

Design & Technology

Edexcel GCSE

Levers

Materials required for questions

- Pencil
- Rubber
- Calculator

Instructions

- Use black ink or ball-point pen
- Try answer all questions
- Use the space provided to answer questions
- Calculators can be used if necessary
- For the multiple choice questions, circle your answer

Advice

- Marks for each question are in brackets
- Read each question fully
- Try to answer every question
- Don't spend too much time on one question

Good luck!

Q1. On a lever, point A is 80 mm from the fixed pivot and point B is 20 mm from the fixed pivot. If point A moves 40 mm clockwise, how far does point B move clockwise?

- A** 10 mm
- B** 20 mm
- C** 40 mm

Q2. What order (class) of lever is a pair of scissors?

- A** Second order
- B** First order
- C** Third order

Q3. On a lever in a toy, point A is 10 mm from the pivot and point B is 40 mm from the pivot. If point A moves 10 mm to the right, how far would point B move to the left?

- A** 10 mm
- B** 20 mm
- C** 40 mm

Q4. What is in the middle of a second order lever?

- A** The load
- B** The fulcrum
- C** The effort

Q5. Which is the correct formula for mechanical advantage?

- A** Effort $\div$ load
- B** Load $\div$ effort
- C** Load $\times$ effort

Q6. Which one of the following is a third order lever?

- A** Wheelbarrow
- B** See-saw
- C** Tweezers

Q7. A sports rowing boat oar is a lever. The handle is where the effort is applied, the sleeve fixed to the boat is the fulcrum, and the blade in the water is the load. The sleeve is between the handle and the blade.

Name the lever classification for the sports rowing boat oar. **(1 mark)**

Q8. This question is about mechanical advantage and velocity ratio calculations. On a see-saw, a load of 300 N is 0.50 m from the fulcrum. An effort of 400 N is applied 0.50 m from the fulcrum.

Q8a. Calculate both the mechanical advantage and velocity ratio of the see-saw. Show all workings. **(4 marks)**

Mechanical advantage:

Velocity ratio:

Q8b. Explain the role of the fulcrum in the see-saw. **(1 mark)**

Q8c. State what would happen if you changed the position of the fulcrum. **(1 mark)**

Q9. A bicycle brake system uses a bell crank lever.

State the function of a bell crank lever. **(1 mark)**

Answers

Q1. A

Q2. B

Q3. C

Q4. A

Q5. B

Q6. C

Q7.

Class 1/type 1/first class (1 mark).

Q8a.

Credit any appropriate approach to calculating the MA and VR (2 × 2 marks):

- Mechanical advantage = load ÷ effort = 300 N ÷ 400 N (1) = 0.75 (1)
- Velocity ratio = distance moved by effort ÷ distance moved by load = 0.50 m ÷ 0.50 m (1) = 1 (1)

Q8b.

Answers must relate to the see-saw (1 mark). The fulcrum is the pivoting point around which the lever turns (1); the point where the load is pivoted (1). Credit any other appropriate response.

Q8c.

1 mark for correctly referring to mechanical advantage and/or velocity ratio.

For example:

- If the fulcrum moves closer to the effort end, the mechanical advantage decreases and more effort is needed to move the same load (1)
- If the fulcrum moves closer to the load end, the mechanical advantage increases and less effort is needed to move the same load (1)
- The balance point will change (1)

Q9.

A bell crank changes the direction of a motion, including around corners (1 mark). Credit any other appropriate response.