

T-1. A rock is dropped from rest over the edge of a cliff. What is the speed of the rock 1 s after being dropped?

m/s

A-1. A car undergoes constant acceleration from 0 ft/s to 88 ft/s in 11 seconds. What is the acceleration of the car?

ft/s <sup>2</sup>
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A-2. The volume of water coolant in an automobile engine is 10.5 L. The density of water is  $1.00 \text{ g/cm}^3$  and its specific heat is  $1.0 \text{ cal/g}^\circ\text{C}$ . How much heat is required to raise the temperature of the water from  $20^\circ\text{C}$  to  $85^\circ\text{C}$ ?  $1 \text{ L} = 1000 \text{ cm}^3$ .

cal
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A-3. An empty rail car traveling 3 mi/hr couples to a loaded rail car which is initially at rest. The loaded car is 3 times heavier than the empty car. What is the speed of the two cars after coupling?

mi/hr
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A-4. A 100-kg satellite revolves around the earth in a circular orbit. The speed of the satellite is 7.54 km/s and the radius of its orbit is 7000 km. What is the earth's gravitational force acting on the satellite?

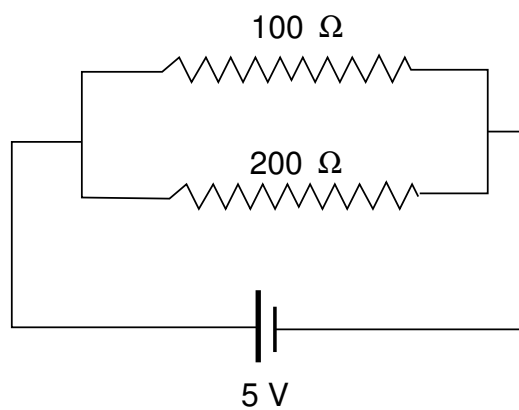
B-1. A constant force of 42 N is applied to a block which has a mass of 7.5 kg. What is the acceleration of the block?

$m/s^2$
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B-2. A group of students constructs a simple pendulum. They observe that it undergoes 10 oscillations in 15 seconds. What is the length of the pendulum?

m

B-3. Two resistors, one with a resistance of  $100\ \Omega$  and the other with a resistance of  $200\ \Omega$ , are connected in parallel across a 5-volt battery as shown below. Find the current flowing through the battery.



A
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B-4. A baseball player throws a ball directly upward. If the ball rises 42 m before stopping and starting to fall, with what speed did the ball leave the player's hand?

m/s

C-1. A tennis ball is dropped from a height of 1.50 m onto the clay surface of a tennis court. The ball loses 15% of its total mechanical energy (sum of kinetic energy and gravitational potential energy) in the first bounce. How high does it rise after the first bounce?

m

C-2. A block slides across a table. The mass of the block is 0.5 kg and the coefficient of friction between the table and block is 0.3. If the initial speed of the block is 2 m/s, how long does it take the block to come to rest?

s

C-3. How much power is required to lift a 3-kg block a distance of 2 m in a time of 4 s?

W

C-4. In the ground state of hydrogen, the mean separation between the electron and proton is  $5.3 \times 10^{-11}$  m. What is the magnitude of the Coulomb force between electron and proton at this distance? The charge of the electron is  $-1.602 \times 10^{-19}$  C and the charge of the proton is  $1.602 \times 10^{-19}$  C.

N

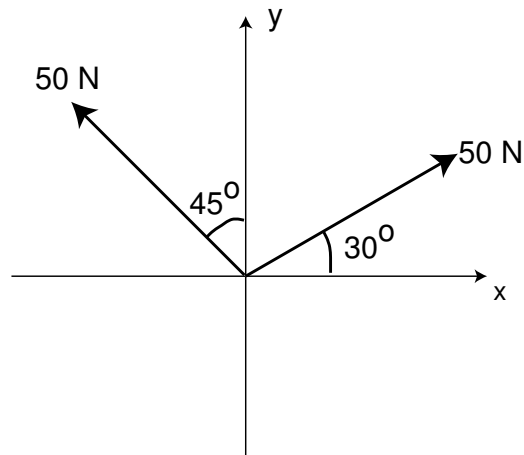
D-1. The weight of a spaceship on Mars is 1000 N. The weight of the spaceship on earth is 3848 N. What is the acceleration of gravity on Mars?

$m/s^2$
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D-2. A disk has a moment of inertia of  $0.1 \text{ kg}\cdot\text{m}^2$  about its axis of rotation. The disk is initially at rest. If a constant torque of  $0.05 \text{ N}\cdot\text{m}$  is then applied to the disk, what is the angular speed of the disk after  $5 \text{ s}$ ?

rad/s
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D-3. Two forces act on a block. The two forces have equal magnitude and are directed as shown below. What is the magnitude of the net force acting on the block?



N
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D-4. A bullet is fired horizontally from a gun at a speed of 300 m/s. By how much has it dropped vertically after traveling 100 m horizontally?

m

S-1. Two students balance on a weightless teeter-totter. One student has a weight of 60 lbs and is 6 ft from the pivot. The other student is 4 ft from the pivot. How much does the second student weigh?

lbs
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S-2. The speed of an airplane in air is 225 mi/hr. The airplane flies from Birmingham to Huntsville in 36 min in a steady wind which is blowing out of the north. How long would it have taken the plane to fly from Huntsville to Birmingham in the same wind? Assume that Huntsville is 120 mi directly north of Birmingham.

min

S-3. An object 25 cm in front of a converging lens is focused 40 cm behind the converging lens. What is the focal length of the lens?

cm

S-4. A 300-g mass is suspended vertically from a spring. When the mass is hung from the spring, it is observed that the spring stretches by 20 cm. The mass is then set into oscillation. What is the period of oscillation? Neglect the mass of the spring.

S