MARKER CODE				

Student Enrolment Number									

TONGA FORM SIX CERTIFICATES

2016

DESIGN TECHNOLOGY

QUESTION AND ANSWER BOOKLET

Time allowed: 3 Hours

INSTRUCTIONS

1. Answer ALL questions.
2. This examination has **TWO** Sections. **A** = 35 marks **B** = 30 marks

Section	Description	Marks
A	DESIGN UNDERSTANDING	Compulsory. Answer ALL questions.
B	MAJOR OUTCOMES	Choose ONE (Major 1 – Major 6)

Major	Topic	Questions	Pages
1	**Wood Technology**	**B1-B4**	**9-18**
2	**Metal Technology**	**B5-B8**	**19-28**
3	**Food and Nutrition**	**B9-B11**	**29-34**
4	**Textiles and Garment Construction**	**B12-B14**	**35-40**
5	**Technical Graphics**	**B15-B18**	**41-50**

3. Select only ONE major and answer all the questions in that major.
4. Write your answers in the spaces provided in this booklet.
5. Write your **Student Enrolment Number (SEN)** in the box at the top right hand corner of this page and on the last page of this booklet. Check that this booklet contains 43 pages in the correct order. Pages 42-43 has been deliberately left blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR BEFORE YOU LEAVE THE EXAMINATION ROOM.

SECTION A: DESIGN UNDERSTANDING

Answer ALL questions in this section

Question A1: Multiple Choice

Circle the letter of the best answer to each of the following multiple choice questions.

1. The main stages in the designing process are

Skill level 1	
1	
0	
NR	

A. problem, specification and task.
B. evaluating, building and decision making.
C. designing, making and evaluating.
D. investigation, processes and developing.

2. The small arrow s in the designing process diagram shows the

Skill level 1	
1	
0	
NR	

A. direction of production.
B. revisiting of stages for evaluation.
C. big picture of the process.
D. main flow of the designing process.

3. What is the sample used to test a design concept through observation?

Skill level 1	
1	
0	
NR	

A. observation
B. prototype
C. designing
D. specification

4. A detailed description of what the client needs such as the necessary features is

Skill level 1	
1	
0	
NR	

A. design brief.
B. document.
C. summary.
D. solution.

5. Why it is important to keep records during the process of making the product?

Skill level 1	
1	
0	
NR	

A. to calculate cost
B. for evaluation
C. to save energy and time
D. to see the progress made

6. Two activities taking place during the production process are

Skill level 1	
1	
0	
NR	

A. repairing task and building a prototype.
B. thinking about the outcome and modifying the product.
C. building a prototype and investigating solution.
D. constructing the product and collecting information.

7. During the designing stage, the very first thing to do before investigating the solution is

Skill level 1	
1	
0	
NR	

A. model the solution.
B. identify the problem.
C. develop ideas.
D. evaluate and document.

QUESTION A2:

1. Complete the table below with example of the given design components based on your Project.

	Design Component	Examples
1	Expectation	
2	Specification	

Skill level 2	
2	
1	
0	
NR	

2. Complete the table below with a brief explanation of the given design components based on your project.

	Design Component	Brief Explanation
1	Investigation	
2	Closed Design Brief	
3	Skills	

Skill level 3	
3	
2	
1	
0	
NR	

QUESTION A3:

1. Name main components of a design brief.

Skill level 3	
3	
2	
1	
0	
NR	

i. _____

ii. _____

iii. _____

2. Give **TWO** (2) reasons why it is important to collect information on appropriate tools and equipment before making decision on which to be used.

Skill level 2	
2	
1	
0	
NR	

i. _____

ii. _____

3. Why proper and appropriate techniques and skill have positive impact on our product? Give **THREE** (3) reasons.

Skill level 3	
3	
2	
1	
0	
NR	

i. _____

ii. _____

iii. _____

4. What do these **TWO** (2) activities mean in the designing stage?

i. Investigating ideas for solution

_____

ii. Model or trial the proposal

_____

Skill level 2	
2	
1	
0	
NR	

QUESTION A4:

1. State **ONE** (1) evaluation point and elaborate how you evaluate your product when finish.

Skill level 2	
2	
1	
0	
NR	

2. List **THREE** (3) activities involved in making a product.

i. _____

ii. _____

iii. _____

Skill level 3	
3	
2	
1	
0	
NR	

3. The more information collected the more ideas are available to help in designing proposal 'for the solution'. Explain how this works in your solution design proposal.

Skill level 4	
4	
3	
2	
1	
0	
NR	

4. Explain the difference between ***Model or trial the proposal*** and ***Build and test a prototype***?

Skill level 4	
4	
3	
2	
1	
0	
NR	

MAJOR 1: WOOD TECHNOLOGY

QUESTION B1.

1. Timber are commonly classified as either **Hardwood** or **Softwood**. Indicate whether the corresponding statement refer to **Hardwood** or **Softwood** by labelling either **H** for **Hardwood** and **S** for **Softwood** in the boxes provided.

a. Trees that losses their leaves in winter. [ ]

Skill level 1		
1	0	NR

b. Needle-leaved trees. [ ]

Skill level 1		
1	0	NR

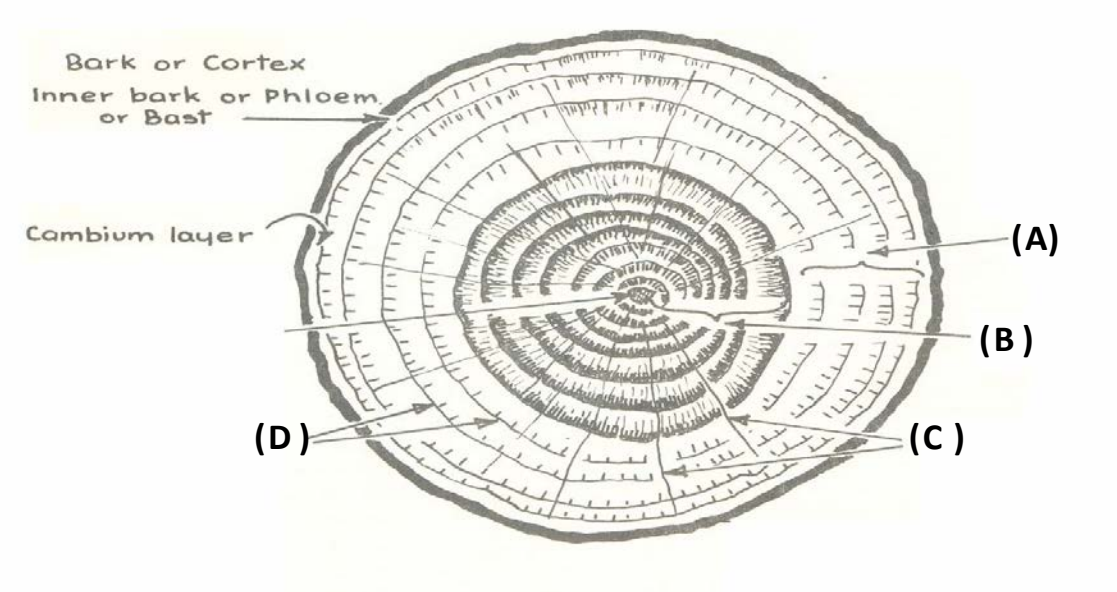
c. Trees that produce uncovered seed. [ ]

Skill level 1		
1	0	NR

d. Trees with visible pores on the end grain. [ ]

Skill level 1		
1	0	NR

2. Shown below is the cross section of a tree trunk. Study the diagram carefully and answer the question.



a. Complete the table below with the correct name of the parts of the tree trunk indicated by the letter.

Parts	Name
(A)	
(B)	
(C)	
(D)	

Skill level 1	
1	
0	
NR	

Skill level 1	
1	
0	
NR	

Skill level 1	
1	
0	
NR	

Skill level 1	
1	
0	
NR	

3. Briefly define the following timber properties.

a. Texture:

_____

_____

_____

Skill level 1	
1	
0	
NR	

b. Hardness:

_____

_____

_____

Skill level 1	
1	
0	
NR	

QUESTION B2.

a. Timber Conversion

i. Name and briefly explain one method of Timber Conversion.

Name : _____

Explanation :

_____

_____

_____

_____

_____

_____

_____

_____

Skill level 2	
2	
1	
0	
NR	

b. Seasoning of Timber

i. Name and briefly explain one method of Timber Seasoning

Name : _____

Explanation :

_____

_____

_____

_____

_____

_____

_____

_____

Skill level 2	
2	
1	
0	
NR	

c. Wood Working Machine

i. Name and explain **TWO** (2) different types of operations that can be safely carried out on the wood working lathe machine.

Name of Operation 1 : _____

Explanation :

_____

_____

_____

_____

_____

_____

_____

Name of Operation 2 : _____

Explanation :

_____

_____

_____

_____

_____

_____

_____

Skill level 2	
2	
1	
0	
NR	

QUESTION B3.

a. Moisture Content

i. Calculate the moisture content (MC) of a sample piece of timber weigh 240 grams. After oven trying, the weight goes down to 200 grams. What is the application of the timber with the calculated moisture content?

Calculation:

Moisture Content (%) = _____

Application : _____

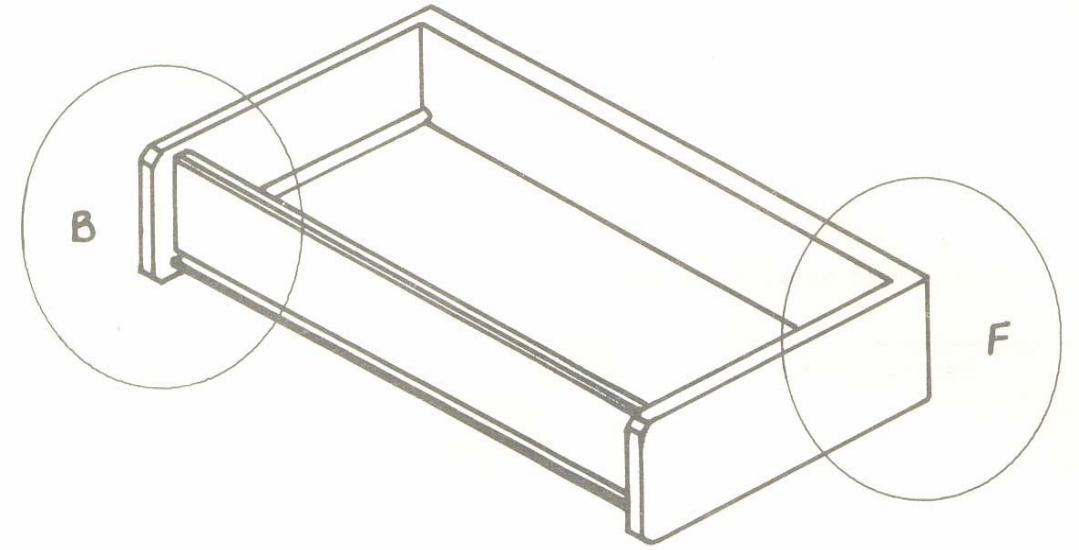
_____

_____

Skill level 3	
3	
2	
1	
0	
NR	

b. **Fastening & Fittings**

Study the drawing of the drawer given below and answer questions that follow.



i. Name the 2 suitable types of joint for joint **B**.

Name of suitable Joint 1: _____

Name of suitable Joint 2: _____

ii. Compare the 2 joints stated in part i) and name the most suitable joint to be used for joint **B**.

_____

_____

_____

_____

_____

_____

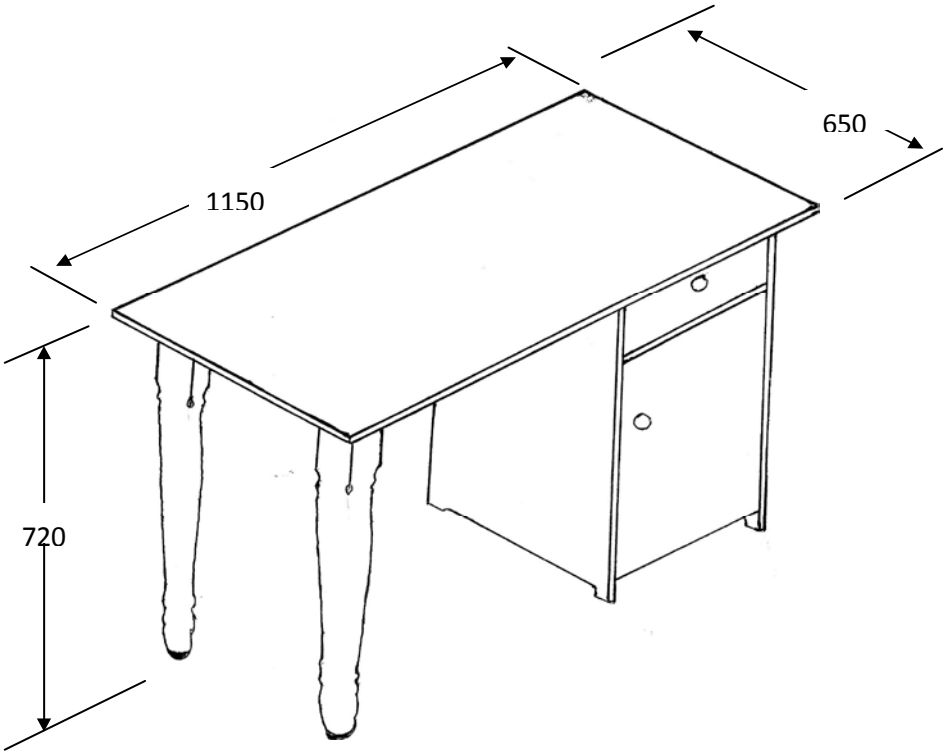
_____

_____

_____

Skill level 3	
3	
2	
1	
0	
NR	

c. Study the student's desk given below and answer the question that follow.



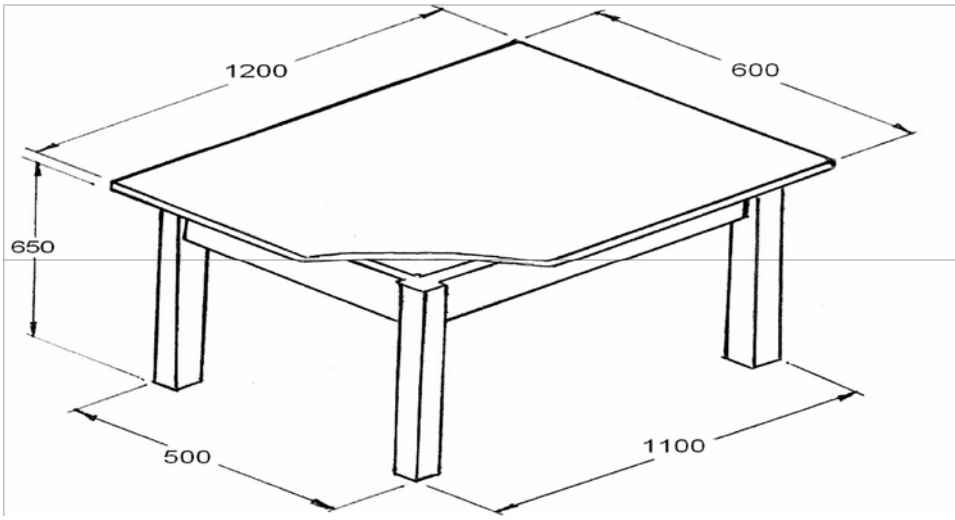
Complete the table below by:

i. Listing TWO required properties that must be considered in choosing material for the top and the leg of the student's desk.
ii. Suggesting the most appropriate material that matches the two properties stated in part i).

Parts	Required properties	Suggested material
Top	1. 2.	1.
Legs	1. 2.	1.

Skill level 3	
4	
3	
2	
1	
0	
NR	

d. Study the dining table below and answer the question that follow.



Use the information given below to calculate the cost of the timber required for the dining table.

Table Parts	Size	Material	Cost
Leg	75 mm x 75 mm	Hardwood - Tawa	$8.50/m
Rail	25 mm x 75 mm	Hardwood - Tawa	$4.30/m
Top	25 mm x 100 mm	Hardwood - Tawa	$6.20/m

i. Calculation of 4 Legs

ii. Calculation of 4 Rails

iii. Calculation of the top

Skill level 4	
4	
3	
2	
1	
0	
NR	

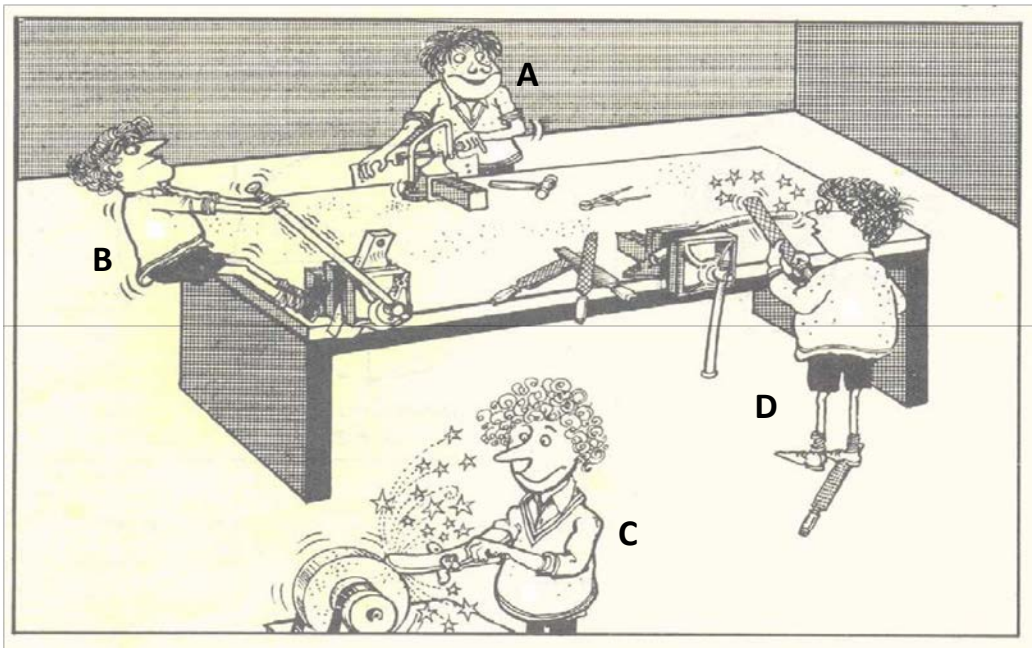
TOTAL Timber cost for the Dining Table: _____

METAL TECHNOLOGY

QUESTION B5.

1. **Workshop Safety**

Study the cartoon below and answer the questions that follow.



i. Describe one way in which **boy A** is neglecting common sense safety practice in which he is working.

Skill level 1	
1	
0	
NR	

_____

_____

ii. Give one reason why the grinding machine shown is dangerous that should not be used.

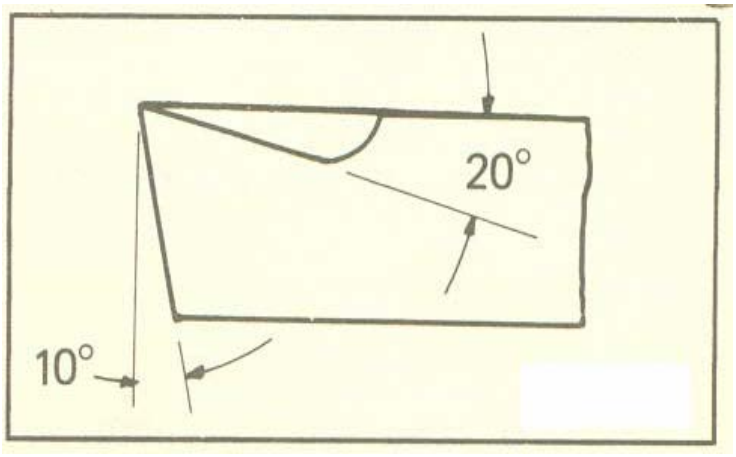
Skill level 1	
1	
0	
NR	

_____

_____

2. **Metal Lathe Tool**

a. The side view of a lathe tool suitable for cutting soft steel is shown below.



Skill level 1	
1	
0	
NR	

i. The angle of 10º is known as _____

3. **Solder** is an example of:

Skill level 1	
1	
0	
NR	

A. Ferrous Metal.
B. Non-Ferrous Metal.
C. Ferrous Alloy.
D. Non-Ferrous Alloy.

4. A simple formula used to calculate the tap drill required to a metric tap when a tap drill chart is not available is:
Outside diameter minus pitch equals tap drill size
The tap drill required for the M12 x 1.75 is:

Skill level 1	
1	
0	
NR	

A. 12 mm.
B. 10.75 mm.
C. 10.50 mm.
D. 10.25 mm.

5. **Oxy-Acetylene Welding**

a. The oxy-acetylene welding equipment in most schools is fitted with flash-back arrestor. What is the purpose of the flash-back arrestor?

Skill level 1	
1	
0	
NR	

_____

b. Name the correct tool used to clean a block welding torch tip.

Skill level 1	
1	
0	
NR	

_____

6. **Metal Lathe Machine**

a. Name 2 factors that should be considered in selecting the speed of a lathe machine if the lathe tool is from high speed steel (HSS).

Skill level 1	
1	
0	
NR	

Factor 1: _____

Factor 2: _____

Skill level 1	
1	
0	
NR	

7. **Electric Arc Welding**

a. Name 1 factor that should be considered in choosing the right electrode for an electric arc welding job.

Skill level 1	
1	
0	
NR	

Factor 1: _____

QUESTION B6

1. **Soldering**

a. Preparation for soldering of sheet metal would include the use of flux. Give 2 reasons why flux is used in soldering.

Reason1: _____

_____

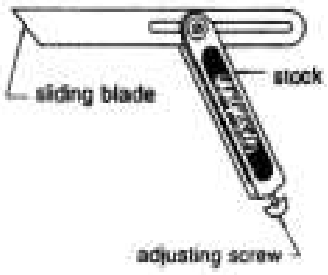
Reason 2: _____

_____

Skill level 2	
2	
1	
0	
NR	

2. **Hand Tools**

a. Complete the table below by naming the hand tools and the description of their use.

Hand Tools	Name	Use
		
		

Skill level 2	
2	
1	
0	
NR	

3. **Material Properties**

a. Briefly explain the following mechanical properties of metal.

a. Elasticity: _____

_____

_____

b. Plasticity: _____

_____

_____

Skill level 2	
2	
1	
0	
NR	

QUESTION B7

1. **Fasteners**

a. Complete the table below by stating one advantage and one disadvantage of the following common fasteners if you need to joint causes of the following n galvanised sheet metal for a funnel.

Types of Fasteners	Advantage	Disadvantage
Soldering		
Rivets		
Screw		

Skill level 3	
3	
2	
1	
0	
NR	

2. **Drilling Operation**

a. Complete the table below by listing the causes of the following faults that can occur when drilling.

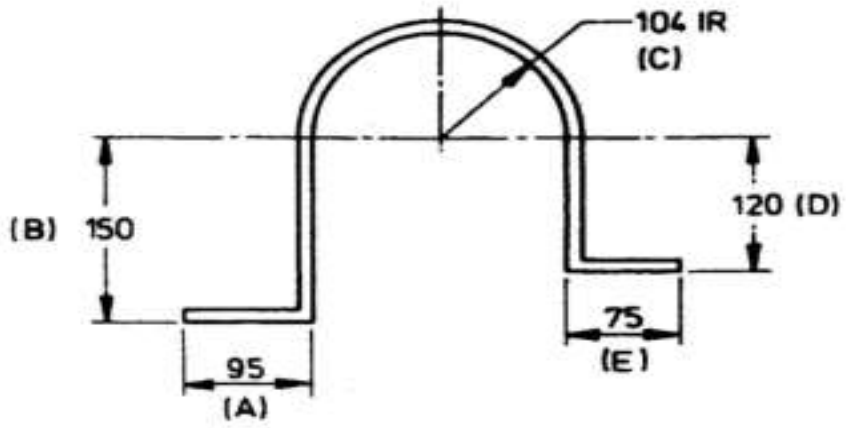
Faults	Cause(s)
Oversize hole	
Drill squeaks and won't cut	
Wall of hole is rough	

Skill level 3	
3	
2	
1	
0	
NR	

3. **Form Work**

a. The golden rule when calculating the material for formed work is to take measuring to the inside of square sharp bends and to use the centre line material (MD) for all curved work.

Calculate the length of the bar required to bend the pipe bracket in the diagram below.



Skill level 4	
4	
3	
2	
1	
0	
NR	

Material: 75 mm x 10 mm flat steel bar

Calculation of part (A) =

Calculation of part (B) =

Calculation of part (C) =

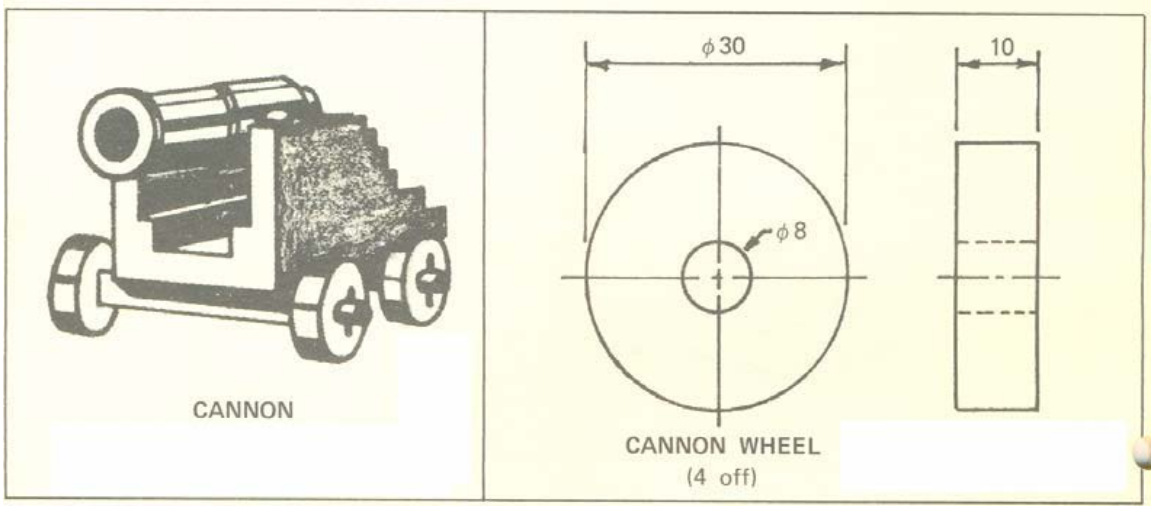
Calculation of part (D) =

Calculation of part (E) =

Total Length of the bar = _____

4. **Metal Turning Process**

A pictorial sketch of a model cannon is shown below. Four wheels are to be made to the sizes given.



The table below shows how the four wheels could be made from ONE setting of the material in the lathe machine.

Complete he table by writing the correct Operation and Description in the spaces provided.

Material: 150 mm long x 32 mm diameter from free cutting mild steel.

Operation	**Description**
i. Setting up	Hold in a 3 jaw chuck approximately half way along its length
ii. Facing	a. _____ b. _____ _____
iii._____	Use a right-hand tool in tool holder and machine the outside diameter to 30 mm foe a length of 60 – 70 mm
iv. Drilling	a. _____ b. _____ _____
v. Parting Off	a. Set parting off tool up square and on centre. b. Using cutting fluid and a slow speed, cut wheel off 10 mm wide.

Skill level 4	
4	
3	
2	
1	
0	
NR	

MAJOR 3 FOOD AND NUTRITION

Answer ALL questions in this section

Question B1 Essential Nutrients

1. Explain **ONE** (1) function of each of the following nutrients in the human body.

Skill level 3	
3	
2	
1	
0	
NR	

i. Protein: _____

ii. Lipid: _____

iii. Vitamin: _____

2. i. Name **ONE** (1) nutrition-related disease discussed in the classroom.

_____

Skill level 3	
3	
2	
1	
0	
NR	

ii. Explain the cause of the disease and how to prevent it from happening.

_____

_____

3. Fill in the table below to show the nutritional requirements of each type of people and identify why they need that particular nutrient.

Skill level 4	
4	
3	
2	
1	
0	
NR	

Type of people	Nutrient needs	Why
i. Sports people		
ii. Elderly people		

Question B2 **Food Quality and Food Preparation**

1. Fill in the table below to show the changes happen to food when put in the refrigerator longer than it should be.

Food	Physical change	Nutritional change
Fish		
Vegetables		

Skill level 4	
4	
3	
2	
1	
0	
NR	

2. Safe food handling and preparation is very important when preparing food for your family or any other occasion. Explain the following techniques and give **ONE** (1) example each.

i. Personal hygiene

_____

_____

Example:_____

ii. Kitchen hygiene

_____

_____

Example:_____

Skill level 2	
2	
1	
0	
NR	

3. Explain what are 'high risk' food and give 2 examples

Explanation

_____

Example

_____

Skill level 2	
2	
1	
0	
NR	

4. To prepare a healthy meal for your family, it is important to use very little fat and salt when cooking. Explain **TWO** (2) reasons for this advice.

i. _____

_____

ii. _____

_____

Skill level 2	
2	
1	
0	
NR	

Question B3 **Food issues and solution**

1. Healthy food is very expensive here in Tonga and unhealthy food is cheap. This makes people buy unhealthy foods that make them suffered different type of diseases.

   i. Name **TWO** (2) healthy foods that are expensive and TWO unhealthy foods that are cheap.

   Healthy foods

   _____

   Unhealthy foods

   _____

Skill level 2	
2	
1	
0	
NR	

   ii. How can you help to solve this problem and make healthy food cheaper? Give **TWO** (2) ways.

   _____

   _____

Skill level 2	
2	
1	
0	
NR	

2. Explain how you could promote good nutrition and health in your school. Give **TWO** (2) ways.

   _____

   _____

   _____

   _____

   _____

Skill level 2	
2	
1	
0	
NR	

3. One of the most killing diseases to the Tongan people is Diabetic. This is primarily due to their eating habit. Write down an appropriate lunch menu for a diabetic woman's diet. Explain your food choice.

Menu:

_____

_____

_____

_____

_____

Skill level 1	
1	
0	
NR	

Reason:

_____

_____

_____

_____

_____

Skill level 3	
3	
2	
1	
0	
NR	

MAJOR 4 TEXTILES AND GARMENT CONSTRUCTION

Answer ALL questions in this section

Question B4 Textiles Properties & Fabric Construction

1. Blending of wool and cotton will improve the properties of the fabric.

   i. List **TWO** (2) good properties of fabrics that are made from blending of wool and cotton.

   _____

   _____

Skill level 2	
2	
1	
0	
NR	

   ii. What could you make from this fabric?

   _____

   _____

Skill level 1	
1	
0	
NR	

   iii. How would you launder it?

   _____

Skill level 1	
1	
0	
NR	

2. Describe the following properties of fibre

   i. Resilience

   _____

   ii. Absorbency

   _____

   iii. Elasticity

   _____

   iv. Lustre

   _____

Skill level 4	
4	
3	
2	
1	
0	
NR	

3. List any **TWO** (2) reasons why we wear clothes.

Skill level 2	
2	
1	
0	
NR	

_____

_____

_____

_____

Question B5 **Design Principles and Elements**

1. Describe what happens to the figure when wearing fabric with the following lines.

   a. Curved

   _____

   _____

   b. Horizontal

   _____

   _____

   c. Vertical

   _____

   _____

Skill level 3	
3	
2	
1	
0	
NR	

2. Explain how could you use design to emphasize a person with the following body features:

   a. Attractive faces

   _____

   _____

   b. Slim waistline

   _____

   _____

   c. Attractive legs

   _____

   _____

Skill level 3	
3	
2	
1	
0	
NR	

3. Describe the following design elements with example.

a. Texture

_____

_____

b. Point

_____

_____

c. Line

_____

_____

d. Shape

_____

_____

Skill level 4	
4	
3	
2	
1	
0	
NR	

Question B6 Garment Construction and Techniques

1. Select **TWO** (2) best methods of transferring pattern symbols, giving reasons for your choices.

Method 1:_____

Reason:_____

_____

Method 2:_____

Reason: _____

_____

Skill level 4	
4	
3	
2	
1	
0	
NR	

2. Explain the purpose of the following sewing techniques that are used on a garment.

i. Clip

_____

_____

ii. Dart

_____

_____

iii. French seam

_____

_____

Skill level 3	
3	
2	
1	
0	
NR	

3. Explain how you handle the following problems when using your sewing Machine

i. The lower thread is loosening

_____

_____

ii. Breaking of needle thread

_____

_____

iii. Skipping of stitches

_____

_____

Skill level 3	
3	
2	
1	
0	
NR	

MAJOR 5: TECHNICAL GRAPHICS

Question B1 - TG

a. Complete the Table below with standard line drawing of the following line types.

	Line Types (description)	**Standard Line Drawing**
i.	Continuous Thin Line	
ii.	Thin Dashed Line	
iii.	Continuous Thick Line	
iv.	Chain Line , Thick at the ends and at change of direction but Thin elsewhere	

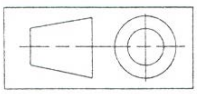
Skill level 1	
1	
0	
NR	

Skill level 1	
1	
0	
NR	

Skill level 1	
1	
0	
NR	

Skill level 1	
1	
0	
NR	

b. Complete the table below by the correct name of the standard technical drawing symbol.

	Standard Technical Drawing Symbols	**Correct Name of Standard Technical Drawing Symbols**
i.	Ø	
ii.		
iii.		

Skill level 1	
1	
0	
NR	

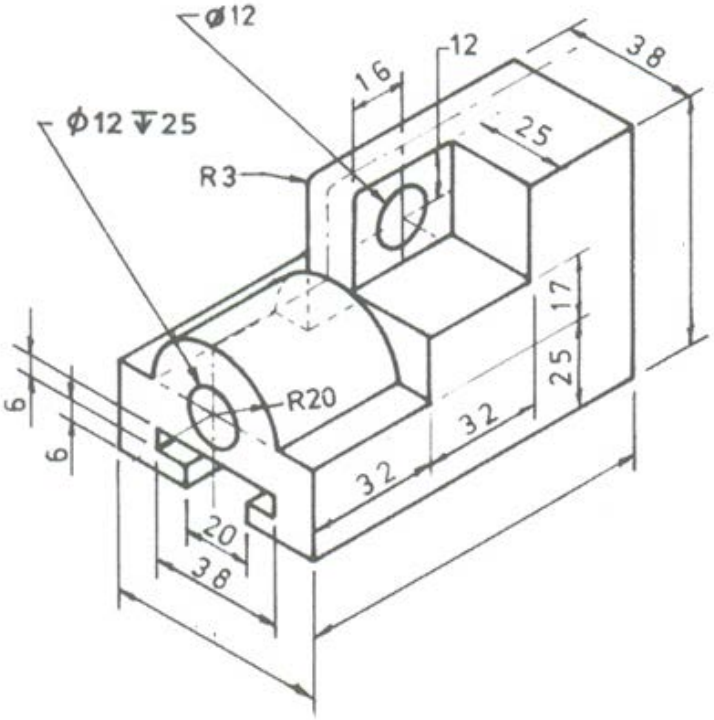
Skill level 1	
1	
0	
NR	

Skill level 1	
1	
0	
NR	

Skill level 1	
1	
0	
NR	

c. The dimension Ø12 ↧ 25 is given in the diagram below.

i. What is 25 mean? : _____



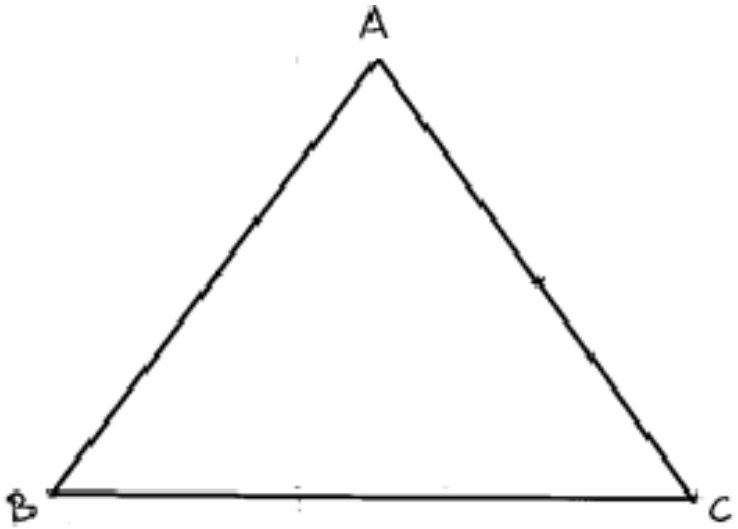
Skill level 1	
1	
0	
NR	

ii. What is the total Length of the diagram above: _____

Skill level 1	
1	
0	
NR	

iii. What is the total height of the diagram above: _____

d. Bisect the angle BCA of the triangle ABC given below. Show Construction Line.



Skill level 2	
2	
1	
0	
NR	

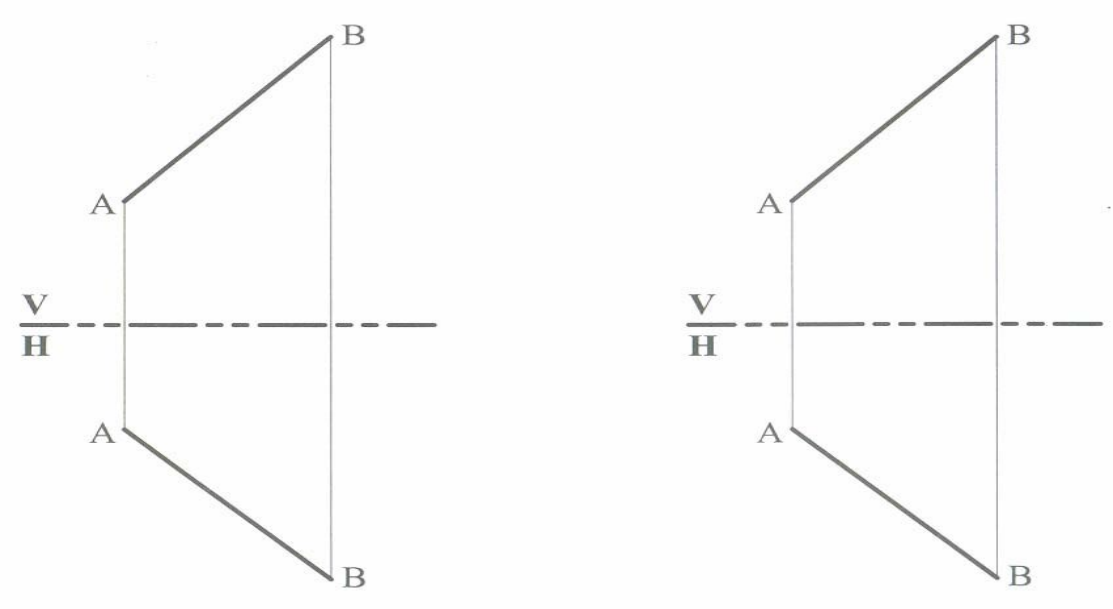
e. The projection of an oblique line AB onto the horizontal and vertical planes is given below.

Use the rotational method to determine the true length and true angle of inclination of the line AB to:

i. the horizontal plane
ii. the vertical plane. (Show ALL construction lines)

Skill level 2	
2	
1	
0	
NR	

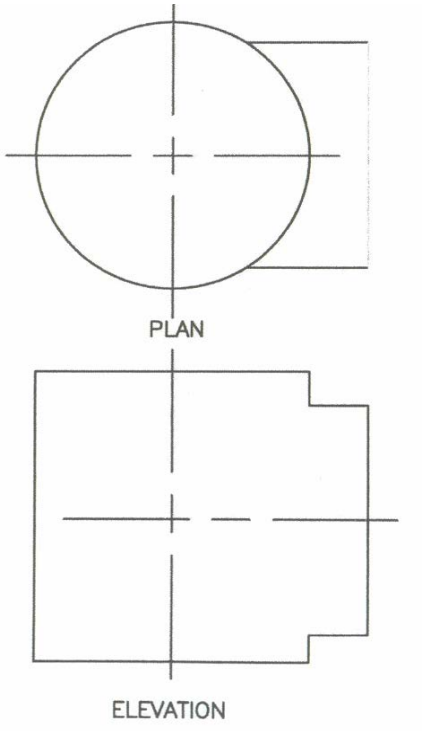
Skill level 2	
2	
1	
0	
NR	



Question B2 - TG

a. Given below is the plan and incomplete elevation of interpenetration cylinders.
Complete the elevation by drawing of intersection. Show all construction lines.

Skill level 3	
3	
2	
1	
0	
NR	

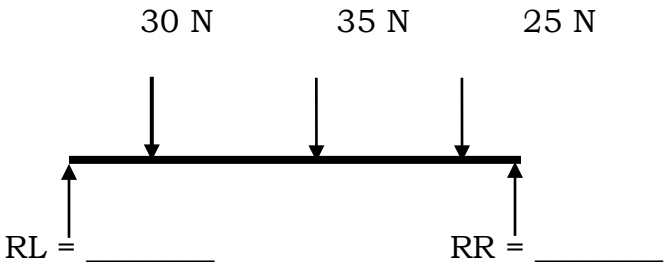


Skill level 4	
4	
3	
2	
1	
0	
NR	

Skill level 3	
3	
2	
1	
0	
NR	

b. Given below is the Space diagram of parallel forces acting on a beam. Use the Funicular, force and Polar diagram to determine the following:

i. Position of the resultant force.
ii. Reaction RL and RR at the supports.



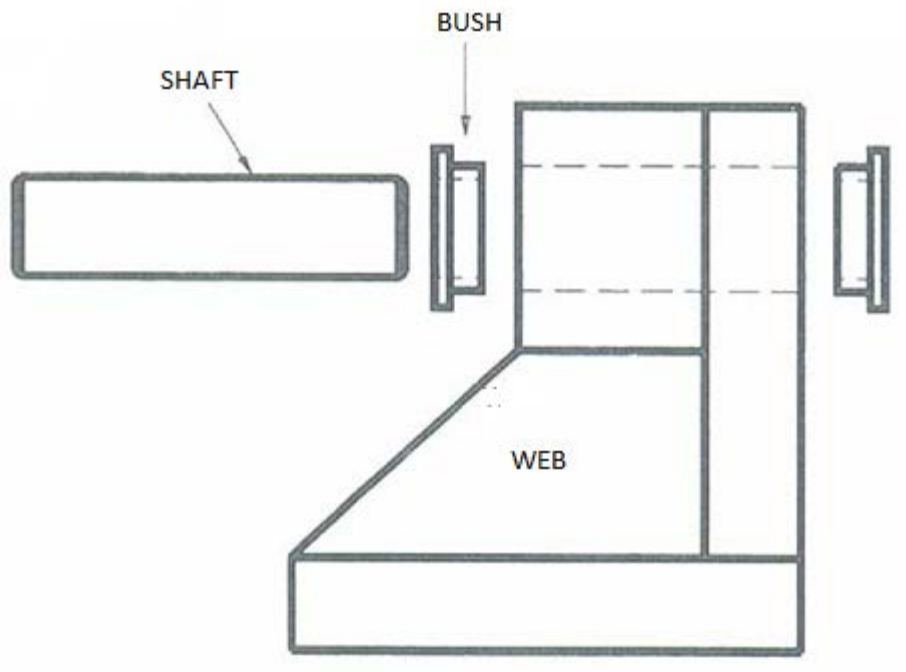
Scale: _____

c. **Simple Assembly Drawing**

Skill level 4	
4	
3	
2	
1	
0	
NR	

Below is an exploded front view of a CI Support Bracket.

Draw the sectional assembly front view of the CI Support Bracket, taking into consideration the shaft, bushes and the web.



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