7-1A) A pulley wheel is rotating at 100 rev/sec. What is its frequency of rotation in rad/sec?
(a) 628 rad/sec (b) 15.9 rad/sec (c) 100 rad/sec (d) 10.5 rad/sec (e) None of these is close.

A pulley wheel is rotating at a constant angular speed of $\omega = 5.0$ rad/sec.

7-2A) About how many complete revolutions does it make in 10 seconds?
(a) 310 (b) 50 (c) 8.0 (d) 31 (e) 0.50

7-3A) What is the linear speed of a point a distance 0.50 m from the center of the wheel?
(a) 10 m/s (b) 16 m/s (c) 1.3 m/s (d) 2.5 m/s (e) 5.0 m/s

A pulley wheel of radius 0.20 m, initially at rest, has a constant angular acceleration of $\alpha = 2.0$ rad/s^2.

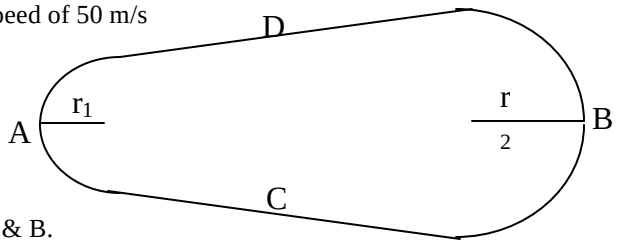
7-4A) What is its angular speed at the end of 3.0 seconds?
(a) 3 rad/s (b) 19 rad/s (c) 1.5 rad/s (d) 6 rad/s (e) 38 rad/s.

7-5A) Through how large an angle has it turned at the end of 3.0 seconds?
(a) 18 rad (b) 9 rad (c) 56 rad (d) 4.5 rad (e) None of these is close.

7-6A) What is the linear tangential acceleration of a point on its outer rim at the end of 3.0 sec?
(a) 0.2 m/s^2 (b) 0.4 m/s^2 (c) 3 m/s^2 (d) 1.2 m/s^2 (e) You don't have enough information to tell.

7-7A) What is the linear speed of a point on its outer rim at the end of 3.0 sec?
(a) 0.4 m/s (b) 0.19 m/s (c) 7.5 m/s (d) 6.0 m/s (e) 1.2 m/s

A race track is made of two semicircles of radius $r_1 = 40$ m at A and $r_2 = 80$ m at B joined by two stretches of straight track, C and D. In a trial run, a driver traveled at a constant speed of 50 m/s for one complete lap. Answer three questions about this lap.



7-8A) The ratio of the centripetal acceleration on A to that on B is:
(1) ½ (b) ¼ (c) 2 (d) 4 (e) None of these.

7-9A) The ratio of the tangential acceleration on A to that on B is:
(a) ½ (b) ¼ (c) 2 (d) 4 (e) Undefined. The tangential accelerations are zero at A & B.

7-10A) The angular speed is greatest at:
(a) on semicircle A. (b) on flat side C. (c) on semicircle B. (d) on flat side D (e) It is the same on all four.

7-11A) A particle moves at constant speed in a circular path. The instantaneous linear velocity and instantaneous linear acceleration vectors are:
(a) both tangent to the circular path.
(b) both perpendicular to the circular path.
(c) perpendicular to each other.
(d) opposite to each other.
(e) none of the above.

7-12A). A pulley wheel of radius 5 cm has its center fixed but is free to rotate. The wheel is initially at rest with a 3.2 m long cord wrapped around its periphery. If the pulley is given a constant angular acceleration of 2 rad/s^2, about how long should it take for the cord to unwind?
(a) 64 s (b) 20 s (c) 3.2 s (d) 8 s (e) None of these is close.

A test car moves at a constant speed of 30 m/s around a circular track of radius 60 m.

7-13A) The car's angular velocity is about:
(a) 0.5 rad/s (b) 3.1 rad/s (c) 1 rad/s (d) 6.2 rad/s (e) 0.25 rad/s

7-14A) The car's centripetal acceleration is about:
(a) 94 m/s^2 (b) 40 m/s^2 (c) 30 m/s^2 (d) 60 m/s^2 (e)15 m/s^2

7-15A) A 0.400 kg object on the end of a 0.500 m long string is rotating in a horizontal circular path on top of a frictionless table. If a constant angular speed of 8.00 rad/s is maintained, what should be the tension in the string?
(a) 8.8 N (b) 12.8 N (c) 16.8 N (d) 10.5 N (e) None of these is close

7-16A) A 0.400 kg object is swung in a circular path and in a vertical plane on the end of a 0.500 m long string. If a constant angular speed of 8.00 rad/s is maintained, what should the tension in the string be when the object is at the top of the circle?
(a) 8.8 N (b) 12.8 N (c) 16.8 N (d) 10.5 N (e) None of these is close.

7-17A). Superman circles the Earth at a radius of 2R, where R is the Earth's radius. He then moves to a circular orbit of radius 4R. The ratio of the gravitational force on him in this second orbit to that in the first orbit is:
(a) 2 (b) 4 (c) 8 (d) ½ (e) ¼.

7-18A) Let f be the magnitude of the gravitational force on the Earth due to the Moon and F be the magnitude of the gravitational force on the Moon due to the Earth. Which one of the following statements is CORRECT?
(a) F >> f (b) F << f (c) F = f (d) F > f (e) F < f

7-19A) Which one of the following statements is WRONG?
(a) The gravitational force is a vector.
(b) The gravitational potential energy is a scalar.
(c) For a satellite to move in a circular orbit around the earth, the gravitational acceleration at the satellite's location must equal the centripetal acceleration of the satellite.
(d) Kepler's three laws only apply to circular (as opposed to elliptical) orbits.
(e) The gravitational potential energy can be taken to be zero at infinity.

7-20A) Which one of the following statements is WRONG?
(a) If a spherical planet of a given density is made larger while holding its density constant, then the gravitational attraction for an object on the planet's new surface should be larger than that on its old surface.
(b) The weight of a body on the moon should be smaller than its weight on earth.
(c) If an astronaut working outside of a satellite that is in circular orbit around the earth drops a wrench, the wrench will continue to orbit with the satellite.
(d) The farther a planet is from the sun, the longer is its year.
(e) Because a bowling ball in space is weightless, an astronaut could kick it without stubbing her toe.

7-21A) A spherical Planet's radius is about 1/4th of the Earth's radius, and the Planet's mass is about 1/64th of the Earth's mass (i.e. the Planet's density is about the same as the Earth's density). About what is the acceleration due to gravity on the surface of this planet.
(a) 2.5 m/s (b) 40 m/s (c) 10 m/s (d) 5 m/s (e) 0.625 m/s

A "planet" of radius r = 10 km has a gravitational acceleration at its surface of $g = 1\ m/s^2$.

7-22A) About how large would the speed of an object on the planet's surface be if it is "in orbit"?
(a) 10 m/s (b) 100 m/s (c) 1000 m/s (c) 10,000 m/s (d) You don't have enough information to tell.

7-23A) About how long would that planet's day have to be?
(a) 1 min. (b) 2 min. (c) 10 min. (d) 100 min. (e) 1000 min.

7-1B) A record is rotating at 66 rev/min (rpm). What is its rotation frequency in rad/sec?
(a) 1.1 rad/sec (b) 414 rad/sec (c) 6.9 rad/sec (d) 0.18 rad/sec (e) None of these is close.

A pulley wheel is rotating at a constant angular speed of $\omega = 7.0$ rad/sec.

7-2B) About how many complete revolutions does it make in 5 seconds?
(a) 110 (b) 220 (c) 1.4 (d) 35 (e) 5.6

7-3B) What is the linear tangential speed of a point a distance 0.60 m from the center of the wheel?
(a) 21 m/s (b) 12 m/s (c) 42 m/s (d) 2.5 m/s (e) 4.2 m/s

A pulley wheel of radius 0.3m, initially moving with angular speed of 10 rad/sec, is decelerating at a rate of $\alpha = 2$ rad/s^2.

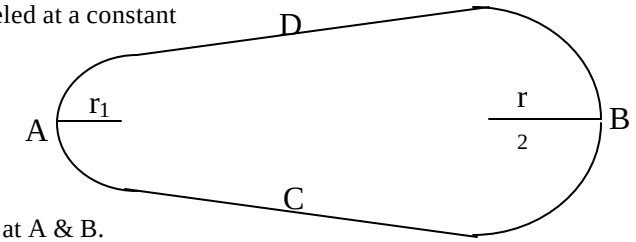
7-4B) What is its angular speed at the end of 3 seconds?
(a) 16 rad/s (b) 25 rad/s (c) 17 rad/s (d) 4 rad/s (e) 5 rad/s.

7-5B) Through how large an angle has it turned at the end of 3 seconds?
(a) 39 rad (b) 131 rad (c) 111 rad (d) 21 rad (e) None of these is close.

7-6B) What is the linear acceleration of a point on its outer rim at the end of 3 sec?
(a) 6.7 m/s^2 (b) 0.6 m/s^2 (c) 1.8 m/s^2 (d) 0.45 m/s^2 (e) None of these is close.

7-7B) What is the linear speed of a point on its outer rim at the end of 3 sec?
(a) 1.2 m/s (b) 13 m/s (c) 1.5 m/s (d) 4.8 m/s (e) 0.19 m/s

A race track is made of two semicircles of radius $r_1 = 20$ m at A and $r_2 = 60$ m at B joined together by two stretches of straight track, C and D. In a particular trial run, a driver traveled at a constant speed of 50 m/s for one complete lap. Answer three questions about this lap.



7-8B) The ratio of the centripetal acceleration on A to that on B is:
(1) 1/3 (b) 1/9 (c) 3 (d) 9 (e) None of these.

7-9B) The ratio of the tangential acceleration on A to that on B is:
(a) 1/3 (b) 1/9 (c) 3 (d) 9 (e) Undefined. The tangential acceleration is zero at A & B.

7-10B) The angular speed is greatest:
(a) on semicircle A. (b) on flat side C (c) on semicircle B (d) on flat side D (e) It is the same on all four.

7-11B) A particle moves with constant angular acceleration in a circular path. The instantaneous tangential and centripetal acceleration vectors are:
(a) both tangent to the circular path.
(b) both perpendicular to the circular path.
(c) perpendicular to each other.
(d) opposite to each other.
(e) none of the above.

7-12B). A pulley wheel of radius 2.5 cm has its center fixed but is free to rotate. The wheel is initially at rest with a 12.8 m long cord wrapped around its periphery. If the pulley is given a constant angular acceleration of 1 rad/s^2, about how long should it take for the cord to unwind?
(a) 0.8 s (b) 128 s (c) 32 s (d) 8 s (e) None of these is close.

A test car moves at a constant speed of 40 m/s around a circular track of radius 40 m.

7-13B) The car's angular velocity is about:
(a) 0.5 rad/s (b) 3.1 rad/s (c) 1 rad/s (d) 6.2 rad/s (e) 0.25 rad/s

7-14B) The car's centripetal acceleration is about:
(a) 94 m/s^2 (b) 40 m/s^2 (c) 30 m/s^2 (d) 60 m/s^2 (e)15 m/s^2

7-15B) A 0.400 kg object on the end of a 0.500 m long string is rotating in a horizontal circular path on top of a frictionless table. If a constant linear speed of 4.00 m/s is maintained, what should be the tension in the string?
(a) 8.8 N (b) 12.8 N (c) 16.8 N (d) 10.5 N (e) None of these is close

7-16B) A 0.400 kg object is swung in a circular path and in a vertical plane on the end of a 0.500 m long string. If a constant linear speed of 4.00 m/s is maintained, what should the tension in the string be when the object is at the top of the circle?
(a) 8.8 N (b) 12.8 N (c) 16.8 N (d) 10.5 N (e) None of these is close.

7-17B). Superman circles the Earth at a radius of 4R, where R is the Earth's radius. He then moves to a circular orbit of radius 2R. The ratio of the gravitational force on him in this second orbit to that in the first orbit is:
(a) 2 (b) 4 (c) 8 (d) ½ (e) ¼.

7-18B) The radius of the Moon is roughly ¼ that of the Earth, and the mass of the Moon is roughly 1/80 that of the Earth. About what is the ratio of the force of gravity an astronaut would feel on the Moon to that she would feel on the Earth?
(a) 1/5 (b) 1 (c) 5 (d) 1/3 (e) 3

7-19B) Which one of the following statements is WRONG?
(a) The gravitational force is a vector.
(b) The gravitational potential energy is a scalar.
(c) Kepler's three laws apply to elliptical orbits.
(d) For a satellite to move in a circular orbit around the earth, the gravitational acceleration at the satellite's location must be greater than the centripetal acceleration of the satellite.
(e) The gravitational potential energy can be taken to be zero at infinity.

7-20B) Which one of the following statements is WRONG?
(a) If a spherical planet of a given density is made larger while holding its density constant, then the gravitational attraction for an object on the planet's new surface should be larger than that on its old surface.
(b) The weight of a body on the moon should be smaller than its weight on earth.
(c) The farther a planet is from the sun, the longer is its year.
(d) If an astronaut working outside of a satellite that is in circular orbit around the earth drops a wrench, the wrench will slowly fall behind the satellite.
(e) Even though a bowling ball in space is 'weightless', an astronaut could not kick it without stubbing her toe.

7-21B) A spherical Planet's radius is about 1/4 of the Earth's radius, and the Planet's mass is about 1/4th of the Earth's mass (i.e. the Planet's density is about the same as the Earth's density). About what is the acceleration due to gravity on the surface of this planet.
(a) 2.5 m/s (b) 40 m/s (c) 10 m/s (d) 5 m/s (e) 0.625 m/s

A satellite is rotating in a circular orbit above the Earth's equator at a distance above the Earth's surface equal to the Earth's radius = 6.4×10^6 m. Take g = 10 m/s^2 at the Earth's surface.

7-22B) About what must be the satellite's speed?
(a) 4.0 km/s (b) 8.0 km/s (c) 11 km/s (d) 2.0 km/s (e) 5.7 km/s

7-23B) About what must be its period of rotation?
(a) 3.9 hr. (b) 2 hr. (c) 1 hr (d) 24 hr. (e) None of these is close.

7-1A) a 2A) c 3A) d 4A) d 5A) b 6A) b 7A) e 8A) c 9A) e 10A) a 11A) c 12A) d 13A) a 14A) e 15A) b 16A) a 17A) e 18A) c 19A) d 20A) e 21A) a 22A) b 23A) c

7-1B) c 2B) e 3B) e 4B) d 5B) d 6B) b 7B) a 8B) c 9B) e 10B) a 11B) c 12B) c 13B) c 14B) b 15B) b 16B) a 17B) b 18B) a 19B) d 20B) d 21B) b 22B) e 23B) a