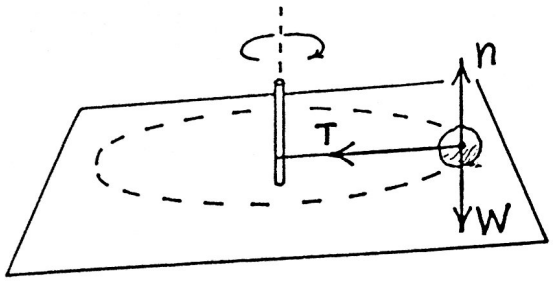
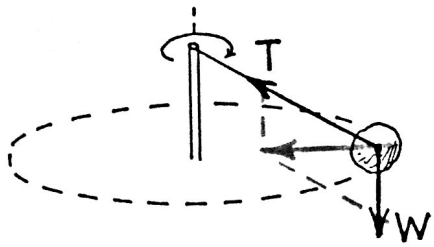
Centripetal Force



1. A rock tied to a post moves in a circle at constant speed on a frictionless horizontal surface. All the forces acting on the rock are shown: Tension T, support force **n** by the table, and the force due to gravity W.

a. The vector responsible for circular motion is T.

b. The net force on the rock is T.



2. In this case the rock is tied to a string and swings in a circular path as shown. It is not resting on a surface. No friction. Use the parallelogram rule and find the resultant of vectors T and W.

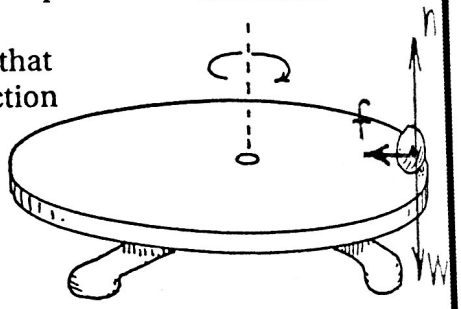
a. What is the direction of the resultant of T and W? Toward center of circle

b. Does this resultant lie in the plane of the circular path? Yes

c. Is this resultant also the horizontal component of T? Yes

d. Is the resultant T + W (or the horizontal component of T) a centripetal force? Yes

3. In the case shown at the right, the rock rides on a horizontal disk that rotates at constant speed about its vertical axis (dotted line). Friction prevents the rock from sliding.

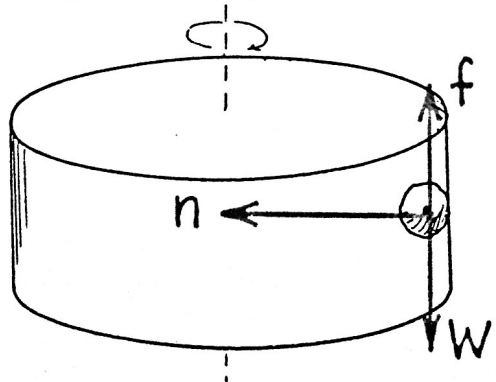


a. Draw and label vectors for all forces that act on the rock.

b. Which force is centripetal? f

c. Which force provides the net force? f

d. Why do we *not* say the net force is zero? Because centripetal acceleration is not zero

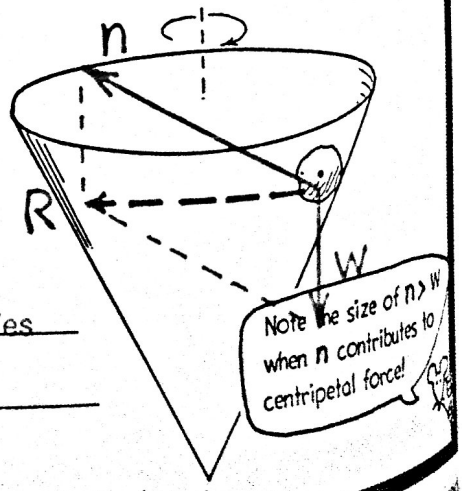


4. Now the rock is held in place by friction against the inside wall of the rotating drum. Draw and label vectors for all forces that act on the rock.

a. Which force is centripetal? n

b. Which force provides the net force? n

5. More challenging: This time the rock rests against the frictionless inside wall of a cone. It moves with the cone, which rotates about its vertical axis (dotted line). The rock does not slide up or down in the cone as it rotates. Draw and label vectors for all forces that act on the rock.



Should the resultant force lie in the plane of the circular path? Yes

Why? Provides centripetal force for circular motion