# Moments

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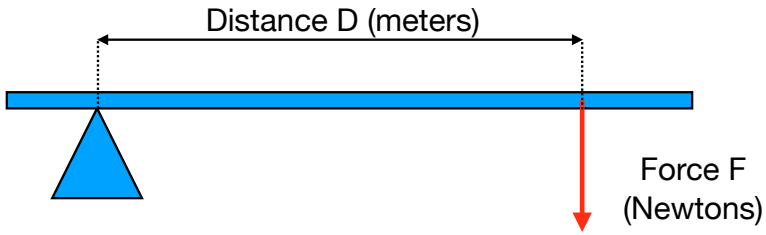
## Moments

- The turning effect of a force is called a moment.
- We do this by applying a force at a distance from a pivot.
- Moments can be clockwise (CW) or anticlockwise (ACW) depending on the rotation they would cause.

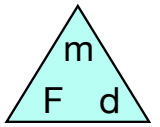
## Moments



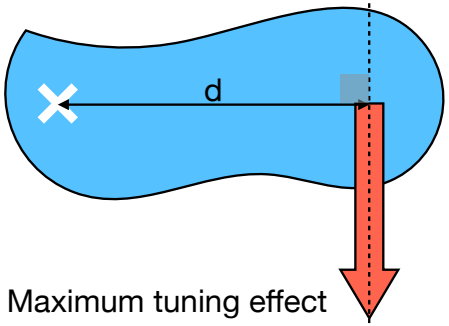

F causes a clockwise moment about the pivot

moment = force x perpendicular distance from the pivot

Units are N x m = Newton meters

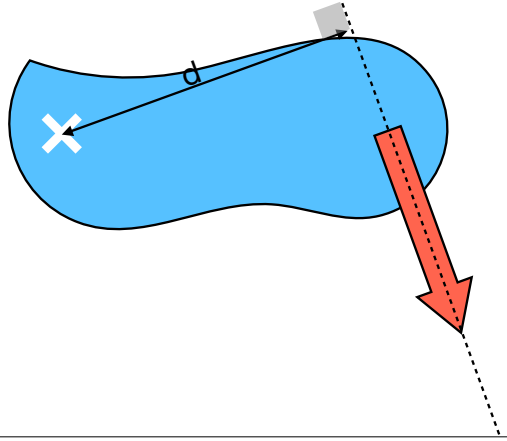


# Perpendicular distance?

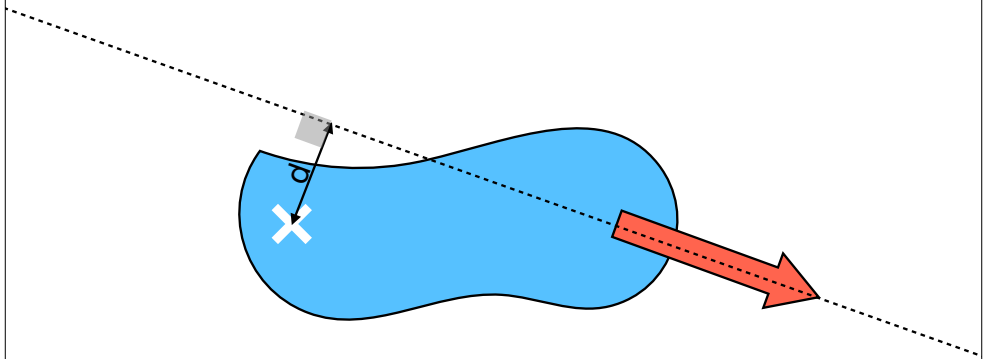



Maximum tuning effect

# Perpendicular distance?

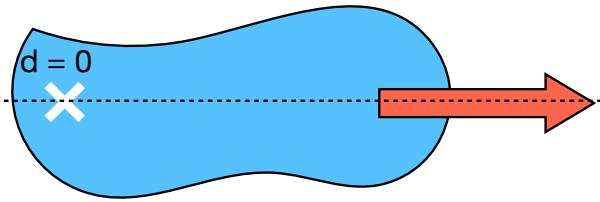



# Perpendicular distance?




The turning effect is greatly reduced

# Perpendicular distance?




Here the perpendicular distance is 0 and
there is no turning effect.
Moment = 0.

# Equilibrium

If a bunch of moments act on the same object they can cancel out so the object doesn't spin faster or slower.

For example if the cap of a bottle is difficult to unscrew the moment you're applying to it with your hands is balanced by the moment caused by friction between the cap and the bottle.

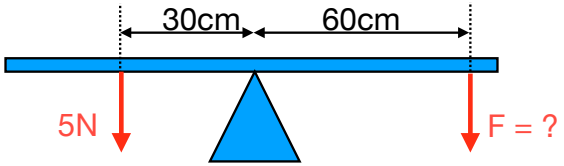
When this happens we say the object is in equilibrium

# The Principle of Moments

For an object in equilibrium the sum of the clockwise and anticlockwise moments about any point are equal.

The underlined part is important but we'll get to it later

# See Saws

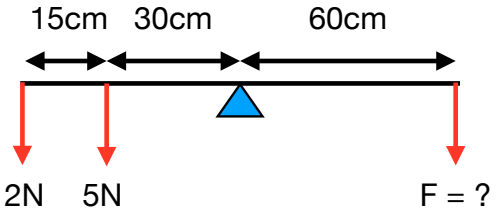



For an object in equilibrium the sum of the clockwise and anticlockwise moments about any point are equal.

| CW | ACW |
|---|---|
| F x 60 | 5 x 30 |

So 60F = 150
F = 2.5N

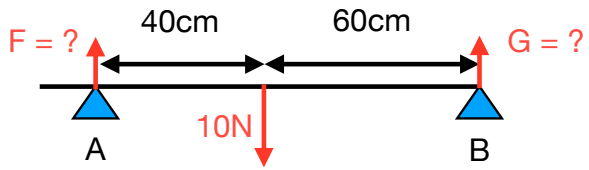
# Harder See Saw




| | CW | ACW |
|---|---|---|
| | F x 60 | 5 x 30 =150 |
| | | 2 x 45 = 90 |
| Total | 60F | 240 |

Since the see saw is in equilibrium we have:
60F = 240
F = 4N

# Double Pivots

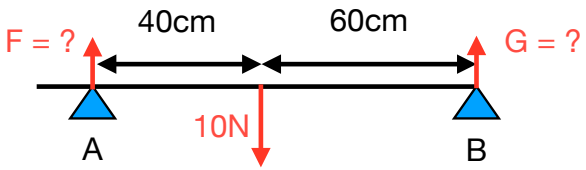



Remember the *about any point* part?

For an object in equilibrium the sum of the clockwise and anticlockwise moments about any point are equal.

"taking moments about A" means we measure distances from A.
In this question we're going to take moments about A and B.

# Double Pivots




taking moments about A

| CW | ACW |
|---|---|
| 10 x 40 | G x 100 |

taking moments about B

| CW | ACW |
|---|---|
| F x 100 | 10 x 60 |

100G = 400
G = 4N

These upward forces balance the 10N down force

100F = 600
F = 6N