Forces and stresses

Unit 4 · Common specialist technical principles · matches the "Forces and stresses" lesson slides (about 60 minutes)

Teacher notes for someone teaching this lesson without a Design and Technology background, including a cover or supply teacher standing in for the usual class teacher.

IF YOU ONLY DO ONE THING (RUSHED COVER LESSON)

If you only do one thing: make sure every pupil can say what "Tension" means in their own words before the lesson ends. A pulling force that stretches a material. Ask two or three pupils to explain it back to you - do not just ask "does that make sense?".

Key facts in plain language

These are the facts this lesson depends on. They are written in plain English, not subject jargon, so you can say them in your own words while you teach.

Tension:
A pulling force that stretches a material.

Compression:
A pushing force that squashes a material.

Bending:
A force that makes a beam curve: one side in tension, the other in compression.

Torsion:
A twisting force.

Shear:
Forces acting in opposite directions that make layers slide.

Common misconceptions

Drawn from the wrong answers pupils pick in this lesson's own question bank, paired with the explanation that is already written for the right answer.

Pupils may think: "Compression" is correct.
Why it is wrong: the correct answer is "Tension". The load pulls along the rope.

Pupils may think: "Tension" is correct.
Why it is wrong: the correct answer is "Compression". The leg is pushed and squashed.

Pupils may think: "Shear" is correct.
Why it is wrong: the correct answer is "Compression". The top squashes (compression) and the bottom stretches (tension).

Pupils may think: "Shear" is correct.
Why it is wrong: the correct answer is "Torsion". Torsion is a twisting force.

Pupils may think: "Compression" is correct.
Why it is wrong: the correct answer is "Shear". Two blades push in opposite directions so the paper shears.

Talking points to follow the slide deck

The slide deck for this lesson follows the usual DT Classroom shape: a retrieval starter, then each key term below in turn, worked examples, exam-style practice, then an exit ticket. Use these lines as you reach each part - they are the same facts as above, just phrased as something you can say out loud.

When the deck reaches "Tension": say — A pulling force that stretches a material. Ask: "can someone give me an example?"

When the deck reaches "Compression": say — A pushing force that squashes a material. Ask: "can someone give me an example?"

When the deck reaches "Bending": say — A force that makes a beam curve: one side in tension, the other in compression. Ask: "can someone give me an example?"

When the deck reaches "Torsion": say — A twisting force. Ask: "can someone give me an example?"

When the deck reaches "Shear": say — Forces acting in opposite directions that make layers slide. Ask: "can someone give me an example?"

Worked answers to this lesson's questions

The same question bank used for this lesson's knowledge organiser self-check and worksheet exam practice. Use this page as the answer key, or cover the right-hand explanation and hand out the questions as a silent task (see the cover lesson box below).

1. A rope holding a swing is in…

a) Tension, b) Compression, c) Shear, d) Torsion

Answer: a) Tension. The load pulls along the rope.

2. A table leg holding a heavy load is in…

a) Tension, b) Compression, c) Shear, d) Torsion

Answer: b) Compression. The leg is pushed and squashed.

3. When a shelf supported at both ends bends under load, the top surface is in…

a) Compression, b) Shear, c) Tension, d) Torsion

Answer: a) Compression. The top squashes (compression) and the bottom stretches (tension).

4. Turning a screwdriver puts the shaft in…

a) Torsion, b) Shear, c) Compression, d) Tension

Answer: a) Torsion. Torsion is a twisting force.

5. Scissors cutting paper apply…

a) Compression, b) Torsion, c) Tension, d) Shear

Answer: d) Shear. Two blades push in opposite directions so the paper shears.

READY-TO-RUN COVER LESSON

Project the existing lesson slides as normal; read the key facts and talking points above before the lesson starts.

Low-prep silent task (needs no workshop tools or machinery): write or display the numbered questions above without the "Answer:" line, and have pupils answer them in silence on paper. Mark from the answers above at the end, or next lesson.

If the lesson plan calls for tools, machinery, heat or anything hands-on, do not run that part as a non-specialist cover teacher - set the silent task above instead and leave the practical for the subject teacher. See the general workshop safety guide in the Teachers hub.