. Draw a motion map for the ball with position dots and velocity arrows.



48. Draw a motion map for the ball with position dots and acceleration arrows.

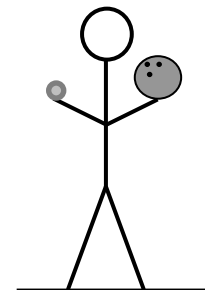


49. The gravitational field strength near the surface of the earth has a value of approximately 10 N/kg. Write a “for every” statement for that field strength.

A teacher drops a bowling ball and a golf ball from the same height at the same time.

50. Neglecting any air resistance, which has a larger acceleration?

51. The proper justification for your previous answer is:



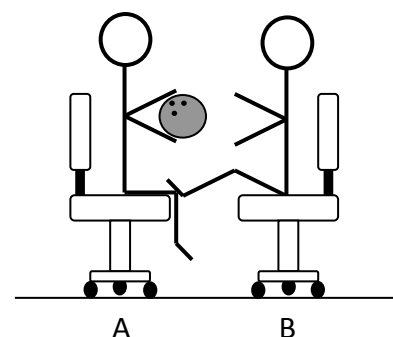
To test Newton's Laws, two physics students of equal mass sit in low friction chairs (as shown at right.) One student (A) is holding a 16-pound bowling ball. The other student (B) puts her feet on A's knees and pushes off (see picture at the right).

52. Which exerts more force?

53. What has a larger acceleration?

54. Why is it more difficult to get student A to move?

55. If student A took his bowling ball to the moon how would the mass and weight change?



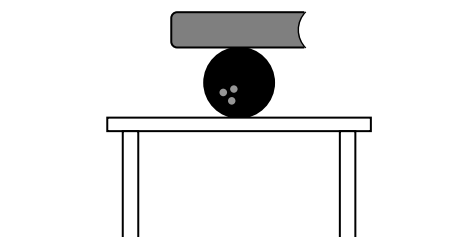
A 2 kg book sits on top of a 6 kg bowling ball which sits on a table.

56. With how much force does the table push up on the **book**?

57. With how much force does the table push up on the **ball**?

58. Which exerts more force book on ball or ball on book?

59. Draw a force diagram for the ball.



A block is being pulled across a frictionless table and speeding up.

60. How many forces are acting on block?



61. Which way is the net (unbalanced) force?

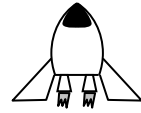
62. Which way is the acceleration?

63. The force is removed and the box keeps sliding forward. What is the force that keeps the block moving?

64. A big, heavy truck is cruising down Mack at 35 mph. The brakes fail and the truck runs into the back of a small, light VW Beetle at rest, causing serious damage to the Beetle, but very little to the truck. Which is true about the forces?

A rocket is falling toward a planet. To try to stop it fires its engines as shown and continues to move downward but slowing as it goes.

65. What provides the force that causes the acceleration?

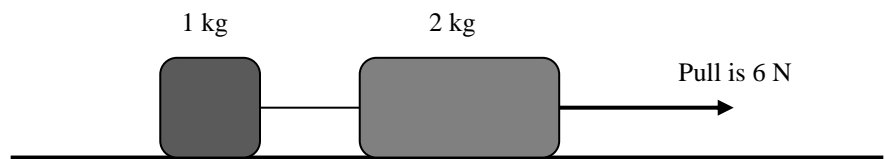


66. How would the acceleration of the ship differ if it were pushed by three times as much force?

67. How would the acceleration of the ship differ if it were three times as massive?

68. How would the acceleration of the ship differ if it were pushed by three times as much force and had three times as much mass?

The two at the right are attached to each other by a thin rope and pulled to the right with a thick rope. Assume that there is **no friction** between the masses and the surface.

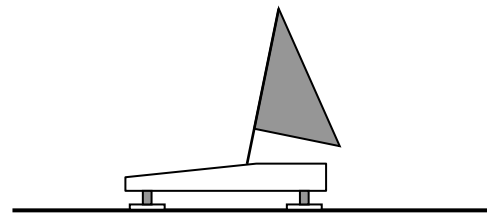


69. What is the acceleration of the blocks?
70. What is the force on the 1 kg block from the thin rope?
71. What is the force on the 2 kg block from the thin rope?

A 1000 kg ice boat finds itself stopped in the middle of a frozen lake. Assume no friction on between the lake and the ice boat. From the shore two boaters attempt to pull the boat in using ropes attached to the back of the boat. One boater pulls to the south with 400 N and the other pulls west with 300 N.

72. What is the resulting (combined) combined force of the two pullers?

73. What is the resulting acceleration of the boat?

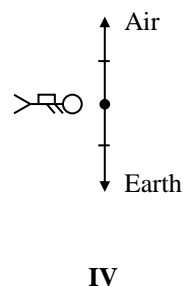
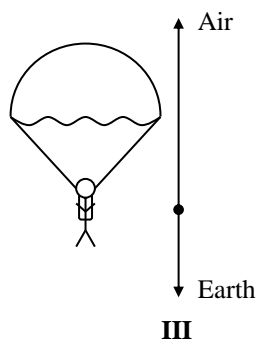
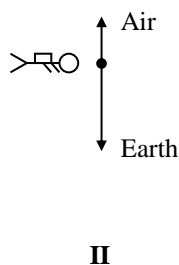
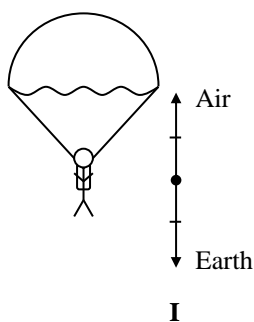


A 75 kg skydiver jumps out of an airplane (do not ignore air resistance).

74. What is the direction of the net force on the skydiver just after he pulls the rip cord?

75. When the skydiver is falling at a constant speed the net unbalanced force is...

76. Which picture/force diagram below shows the skydiver just after he pulls the ripcord?

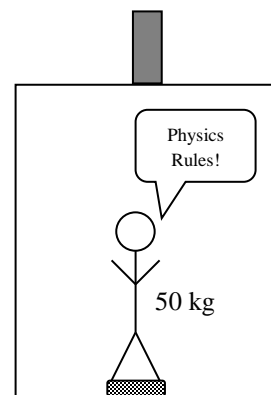


A 50 kg physics student is standing on a bathroom scale (calibrated in Newtons) in an elevator. The elevator suddenly accelerates downward at 2.5 m/s^2 .

77. What is the net unbalanced force on the student?

78. What is the scale reading?

79. If the student were holding a 2.5 kg box, how would it feel to him?



80. Neglecting any friction, what is the best estimate of the acceleration of the cart on the ramp?

81. How does the net (unbalanced) force on the cart change as it rolls down the ramp?

82. How would the acceleration be different if the cart instead 2 kg?

