EXAM FEVER

Technology 8

Workbook

- ANSWERS -

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Images/Diagrams

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1 What is Technology?

Question 1

Technology is the process of using natural and synthetic materials to make a new product that will solve a problem.

Question 2

- Identifying the problem.
- Researching how to solve the problem.
- Designing a solution.
- Making a prototype (a test model) of the solution to test the design.
- Communicating that solution.

Question 3

- The effect the design might have on the environment.
- How the design might affect the communities in the country, good or bad.
- Whether the design might be biased towards one or more groups of people.

2 The Design Process

Question 1

1.1 One marks for each of the following:

- I have been asked by Amta Technology.
- To design a protective case for their new cell phone.
- It will be used in the launch of their new cell phone range at the end of the year.
- The range will mainly be used by high school children.

4 marks

1.2
- The case size must be 100 mm high, 60 mm wide and 10 mm thick.
- There must be a place for a camera as well as buttons to work the phone.
- The materials used need to be strong.
- The case must be colourful.

4 marks

1.3
- The materials must not be too expensive.
- The case must appeal to high school kids.

2 marks

1.4 Evaluation rubric: (10 marks)

Criteria	Mark out of 3		
The case size is 100 mm high, 60 mm wide, 10 mm thick.	1	2	3
A place for a camera as well as buttons to work the phone.	1	2	3
The materials used are strong.	1	2	3
The case is colourful.	1	2	3
The materials are not too expensive.	1	2	3
The case appeals to high school kids.	1	2	3

- 6 Marks for including all aspects of the cap.
- 2 Mark for a neat layout.
- 2 Marks for a logical marking scheme.

Question 2

2.1 One marks for each of the following:

- I have been asked by my school.
- To design a new classroom.
- It needs to be built because the school is running out of space for new students.
- Mathematics and Technology will be the two main subjects taught in the classroom.

4 marks

2.2
- It must have a back room for storage.
- It must be made out of strong materials.
- The ceiling must be high for the class to stay cool in summer.
- The inside must be painted a bright colour.

4 marks

2.3
- It must be big enough to fit 35 students.
- It must have at least 2 doors.
- The windows may not be smaller than 100 mm wide and 1500 mm high.
- The materials must not be too expensive.

4 marks

2.4 Evaluation rubric: (10 marks)

Criteria	Mark out of 3		
It has a back room for storage.	1	2	3
It is made out of strong materials.	1	2	3
The ceiling is high for the class to stay cool in summer.	1	2	3
The inside is painted a bright colour.	1	2	3
It is big enough to fit 35 students.	1	2	3
It has at least 2 doors.	1	2	3
Windows are not smaller than 100 mm wide,1 500 mm high.	1	2	3
The materials not too expensive.	1	2	3

- 8 Marks for including all aspects of the cap.
- 1 Mark for a neat layout.
- 2 Marks for a logical marking scheme.

Question 3

3.1 One marks for each of the following:

- I have decided.
- To design a new chair for my teacher.
- The chair will replace their current chair that hurts their back
- There are a set of requirements to be followed.

4 marks

3.2
- The chair must be 500 mm high.
- The chair must be made out of a very hard material.
- The chair must be painted green.

3 marks

3.3
- The chair must last at least 10 years.
- The chair back must not angle less than 10 degrees.
- The chair seat must not be smaller than 400 mm wide.
- The complete height of the chair must not exceed 1 000 mm.

4 marks

3.4 Evaluation rubric: (10 marks)

Criteria	Mark out of 3		
The chair is 500 mm high.	1	2	3
The chair is made out of a very hard material.	1	2	3
The chair is painted green.	1	2	3
The chair will last at least 10 years.	1	2	3
The chair back is not angled less than 10 degrees.	1	2	3
The chair seat is not smaller than 400 mm wide.	1	2	3
The complete height of the chair does not exceed 1000 mm.	1	2	3

- 7 Marks for including all aspects of the chair.
- 1 Mark for a neat layout.
- 2 Marks for a logical marking scheme.

3 Graphic Communication

Question 1

1.1 Three feint lines 100 mm long.

1.2 Four dark lines 120 mm long.

1.3 Three dashed lines 130 mm long.

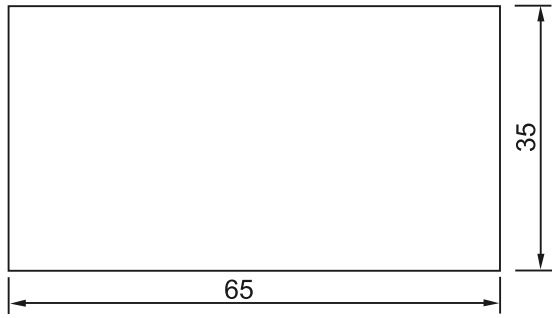
1.4 Two wavy lines 50 mm long.

1.5 Three chain lines 90 mm long.

1.6 Draw one each of the following lines 120 mm long:

Question 2

2.1



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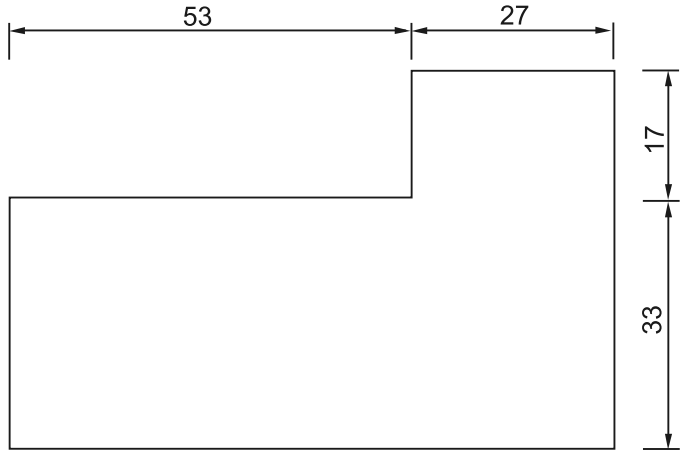
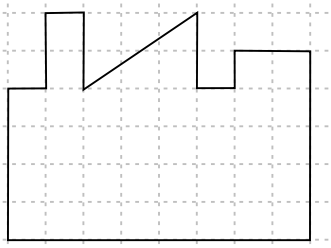


Question 3



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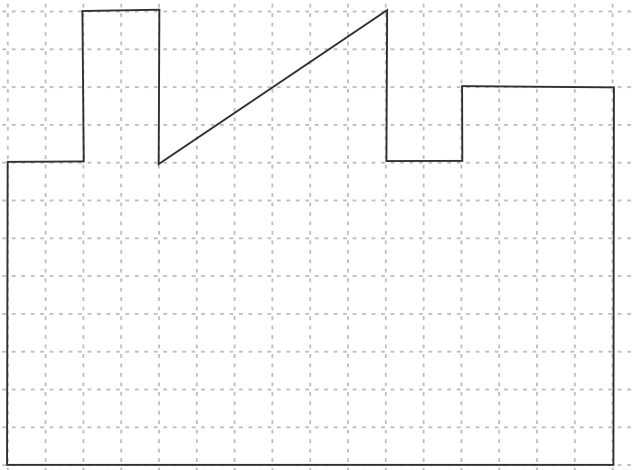

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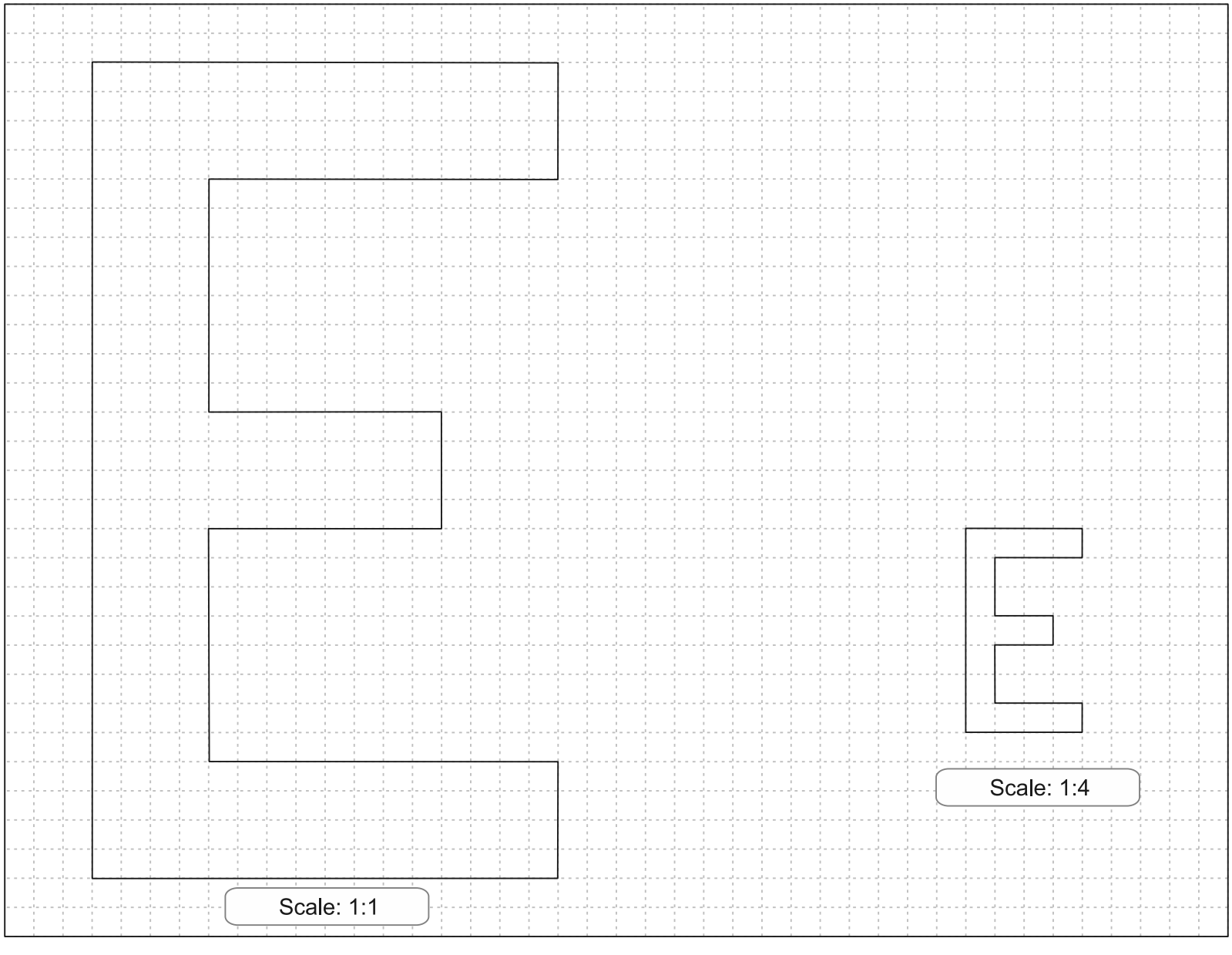

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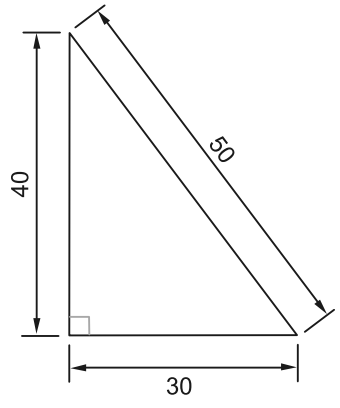
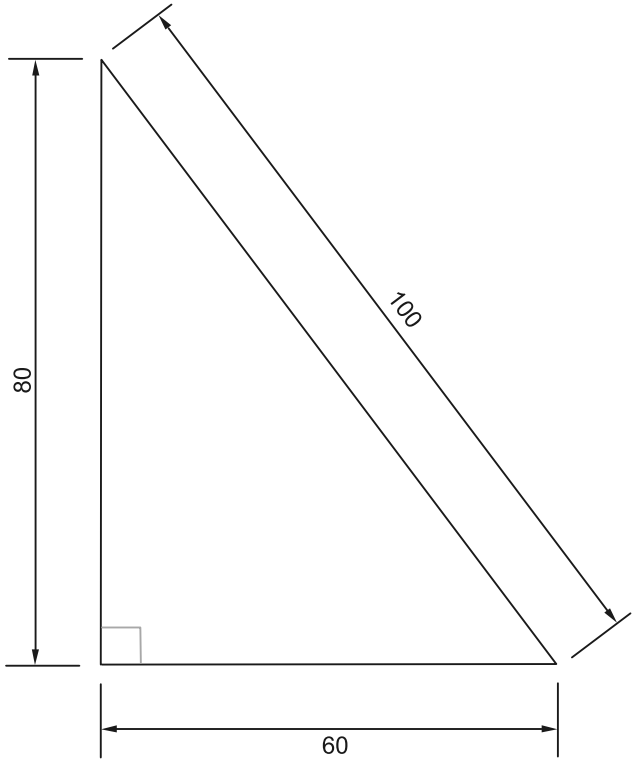
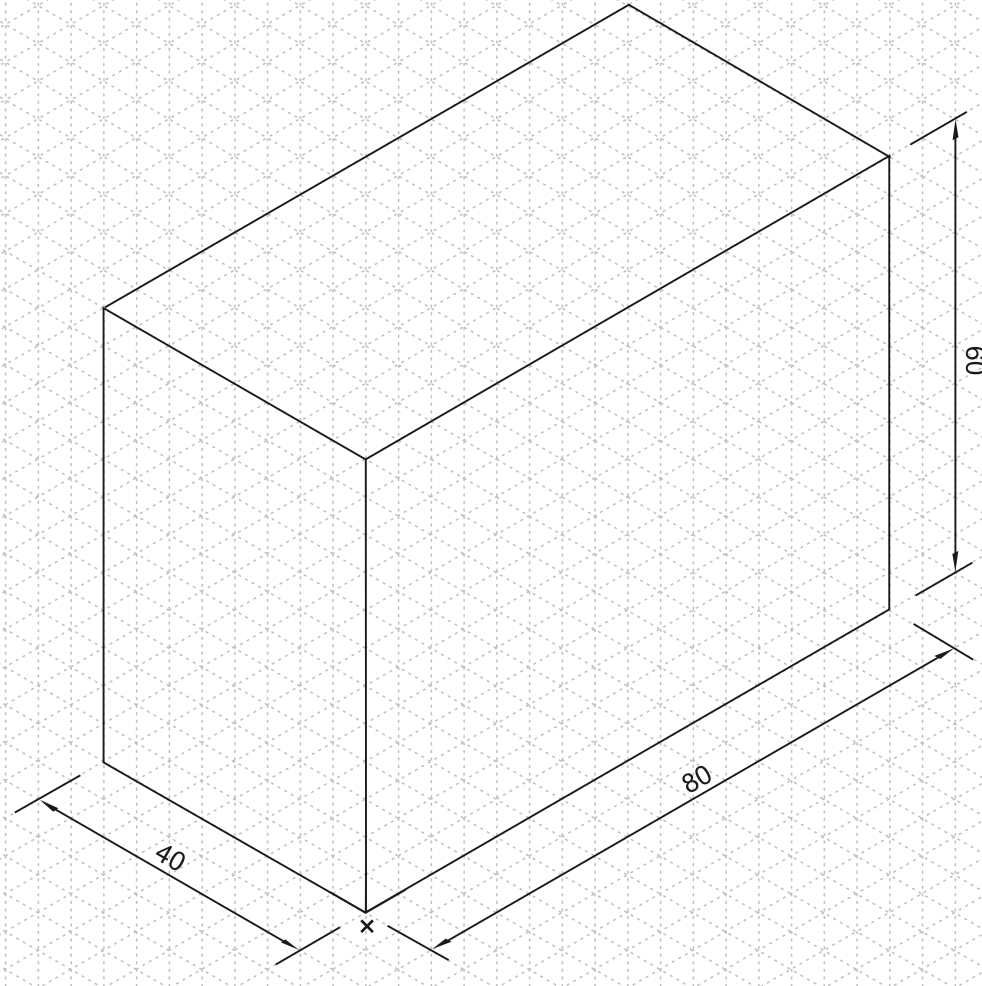




Question 4

Answer will be identical to the drawing in the question.

4.1



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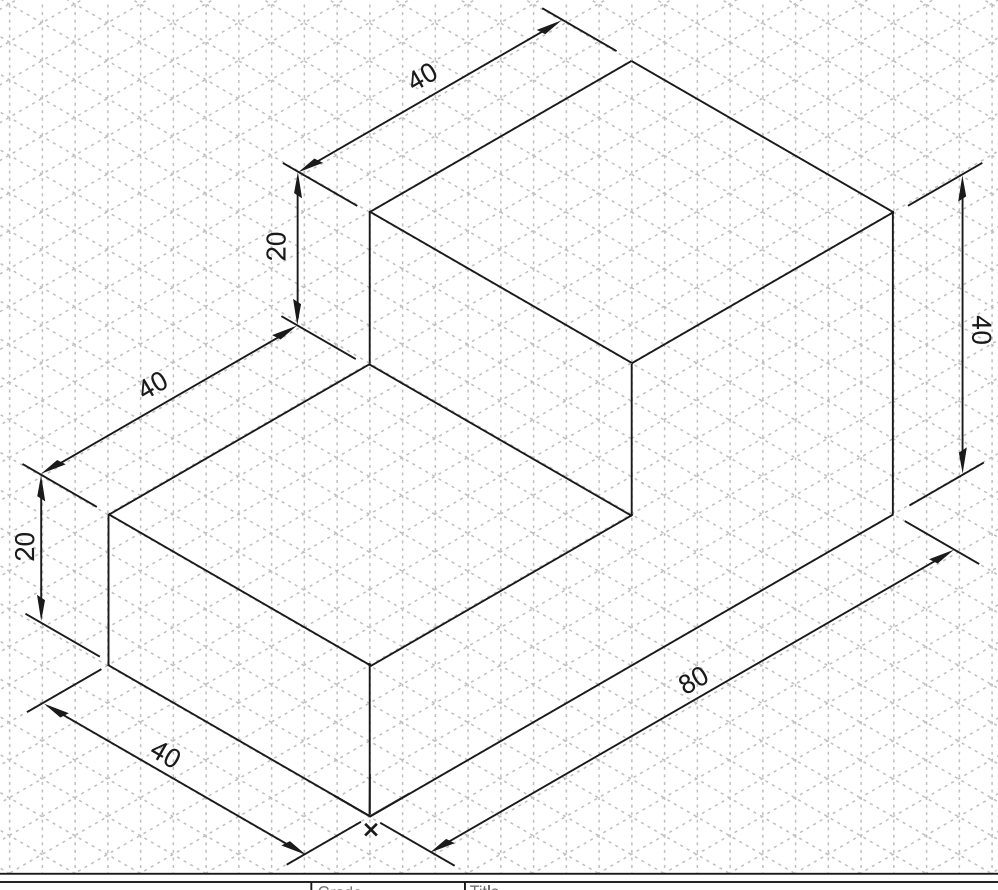

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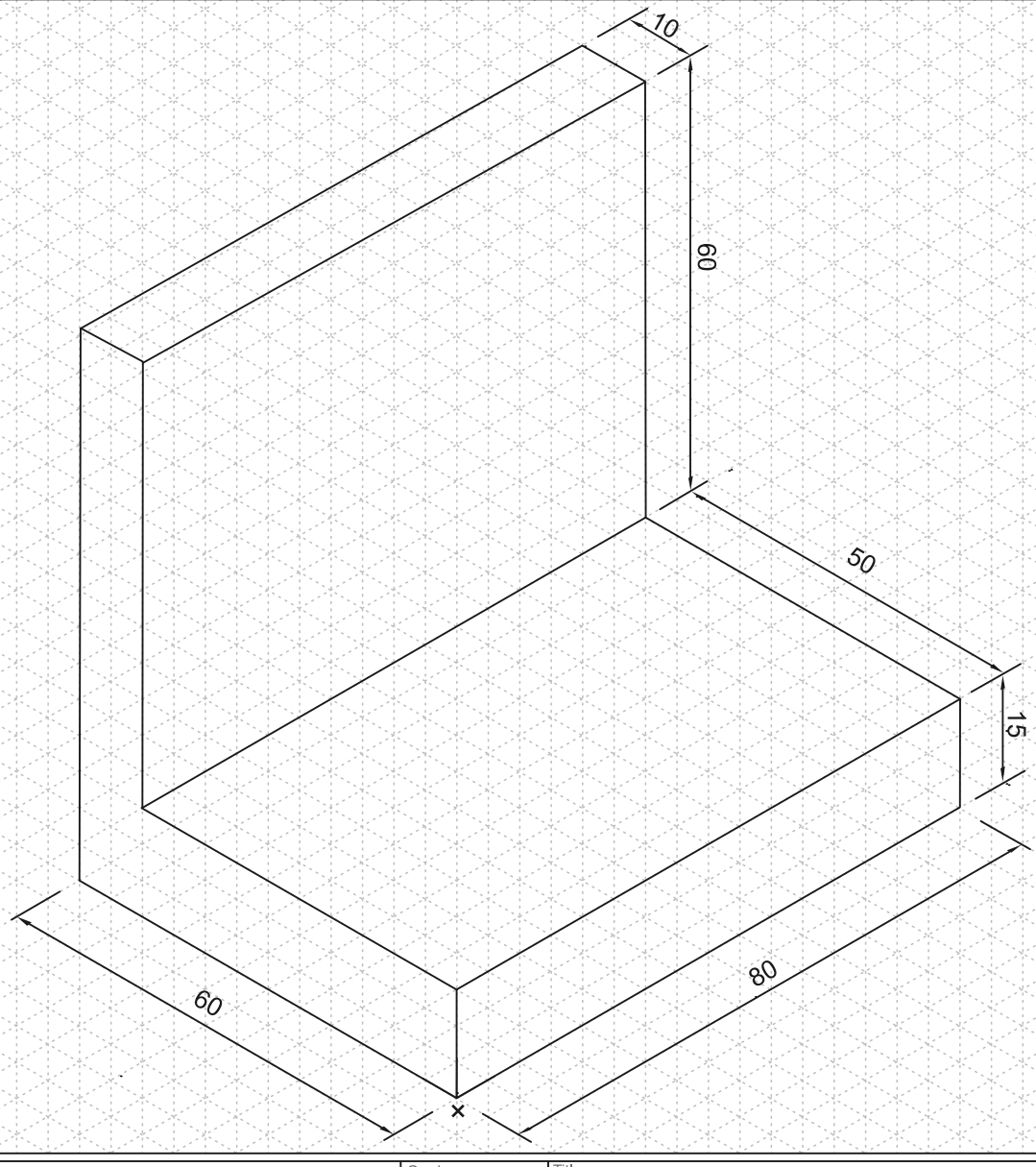

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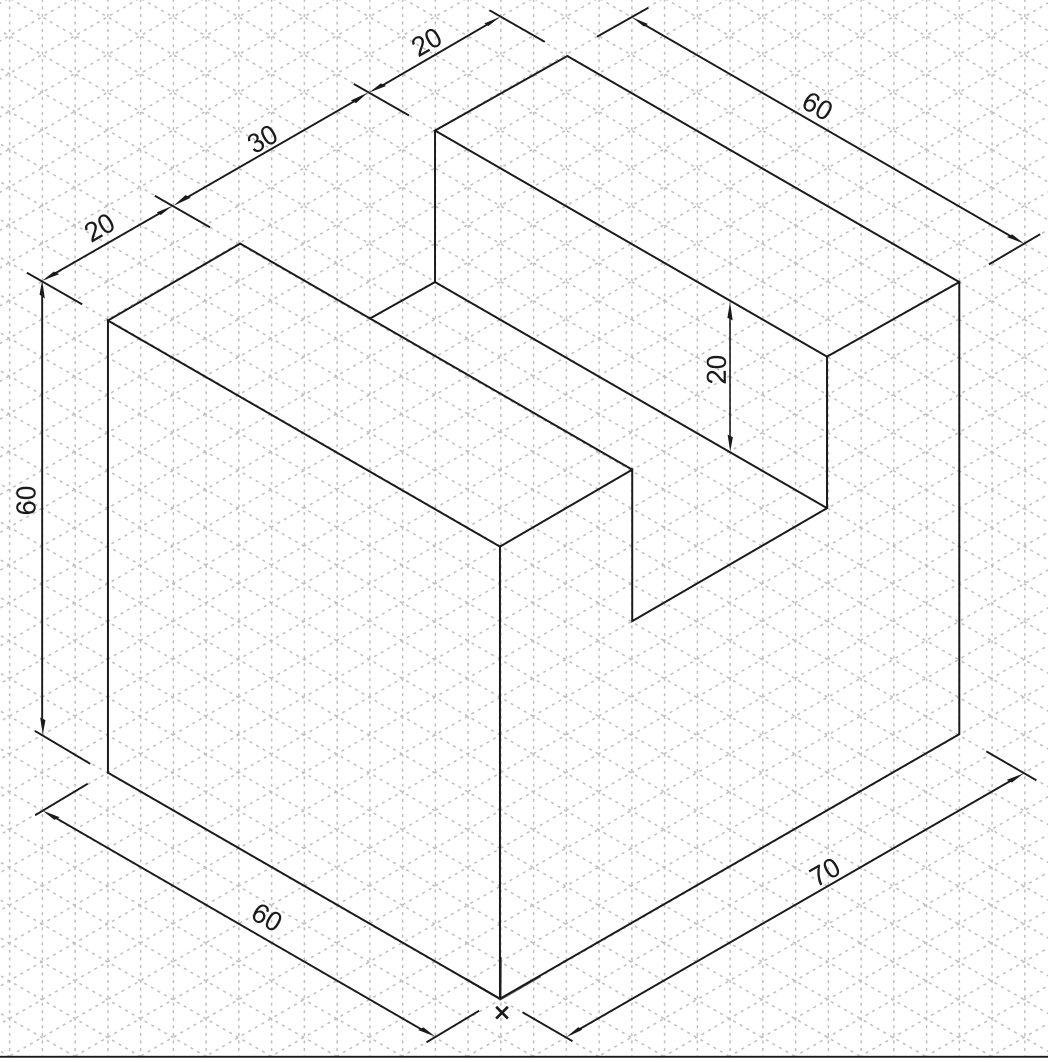

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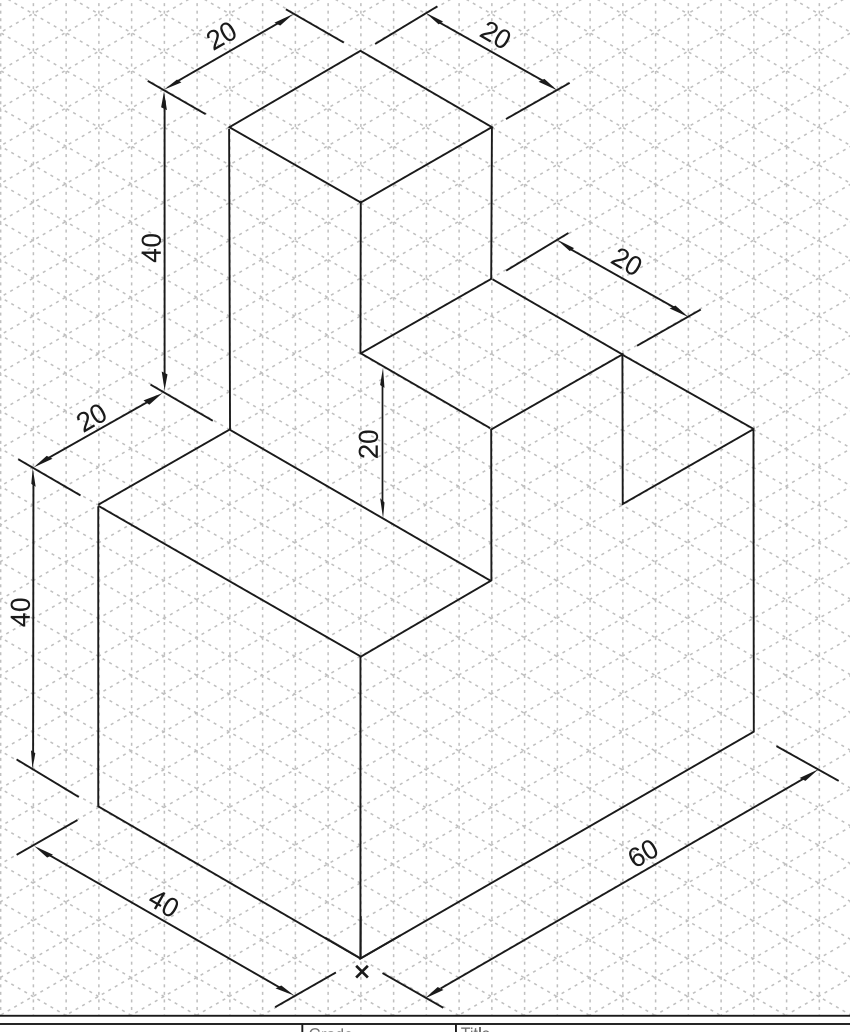

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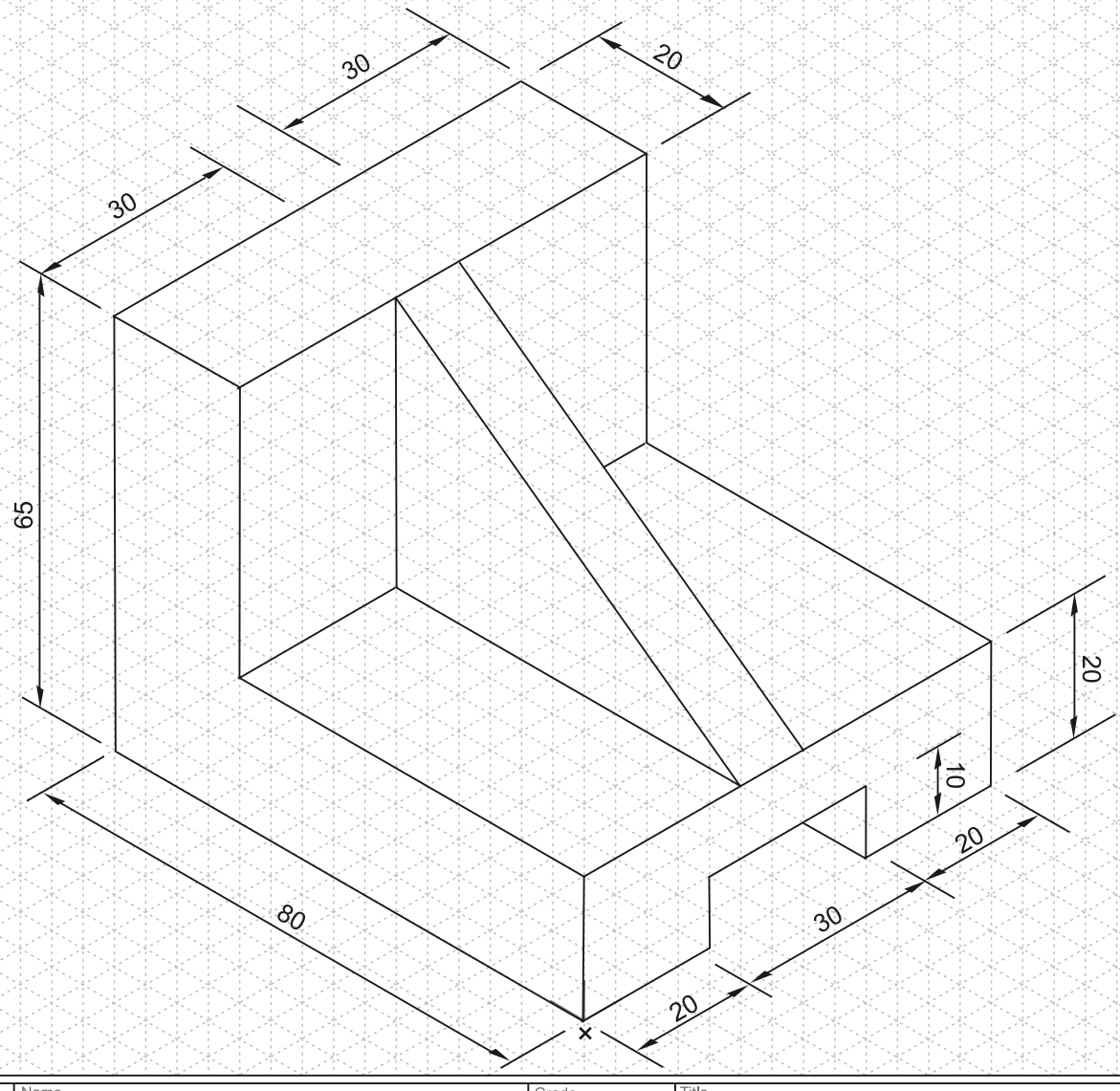
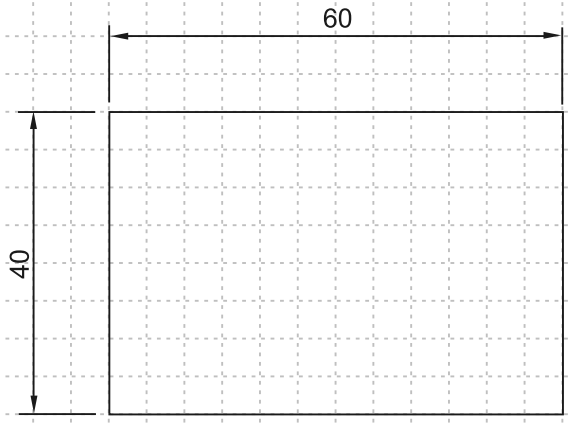


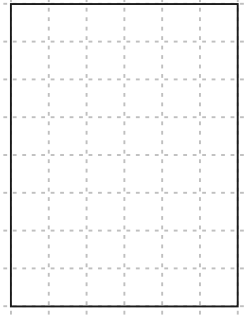
Date	Name	Grade	Title
		12	

5.1

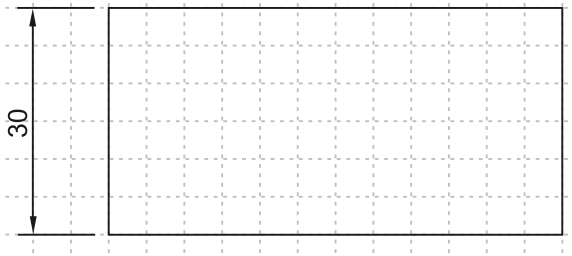
Front view



Left side view



Top view (plan)



Date	Name	Grade	Title
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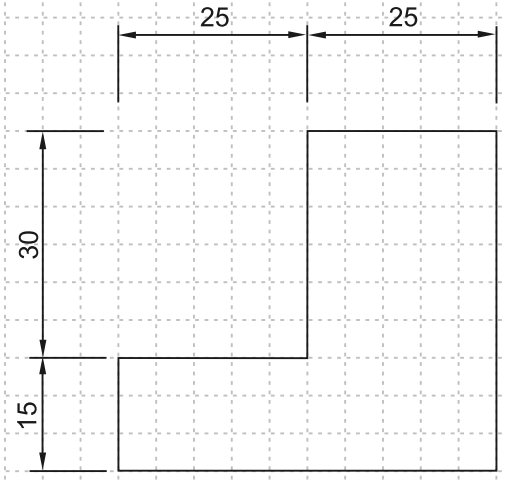
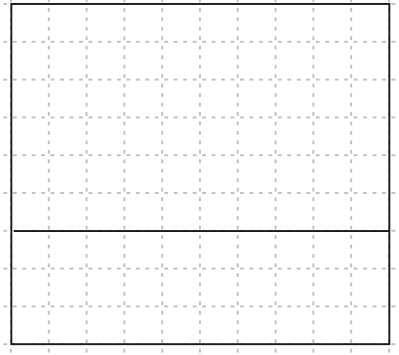
5.2

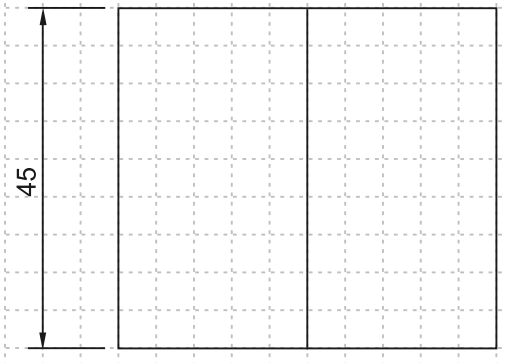
Front view



Left side view



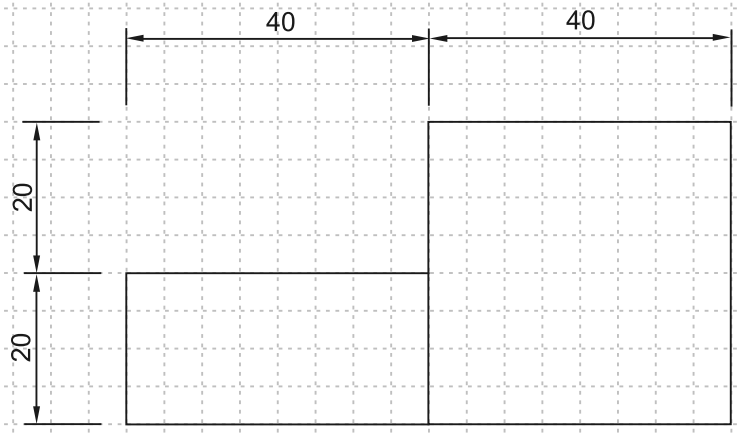
Top view (plan)



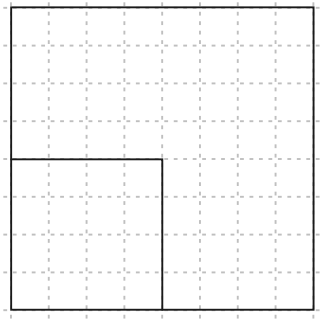
Date	Name	Grade	Title

5.3

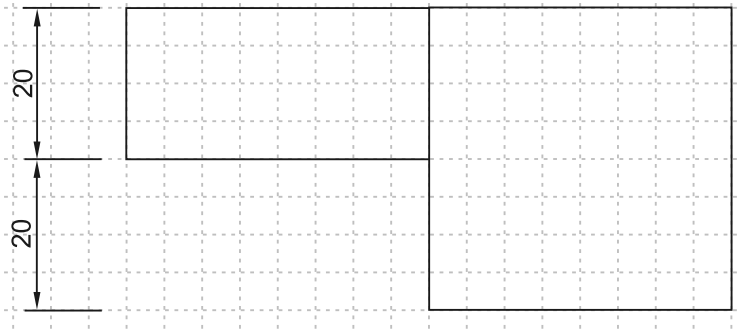
Front view



Left side view



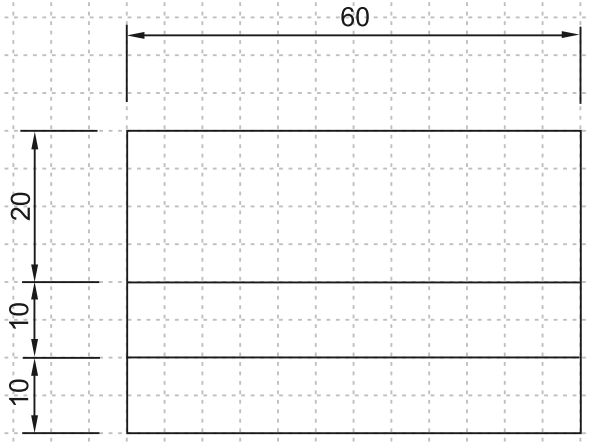
Top view
(plan)



Date	Name	Grade	Title

5.4

Front view



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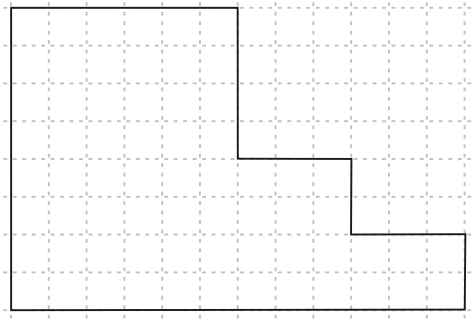
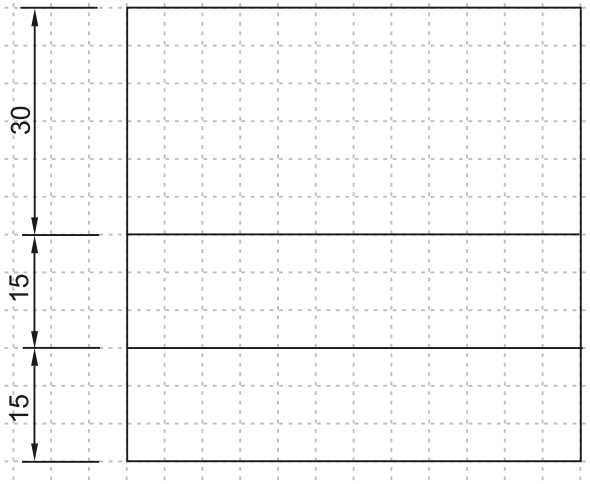


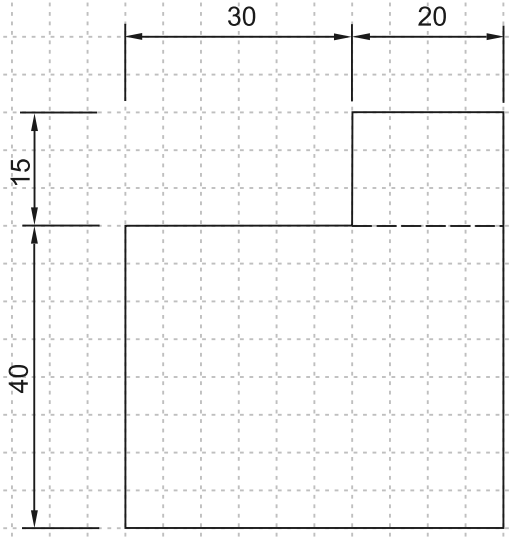
Top view (plan)



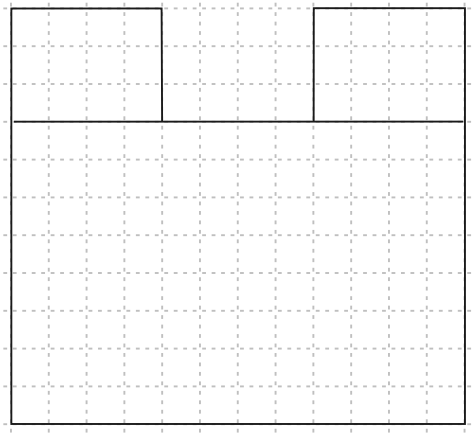
Date	Name	Grade	Title

5.5

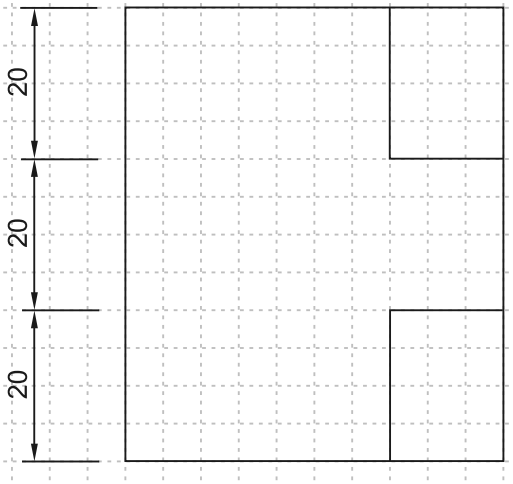
Front view



Left side view



Top view (plan)



Date	Name	Grade	Title
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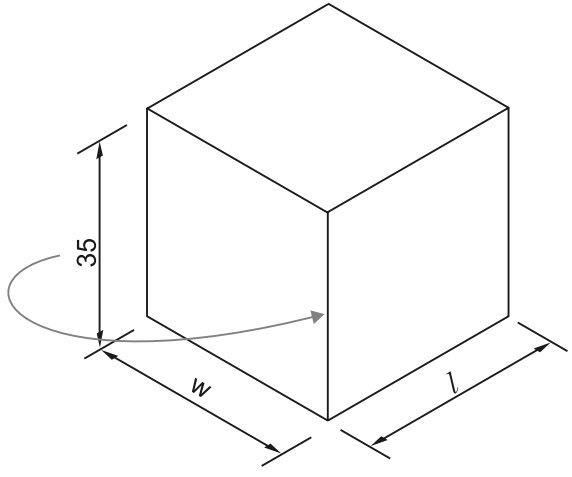
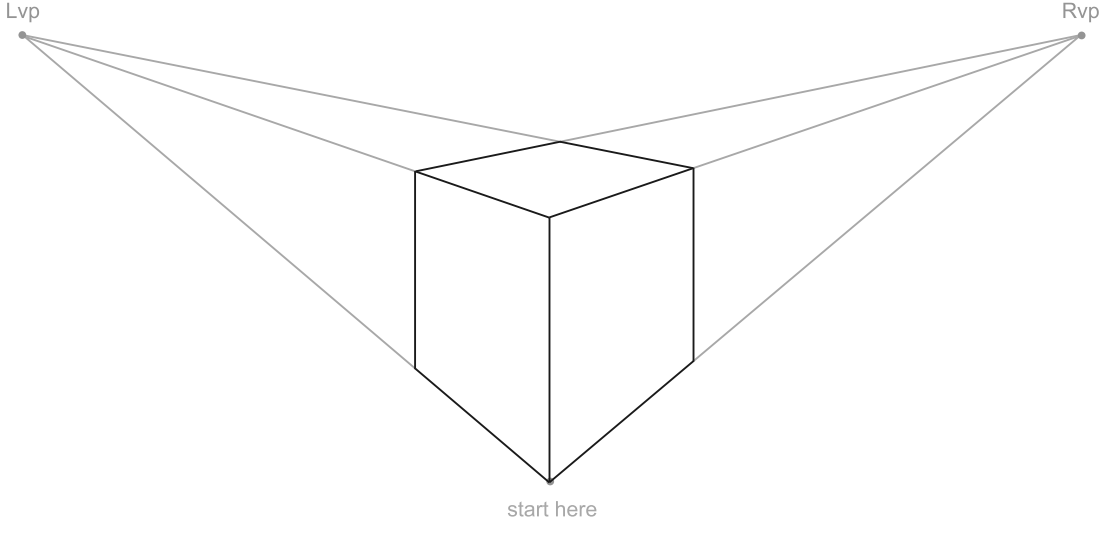
Question 8

8.1





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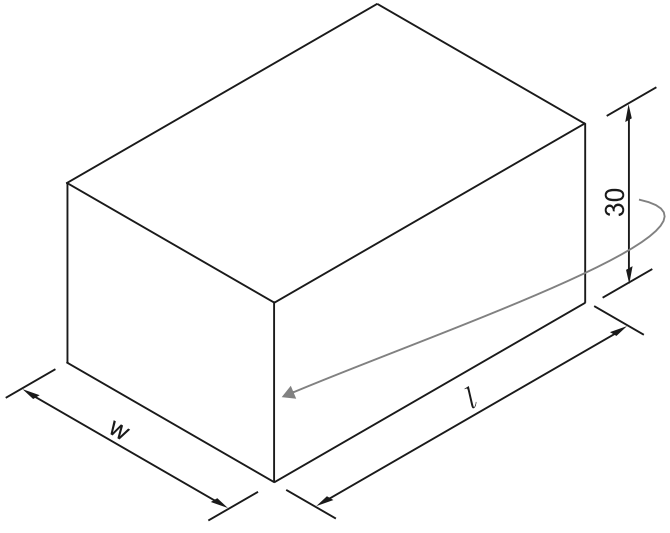

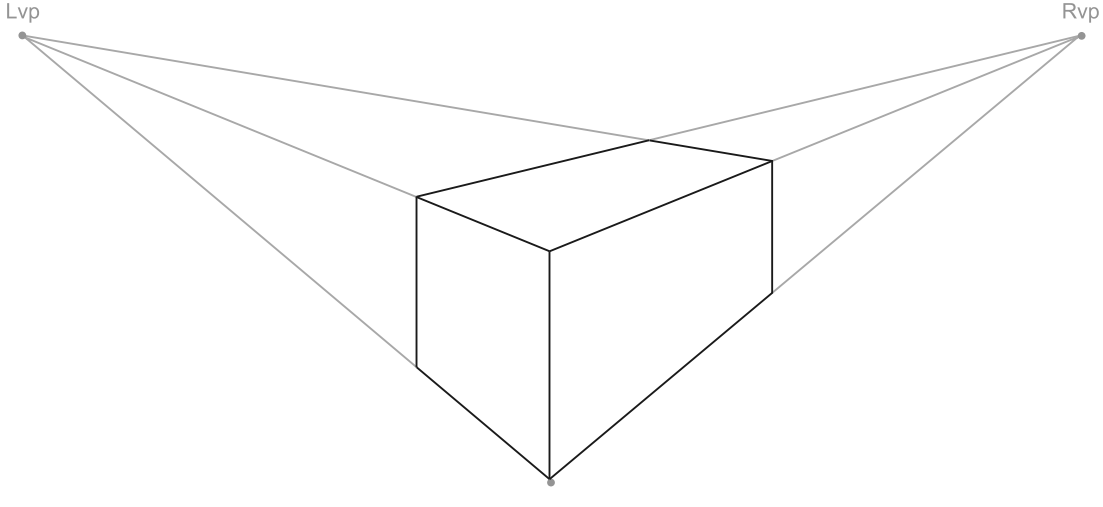

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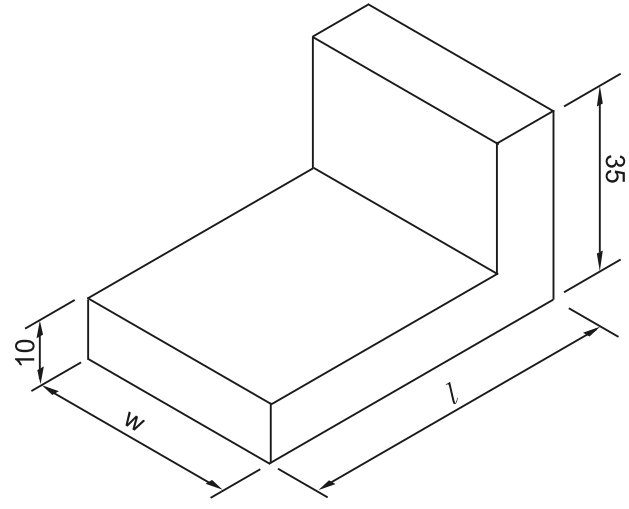

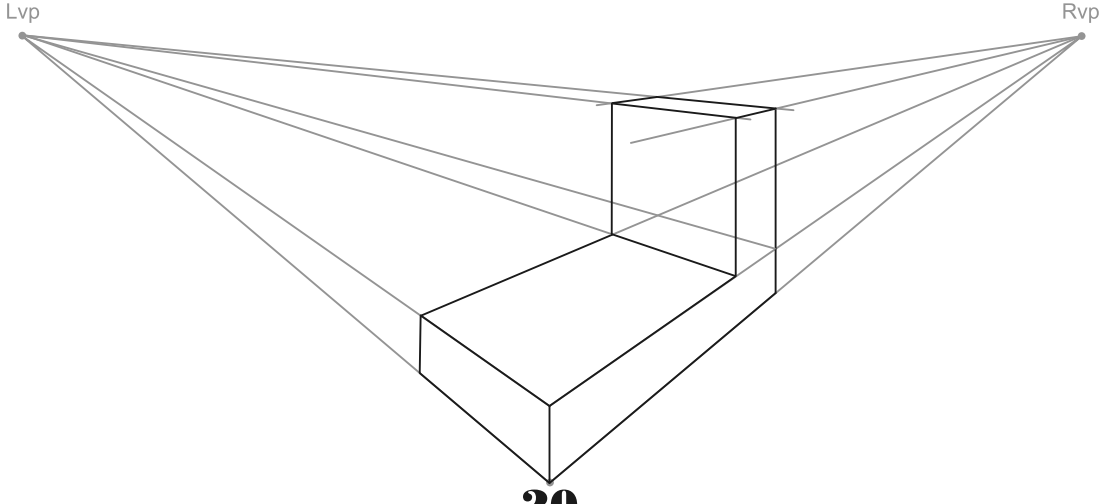

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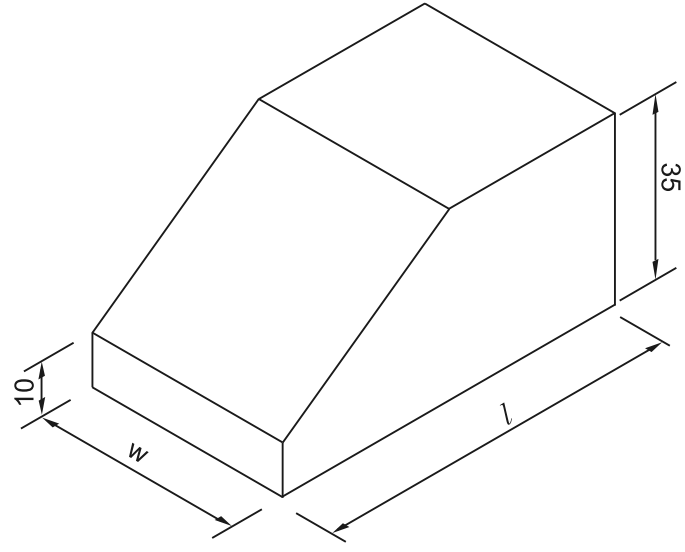
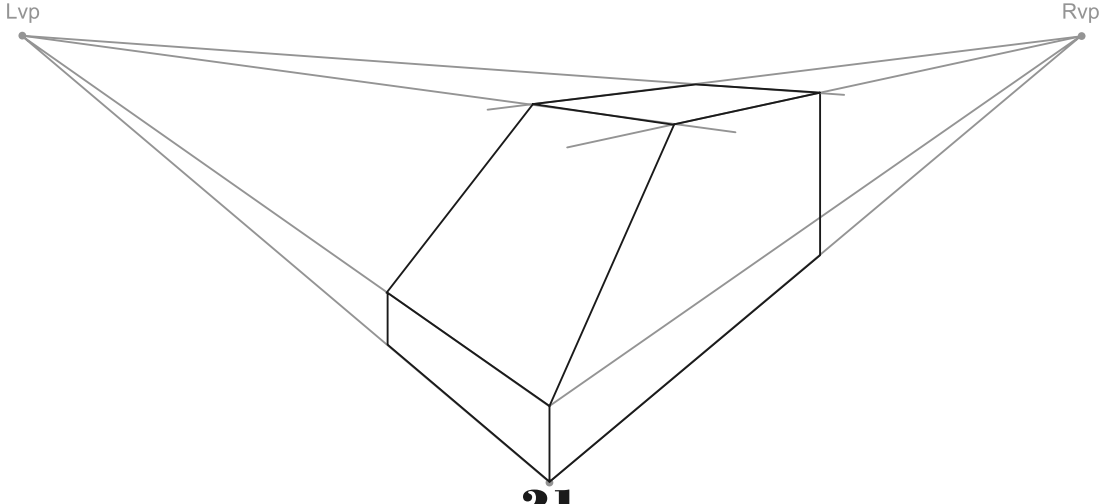




4 Forces

Question 1

1.1 Compression and Tension (2)

1.2 (5)
- Tension (Rope)
- Compression (Ball)
- Compression and tension (Spring)
- Torsion (Wet cloth)
- Shearing (Paper)

Question 2

2.1 B
2.2 B
2.3 C
2.4 C
2.5 C (5)

5 Structures

Question 1

Any appropriate sketch - Ref Book/Study Guide

1 Mark for each correct Example and 2 marks for a clear sketch of one of the given examples.

Question 2

2.1
- If a structure is not stable it will topple over and fall.
- If a structure is not rigid and stiff, it could bend, buckle and break.
- If a structure is not strong it could fracture.

2.2
- Create a broad base
- Make sure that the structure is perfectly straight.
- Make the structures centre of gravity as low as possible.

2.3 1 mark for each point.

a)
- Make sure that the structure is perfectly straight/upright.
- The structure is built skew.

b)
- Broaden the base.
- The base is too narrow.

Question 3

3.1 Any 3 of the following:
- Triangulation
- Angled Member
- Bema on edge
- Hollow member
- Corrugation

3.2 The creation of triangles in a structure to increase its stability.

Question 2

2.1
- If a structure is not stable it will topple over and fall.
- If a structure is not rigid and stiff, it could bend, buckle and break.
- If a structure is not strong it could fracture.

2.2
- Create a broad base
- Make sure that the structure is perfectly straight.
- Make the structures centre of gravity as low as possible.

2.3 a)
- Make sure that the structure is perfectly upright/straight.
- The structure is built skew.

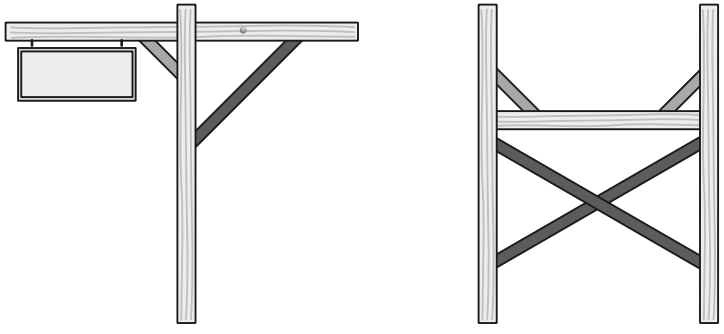
b)
- Broaden the base.
- The base is too narrow

Question 3

3.1 Any 3 of the following:
- Triangulation
- Angled Member
- Beam on edge
- Hollow member
- Corrugation

3.2 The creation of triangles in a structure to increase its stability.

3.3



Possible solutions

Question 4

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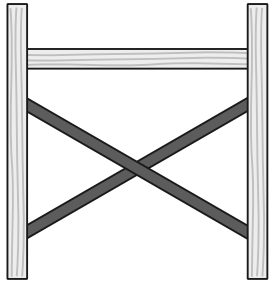
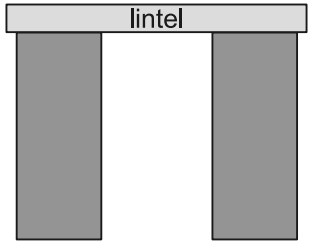
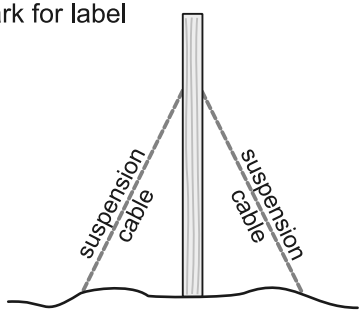


4.2
- 1 mark for drawing
- 1mark for label



4.3
- 1 mark for drawing
- 1 mark for label



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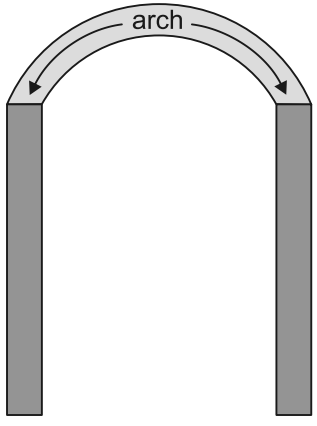


- 1 mark for drawing
- 1 mark for arrows

Question 5

5.1 It is usually used to hold up a roof.

5.2 Can be made of wood, steel or reinforced concrete.

5.3 Piers

Question 6

6.1 Concrete slabs and pillars are strengthened by including steel rods. These rods have ridges that stop them from slipping out of the concrete structure.

6.2 Layers of wood are glued together such that the layer below has its grain at 90° to the layer above.

6.3 An angled beam resists bending horizontally and vertically.

6.4 The part of the beam that holds the force is much thicker and stronger.

6.5 A cantilever is a structure supported at one end only, with the other end free of any support.

Question 7

7.1 

7.2 Reinforced

Question 8

8.1 It is a rigid structure made of a number of members arranged in triangles.

8.2 Truss structures are common in steel bridges, towers and roof trusses. (Any ONE is correct)

8.3

No.	Member	Force
1	Rafter	Compression
2	Strut	Tension
3	Tie beam	Tension
4	King post	Compression

8.4 a) Supports the roof.
b) Holds the rafters in place.
c) Holds other members in place.
d) Supports any member it is attached to.

8.5 King post Queen post

Question 9

9.1 B
9.2 A
9.3 C
9.4 A
9.5 C
9.6 D
9.7 A
9.8 B
9.9 C
9.10 B

6 Mechanical Systems

Question 1

1.1 a) It is a device that does mechanical work and is usually made up of a number of mechanisms.

b) A wheel and axle is a combination of two circular discs: the wheel which is large, and a rod (axle) attached to the centre of the larger wheel. Large (rotary) movements of the wheel cause smaller rotations of the axle, but transmit a greater force to the axle.

1.2 Input, process and output.

1.3 An axe, knife, door stop, any TWO correct examples

1.4 The distance the object moves along the inclined plane is greater than the height it is raised. The longer the inclined plane the easier it is to move an object to a new height. The inclined plane decreases the amount of force needed to lift an object.

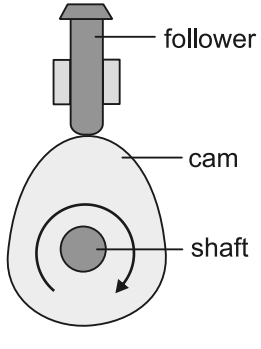
1.5 When splitting an object, a wedge moves into the object a long distance, but the gap caused by the movement is small. It creates a large force which acts over a large distance to push the wood apart.

Cams

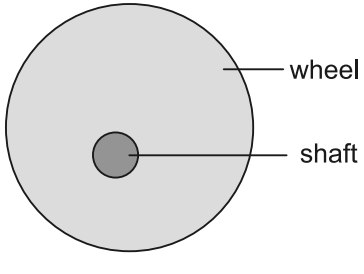
Question 1

1.1

Cam



Eccentric cam



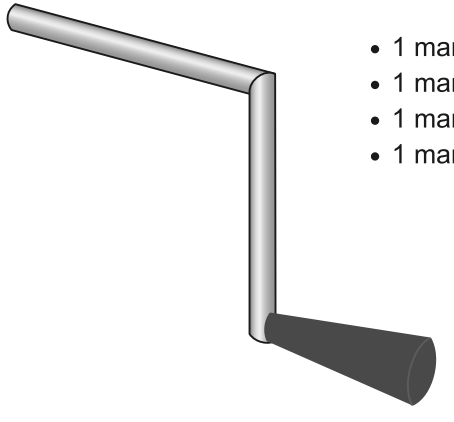
Cam

A cam is a specially shaped wheel that causes a specific motion of the follower that rests on it. A cam-follower system converts rotary motion to reciprocating motion. As the cam turns around the follower either goes up or down depending on the shape of the cam.

Eccentric cam

The eccentric wheel is a circular disk with an axle attached off centre.

2.3

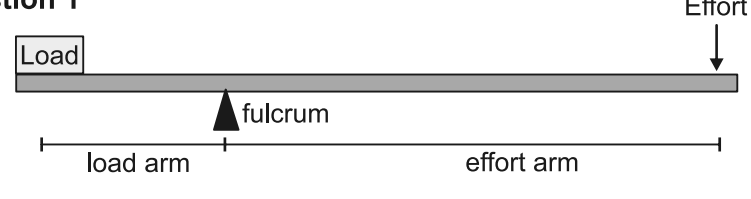


- 1 mark for drawing.
- 1 mark for colour
- 1 mark for shading.
- 1 mark for texture to indicate grip.

Levers

Question 1

1.1



- 5 marks for labels.
- 2 marks for correct symbols.
- 1 mark for neat drawing.

1.2 Any TWO correct examples

a) First class lever

- Scissors
- Shears
- Hedge Clippers
- Pliers

b) Second class lever

- Nut cracker
- Wheel barrow
- Bottle opener

c) Third class lever

- Tweezers
- Braai Tongs
- Stapler

Question 2

4 marks for answer (no units). If unit given the -1.

2.1 $MA = \frac{\text{effort arm}}{\text{load arm}}$

$= \frac{800}{200}$

$= 4$

2.2 $MA = \frac{\text{effort arm}}{\text{load arm}}$

$= \frac{900}{300}$

$= 3$

2.3 $MA = \frac{\text{effort arm}}{\text{load arm}}$

$= \frac{600}{200}$

$= 3$

Question 3

4 marks for answer (no units). If unit given the -1.

3.1 $MA = \frac{\text{load}}{\text{effort}}$

$= \frac{4000}{200}$

$= 20$

3.2 $MA = \frac{\text{load}}{\text{effort}}$

$= \frac{3000}{100}$

$= 30$

3.3 $MA = \frac{\text{load}}{\text{effort}}$

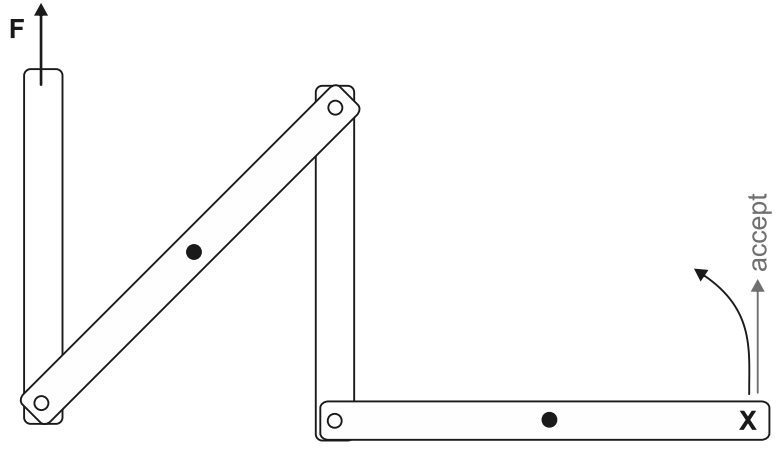
$= \frac{100}{3000}$

$= \frac{1}{30}$

Question 4

1st class	3rd class
2nd class	1st class

Question 5



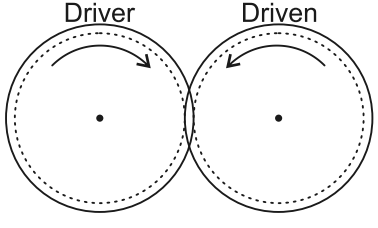
Gears

Question 1

When two or more meshing gears work together.

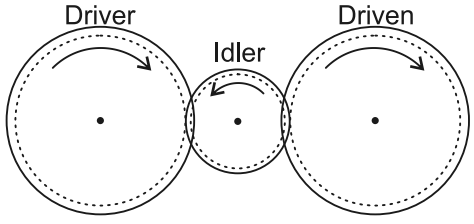
Question 2

2.1 The driven gear and driver gear turns in opposite directions.



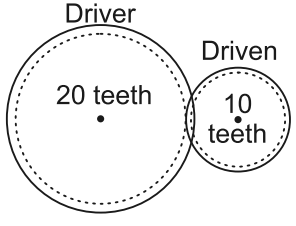
- 1 mark for correct convention.
- 2 marks for correct labels.
- 1 mark for gears.

2.2 The driven gear and driver gear turns in the same direction.



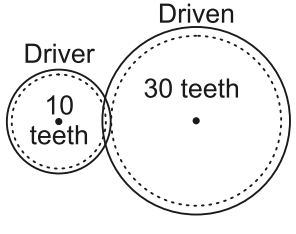
- 1 mark for correct convention.
- 2 marks for correct labels.
- 1 mark for gears.

2.3 Two gears, one with 20 teeth and the other with 10 teeth. The driven gear rotates faster than the driver gear.



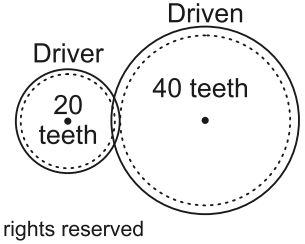
- Marks as for 2.2 above.

2.4 Two gears, one with 30 teeth and the other with 10 teeth. The driver gear rotates faster than the driven gear.



- Marks as for 2.2 above.

2.5 Two gears, one with 40 teeth and the other with 20 teeth. The driver gear rotates faster than the driven gear. Both gears turning in the same direction.



- Marks as for 2.2 above.

Question 3

3.1 The velocity ratio indicates what the difference is in speed between the driver and driven gears.

3.2 $VR = \frac{\text{driven teeth}}{\text{driver teeth}}$ $VR = \frac{\text{driven Ø}}{\text{driver Ø}}$

3.3 a) $VR = \frac{\text{driven Ø}}{\text{driver Ø}}$

$= \frac{60}{30}$

$= 2 : 1$

b) $VR = \frac{\text{driven teeth}}{\text{driver teeth}}$

$= \frac{15}{30}$

$= 1 : 2$

- Minus 1 if answer not expressed as a ratio.

Question 4

4.1 The force ratio indicates what the difference is in force between the driver and driven gears.

4.2 a) $FR = \frac{\text{driven teeth}}{\text{driver teeth}}$

$= \frac{20}{80}$

$= 1 : 4$

b) $FR = \frac{\text{driven Ø}}{\text{driver Ø}}$

$= \frac{60}{10}$

$= 6 : 1$

- Minus 1 if answer not expressed as a ratio.

Question 5

5.1	D	5.6	D
5.2	A	5.7	A
5.3	C	5.8	A
5.4	B	5.9	A
5.5	A	5.10	B

7 Electrical Systems and Control

Question 1

Any three correct examples

INPUT device

- Cell
- Battery
- Solar Panel
- Generator

CONTROL device

- Switches
- Transistors
- Resistors

OUTPUT device

- Buzzers
- Motors
- Bulbs
- Heaters
- LED's

Question 2

Component	Symbol
Cell	
Series Battery (2 cells)	
Parallel Battery (3 cells)	
Switch	
Light Bulb	
Resistor	
Buzzer	
Variable Resistor	
Motor	M
Voltmeter	V
Ammeter	A

Question 3

3.1 a) In a series circuit cells are connected one after the other, positive to negative.

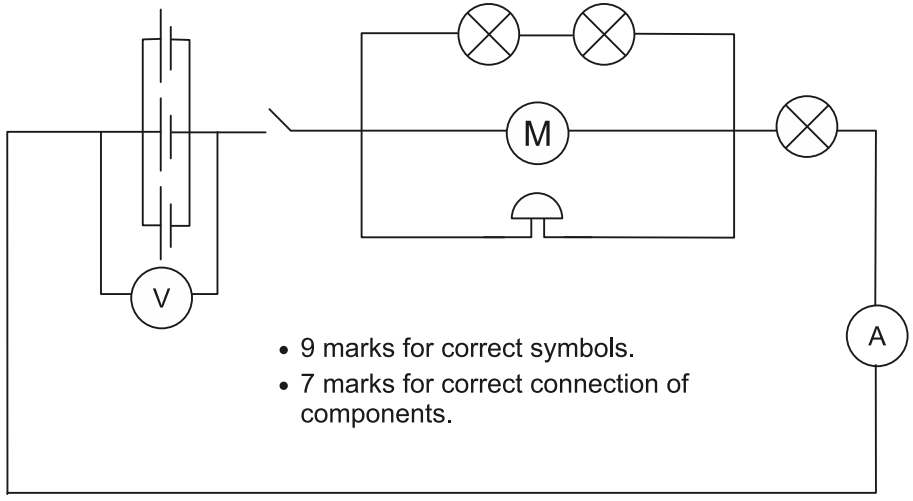
b) In a parallel circuit cells are connected side by side, positive to positive and negative to negative.

3.2 Any ONE correct example.

a)
- There is an increase in voltage and current into the circuit.
- If one cell is faulty it is easily detectable as the circuit will stop working.

b)
- They can supply the voltage to a circuit for a much longer period of time.
- If one cell fails the circuit will still work.

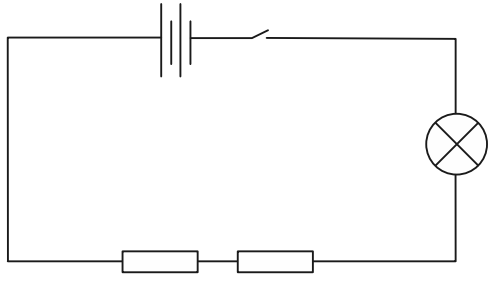
Question 4



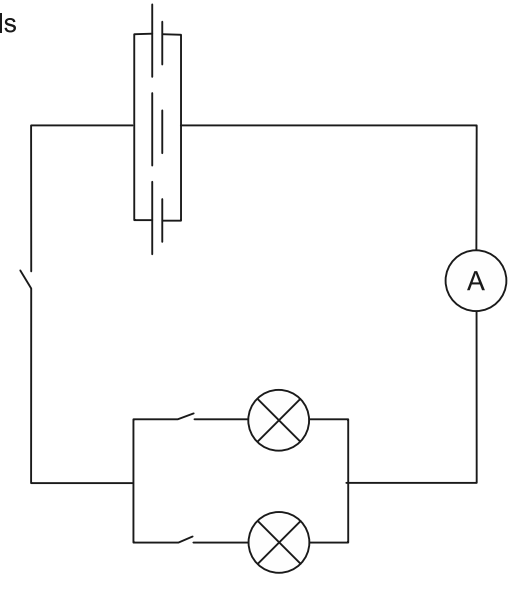
- 9 marks for correct symbols.
- 7 marks for correct connection of components.

Question 5

5.1
- 4 marks for correct symbols in correct places.
- 1 mark for neatness.



5.2
- 7 marks for correct symbols in correct places.
- 1 mark for neatness.



Question 6

6.1 Yes

6.2 Bulb X

6.3 Bulb Z on its own or Bulb W and Y together

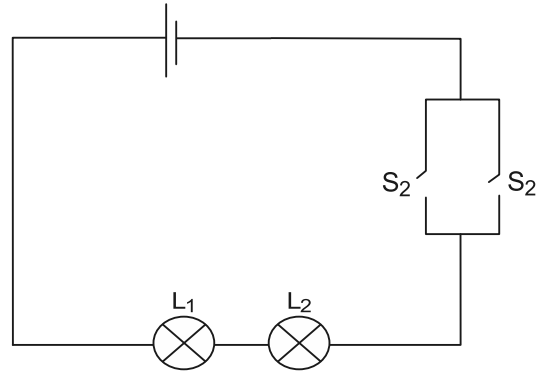
6.4 Yes

6.5 Z and the ammeter.

6.6 1,5 V

Question 7

7.1 a)

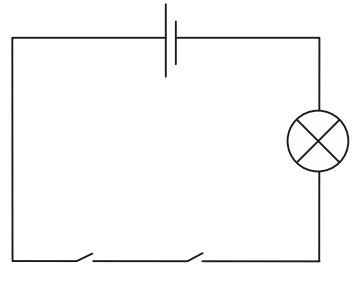


7.1 b)

S1	S2	L1	L2
Closed	Open	On	On
Open	Closed	On	On
Open	Open	Off	Off
Closed	Closed	On	On

7.2 a) An OR gate

7.2 b)



- 4 marks for correct symbols in correct places.
- 1 mark for neatness.

Question 8

8.1 photovoltaic cells.

8.2 Any THREE of the following correct.

- They can be used to produce electricity and heat.
- They produce renewable energy.
- They save money in the long run.
- They are environmentally friendly.

8.3
- They expensive to set up.
- At night and when it is overcast there will be little or no electricity production.

Question 9

9.1 The current in a circuit is directly proportional to voltage across the circuit if the resistance stays the same.

9.2 a) Alternating current moves forwards and backwards in a circuit.
b) Direct Current moves in only one direction in a circuit.

Question 10

10.1 Any THREE correct ways with a correct advantage and disadvantage.

Coal or Gas Power Stations

Advantage	*Disadvantage*
• Coal and gas are cheap forms of fuel.	• Using them to produce electricity harms the environment.

Nuclear Power Stations

Advantage	*Disadvantage*
• Nuclear power stations can produce a large amount of power for a very long period of time.	• They are very dangerous and can cause large loss of life if anything goes really wrong with them.

Hydroelectric Power Stations

Advantage	*Disadvantage*
• Electricity generator gives off no pollution.	• Hydroelectric power will not work if a dam's water levels are too low or there is a drought.

Solar Farms

Advantage	*Disadvantage*
• Solar farms are a very clean form of energy.	• No electricity is produced when the sun is not shining.

Wind Farms

Advantage	*Disadvantage*
• Wind farms are a very clean form of energy.	• If the wind does not blow no electricity is generated.

10.2 The national grid is the network of power lines between all major power stations in the country

10.3 A **step-up transformer** increases the voltage of the electric current and a **step-down transformer** decreases the voltage.

Question 11

11.1 B
11.2 B
11.3 D
11.4 C
11.5 A
11.6 D

8 Impact of Technology

Question 1

1.1 **Silicone:**

It is used in microchip technology where without it the same computers and cell phones used today would not exist.

Example: Microchips, silicone sealant.

Carbon Fibre:

It is used extensively in the building of planes because it is light weight and very strong. It is used to make some car parts. Another important use is in the renewable wind energy market where it is used to make the propeller blades that transfer wind energy so that it can be turned into electricity.

Examples: Car bumper, propeller blades.

Glass:

Glass has been reinforced in a number of ways making it useful for building with. There have also been a number of safety advancements which has made it a much safer material to work with and add into different products.

Examples: Glass drinking bottle, glass windshield.

Plastics:

The invention of plastics has introduced thousands of new and exciting products. It is a very durable material which largely increases the life span of products. It is flexible which has given birth to new products. It is malleable which allows it to be moulded into any shape imaginable. This makes it the most versatile material on the planet.

Examples: Plastic chair, plastic ruler.

- 1 Mark for each materials name.
- 1 Mark for each materials explanation.
- 1 Mark for each materials examples.

1.2 Any FOUR correct

- Release of toxic gases.
- Greenhouse gas emissions.
- Groundwater contamination.
- Destruction of natural wildlife habitats.
- Disease in humans caused by breathing in of toxins.

1.3 Technology has become part of our everyday lives.

- Because of this, poorer communities that cannot afford electricity for basic use and to run new technologies, like cell phones, start to resort to illegal practices to obtain these technologies and the electricity needed to run them.
- In doing so they break the law putting their future and their family's future at risk.
- Illegal activities, which include illegal electrical connections, also put people in danger. Illegal electrical connections can easily electrocute people and can cause fires

1.4 Two marks each.

- Earth is a closed system. A closed system is a system where nothing can be added in from the outside. Because of this the planet will eventually run out of natural resources unless something is done to slow down the rate at which they are being used.
- With the advancement of new technologies, the rate at which natural resources are used up has increased. New technologies now need to be developed to decrease this rate.

1.5

Advantages

1. New technology has enabled rural and poor communities to have access to cheaper and more convenient forms of heating.
2. It has also brought electricity to many homes but where that is not accessible technology provides cheap, portable forms of lighting and cooking products.
3. It has brought us many new materials such as plastic, glass, silicone and carbon fibre which without we would not have many of our positive technological advancements today.
4. Recycling has improved dramatically which has enabled many communities to make a living off of recycling materials.
5. 3D printing has enabled us to use materials in ways that we never imagined.

Disadvantages

6. Many of the new materials produced are not recyclable which is causing harm to our environment.
7. Factories are causing air and water pollution and in this way contributing to global warming.
8. Mining is having a number of very negative effects on the environment.
9. Our natural resources are being depleted to the extent that we will run out of some of them soon.
10. The safety of poor communities is being put at risk.

Question 2

2.1 C
2.2 B
2.3 A