

Circular Motion/Gravity and the Solar System

Test Review

Name _____

Inquiry Physics

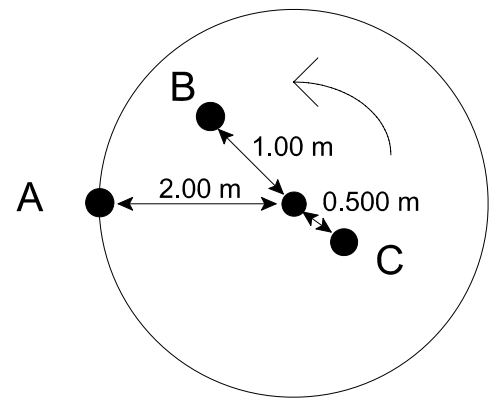
Use your notes and/or section 7.1 of your textbook to help you complete the following paragraph about circular motion.

- If an object is moving with uniform circular motion, the speed is _____. Velocity is _____ because the direction is _____. The direction of the velocity vector is _____ to the radius and _____ to the circular path. The vector that represents acceleration points toward the _____ of the circle. This _____ acceleration is _____ proportional to the square of the _____ and _____ proportional to the _____. According to Newton's Laws of Motion, this acceleration must be caused by a(n) _____ force which acts toward the center of the circle. Thus the _____ acceleration and the _____ force both point in the same direction. If the inward force disappears, the object in uniform circular motion will travel on a new path that is a(n) _____ line which is _____ to the circle.

The diagram below shows a carousel which is spinning at 0.500 revolutions per second. Various points are shown along with their distance from the center of the carousel.

- Calculate and record the linear and angular speeds at each point.

Point	Angular Speed (rev/s)	Linear speed (m/s) (SHOW YOUR WORK and note that the period is NOT 0.5 s here.)
A		
B		
C		



- One can see that as a person walks toward the center of the carousel, their _____ speed does not change, although their _____ speed becomes _____.
- Now, assume a person is standing at point A on the carousel. **Draw on the diagram both the acceleration vector and the linear velocity vector the person would experience.** Label the acceleration vector as \vec{a}_c and the velocity vector as \vec{v} .

Use your notes and/or section 8.1 of your textbook to help you complete the following paragraph about gravity and the solar system.

5. The ancient Greeks developed an earth-centered or _____ model of the solar system. In this model, the sun, moon, and other planets all orbited the earth in _____ paths because they were imbedded in crystal spheres. Later, the Greek mathematician and astronomer _____ formulated a refined version that would be used for over 1,400 years. Centuries later, _____ developed a workable model with the _____ at the center; this is called a _____ model. His model had the earth and other planets revolving about the sun in paths which were _____. Later, _____ made extensive observations on the motions of the planets. This data was used by his assistant _____ to develop three laws of planetary motion. One of those laws says that the paths of the planets are _____ with the _____ located at one focus. Another law shows that the planets' speeds are _____ as they orbit. They move _____ when closer to the sun and _____ when farther from it. The last law states that the square of a planet's _____ is directly proportional to the cube of its _____ . Later, _____ showed that the three laws of planetary motion are consequences of a single equation. His equation showed that _____ was the inward or _____ force responsible for the planets' curved motion. It also showed that the force on a planet was directly proportional to its mass as well as the mass of the _____ and that the force was inversely proportional to the square of the average _____ between the center of the planet and the center of the _____. Later, _____ explained gravity as a warp in space and time due to the presence of matter.

Write the letter corresponding to the best answer in the blank at the left of each question.

- _____ 6. Mr. M and Fluffy were riding on a merry-go-round as shown in the overhead view at right. When they were at the indicated position, what was the direction of the force pulling on them?

A) due north B) due west
C) due east D) northeast

- _____ 7. When Mr. M and Fluffy were at the indicated position, what was the direction of their acceleration?

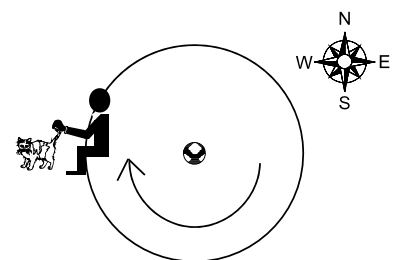
A) due north B) due west
C) due east D) northeast

- _____ 8. Mr. M let Fluffy go at the position shown in the diagram. In what direction did Fluffy fly off?

A) due north B) due west C) due east D) northeast

- _____ 9. After letting Fluffy go, Mr. M got up and started walking toward the center of the merry-go-round. How did his **angular** speed (revolutions per second) change?

A) it became larger
B) it remained the same
C) it became smaller



Show your work, including equations and units. Express answers with appropriate significant figures.

10. A car went around a curve at 20.0 m/s. If the radius of curvature was 175 m, how much did the car accelerate?
11. A person was riding the "Rotor", an amusement park ride where people are spun in a giant cylinder and then the floor is lowered while they remain suspended against the wall. A man with a mass of 75.0 kg was riding the Rotor and he was 3.00 m from the center of the cylinder. If a centripetal force of 875 N was applied by the ride, what was his linear speed?
12. a) A 475 kg satellite is placed in orbit 265 km above Mercury. If Mercury's mass is 3.30×10^{23} kg and its radius is 2.44×10^6 m, how much does the satellite weigh? ($G = 6.67 \times 10^{-11}$ Nm²/kg²)
- b) If the satellite's linear orbital speed is 2850 m/s, what is its period in minutes?