Simulated Final Exam (SF15Ph1FF)

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1. Find the total distance a person travels: training for a marathon, a man runs in a straight line for 1.50 km. He gets tired and stops, refusing to continue. The man eventually looks up to sees the finish line only 1300 feet away. He picks himself up and walks to the finish line (1 foot = 30.5 cm).

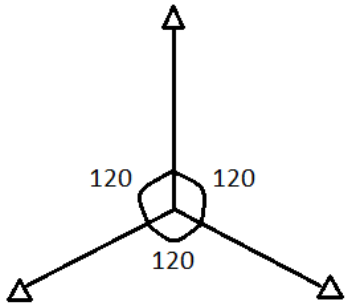
a) 1300 m
b) 1500 m
c) 2.8 m
d) 1900 m
e) 6221 m

2. After crossing the finish line, the man decides to walk home. He walks 23.0 km north then turns east walking 10.5 km in that direction. What is the magnitude and direction of this displacement (let the x-axis be west and east)

a) 53.5 km, 60.3° with respect to + x-axis
b) 21.5 km, 55.5° with respect to + x-axis
c) 25.3 km, 65.5° with respect to + x-axis
d) 75.1 km, 65.5° with respect to + x-axis
e) None of the above

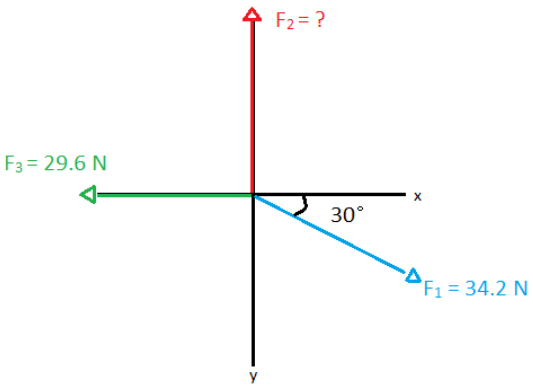
3. Imagine for the figure below, three equal force (F = 10 N) pull in different directions. What would be the net force?

a) 30 N
b) 20 N
c) 10 N
d) 0 N
e) None of the above



4. An object moves at constant velocity with 3 forces acting on it (see figure). What is the magnitude of F_2?

a) 17.1
b) 6.4
c) 8.7
d) 22.4
e) None of the above



5. An Olympic diver jumps into a pool and reaches 6.0 m below the surface in 3 seconds. What was the diver's initial speed as the water is reached.

a) 9.81 m/s
b) 4.0 m/s
c) 6.0 m/s
d) 5.0 m/s
e) None of the above

6. A bratty child stands atop a building and spits at the people walking below. The spit has lands on a person's head after 4.3 seconds with an initial speed of 5.00 m/s. If we don't take into account air resistance, how high was this building?

a) 830 m
b) 311 m
c) 112 m
d) 320 m
e) None of the above

7. A dolphin jumps out of the pool to take the fish offered to it by a Seaworld trainer. After 0.52 seconds it no longer travels higher. Horizontally, it has traveled 1.2 m from its initial spot. Calculate the initial speed.

a) 3.2 m/s
b) 4.5 m/s
c) 5.6 m/s
d) 3.7 m/s
e) None of the above

8. Starting from rest, an object accelerates to a speed of 25 m/s within 6.5 s. If the force exerted on the object is 10 N, what is the mass of this object?

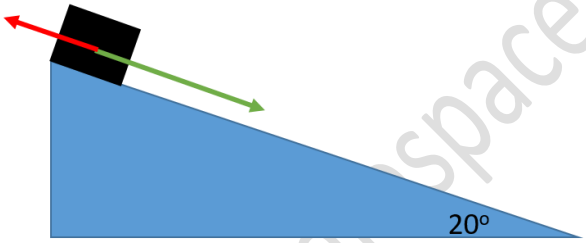
a. 3.4 kg
b. 8.1 kg
c. 5.2 kg
d. 4.2 kg
e. 2.6 kg

9. A man is standing on a scale while riding an elevator from the 5th floor down to the 1st floor. If his mass is 60 kg, what is the reading on the scale as the elevator begins to slow down at a rate of 2.00 m/s^2?

a. 709 N
b. 210 N
c. 985 N
d. 824 N
e. 625 N

10. A 4 kg box is at rest on a ramp of 20° , and has a coefficient of kinetic friction μ_k = 0.2. After the box is given a push, its initial velocity is 1.0 m/s as it slides down due to gravity. What is its speed after traveling a distance of 3.0 m?

a. 5.0 m/s
b. 9.1 m/s
c. 1.6 m/s
d. 3.2 m/s
e. 8.4 m/s

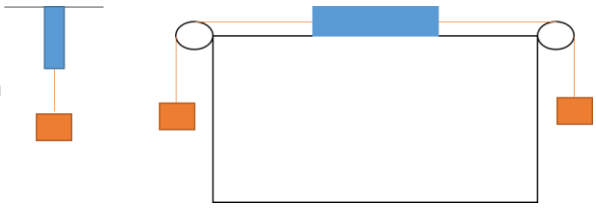


11. A 50 kg sofa is being pushed down a 20 m hallway. If the coefficient of kinetic friction is μ_k = 0.45, how much work does the frictional force do on the sofa?

a. 0 Nm
b. -8800 Nm
c. 8800 Nm
d. 4400 Nm
e. -4400 Nm

12. On the left, a scale attached to the ceiling reads 9.81 N when a mass of 1.00 kg hangs from it. On the right, two 1.00 kg masses are each hanging by a string that is passed over a pulley and connected to an identical scale. What is the reading of the scale on the right?

a. Greater than 19.62 N
b. Exactly 19.62 N
c. Greater than 9.81 N, but not twice as much
d. Less than 9.81 N
e. Exactly 9.81 N



13. A person does 6 J of work to push an object a certain distance up a ramp of 30°. If the object has as mass of 2.0 kg, how far along the incline does the object travel?

a. 1.3 m
b. 2.6 m
c. .13 m
d. .61 m
e. .31 m

14. A 2500 kg roller coaster is initially at 10.0 m above the ground. If it obtains a speed of 12.5 m/s at the bottom of the ride (ground level), what is the work done by frictional forces?

a. -49,900 Nm
b. -591,000 Nm
c. -425,000 Nm
d. 49,900 Nm
e. 425,000 Nm

15. Object A has a mass of 450 g and is traveling toward the right at .850 m/s, while object B has a mass of 300 g and is traveling toward the left at 1.12 m/s. If the two objects are approaching each other in along a straight line, what is the total momentum of the system?

a. 5.370 kg*m/s toward the right
b. 5.370 kg*m/s toward the left
c. 0.0465 kg*m/s toward the right
d. 0.917 kg*m/s toward the right
e. 0.917 kg*m/s toward the left

16. A truck of m_T = 1100 kg travels north at 50.0 km/h. After colliding with a car traveling east at 35.0 km/h, both vehicles move together at an angle of 45° with the east. What is the mass of the car?

a. 1480 kg
b. 800 kg
c. 1200 kg
d. 1570 kg
e. 2100 kg

17. A billiard ball of mass *m* and speed *v* collides with and sticks to an identical billiard ball that is initially at rest. How does kinetic energy of the system after the collision compare to the original kinetic energy of the system?

a. Twice the original
b. Equal to the original
c. 1/4 of the original
d. 1/2 of the original
e. 1/3 of the original

18. A 4.0 kg block is attached to one end of an ideal massless spring of k = 2400 N/m on a frictionless surface. When an 8.0 g bullet is shot into the block, it is lodged into the block, and the spring compresses a distance of 8.7 cm. What is the initial velocity of the bullet?

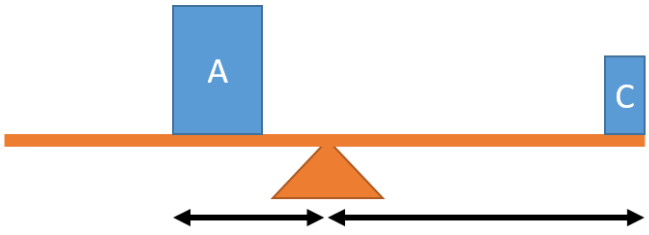
a. 990 m/s
b. 1200 m/s
c. 850 m/s
d. 1100 m/s
e. 1300 m/s

19. Starting from rest, a uniform disk accelerates uniformly at .20 rad/s^2 . What is the time required to finish the first revolution?

a. 7.9 s
b. 21 s
c. 36 s
d. 5.9 s
e. 1.5 s

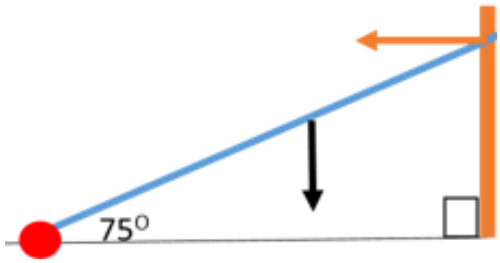
20. An adult of mass 70 kg sits 1.0 m from the pivot point of a sea-saw. How far from the pivot point does a 25 kg child need to be keep the board in balance?

a. 1. 4 m
b. 2.8 m
c. 3.1 m
d. .92 m
e. 3 m



21. A 3.00 m long massless ladder forms an angle of 75° with the ground while leaning against a frictionless wall. If a 60.0 kg person is standing halfway up the ladder, what is the magnitude of the force that the wall exerts on the ladder? (The ladder does not slip on the ground).

a. 78.9 N
b. 91.8 N
c. 527 N
d. 12.9 N
e. 53.2 N



22. Child A of m_A = 35 kg and child B of m_B = 30 kg are both sitting at a distance R = 1.5 m from the axis of rotation of a merry-go-round that is spinning with an initial angular speed of 1.0 rad/s. What will be the angular speed if child B jumps off the merry-go-round? (Neglect the mass of the frame)

a. .90 rad/s
b. 1.9 rad/s
c. 3.0 rad/s
d. 2.2 rad/s
e. 1.3 rad/s

23. The magnitude of the gravitational force the Earth exerts on the Moon is _____ .

a. 0.95×10^{25} N
b. 4.93×10^{15} N
c. 1.98×10^{20} N
d. 5.02×10^{10} N
e. 1.20×10^{37} N

24. On Earth, a certain pendulum of m = 28 kg oscillates back and forth in simple harmonic motion. If it is attached to a 67 m long wire, what is the frequency of this pendulum's oscillations?

a. 0.021 Hz
b. 42 Hz
c. 0.061 Hz
d. .25 Hz
e. 5.1 Hz

25. It takes 0.545 s for a wave to propagate along the rope when it is pulled taut with a tension of 140 N. If the rope is 15.0 m long, what is the mass of this rope?

a. 1.39 kg
b. 2.77 kg
c. 6.71 kg
d. 9.05 kg
e. 5.27 kg

26. A bell tower emits a tone with a frequency of 500 Hz. If a motorcyclist is driving at 100 km/h away from the tower, what frequency does he hear? (Speed of sound in air is 343 m/s)

a. 160 Hz
b. 750 Hz
c. 953 Hz
d. 600 Hz
e. 460 Hz