

Forces Review: look over all labs and worksheets. Your answers should be in another color pen. This is not all inclusive of items on the test but a very close representation.

This test will have a set of data where you will need to

- create a hypothesis regarding the data
- Identify the Independent and Dependent variables
- make a graph with an appropriate title (Effect of IV on DV)
- Label the graph appropriately
- Make a Best fit line and calculate the slope of the line.

1. Draw a free body diagram showing the following scenarios:

a) an object moving at a constant velocity b) An object resisting a force and not moving c) An object speeding up

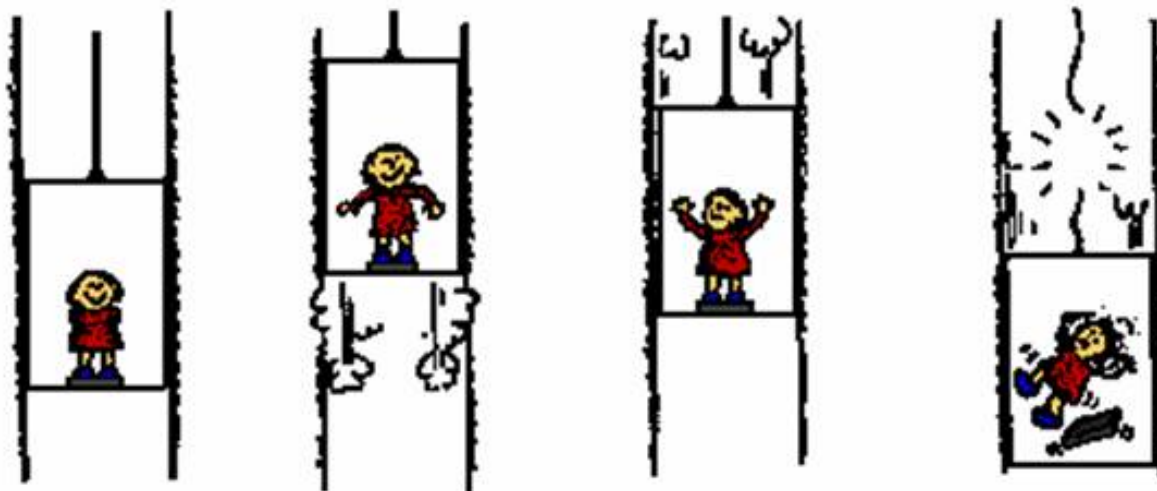
2. Draw a PT and VT graph for the following scenarios:

a) an object moving at a constant velocity

b) An object resisting a force and not moving

c) An object speeding up

3. Describe the apparent weight of the girl on the four scenarios in the elevator as if she were on a bathroom scale. Also draw free body diagrams to show where the net force is:



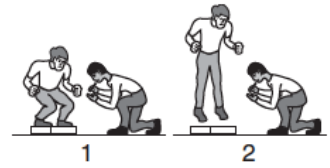
4. A student in a lab experiment jumps upward off a common bathroom scale as the lab partner records the scale reading. What does the lab partner observe during the instant the student pushes off?

A The scale reading will remain unchanged during the entire time the student is in contact with the scale.

B The scale reading will increase momentarily then will decrease as the student is moving upward from the scale.

C The scale reading will increase during the entire time the student is in contact with the scale.

D The scale reading will decrease momentarily then will increase as the student is moving upward from the scale.



5. A ball is dropped from rest from a height 6.0 meters above the ground. The ball falls freely and reaches the ground 1.1 seconds later. What is the average speed of the ball?

A 5.5m/s

B 6.1m/s

C 6.6m/s

D 11m/s

6. A 10-newton force and a 15-newton force are acting from a single point in opposite directions. What additional force must be added to produce equilibrium?

A 5 N acting in the same direction as the 10-N force

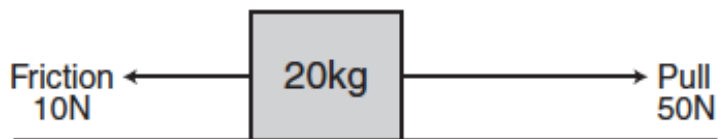
B 5 N acting in the same direction as the 15-N force

C 10 N acting in the same direction as the 10-N force

D 25 N acting in the same direction as the 15-N force

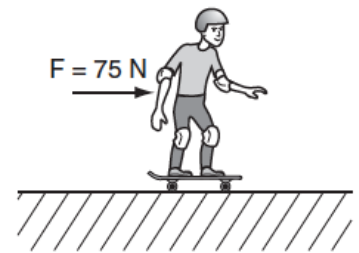
7. The figure shows a block that is being pulled along the floor. According to the figure, what is the acceleration of the block?

A 2 m/s^2 C 4 m/s^2 B 3 m/s^2 D 6 m/s^2



8. A 50-kg child on a skateboard experiences a 75-N force as shown. What is the expected acceleration of the child?

A 0.67 m/s^2 B 1.50 m/s^2 C 6.70 m/s^2 D 25.00 m/s^2



9. A soccer player kicks a 0.5-kilogram stationary ball with a force of 50 Newtons. What is the force on the player's foot?

A 0 N

B 25 N

C 50 N

D 100 N

10. You push a box with a force of 80 N. If the net force on the box is 50 N, what is the force on the box due to sliding friction?

11. The downward force of gravity and the upward force of air resistance on a falling ball are both 5N. What is acceleration?

12. What is friction?

13. Compare the magnitude of forces due to static, sliding and rolling friction between two surfaces?

14. An object is pulled with 20 N of force to the right against a friction force of 10 N. What is the net force? In what direction is the friction force? Draw a diagram

15. A dragster exerts 3000 N of force on the tires causing an acceleration of 10 m/s/s. What is the mass of the car?

16. Two students push on a box in the same direction and another pushes in the opposite direction. What is the net force if each pushes with 100 N? Draw a diagram of all forces.

17. A student does an experiment to measure the acceleration of a falling object, which is 9.8 m/s^2 . The student obtains an experimental value of 14.6 m/s^2 . The reason for this variation is *most* likely due to

- A human error.
- B air resistance.
- C local fluctuations in gravity.
- D the mass of the object.

18. Draw a force diagram and label all forces of a book on a table that is

- a) slowing down
- b) speeding up
- c) constant speed

19. Assume you pulled a classroom textbook with a constant applied force of 4N. What would the Sliding friction be if the book was moving at a constant speed?

20. 4 washers are stacked one on top of the other so that you form a tower of washers. One washer is aimed at the bottom of the stack of four washers with good hard flick with your finger or hand. One washer is pushed out from the bottom of the stack and the original moving washer stays at the bottom of the still stack. The fact that only the bottom washer moves is an example of:

- a. momentum
- b. inertia
- c. free fall
- d. impulse

21. An object with a net force of 0 N is :

- a. not moving
- b. moving at a constant speed
- c. both a or b
- d. neither

22. The _____ force is equal in magnitude and opposite in direction from the gravitational force.

- a. F_g
- b. Normal
- c. Applied
- d. Frictional

23. When there is a net force of 5N on a mass of 10 kg, is the objects velocity

- a. Increasing
- b. Decreasing
- c. Constant

24. Two bricks of unknown materials are on a wall. In order to determine which brick is more massive, you push both off the edge to see which is harder to push. This is an example of

- Newton's 1st law
- Newton's 2nd law
- Newton's 3rd law

25. True or False. Direction of acceleration is always in the same direction as the net force.

26. True or False. Direction of velocity is always in the same direction as the net force

27. True or False. When speeding up, acceleration and velocity are in the same direction.

28. When considering the equation $F = ma$. Which term describes the relationship between m and a ?

- linear (meaning as one variable increases the other increases as well)
- inverse (meaning as one variable increases the other decreases)

29. A 12.0 kg object is moving across a friction free surface at a constant velocity of 10 m/s. Which one of the following horizontal forces is necessary to maintain this state of motion?

a. 0N b. 12 N c. 120 N d. 1.2 N

30. Imagine a place in the cosmos far from all gravitational and frictional influences. Suppose you visit this place and throw a rock. The rock will:

- gradually stop
- continue with the same motion and speed

31. Bronco skydives from a stationary helicopter.

Use $F = ma$ or $a = F_{net}/m$

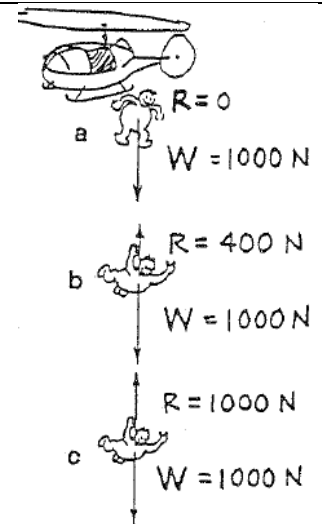
$F_{net} = W$ (weight) – R (air resistance)

Find Bronco's acceleration for pictures

A:

B:

C:



32. When Bronco's (above) speed is the least his acceleration is the

- least
- most

33. When Bronco jumps from the helicopter his velocity is in which direction?

- up
- down

34. In figure C, Bronco has an acceleration

- in the same direction as his velocity
- in the opposite direction of his velocity
- equal to 0 m/s/s

35. In which position(s) does Bronco experience a downward acceleration?

- a. a b. b c. c d. both a and b

36. In which positions does Bronco experience an upward acceleration?

- D E F or None of these

37. When Bronco experiences an upward acceleration, his velocity is:

- a. still downward
- b. upward also

38. In which position is his velocity constant?

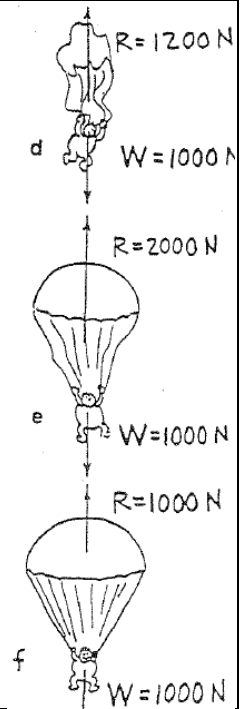
D E F

39. Compare the two figures A – F. In which positions does Bronco experience terminal velocity?

A B C D E F

40. In which position is his terminal velocity the greatest?

A B C D E F



Formulas

$$F = m/a$$

$$a = \frac{F}{m}$$

$$a = \frac{\Delta v}{\Delta t}$$

$$v = \frac{\Delta d}{\Delta t}$$

45. A 214 kg boat is sinking in the ocean. The force of gravity that draws the boat down is partially offset by the buoyant force of the water, so the net unbalanced force on the boat is 1310 N. What is the acceleration of the boat?

46. The whale shark is the largest of all fish and can have the mass of three adult elephants. Suppose that a crane is lifting a whale shark into a tank for delivery to an aquarium. The crane must exert an unbalanced force of 2500 N to lift the shark from rest. If the shark's acceleration equals 1.25 m/s^2 . What is the shark's mass?

47. In drag racing, acceleration is more important than speed, and therefore drag racers are designed to provide high accelerations. Suppose a drag racer has a mass is 1250 kg and accelerates at a constant rate of 16.5 m/s^2 . How large is the unbalanced force acting on the racer?

Summarize Newton's Laws:

50. From the following equation derive the formulas for solving for t and then for g

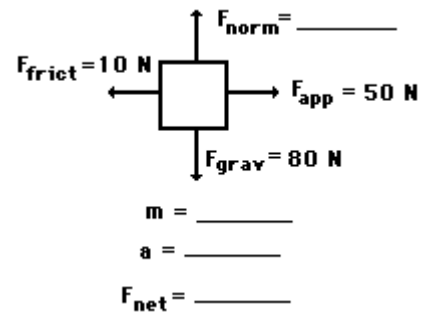
$$d = \frac{1}{2} g t^2$$

$t =$

$g =$

51. One bean bag is dropped from a height of 5 m and an identical bean bag is thrown horizontally with 10 N of force from the same height. Which will hit the ground first? Why?

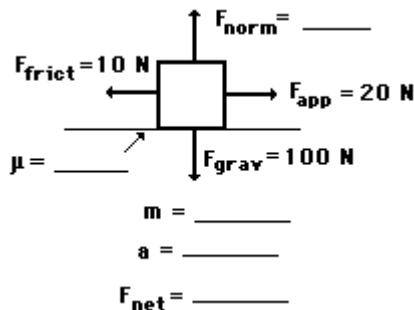
53. An applied force of 50 N is used to accelerate an object to the right across a frictional surface. The object encounters 10 N of friction. Use the diagram to determine the normal force, the net force, the mass, and the acceleration of the object. (Neglect air resistance.)



Draw a PT graph of the object's motion

Draw a VT graph

An applied force of 20 N is used to accelerate an object to the right across a frictional surface. The object encounters 10 N of friction. Use the diagram to determine the normal force, the net force, the coefficient of friction ("mu") between the object and the surface, the mass, and the acceleration of the object. (Neglect air resistance.)



54. In the hang time lab, students compared their height to their actual jump height (the difference between the height of your hand extended straight overhead and the total height you can hit at a running jump). If a graph was constructed of this data table. Which variable would belong on the y axis?

- height
- jump distance

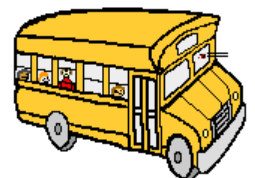
55. In the hang time lab, as you jumped up to hit the wall your velocity was

- increasing
- decreasing

56. If you were having a slam dunk contest on another planet, what pieces of information would be the most crucial for you to determine your hang time?

- your mass
- gravity on the planet

57. While driving down the road, a firefly strikes the windshield of a bus and makes a quite obvious mess in front of the face of the driver. This is a clear case of Newton's third law of motion. The firefly hit the bus and the bus hits the firefly. Which of the two forces is greater: the force on the firefly or the force on the bus?



58. Which undergoes the greater acceleration?

- the bus
- the bug
- the same

60. Why does a skydiver's speed increase after they jump out of the airplane? Explain in words and a model (free body diagram)

Eventually the skydiver stops speeding up. What is this called? Why does this happen? Draw a model to explain.

Draw what happens when the skydiver opens the parachute: Model to explain why she slows down.

61. Does mass affect terminal velocity? Explain why using an example such as the coffee filter lab.

62. When an object is speeding towards the ground, is the acceleration + or - ? velocity? + or -?

63. Draw a graph to show the relationship between mass and terminal velocity. Label units, title, x and y. units. Identify the Independent and Dependent Variables.

Create an imaginary line and calculate the slope of the line.

64. If mass influences Terminal Velocity, explain why a medicine ball (500 g) and a basketball (200 g) fall the same distance and hit the ground at the same time.