

Candidate Name	Centre Number	Candidate Number
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GCSE

142/02

DESIGN AND TECHNOLOGY

PAPER 2

FOCUS AREA: SYSTEMS AND CONTROL

TECHNOLOGY

Foundation Tier

A.M. MONDAY, 2 June 2008

1½ hours

	Leave Blank
Question 1	
Question 2	
Question 3	
Question 4	
Question 5	
TOTAL MARK	

ADDITIONAL MATERIALS

You will need basic drawing equipment, a calculator and coloured pencils for this examination.

INSTRUCTIONS TO CANDIDATES

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

Answer **all** questions.

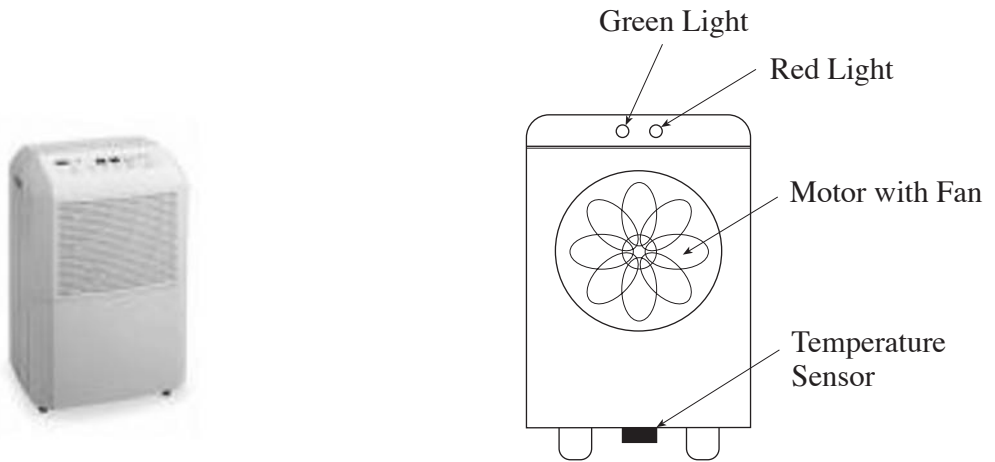
Write your answers in the spaces provided in this booklet. Where the space is not sufficient for your answer, continue the answer at the back of the book, taking care to number the continuation correctly.

INFORMATION FOR CANDIDATES

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

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

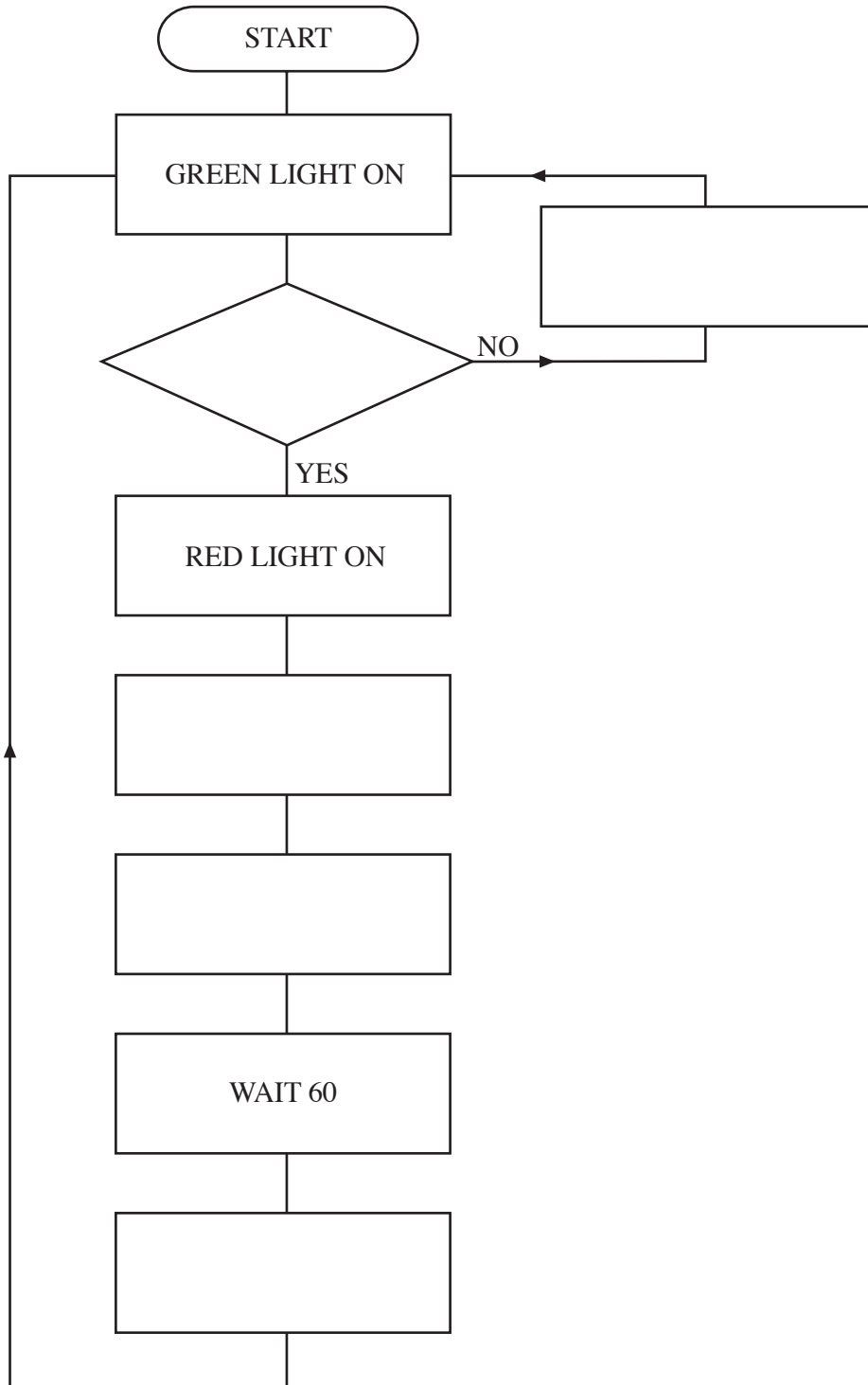
1. (a) An air conditioning unit activates a cooling fan when the room temperature reaches 75°C .



- (i) Place a tick (✓) in the **Input** or **Output** columns for each of the following parts of the system. [4]

	<i>Input</i>	<i>Output</i>
Green Light		
Temperature Sensor		
Red Light		
Fan Motor		

- (ii) The diagram below shows a flowchart which will activate the fan when the temperature is above 75 °C. The green light will be on when the room is cool and the red light will be on when the room is hot. **Using** the statements on the right, **complete** the flowchart. [5]



Statements:

Fan Motor on.

Green Light off.

Is Temperature >75 °C?

Fan Motor off.

Red light off.

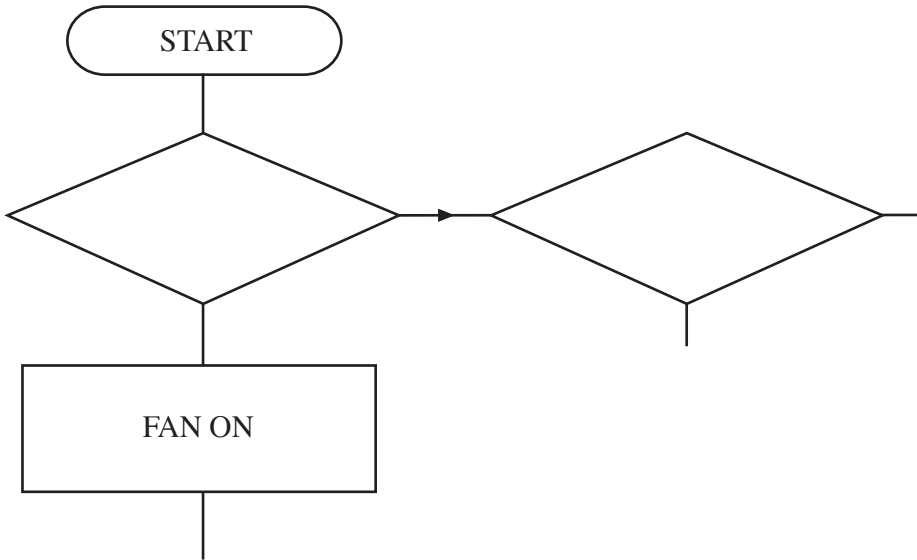
- (iii) **Explain** the reason for the command **WAIT 60** in the flowchart. [2]

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(b) The air conditioning unit can also heat the room if it is cold.

(i) **Using** the statements below, **complete** the flowchart so the air conditioning unit can cool the room if it is too hot, and heat the room if it is too cold. [8]



Statements:

Fan Off.

Wait 60.

Heater On.

Is Room Too hot?

Is Room Too Cold?

Wait 60.

Heater Off.

(ii) A Programmable Interface Controller (PIC) could be used in the air conditioning unit. **Give one** advantage of using this device. [2]

Advantage:

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2. (a) Study the pictures below and give the correct name for each electronic component.



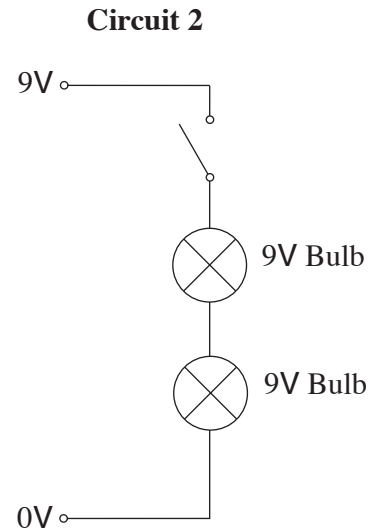
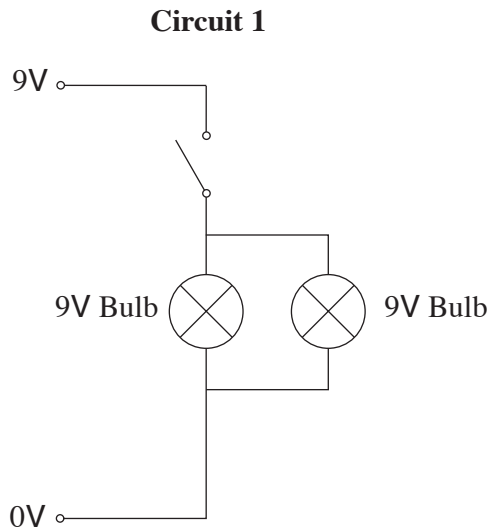
Name:

Name:

Name:

[3]

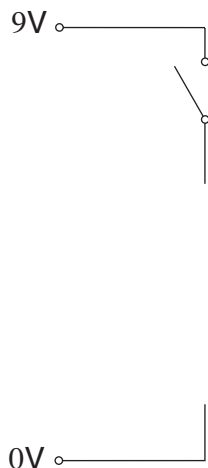
(b) (i) A student designs two different lighting circuits. Circle the correct word in each sentence shown below.



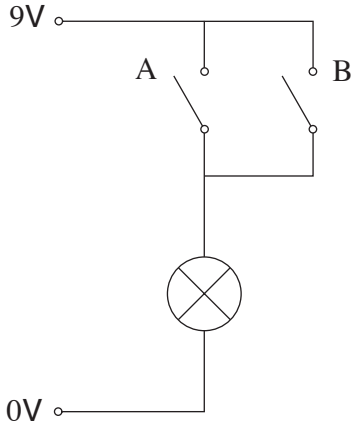
I. When the switch is closed in circuit 1 the bulbs would be lit to **full / half** brightness. [1]

II. When the switch is closed in circuit 2 the bulbs would be lit to **full / half** brightness. [1]

(ii) Complete the circuit diagram shown below by including **two** bulbs drawn in series. [2]

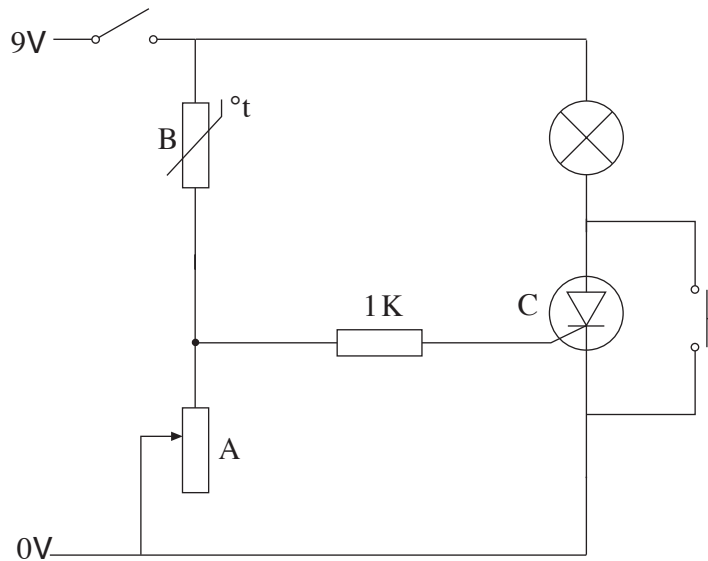


- (iii) Look at the circuit below and **complete** the table showing whether the bulb is **on** or **off**. [3]



<i>Switch A</i>	<i>Switch B</i>	<i>Bulb</i>
Off	Off	
Off	On	
On	On	

- (c) **Study** the electronic circuit below.



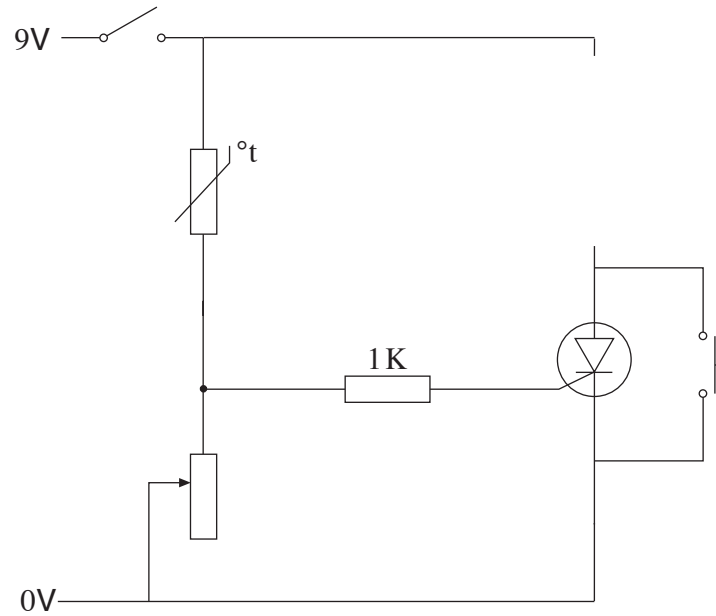
- (i) **Name** component A. [1]
- (ii) **Name** component B. [1]
- (iii) Component C is a Thyristor. In the space below, **describe** how the thyristor works.[3]

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- (iv) The circuit needs to be changed so that an LED can be used instead of a bulb. **Complete** the diagram showing the change in place. [3]



- (v) **Describe one** way that the designer could model this circuit to check it works before constructing it. [2]

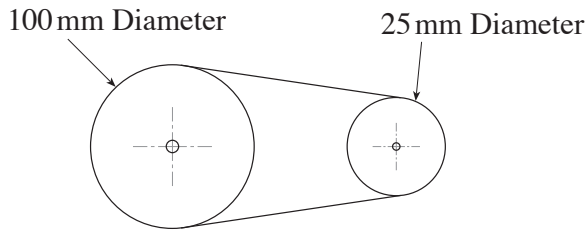
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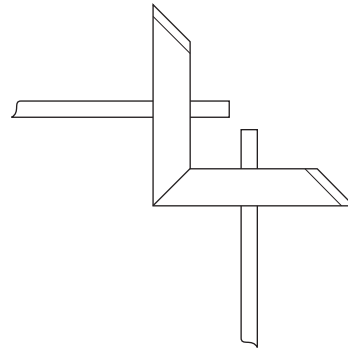
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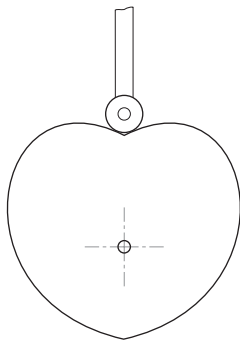
3. (a) Study the mechanisms below and complete the sentences that follow.



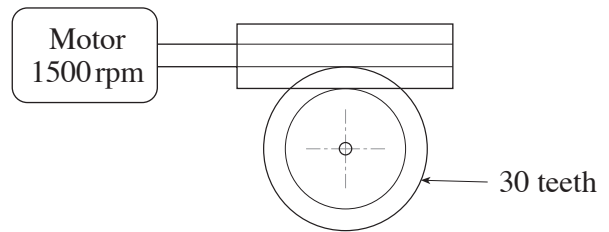
Pulley and Belt



Bevel Gears



Cam and Follower



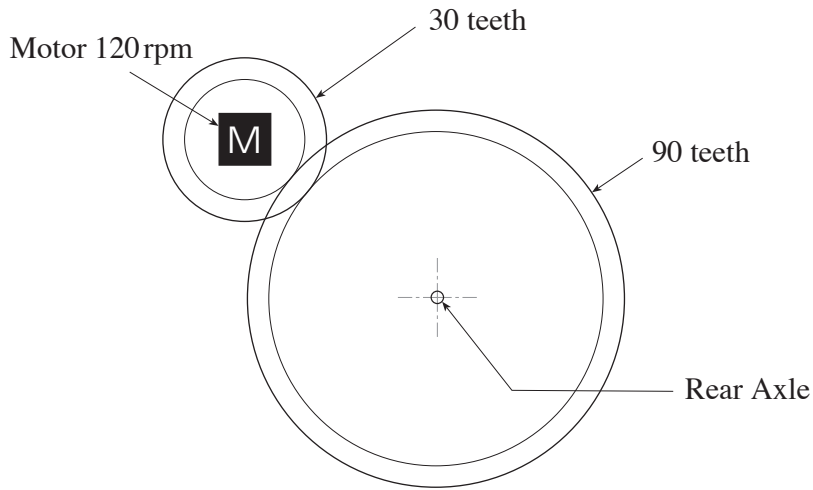
Worm Drive

- (i) The ratio of the pulley and belt system is [1]
 - (ii) The transfer rotary motion through 90 degrees. [1]
 - (iii) A system converts rotary to linear motion. [1]
 - (iv) The gear ratio of the worm drive system is [1]
- (b) **Explain** why some mechanisms often require lubricating. [2]

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(c) The toy train shown is driven by the gear system below.



(i) **Circle** the correct word in the statement below.

The gears are arranged in a **simple** / **compound** system.

[1]

(ii) **Calculate** the rotational velocity (RV) of gear **X**. (*Show all workings.*)

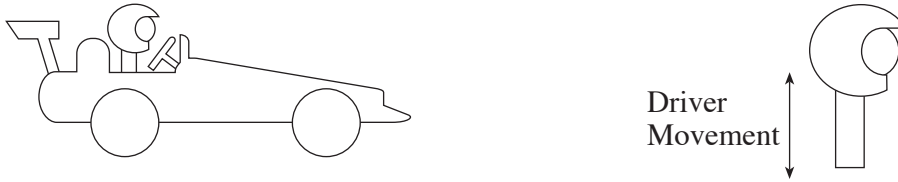
[3]

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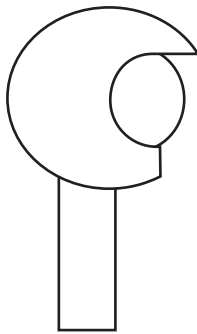
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(d) The toy car shown can be pulled or pushed by a child.



(i) As the car moves, the driver is required to rise and fall. **Complete** the diagram below to show a mechanism that will do this. [5]



(ii) **Name** a suitable wood for making the wheels and give a reason for your choice.

Material: [1]

Reason for choice:

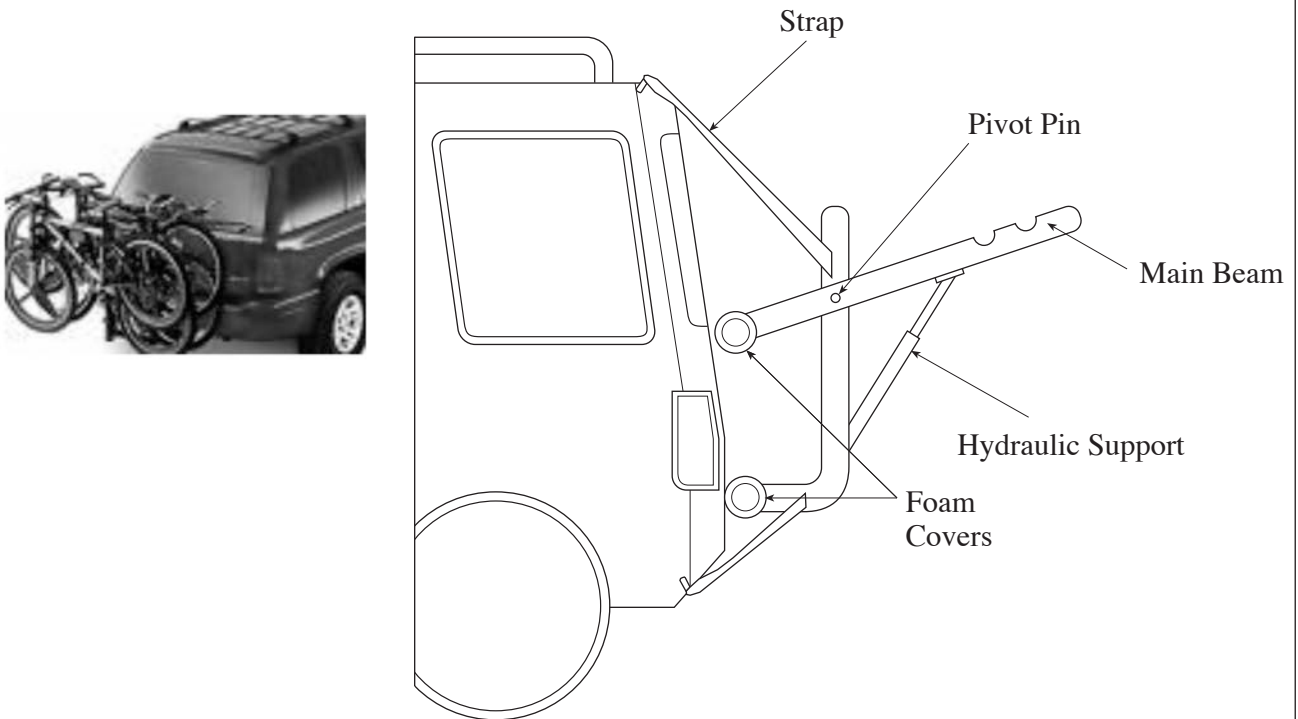
..... [2]

(iii) **Explain** briefly a method of manufacturing which could be used to make four identical wheels. [2]

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4. A bicycle rack for a car is shown below.



(a) When the bicycle rack is loaded a range of forces act on different parts. **Select** the correct word from the list below to **complete** each of the sentences.

TENSION COMPRESSION SHEARING BENDING

- (i) The force acting on the strap is in [1]
- (ii) The pivot pin is experiencing a force. [1]
- (iii) The force acting on the hydraulic support is [1]
- (iv) The main beam will experience a force. [1]

(b) (i) **Explain** the reason for the foam covers used in the bicycle rack. [2]

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- (ii) **Complete** the table below by giving reasons for the materials selected for certain parts of the bicycle rack. [2 × 2]

<i>Part</i>	<i>Material</i>	<i>Reason for selection</i>
Straps	Nylon
Main Beam	Aluminium

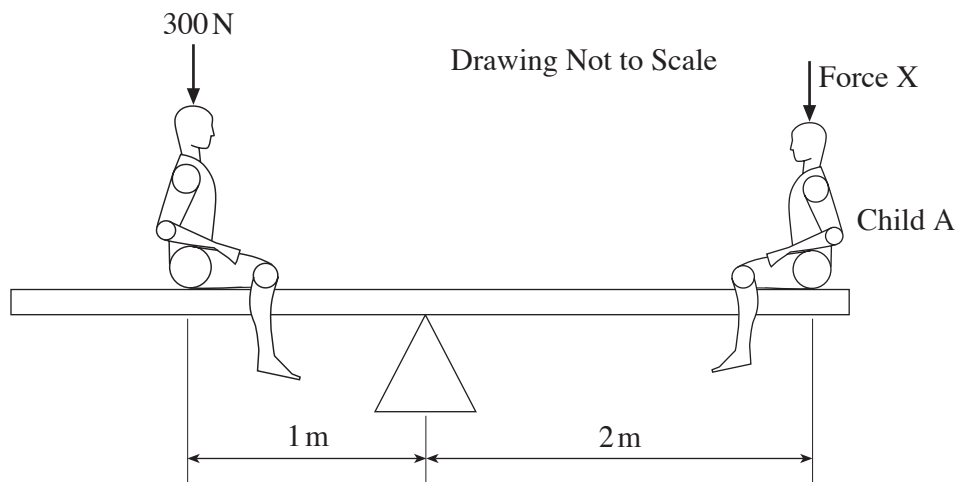
- (c) The diagram below shows two children balanced on a see-saw.

- (i) **Circle** the correct Class of lever for the see-saw shown below. [1]

Class 1

Class 2

Class 3



- (ii) Using the principle of moments, **calculate** the downward force X produced by child A. (Show all workings.) [3]

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5. A clown, who works as a children's entertainer, requires an animated / moving advertisement to promote his act.

SPECIFICATION

The system must:

- start when a switch is pressed;
- be free standing, portable and battery powered;
- produce a fun / novelty movement to promote the entertainer.

Sketch your design in the boxes given.

Marks will be awarded for:

- | | |
|--|-----|
| (i) labelled sketch showing the front of the advertisement; | [5] |
| (ii) a labelled circuit diagram showing details of any electronic components used; | [4] |
| (iii) labelled details of the mechanical system used to create movement; | [4] |
| (iv) including three important dimensions; | [3] |
| (v) names of any materials used; | [3] |
| (vi) quality of communication. | [6] |

(i) Labelled sketch showing the front of the advertisement.

(ii) Labelled circuit diagram.

(iii) Labelled details of the mechanical system.

