

Name _____

Class _____

Date _____

By the end of this worksheet I can...

- ☐ identify tension and compression and types of load
- ☐ draw free body diagrams and apply the conditions of equilibrium
- ☐ use the principle of moments to find reaction forces
- ☐ resolve concurrent forces into components and find resultants
- ☐ find forces in frame members by nodal analysis
- ☐ work with uniformly distributed loads

I DO**Worked example** Read how a full-mark answer is built

A 5 m beam is simply supported at A and B. Loads of 600 N at 1.5 m and 900 N at 3.75 m from A.

1 Calculate the reactions RA and RB. (4 marks)**Full-mark answer** each ✓ is one mark

Take moments about A: $(600 \times 1.5) + (900 \times 3.75) = RB \times 5$ ✓. $RB = 4275 \div 5 = 855 \text{ N}$ ✓. Upward = downward forces: $RA + 855 = 1500$ ✓, so $RA = 645 \text{ N}$ ✓.

Why marks are not awarded

" $RA = RB = 1500 \div 2 = 750 \text{ N}$ "

0 marks: the loads aren't symmetrical, so moments must be taken.

WE DO**Guided practice** Use the starters and word bank to help you

Members in a bridge truss are in tension or compression.

2 State what is meant by a member in tension. (1 mark)**Sentence starters**

1. ...

Word bank

stretched · member · pulled · forces

Tip: 1 marks = 1 separate, developed points.

YOU DO**On your own** No notes. Check your answers afterwards.**3 Quick check: tick one box for each.**

- a) A member being squashed is a...
☐ Strut ☐ Tie ☐ Beam ☐ Cable
- b) A 400 N load sits 1.5 m from a balance beam pivot. A 600 N load balances it at...
☐ 0.9 m ☐ 1.0 m ☐ 1.5 m ☐ 2.25 m
- c) For a beam in equilibrium, which is true?
☐ CWM > ACWM ☐ Upward > downward ☐ CWM = ACWM ☐ No forces act
- d) Loads of 650 N and 890 N are supported by RA and a 560 N force. RA is...
☐ 330 N ☐ 1540 N ☐ 560 N ☐ 980 N

4 Key terms: write the letter of the matching description next to each term.

1. Equilibrant	_____	A A member in compression.
2. Non-concurrent forces	_____	B Triangles make a frame rigid.
3. Triangulation	_____	C A member in tension.
4. Polygon of forces	_____	D Equal in size and opposite in direction to the resultant.
5. Tie	_____	E More than three forces head to tail; the closing side is the equilibrant.
6. Strut	_____	F Forces that don't act through one point, so they can cause turning.

A sign hangs from a bracket.

5 State the two conditions of equilibrium. (2 marks)

A beam 6 m long carries a uniformly distributed load of 2 kN/m along its full length, supported at each end.

6 Calculate each reaction. (2 marks)

Two forces act at a point: 400 N horizontally and 300 N vertically.

7 Calculate the magnitude and direction of the resultant. (3 marks)

Check and reflect

Mark your answers with the answer sheet. Go back to the checklist on the site and re-rate each “I can” statement above. Which one still needs work?
