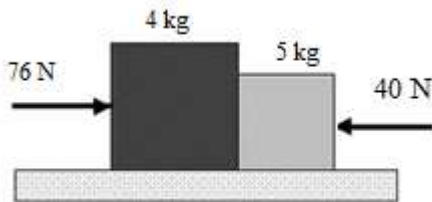


## Supplementary Problems Solutions for Exam 1

1. An object's initial velocity is 40 m/s and is accelerating. When the object's displacement is 300 m, its velocity is -30 m/s. What is the object's acceleration (in  $\text{m/s}^2$ )?
2. A jet flying at 250 m/s at an altitude of 900 meters, and climbing at an angle of  $10^\circ$  relative to the horizontal, drops a bomb. What is the "line-of-sight" distance  $d$  (in meters) between the bomb's initial location and the location on the ground where the bomb lands?
3. At time  $t = 0$  an automobile moving at 30 m/s accelerates at the rate of  $2 \text{ m/s}^2$ . How far will the object travel during the time interval between  $t = 14 \text{ s}$  and  $t = 16 \text{ s}$ ?
4. A ball is thrown straight upward at 20 m/s from the top of a tall building, reaches maximum height, then falls towards the ground. How many seconds after being thrown will its velocity be -30 m/s?
5. A bullet is fired straight upward. How many seconds after it reaches its maximum height will
6. The velocity of an object changes from 120 m/s to 70 m/s in four seconds. What was the object's displacement (in meters) during this time?
7. A bullet is fired over level ground at 200 m/s toward a cliff face 250 meters away. At what angle (in degrees) relative to the horizontal must the bullet be fired in order to strike the wall 60 meters above the point from which the bullet was fired?
8. A stone is thrown from the top of a building 20 meters tall at a speed of 16 m/s and at an angle of 30 degrees below the horizontal. How far (in meters) horizontally will the stone have traveled when it strikes the ground?
9. A struck golf ball leaves the ground with speed 90 m/s, traveling initially along an angle of 40 degrees above the horizontal. How far (in meters) horizontally will it have traveled by the time its elevation is 30 meters for the *second* time?
10. The gravitational force two objects of equal mass exert on each other is 6000 N. What would be the new force (in newtons) if the separation is tripled, and the mass of each object is doubled?

11. An object weighing 500 N is placed in an elevator that is accelerating. What would have to be the acceleration (in  $\text{m/s}^2$ ) of the elevator in order that the object's apparent weight be only 100 N?
12. Three forces in a plane act on an object. Their magnitudes and headings  $\theta$  are indicated in the list below:
13. An object of mass 50 kg is 5.0 m from an object of mass 120 kg. How far from the 50-kg object, on the line connecting the two objects, would the net force on a third object of mass  $m$  be zero?
14. At what firing angle (in degrees) above the horizontal must an arrow, fired at 80 m/s, be aimed to rise to a maximum height of 170 meters?
15. Two blocks are touching on a frictionless tabletop, as shown in the figure below. Two opposing horizontal forces are applied. What is the contact force (in newtons) each block exerts on the other?



16. Two cars are initially separated by 860 meters. Car A is moving at 20 m/s and accelerating at  $4 \text{ m/s}^2$  and is chasing Car B, which is moving at a steady velocity of 30 m/s. How far (in meters) will Car A have traveled by the time it catches up with Car B?
17. Two cars are initially separated by 1800 meters. Car A is moving at 30 m/s and accelerating at  $3.2 \text{ m/s}^2$  and is headed toward Car B, which is moving at -20 m/s. After how many seconds will the cars collide?