The National Orthodox School Shmaisani

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Subject: Science/ Physics

Name: **Title: Moments**

Date: **Grade-Section: 8 …… CS**

Turning Effect:

The turning effect of a force is called the **moment** of the force.

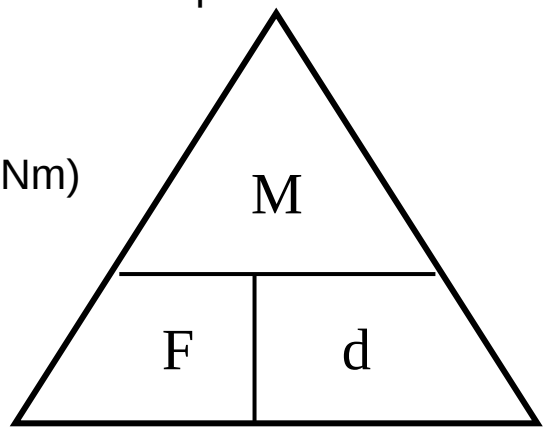
The moment of the force depends on two things:

- The size of the force
- The distance between the line of the force and the turning point is called the **pivot** or **fulcrum**.

We calculate the moment of force using the following formula:

Moment of a force = force x distance from pivot

Moment = F d



Moment is measured in newton meters (Nm)

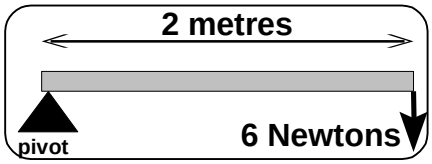
F= force in newtons (N)

d= distance in meters (m)

Core: (Solve the following 8 questions)

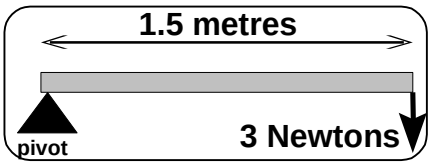
Test your understanding:

1. What is the moment of this force?



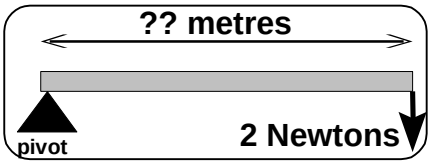
$$M = F \times d = 6 \times 2 = 12\ Nm$$

2. What is the moment of this force?



$$M = F \times d = 3 \times 1.5 = 4.5\ Nm$$

3. What is the <u>length of this lever</u> if the **moment** is **8 Nm**?



$$d = \frac{M}{F} = \frac{8}{2} = 4m$$

4. Calculate the moment if a force of 5.0 N is applied to a crowbar 15 cm long.

$$d = 15cm = 0.15m$$

$$M = F \times d = 5 \times 0.15 = 0.75\ Nm$$

5. A force of 20 N is applied to a door causing a moment of 5 Nm. Calculate the distance in cm from the hinge axle to the point on the door where the force was applied.

$$d = \frac{M}{F} = \frac{5}{20} = 0.25\ m$$

$$d = 0.25 \times 100 = 25\ cm$$

6. What force must be applied to a 30 cm long spanner to generate a moment of 6.0 Nm?

$$d = 30\ cm = 0.3\ m$$

$$F = \frac{M}{d} = \frac{6}{0.3} = 20N$$

7. What distance should a force of 18N be applied to generate a moment of 142 Nm?

$$d = \frac{M}{F} = \frac{142}{18} = 7.89\ m$$

8. What force must be applied to a 0.8m long rod to generate a moment of 250Ncm?

$$M = 250\ Ncm = 2.5\ Nm$$

$$F = \frac{M}{d} = \frac{2.5}{0.8} = 3.125\ N = 3.13N$$

The principle of moments:

The principle states that when a body is in equilibrium (balanced) the sum of the clockwise moments about any point (such as the fulcrum or pivot) equals the sum of the anti-clockwise moments about that point.

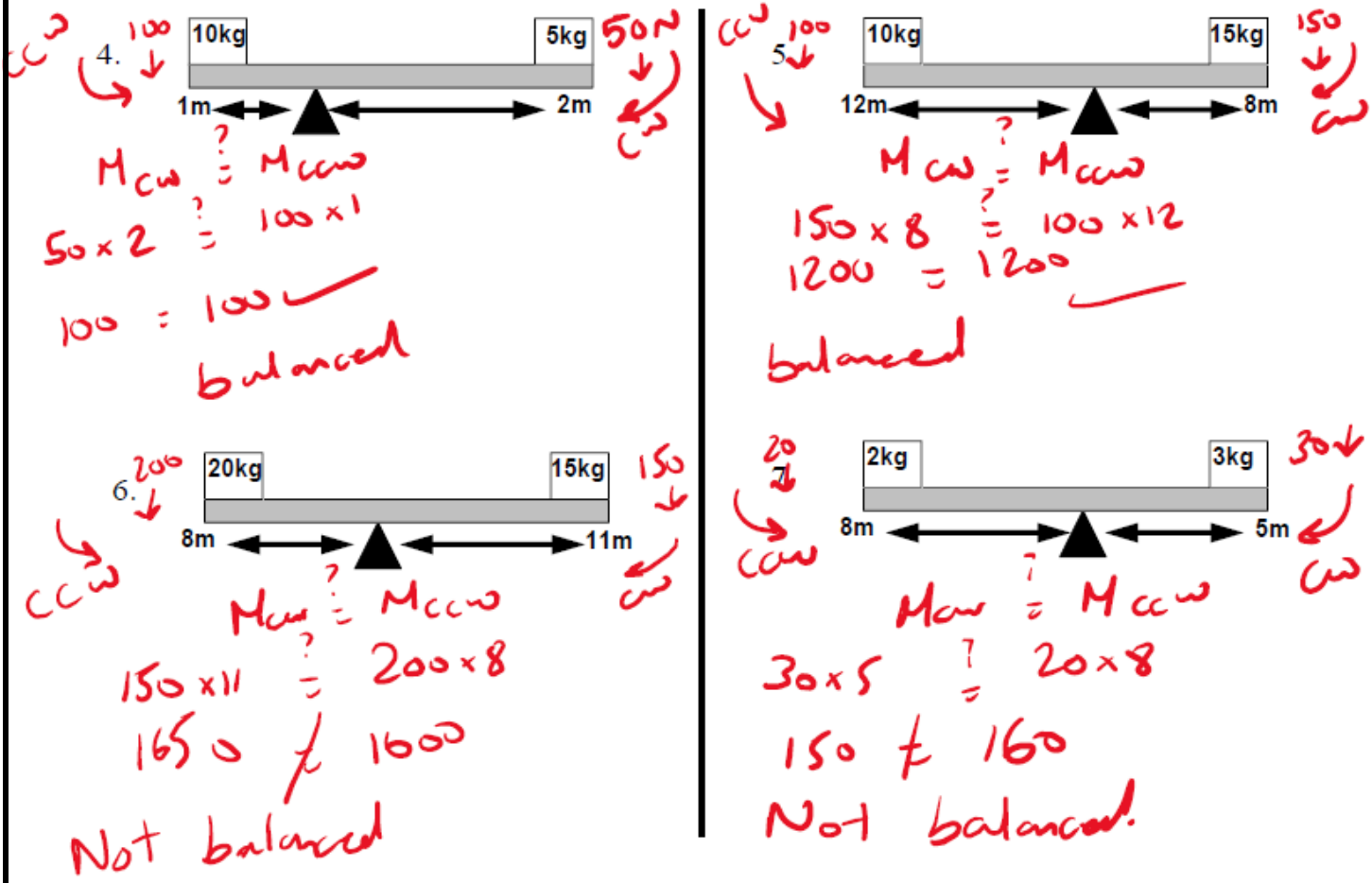
In other words:

Sum of clockwise moments = Sum of anti-clockwise moments

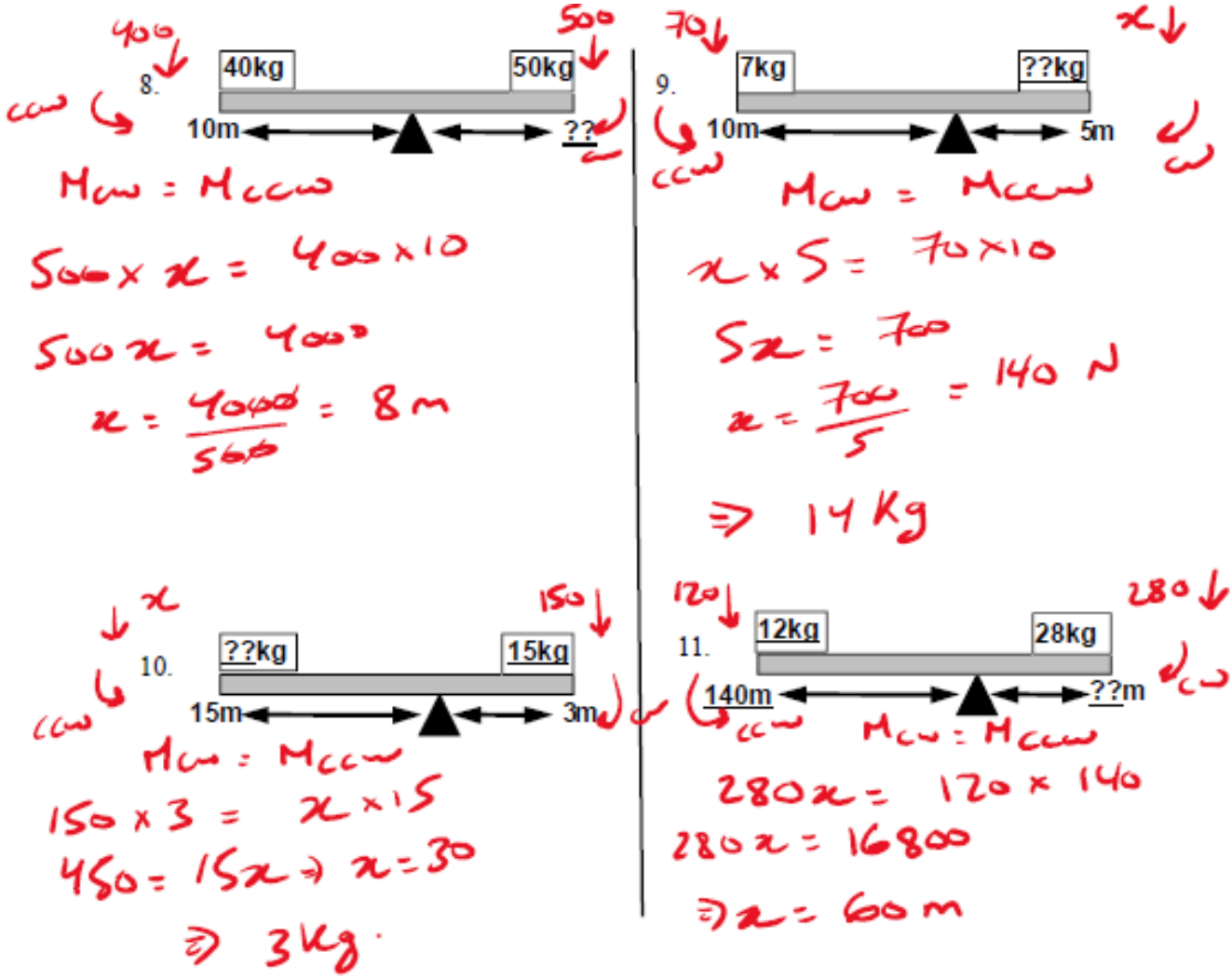
Intermediate: (Solve 9 from the following 11 questions)

Test your understanding:

9. Which of the following see-saws are balanced?



10. All of these see-saws are balanced. Work out the missing number for each one.



Advanced: (Try solving the following question)

11. A uniform plank is pivoted at its mid-point. Two weights are added to the plank as shown. A vertical force is applied at point X to balance the plank. What is the size of this force? Show your work and units