L-Università ta' Malta

MATSEC
Examinations Board

Marking Scheme

SEAC Engineering Technology Unit 2

Main Session 2025

15th April 2024

Marking schemes published by the MATSEC Examination Board are not intended to be standalone documents. They are an essential resource for markers who are subsequently monitored through a verification process to ensure consistent and accurate application of the marking scheme.

In the case of marking schemes that include model solutions or answers, it should be noted that these are not intended to be exhaustive. Variations and alternatives may also be acceptable. Examiners must consider all answers on their merits, and will have consulted with the MATSEC Examinations Board when in doubt.

Criteria Reference	The student should be able to:	Question Number	Max marks that can be achieved	Allocation of marks NOT to be subdivided any further than indicated below	Expected answers:
		Section A	**4**		
K-8	MQF Level 1: Label the different lever classes.	1a	1	0.5 marks for each correct answer.	Candidates are expected to label the following: i. 3rd Class ii. 2nd Class
	MQF Level 2: Identify the different linkages in lever systems.	1b	1	0.25 marks for each correct answer.	Candidates are expected to identify the following: i. Parallel motion ii. Bell Crank iii. Push-Pull iv. Reversing
	MQF Level 3: Describe the output for each linkage system.	1c	2	1 mark for each correct description.	Candidates are expected to describe the output of each of the given linkage systems. Reciprocating/linear motion: The linkage system moves to the left and right repetitively and continuously in order to produce strokes on the piston. Rotary motion: As the slider moves to the right the connecting rod pushes the wheel round for the first 180 degrees of wheel rotation. When the slider begins to move back into the tube, the connecting rod pulls the wheel round to complete the rotation. Any other suitable description is to be accepted.

Criteria Reference	The student should be able to:	Question Number	Max marks that can be achieved	Allocation of marks NOT to be subdivided any further than indicated below	Expected answers:
		Section B	**10**		
A-4	MQF Level 1: Prepare tools/ equipment and the necessary PPEs to assemble cams and cranks systems.	1a	3	As per observation sheet.	Refer to observation sheet 1.
	MQF Level 2: Construct housing for cams and crank systems to given specifications.	1b	3	As per observation sheet.	Refer to observation sheet 1.
	MQF Level 3: Construct appropriate cams and crank assemblies according to given specifications.	1c	4	As per observation sheet.	Refer to observation sheet 1.

Criteria Reference	The student should be able to:	Question Number	Max marks that can be achieved	Allocation of marks NOT to be subdivided any further than indicated below	Expected answers:
		Section C	**10**		
A-5	MQF Level 1: Prepare the necessary PPE and tools/ equipment to construct a mechanical system from a given drawing.	1a	3	As per observation sheet.	Refer to observation sheet 2.
	MQF Level 2: Construct housing for a mechanical system.	1b	3	As per observation sheet.	Refer to observation sheet 2.
	MQF Level 3: Construct a mechanical system composed of different mechanical sub-systems.	1c	4	As per observation sheet.	Refer to observation sheet 2.

<table>
<tr><th>Criteria Reference</th><th>The student should be able to:</th><th>Question Number</th><th>Max marks that can be achieved</th><th>Allocation of marks NOT to be subdivided any further than indicated below</th><th>Expected answers:</th></tr>
<tr><td></td><td></td><td>Section D</td><td>6</td><td></td><td></td></tr>
<tr><td rowspan="3">C-3</td><td>MQF Level 1: Classify a mechanical system into input and output.</td><td>1a</td><td>2</td><td>1 mark for each correct answer.</td><td>Candidates are to classify the TWO given mechanical systems into input/ output/process.
<table><tr><th></th><th>Input and/or output</th><th>Process</th></tr><tr><td>Turning arm</td><td></td><td>✓</td></tr><tr><td>Pulley with operating handle</td><td>✓</td><td></td></tr></table></td></tr>
<tr><td>MQF Level 2: Describe the parameters of your own mechanical system.</td><td>1b</td><td>2</td><td>1 mark for each parameter.</td><td>Candidates are to describe the parameters of the mechanical system constructed in Section C Question 1.

Examples of a good description:
Input and output: Rotating motion given by the pulley converts into reciprocating motion of the turning arm which turns clockwise and anti-clockwise, enabling the hanging item to be dipped.

Any other suitable description is to be accepted.</td></tr>
<tr><td>MQF Level 3: Explain the parameters of your own mechanical system.</td><td>1c</td><td>2</td><td>2 marks for a correct explanation.</td><td>Candidates are to explain the parameters of the mechanical system constructed in Section C Question 1.

Examples of a good explanation:
The pulley with the operating handle turns about a fixed point which in turn rotates the pulley connected with the turning arm by means of a connecting rod. This will also result in the clockwise/anti-clockwise repetitive rotation of the turning arm.

Any other suitable explanation is to be accepted.</td></tr>
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PRACTICAL ASSESSMENT GUIDELINES
FOR TEACHERS

Section B – Question 1 **Criterion A-4**

Assumptions

1. The whole group consists of 16 students.
2. Each student has his/her own workstation.
3. Each student can work on his/her own workstation simultaneously.

Recommended Estimated Time for completion

Total Time: 160 minutes

Preparation

Part a) The following tools/equipment should be made available for each student:

1. Wood glue
2. Wood holding devices
3. Screwdriver
4. Screws
5. File
6. Hand drill / pillar drill
7. Drill bits
8. Hammer

For Parts b) and c) the following material should be made available for each student:

1. **FOUR** pieces of wood for housing to be cut from 15 mm material (e.g. plywood or MDF) cut according to the measurements given in Figure 1.
2. **NINE** circles, R30, cut out of 10 mm material (e.g. plywood or MDF) according to Figure 2:
   i. **FOUR** circles to have a suitable hole for 6mm dowel (drilled according to diagram).
   ii. **FOUR** circles for the top part (to be drilled by students).
   iii. **ONE** circle with 2 suitable holes for the crank (drilled in the centre and another off-centre according to diagram).
3. M6 dowels for the shafts according to Figure 3.
4. **FOUR** squares to be cut from 15 mm material (e.g. plywood or MDF) cut according to the measurements given in Figure 3.

N.B. Dimensions which are not given/available are to be calculated or assumed.

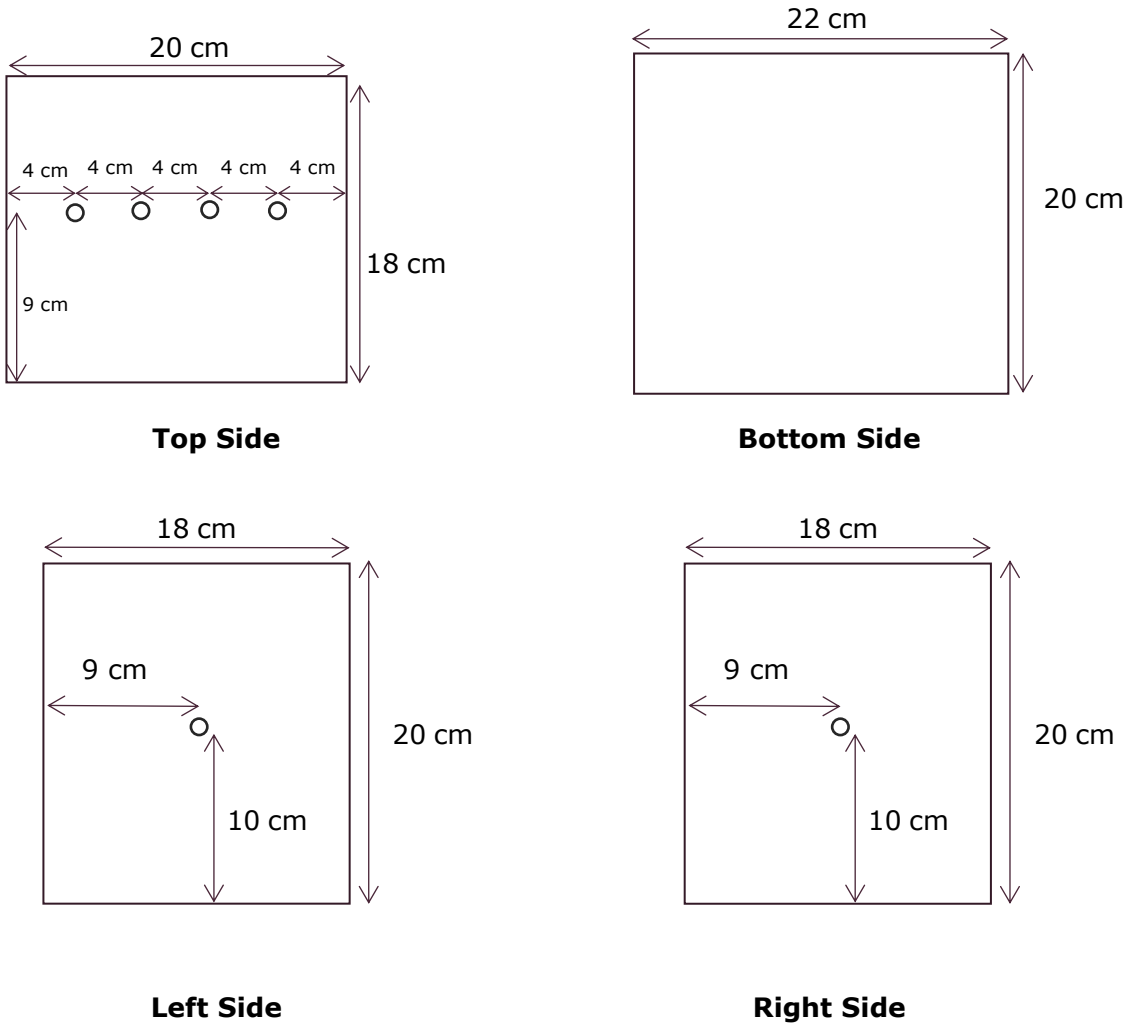


Figure 1: Housing for cam toy

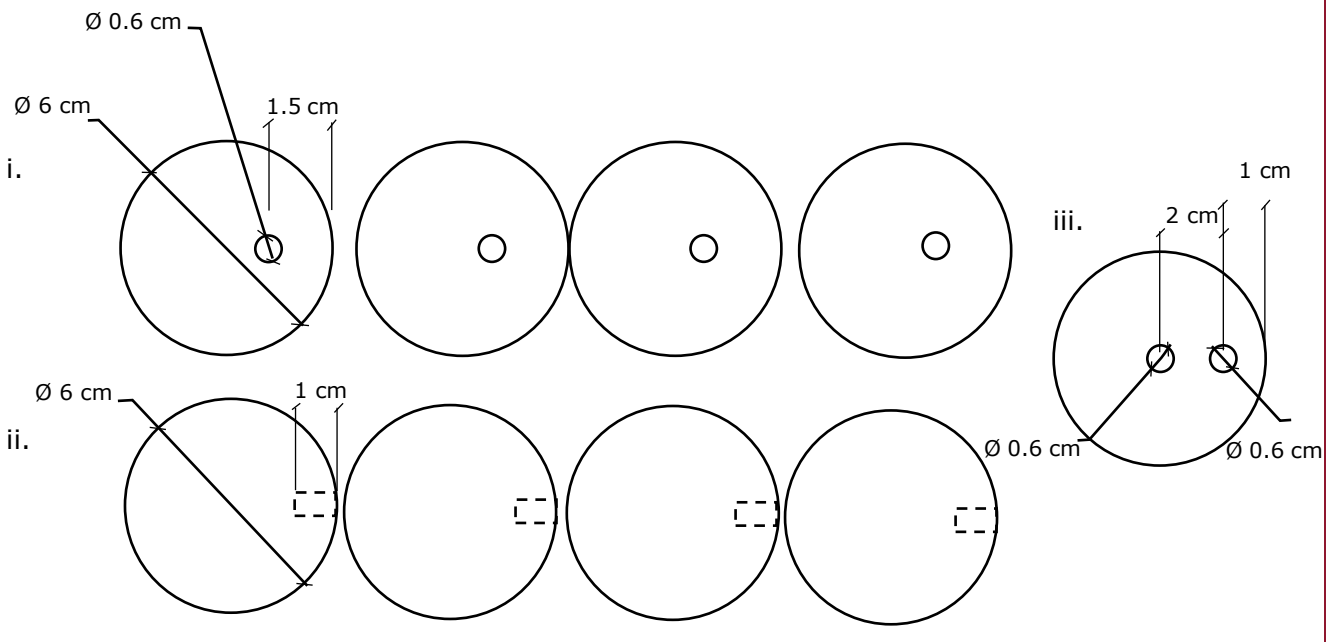


Figure 2: Circles for cam toy

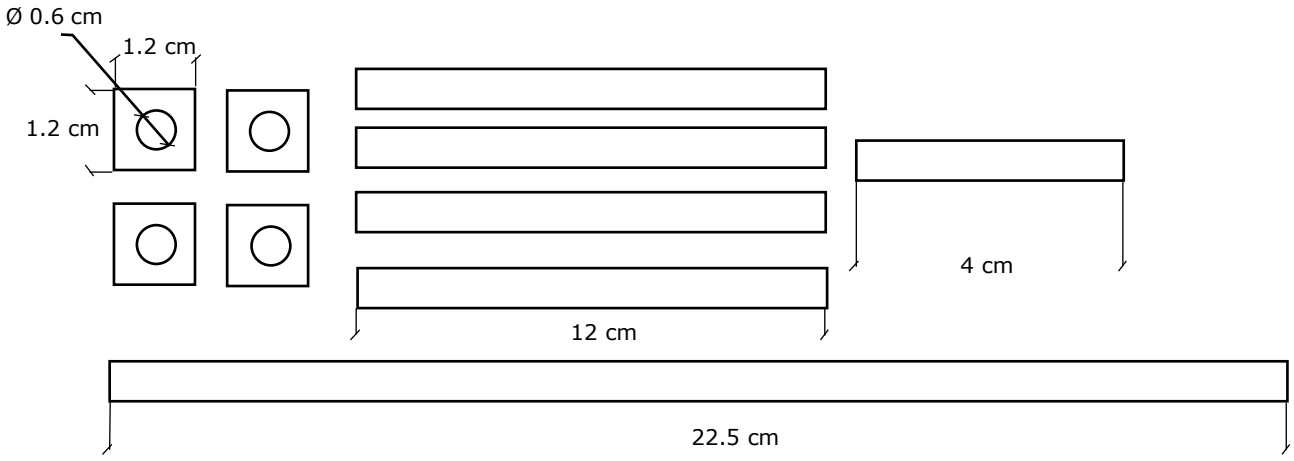


Figure 3: Dowels

Information to be conveyed to students

Before starting the practical assessment, the teacher should communicate the duration of each task to all students.

OBSERVATION SHEET 1

NOT TO BE DISTRIBUTED TO STUDENTS

School:		**Cohort:**	2022-2025
Subject:	Engineering Technology	**Level:**	SEAC
Unit:	2 – Mechanical Systems	**Assignment:**	3 of 3
Student's Name/ID:			
Teacher's Name:			
Task & Question:	Section B – Question 1	**Criterion:**	A-4

Activity requirements to meet grading criterion

A-4	**MQF 1**	Prepare tools/equipment and the necessary PPEs to assemble cams and crank systems.	**3 Marks**

		Comments	***Mark***
Prepare proper PPE (In this task prepare means the preparation of PPE for their use)	☐		1.5
Prepare proper tools / equipment (In this task prepare means the preparation of tools for their use)	☐		1.5
Student's accumulated mark for A-4 [MQF1]:			

A-4	**MQF 2**	Construct housing for cams and crank systems to given specifications.	**3 Marks**

		Comments	***Mark***
Accuracy of holes in relation to each other (tolerance of +/- 5mm)	☐		1
Precision of parts to be constructed by students (tolerance of +/- 5mm)	☐		1
Proper use of tools/equipment	☐		1
Student's accumulated mark for A-4 [MQF2]:			

A-4	**MQF 3**	Construct appropriate cams and crank assemblies according to given specifications.	**4 Marks**
		Comments	***Mark***
Proper handling and use of tools/ equipment	☐		1
Functionality	☐		1
Use appropriate PPE for the specific task	☐		1
Meet requirements as indicated by the given designs	☐		1
Student's accumulated mark for A-4 [MQF3]:			
TOTAL MARK FOR A-4 (OUT OF 10 MARKS):			
Assessor's Signature:		**Date:**	

PRACTICAL ASSESSMENT GUIDELINES
FOR TEACHERS

Section C – Question 1 **Criterion A-5**

Assumptions

1. The whole group consists of 16 students.
2. Each student has his/her own workstation.
3. Each student can work on his/her own workstation simultaneously.

Recommended Estimated Time for completion

Total Time: 240 minutes

Preparation

Part a) The following tools/equipment should be made available for each student:

1. Wood glue
2. Wood holding devices
3. Screwdriver
4. Screws
5. File
6. Hand drill / pillar drill
7. Drill bits
8. Hammer
9. Cutting tools – hack saw / saw, coping saw

For Part b) and c) The following material should be made available for each student:

1. **ONE** Large elastic band.
2. **ONE** piece M6 dowels (1 m rod) for the pulleys and the operating handle.
3. **ONE** piece of wood required for the base to be cut from 15 mm material (plywood or MDF) according to Figure 4.
4. **SEVEN** pieces of wood required for the turning arm and supporting components to be cut from 3 mm material (plywood or solid wood) according to Figure 6.
5. **ONE** piece of wood required for connecting rod to be cut from 5 mm material (plywood or solid wood) according to Figure 6.
6. Circles cut out of 3 mm material (plywood or MDF) drilled in the centre only as per Figure 5 (the rest of the holes are to be drilled by students):
   - **THREE** circles, R30
   - **ONE** circle, R25
   - **THREE** circles, R20
   - **ONE** circle, R15

N.B. Dimensions which are not given/available are to be calculated or assumed

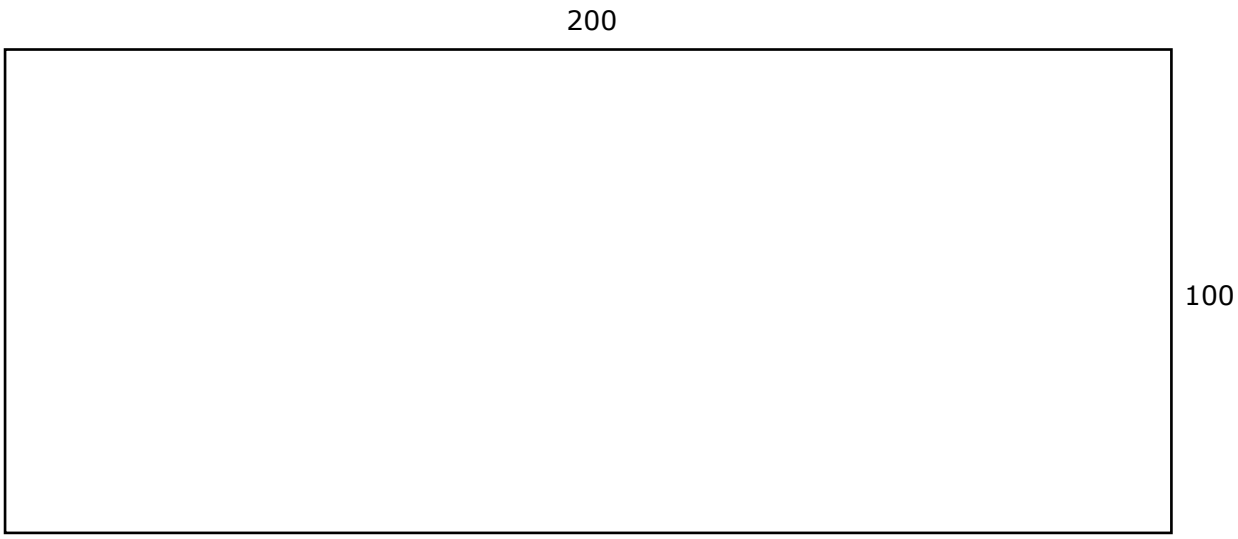
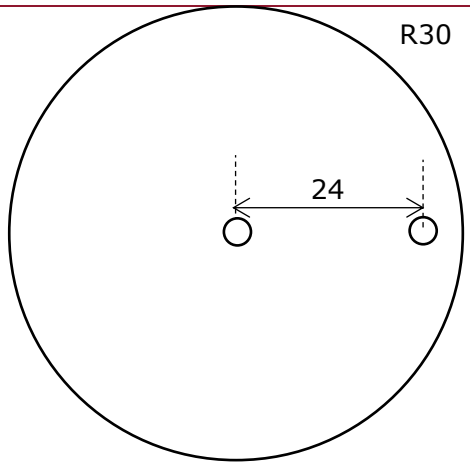
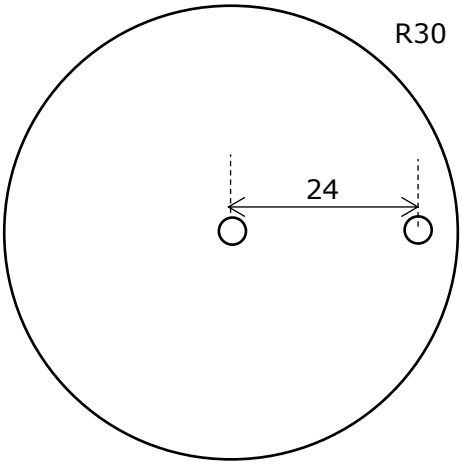
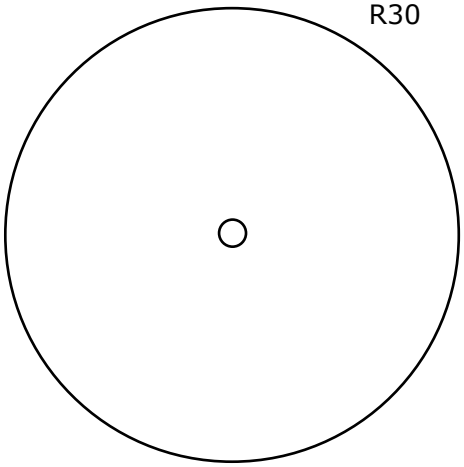
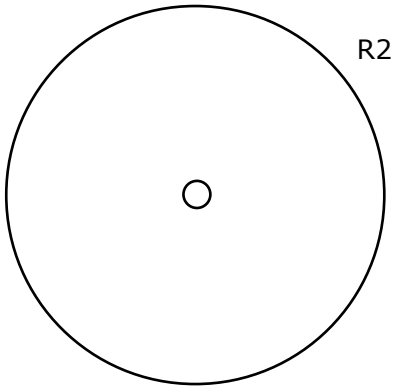


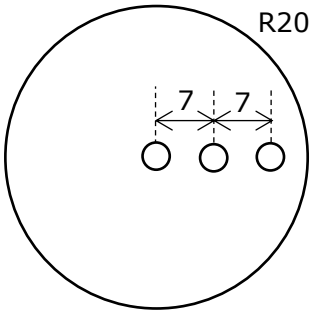
Figure 4: Housing (base)

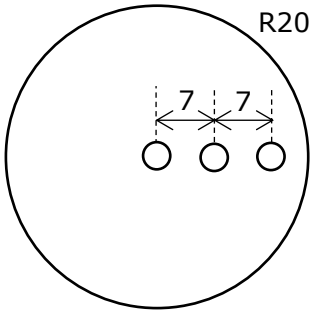


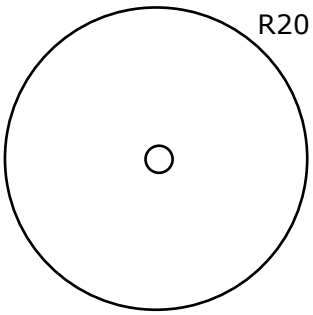












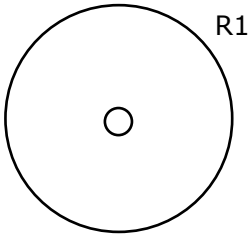


Figure 5: Circles for pulleys

All dimensions are given in mm, all holes of 6mm diameter

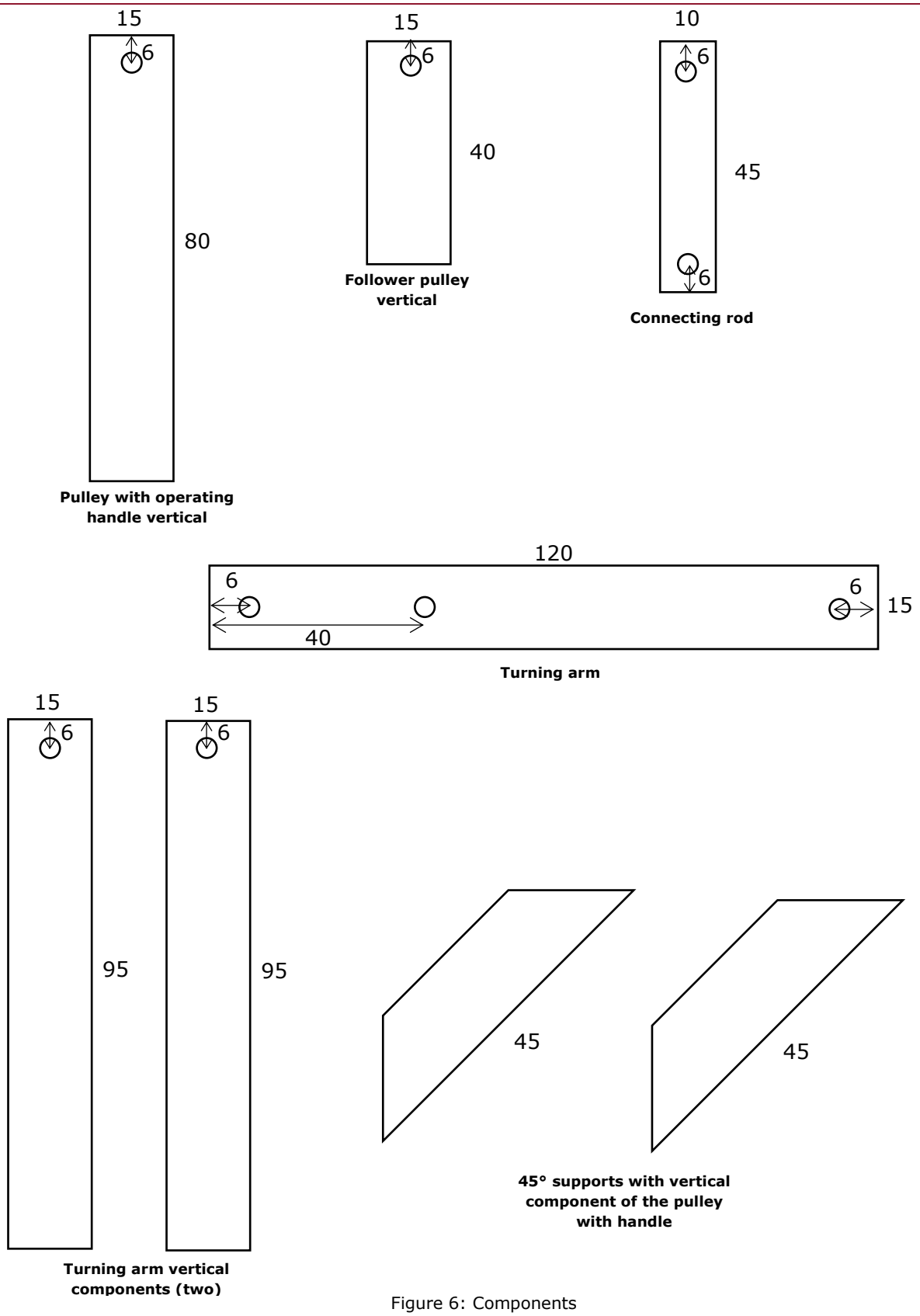


Figure 6: Components

All dimensions are given in mm, all holes of 6mm diameter

Information to be conveyed to students

Before starting the practical assessment, the teacher should communicate the duration of each task to all students.

OBSERVATION SHEET 2

NOT TO BE DISTRIBUTED TO STUDENTS

School:		**Cohort:**	2022-2025
Subject:	Engineering Technology	**Level:**	SEAC
Unit:	2 – Mechanical Systems	**Assignment:**	3 of 3
Student's Name/ID:			
Teacher's Name:			
Task & Question:	Section C – Question 1	**Criterion:**	A-5

Activity requirements to meet grading criterion

A-5	**MQF 1**	Prepare the necessary PPE and tools/equipment to construct a mechanical system from a given drawing.	**3 Marks**
		Comments	***Mark***
Prepare proper PPE (In this task prepare means the preparation of PPE for their use)	☐		1
Prepare proper tools/equipment (In this task prepare means the preparation of tools for their use)	☐		1
Prepare proper materials (according to given measurements)	☐		1
Student's accumulated mark for A-5 [MQF1]:			

A-5	**MQF 2**	Construct housing for a mechanical system.	**3 Marks**
		Comments	***Mark***
Accuracy of holes in relation to each other (tolerance of +/- 5mm and +/- 3°)	☐		1
Precision of parts to be constructed by students (tolerance of +/- 5mm and +/- 3°)	☐		1
Proper use of tools/equipment	☐		1
Student's accumulated mark for A-5 [MQF2]:			

A-5	**MQF 3**	Construct a mechanical system composed of different mechanical sub-systems.	**4 Marks**
		Comments	***Mark***
Proper handling and use of tools/ equipment	☐		1
Functionality	☐		1
Use appropriate PPE for the specific task	☐		1
Meets requirements as indicated by the given designs	☐		1
Student's accumulated mark for A-5 [MQF3]:			
TOTAL MARK FOR A-5 (OUT OF 10 MARKS):			
Assessor's Signature:		**Date:**	