Surname	Centre Number	Candidate Number
Other Names		4

LEVEL 1 / LEVEL 2 AWARD

9793/01

S19-9793-01

FRIDAY, 17 MAY 2019 – MORNING

ENGINEERING – Unit 3
Solving Engineering Problems (VOCATIONAL)

1 hour 30 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**24**	
2.	**16**	
3.	**20**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. Where the space is not sufficient for your answers, continue at the back of the booklet, taking care to number the continuation correctly.

INFORMATION FOR CANDIDATES

The total number of marks for this paper is 60.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

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Answer **all** *questions in the spaces provided.*

1. The images below show a folding bicycle. The bicycle is designed to be folded and is generally used as a means of transportation.

(a) (i) Give **two** advantages to the user of being able to fold the bicycle. [2]

Advantage 1: .....

.....

Advantage 2: .....

.....

(ii) The diameter of the wheels are visibly smaller than the average bicycle. State **two** possible reasons for this. [2]

Reason 1: .....

.....

Reason 2: .....

.....

Examiner only

(b) Explain the main function of the following labelled parts.

(i) Sprocket [1]

.....

.....

(ii) Wheel mud guard [1]

.....

.....

(c) The bicycle frame is made from mild steel tube.

List **two** properties of mild steel that makes it suitable to manufacture the bicycle frame. [2]

Property 1: .....

Property 2: .....

(d) Look at the following list of materials that could have been used in the manufacture of the bicycle.

Stainless Steel Carbon Fibre

Aluminium Mild Steel

(i) From the list, give **one** example of a ferrous metal. [1]

.....

(ii) From the list, give **one** example of a non-ferrous metal. [1]

.....

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(e) The main frame of the bicycle is made from mild steel tubing. Using clear notes and sketches, name and describe a suitable joining process for the manufacture of the frame. [7]

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(f) There are a number of quick release mechanisms on the bicycle.

Explain what is meant by the term 'quick release mechanism' and why it is important to the design of the bicycle. [2]

.....

.....

.....

(g) The maintenance of a bicycle is very important to the user.

(i) Explain why maintaining the bicycle is important to the user. [2]

.....

.....

(ii) Identify **one** part of the bicycle that should be maintained on a regular basis, and state why this is important.

Maintenance: .....

..... [1]

Reason: .....

..... [2]

24

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Turn over.

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2. Road signs are a common feature up and down the country.

In the pictures below, there are two types of road signs. An older traditional cast-iron road sign and a modern alloy road sign.

(a) Modern technology has made the modern road sign safer for road users. Describe **two** ways this has been achieved.

Description 1: .....

..... [2]

Description 2: .....

..... [2]

(b) State **two** disadvantages in using cast iron to manufacture the old road signs.

Disadvantage 1: .....

..... [1]

Disadvantage 2: .....

..... [1]

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(c) The modern signposts are attached to vertical posts with a series of clips and domed nuts.

Describe **two** advantages of using this method. [4]

Advantage 1: .....

.....

Advantage 2: .....

.....

(d) SMART materials are changing the way design engineers approach designing products. List **two** different SMART materials, and describe how they could benefit the user on a product of your choice.

SMART material 1: ..... [1]

Benefit to the user: .....

..... [2]

SMART material 2: ..... [1]

Benefit to the user: .....

..... [2]

16

Turn over.

Examiner only

3. Shown below are two pieces of equipment used in an engineering workshop.

(a) Complete the table below by correctly naming **each** piece of equipment and write a description of its use.

Engineering equipment	Equipment name	Equipment use
	.... [1]	.... [1]
	.... [1]	.... [1]

(b) Various tools are used to mark different materials in the workshop.

Look at the descriptions below, and name the correct marking tool for **each** task.

(i) Mark a parallel line to an edge on an aluminium sheet. [1]

.....

(ii) To ensure a marked line is at right angles to an edge. [1]

.....

(c) Identify and list the basic machining operations required to mill a slot in aluminium stock with a vertical miller. 3 × [1]

Step 1: .....

Step 2: .....

Step 3: .....

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(d) A group of pupils have been asked to update the door sign for the staffroom at their school. The old one was small and had started to fade.

The new sign will be manufactured out of 2 mm thick High Impact Polystyrene (HIPs).

Below is a front view of the piece of HIPs, after it has been laser cut. It is a standard rectangle with four screw holes, one in each corner.

Calculate the total volume of the remaining HIPs plastic after the laser cutting operation. [6]

You must show **all** *your calculations.*

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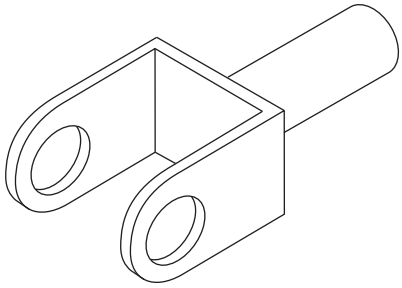
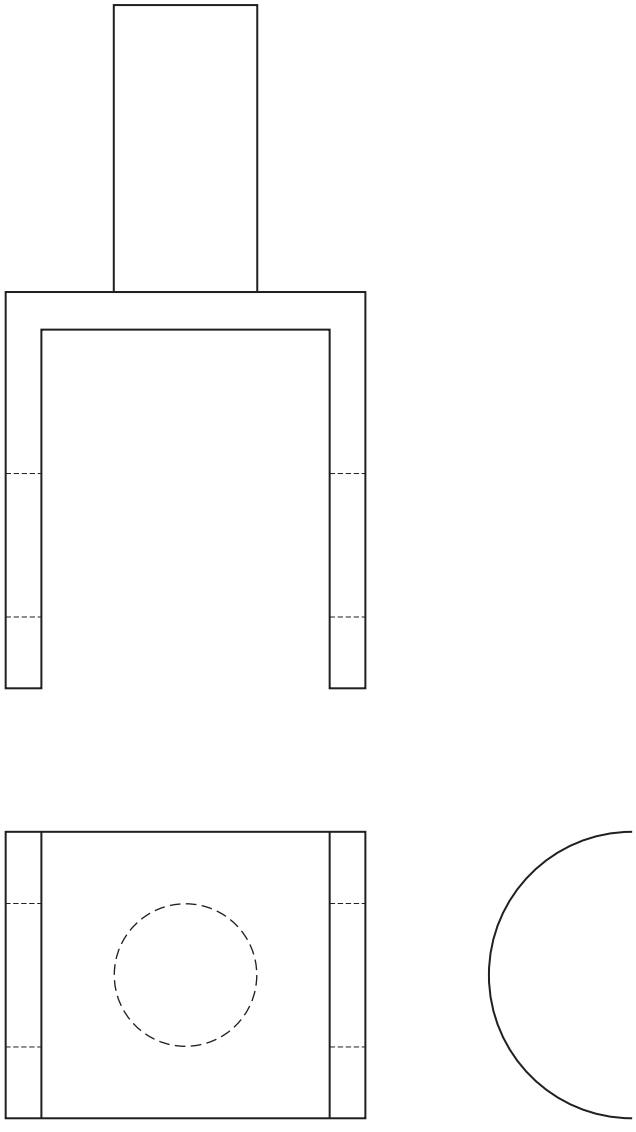
(e) This is a picture of a bracket used to hold parts of a bicycle during manufacture.



Complete the orthographic drawing below. The front and plan views have already been completed for you. [5]

You must show all features and hidden detail.



20

END OF PAPER

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For continuation only.