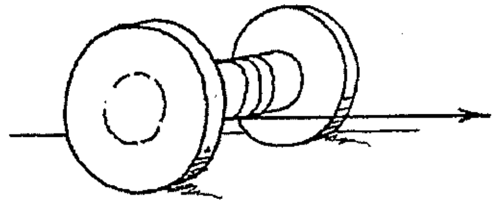
Name ______________________________ Date __________

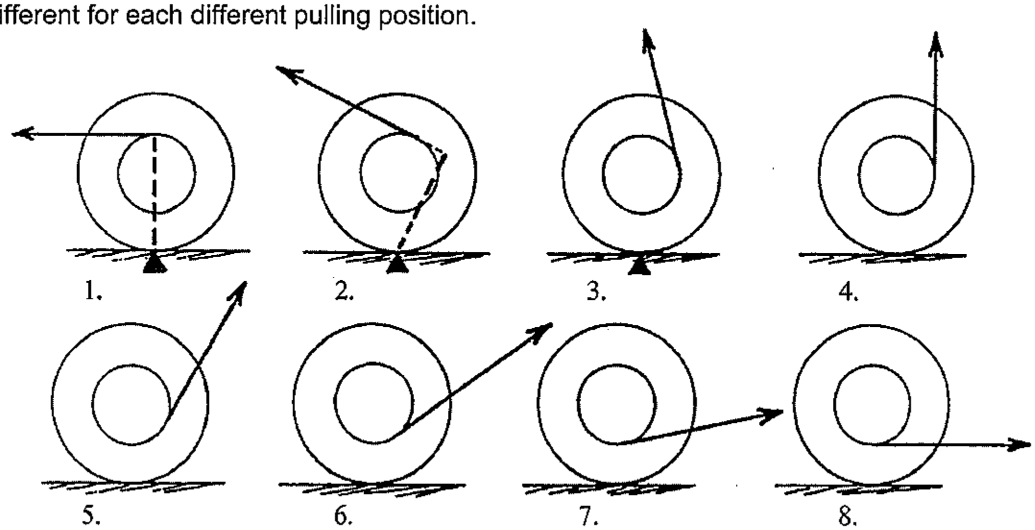
CONCEPTUAL Physics PRACTICE PAGE

Chapter 8 Rotational Motion
Torques and Rotation



1. Pull the string gently and the spool rolls. The direction of roll depends on the way the torque is applied.

   In *1* and *2* below, the force and lever arm are shown for the torque about the point where surface contact is made (shown by the triangular "fulcrum"). The lever arm is the heavy dashed line, which is different for each different pulling position.



   a. Construct the lever arm for the other positions.

   b. Lever arm is longer when the string of the spool spindle is on the [top] [bottom].

   c. For a given pull, the torque is greater when the string is on the [top] [bottom].

   d. For the same pull, rotational acceleration is greater when the string is on the

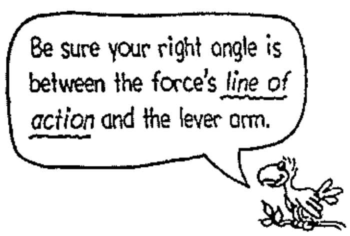
   [top] [bottom] [makes no difference].

   e. At which position(s) does the spool roll to the left? __________

   f. At which position(s) does the spool roll to the right? __________

   g. At which position(s) does the spool not roll at all? __________

   h. Why does the spool slide rather than roll at this position?



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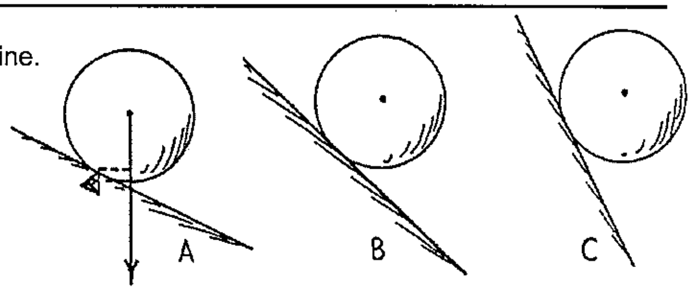
2. We all know that a ball rolls down an incline. But only a few people know that the reason a ball picks up rotational speed is because of a torque. In sketch A, we see a torque acting on a ball. Note the force due to gravity and the lever arm to the point where surface contact is made.



   a. Construct the lever arms for positions B and C.

   b. As the incline becomes steeper, the torque [increases] [decreases] [remains the same].

Hewitt Drew it!

Chapter 8 Rotational Motion
Acceleration and Circular Motion

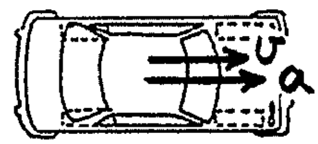
Newton's Second Law, $a = F/m$, tells us that net force and its corresponding acceleration are always in the same direction. (Both force and acceleration are vector quantities.) But force and acceleration are not always in the direction of velocity (another vector).

1. You're in a car at a traffic light. The light turns green and the driver steps on the gas. The sketch shows the top view of the car. Note the direction of the velocity and acceleration vectors.

   a. Your body tends to lurch [forward] [not at all] [backward].

   b. The car accelerates [forward] [not at all] [backward].

   c. The force on the car acts [forward] [not at all] [backward].

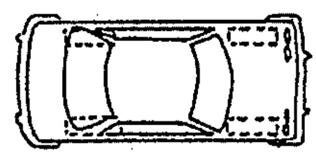


2. You're driving along and approach a stop sign. The driver steps on the brakes. The sketch shows the top view of the car. Draw vectors for velocity and acceleration.

   a. Your body tends to lurch [forward] [not at all] [backward].

   b. The car accelerates [forward] [not at all] [backward].

   c. The force on the car acts [forward] [not at all] [backward].

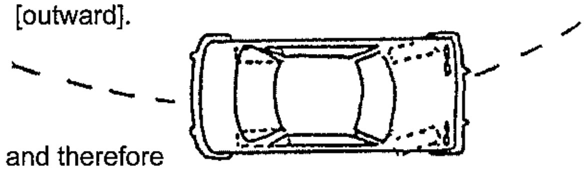


3. You continue driving and round a sharp curve to the left at constant speed. Draw vectors for velocity and acceleration of the car.

   a. Your body tends to lean [inward] [not at all] [outward].

   b. The direction of the car's acceleration is [inward] [not at all] [outward].

   c. The force on the car acts [inward] [not at all] [outward].

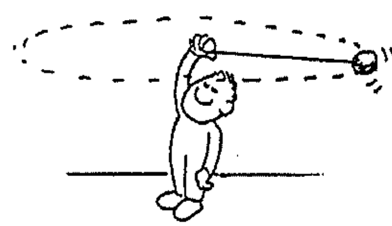


4. In general, the directions of lurch and acceleration, and therefore the directions of lurch and force, are [the same] [not relate] [opposite].

5. The whirling stone's direction of motion keeps changing.

   a. If it moves faster, its direction changes [faster] [slower].

   b. This indicates that as speed increases, acceleration [increases] [decreases] [stays the same].



6. Like Question 5, consider whirling the stone on a shorter string—that is, of smaller radius.

   a. For a given speed, the rate that the stone changes direction is [less] [more] [the same].

   b. This indicates that as the radius decreases, acceleration [increases] [decreases] [stays the same].

thanx to Jim Harper

Hewitt Drew it!