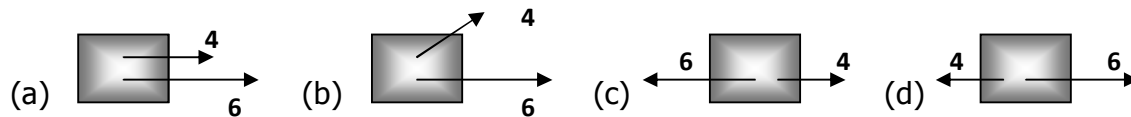


Chapter 5: FORCE AND MOTION I



1. The figures below show four situations in which forces act on a block that lies on a frictionless floor. In which figure the block has the **greatest acceleration**?



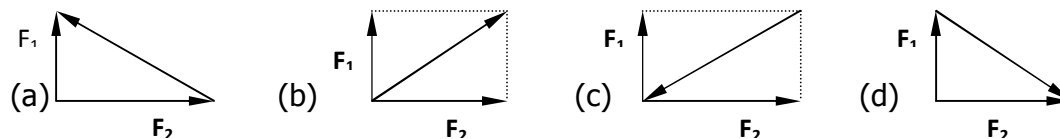
2. A force of **0.2 N** acts on a mass of **100 g**, what is its **acceleration**?

- (a) $2 \times 10^{-2} \text{ m/s}^2$ (b) $2 \times 10^{-6} \text{ m/s}^2$ (c) $2 \times 10^{-3} \text{ m/s}^2$ (d) 2 m/s^2

3. A man **pulls** a box of **mass 3 kg** **vertically upward** with a force of magnitude **40 N**. What is the **acceleration of the box**?

- (a) $a = \frac{T - mg}{m}$ (b) $a = \frac{mg - T}{m}$ (c) $a = \frac{T + mg}{m}$ (d) $a = \frac{m}{T + mg}$

4. Which of the following figures correctly show the vector **addition of forces F_1 and F_2** ?



5. If the **1 kg** body has an **acceleration of 2 m/s^2** at an angle of **20°** above the positive direction of the x-axis. What is the **net force** in unit vector notation?

- (a) $\vec{F} = 0.34\hat{i} + 0.94\hat{j}$ (b) $\vec{F} = 1.88\hat{i} + 0.68\hat{j}$ (c) $\vec{F} = 0.68\hat{i} + 1.88\hat{j}$ (d) $\vec{F} = 0.94\hat{i} + 0.34\hat{j}$

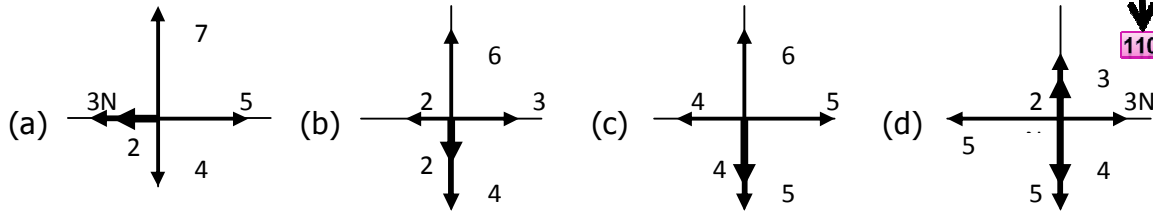
6. Two forces act on a particle that moves with **constant velocity $\vec{v} = 3\hat{i} - 4\hat{j} \text{ m/s}$** , one of the forces is **$\vec{F}_1 = 2\hat{i} - 6\hat{j} \text{ N}$** , what is the other force?

- (a) $\vec{F}_2 = 2\hat{i} - 6\hat{j}$ (b) $\vec{F}_2 = 6\hat{i} - 10\hat{j}$ (c) $\vec{F}_2 = -2\hat{i} + 6\hat{j}$ (d) $\vec{F}_2 = -6\hat{i} + 10\hat{j}$

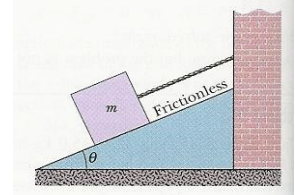
7. A particle has a **weight of 22 N** at a point where **$g = 9.8 \text{ m/s}^2$** , what are its **mass and weight** at a point where **$g = 0$** ?

- (a) $m = 2.2 \text{ kg}$
 $W = 0$ (b) $m = 0$
 $W = 2.2 \text{ N}$ (c) $m = 0.45 \text{ kg}$
 $W = 0$ (d) $m = 0$
 $W = 45 \text{ N}$

8. In which figure of the following the **y-component of the net force is zero**?



9. In the figure a cord holds stationary a block of mass $m = 8.5 \text{ kg}$ on a frictionless plane that is inclined at an angle $\theta = 30^\circ$, the tension in the cord T equals:



- (a) 72.14 N (b) 83.3 N (c) 53.14 N (d) 41.65 N

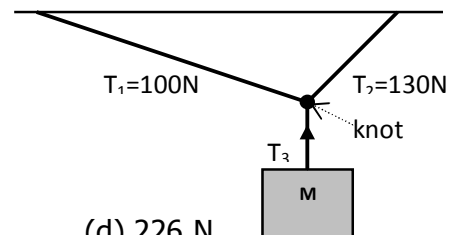
10. In question 9, the Normal force N acting on the block is:

- (a) $N = F_g - mg \cos \theta$ (b) $N = F_g \cos \theta$ (c) $N = F_g + mg \cos \theta$ (d) $N = F_g$

11. In question 9, if the cord is cut then the mass will slide with acceleration equals:

- (a) $a = -4.9 \text{ m/s}^2$ (b) $a = -9.8 \text{ m/s}^2$ (c) $a = -8.5 \text{ m/s}^2$ (d) $a = -3.4 \text{ m/s}^2$

12. A block of mass $M = 20 \text{ kg}$ hangs from three cords by means of a knot, (the mass M does not move), what is the value of tension T_3 ?

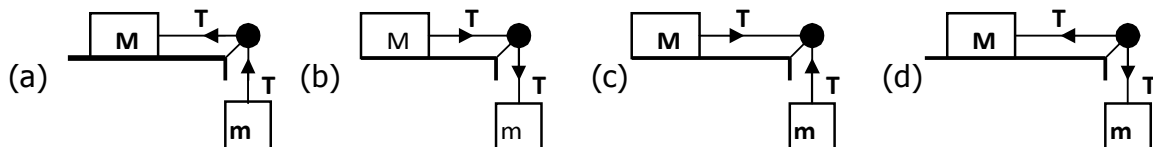


- (a) 230 N (b) 196 N (c) 426 N (d) 226 N

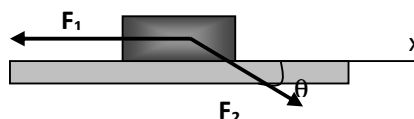
13. What is the net force acting on a body of a mass of 48 kg, when its acceleration is 6 m/s^2 ?

- (a) 758 N (b) 182 N (c) 288 N (d) 470 N

14. Which figure of the following shows the right direction of the tension T ? (the two masses are stationary).



15. Two forces act on a block of mass $m = 0.5 \text{ kg}$ that moves along the x-axis on a frictionless table, $F_1 = 3 \text{ N}$ and $F_2 = 1 \text{ N}$ directed at angle $\theta = 30^\circ$ as shown, What is the acceleration of the block?



- (a) -4.3 m/s^2 (b) -7.7 m/s^2 (c) -5 m/s^2 (d) -7 m/s^2

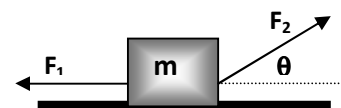
16. If $m_1 = 2 \text{ kg}$ and $m_2 = 4 \text{ kg}$ and the same force is applied to both masses, then the ratio of their accelerations is:

- (a) $\frac{a_2}{a_1} = \frac{1}{2}$ (b) $\frac{a_2}{a_1} = 2$ (c) $\frac{a_2}{a_1} = \frac{1}{4}$ (d) $\frac{a_2}{a_1} = 4$

17. A force F applied to a body of mass m_0 giving it an acceleration a_0 , what is the mass of a body x if the same force is applied to it and accelerate it by a_x ?

- (a) $m_x = m_0 \frac{a_x}{a_0}$ (b) $m_x = m_0 \frac{a_0}{a_x}$ (c) $m_x = \frac{a_x}{a_0}$ (d) $m_x = \frac{a_0}{a_x}$

18. In the figure, two forces acting on a box of mass m moving over a frictionless ice along the x-axis. What is the acceleration of the box?



- (a) $a_x = \frac{F_1 + F_2 \cos \theta}{m}$ (b) $a_x = \frac{F_2 \cos \theta - F_1}{m}$ (c) $a_x = \frac{F_2 \cos \theta}{m}$ (d) $a_x = \frac{F_1 - F_2}{m}$

19. The magnitude of the centripetal force is

- (a) $F = m \frac{v^2}{R^2}$ (b) $F = \frac{v^2}{R}$ (c) $F = m \frac{v}{R}$ (d) $F = m \frac{v^2}{R}$

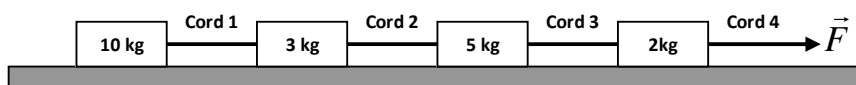
1. What is the gravitational force on a man of mass m when he is sitting in a car that accelerates at a ?

- (a) $F_g = m a$ (b) $F_g = m (g - a)$ (c) $F_g = m g$ (d) $F_g = m (a - g)$

20. Two forces act on a particle that moves with constant velocity $\vec{v} = 3\hat{i} - 4\hat{j} \text{ m/s}$, one of the forces is $\vec{F}_1 = 2\hat{i} - 6\hat{j} \text{ N}$, what is the other force?

- (a) $\vec{F}_2 = 2\hat{i} - 6\hat{j}$ (b) $\vec{F}_2 = 6\hat{i} - 10\hat{j}$ (c) $\vec{F}_2 = -2\hat{i} + 6\hat{j}$ (d) $\vec{F}_2 = -6\hat{i} + 10\hat{j}$

21. The figure shows a train of four blocks being pulled across a frictionless floor by force $\vec{F}$, what total mass is accelerated to the right by Cord 2?



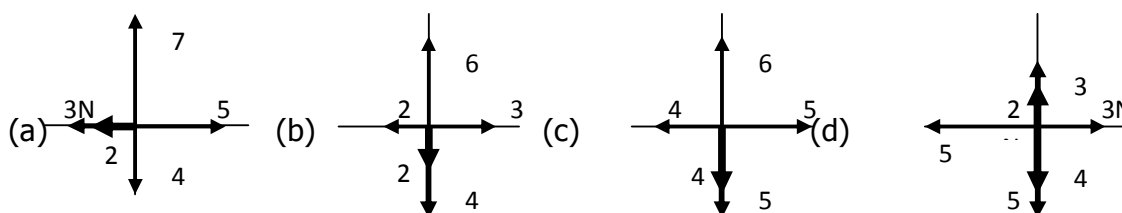


- (a) 10 kg (b) 18 kg (c) 13 kg (d) 7 kg

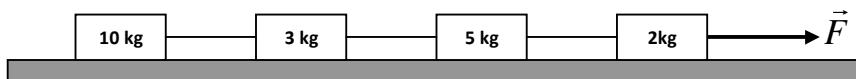
22. A particle has a **weight of 22 N** at a point where $g = 9.8 \text{ m/s}^2$, what are its **mass and weight** at a point where $g = 0$?

- (a) $m = 2.2 \text{ kg}$ (b) $m = 0$ (c) $m = 0.45 \text{ kg}$ (d) $m = 0$
 $W = 0$ $W = 2.2 \text{ N}$ $W = 0$ $W = 45 \text{ N}$

23. In which figure of the following the **y-component of the net force is zero**?



24. The figure shows a train of four blocks being pulled across a frictionless floor by force $\vec{F}$, what total mass is accelerated to the right by force $\vec{F}$?



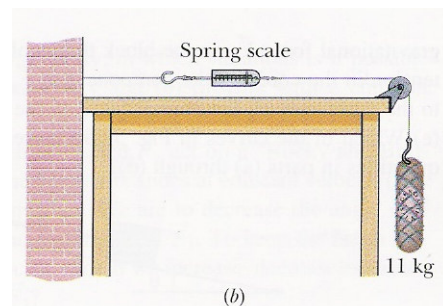
- (a) 10 kg (b) 18 kg (c) 13 kg (d) 245 m/s

25. Three forces act on a particle that moves with **unchanging** velocity $\vec{v} = 2\hat{i} - 7\hat{j}$, two of the forces are $\vec{F}_1 = 2\hat{i} + 3\hat{j} - 2\hat{k}$ and $\vec{F}_2 = -5\hat{i} + 8\hat{j} - 2\hat{k}$. what is the **third force** ?

- (a) $3\hat{i} - 11\hat{j} + 4\hat{k}$ (b) $7\hat{i} - 5\hat{j}$ (c) $-3\hat{i} + 11\hat{j} - 4\hat{k}$ (d) $-7\hat{i} + 5\hat{j}$

26. An **11 kg** object is supported by a cord that Runs around a pulley and to a scale. The opposite end of the scale is attached by a cord to a wall.

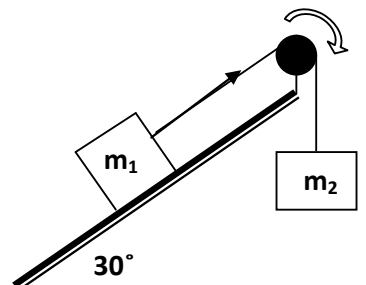
What is the reading on the scale?



- (a) 11 N (b) 9.8 N (c) 107.8 N (d) 215.6 N

27. A block of mass $m_1 = 3.7 \text{ kg}$ on frictionless inclined plane of angle 30° is connected by a cord over a massless frictionless pulley to a second block of mass $m_2 = 2.3 \text{ kg}$ hanging vertically **as shown**.

If the magnitude of the **acceleration** of each block is 0.735 m/s^2 , what is the **tension in the cord** ?



- (a) 36.3 N (b) 22.5 N (c) 20.8 N (d) 18.1 N

28. In question 27, what is the **normal force** acting on the block m_1 ?

- (a) $N = F_g - m_1 g \cos \theta$ (b) $N = F_g \cos \theta$ (c) $N = F_g + m_1 g \cos \theta$ (d) $N = F_g$

29. In question 27, if the cord is cut what is the **acceleration** of mass m_2 ?

- (a) $a = -4.9 \text{ m/s}^2$ (b) $a = -9.8 \text{ m/s}^2$ (c) $a = -0.735 \text{ m/s}^2$ (d) $a = \text{zero}$

30. If the 1 kg body has an **acceleration of 2 m/s^2** at an angle of 20° above the positive direction of the x-axis. What is the **net force** in unit vector notation?

- (a) $\vec{F} = 0.34\hat{i} + 0.94\hat{j}$ (b) $\vec{F} = 1.88\hat{i} + 0.68\hat{j}$ (c) $\vec{F} = 0.68\hat{i} + 1.88\hat{j}$ (d) $\vec{F} = 0.94\hat{i} + 0.34\hat{j}$