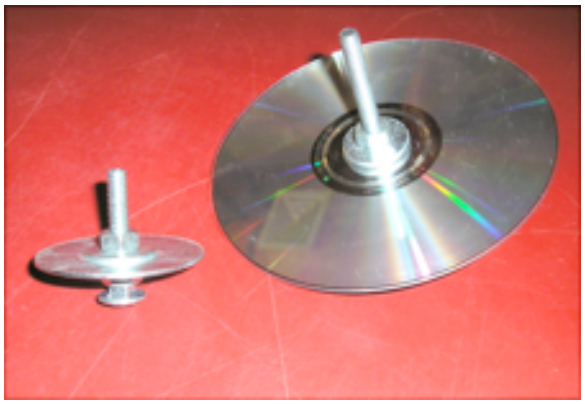
Spinning Tops (Variation 1)

Make a toy with nuts and bolts and experiment with spinning motion.

Please note: This activity is included in the family take-home brochures.

Related exhibits: none
Related toys: Tops
Ages: 5 and up
Time: 5-15 minutes
Staff: Floor staff or volunteer
Safety Issues: Small parts



Materials:
- Bolts (of various lengths between 1 1/2 inches to 4 inches)
- Nuts
- Washers (of various sizes and weights)
- Junk CDs
- Box board

Procedure:
1. Select a bolt and screw on a nut so it is near the head of the bolt.
2. Add at least one washer. Add additional washers or CDs to make your top.
3. Each top should be tightened off with a bolt after the final washer.
4. Give it a spin.

Questions to Ask:
Can you design a top that spins both right side up and upside down?
Does the length of the bolt affect how the top spins?
How does the weight of the top affect how it spins? Try one CD versus two or three CDs. What do you notice?
Is your top balanced or does it wobble? Is the bolt centered?
How does the distribution of weight affect the way the top spins? Add weight to the center or the outside rim of a top (tape on pennies). What do you notice?

Science Content:
Tops are not included in the *Toys* exhibition, but they are a great universal toy and wonderful for experimenting with rotational motion. They are one of the oldest recognizable toys that have been found in archeological digs.

Tops rely on the concept that mass rotates around an axis by means of its angular momentum. Angular momentum is defined by the velocity of an object, its mass and how that mass is distributed in an item spinning on its axis. Angular momentum is conserved and maintained if no force acts on it. In a spinning top, the main force acting on it is the friction between its point and the surface, which will gradually slow the top down. The

faster an item spins and the heavier it is, the greater the force needed to slow it down. Therefore a heavy top should spin longer than a lighter top if they had both started spinning at the same rate. A spinning ice skater is a good example of what happens when weight is redistributed: as the skater pulls her arms in, she spins faster.

Other Resources:

Tops: Building and Experimenting with Spinning Toys, by Bernie Zubrowski. A Boston Children's Museum Activity Book. Morrow Junior Books, New York, 1989. This book also includes a section on yo-yos.

Spinning Tops (Variation 2)

A more involved top-building session with a different assortment of materials.

Related exhibits: none
Related toys: Tops
Ages: 10 and up
Time: 30 minutes
Staff: Museum educator
Safety Issues: none

Materials:
- Sample tops (normal looking and of unusual shape if available)
- 1/4 inch dowels with slightly rounded ends, 4 to 6 inches in length
- Box board
- Paper plates
- Clay
- Tape
- Scissors
- Pennies (or other items for weight)

Procedure:
1. Begin by discussing what tops are. What parts of the top affect how it spins?
2. Observe pre-made tops and how they spin. Include tops that both support and contradict some of the group's assumptions (i.e., a top must be round).
3. Discuss how tops must be balanced. What happens when the washing machine or car tire is out of balance? Tops must be balanced to spin properly. Demonstrate how to find the balance point of a shape.
4. Introduce the materials available.
5. Let participants design and build tops. By using the dowels and cardboard, problem-solving is required in getting a well balanced and stable top.
6. Once a few people have made a successful top, have participants regroup and share successes, failures, and challenges encountered. Have participants theorize as to their own and others' challenges.
7. Give those who still haven't gotten a working top on opportunity to continue testing after the discussion.
8. For those who have created a working top, encourage them to experiment with variations such as weight or placement of weight, to see how that alters its spin.