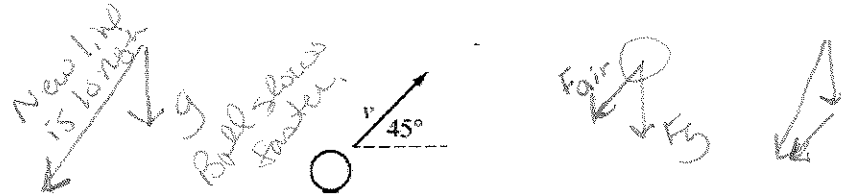


Preliminary Quiz: 2 dimensional motion

Multiple Choice

Identify the choice that best completes the statement or answers the question.

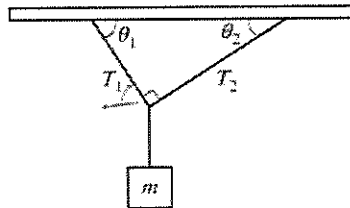
_____ 1.



(#2) A hollow plastic ball is projected into the air. There is significant air resistance opposing the ball's motion, so the magnitude of the ball's acceleration is not equal to g . At time t , the ball is moving up and to the right at an angle of 45° to the horizontal, as shown above. Which of the following best shows the magnitude (ignore sign) a and the direction of the ball's acceleration at time t ? Hint: Take a moment and draw a the forces present.

- a.
- b.
- c.
- d.

_____ 2.

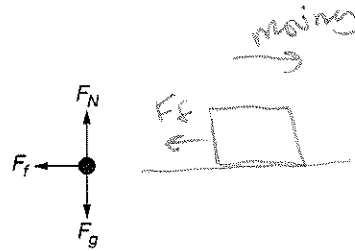


(#2) A box of mass m hangs from massless strings, as shown in the figure above. The angle between strings 1 and 2 is 90° , and the angles that the strings make with the ceiling are θ_1 and θ_2 , respectively. If T_1 is the tension in string 1, which of the following are the magnitudes of the horizontal and vertical components of the tension in string 2?

| | Horizontal Component | Vertical Component |
|----|----------------------|--------------------------|
| a. | $T_1 \cos \theta_1$ | $mg - T_1 \sin \theta_1$ |
| b. | $T_1 \cos \theta_1$ | $mg - T_1 \cos \theta_1$ |
| c. | $T_1 \sin \theta_1$ | $mg - T_1 \cos \theta_1$ |
| d. | $T_1 \sin \theta_1$ | $mg - T_1 \sin \theta_1$ |

X components are equal
 $\cos \theta T_1 = \text{Horizontal}$
 Y component
 $mg - \frac{Y \text{ component}}{\sin \theta T_1} = \text{Vertical}$

3.



(#2) A block slides to the right on a rough horizontal surface. The forces exerted on the block are shown above. Which of the following statements about the frictional force F_f exerted on the block is true?

- a. It is the only force acting on the block that is caused by microscopic interactions.
- b. It does not depend on the materials that the block and the surface are made of.
- c. It is caused by gravitational interactions between the atoms in the block and the atoms in the surface.
- d. It is the sum of all the microscopic contact forces between the bottom of the block and the surface.

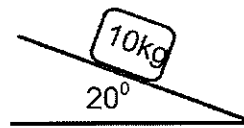
4. A 10kg box is sliding down a frictionless 18° ramp. What is the acceleration of the box down the ramp?

- a. 9.8 m/s^2
- b. 0.54 m/s^2
- c. 6.6 m/s^2
- d. 3.0 m/s^2



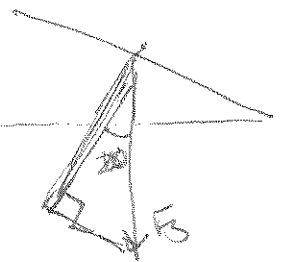
$\sin(18) \cdot 9.8 = 3.02$

Short Answer



Answer the following questions relative to the 10kg block sitting stationary on the ramp above.

- 5. a. Calculate the weight of the object. $10 \cdot 10 = 100 \text{ N}$
- b. Calculate the force normal of the object. $\cos(20) 100 = 93.9 \text{ N}$
- c. Calculate the force of friction. $F_f = F_r$ (Not Moving) $\sin(20) 100 = 34.2$
- d. Calculate the minimum coefficient of friction at this point on the ramp.



6. $\tan \theta = \tan 20 = 0.36 = \mu_k$



A 15kg block is being pulled on a frictionless surface.

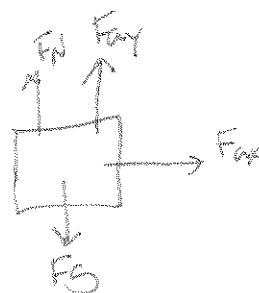
a. Calculate the acceleration of the object.

$a = \frac{\Sigma F}{m} = \frac{19.3}{15} = 1.28 \text{ m/s}^2$

b. What is the weight of the object? 150 N

c. What is the force normal of the object.

$F_N + F_{Ay} = F_g$
 $F_N = F_g - F_{Ay} = 150 - 5.17 = 144.8 \text{ N}$



$\sin 15 \cdot 20 = 5.17$
 F_{Ax}
 $\cos(15) \cdot 20 = 19.3$