TORQUE INVENTION SEQUENCE

Includes: ring toss balance **(***condition for balanced torques)*

Teacher Notes: Torque is both central to rotational dynamics and one of the most challenging physical quantities students encounter in the course. This activitiy is a pre-instruction activity for torque, but is not intended to lead them to torque, in fact the balancing condition requires summing the products of the mass by the radial position. But the processes of creating a product of a spatial and inertial quantity, and then summing them up to create a new net quantity that must be the same on both sides is a lot of mathematical decision-making that will prime them for thinking about the net torque about a point.

Levels: This sequence is appropriate for all levels.

Balancing Rule

1. There is a balance at your table, and you can add masses to the hangers at different positions. Experiment with attaching different masses at different locations. Can you invent a rule such that adding different masses to each side results in balance?

2. A new game of skill is sweeping the nation! The rules for Seesaw Ring Toss are simple: a team of two players throws rings at the target shown in the figure below. Once all the rings have been thrown, the end supports are removed and seesaw is allowed to pivot. If the seesaw does not stay horizontal, the team fails is awarded zero points for that round. Below are pictures of targets after the rings have been thrown but before the supports have been removed; can you predict which teams will be get points and which will receive scores of zero before the supports are even removed?
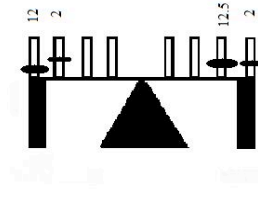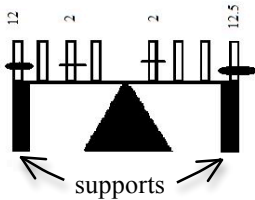
Invent a way to decide whether a given target will pass or fail just by looking at it. Circle the targets that you think will pass.
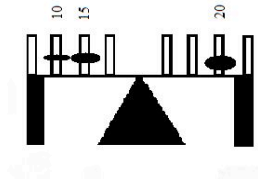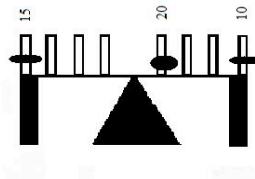same for each trial at a certain intensity level. The index characterizes the intensity level.
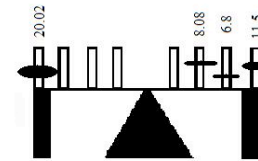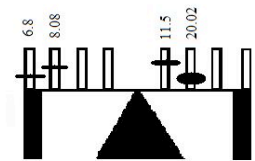
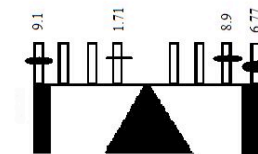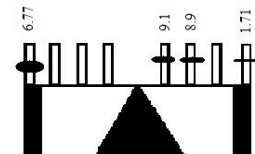ROUND 1   ROUND 2

Team A

Team B

Team C

Team D

Follow up questions

1. How is the index you created here different from a ratio quantity?

2. How can you tell whether a seesaw ring toss team will be disqualified before the supports are removed?

3. Of the targets which receive scores of zero, which is *closest* to being balanced? How do you know? Which is *farthest* from being balanced?

4. What would happen if team A moved their rightmost ring in one peg in round 1?

5. What would happen if team B moved their leftmost ring out one peg in round 2?

1.