Lesson 10 - Moments and Work Revision

Physics - KS3

Forces in Action

Mrs Wolstenholme

Complete the task

Moments:

1. **What is the moment of a force?**
2. **Write down two ways to increase the moment about a pivot.**

Calculating moments

Moment	=	Force	x	Perpendicular distance
(Nm) (Ncm)		(N)		(m) (cm)

What are the units for moment?

Option 1

Cm and m

Option 2

Nm and m

Option 3

N and Ncm

Option 4

Nm and Ncm

What are the units for perpendicular distance?

Option 1

Cm and m

Option 2

Nm and m

Option 3

N and Ncm

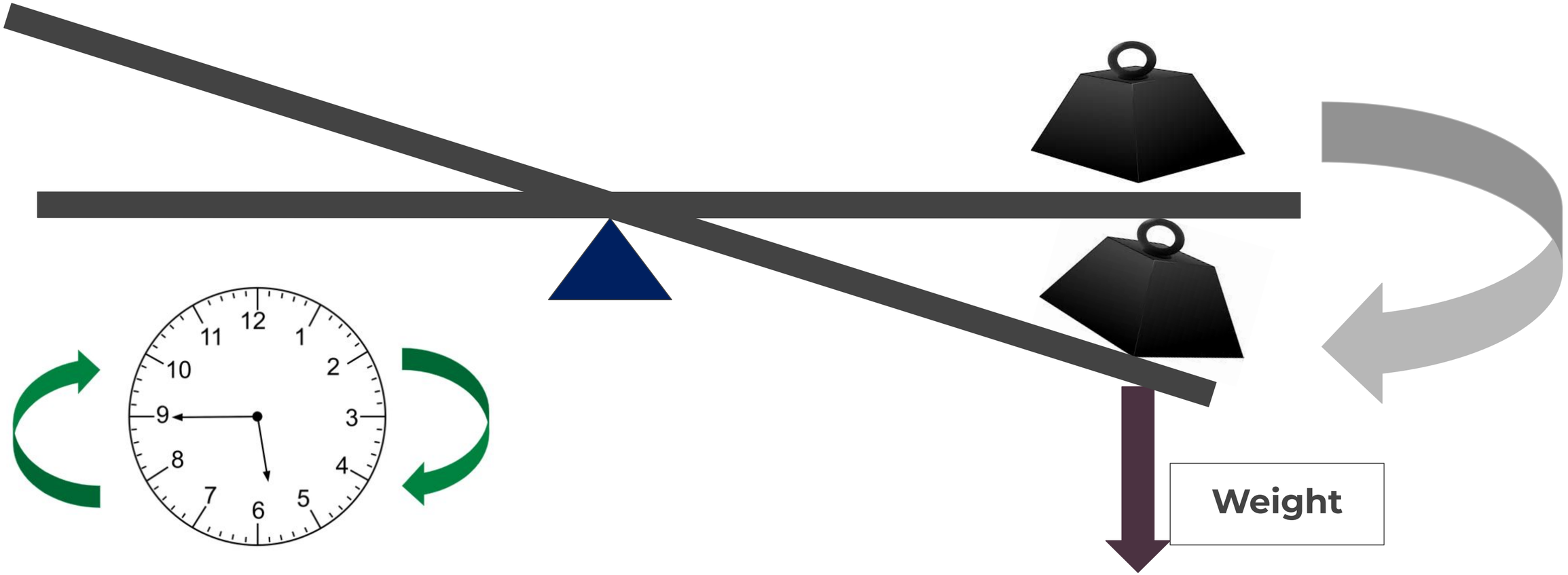
Option 4

Nm and Ncm

What is the unit for force?

Option 1	Option 2
m	Nm
Option 3	**Option 4**
Ncm	N

Clockwise moment



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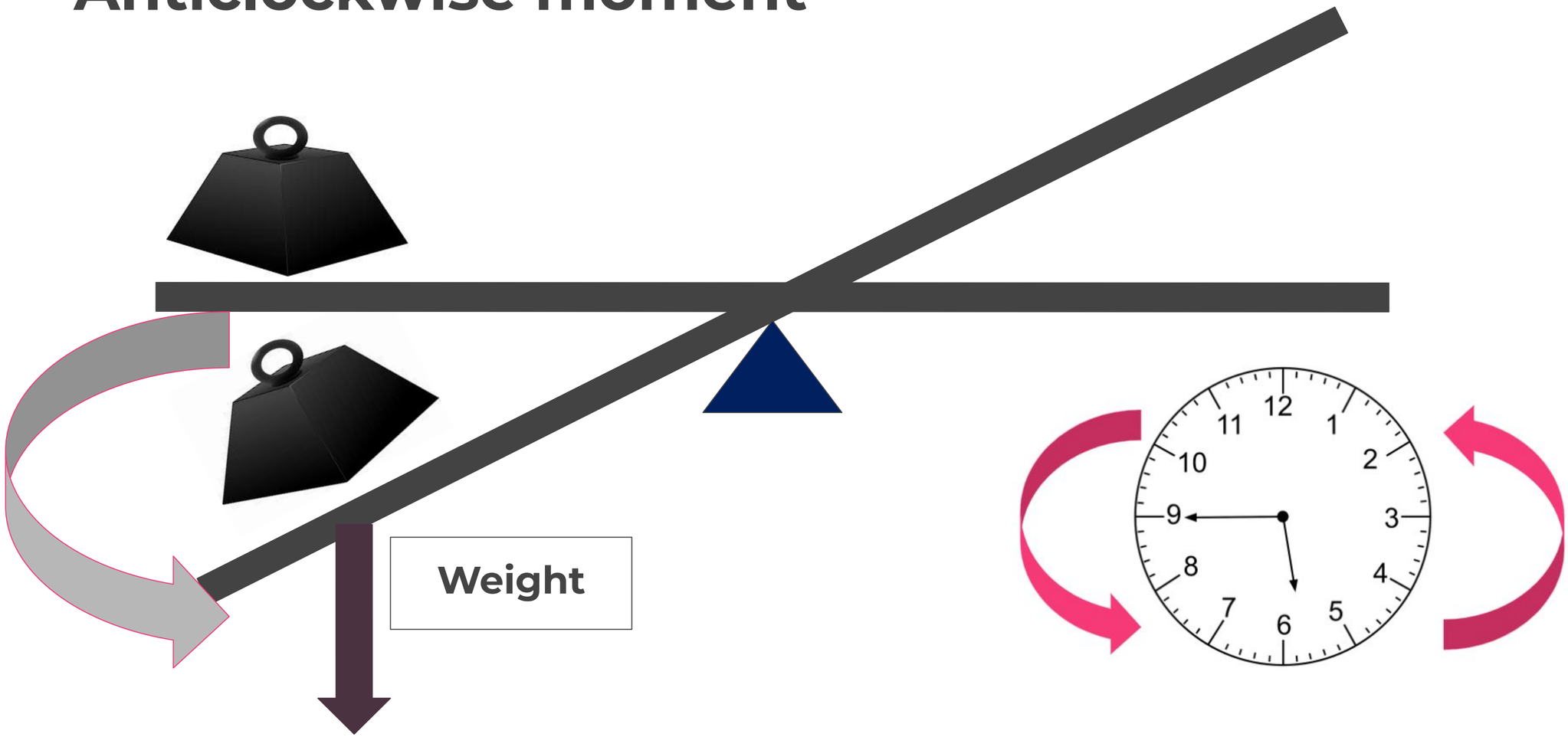
Anticlockwise moment



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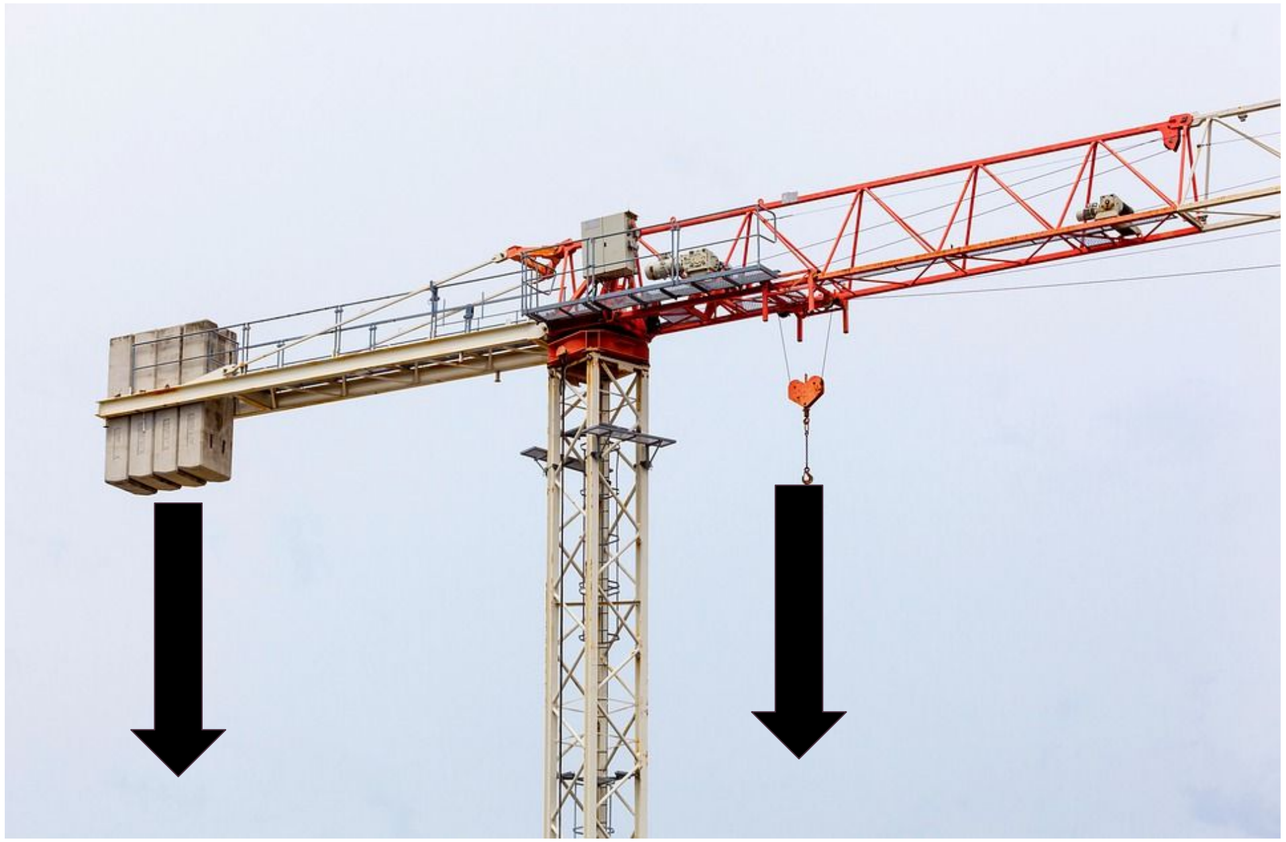
Balanced Moments



Clockwise Moment = Anticlockwise Moment

Which Direction will an object rotate because of a clockwise moment?

Option 1

Same as a clock hand

Option 2

Up

Option 3

Opposite to a clock hand

Option 4

Down

Which Direction will an object rotate because of an anticlockwise moment?

Option 1

Same as a clock hand

Option 2

Up

Option 3

Opposite to a clock hand

Option 4

Down

For an object to be balanced:

Option 1

Left side moment = Right side moment

Option 2

Clockwise moment is larger than anticlockwise moment

Option 3

Clockwise moment = Anticlockwise moment

Option 4

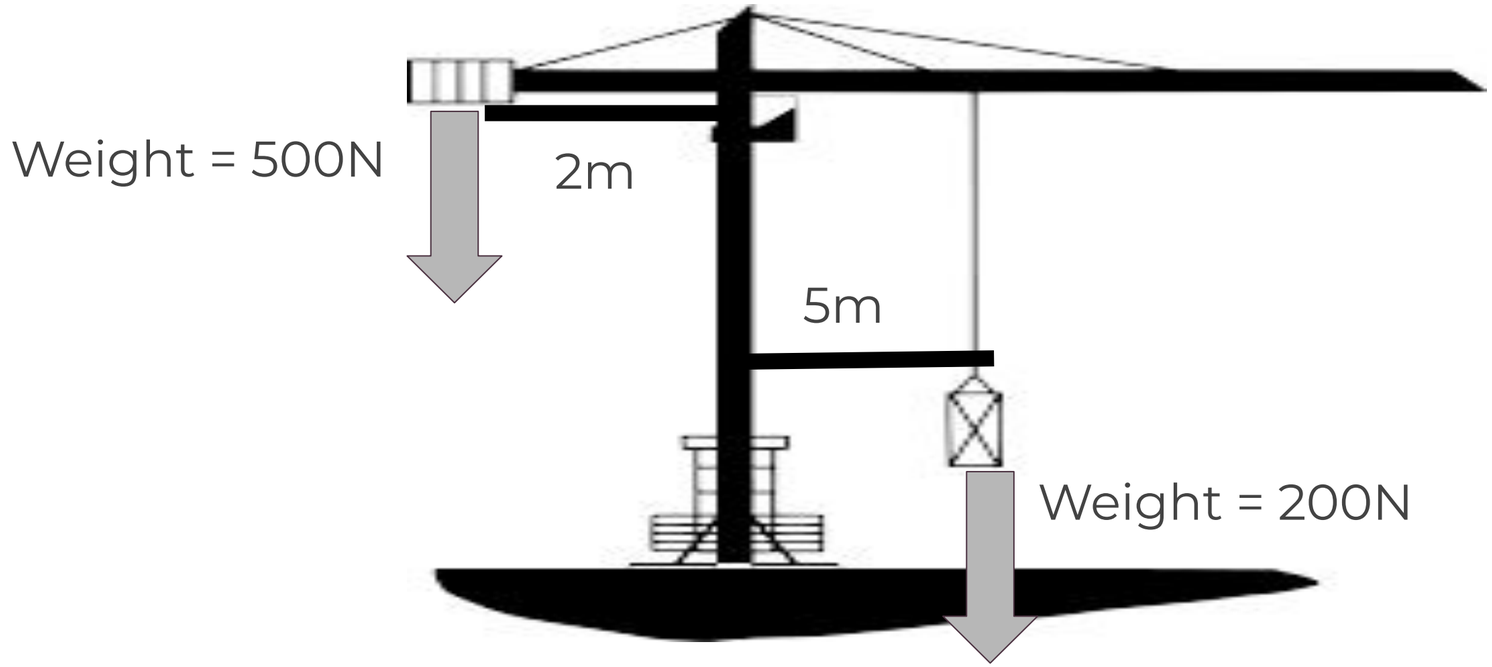
There are no forces on the object

Complete the task

Fill in the gaps

Moments can be _____ or _____

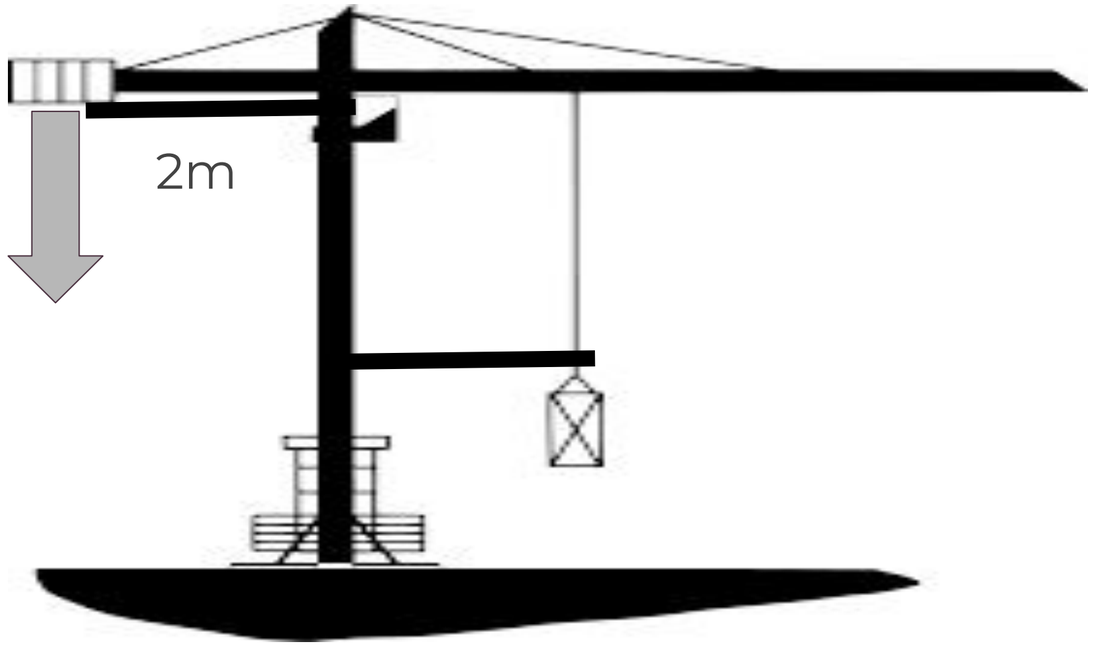
- **Clockwise moments cause a rotation in the _____ direction of a clock hand**
- **Anticlockwise moments cause a _____ in the opposite direction of a _____ hand**
- **For an object to be balanced .....**



Is this crane balanced?

Clockwise Moment = Anticlockwise Moment

Credit: no attribution required

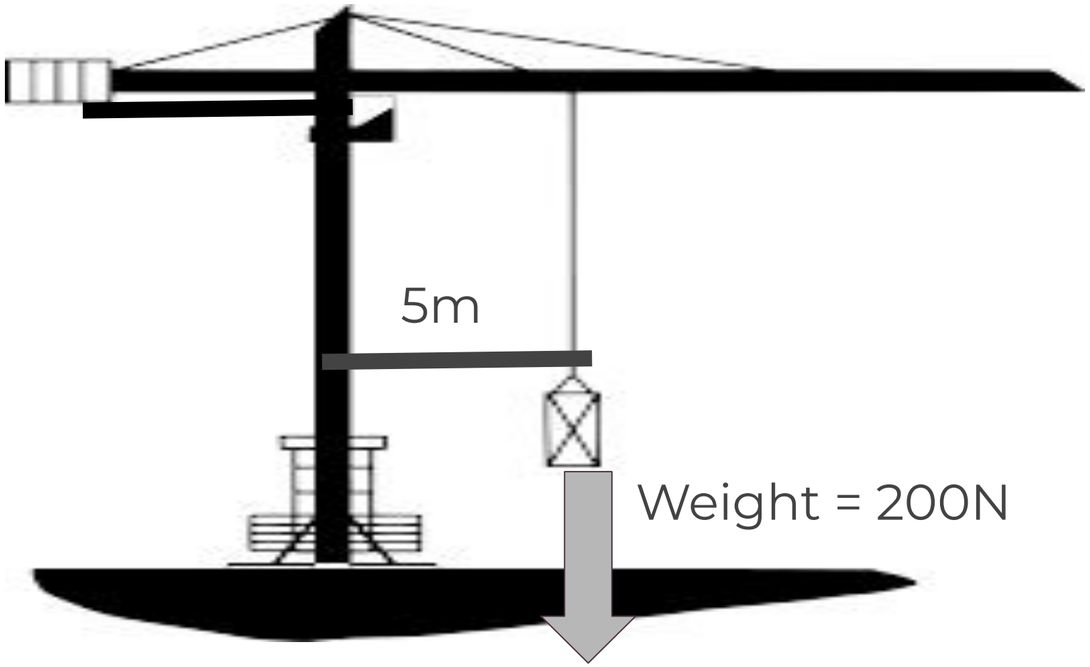


Anticlockwise moment = Force x perpendicular distance

= 500 x 2

= 1000Nm

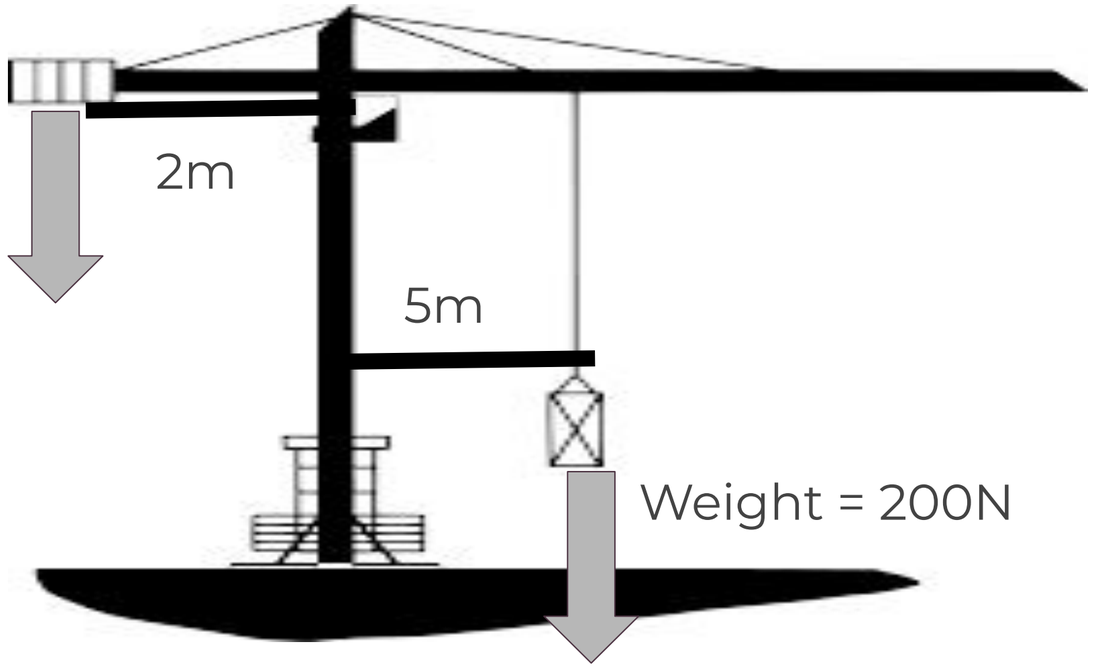
Credit: no attribution required



Clockwise moment = Force x perpendicular distance

= 200 x 5

= 1000Nm



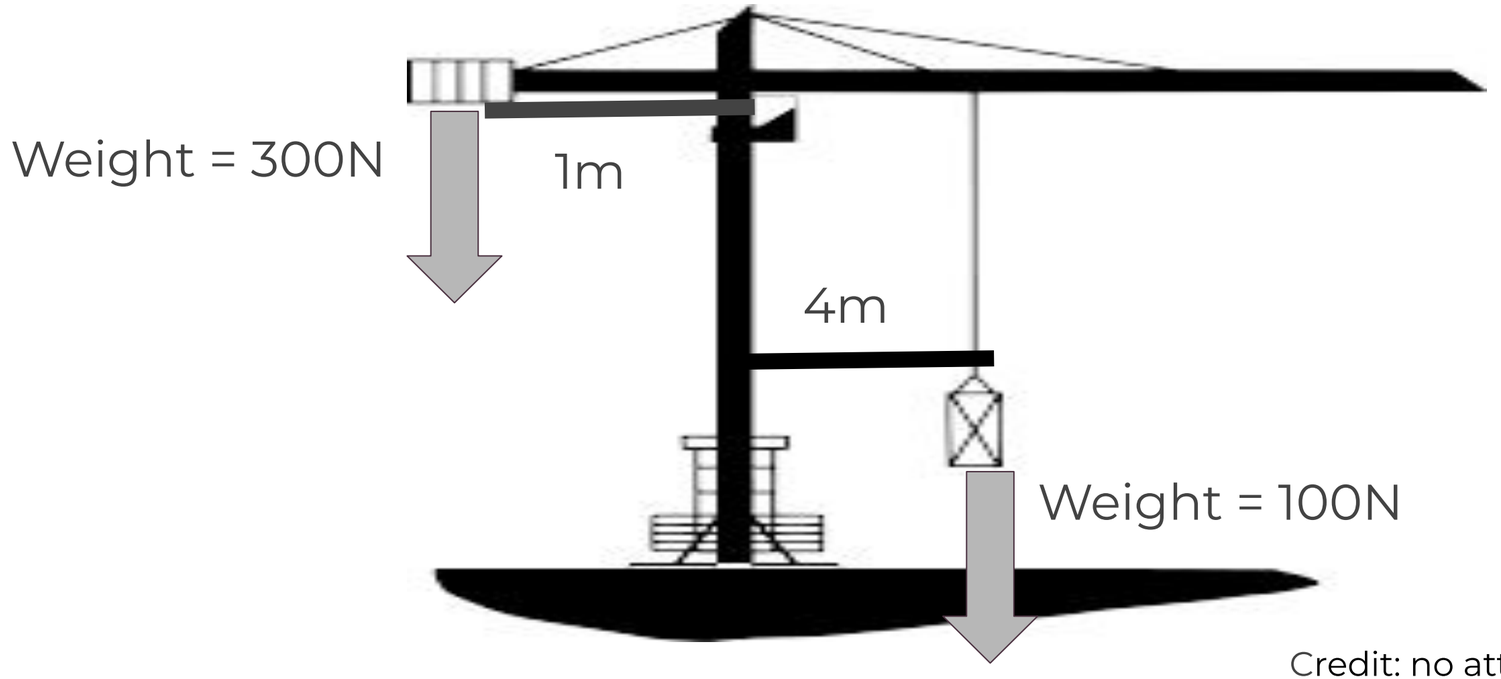
Anticlockwise moment = 1000Nm

Clockwise moment = 1000Nm

Clockwise Moment = Anticlockwise Moment

Balanced!

Credit: no attribution required



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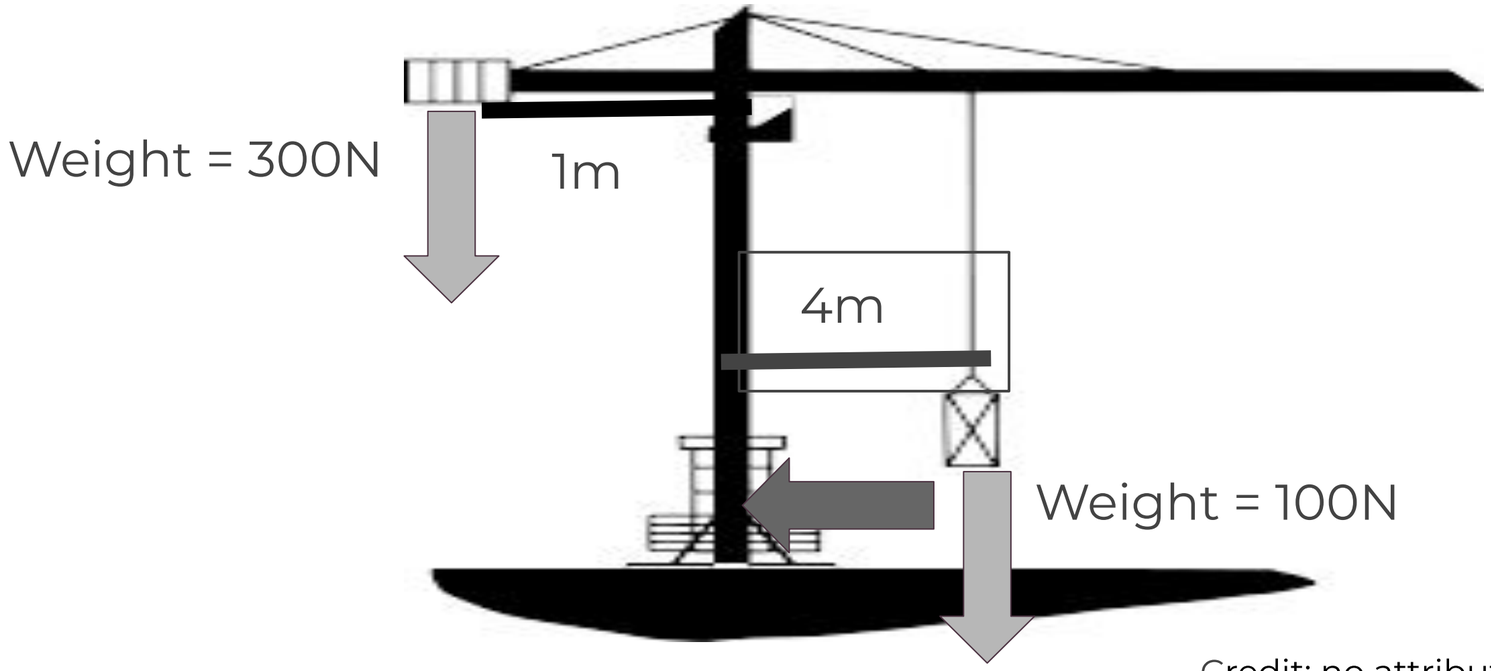
Your Turn: Is this crane balanced?

Clockwise Moment = Anticlockwise Moment



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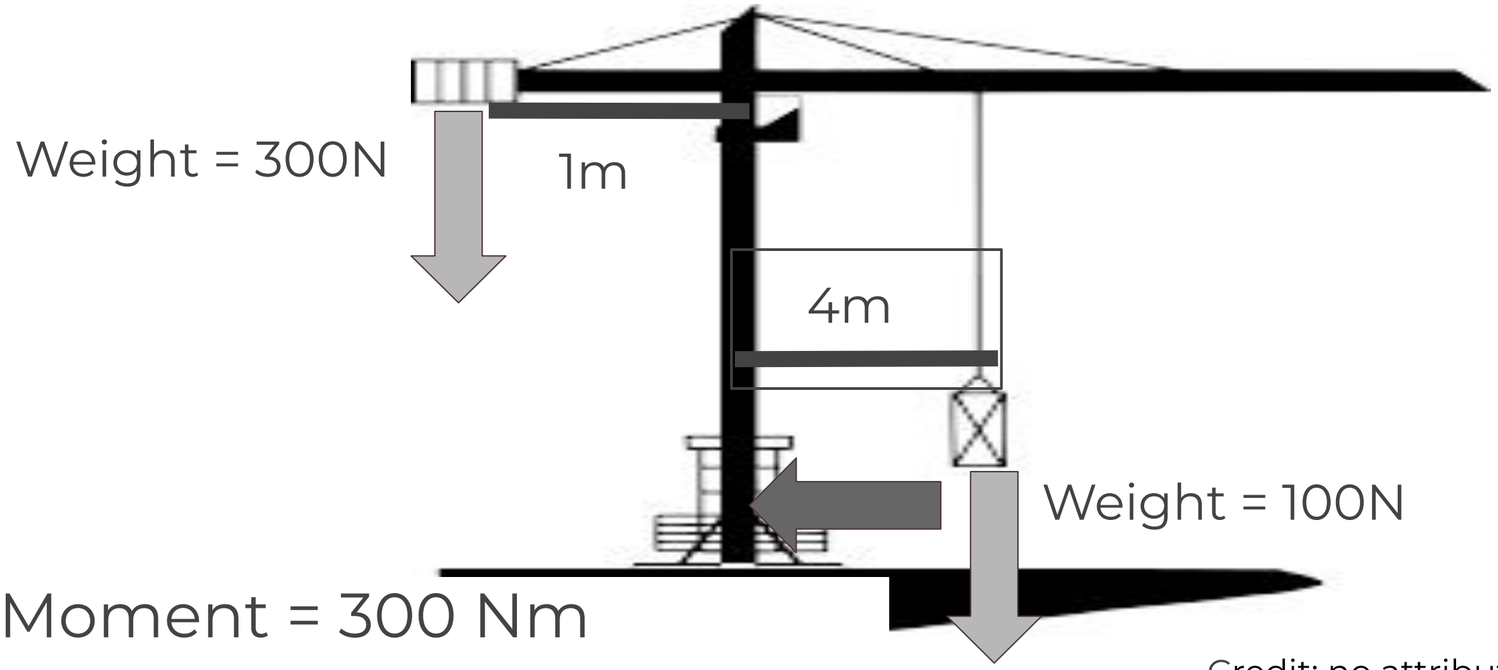
Clockwise Moment = 100 x 4 = 400 Nm

Anticlockwise Moment = 300 x 1 = 300 Nm

Not Balanced. Clockwise moment is larger than anticlockwise moment.

What can we do to balance the crane?



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Anticlockwise Moment = 300 Nm

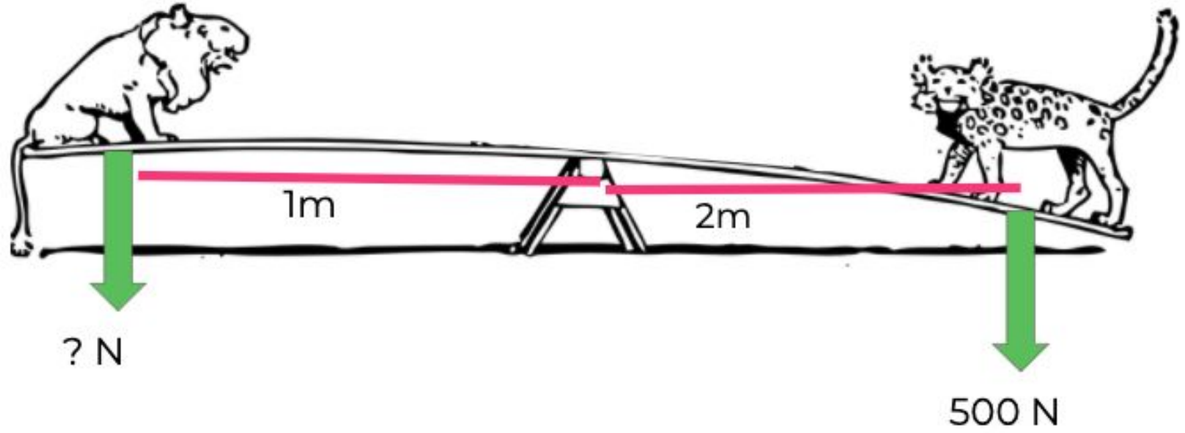
Clockwise Moment = Force x Distance

300 = 100 x Distance

300 ÷ 100 = 100 x Distance ÷ 100

300 ÷ 100 = Distance → Distance = 3 m

The seesaw is balanced. What is the weight of the animal on the left?



Clockwise moment = Anticlockwise moment

Force x distance = Force x distance

500 x 2 = Force x 1

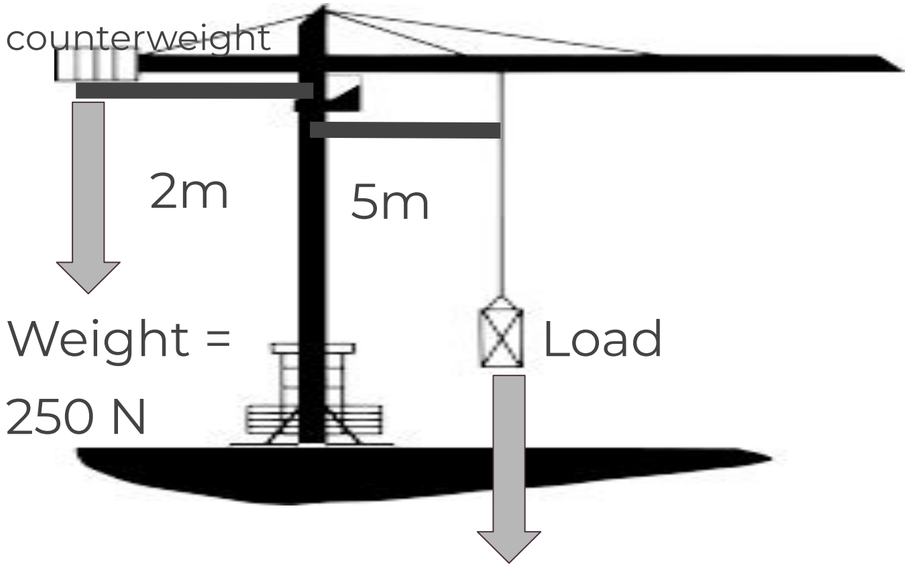
1000 = Force

Force = 1000 N

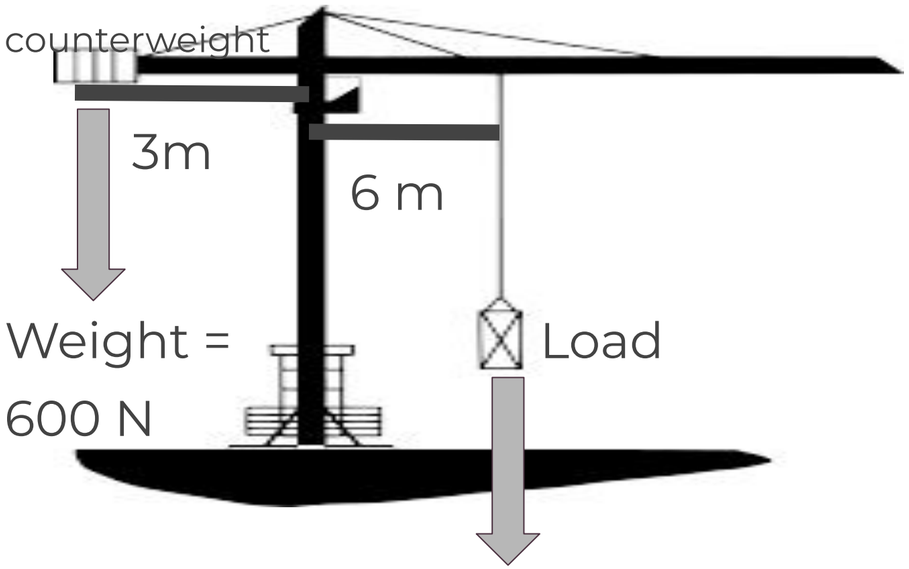
Credit: no attribution required

Independent Practice

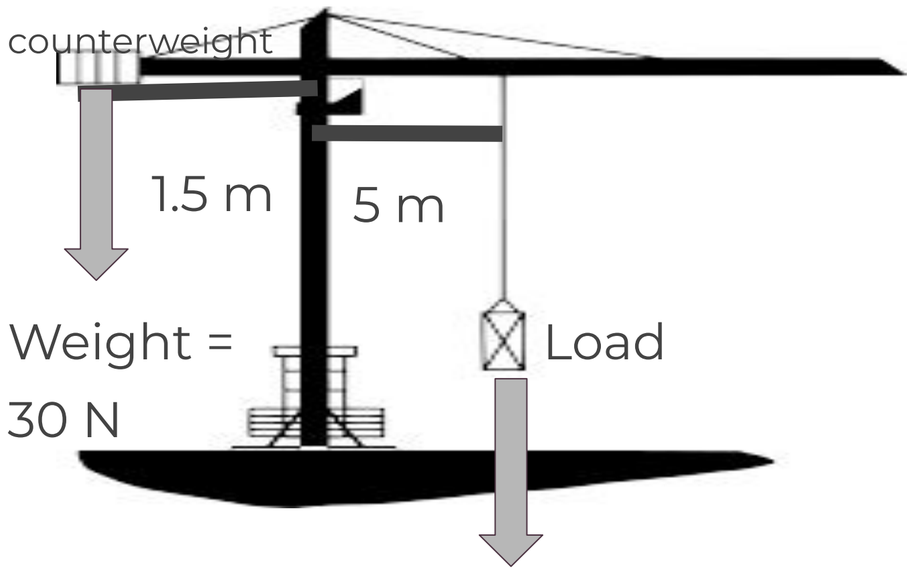
1. The crane is balanced. The weight of the counterweight is 250 N. What is the weight of the load?



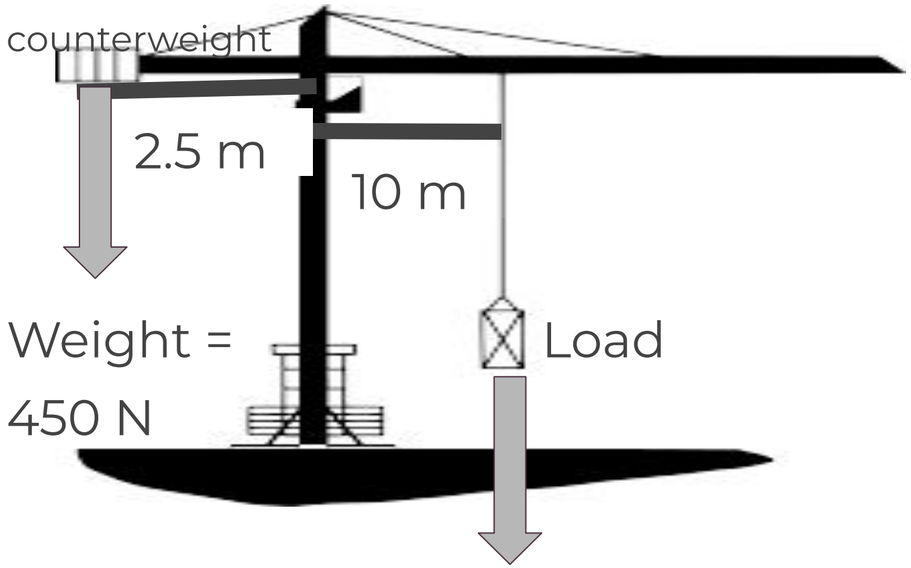
2. The crane is balanced. The weight of the counterweight is 600 N. What is the weight of the load?



3. The crane is balanced. The weight of the counterweight is 30 N. What is the weight of the load?



4. The crane is balanced. The weight of the counterweight is 450 N. What is the weight of the load?



Credit: no attribution required

Work Done

Exerts a force

Energy is transferred

Work is done

Work Done or Energy Transferred = Force x distance

(J) (N) (m)

÷100

cm → m

x1000

km → m

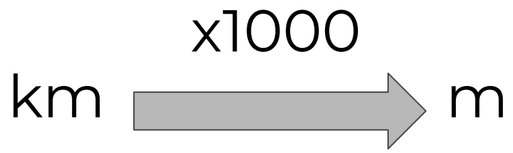
750 cm ÷ 100 = 7.5 m

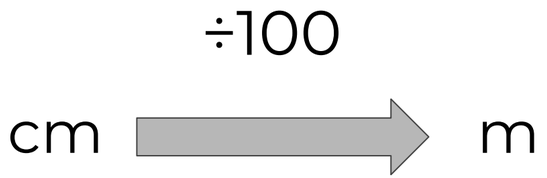
3 km x 10000 = 3000 m

Changing Units

Change the following distances into metres:

1. 3 km
2. 0.2 km
3. 500 cm
4. 40000 cm
5. 0.6 cm
6. 300 cm
7. 0.05 km





Power

Power is the rate at which energy is transferred or work is done.

Power	=	Energy Transferred or Work Done	÷	time
(W)		(J)		(s)

Rounding to 3 s.f.

Zeros at the beginning don’t count.

Zeros at the end don’t count unless there is a decimal point.

23**0**4**0**3 Zeros between numbers **do** count.

Round 346.73 to 3 significant figures

Option 1

346.7

Option 2

345

Option 3

346.8

Option 4

347

Round 60352 to 3 significant figures

Option 1

60400

Option 2

60300

Option 3

604

Option 4

60452

Round 36.45 to 3 significant figures

Option 1

36.46

Option 2

36

Option 3

36.5

Option 4

36.4

Rounding to 3 s.f.

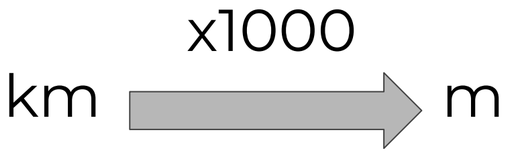
Round the following numbers to 3 s.f.

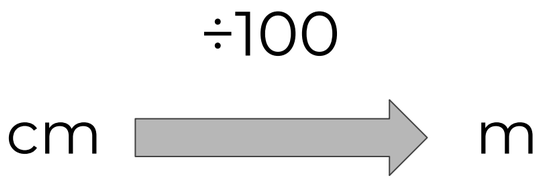
1. 403.5
2. 3.33333333
3. 89.45678
4. 0.004372
5. 65.66666

Put it all together

Work Done = Force x Distance

Power = Work Done ÷ time





A force of 30 N is required to move an object 40 cm in 36 seconds. Calculate the power and give your answer to 3 s.f.

Step 1: Change Distance into m **40 cm ÷ 100 = 0.4 m**

Step 2: Calculate Work Done **Work Done = Force x Distance = 30 x 0.4 = 12 J**

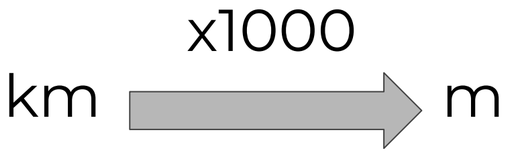
Step 3: Calculate Power **Power = Work Done ÷ Time = 12 ÷ 36 = 0.33333333 W**

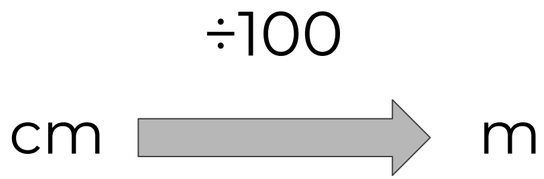
Step 4: Round to 3 s.f. **Power = 0.333 W**

Put it all together

Work Done = Force x Distance

Power = Work Done ÷ time





A force of 15 N is required to move an object 0.6 km in 70 seconds. Calculate the power and give your answer to 3 s.f.

Step 1: Change Distance into m

Step 2: Calculate Work Done

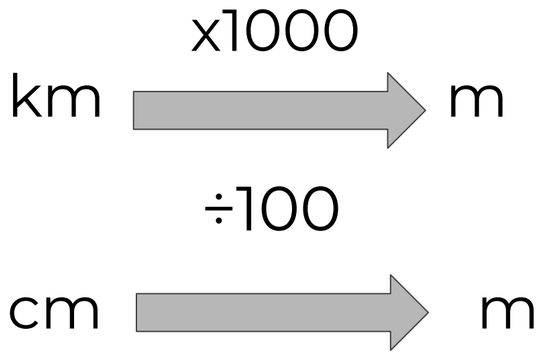
Step 3: Calculate Power

Step 4: Round to 3 s.f.

Independent Practice

Work Done = Force x Distance

Power = Work Done ÷ time

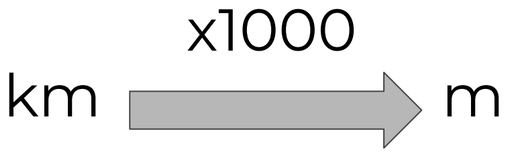


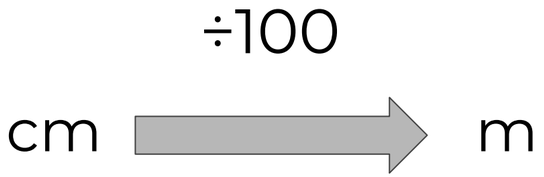
Question	A force of 2 N is required to move an object 400 cm in 30 seconds. Calculate the power and give your answer to 3 s.f.	A force of 6 N is required to move an object 0.5 km in 90 seconds. Calculate the power and give your answer to 3 s.f.
Step 1: Change distance to m		
Step 2: Calculate Work Done		
Step 3: Calculate Power		
Step 4: Round to 3 s.f.		

Independent Practice

Work Done = Force x Distance

Power = Work Done ÷ time





Question	A force of **80 N** is required to move an object **2 km** in **600** s. Calculate the power and give your answer to 3 s.f.	A force of **0.5 N** is required to move an object **40 cm** in **0.7 s**. Calculate the power and give your answer to 3 s.f.
Step 1: Change distance to m		
Step 2: Calculate Work Done		
Step 3: Calculate Power		
Step 4: Round to 3 s.f.		

Well Done!