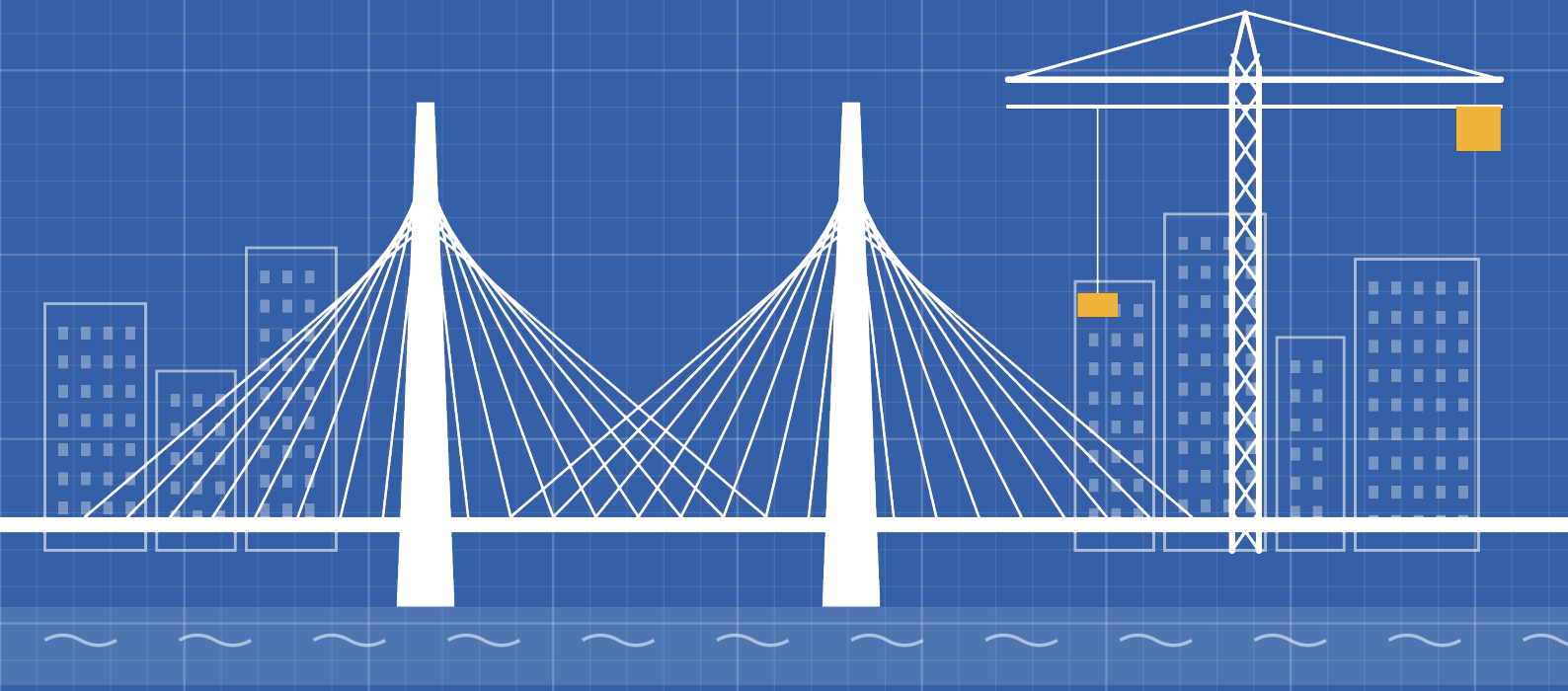


HOMEWORK PACK

# STRUCTURES HOMEWORK PACK

Six short homework tasks — one a week — to help you remember, research and practise what you learn in class.

Each homework takes about 15–20 minutes. Bring it back by the date your teacher gives you.

NAME

CLASS

TEACHER

designclass
design | engineering | technology

HOMEWORK PACK

# YOUR HOMEWORK PLAN

| # | Homework | Links to | Tick when done |
|---|---|---|---|
| 1 | Meet an engineer — careers research | Course notes p3 · Worksheet 1 | |
| 2 | Structure spotter — mass, frame, shell | Course notes p4–5 · Worksheet 1 | |
| 3 | Scottish bridge fact file | Course notes p6–7 · Worksheet 2 | |
| 4 | Forces at home | Course notes p8–12 · Worksheet 2 | |
| 5 | Beam and brace hunt | Course notes p9, 13 · Worksheet 3 | |
| 6 | Moments practice | Course notes p14–15 · Worksheet 3 | |

### HOW TO GET THE MOST FROM HOMEWORK

Each homework starts with a **Quick recall** section — try it **without** looking at your notes first, then check. This is called **retrieval practice**, and research shows it is one of the best ways to make learning stick.

### SAFETY FIRST

When you go out to spot structures, stay with an adult, keep away from roads, railways, water and building sites, and only take photos where it is safe and allowed.



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HOMEWORK 1

# MEET AN ENGINEER

Careers in structural engineering

15–20 min

Due: _____

## QUICK RECALL

**1** Which job calculates the forces in beams and columns so a structure is safe?

- ☐ **A** Architect
- ☐ **B** Structural engineer
- ☐ **C** Quantity surveyor
- ☐ **D** Site manager

**2** Which job controls the **costs** of a building project?

- ☐ **A** CAD technician
- ☐ **B** Civil engineer
- ☐ **C** Quantity surveyor
- ☐ **D** Architect

**3** Name **three** routes into an engineering career.

## RESEARCH TASK

Choose **one** of these careers: structural engineer · civil engineer · architect · quantity surveyor · CAD technician · site manager. Use **My World of Work** (myworldofwork.co.uk) or another reliable website to complete the fact file.

| Fact file | Your research |
|---|---|
| Job title | |
| What do they do each day? | |
| Qualifications or routes in (university, college, apprenticeship) | |
| School subjects that help | |
| Skills you need (e.g. maths, teamwork, problem solving) | |
| Would this job suit you? Why or why not? | |
| Website(s) I used | |

HOMEWORK 2

# STRUCTURE SPOTTER

Mass, frame and shell structures

15–20 min

Due: _____

## QUICK RECALL

1 What is **biomimicry**?

2 A structure that stays up because it is very heavy is a...

- ☐ **A** Mass structure
- ☐ **B** Frame structure
- ☐ **C** Shell structure

## SPOTTER TASK

Find **two** examples of each type of structure at home or in your local area (with an adult). Fill in the table.

| Structure I found | Mass, frame or shell? | How do I know? |
|---|---|---|
| | Mass | |
| | Mass | |
| | Frame | |
| | Frame | |
| | Shell | |
| | Shell | |

**3** Sketch your favourite structure from the table. Label what it is made from.

SKETCH HERE



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HOMEWORK 3

# SCOTTISH BRIDGE FACT FILE

Bridges, the environment and the economy

20 min

Due: _____

## QUICK RECALL

1 What does the **span** of a bridge mean?

2 Which bridge type uses cables that run **straight** from the towers to the deck?

- ☐ **A** Suspension
- ☐ **B** Cable-stayed
- ☐ **C** Arch
- ☐ **D** Beam

## FACT FILE

Pick a Scottish bridge — for example the Forth Bridge, Forth Road Bridge, Queensferry Crossing, Tay Road Bridge, Kessock Bridge, Erskine Bridge, Skye Bridge, Glenfinnan Viaduct, the Clyde Arc in Glasgow, or a bridge near you. Research it and complete the fact file.

| My research | |
|---|---|
| Name of bridge | |
| Where is it? What does it cross? | |
| Type of bridge | |
| Year it opened | |
| Main span or total length | |
| One effect on the **economy** | |
| One effect on the **environment** | |

3 Sketch your bridge from the side. Label the deck, towers or piers, and any cables or arches.

SKETCH HERE

HOMEWORK 4

# FORCES AT HOME

Mass, force and types of force

15–20 min

Due: _____

## QUICK RECALL

1 Mass is measured in _____ and force is measured in _____.

2 Which force tries to make a material **longer**?

☐ **A** Compression ☐ **B** Tension ☐ **C** Torsion ☐ **D** Shear

## FORCE HUNT

Find an example of each type of force at home. Try to find examples that are **different** from the ones in class.

| Type of force | My example at home |
|---|---|
| Static | |
| Dynamic | |
| Torsion (twisting) | |
| Shear | |
| Tension (pulling apart) | |
| Compression (squashing) | |

## THINK LIKE AN ENGINEER

3 Two shelf brackets are tested. Bracket A has a mass of 200 g and holds 20 kg (20 000 g). Bracket B has a mass of 250 g and holds 30 kg (30 000 g). Work out **load ÷ mass** for each. Which has the better strength-to-weight ratio?

WORKING

**Better bracket:** _____

HOMEWORK 5

# BEAM AND BRACE HUNT

Beam sections, frames, struts and ties

15–20 min

Due: _____

## QUICK RECALL

1 What is **racking**?

2 A member in **compression** is called a…

- ☐ **A** Tie
- ☐ **B** Strut
- ☐ **C** Beam
- ☐ **D** Cable

## HUNT TASK

Look for beams and cross-bracing around you: scaffolding, electricity pylons, goalposts, playground frames, gates, sheds, bridges, roof trusses, shelving. Record **four** finds.

| Where I saw it | What I spotted (section shape or bracing) | Why is it there? |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

3 Concrete is strong in compression but weak in tension. Explain why steel bars are placed inside concrete beams.

HOMEWORK 6

# MOMENTS PRACTICE

moment = force × distance · the principle of moments

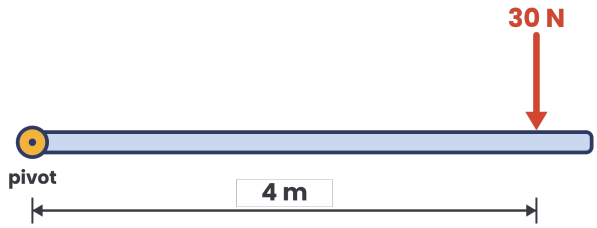
20 min

Due: _____

**REMEMBER**

**moment (Nm) = force (N) × distance (m)**. When balanced: clockwise moments = anticlockwise moments. Show your working and units!

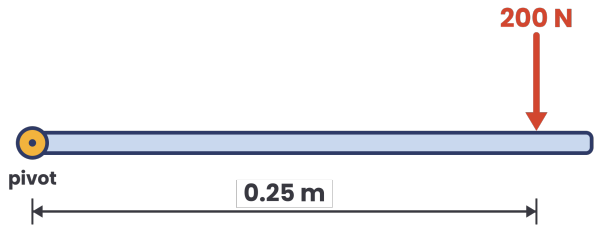
**1** Calculate the **moment** of the force about the pivot.




WORKING

**Answer =** _____ **Nm**

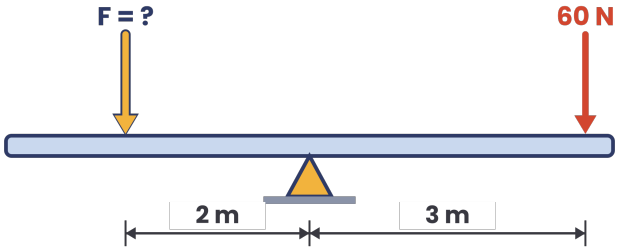
**2** Calculate the **moment** of the force about the pivot.




WORKING

**Answer =** _____ **Nm**

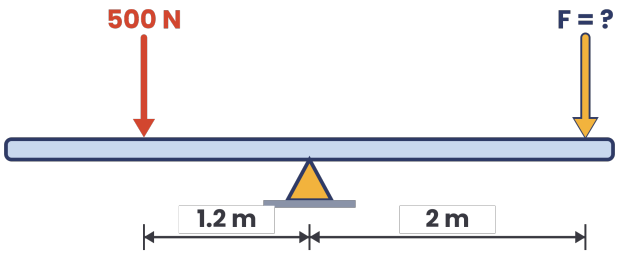
**3** The beam is balanced. Calculate the force **F**.




WORKING

**Answer =** _____ **N**

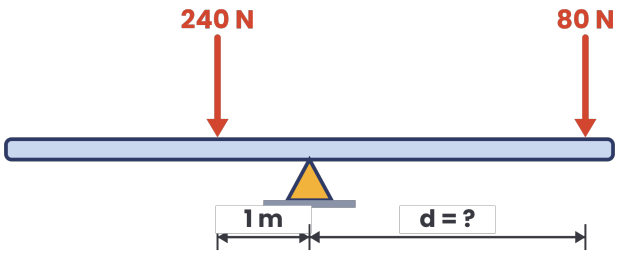
**4** The beam is balanced. Calculate the force **F**.




WORKING

**Answer =** _____ **N**

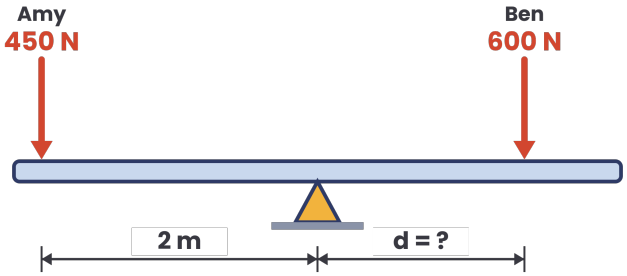
**5** The beam is balanced. Calculate the distance **d**.




WORKING

**Answer =** _____ **m**

**6** Amy (450 N) sits 2 m from the pivot of a see-saw. Ben weighs 600 N. How far from the pivot must Ben sit to balance?




WORKING

**Answer =** _____ **m**

**7** Explain, using the word **moment**, why a door is easier to push open near the handle than near the hinges.

# HOMEWORK DONE.

Hand in your pack and get ready for the **topic test**.

Revise with the **Knowledge Organiser** and the course notes at **detscotland.co.uk**.

*"Engineering is the art of directing the great sources of power in nature for the use and convenience of man."*

Thomas Tredgold, civil engineer (1788–1829)

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