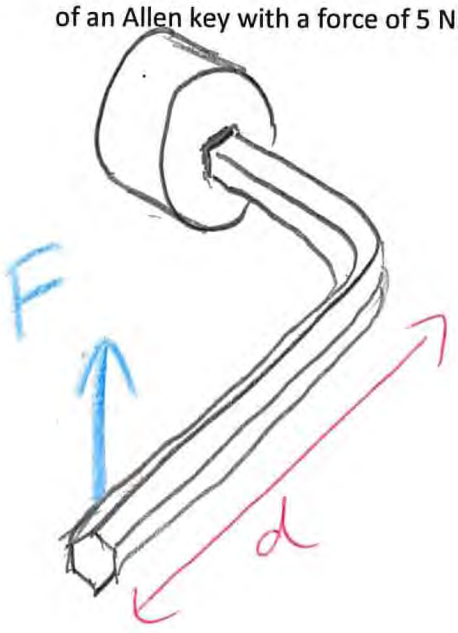
More Moments Questions

Name .....

1. An Allen bolt needs to be tightened to a torque of 60 Ncm. A technician tightens the bolt by pushing on the end of an Allen key with a force of 5 N. How long was the Allen key?

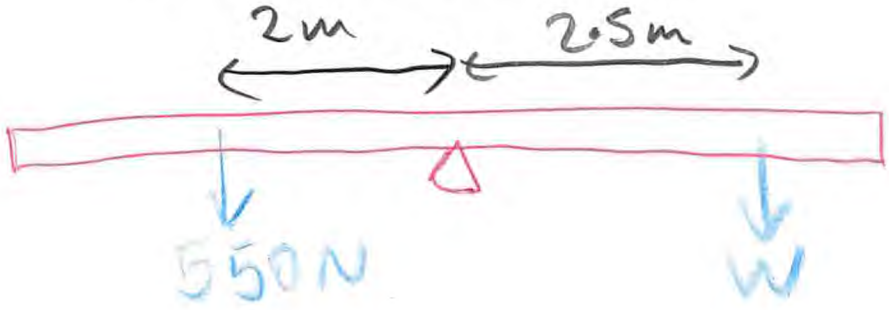


$M = F \times d$

$d = \frac{M}{F} = \frac{60\ Ncm}{5\ N}$

$= 12\ cm$

2. Two children balance a see-saw. The child on the left weighs 550 N and sits 2 m from the pivot. The child on the right sits 2.5 m from the pivot. How much does the second child weigh?



ACW: $550N \times 2m$

$= 1100Nm$

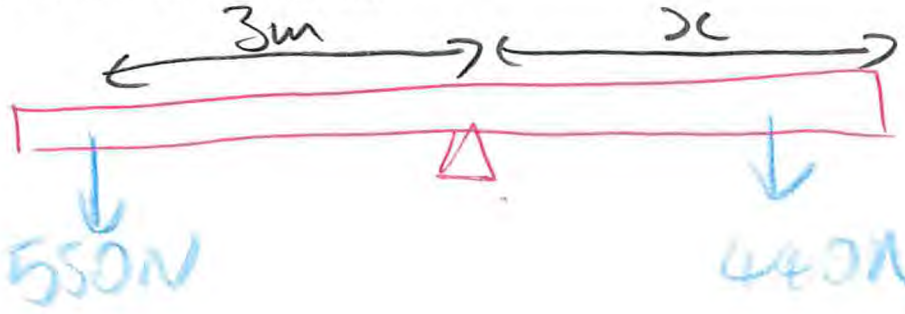
CW: $2.5m \times W$

Balanced so ACW = CW

$1100\ Nm = 2.5m \times W$

$W = \frac{1100\ Nm}{2.5m} = 440N$

3. In Q2, the child on the left moves so that she is 3m from the pivot. How far must the child on the right be from the pivot so that the see-saw still balances?

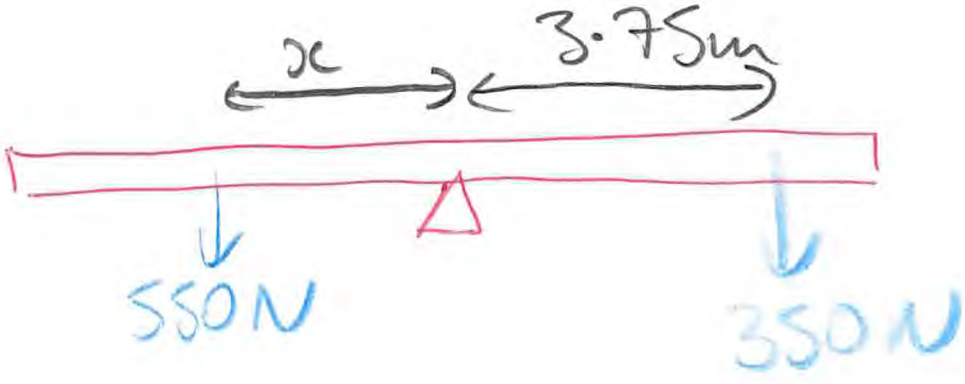


$550\,N \times 3m = 440\,N \times x$

$1650\,Nm = 440\,N \times x$

$x = \frac{1650\,Nm}{440\,N} = 3.75m$

4. In Q3, the child on the right gets off and another child weighing 350N gets on in the same place. Where must the child on the left move to so that the see-saw still balances?

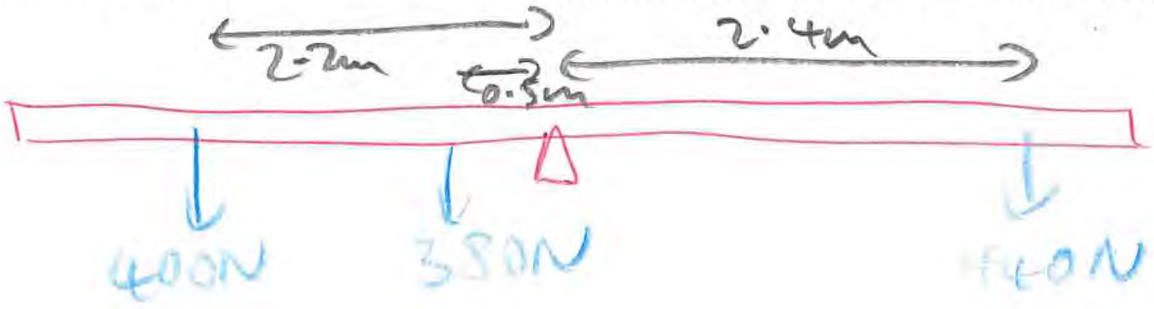


$550N \times x = 350N \times 3.75m$

$x = \frac{350N \times 3.75m}{550N}$

$= 2.39m$

5. A girl weighing 400 N sits on the left of a see-saw 2.2 m from the pivot.
   A boy weighing 380 N sits on the left 0.5 m from the pivot.
   A boy weighing 440 N sits on the right 2.4 m from the pivot.
   Calculate the total CW moment and the total ACW moment, and say what will happen to the see-saw.

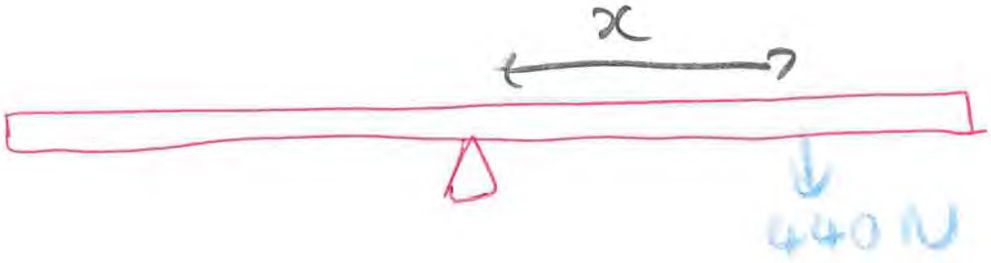


CW: $440N \times 2{\cdot}4m = 1056\ Nm$

ACW: $400N \times 2{\cdot}2m + 380N \times 0{\cdot}5m$
$= 1070\ Nm$

∴ see-saw turns anticlockwise.

6. In Q5, where must the boy on the right move to so that the see-saw is balanced?



ACW moment is the same - 1070Nm

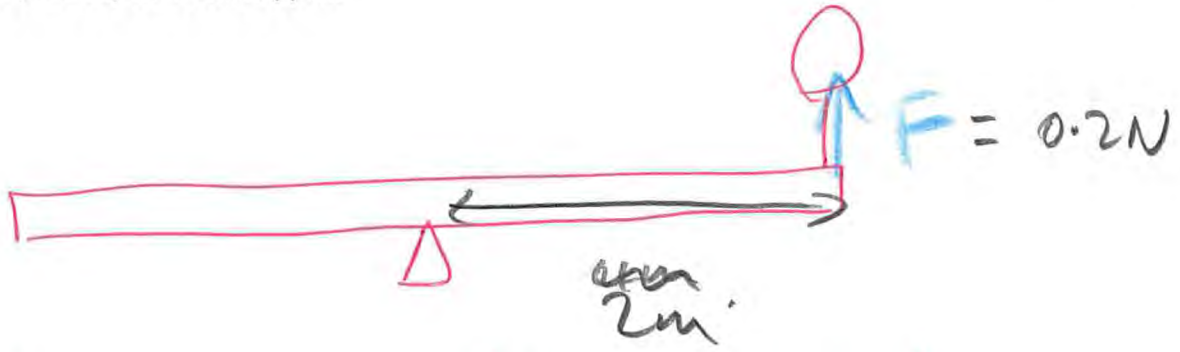
CW: $440N \times x$

$\therefore 440N \times x = 1070\ Nm$

$x = \frac{1070\ Nm}{440N}$

$= 2{\cdot}43\ m$

7. A see-saw that is 4m long is perfectly balanced on a pivot in the middle. A helium balloon is then attached to the right hand side of the see-saw, and pulls upwards with a force of 0.2 N. Draw a diagram showing the force from the balloon, and say what will happen:



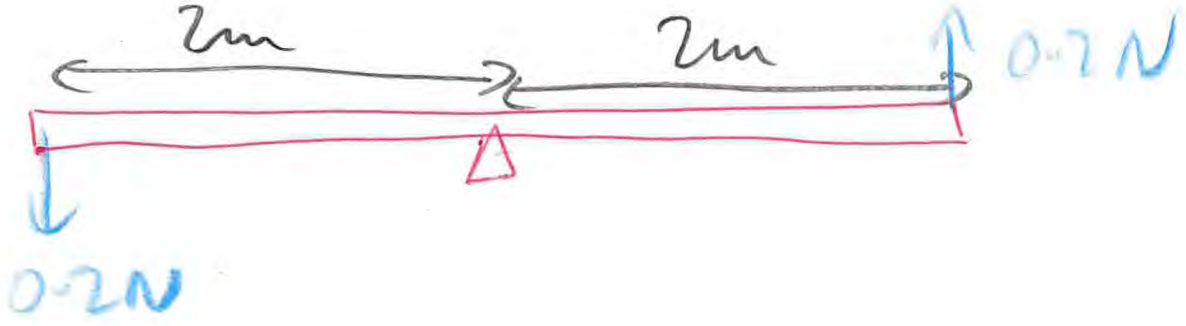
Balloon causes ACW moment,

so the see-saw will turn ACW.

$M = F \times d = 0.2N \times 2m$

$= 0.4Nm$

8. A boy tries to balance the see-saw by putting a 0.2N weight on the left hand end of the see-saw. Draw a diagram and label the forces from the balloon and the weight. Explain whether this balances the see-saw or not.



Weight also causes ACW moment

$\therefore$ ACW $= 0.2N \times 2m + 0.2N \times 2m$

$= 0.8m$

$\therefore$ does not work - see-saw still turns.