

Physics Problem Set 5 - Week 6 (5720083)

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1. Question Details OSColPhys1 6.P.001.WA. [2611722]

(a) Express the following angles in radians.

$10^\circ =$   rad

$40^\circ =$   rad

$85^\circ =$   rad

$190^\circ =$   rad

(b) The following angles are in units of radians. Express them in degrees.

$\pi/5 =$    $^\circ$

$0.90\pi =$    $^\circ$

$1.3\pi =$    $^\circ$

$7\pi =$    $^\circ$

(c) The following angles are in units of radians. Express them in units of revolutions.

$\pi/5 =$   rev

$0.90\pi =$   rev

$1.3\pi =$   rev

$7\pi =$   rev

Supporting Materials

[Physical Constants](#)

2. Question Details OSColPhys1 6.P.005.WA. [2611552]

A bicycle tire of radius 0.38 m has a piece of gum stuck on its rim. What is the angle through which the tire rotates when the gum has moved through a linear distance of 1.85 m? Express your answer in radians and degrees.

rad

$^\circ$

Supporting Materials

[Physical Constants](#)

3. Question Details OSColPhys1 6.P.002.WA. [2611697]

An automobile with 0.270 m radius tires travels 85,000 km before wearing them out. How many revolutions do the tires make, neglecting any backing up and any change in radius due to wear?

rev

Supporting Materials

[Physical Constants](#)

4. Question Details OSColPhys1 6.P.004.WA. [2611605]

A truck with 0.345 m radius tires travels at 47.0 m/s. At how many radians per second are the tires rotating?

rad/s

What is this value in rpm?

rpm

Supporting Materials

[Physical Constants](#)

5. Question Details OSColPhys1 6.P.007.WA. [2611557]

Mary and her younger brother Alex decide to ride the 26-foot-diameter carousel at the State Fair. Mary sits on one of the horses in the outer section at a distance of 11 feet from the center. Alex decides to play it safe and chooses to sit in the inner section at a distance of 7 feet from the center.

(a) What is Mary's angular speed  $\omega_M$  compared to that of Alex's angular speed  $\omega_A$ ? Give your answer as a multiple of  $\omega_A$ .

$\omega_M =$    $\omega_A$

(b) What is Mary's tangential speed  $v_M$  compared to that of Alex's tangential speed  $v_A$ ? Give your answer as a multiple of  $v_A$ .

$v_M =$    $v_A$

Supporting Materials

[Physical Constants](#)

6. Question Details OSColPhys1 4.P.007.WA. [2707312]

An object of mass 13.0 kg subjected to a non-zero net force moves with an acceleration of 1.6 m/s<sup>2</sup>.

(a) Determine the net force acting on it. (Enter the magnitude only.)

N

(b) What acceleration would a 26.0-kg object have if the same net force is applied to it?

m/s<sup>2</sup>

Supporting Materials

[Physical Constants](#)

7. Question Details OSColPhys1 4.P.009.WA. [2707387]

An object of mass 0.77 kg is initially at rest. When a force acts on it for 2.9 ms it acquires a speed of 17.6 m/s. Find the magnitude of the average force acting on the ball during the 2.9 ms time interval.

N

Supporting Materials

[Physical Constants](#)

8. Question Details OSColPhys1 4.P.013.WA. [2707292]

A ball rolls onto the path of your car as you drive down a quiet neighborhood street. To avoid hitting the child that runs to retrieve the ball, you apply your brakes for 1.40 s. The car slows down from 15.0 m/s to 9.00 m/s. The mass of the car is 1390 kg.

(a) During the time the brakes were applied, what was the average force exerted on your car?

magnitude  N

direction

(b) How far did the car move while braking?

m

Supporting Materials

Physical Constants

9. Question Details 4.P.025 mod [2969667]

Tom and Jerry are enjoying an afternoon at the ice rink. They playfully place their hands together and push against each other. Tom's mass is 66 kg and Jerry's mass is 15 kg.

(a) Which of the following statements is correct?

- The magnitude of the force Jerry exerts on Tom is less than the magnitude of the force Tom exerts on Jerry.
- The magnitude of the force Tom exerts on Jerry is less than the magnitude of the force Jerry exerts on Tom.
- The magnitude of the force Jerry exerts on Tom is equal to the magnitude of the force Tom exerts on Jerry.

(b) Which of the following statements is correct?

- Tom's acceleration is less than Jerry's acceleration.
- Tom's acceleration is more than Jerry's acceleration.
- They both have the same acceleration.

(c) If Jerry's acceleration is  $2.7 \text{ m/s}^2$  in magnitude, what is the magnitude of Tom's acceleration?

$\text{m/s}^2$

10. Question Details OSColPhys1 4.P.006.WA. [2707410]

An astronaut weighing 223 lbs on Earth is on a mission to the Moon and Mars.

(a) What would he weigh in newtons when he is on the Moon? The acceleration due to gravity on the Moon is one-sixth that on Earth.

N

(b) How much would he weigh in newtons when he is on Mars, where the acceleration due to gravity is 0.38 times that on Earth?

N

(c) What is his mass on Earth?

kg

(d) Which of the following are true? (Select all that apply.)

- His mass on Mars is smaller than his mass on Earth.
- His mass on the Moon is exactly equal to his mass on Earth.
- His mass on the Moon is smaller than his mass on Earth.
- His mass on the Moon is greater than his mass on Earth.
- His mass on Mars is exactly equal to his mass on Earth.
- His mass on Mars is greater than his mass on Earth.

Supporting Materials

Physical Constants

11. Question Details OSColPhys1 4.7.061.XP. [2153762]

Calculate the force a mother must exert to hold her 12.0 kg child in an elevator under the following conditions.

(a) The elevator accelerates upward at  $0.850 \text{ m/s}^2$ .

N

Calculate the ratio of this force to the weight of the child.

(b) The elevator moves upward at a constant speed.

N

Calculate the ratio of this force to the weight of the child.

(c) The upward bound elevator decelerates at  $2.30 \text{ m/s}^2$ .

N

Calculate the ratio of this force to the weight of the child.

(d) Show the free body diagram used (same for all parts). Do this on paper. Your instructor may ask you to turn in this work.

12. Question Details

OSColPhys1 4.P.008.WA. [2707404]

You work at a garden store for the summer. You lift a bag of fertilizer with a force of  $122\text{ N}$ , and it moves upward with an acceleration of  $0.786\text{ m/s}^2$ .

(a) What is the mass of the fertilizer bag?

  kg

(b) How much does the fertilizer bag weigh?

  N

Supporting Materials

[Physical Constants](#)

13. Question Details

OSColPhys1 4.P.016.WA. [2707405]

Two horizontal forces,  $\vec{P}$  and  $\vec{Q}$ , are acting on a block that is placed on a table. We know that  $\vec{P}$  is directed to the left but the direction of  $\vec{Q}$  is unknown; it could either be directed to the right or to the left. The object moves along the  $x$ -axis. Assume there is no friction between the object and the table. Here  $P = -3.4\text{ N}$  and the mass of the block is  $3.6\text{ kg}$ .



(a) What is the magnitude and direction of  $\vec{Q}$  when the block moves with constant velocity? (Indicate the direction with the sign of your answer.)

  N

(b) What is the magnitude and direction of  $\vec{Q}$  when the acceleration of the block is  $+5.0\text{ m/s}^2$ . (Indicate the direction with the sign of your answer.)

  N

(c) Find the magnitude and direction of  $\vec{Q}$  when the acceleration of the block is  $-5.0\text{ m/s}^2$ . (Indicate the direction with the sign of your answer.)

  N

Supporting Materials

[Physical Constants](#)

14. Question Details

OSColPhys1 4.P.017.WA. [2707279]

Two forces  $\vec{P}$  and  $\vec{Q}$  act on an object of mass  $12.0\text{ kg}$  with  $\vec{Q}$  being the larger of the two forces. When both forces are directed to the left, the magnitude of the acceleration of the object is  $1.30\text{ m/s}^2$ . However, when the force  $\vec{P}$  is directed to the left and the force  $\vec{Q}$  is directed to the right, the object has an acceleration of  $0.600\text{ m/s}^2$  to the right. Find the magnitudes of the two forces  $\vec{P}$  and  $\vec{Q}$ .

 $P =$    N

 $Q =$    N

Supporting Materials

[Physical Constants](#)