

Qualification title: Level 2 Technical Certificate in Engineering (1145-21)

Test title: Externally set, externally marked (1145-520)

Version: Sample

Base mark: 40

Guidance

- For questions requiring calculations, candidates are advised to show the method they have used and all working out to access all available marks.
- Use of non-programmable calculators is permitted.

Question 1

A triangle-shaped piece of material is needed to repair a damaged casing, Figure 1. The dimensions need to be calculated so that the part can be cut out.

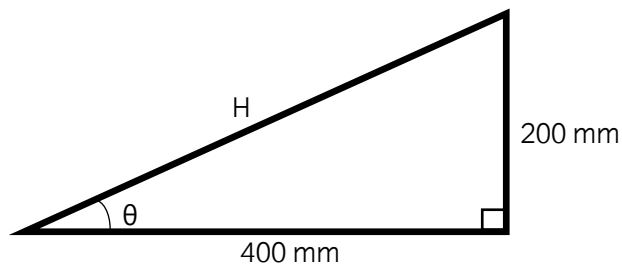


Figure 1 – NOT TO SCALE

- Calculate the area of the piece of material (3 marks)
- Calculate the length of the side H (3 marks)
- Calculate the value of the angle θ (3 marks)

Mark Scheme

Marks Awarded

Award 1 mark for method, 1 mark for correct answer, 1 mark for correct notation.

- Area = $\frac{1}{2} \times 200 \times 400 = 40,000 \text{ mm}^2$
- $H = \sqrt{(200^2 + 400^2)} = \sqrt{200,000} = 447.2 \text{ mm}$
- $\theta = \tan^{-1}(200/400) = 26.565^\circ$

Test spec reference:

- 203 1.1, 1.2
- 203 1.1, 1.3
- 203 1.1, 1.3

Total marks: 9 marks

Question 2

Find the value of x in the following simultaneous equations:

$$5x - 4y = 24$$

$$2x - 2y = 10$$

(3 marks)

Mark Scheme

Marks Awarded

Award up to 2 marks for method, 1 mark for correct value of x

Taking $A = 5x - 4y = 24$, $B = 2x - 2y = 10$

$$A - 2B = 5x - 4y - 2(2x - 2y)(1) = 5x - 4y - 4x - -4y (1) = 24 - 20$$

$$X = 4 (1)$$

Test spec reference:

203 1.4

Total marks: 3 marks

Question 3

Figure 2 shows two resistors arranged in parallel. The current in the circuit was measured as 0.015 amps.

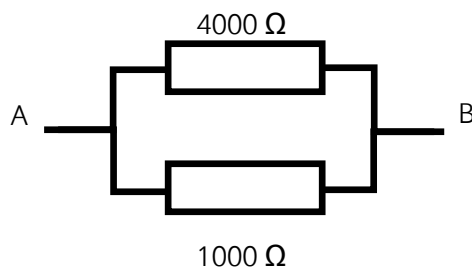


Figure 2

- Calculate the total resistance offered by this arrangement (3 marks)
- Calculate the voltage across the arrangement (between A and B) (3 marks)

Mark Scheme

Marks Awarded

Award 1 mark for equation, 1 mark for method, 1 mark for correct value

a) $1 / R_T = 1 / R_1 + 1 / R_2 (1) = 1 / 4000 + 1 / 1000 = 5 / 4000 (1)$ therefore $R_T = 800 \Omega (1)$

b) $V = IR (1) = 0.015 \times 800 (1) = 12 \text{ volts}$

Test spec reference:

203 2.2

Total marks: 6 marks

Question 4

Give the meaning of the following material properties:

- a) Strength (2 marks)
- b) Elasticity (2 marks)

Mark Scheme**Marks Awarded**

Award 1 mark for a limited answer or single word; or 2 marks for a detailed response.

- a) Resistance to breaking (1)
The resistance of a material to breaking when a (non-impact) load is applied (2).
- b) Stretchiness (1)
The ability of an object or material to resume its normal shape after being stretched or compressed (2)

Test spec reference:

203 3.2

Total marks:4 marks

Question 5

Describe the features of a safety sign that show:

- a) the action is a mandatory requirement (1 mark)
- b) a warning of a potential risk or hazard (2 marks)
- c) information to the reader (such as the location of emergency exits) (2 marks)

Mark Scheme**Marks Awarded**

Award 1 mark for each relevant point made.

- a) The sign is a blue colour
- b) The sign is a yellow colour (1) and a triangular shape (1)
- c) The sign is a rectangular shape (1) and a green colour (1).

Test spec reference:

204 1.3

Total marks: 5 marks

Question 6

An apprentice is writing a production plan for a new product. The plan currently lists only the manufacturing tasks to be carried out, in the correct sequence.

Explain why quality control details should be included in the production plan. (3 marks)

Mark Scheme**Marks Awarded**

Award 1 mark each for each relevant point made to a maximum 3 marks.

To ensure that evaluation takes place (1) and it is clear what needs to be measured (1) and the criteria it is measured against (1) so that appropriate equipment needed for measurement can be identified (1).

Test spec reference:
204 2.2

Total marks: 3 marks

Question 7

One of the key stakeholders in an engineering business is the client who buys the product.

Explain the expectations of this type of stakeholder. (3 marks)

Mark Scheme**Marks Awarded**

Award 1 mark for each relevant point made to a maximum of 3 marks

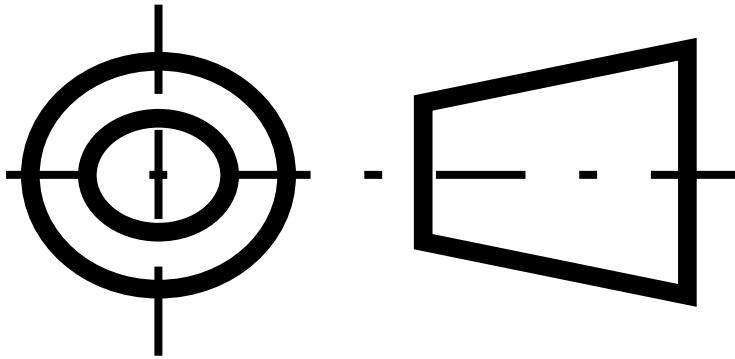
The client will want the product they have purchased (1) to the specification they gave (1) as they need to incorporate it into their next step/planning (1)

Test spec reference:
205 1.3

Total marks: 3 marks

Question 8a

What is the meaning of this symbol on an orthographic drawing? (1 mark)

**Mark Scheme****Marks Awarded**

Award 1 mark for correct answer.

Third angle projection (1).

Test spec reference:

205 4.1

Total marks: 1 marks

Question 8b

Describe where the value of the dimension should be placed on the dimension line shown in Figure 3. (2 marks)

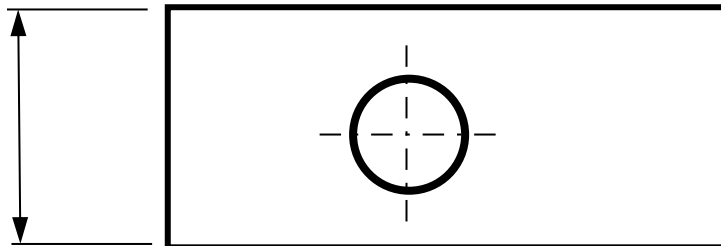


Figure 3

Mark Scheme**Marks Awarded**

Award 1 mark for each relevant point made to a maximum 2 marks.

- To the left of the line (1)
- In the middle (1)

Test spec reference:

205 4.2

Total marks: 2 marks

Question 9

Explain how a 'Six Sigma' approach to quality can improve the performance of an engineering business. (4 marks)

Mark Scheme**Marks Awarded**

Award 1 mark for each relevant point made to a maximum of 4 marks.

- Dimensional tolerance for any part is three standard deviations from the nominal part size (1)
- All (almost) parts should be made within tolerance (1) leading to improved overall quality performance (1) reducing costs in high volume manufacturing (1) leading to overall profitability to the business. (1)

Test spec reference:

205 3.2

Total marks: 4 marks