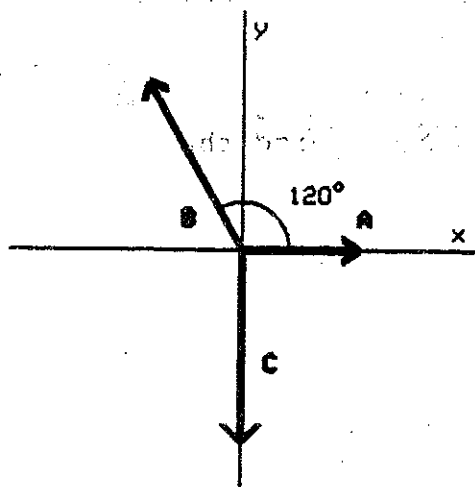
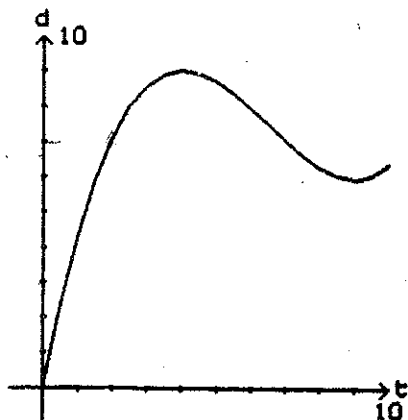


1 Use the diagram below and find the magnitude and direction of the sum of the three vectors. Vector A has magnitude of 5.0, Vector B has magnitude of 8.0, and Vector C has magnitude of 8.0. (Express the angle with respect to the x-axis.)



- 2 While flying due east at 120 km/h, an airplane is also carried northward at 27 km/h by the wind blowing due north. What is the plane's resultant speed?
- 3 A rope with a breaking strength of 238 N supports a 384 N weight suspended from the middle of the rope. What is the minimum angle the rope can make with the horizon without breaking?
- 4 On the position-time graph below find the approximate velocity at times $t = 2.0$, $t = 6.5$, and $t = 9.0$.



- 5 An airplane with a velocity of 36 m/s needs to reach a velocity of 81 m/s for takeoff. If there is only 0.70 km of runway left, what must the constant acceleration be?

6. A brick is tossed upward from the edge of a balcony that is 15.0 meters above the ground. The brick just misses the balcony on its way down and strikes the ground 4.00 seconds after being thrown. Find the initial speed of the brick.
7. An arrow is shot directly upward. It rises to a height of 53.6 meters above the point from which it was shot. Find the initial speed of the arrow.
8. A 619-kg horse, starting from rest, attains a speed of 8.84 m/s in 3.54 s. Find
- the average acceleration of the horse.
 - the size of the average force exerted on the road by the horse.
 - the horizontal force the saddle exerts on the rider if the rider has a mass of 58.2 kg.
9. A box with a mass of 24 kg is resting on a wooden table. The coefficient of kinetic friction is 0.31. Find the horizontal force necessary to give the box an acceleration of 1.1 m/s^2 .
10. An elevator is accelerating downward with an acceleration of 2.60 m/s^2 . The tension in the cable supporting the elevator is 6128 N. Find the mass of the elevator.
11. A train made up of a locomotive and 5 freight cars is accelerating at 0.22 m/s^2 on a level track. If each of the cars has a mass of 38,000 kg, what is the tension in the coupling between the second and third cars?
12. A horseshoe player tosses a horseshoe from ground level directly at the stake at an angle of 25.3° above the horizontal. The horseshoe has an initial velocity of 12.6 m/s. The stake is 12.0 m away.
- How far from the stake does the horseshoe land?
 - What is the maximum height reached by the horseshoe?
13. A 22.3-kg child is riding on a merry-go-round with a radius of 6.7 m. The time it takes the merry-go-round to make one revolution is 3.2 s.
- Find the centripetal acceleration of the child.
 - Find the horizontal force on the child.
14. A rock is thrown from the roof of a building, with an initial velocity of 10.0 m/s at an angle of 30.0° above the horizontal. The rock is observed to strike the ground 32.0 m from the base of the building. What is the height of the building?

1.15 On a bookcase where the shelves are 0.24 m apart, a 2.9-kg box of books is moved from the bottom shelf up two shelves. What is the amount of work done on the box?

1.16 A motor with an efficiency of 85% operates a winch with an efficiency of 60%. If the power supplied to the motor is 5.6 kw, how far will the winch lift a 311-kg mass in 5.0 s?

1.17 A tennis player hitting a backhand shot exerts a 23 N force on the tennis ball for 0.16 s. What impulse is given to the ball?

1.18 A 0.37-kg kickball is rolled towards a kicker at 6.8 m/s. After the ball is kicked, its velocity is -13.0 m/s. What impulse is acting on the kicker's foot?

1.19 A 20.0-kg child is riding on a 9.0-kg bicycle going 3.6 m/s north. Seeing that she is about to crash, she jumps off the bicycle and lands on the ground still moving at 2.2 m/s north. How fast is the bicycle now traveling?

1.20 A 1221-kg car moving north at 28.0 m/s collides with a 2141 kg car moving east at 15.0 m/s. They stick together. In what direction and at what speed do they move after the collision?

2. An arrow is shot directly upward. It rises to a height of 53.6 meters above the point from which it was shot. Find the initial speed of the arrow.

2. A rock is thrown from the roof of a building, with an initial velocity of 10.0 m/s at an angle of 30.0° above the horizontal. The rock is observed to strike the ground 32.0 m from the base of the building. What is the height of the building?

23. A force of 200 N is used to lift a 15-kg object, initially at rest, to a height of 8.0 m. No friction is present. What is the speed of the object at this height? 7.5

24. An 800-kg car coasts down a hill 40 m high with its engine off and its driver's foot pressing on the brake pedal. At the top of the hill the car's speed is 6.0 m/s, and at the bottom it is 20.0 m/s. How much energy was converted to heat on the way down? 155,000 J

25. A 60-kg woman jumps off a wall 1.2 m high and lands with her knees stiff. If her body is compressed by 25 mm on impact, what is the average force exerted on her by the ground? What would the force be if she had bent her knees on impact, so that she came to a stop in 25 cm? 28224 N, 28127 N

26. The bob of a pendulum 1.2 m long is pulled aside so that the string is 40° from the vertical. When the bob is released, with what speed will it pass through the bottom of its path? 2.3