

# Torque

(Using PhET Simulation “Balancing Act”)

Name: \_\_\_\_\_

## Setup

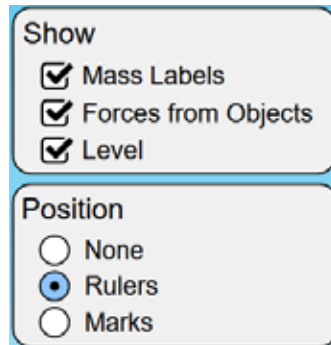
Open the simulation: [https://phet.colorado.edu/sims/html/balancing-act/latest/balancing-act\\_en.html](https://phet.colorado.edu/sims/html/balancing-act/latest/balancing-act_en.html)

## Part A – Balancing Torques

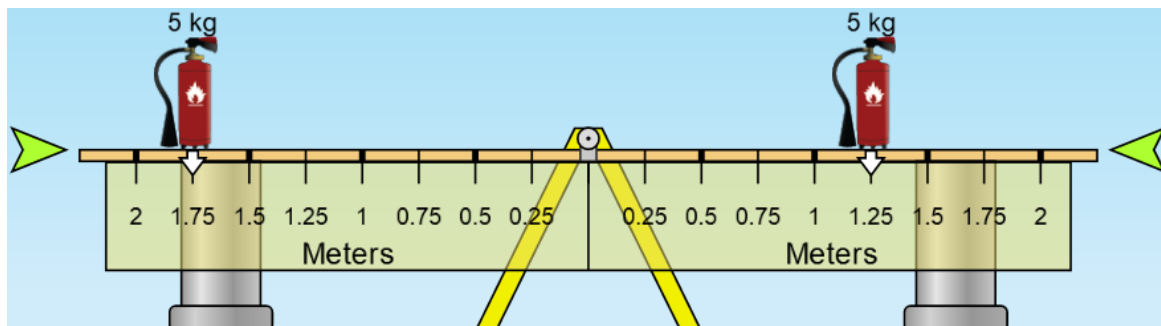
1. Select Intro.



2. Select options as shown.



3. Place the fire extinguishers as shown.



4. The seesaw will be balanced if the clockwise torque is equal to the counterclockwise torque. This is referred to as rotational equilibrium. Calculate the torques and the difference between them.

Clockwise torque	
Counterclockwise torque	
Difference	

5. Which direction will the seesaw rotate? \_\_\_\_\_
6. Which side has more torque? \_\_\_\_\_
7. The 10 kg garbage can will be added to the seesaw to balance the torques. It has to have a torque equal to the difference between the torques due to the fire extinguishers, but in the opposite direction.

Calculate where the 10 kg garbage can must be placed so that the seesaw experiences rotational equilibrium. Show your work.

8. Place the garbage can at the position you calculated.
9. Check to see if you are correct by moving the switch at the bottom to the right as shown.



## Part B – Calculating Torque

1. Select Balance Lab



2. Select options as shown

Show

Mass Labels

Forces from Objects

Level

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Position

None

Rulers

Marks

3. Complete the following table such that the seesaw is in a state of rotational equilibrium.  
Note: CW = clockwise and CCW = counterclockwise.

Left Side		Torque		Right Side	
Mass (kg)	Distance from Pivot (m)	CCW (Nm)	CW (Nm)	Mass (kg)	Distance from Pivot (m)
5				20	0.25
20	2				0.5
30	0.5			10	
	.25			15	1

4. Use the bricks and people in the simulation to determine the mass of each of the 8 mystery objects.

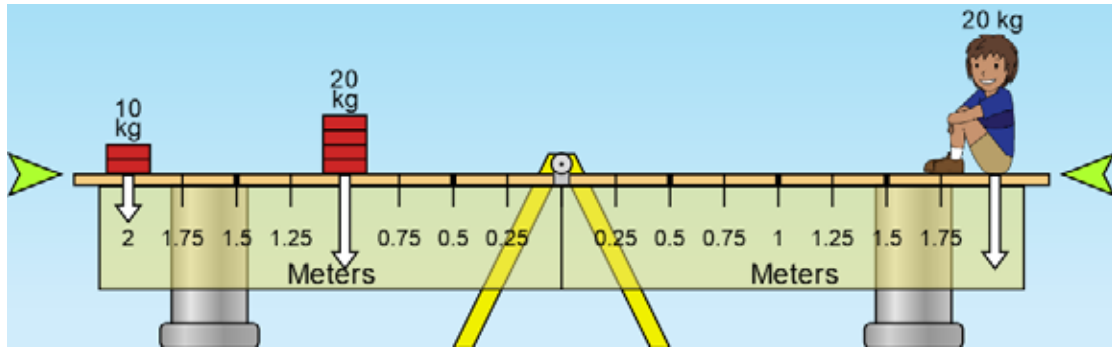


Mystery Object	Mass (kg)
A	
B	
C	
D	
E	
F	
G	
H	

### Part C – Net Torque from Multiple Forces

When more than one force act on an object causing it to rotate, the net torque is the sum of the individual torques.

1. Set objects on the seesaw as shown.



2. Calculate the torques due to the masses and enter them in the following table.

Counterclockwise			Clockwise		
Mass (kg)	Distance (m)	Torque (Nm)	Torque (Nm)	Mass (kg)	Distance (m)
10	2			20	2
20	1				
Net torque				Net torque	

3. Notice that the system is in rotational equilibrium. Confirm this by moving the switch to the right and seeing that the seesaw is balanced.



4. Fill in the missing pieces in the following table so that each row is in rotational equilibrium.

Left Side				Right Side			
Mass (kg)	Distance (m)	Mass (kg)	Distance (m)	Mass (kg)	Distance (m)	Mass (kg)	Distance (m)
10	1.5	60	0.25	20		20	1
80	0.25	10	1	30	0.5		1
5	2	20		60	0.25	10	0.5
10		20	1	80	0.25	20	1

5. Check these values with the simulation.

## Part C - Practice

1. Select Game.



2. Play each of the games and record your scores below.

	Score
Level 1	
Level 2	
Level 3	
Level 4	