EXAM FEVER

Technology 9 Workbook

- ANSWERS -

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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

2.1
- 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.

2.2 Is what has been done gone enough to solve the problem?

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 1 mark for each of the following:
- To design a new cap.
- It needs to be one of a kind.
- It needs to appeal to teenagers.
- They have given me a list of guidelines to work from.

1.2
- The cap must have a peak.
- The cap must have a simple logo on the front and a slogan on the back.
- The cap must have a Velcro strap at the back to keep it fastened.
- There must be a long open slit 10mm wide on both sides of the cap.

4 marks

1.3
- It must cost between R 100 and R250.
- The peak may not be longer than 50mm.

2 marks

1.4 Evaluation rubric: (10 marks)

Criteria	Mark out of 3		
It is not be too big to transport.	1	2	3
Box is no bigger than 200 mm (h), 200 mm (w), 200 mm (l).	1	2	3
The buttons are bright and easily noticeable.	1	2	3
It has a coloured stripe that runs around it.	1	2	3
The case is be black.	1	2	3
It has a conveniently placed carry handle.	1	2	3
It is square in shape.	1	2	3
The speaker design will appeal to teenagers.	1	2	3

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

1.5
- 2 Marks for the logo being appealing to teenagers.
- 2 Marks for a neat and well thought out design.
- 1 Mark for colour included.

1.6
- 1 Mark for the slogan being relevant to a cap.
- 1 Mark for the slogan drawn neatly.
- 1 Mark for colour included.

Question 2

2.1 1 mark for each of the following:

- Design the exterior housing of a new boom box.
- It needs to be one of a kind.
- It will be used to promote their new range of speakers.
- It must be targeted at teenage customers.

2.2 1 mark for each of the following:

- It must be square in shape.
- It must have a conveniently placed carry handle.
- The case must be black.
- It must have a coloured stripe that runs around it.

2.3 1 mark for each of the following:

- It must not be too big to transport.
- The box must be no bigger than 200 mm in height, 200 mm in width and 200 mm in length.
- The buttons must be bright and easily noticeable.
- It must appeal to teenagers.

2.4 Evaluation rubric: (10 marks)

Criteria	Mark out of 3		
It is not be too big to transport.	1	2	3
The box is no bigger than 200 mm in height, 200 mm in	1	2	3
width and 200 mm in length.	1	2	3
The buttons are bright and easily noticeable.	1	2	3
It has a coloured stripe that runs around it.	1	2	3
The case is be black.	1	2	3
It has a conveniently placed carry handle.	1	2	3
It is square in shape.	1	2	3
The speaker design will appeal to teenagers.	1	2	3

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

Question 3

3.1 1 mark for each of the following:

- I have been asked by my Technology teacher,
- To design a new desk.
- It will replace all of the desks at your school.
- The current desks at school take up too much space, these desks need to be smaller but with enough space to still work on.

3.2 1 mark for each of the following:

- The desk must be 900 mm high.
- The desk must be made out of a very hard material.
- The desk must have a foot rest.

3.3 1 mark for each of the following:

- The desk must not be wider than 400 mm and not longer than 600 mm.
- The desk must cost less than R600.
- The desk must be cheap to make.
- The desk must be very strong.

3.4 Evaluation rubric: (10 marks)

Criteria	Mark out of 3		
The desk is 900 mm high.	1	2	3
The desk is made out of a very hard material.	1	2	3
The desk has a foot rest.	1	2	3
The desk is not wider than 400 mm; not longer than 600 mm.	1	2	3
The desk costs less than R600.	1	2	3
The desk is cheap to make but strong.	1	2	3
The desk has enough space to work on.	1	2	3

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

3 Graphic Communication

Question 1

1.1 Three feint lines 120 mm long.

1.2 Three dark lines 90 mm long.

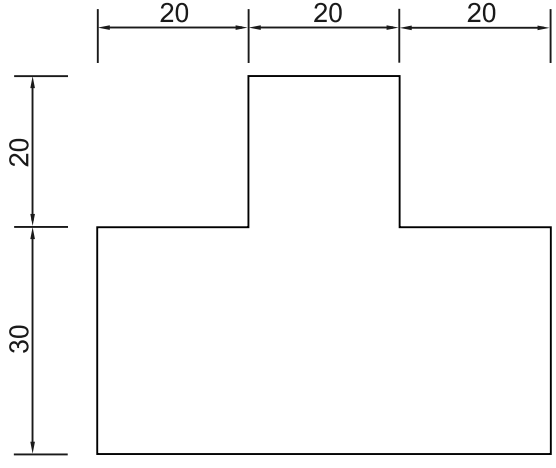
1.3 Three dashed lines 100 mm long.

1.4 Two wavy lines 80 mm long.

1.5 Three chain lines 90 mm long.

Question 2

2.1



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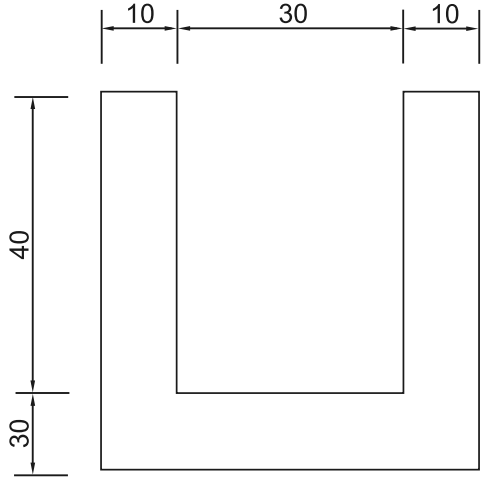

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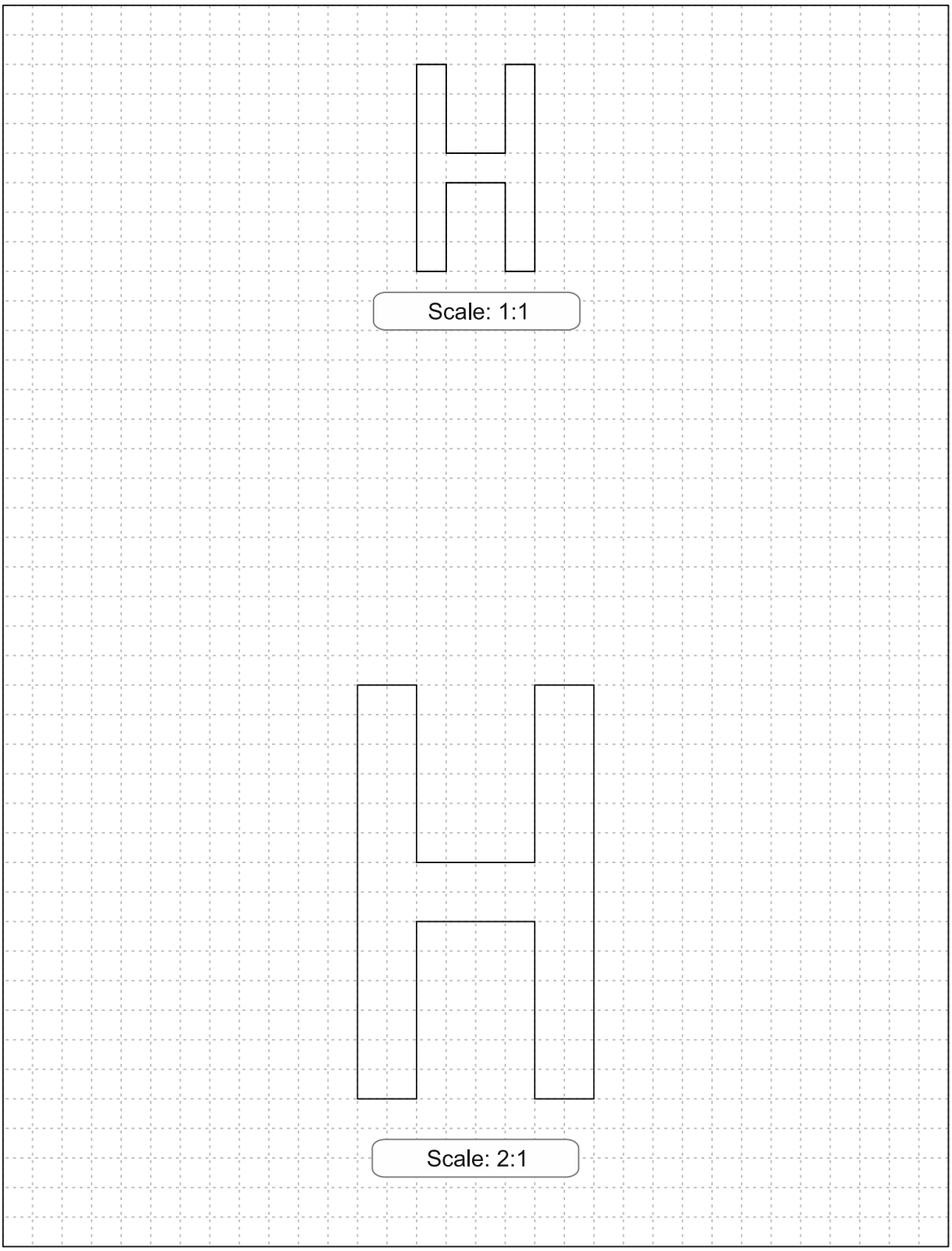
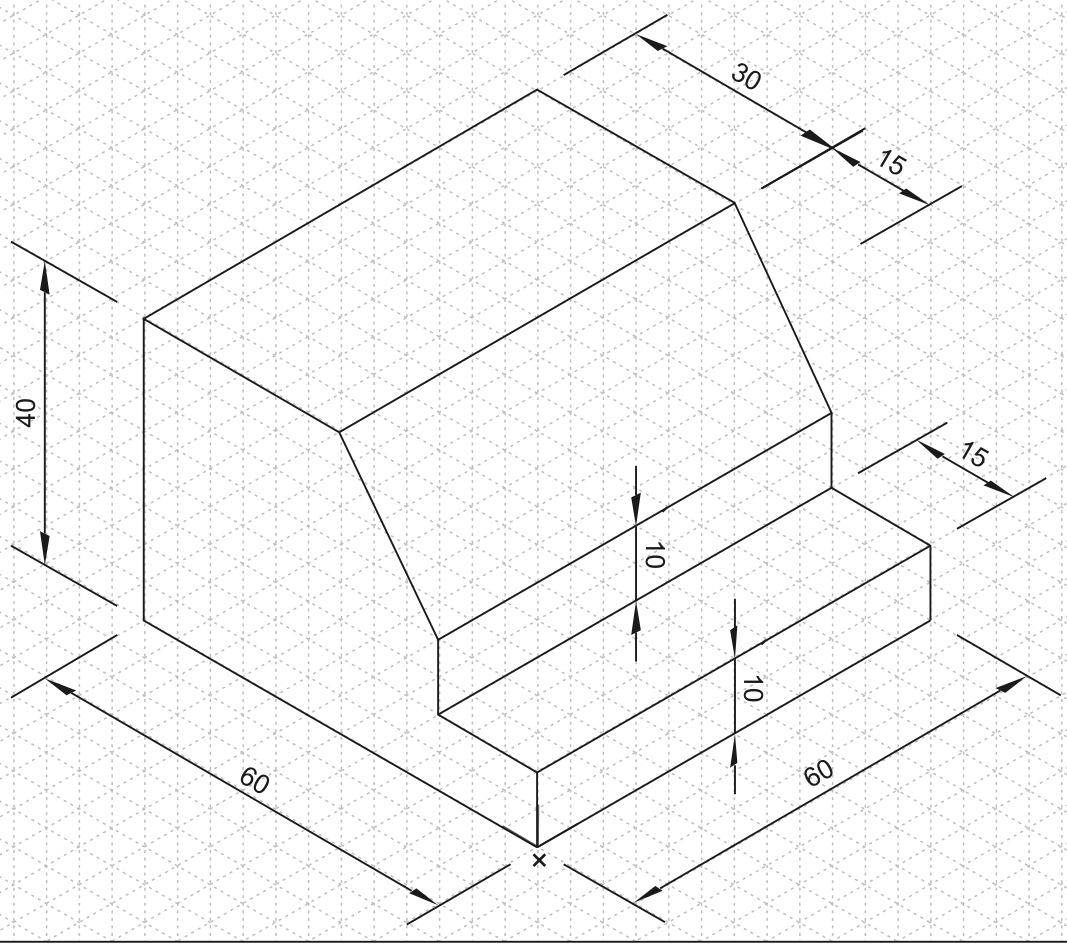


3.2

3.3

4.1



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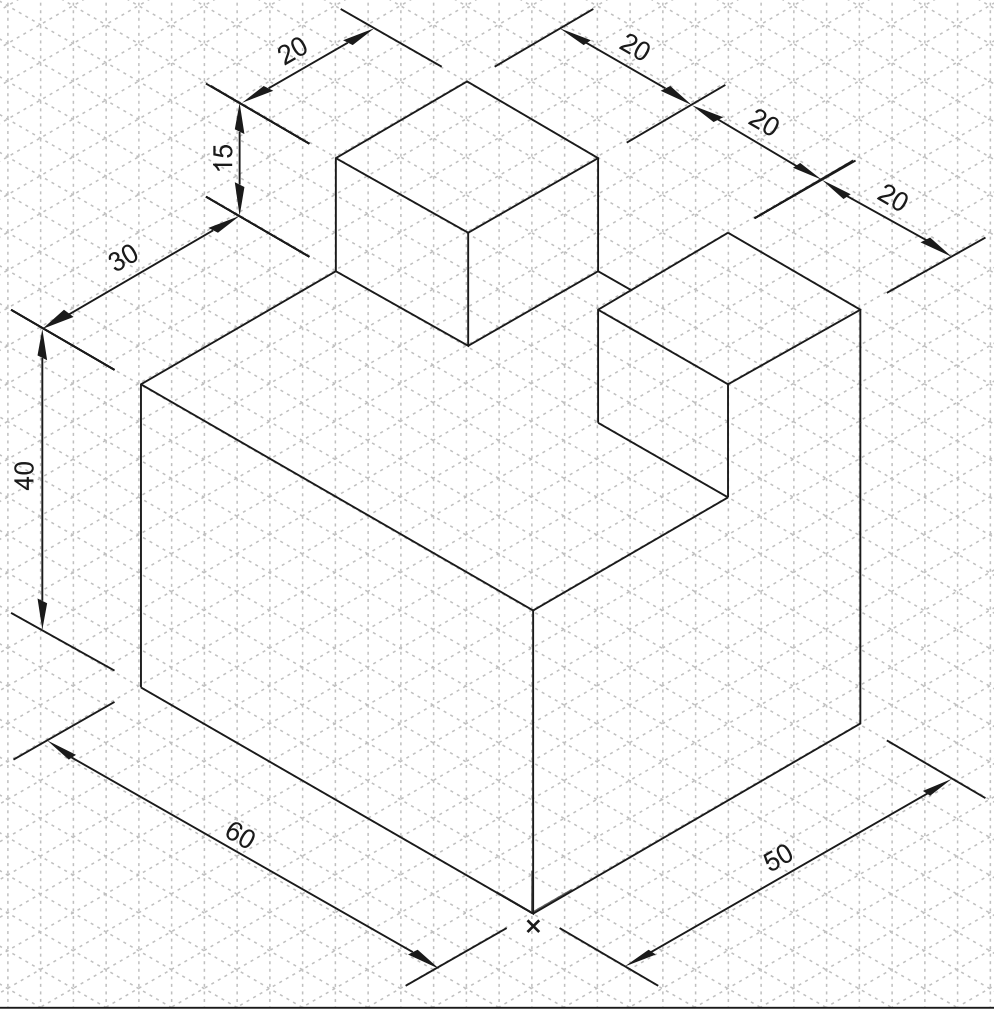

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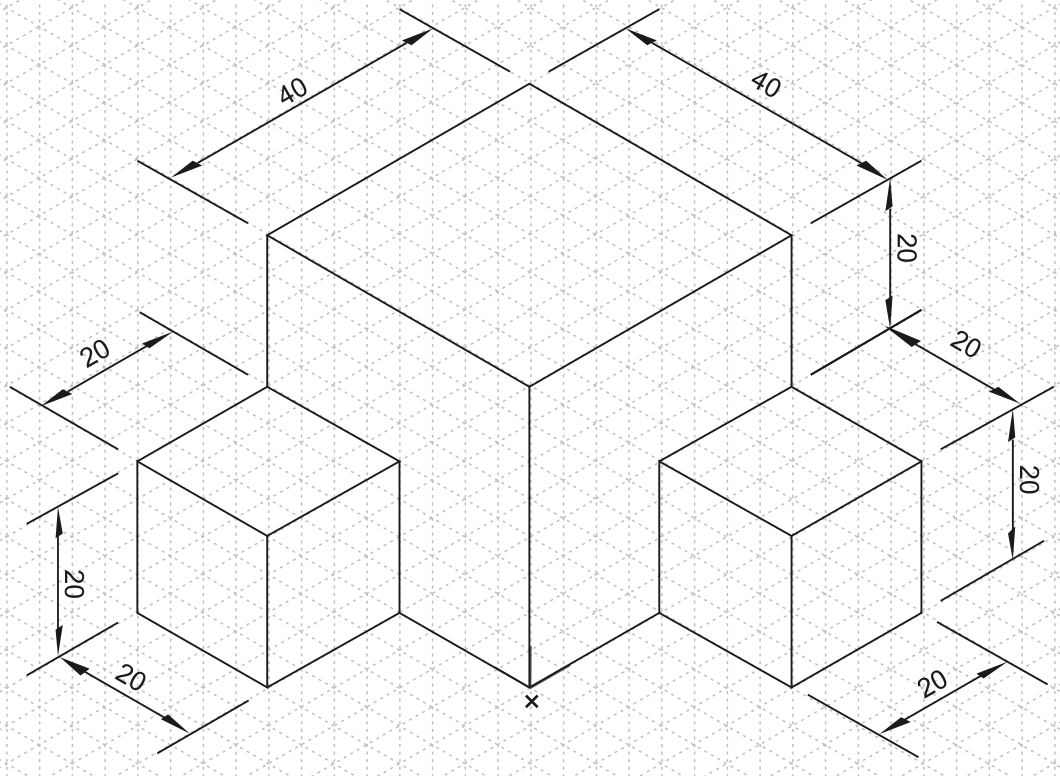

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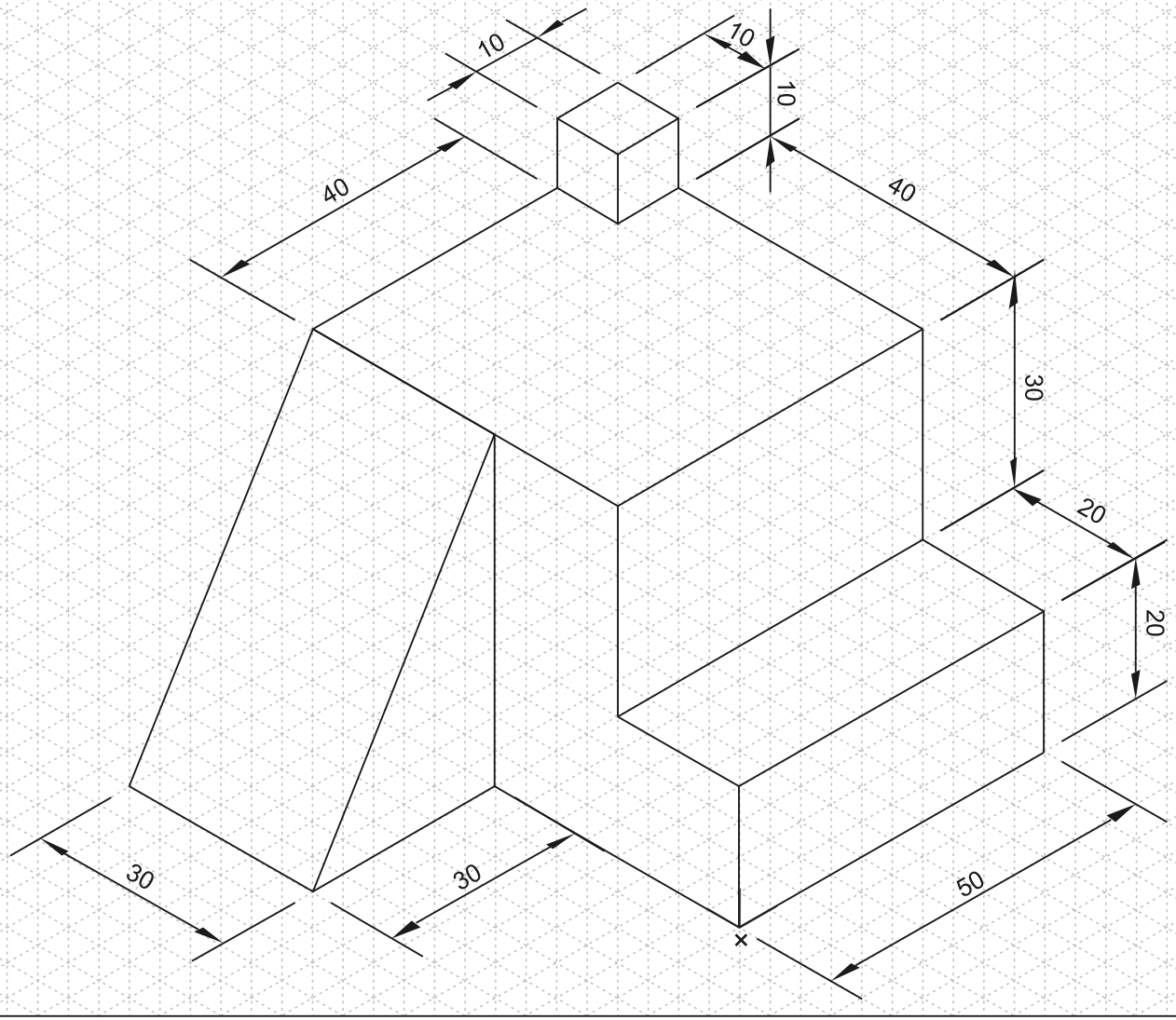

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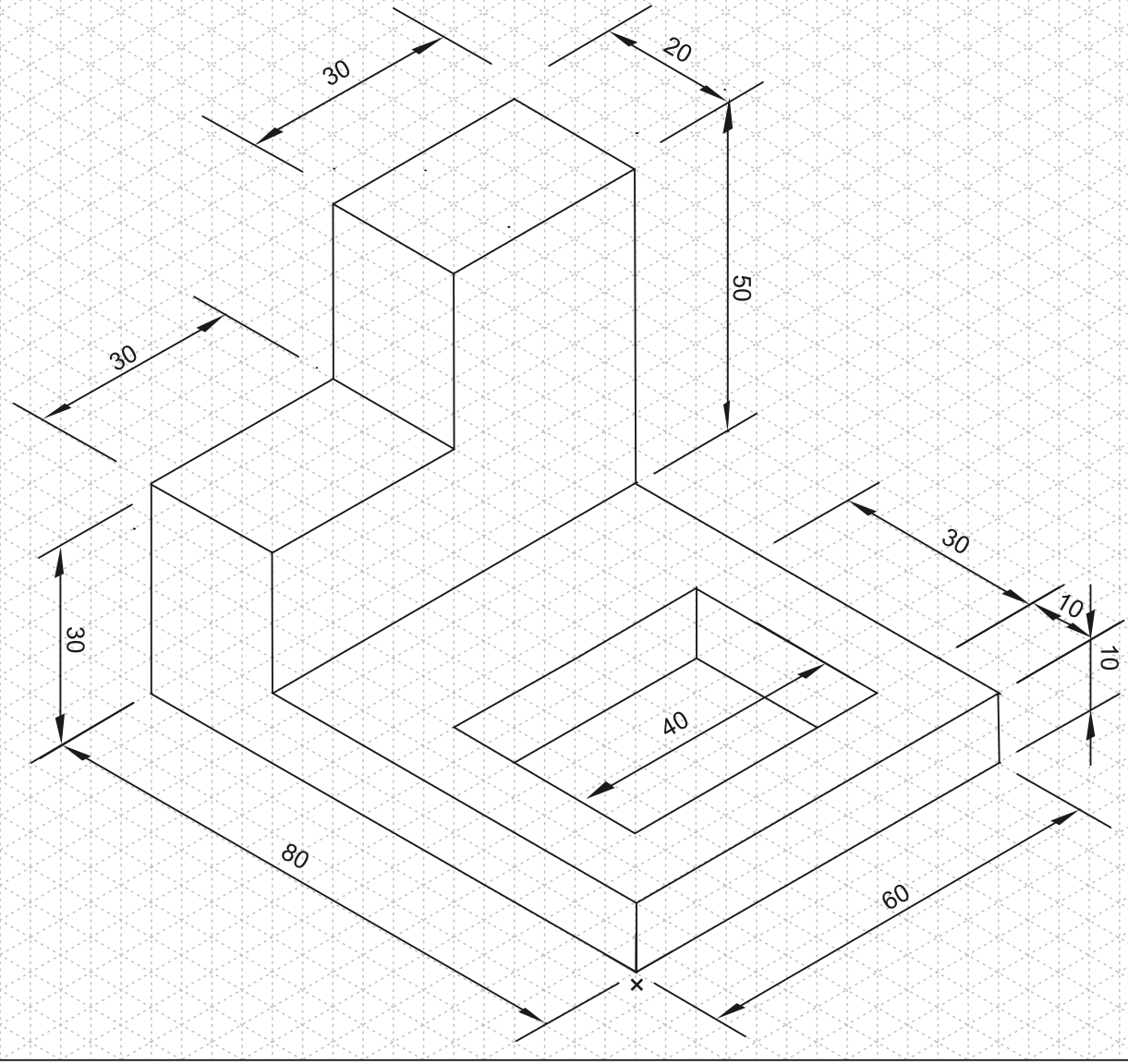

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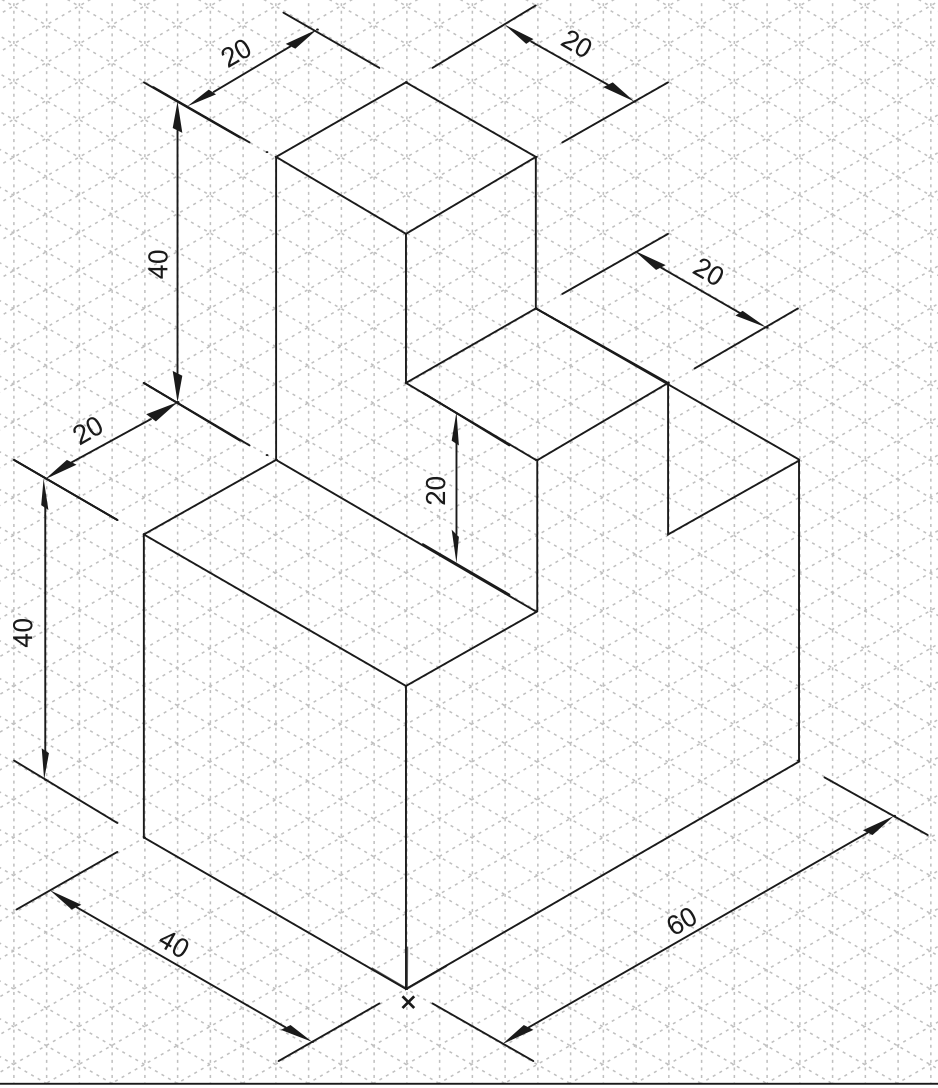

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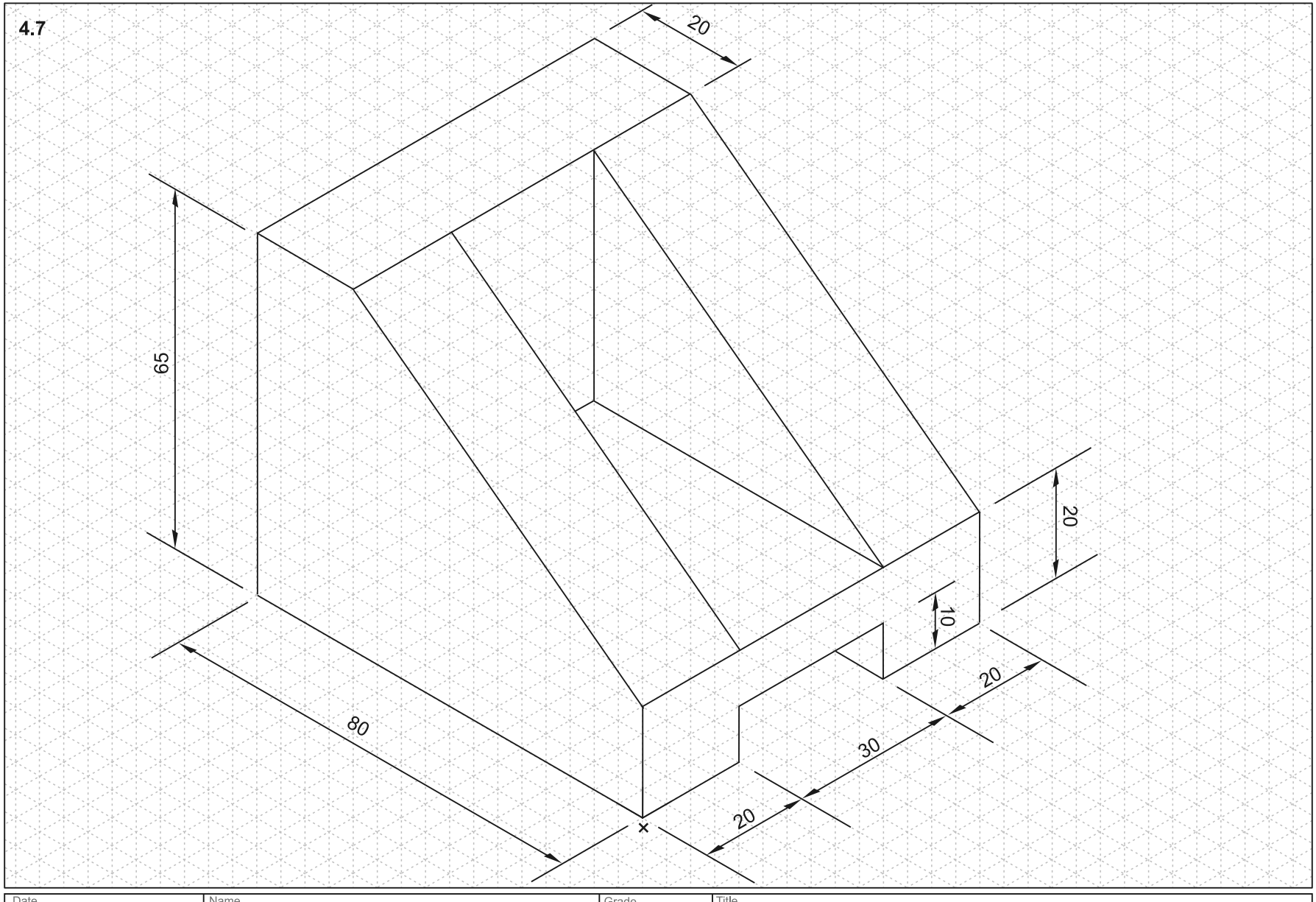

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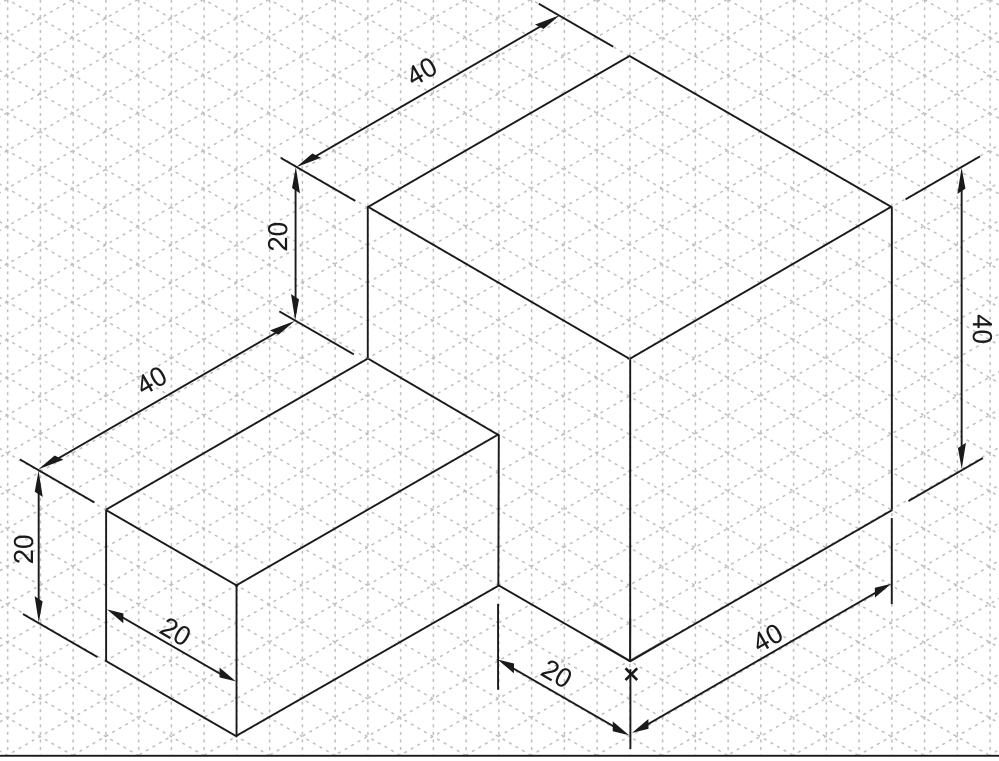

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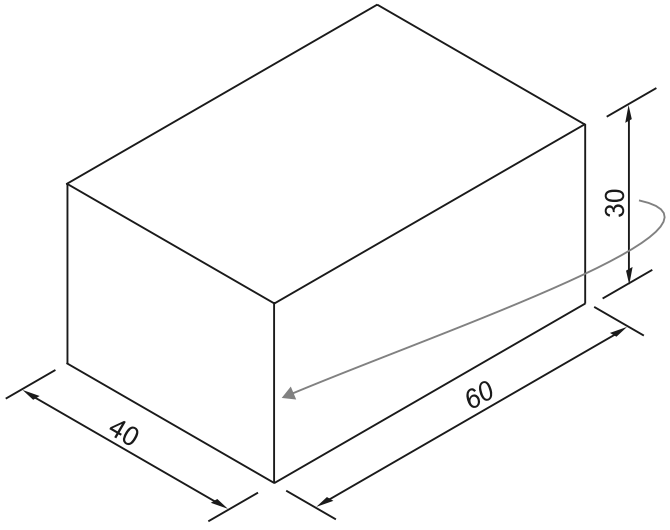
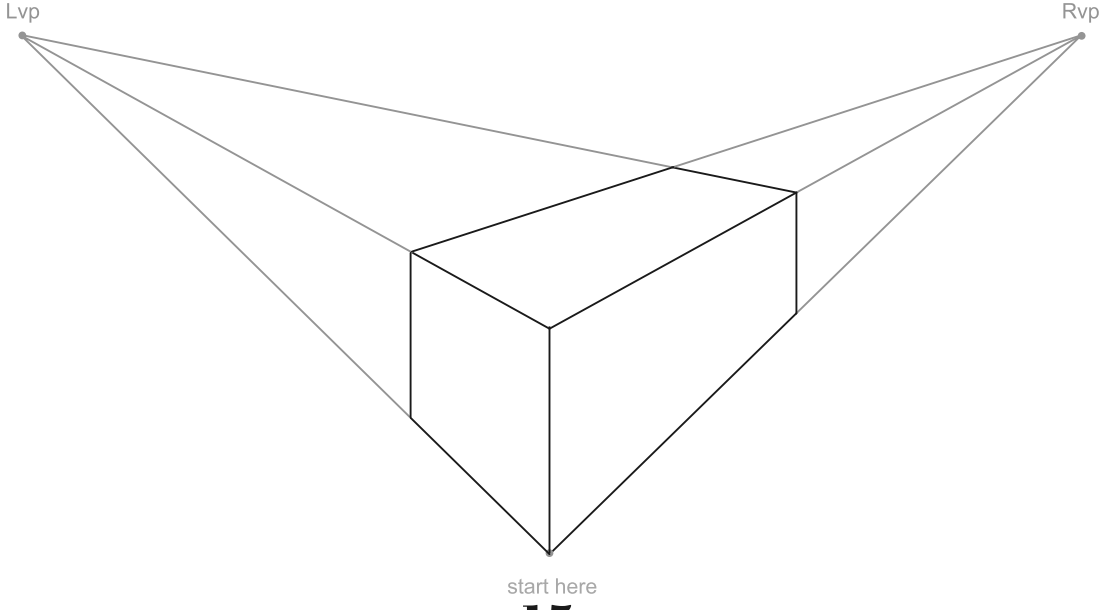
Question 5

5.1





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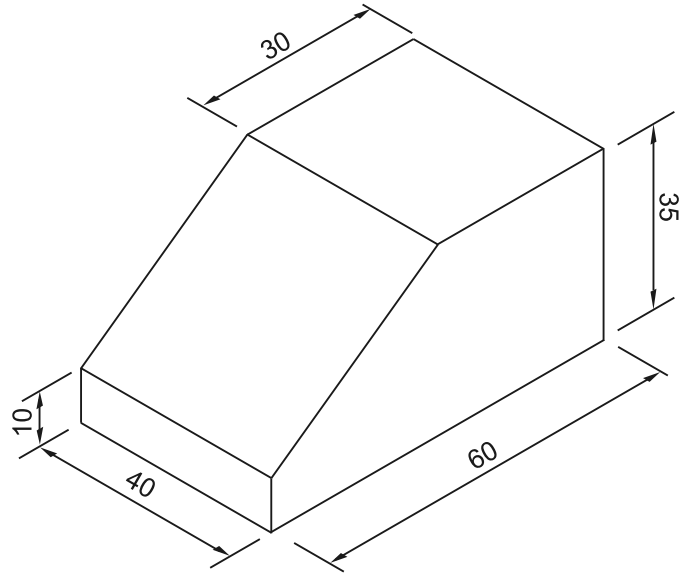

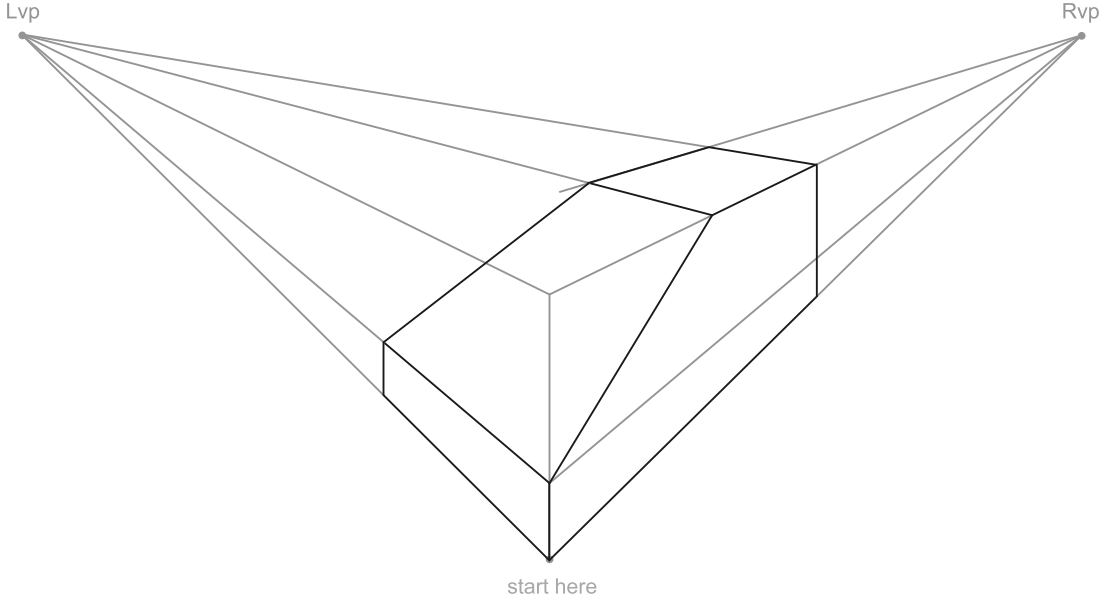

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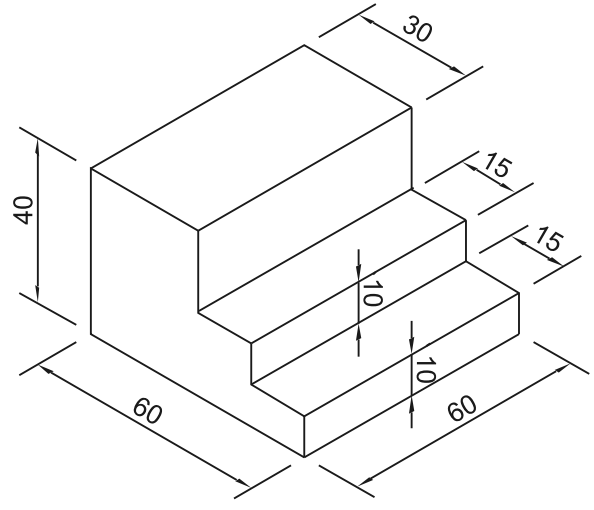

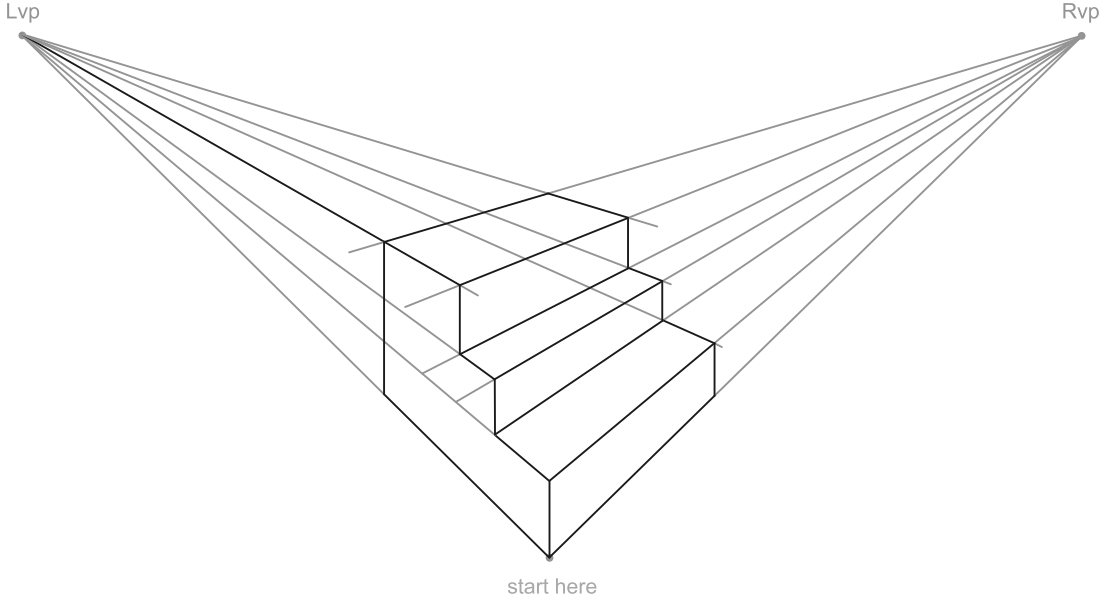

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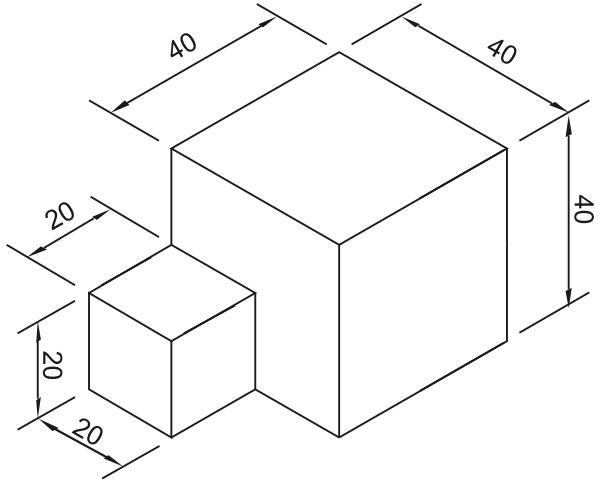

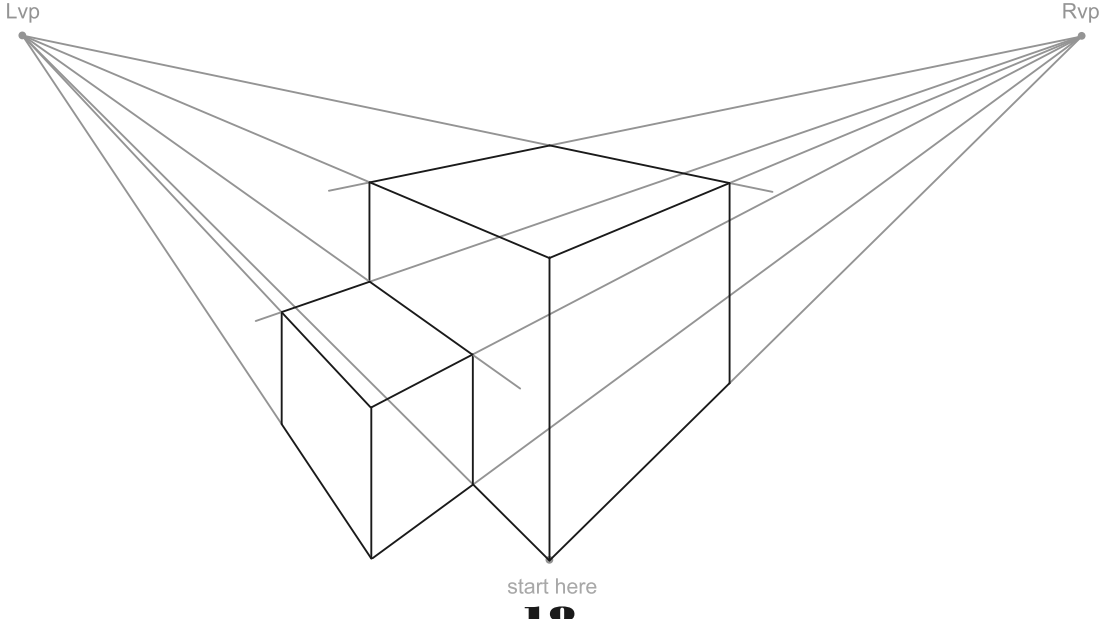

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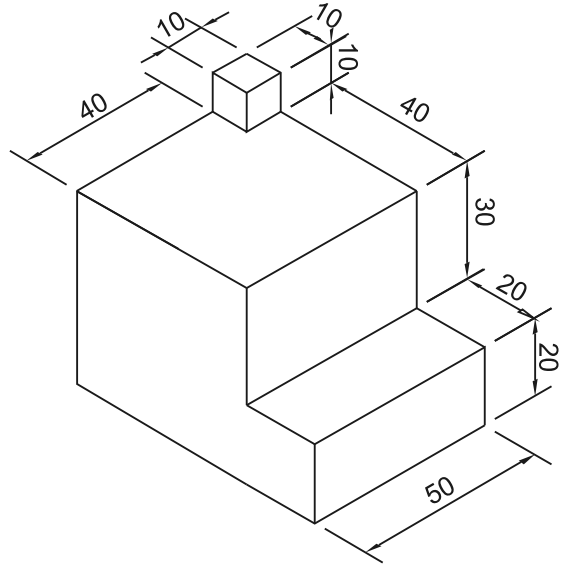

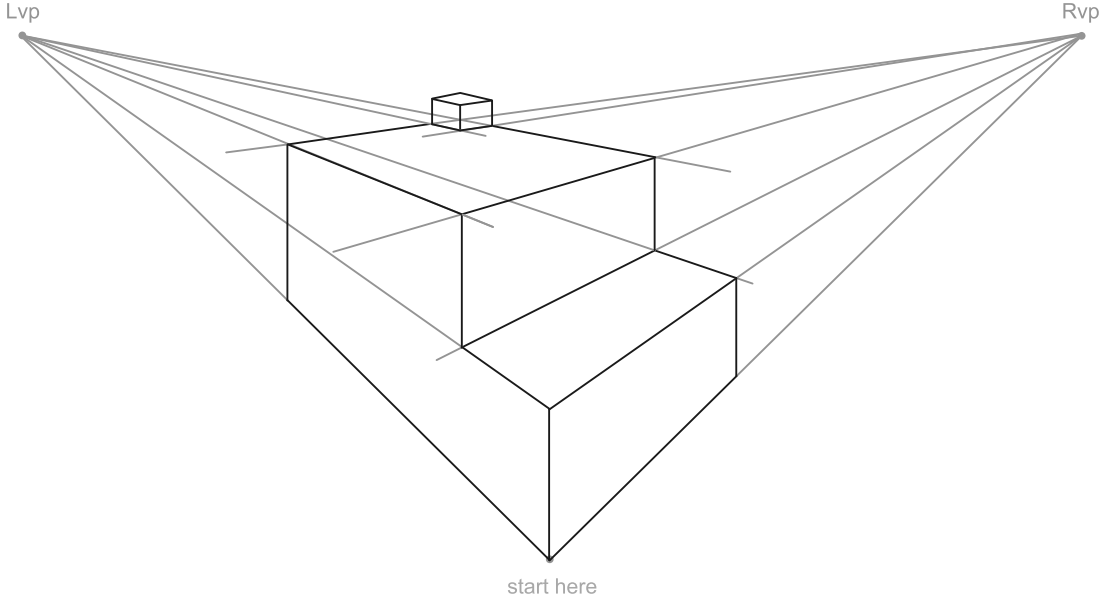

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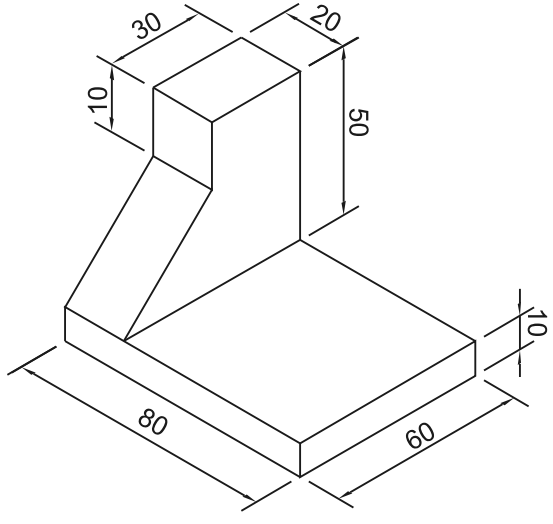
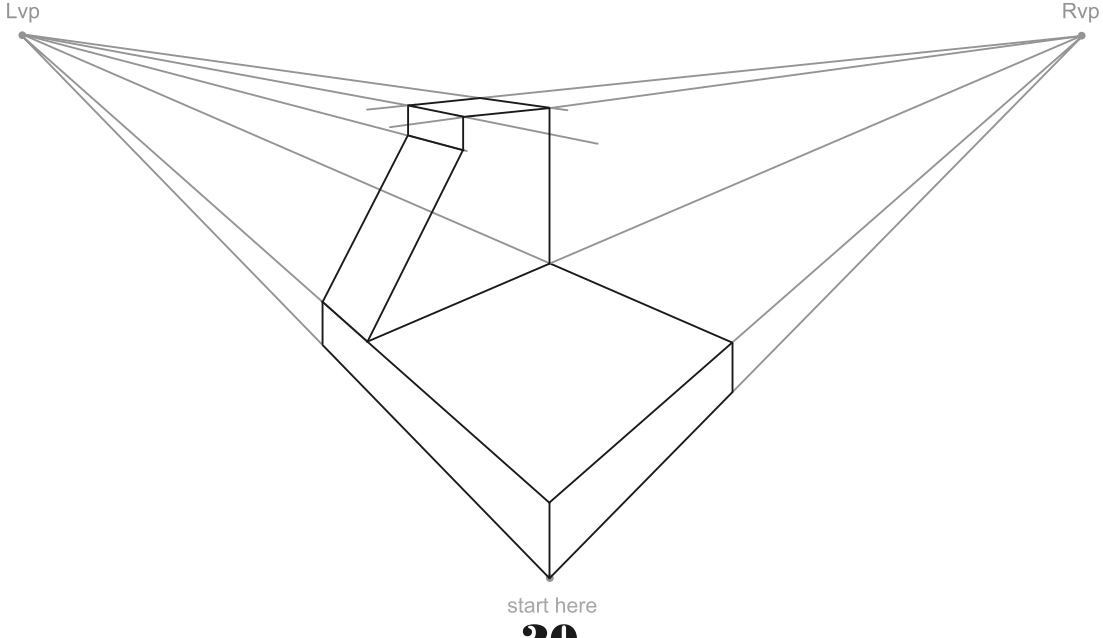
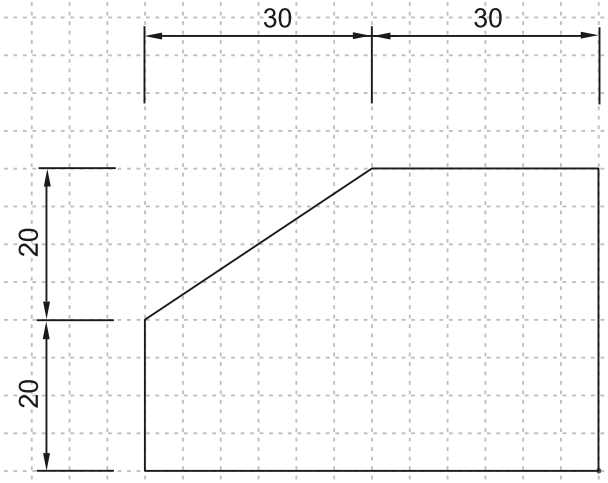


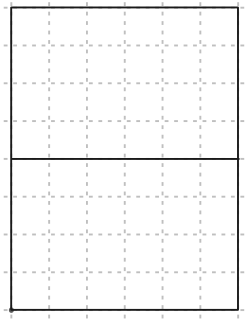


6.1

Front view



Left side view



Top view
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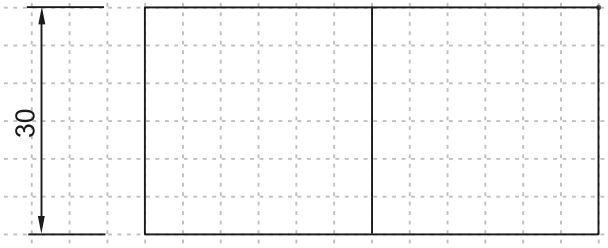

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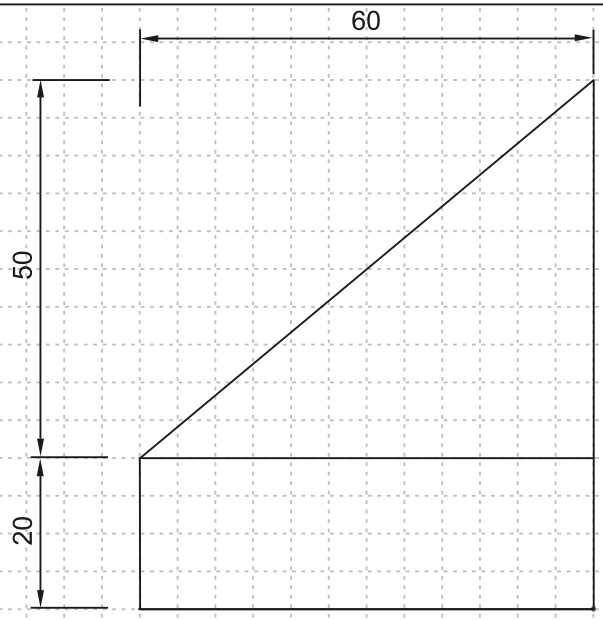
6.2

Front view



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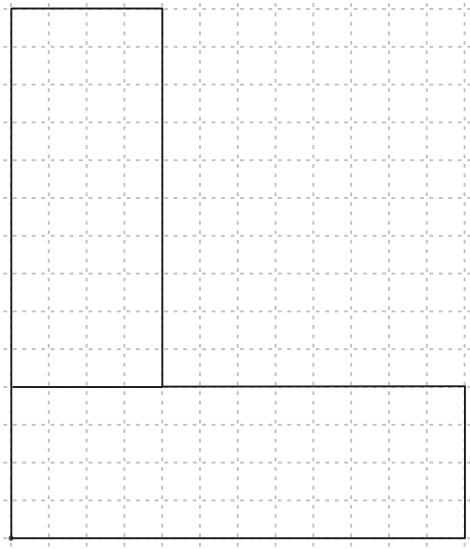
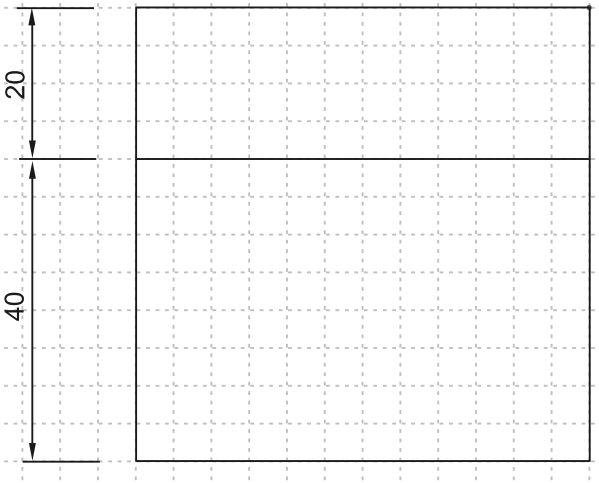


Top view
(plan)



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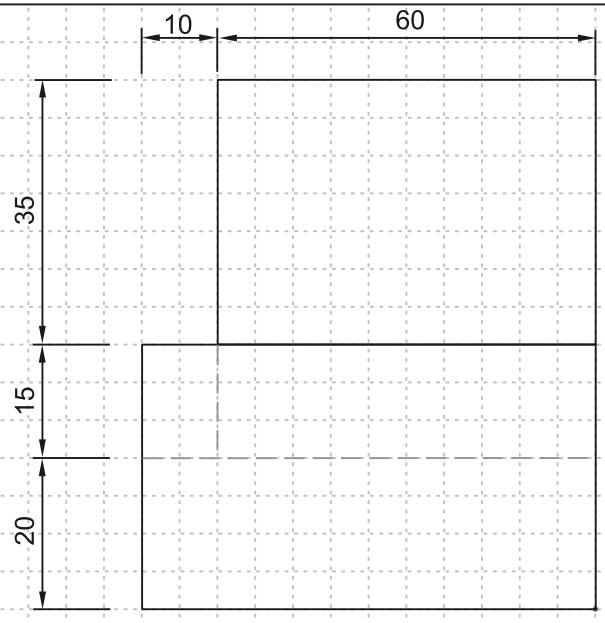
6.3

Front view



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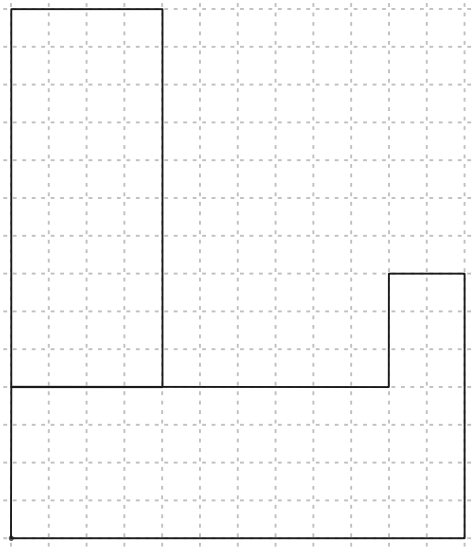
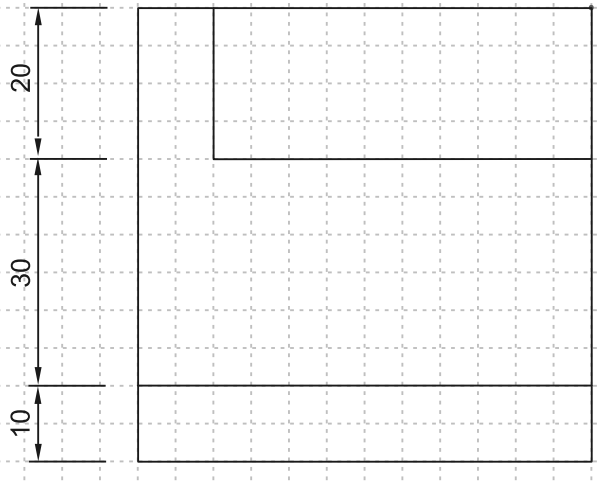


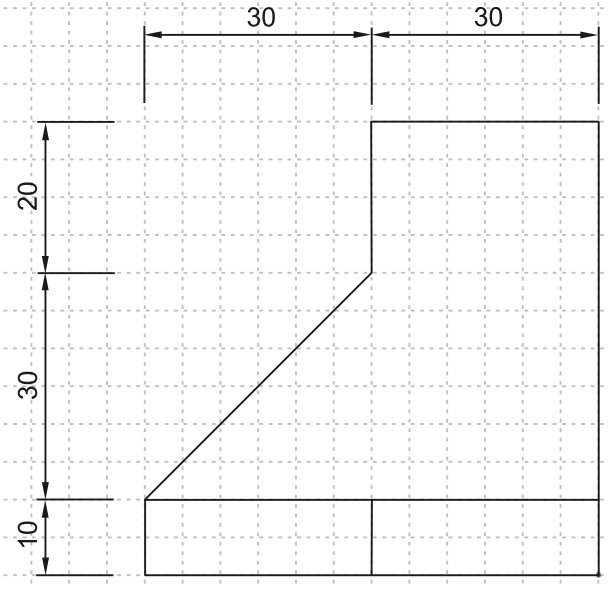
Top view
(plan)



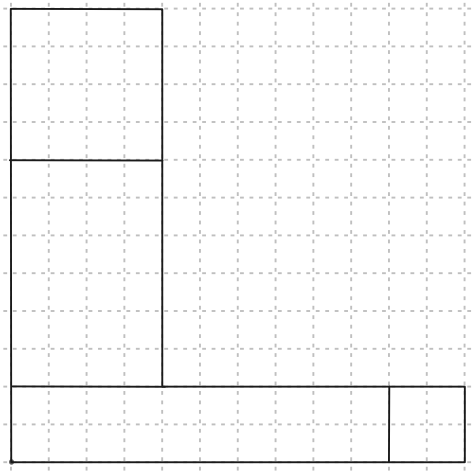
Date	Name	Grade	Title

6.4

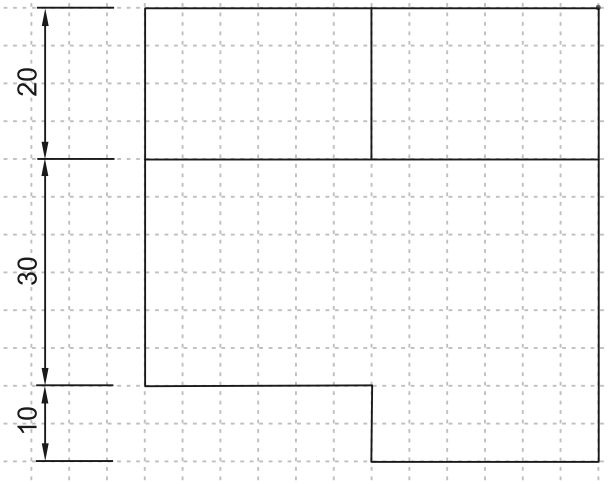
Front view



Left side view



Top view
(plan)



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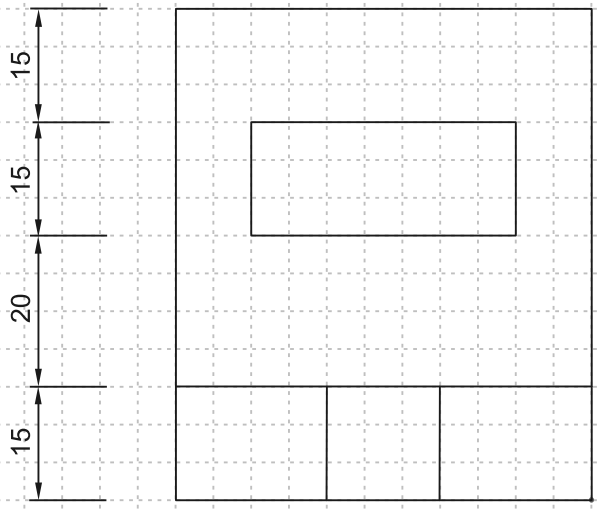
6.5

Front view



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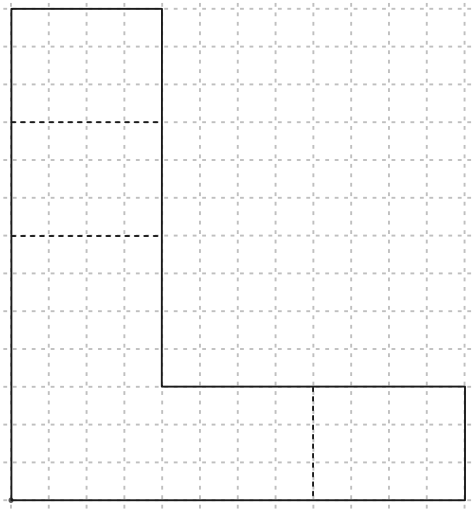

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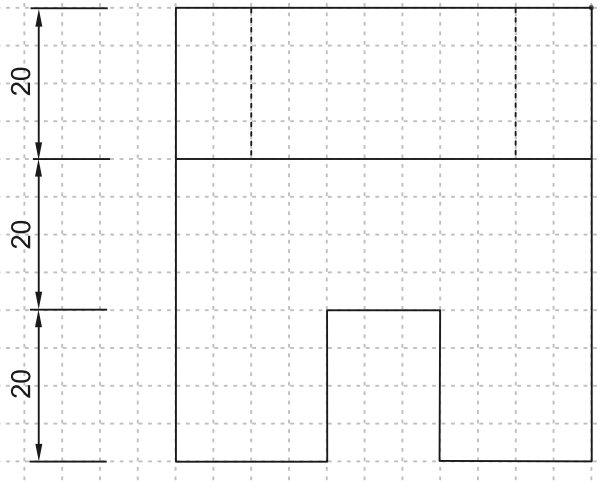

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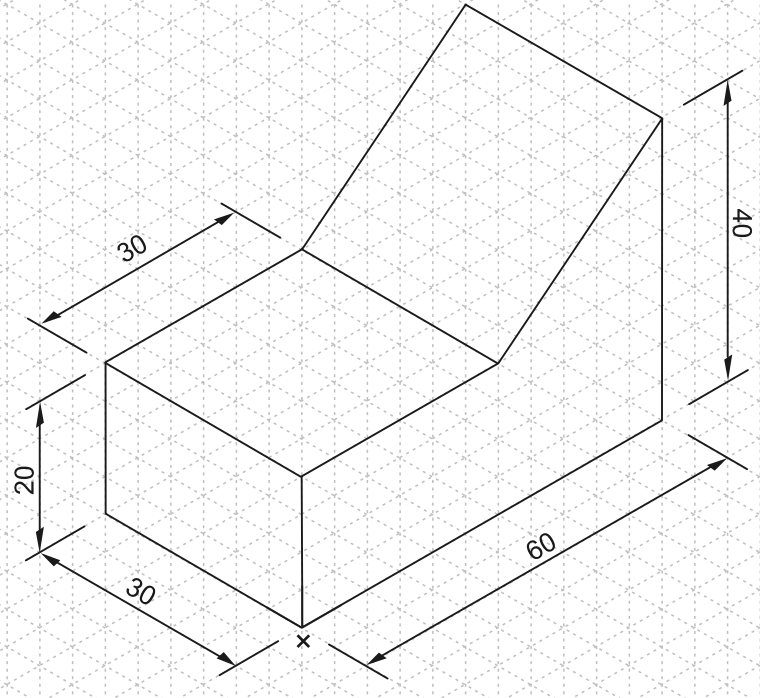
CHALLENGE



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4 Forces

Question 1

1.1 Something that moves, pushes, pulls, twists or breaks a material. (2)

1.2 2000 N (4)

10 kg

3500 N

150 kg

No unit, no mark!

Question 2

Compression:

- 1 Mark for a clear drawing illustrating compression.
- 1 Mark for arrows that indicate the direction of the force that causes the compression.

Tension

- 1 Mark for a clear drawing illustrating tension.
- 1 Mark for arrows that indicate the direction of the force that causes the tension.

Torsion

- 1 Mark for a clear drawing illustrating tension
- 1 Mark for arrows that clearly indicate that the material or object is being twisted.

Shear

- 1 Mark for a clear drawing illustrating a material being sheared.
- 1 Mark for arrows that indicate the two forces working in opposite directions to shear the material.

Question 3

Drawing (4)

- 1 Mark for a clear drawing showing a material or object being bent.
- 1 Mark for a label and arrow showing the direction of the force causing the bend in the material or object.
- 1 Mark for the label showing which part of the material or object is under tension.
- 1 Mark for the label showing which part of the material or object is under compression.

Explanation (3)

- 1 Mark for stating that bending is the result of a force acting on a material.
- 2 Marks for stating that two forces, compression and tension, act on the material or object when it is bent.

Question 4

Multiple choice (5)

4.1 C

4.2 A

4.3 B

4.4 C

4.5 A

5 Structures

Question 1

1.1 Density: Amount of matter or substance is concentrated in a fixed volume of matter. (2)

1.2 Stiffness: Ability of a material to resist bending. (2)

1.3 Stability: A materials ability to resist changing its shape or size when wet, dry, hot or cold. (2)

Question 2

2.1 Corrosion: Wearing away or breaking down of a material because of outside forces. The sun breaks down plastic and makes it brittle, water causes metal to rust and wood to rot. (3)

2.2 Corrosion resistance: Ability of a material to resist corrosion. Stainless steel, an alloy (mixture) of iron and chromium, is resistant to rusting. We paint wood to stop it from rotting. (3)

2.3 Brittleness: A material's tendency to crack or break under compression. You cannot pull a piece of chalk apart but when you press it between your fingers, it crumbles under the compression. It is brittle. (3)

Question 3

3.1 Yes, as it is hard and can be coated with varnish to preserve it. (4)

1 Mark for saying yes.

3 Marks for any good reason as to why.

3.2 Yes, as this metal is strong and light and does not rust. (4)

1 Mark for saying yes.

3 Marks for any good reason as to why.

3.3 No, as rubber is too flexible and the fishing rod will not be able to keep its shape. (4)

1 Mark for saying no.

3 Marks for any good reason as to why.

3.4 Yes, as this material is very strong under compression. (4)

1 Mark for saying yes.

3 Marks for any good reason as to why.

Question 4

Multiple choice (5)

4.1 B

4.2 C

4.3 A

4.4 D

6 Mechanical Systems & Control

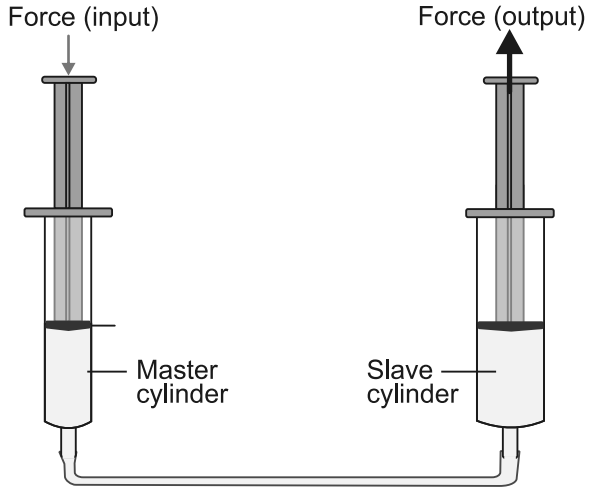
Question 1

1.1 Mechanical systems are used to transmit a force and for converting one type of motion into some other type of motion. They do mechanical work. They are usually composed of a number of mechanisms, like levers, pulleys, gears, that work together. (2)

1.2 An input, process and output. (3)

Pneumatics and Hydraulics

Question 2



Marks:

- 4 marks: labels.
- 1 mark: correct drawing of master cylinder.
- 1 mark: correct drawing of slave cylinder.
- 1 mark: neatness.

Question 3

3.1 Any 3 of the below or any other correct example:

- Air brakes on large vehicles.
- A dentist's drill.
- A jackhammer.
- A nail gun.

3.2 Any 3 of the below or any other correct example:

- Cars breaking system.
- Hydraulic lifts.
- Garbage compactors.
- Construction machinery.
- Factory machinery.

3.3 Pneumatic systems:

Advantages

- Cheap to make.
- Easy to fix.
- Not messy.
- Relatively safe and easy to control.

Disadvantages

- They are inaccurate.
- They are noisy.

3.3 Hydraulic systems:

Advantages

- It is accurate while providing the user a constant force.
- Can cope with very large amounts pressure.

Disadvantages

- They are more expensive than pneumatics.
- They are messy.
- Can be a fire hazard.
- Leaks are difficult to block.

Question 4

4.1 Pascal's principle states that the pressure exerted on a fluid in a closed hydraulic system will be transferred equally, without loss, to all other parts of the system.

4.2 $P = \frac{F}{A}$

Question 5

5.1 B

5.2 $P = \frac{F}{A}$

$= \frac{1\,000}{0,1}$

$= 10\,000 \text{ N/m}^2$

5.3 $P = \frac{F}{A}$

$F = P \times A$

$= 10\,000 \times 0,6$

$= 6\,000 \text{ N}$

5.4 An advantage of an increase in force would change to a loss of force but an increase of distance.

Question 6

6.1 $P = \frac{F}{A}$

$= \frac{4\,000}{1,6}$

$= 2\,500 \text{ N/m}^2$

6.2 $\frac{F_1}{A_1} = \frac{F_2}{A_2}$

$F_1 = \frac{F_2 \times A_1}{A_2}$

$= \frac{4\,000 \times 0,2}{1,6}$

$= 500 \text{ N}$

6.3 $MA = \frac{\text{Output force}}{\text{Input force}}$

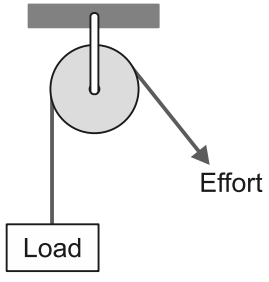
$= \frac{4\,000}{500}$

$= 8$

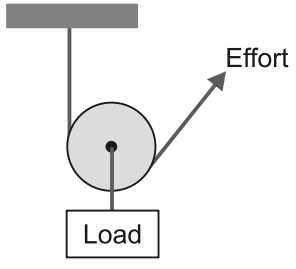
Pulleys

Question 7

7.1



7.2



Question 8

8.1 a) MA = 2

8.2 b) $\text{Effort} = \frac{\text{Load}}{\text{MA}}$

$= \frac{2000}{2}$

$= 1\,000 \text{ N}$

a) MA =3

b) $\text{Effort} = \frac{\text{Load}}{\text{MA}}$

$= \frac{6000}{3}$

$= 2\,000 \text{ N}$

a) MA = 4

c) $\text{Effort} = \frac{\text{Load}}{\text{MA}}$

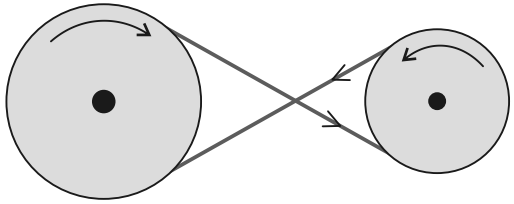
$= \frac{12\,000}{4}$

$= 3\,000 \text{ N}$

Question 9

9.1 They are used when a change in speed is needed.

9.2 The belt must be twisted to get the pulleys to move in opposite directions.



Question 10

10.1 a) $VR = \frac{\text{ø of driven}}{\text{ø of driver}}$

$= \frac{120}{40}$

$= \frac{3}{1}$

$= 3 : 1$

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

$= \frac{40}{120}$

$= \frac{1}{3}$

$= 1 : 3$

10.2 a) $VR = \frac{\text{ø of driven}}{\text{ø of driver}}$

$= \frac{30}{60}$

$= \frac{1}{2}$

$= 1 : 2$

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

$= \frac{60}{30}$

$= \frac{2}{1}$

$= 2 : 1$

10.2 a) $VR = \frac{\text{ø of driven}}{\text{ø of driver}}$

$= \frac{30}{60}$

$= \frac{1}{2}$

$= 1 : 2$

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

$= \frac{60}{30}$

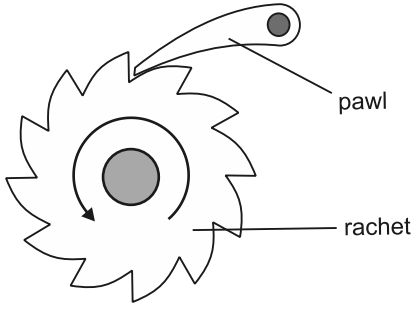
$= \frac{2}{1}$

$= 2 : 1$

Mechanical Control systems

Question 11

11.1



A rachet and pawl mechanism

11.2 a) A cleat is a piece of metal, wood or plastic that is used to control the movement of a rope.

b) Boats

Question 12

Flow diagram:

The brake pedal is pushed with force from the driver.

↓

The liquid in the hydraulic system transfers the force of the brake pedal to the pistons held by callipers.

↓

The pistons push the brake pads onto the wheel drum.

↓

The force from the brake pads slows the wheel drum down to stop the car.

Gears

Question 13

13.1
- Increase force.
- Change the speed of rotation.
- Change the direction of rotation.
- Change the axis of rotation.

(4)

13.2
- Always rotate in opposite directions (counter rotation),
- Have the same size teeth, although the diameters of the gears may vary.

(2)

13.3 An idler gear can be placed between the driver gear and the driven gear so that the direction of rotation of the drive gear is the same as the driven gear. (3)

13.4 Define each of the following: (2×2)

13.4 a) Velocity ratio: It is the difference in speed between the driver and driven gears.

b) Force ratio: It is the difference in forces between the driver and driven gears.

14.1 a) $VR = \frac{\text{ø of driven}}{\text{ø of driver}} = \frac{60}{40} = \frac{3}{1} = 3 : 1$

b) $FR = \frac{\text{ø of driver}}{\text{ø of driven}} = \frac{20}{60} = \frac{1}{3} = 1 : 3$

14.2 a) $VR = \frac{\text{ø of driven}}{\text{ø of driver}} = \frac{100}{50} = \frac{2}{1} = 2 : 1$

b) $FR = \frac{\text{ø of driver}}{\text{ø of driven}} = \frac{50}{100} = \frac{1}{2} = 1 : 2$

14.3 a) $VR = \frac{\text{ø of driven}}{\text{ø of driver}} = \frac{20}{80} = \frac{1}{4} = 1 : 4$

b) $FR = \frac{\text{ø of driver}}{\text{ø of driven}} = \frac{80}{20} = \frac{1}{2} = 4 : 1$

14.4 a) $VR = \frac{\text{ø of driven}}{\text{ø of driver}} = \frac{50}{25} = \frac{2}{1} = 2 : 1$

b) $FR = \frac{\text{ø of driver}}{\text{ø of driven}} = \frac{25}{50} = \frac{1}{2} = 1 : 2$

14.5 a) $VR = \frac{\text{ø of driven}}{\text{ø of driver}} = \frac{80}{20} = \frac{4}{1} = 4 : 1$

b) $FR = \frac{\text{ø of driver}}{\text{ø of driven}} = \frac{20}{80} = \frac{1}{4} = 1 : 4$

14.6 a) $VR = \frac{\text{ø of driven}}{\text{ø of driver}} = \frac{40}{10} = \frac{4}{1} = 4 : 1$

b) $FR = \frac{\text{ø of driver}}{\text{ø of driven}} = \frac{10}{40} = \frac{1}{4} = 1 : 4$

Question 15

Type of gear: **Spur Gear**
Function: Change the speed of rotation.
Transfer counter rotation to rollers on machines.
Serve as a force multiplier.
Example where used: Motors, car gear boxes

Type of gear: **Bevel Gear**
Function: Change the plane of motion at a 90° angle
Example where used: Cars, toys, hand drills

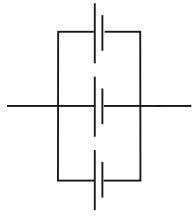
Type of gear: **Rack and Pinion**
Function: Converts rotary motion to linear motion (or vice versa).
Example where used: Steering of a car or a sliding gate.

Question 16

16.1 A
16.2 B
16.3 A
16.4 D
16.5 A
16.6 B
16.7 D
16.8 A
16.9 C
16.10 D

7 Electrical Systems and Control

Question 1

Series	Parallel
Drawing 	
Advantage There is an increase in voltage and current in the circuit. OR If one cell is faulty it is easily detectable as the circuit will stop working.	They can supply the voltage to a circuit for a much longer time. OR If one cell fails, the circuit will still work.
Disadvantage The current in one cell will last as long as the current in two or more cells connect in series. OR If one cell is faulty the entire circuit will no longer work.	It is difficult to detect if a cell is faulty. OR There is no increase of current or voltage no matter how many cells are connected.

2.1 a) Two cells connected in parallel: **1,5 V**

b) Four cells connected in series: **5 V**

c) Eight cells connected in parallel: **1,5 V**

2.2 **3V**

Question 3

3.1 AND

Truth table:

A	B	Z
1	0	0
0	1	0
1	1	1
0	0	0

3.2 OR

Truth table:

A	B	Z
1	0	1
0	1	1
1	1	1
0	0	0

3.3 AND

Truth table:

A	B	C	Z
1	0	0	0
0	1	0	0
0	0	1	0
1	1	0	0
0	1	1	0
1	0	1	0
1	1	1	1

3.4 OR

Truth table:

A	B	C	Z
1	0	0	1
0	1	0	1
0	0	1	1
1	1	0	1
0	1	1	1
1	0	1	1
1	1	1	1

Question 4

4.1 The current in a circuit is directly proportional to the voltage across the circuit, provided the resistance remains constant.

4.2 $I = \frac{V}{R}$

$= \frac{220}{100}$

$= 2{,}2$ A

4.3 $V = IR$

$= 60 \times 60$

$= 3\,600$ V

Question 5

5.1 A

5.2 A

5.3 A

5.4 B

5.5 D

8 Electronic Systems and Control

Question 1

1.1 SPST SPDT DPDT DPST

1.2

Name: Single Pole Single Throw

Abbreviation: SPST

Drawing:

Name: Single Pole Double Throw

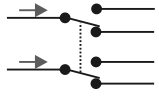
Abbreviation: SPDT

Drawing:

Name: Double Pole Double Throw

Abbreviation: DPDT

Drawing:



Question 2

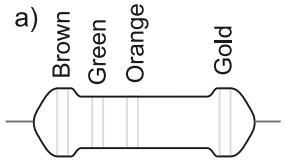
2.1

a) *R:* 2 400 000 ohms
Variance: 10%

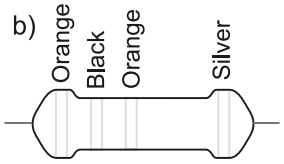
b) *R:* 34 000 000 ohms
Variance: 5%

c) *R:* 6 700 000 ohms
Variance: 10%

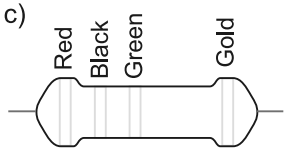
2.2 a)



b)



c)



Question 3

3.1 When light levels are low the LDRs resistance increases; when light levels are high its resistance decreases

3.2 Burglar alarms; Alarm Clocks

3.3 +t and -t

3.4 +t type: resistance increases with temperature,
-t type: resistance decreases with temperature.

3.5 A capacitor is a component that can store a charge.

Question 4 *Next column*

Question 5

5.1 A

5.2 B

5.3 D

5.4 B

5.5 C

Component	Symbol
Cell	
Two cells in series	
Switch	
Light bulb	
Resistor	
Variable resistor	
Light dependent resistor (LDR)	
Motor	M

Component	Symbol
Ammeter	A
Voltmeter	A
Diode	+ -
Light emitting diode	+ -
NPN transistor	C B E
Polarised capacitor	+
Unpolarised capacitor	
Moisture detector	

9 Preservation of Metals

Question 1

1.1 Corrosion is the breaking down of a material through external chemical reactions.

1.2
- First the metal needs to be very well cleaned, removing all the dirt.
- Two coats of primer are then applied. A primer helps the paint stick onto the metal.
- The primer is left to dry.
- The first coat of acrylic paint is then applied.
- Once completely dry, the next coat of acrylic paint is applied and left to dry.

Question 2

2.1 Galvanising is a process in which a metal, usually iron or steel, is dipped into hot, molten zinc, to prevent it from rusting.

2.2 Any TWO of the below:
- To prevent rusting.
- To make the metal stronger by adding an extra layer of metal.
- To Improve the appearance.

2.3
- The metal is cleaned of all dirt and rust.
- It is dipped into a vat of molten zinc.
- It is removed from the vat of zinc and left to dry.

Question 3

3.1 The process involves using an electric current to deposit a thin layer of non-corroding metal on the object that you want to preserve and is widely used to preserve and beautify metal items that would otherwise corrode.

3.2
- Improve the appearance of an object.
- Improve the electrical conductivity.
- Protect the object from corrosion, rust and wear.

3.3 Gold (Au)
Platinum (Pt)
Silver (Ag)
Tin (Sn)
Chromium (Cr)
Copper (Cu)

Question 4

4.1 C

4.2 A

4.3 C

4.4 D

10 Food Preservation

Question 1

1.1
- Freezing.
- Salting and drying.
- Pickling.

1.2 All food contains bacteria. Food without bacteria is sterile. Very low temperatures in a freezer, e.g. -15ºC, causes bacteria to become inactive and food is preserved for many months.

1.3 Evaporation
Freeze-drying

Question 2

Meat: Freezing or drying

Fish: Freezing or drying

Cucumber: Pickling

Onion: Pickling

Grains: Drying

Pumpkin: Freezing

Question 3

3.1 B

3.2 A

3.3 A

3.4 C

11 Plastics

Question 1

1.1 Oil, gas or coal

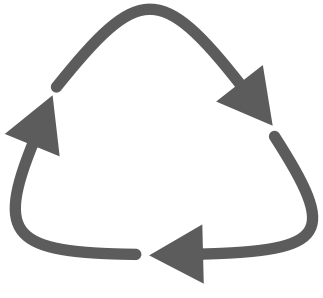
1.2
- Acrylics
- Polyesters
- Silicones
- Polyurethanes
- Halogenated plastics

1.3 Any two below:

Thermoplastics
- Becomes soft when heated
- Becomes hard when cooled
- Can be reheated so that its shape can be moulded

Thermosets
- Become hard when heated
- Cannot be reheated to be moulded but instead breakdown and disintegrate

1.4



Question 2

Code	Abbreviation	Name	Example
1.	PET	Polyethylene terephthalate	Water bottles, etc.
2.	HDPE	High Density Polyethylene	Bottle caps, etc.
3.	PVC	Polyvinyl Chloride	Pipes, etc.
4.	LDPE	Low density polyethylene	Shopping bags, etc.
5.	PP	Polypropylene	Furniture
6.	PS	Polystyrene	Packaging, etc.
7.	Other	All other plastics	CD's, DVD's, Baby bottles, spectacle lenses

Question 3

- waterproof
- corrosion resistant
- poor conductors of heat
- poor conductors of electricity
- easily coloured
- durable
- cheap to produce
- produced at different levels of transparency
- shock resistant
- very strong
- flexible
- easily moulded

Question 4

4.1
- Plastic pellets are poured into a hopper.
- The hopper feeds the pellets into a long metal tube.
- In the tube is a large screw that pushes the pellets down the tube.
- On the outside of the tube are heating bands that heat up the plastic to the correct melting temperature.
- The melted plastic is pushed to the front of the tube.

4.2
- A mould in the shape of the product to be made is attached to the end of the tube.
- The molten plastic is pushed into the mould at high pressure.
- The mould is then pulled off of the end of the tube.
- The mould is opened and the newly formed part is removed.

4.3
- A die or a disk of metal with a shaped hole is placed at the end of the tube.
- The molten plastic is steadily pushed through the die.
- The stream of shaped plastic moves through a water bath to harden it so that it keeps it shape.
- A cutter at the end of the line cuts the shaped plastic into equal lengths.

Question 5

5.1
- Many restaurants have started giving customers paper based straws and cardboard takeaway containers.
- Some countries have started to look at removing the plastic that vegetables and fruit are wrapped in when being sold in shops.
- There have been drives to remind consumers to rather take their own container to hold their shopping rather than buying a plastic bag.

5.2 ANY three clearly correct examples found around your school.

5.3
- Collecting
- Sorting of plastic according to type
- Washing plastic to remove all unwanted substances
- Shredding plastic
- Separation of plastic by colour or grade
- Production into pellets that can be used to form new products

Question 6

6.1 B

6.2 C

6.3 A

6.4 D

6.5 C