Paper 1

1- Identify the following quantities as scalar or vector: the speed of a snail, the time it takes to run a mile, the free-fall acceleration.

a. vector, scalar, scalar
b. scalar, scalar, vector
c. vector, scalar, vector
d. scalar, vector, vector

2- Multiplying or dividing vectors by scalars results in

a. vectors.
b. scalars.
c. vectors if multiplied or scalars if divided.
d. scalars if multiplied or vectors if divided.

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

e. 12.5 m/s south
f. –12.5 m/s south
g. 7.5 m/s south
h. –7.5 m/s south

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

a. straight down.
b. straight down and backward.
c. straight down and forward.
d. straight backward.

5- Which of the following is the best coordinate system to analyze a painter climbing a ladder at an angle of 60° to the ground?

a. x-axis: horizontal along the ground; y-axis: along the ladder
b. x-axis: along the ladder; y-axis: horizontal along the ground
c. x-axis: horizontal along the ground; y-axis: up and down
d. x-axis: along the ladder; y-axis: up and down

6- In the figure, the magnitude of the ball's velocity is least at location

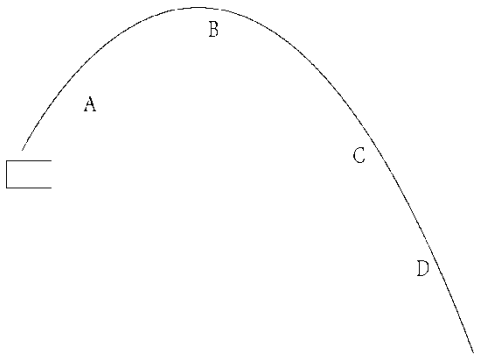
A- B- C- D-

7- The horizontal component of the ball's velocity at A is

a. zero.
b. equal to the vertical component of the ball's velocity at C.
c. equal in magnitude but opposite in direction to the horizontal component of the ball's velocity at D.
d. equal to the horizontal component of its initial velocity.

8- At which point is the ball's speed about equal to the speed at which it was tossed?

A- B- C- D-



9- Which displacement vectors shown in the figure have vertical components that are equal?

a. d1 and d2
b. d1 and d3
c. d2 and d5
d. d4 and d5

10- A passenger on a bus moving east sees a man standing on a curb. From the passenger's perspective, the man appears to

a. stand still.
b. move west at a speed that is less than the bus's speed.
c. move west at a speed that is equal to the bus's speed.
d. move east at a speed that is equal to the bus's speed.

11- Which of the following is the cause of acceleration?

a. Speed
b. inertia
c. force
d. velocity

12- Which of the following statements does *not* describe force?

a. Force causes objects at rest to remain stationary.
b. Force causes objects to start moving.
c. Force causes objects to stop moving.
d. Force causes objects to change direction.

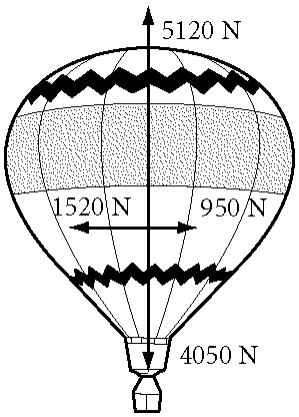
13- What causes a moving object to change direction?

a. acceleration
b. velocity
c. inertia
d. force

14- A newton is equivalent to which of the following quantities?

a. kg
b. kg.m/s
c. $kg.m/s^2$
d. $kg.(m/s)^2$

15- The free-body diagram shown above represents a car being pulled by a towing cable. In the diagram, which of the following is the gravitational force acting on the car?



a. 5800 N
b. 775 N
c. 14 700 N
d. 13 690 N

16- In the diagram, the 5800 N force is

a. the gravitational force acting on the car.
b. the backward force the road exerts on the car.
c. the upward force the road exerts on the car.
d. the force exerted by the towing cable on the car.

17- In the free-body diagram shown, which of the following is the gravitational force acting on the balloon?

a. 1520 N
b. 950 N
c. 4050 N
d. 5120 N

18- A 56.0 kg diver jumps off a diving platform, rises about 1.0 m above the platform, then falls to the pool. What is the diver's momentum at her highest point in the dive?

a. 10 kg.m/s
b. 0 kg.m/s
c. 20 kg.m/s
d. 30 kg.m/s

19- A swimmer with a mass of 59 kg dives off a raft with a mass of 400 kg. If the swimmer's speed is 3 m/s immediately after leaving the raft, what is the speed of the raft?

a. 0.4 m/s
b. 0.5 m/s
c. 0.6 m/s
d. 0.7 m/s

20- A baseball bat strikes a baseball with a force of 37 N. The bat is in contact with the ball for 0.19 s. What is the magnitude of the change in momentum of the ball?

a. 6.0 kg.m/s
b. 7.0 kg.m/s
c. 8.0 kg.m/s
d. 9.0 kg.m/s

21- A bullet with a mass of 6.58 g is fired through a 1.95 kg block of wood on a frictionless surface. The initial speed of the bullet is 822 m/s, and the speed of the bullet after it exits the block is 439 m/s. At what speed does the block move after the bullet passes through it?

a. 4.29 m/s
b. 3.29 m/s
c. 2.29 m/s
d. 1.29 m/s

22- An infant throws 7 g of applesauce at a velocity of 0.5 m/s. All of the applesauce collides with a nearby wall and sticks to it. What is the decrease in kinetic energy of the applesauce?

a. 6×10^{-4} J
b. 7×10^{-4} J
c. 8×10^{-4} J
d. 9×10^{-4} J

23- A pool cue strikes a 0.16 kg billiard ball with a force of 11 N. The cue remains in contact with the ball for 0.065 s. The ball was initially at rest. What is the final speed of the ball?

a. 1.5 m/s
b. 2.5 m/s
c. 3.5 m/s
d. 4.5 m/s

24- How much work is done on a bookshelf being pulled 4.00 m at an angle of 35.0^{o} from the horizontal? The magnitude of the component of the force that does the work is 87.0 N.

a. 338 J
b. 348 J
c. 358 J
d. 368 J

25- A skier with a mass of 84 kg hits a ramp of snow at 32 m/s and becomes airborne. At the highest point of flight, the skier is 4.7 m above the ground. What is the skier's gravitational potential energy at this point?

a. 3.7×10^3 J
b. 3.9×10^3 J
c. 4.1×10^3 J
d. 4.5×10^3 J

26- A flight attendant pulls a 60.0 N flight bag a distance of 239.0 m along a level airport floor at a constant speed. A 21.0 N force is exerted on the bag at an angle of 66.0^{o} above the horizontal. How much work is done on the flight bag?

a. 2020 J
b. 2030 J
c. 2040 J
d. 2050 J

27- Water flows over a section of Niagara Falls at a rate of 1.30×10^6 kg/s and falls 49.5 m. What is the power of the waterfall?

a. 631 MW
b. 651 MW
c. 671 MW
d. 691 MW

28- On a given occasion, Old Faithful geyser in Yellowstone National Park shoots water to a height of 47.1 m. With what velocity does the water leave the ground during this eruption? (Assume no air resistance and that $g = 9.81$ m/s^2.)

a. 00.4 m/s
b. 10.4 m/s
c. 20.4 m/s
d. 30.4 m/s

29- A 1.71×10^3 kg sports car accelerates from rest to 25.8 m/s in 7.41 s. What is the average power output of the automobile engine?

a. 46.8 kW
b. 56.8 kW
c. 66.8 kW
d. 76.8 kW

30- A 2.74 g coin, which has zero potential energy at the surface, is dropped into a 12.2 m well. After the coin comes to a stop in the mud, what is its potential energy with respect to the surface?

a. –0.228 J
b. –0.328 J
c. –0.428 J
d. –0.528 J

31- A 3.62×10^2 N crate is pushed to the top of a 2.53 m ramp, which is inclined at 15.0^o with the horizontal. What is the potential energy of the crate?

a. 237 J
b. 247 J
c. 257 J
d. 267 J

32- A 31.0 kg crate, initially at rest, slides down a ramp 2.6 m long and inclined at an angle of 14.0^o with the horizontal. Using the work-kinetic energy theorem and disregarding friction, find the velocity of the crate at the bottom of the ramp. (g = 9.81 m/s^2)

a. 0.5 m/s
b. 1.5 m/s
c. 2.5 m/s
d. 3.5 m/s

33- A hill is 132 m long and makes an angle of 12.0^o with the horizontal. As a 54 kg jogger runs up the hill, how much work does the jogger do against gravity?

a. 1.5×10^4 J
b. 2.5×10^4 J
c. 3.5×10^4 J
d. 4.5×10^4 J

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