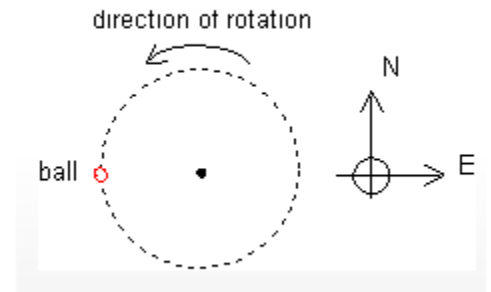


Section 3.1 and 3.2
Speed, Tangential Velocity, and Centripetal Acceleration

1. The cutting cord on a gas-powered weed cutter is 0.16 m in length. If the motor rotates at a rate of 20 revolutions per second, what is the approximate linear speed of the end of the cord?
- A) 20 m/s
 - B) 25 m/s
 - C) 35 m/s
 - D) 65 m/s

2. The ball in the picture is undergoing uniform circular motion. What is the direction of the velocity vector for the position shown?
- A) N
 - B) S
 - C) E
 - D) W



3. If the tangential speed remains constant what happens to the centripetal acceleration if a 90 cm string on a twirling ball is replaced with a 30 cm string?
- A) a_c triples
 - B) a_c becomes $1/3$ of what it was
 - C) a_c becomes $1/9$ of what it was
 - D) a_c becomes 9 what it was
4. What is the centripetal acceleration of a point on the perimeter of a bicycle wheel of diameter 70.0 cm when the bicycle is moving at 8.00 m/s?
- A) 91.0 m/s^2
 - B) 183 m/s^2
 - C) 206 m/s^2
 - D) 266 m/s^2
5. How many revolutions per minute (rpm) must a circular rotating space station ($r = 1000 \text{ m}$) rotate to produce an artificial gravity of 9.8 m/s^2 ?
- A) 0.95 rpm
 - B) 0.83 rpm
 - C) 0.075 rpm
 - D) 0.094 rpm
6. What is the effect on a ball undergoing centripetal acceleration if the speed of the ball doubles?
- A) a_c is 2 times larger
 - B) a_c is 2 times smaller
 - C) a_c is 4 times larger
 - D) a_c is 4 times smaller

1. Two Physics students are taking a break from studying and are relaxing on a merry-go-round which is spinning at a constant rate of 12 RPMs (revolutions per minute). Billy Ray is standing 0.50 m from the center of the merry-go-round while his girlfriend Bobby Sue is sitting on the edge of the merry-go-round which is 2.5 m from the center.



- A) What is the linear speed (in m/s) of each student?
B) What is the centripetal acceleration of each student?

2. The radar receiver on a boat has a diameter of 0.75 m and is rotating at a constant speed. If the receiver takes 8.2 s to make each complete revolution, what is the centripetal acceleration of a point on the edge of the receiver?



3. A centrifuge is a device used to spin objects to create a centripetal force. It is often used in astronaut training to allow astronauts to experience high g-forces to simulate rocket launches. If NASA uses a centrifuge with a 7.2 m radius, how fast would it need to spin in order for an astronaut seated at the edge of the centrifuge to experience a centripetal acceleration of 4.0 g's?



4. Explain how an object which is moving at a constant speed can still be accelerating. Give an example.
5. A computer floppy disc, with a 0.080 m diameter, spins at a constant speed of 1.40 m/s measured at its rim.
- A) What is the frequency and period of the floppy disc?
B) What is the centripetal acceleration at the edge of the disc?
C) What is the acceleration at a point halfway between the centre and the edge of the disc?
D) By what factor will the centripetal acceleration change if the speed of the disc is doubled and the radius of the disc's rotation is reduced by $\frac{1}{2}$?
6. Why does mud fly off a rapidly turning wheel on a quad?
7. A centrifuge spins at 7000 rpm's at a speed of 576 km/h and an acceleration of $1.14 \times 10^5 \text{ m/s}^2$.
- a) What is the distance covered by the centrifuge in one complete spin?
b) How long does it take to complete 10 spins?