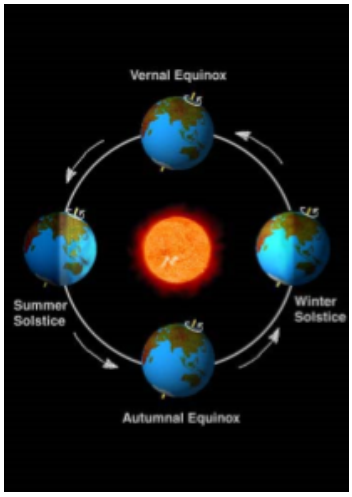
Chapter 9: Circular Motion

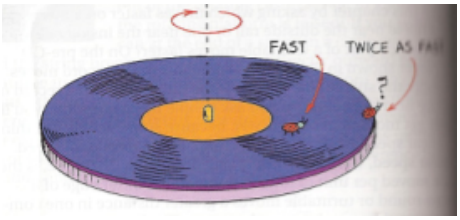
Rotation (spin) - axis within object
Revolution - axis is external to the object



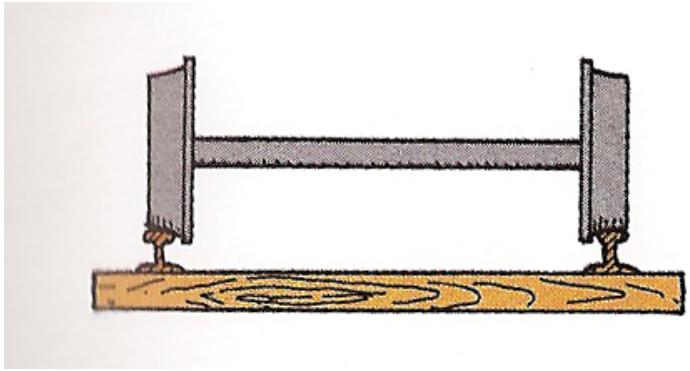
Earth's period of rotation - 24 hours
Earth's period of revolution - 365.25 days

Linear Speed = distance/time -> m/s
Angular speed = angle/time -> radians/s or rev/min

A point on the outside of a wheel has a larger linear speed than a point closer to the axis, but both points have the same rotational speed!



Railroad Wheels:



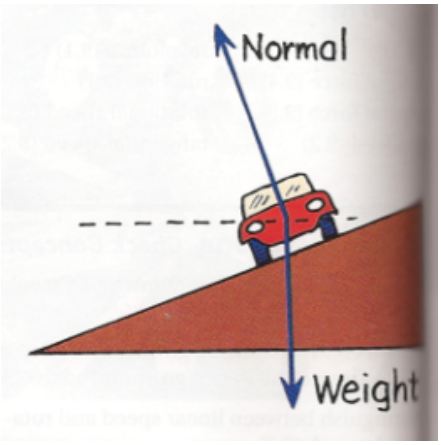
Centripetal Force - Toward the center of the circle

$$Fc = mv^2/r$$

Amusement Park Ride

Uses centripetal force and friction

Car on a banked turn



Ch 8

1. Which part of the Earth's surface has the greatest rotational speed about the earth's axis?

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2. Which part of the earth's surface has the greatest linear speed relative to the earth's axis?

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3. Trains ride on a pair of tracks. For straight-line motion, both tacks are the same length. But which track is longer for a curve, the one on the outside or the one on the inside of the curve?

4. A boy sits on a horse on a merry-go-round which is near the inner rail. He has a rotational speed of 4 RPM and a linear speed of 2 m/s. His sister is on the outside ring of horses which are 3 times as far from the axis of rotation. What is her rotational speed? What is her linear speed?

Ch 8

5. When a car makes a turn, do the seat belts provide centripetal force or centrifugal force?

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6. What is the tension in a 2 m length of string that whirls a 2 kilogram mass at 2 m/s in a horizontal circle?

7. Mars is about twice as far from the sun as is Venus. A Martian year, which is the time it takes Mars to make one orbit of the sun is about three times as long as a Venusian year. Which planet has a greater rotational speed in its orbit? Which planet has a greater linear speed?

8. A turntable turns 10 rev/sec at tht top of a mountain. Mounted on the turntable is a laser that emits a bright beam of light. As the turntable and laser rotate, the beam also rotates and sweeps across the sky. On a dark night the beam reaches some clouds 10 km away. How fast does the spot sweep across the clouds?

9. Suppose you tie a 2 kg. rock to the end of a 1 m long string and spin it in a vertical circle. What is the minimum speed it can tavel and just get around the top? (At the top the only force acting on the rock is gravity.)

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