Model Answers

Domain	Manufacturing Pathways Skills

Unit	US032051	Demonstrate and apply knowledge of mechanical engineering drawings and geometric construction in MaPS environment	Level 2	Credits 4

Teacher's note

This is a combined theory and practical unit that covers the theory and practical parts of US32051.

Change control

The following changes have been made to US032051 v1 assessment materials.

Edition of this document	Changes made
Edition 5 December 2024	» Updated with feedback from teachers and review by moderator.
Edition 4 November 2023	» Information note added about this being a theory and a practical assessment. » Updated to latest template. » No pre-moderation was required. » This edition was pre-moderated August 2017.
Edition 3 January 2023	» Updated table and answers for questions 21 and 24 to align with learning material. » Footer has been updated to reflect new edition. » No pre-moderation was required.
Edition 2 November 2021	» Some model answers corrected post feedback. » Footer has been updated to reflect new Edition. » No pre-moderation was required. » This edition was pre-moderated August 2017.
Edition 1 May 2020	» No changes. Original document.

Student instructions

You will need to be able to:

» Demonstrate knowledge of drawing principles.

» Interpret mechanical engineering drawings.

» Produce mechanical engineering orthographic drawing in third angle.

» Construct geometric details manually.

Important information

» Carefully read through this Assessment Guide so you know exactly what is expected.

» All evidence you provide for this assessment must be your own work.

» Clearly name and label all attached evidence.

» See the Appendix at the back of this assessment for further information.

What you need to do		Completed
Question Set	Answer questions about engineering drawings and geometric construction techniques.	☐
Task Sheet 1	This will involve producing **one** mechanical engineering orthographic detail drawing: » Interpreting specifications. » Drawing the object. » Labelling all dimensions and views. » Attaching the drawing.	☐
Task Sheet 2	This will involve producing **one** mechanical engineering orthographic assembly drawing: » Interpreting specifications. » Drawing the object. » Labelling all dimensions and views. » Attaching the drawing.	☐
Task Sheet 3	This will involve manually constructing geometric details: » Completing construction using only a rule and compass. » Showing construction working details. » Attaching completed drawings.	☐

Unit standard evidence map

Unit 30251 V1	Demonstrate and apply knowledge of engineering drawings and geometric construction techniques in MaPS environment	Level 2	Credits 4
Outcomes and Performance Criteria		**Evidence**	**No.**
Outcome 1: Demonstrate knowledge of drawing principles.			
1.1 Drawing principles are explained. Range: scale, third angle orthographic projection, isometric, oblique.		Question Set	1, 2, 3
1.2 The characteristics of good drawing practice and the reasons for these are explained. Range: communication of requirements and specifications, avoidance of ambiguity, scaling, dimensional accuracy, clarity.		Question Set	1, 4
1.3 The purpose and contents of the drawing title block are identified and explained.		Question Set	5, 6
1.4 General engineering, and welding symbols are interpreted. Range: symbols may include but not limited to – datum point, diameter, radius, square, centre line, angularity, machining, plus six other general engineering symbols.		Question Set	7, 8
1.5 Fastener types are identified from symbols. Range: thread pitch, grades of bolts, types of pins, types of nuts, types of washers.		Question Set	9, 10, 11, 12, 13

Outcome 2: Interpret mechanical engineering drawings. Range: one detail drawing and one assembly drawing.		
2.1 Drawing lines are interpreted. Range: may include but are not limited to – continuous thick, continuous thin, continuous ruled with zigzag, dashed, chain, section, dimension and extension lines.	Question Set Task Sheets 1 and 2	14 1, 2
2.2 Dimensions and tolerances are interpreted from given drawings. Range: dimensions and size tolerances may include but are not limited to – length, diameter, radius, positioning of holes, countersink, chamfer; dimensioning for – bolts, nuts, screws, screw threads, keyways.	Question Set Task Sheets 1 and 2	15 1, 2
2.3 Drawing symbols are interpreted for one of each type of fasteners. Range: thread pitch, grades of bolts, types of pins, types of nuts, types of washers.	Question Set Task Sheets 1 and 2	9, 10, 11, 12, 13, 15 1, 2
2.4 Materials list is interpreted and required materials are established. Range: may include but are not limited to – raw materials, types and quantity of fasteners.	Question Set	15
2.5 Materials list is interpreted and required materials are established. Range: may include but are not limited to – raw materials, types and quantity of fasteners.	Question Set	15

Outcome 3: Produce mechanical engineering orthographic drawing in third angle.		
3.1 Objects to be drawn are identified.	Task Sheets 1 and 2	1, 2
3.2 Tolerances are established from job specifications.	Task Sheets 1 and 2	1, 2
3.3 Objects are drawn according to the drawing standard. Range: front view, plan view, side views, views are labelled, dimensions and tolerances included.	Task Sheets 1 and 2	1, 2
Outcome 4: Construct geometric details manually. Range: bisection of two lines and two angles, one 6 and one 8-hole pitch circle diameter (PCD), divide two lines into equal parts.		
4.1 Construction is completed using only a rule and compass.	Task Sheet 3	1 - 8

Question Set

Answer the following questions about engineering drawing principles.

Use your own words. You can answer the questions in writing or give your answers verbally to your teacher who will write down what you say. You may need to arrange this in advance.

Your teacher may ask you additional questions to check your knowledge and understanding.

Your name	Student name provided
School	School identified
Answers written by:	☐ Student ☐ Teacher **Teacher –** when using verbal questioning, record key points from the student's responses as accurately and fully as possible.

	☑
1. Explain how **scale** is used in engineering drawing. Use no more than **three** sentences. **Teacher** This question supports 32051, PC 1.1, 1.2 **Judgement statements** ☐ The student explains why scale is necessary in engineering drawing. ☐ The student's answer does not have to match the example answer but must convey the same overall meaning. **Example answer** The proportion by which the drawing of an object is enlarged or reduced is called the scale of the drawing. A scale is defined as the ratio of the linear dimensions of the object as represented in a drawing to the actual dimensions of the same.	☑

2. Explain **third angle orthographic projection**. List **three** views that can be used in a third angle projection drawing. ☑

Teacher

This question supports 32051, PC 1.1

Judgement statements

- ☐ The student gives a brief explanation of third angle orthographic projection.
- ☐ Three views are stated.

Example answer

Orthographic projection is a way of drawing an object from different directions. Usually a front, side and plan view are drawn so a person looking at the drawing can see all the important sides.

3. Explain the differences between **isometric** and **oblique** drawings. Include in your answer the angles these are usually drawn in. ☑

Teacher

This question supports 32051, PC 1.1

Judgement statements

- ☐ The student explains the differences between isometric and oblique drawings.
- ☐ Angles of the drawings are included in answer.

Example answer

An oblique sketch puts more focus on the face or front of an object while an isometric sketch puts more focus on the edge of an object. To achieve this, oblique sketches are usually drawn using a 45-degree angle to render the third dimension while isometric sketches are drawn using a 30-degree angle.

4. Below are **four** of the characteristics of good drawing practice. ☑

Explain how each one will help produce accurate, usable drawings.

Use no more than **two** sentences for each one.

Teacher

This question supports 32051, PC 1.2

Judgement statements

☐ The student explains the characteristics of good drawing practice.

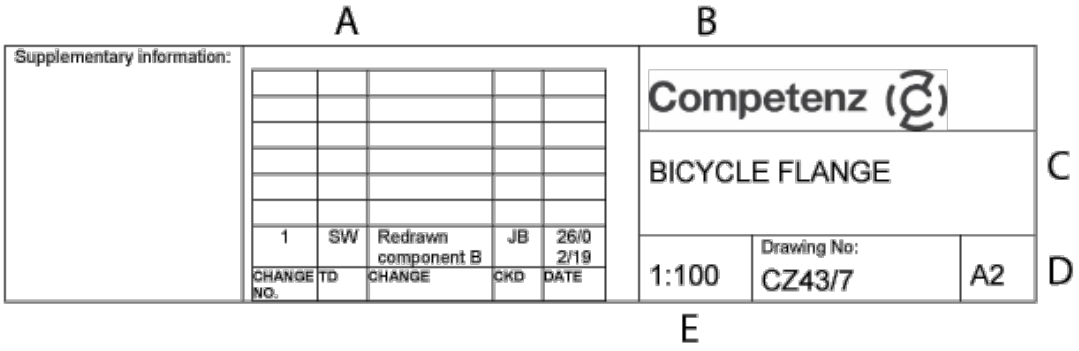
☐ Answers do not have to match those below exactly but must convey the same overall meaning.

Example answer

Communication of requirements and specifications	The correct/required item will be represented and produced when drawings are used in production.
Avoidance of ambiguity	There will be no question of what is required, reducing consultation between designer and production.
Dimensional accuracy	Finished product will be correct size and proportion.
Clarity	There will be no question of what is required, reducing consultation between designer and production.

5. Below is an image of a drawing title block. ☑

Match the missing title block headings to the list below by writing in the correct letter from the image next to it.



Teacher

This question supports 32051, PC 1.3

Judgement statement

☐ The student identifies the parts of the title block.

Answers

Letter	Headings
D	Drawing size
C	Drawing title
B	Name of company
A	Preparation information
E	Scale

☐

6. Using the image from the previous question, explain how the headings you identified can help the person reading a finished drawing. ☑

Use no more than **two** sentences for each one.

Teacher

This question supports 32051, PC 1.3

Judgement statements

- ☐ The student explains the contents of the title block.
- ☐ Answers do not have to match those below exactly but must convey the same overall meaning.

Example answer

Drawing size shows the correct size of paper that drawing should be displayed on to give best definition.

Drawing title shows the component(s) being displayed.

Name of company shows the name of company producing the drawing.

Preparation information shows what changes have been made and when so most recent drawing can be confirmed.

Scale shows how big the drawing is compared to the finished product.

7. Identify the following general engineering symbols. ☑

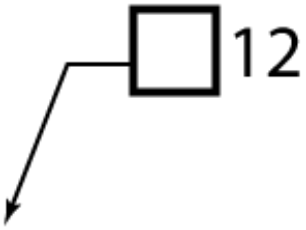
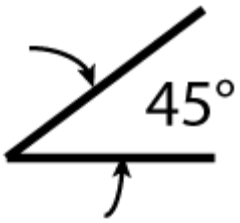
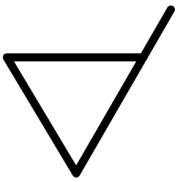
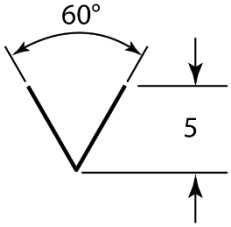
Teacher

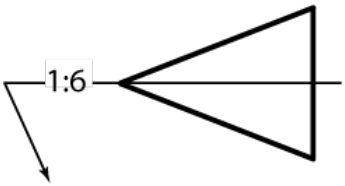
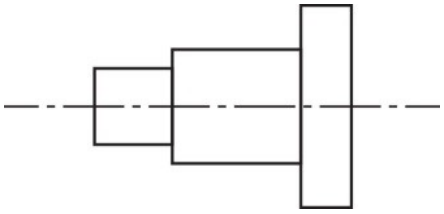
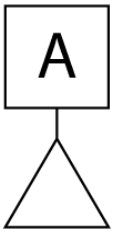
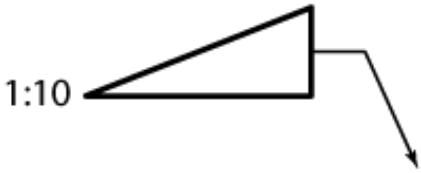
This question supports 32051, PC 1.4

Judgement statement

☐ The student interprets and identifies general engineering symbols.

Answers

	☐ Centre line ☐ Angularity ☑ Radius
	☑ Square ☐ Machining ☐ Diameter
	☑ Angularity ☐ Centre line ☐ Countersink
	☐ Angularity ☑ Machining ☐ Hidden detail line
	☐ Machining ☑ Countersink ☐ Centre line
	☑ Diameter ☐ Countersink ☐ Radius

	☐ Square ☑ Hidden detail line ☐ Machining	
	☐ Radius ☐ Machining ☑ Taper	
	☑ Centre line ☐ Hidden detail line ☐ Countersink	
	☑ Datum ☐ Centre line ☐ Countersink	
	☐ Machining ☑ Slope ☐ Square	

8. Identify the following welding symbols. ☑

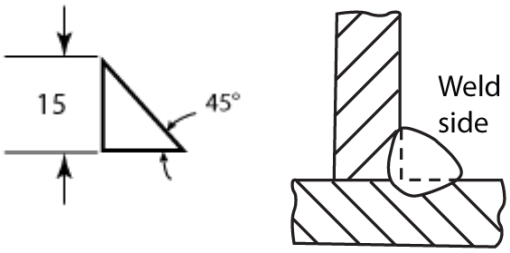
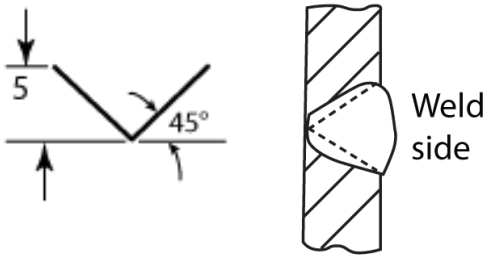
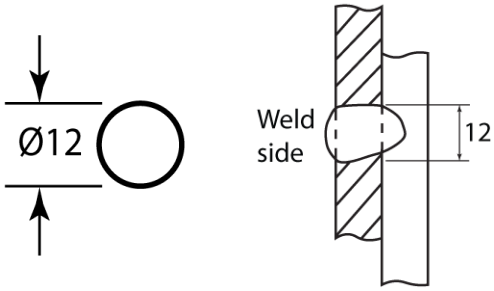
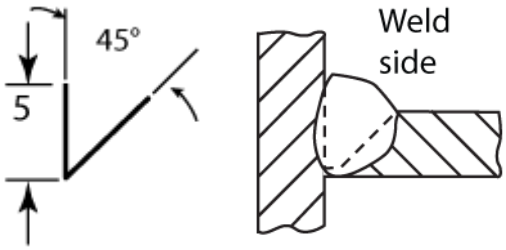
Teacher

This question supports 32051, PC 1.4

Judgement statement

☐ The student interprets and identifies welding symbols.

Answers

Symbol and cross section	What it represents
	☑ Fillet weld ☐ Site weld ☐ Spot weld
	☐ Spot weld ☐ Weld all round ☑ V butt
	☐ Scarf ☐ Site weld ☑ Spot weld
	☑ Bevel butt ☐ Penetration ☐ Spot weld

9. In the diagrams below, identify the type of thread by ticking the correct box. ☑

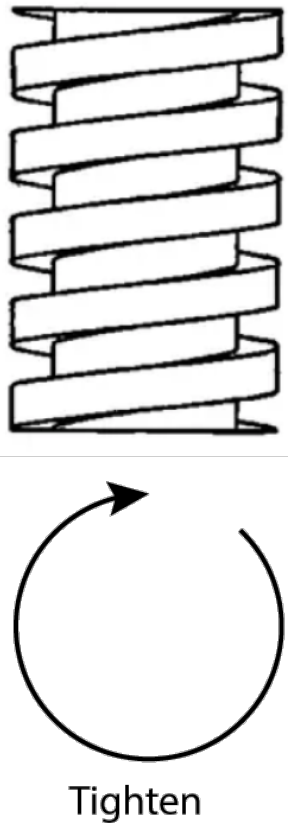
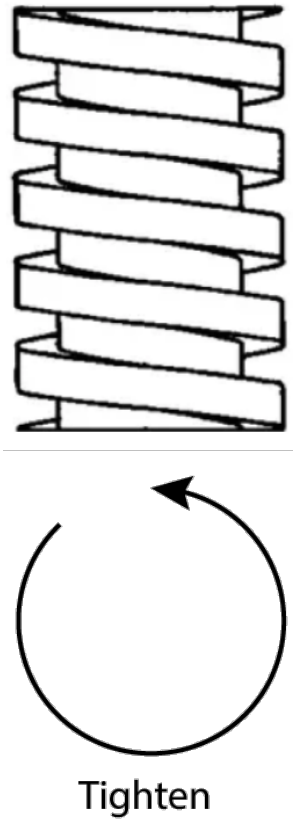
Teacher

This question supports 32051, PC 1.5, 2.3

Judgement statement

☐ The student identifies the threads.

Answers

☐ Double start thread	☐ Double start thread
☐ Knurling	☐ Knurling
☐ Left hand thread	☑ Left hand thread
☑ Right hand thread	☐ Right hand thread
	

10. Identify the following bolt grades. ☑

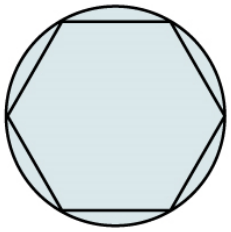
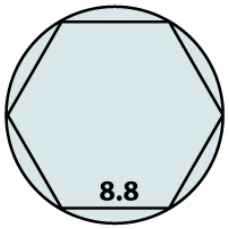
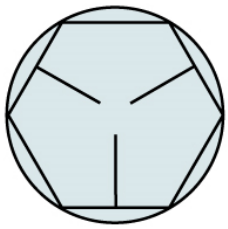
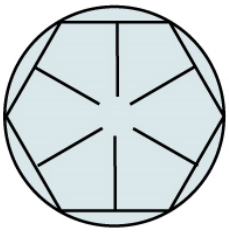
Teacher

This question supports 32051, PC 1.5, 2.3

Judgement statement

☐ The student interprets and identifies the nuts.

Answers

	☐ ISO Class 10.9 ☑ SAE Grade 2 ☐ ISO Class 12.9
	☑ ISO Class 10.9 ☐ SAE Grade 2 ☐ SAE Grade 8
	☐ SAE Grade 2 ☐ SAE Grade 8 ☑ ISO Class 8.8
	☐ ISO Class 10.9 ☐ ISO Class 8.8 ☑ SAE Grade 5
	☐ SAE Grade 2 ☑ SAE Grade 8 ☐ ISO Class 12.9

11. Identify the following types of washers. ☑

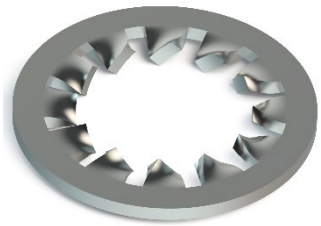
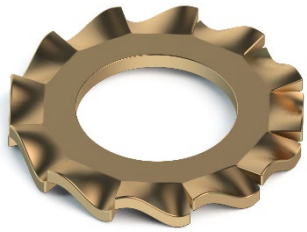
Teacher

This question supports 32051, PC 1.5, 2.3

Judgement statement

☐ The student interprets and identifies the washers.

Answers

	☑ Internal tooth washer ☐ Plain-flat washer ☐ Spring washer
	☐ External tooth washer ☐ Plain-flat washer ☑ Spring washer
	☑ External tooth washer ☐ Internal tooth washer ☐ Spring washer
	☐ External tooth washer ☐ Internal tooth washer ☑ Plain-flat washer

12. Identify the following types of nuts. ☑

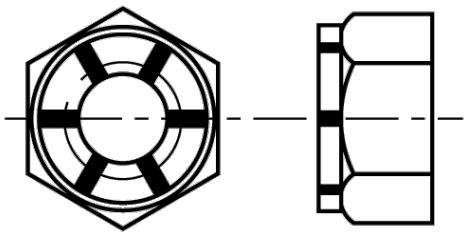
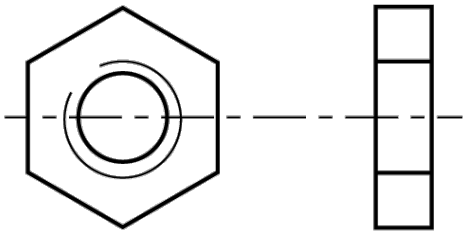
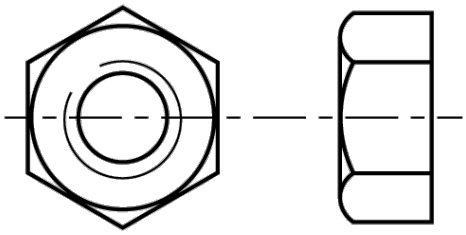
Teacher

This question supports 32051, PC 1.5, 2.3

Judgement statement

☐ The student interprets and identifies the nuts.

Answers

	☑ Castellated nut ☐ Hexagonal nut ☐ Thin nut
	☐ Castellated nut ☐ Hexagonal nut ☑ Thin nut
	☐ Castellated nut ☑ Hexagonal nut ☐ Thin nut

13. Identify the following types of pins. ☑

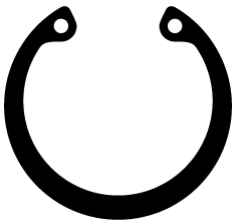
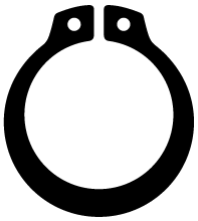
Teacher

This question supports 32051, PC 1.5, 2.3

Judgement statement

☐ The student interprets and identifies the pins.

Answers

	☑ Dowel pin ☐ External Circlip ☐ Internal Circlip
	☐ External Circlip ☑ Internal Circlip ☐ Split or cotter pin
	☑ External Circlip ☐ Internal Circlip ☐ Split or cotter pin
	☐ Dowel pin ☑ Split or cotter pin ☐ Taper pin
	☐ Dowel pin ☐ External Circlip ☑ Pop rivet

14. Match the following lines to the correct description by writing in the letter next to the description. ☑

Teacher

This question supports 32051, PC 2.2

Judgement statement

☐ The student interprets and identifies the lines.

Answers

Line			Description
A		B	Continuous thick line. To indicate visible outlines.
B		A	Dashed line. To show outlines of hidden features: For hidden features that are complete, the line should begin with dashes and should meet at corners. Where a hidden line is a continuation of a visible outline, it should begin with a space.
C		D	Section line. To indicate a cutting plane for sectional views.
D		F	Continuous thin line. For fictitious outlines, dimensions, projection, hatching and leader lines; also for the imaginary intersection of surfaces, revolved sections, adjacent parts, fold and tangent bend lines, short centre lines, and for indicating repeated detail.
E		E	Chain line.

					To indicate centre lines, pitch lines, path movement, developed views, material for removal and features in front of a cutting plane.
	F			C	Continuous ruled with zigzag. To show a break on an adjacent member to which a component is attached; also to indicate a break in a long continuous series of lines on architectural or structural drawings.

15. Look at the supplied drawing of a pipe vice and then select the correct answer for the following questions. ☑

Teacher

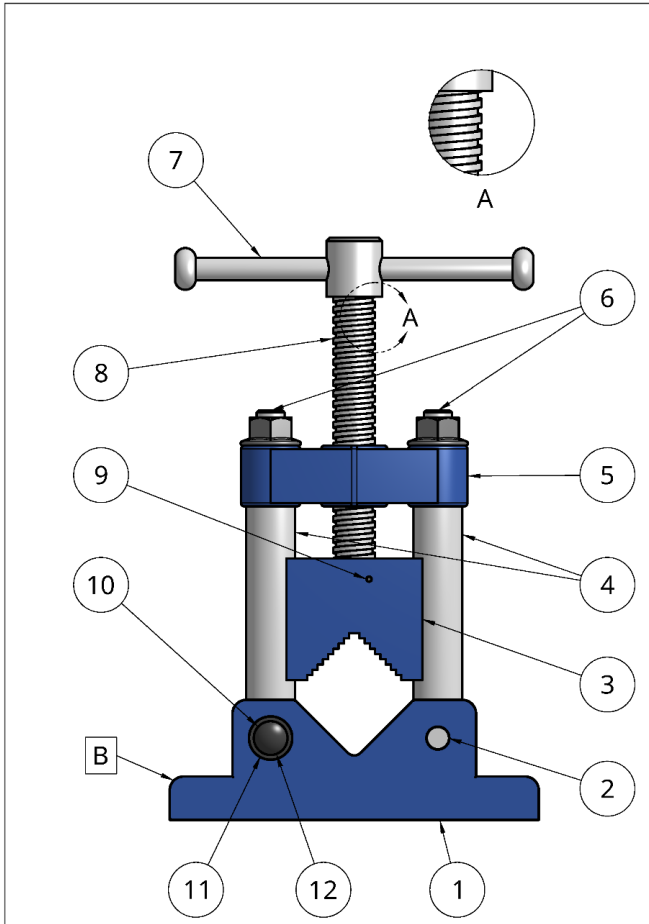
This question supports 32051, PC 2.3, 2.4, 2.5

Judgement statements

- ☐ The student interprets and identifies the dimensions and tolerances.
- ☐ The student interprets the drawing to establish thread pitches.
- ☐ The student establishes the required materials by interpreting the materials list.

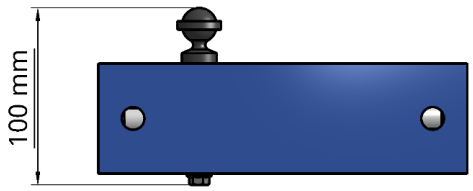
Answers

What is the pitch of the thread of the spindle screw ⑧?	☑ 5 mm ☐ 8 mm ☐ 24 mm
What is the type of thread A on the spindle screw ⑧?	☐ Imperial ☑ Square ☐ Whitworth
How many M16 nuts ⑥ are required?	☐ 1 ☑ 2 ☐ 3
What is the moveable jaw ③ manufactured from?	☑ Cast Iron ☐ Mild Steel ☐ Stainless Steel
What is the maximum permitted length of the locking pin ⑫?	☐ 95 mm ☑ 100 mm ☐ 105 mm
What is the name of highlighted feature B of the fixed jaw ①?	☐ Chamfer ☑ Radius ☐ Rounding



Materials List

ITEM NO.	PART NUMBER	DESCRIPTION	MATERIAL	QTY
1	LO-FJAW-CZ	Fixed Jaws	Cast Iron	1
2	LO-MPIN-CZ	Mounting Pin	Stainless Steel	1
3	LO-MJAW-CZ	Movable Jaws	Cast Iron	1
4	LO-MSHA-CZ	Mounting Shaft	Stainless Steel	2
5	LO-CONN-CZ	Connecting Wedge	Cast Iron	1
6	ISO-4161-M16-S	Nut (M16)	Mild Steel	2
7	LO-HAND-CZ	Turning Shaft (Handle)	Stainless Steel	1
8	LO-SPIN-CZ	Spindle Screw (Sq24 x 5)	Stainless Steel	1
9	LO-3PIN-CZ	3 mm Pin	Stainless Steel	1
10	ISO-4161-M6-S	Nut (M6)	Mild Steel	1
11	LO-KNOB-CZ	Knob	Plastic	1
12	LO-LOCK-CZ	Locking Pin	Stainless Steel	1



You have reached the end of Question Set 1.

Task Sheet 1 – Detail drawing

Note to the student

You must produce **one** mechanical engineering orthographic detail drawing, either manually or using CAD.

You will need to:

» Ask your teacher to give you an object to draw.

» Produce your drawing using third angle projection.

» Include front, plan, and side views.

» Label all views.

» Include scale, dimensions, and any tolerances.

» Complete Part A of the Task Sheet. A teacher will need to complete Part B.

» Attach the completed drawing.

You may be asked additional questions to check your knowledge and understanding and may need to demonstrate your skills and/or carry out tasks more than once.

Note to the teacher

» Select **one** of the three models below for the student to draw.

» Complete Part B of the Task Sheet. By completing this checklist, you are confirming the student has completed the tasks and/or demonstrated the skills.

» Where prompted, please provide specific and detailed comments.

» Check the student has completed Part A and has attached any required evidence.

Teacher

This Task Sheet supports PC 2.1, 2.2, 2.3 and Outcome 3

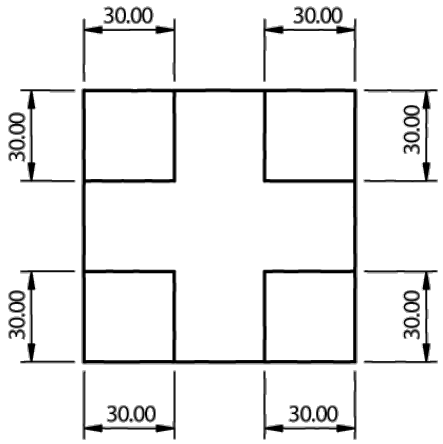
Judgement statements

☐ The completed Task Sheet supports the student's ability to produce mechanical engineering orthographic detail drawing in third angle.

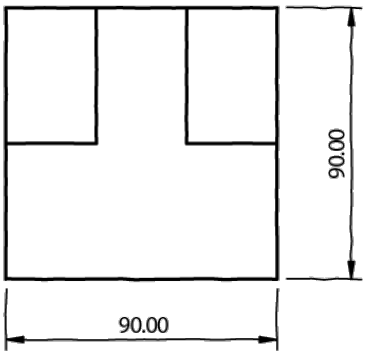
☐ The student's written and/or verbal responses support their competency in the tasks.

Part A: Student to complete this section			
Your name	Student name provided		
School	School identified		
Date begun	Date recorded	**Date completed**	Date recorded
Object drawn (tick **one**)	☐ 1 – Plus ☐ 2 – Castle ☐ 3 – T. **Teacher** One box must be ticked.		
Attach	Must attach: ☑ Completed detail drawing.		
			☑
1. Draw the object, including the following specifications: ☑ Front, plan, and side views ☑ Label views ☑ Dimensions and tolerances ☑ Scale. **Teacher** This supports PC 2.1, 2.2, 2.3 and Outcome 3			☑
2. Attach a copy of your completed detail drawing. **Teacher** This supports PC 2.1, 2.2, 2.3 and Outcome 3			☑

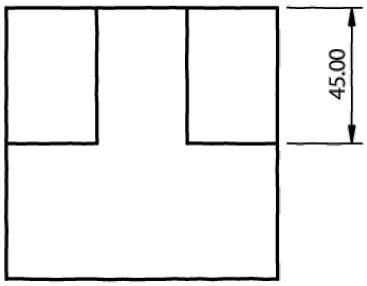
Model 1 – Plus



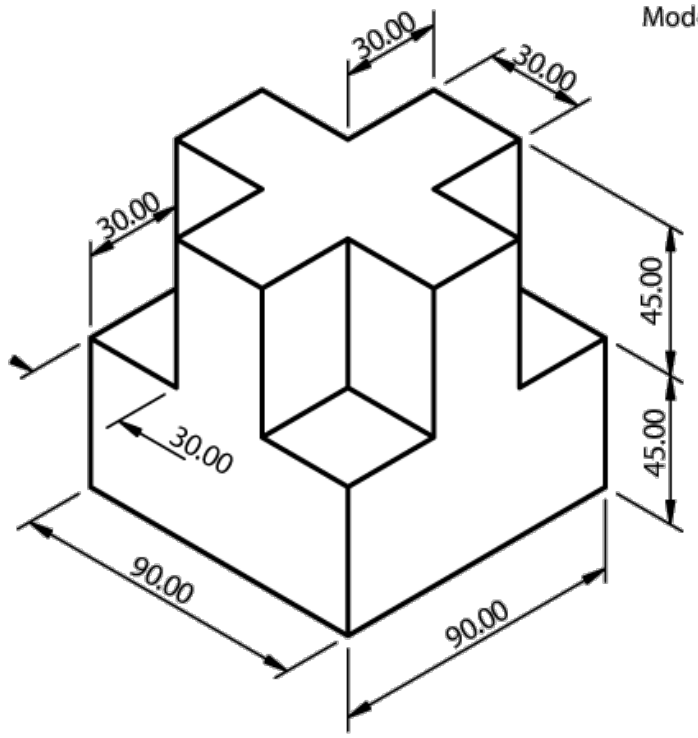
TOP VIEW



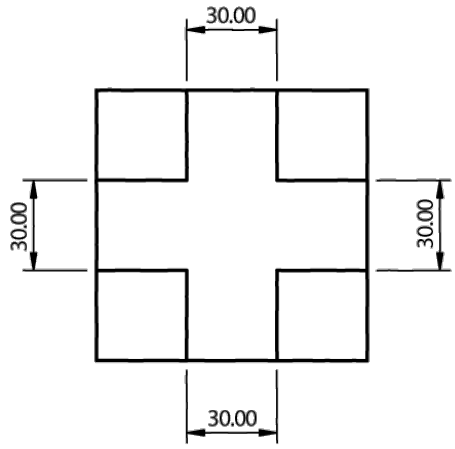
FRONT VIEW

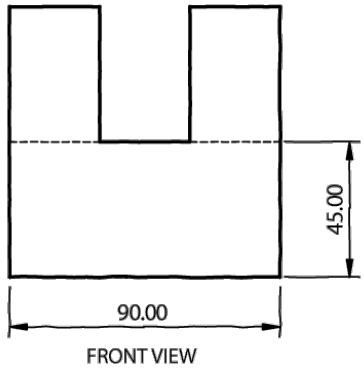


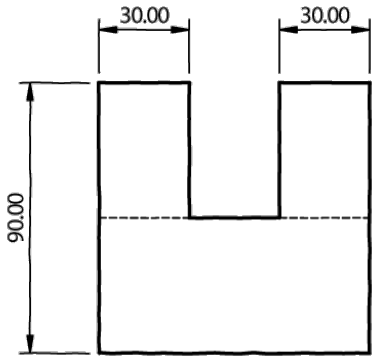
RIGHT SIDE VIEW

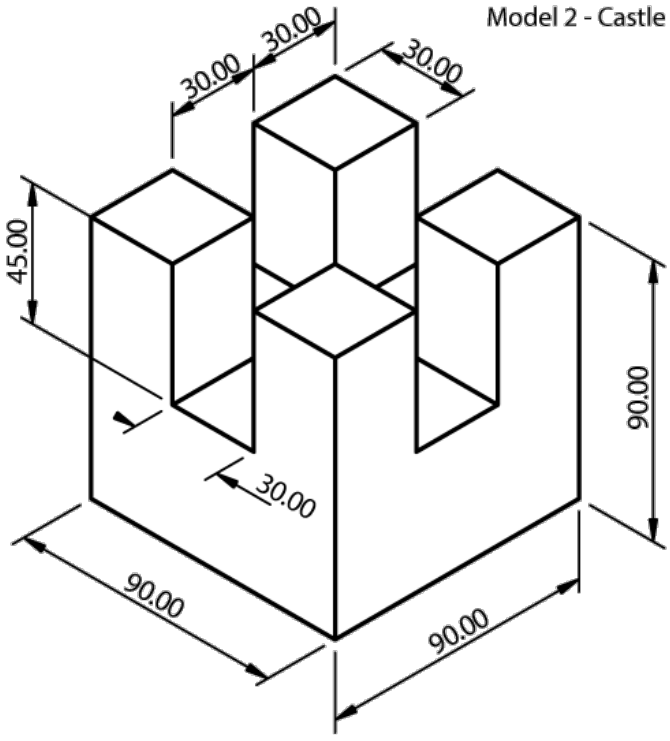


Model 2 – Castle

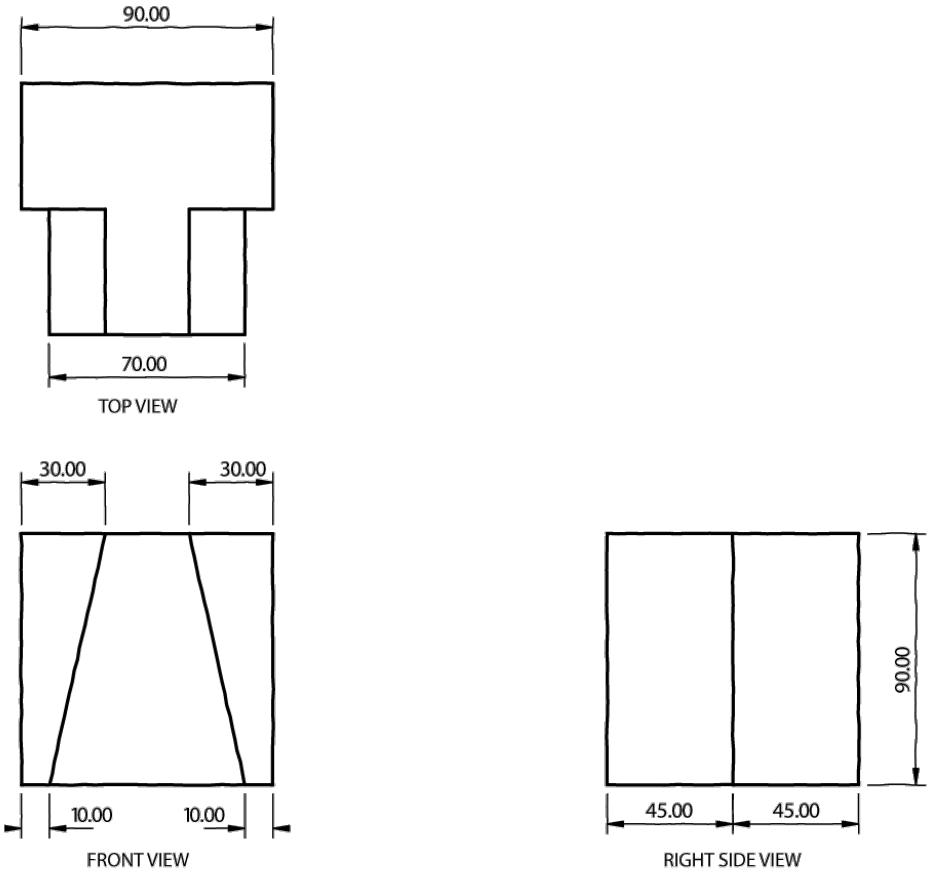


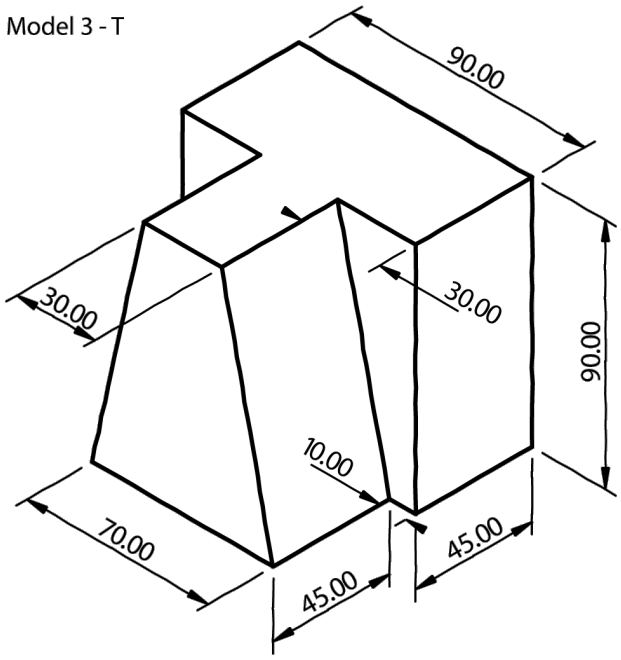






Model 3 – T





You have reached the end of Task Sheet 1.

Task Sheet 2 – Assembly drawing

Note to the student

You must produce **one** mechanical engineering orthographic assembly drawing, either manually or using CAD.

You will need to:

» Ask your teacher to give you an object to draw.

» Produce your drawing using third angle projection.

» Include front, plan, and side views.

» Label all views.

» Include scale, dimensions, and any tolerances.

» Complete Part A of the Task Sheet. A teacher will need to complete Part B.

» Attach the completed drawing.

You may be asked additional questions to check your knowledge and understanding and may need to demonstrate your skills and/or carry out tasks more than once.

Note to the teacher

» Give the assembly model below to the student to draw.

» Complete Part B of the Task Sheet. By completing this checklist, you are confirming the student has completed the tasks and/or demonstrated the skills.

» Where prompted, please provide specific and detailed comments.

» Check the student has completed Part A and has attached any required evidence.

Teacher

This Task Sheet supports PC 2.1, 2.2, 2.3 and Outcome 3

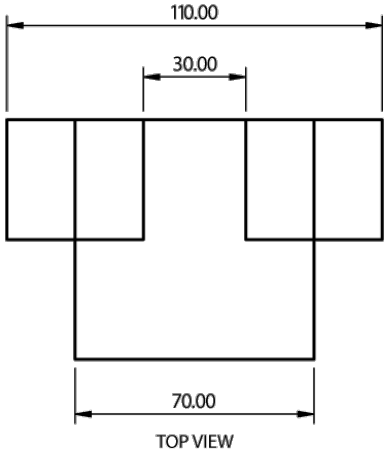
Judgement statements

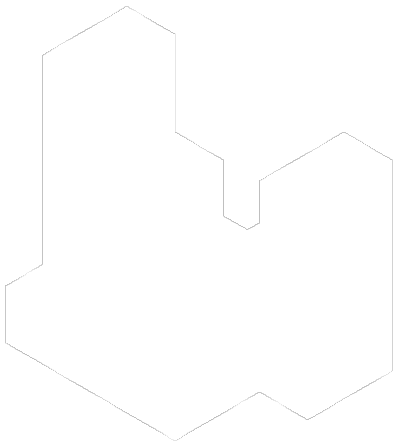
☐ The completed Task Sheet supports the student's ability to produce mechanical engineering orthographic drawing in third angle.

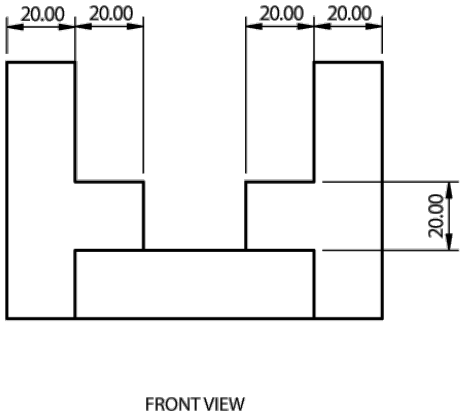
☐ The student's written and/or verbal responses support their competency in the tasks.

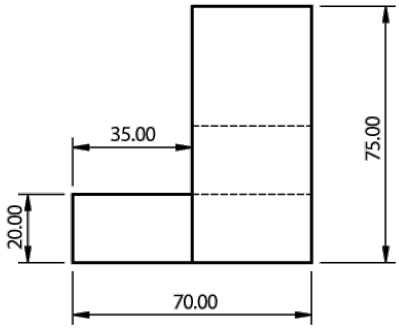
Part A: Student to complete this section			
Your name	Student name provided		
School	School identified		
Date begun	Date recorded	**Date completed**	Date recorded
Object drawn	Assembly model H		
Attach	Must attach: ☑ Completed assembly drawing.		
			☑
1. Draw the object, including the following specifications: ☑ Front, plan, and side views ☑ Label views ☑ Dimensions and tolerances ☑ Scale. **Teacher** This supports PC 2.1, 2.2, 2.3 and Outcome 3			☑
2. Attach a copy of your completed detail drawing. **Teacher** This supports PC 2.1, 2.2, 2.3 and Outcome 3			☑

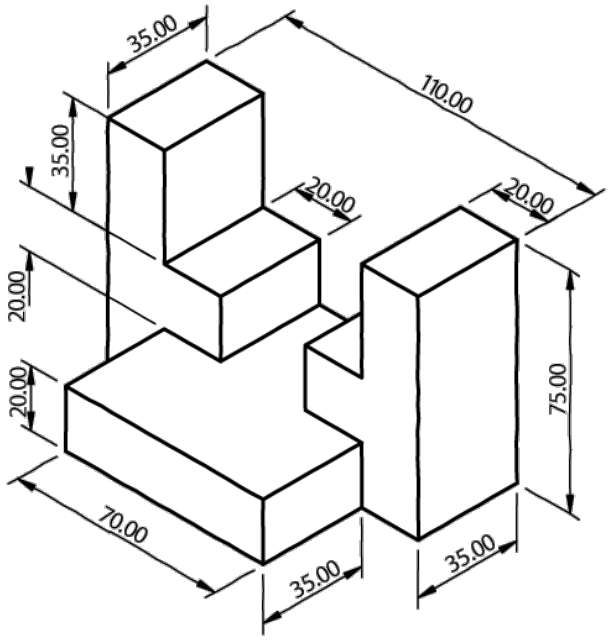
Assembly model – H











You have reached the end of Task Sheet 2.

Task Sheet 3 – Geometric details

Note to the student

You will need to manually construct geometric details.

You will need to:

» Bisect **two** lines.

» Bisect **two** angles.

» Draw **two** pitch circle diameters, one 6-hole and one 8-hole.

» Divide **two** lines into equal parts.

» Only use a straight edge and compass.

» Show construction working details.

» Complete Part A of the Task Sheet. A teacher will need to complete Part B.

» Attach the completed drawing.

You may be asked additional questions to check your knowledge and understanding and may need to demonstrate your skills and/or carry out tasks more than once.

Note to the teacher

» Complete Part B of the Task Sheet. By completing this checklist, you are confirming the student has completed the tasks and/or demonstrated the skills.

» Where prompted, please provide specific and detailed comments.

» Check the student has completed Part A and has attached any required evidence.

Teacher

This Task Sheet supports Outcome 4

Judgement statements

☐ The completed Task Sheet supports the student's ability to construct geometric details manually.

☐ The student's written and/or verbal responses support their competency in the tasks.

Part A: Student to complete this section	
Your name	Student name provided
School	School identified
Attach	Must attach: ☑ Completed drawings.
	☑

1. Bisect the line below using only a pair of compasses and a straight edge. ☑
   Show your working on the diagram.

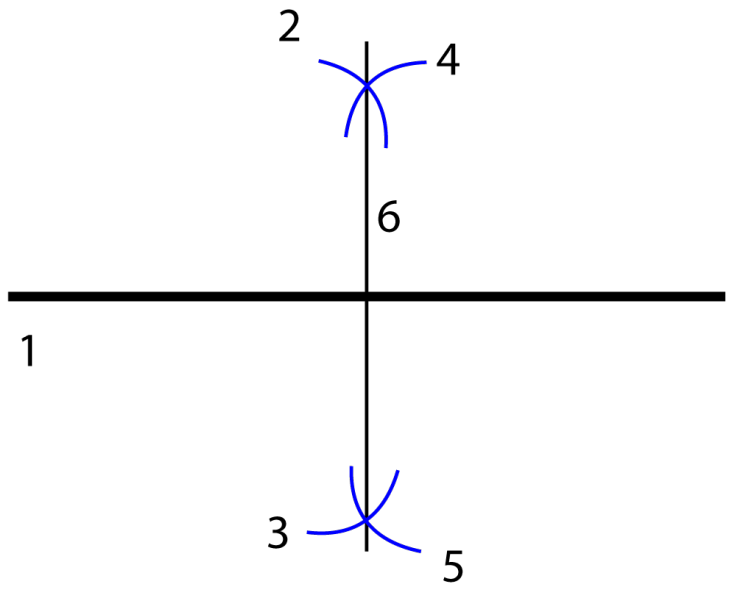
Teacher

This supports Outcome 4

Judgement statements

- ☐ The student bisects the line.
- ☐ Construction working details are shown on the diagram.
- ☐ The numbers in the example answer are shown as the order the student may carry the steps out in and will not be on the student's answer.

Answer



2. Bisect the line below using only a pair of compasses and a straight edge. ☑
Show your working on the diagram.

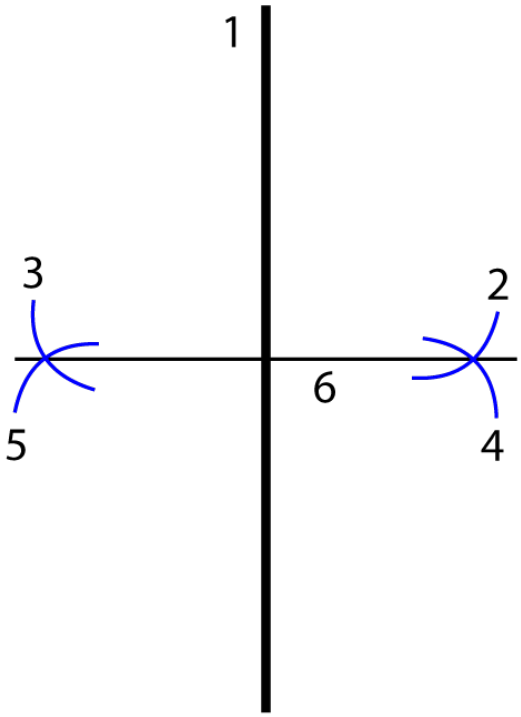
Teacher

This supports Outcome 4

Judgement statements

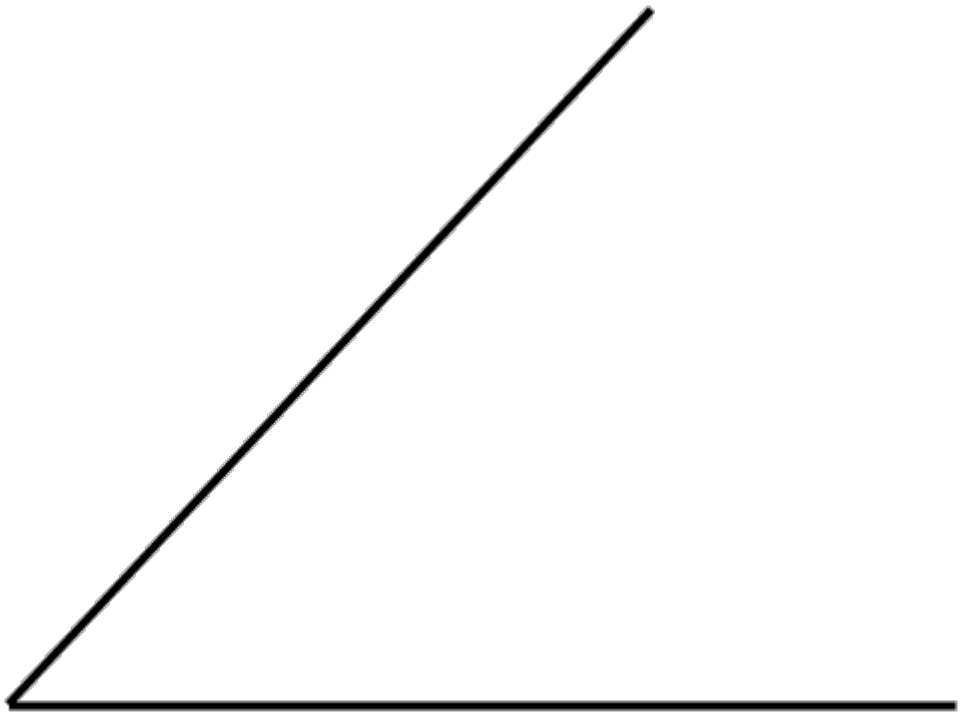
- ☐ The student bisects the line.
- ☐ Construction working details are shown on the diagram.
- ☐ The numbers in the example answer are shown as the order the student may carry the steps out in and will not be on the student's answer.

Answer



3. Bisect the angle below using only a pair of compasses and a straight edge. ☑

Show your working on the diagram.



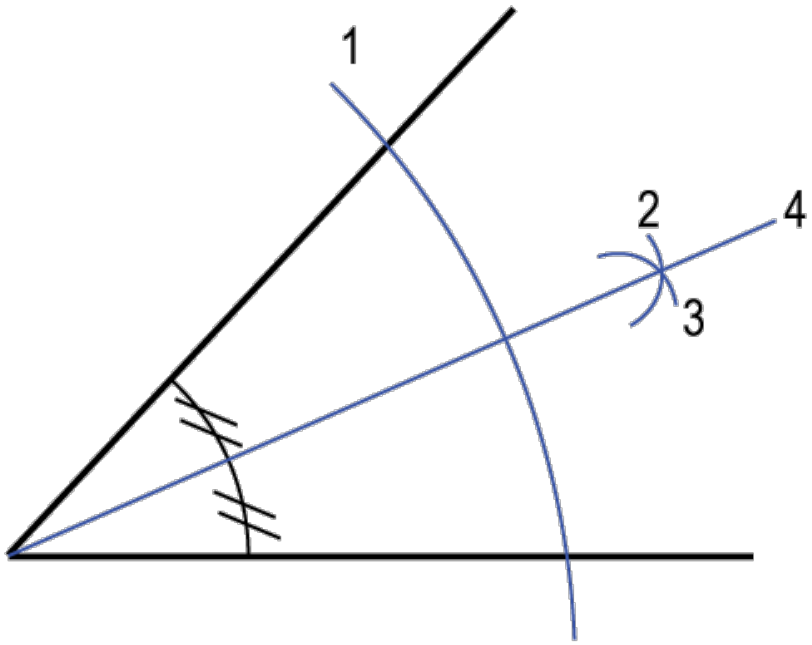
Teacher

This supports Outcome 4

Judgement statements

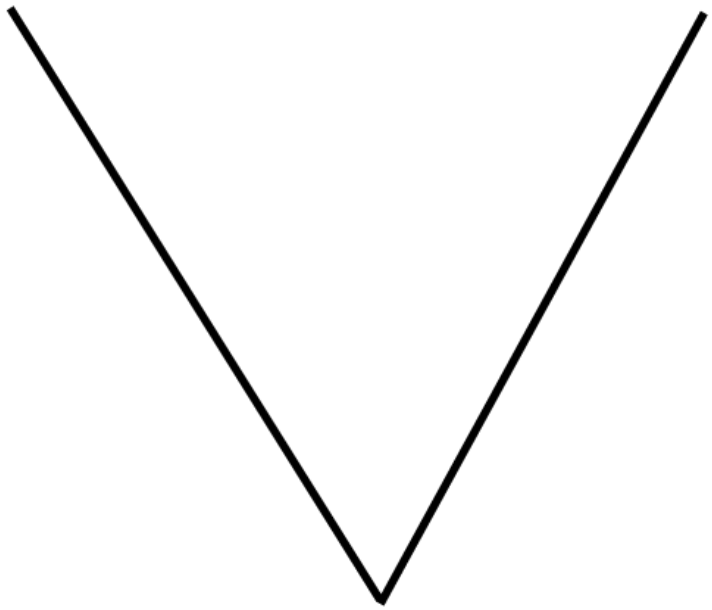
- ☐ The student bisects the angle.
- ☐ Construction working details are shown on the diagram.
- ☐ The numbers in the example answer are shown as the order the student may carry the steps out in and will not be on the student's answer.

Answer



4. Bisect the angle below using only a pair of compasses and a straight edge. ☑

Show your working on the diagram.



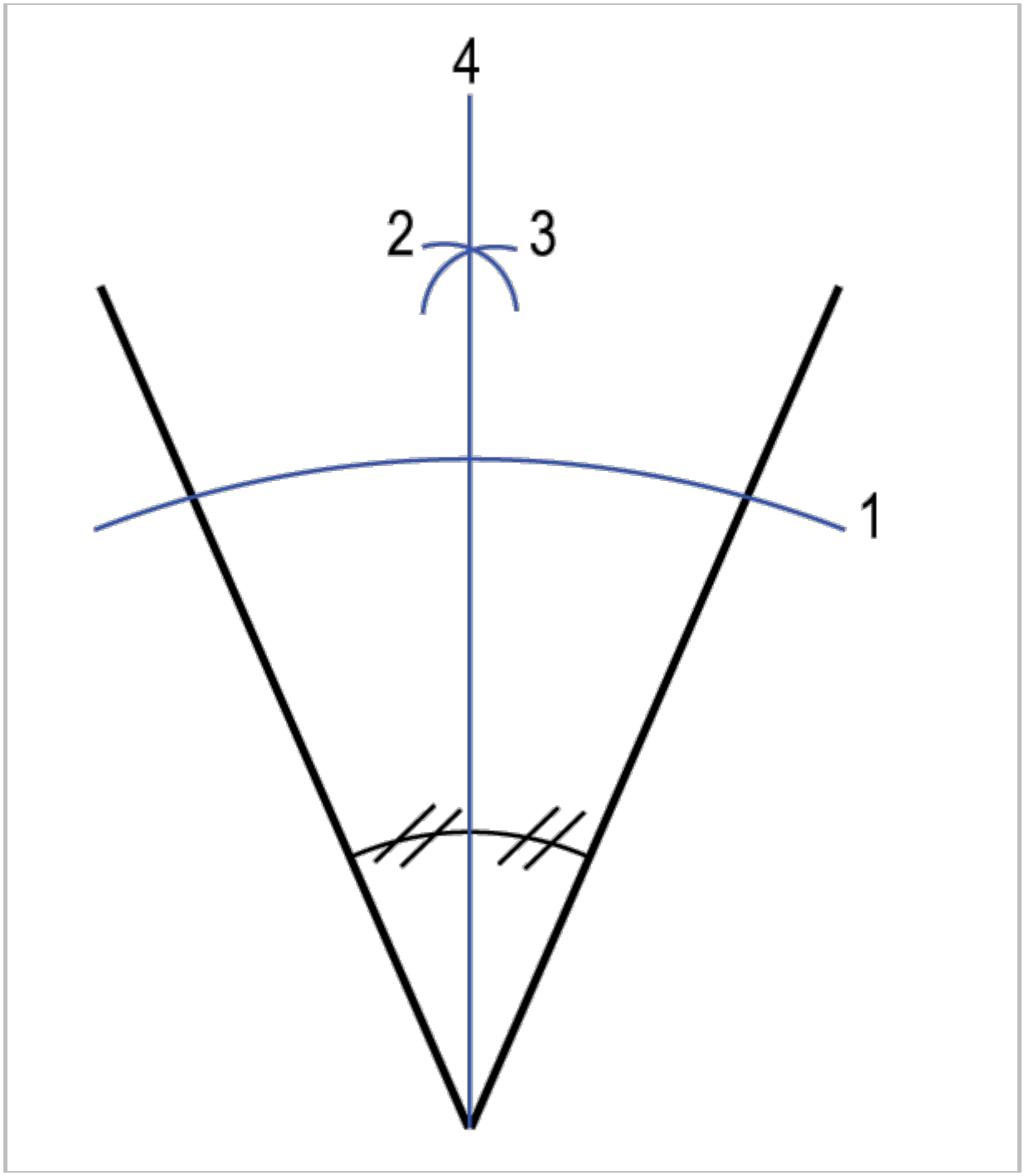
Teacher

This supports Outcome 4

Judgement statements

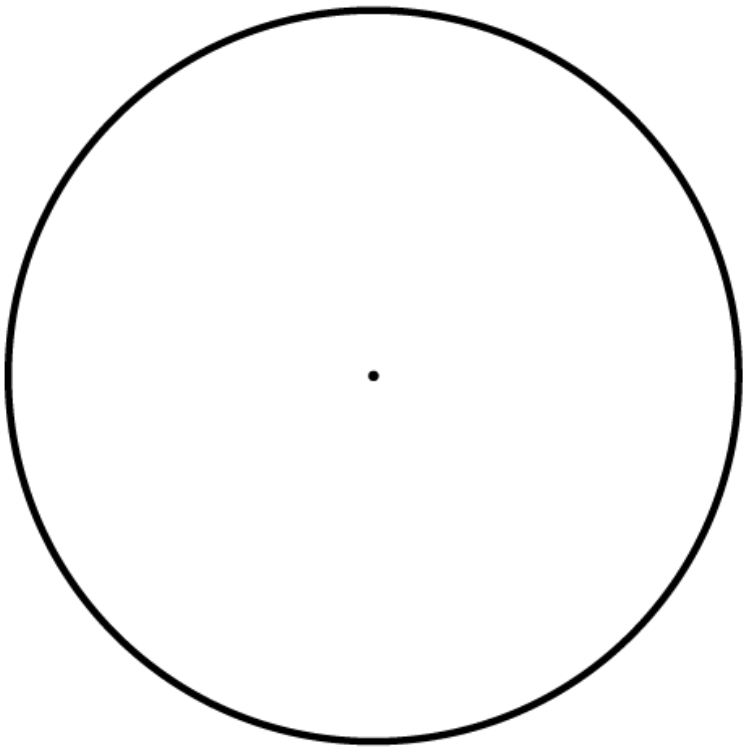
- ☐ The student bisects the angle.
- ☐ Construction working details are shown on the diagram.
- ☐ The example answer is similar to the one in the question above.
- ☐ The numbers in the example answer are shown as the order the student may carry the steps out in and will not be on the student's answer.

Answer



5. Construct a 6-hole pitch circle diameter on the diagram below using only a pair of compasses and a straight edge. ☑

Show your working on the diagram.



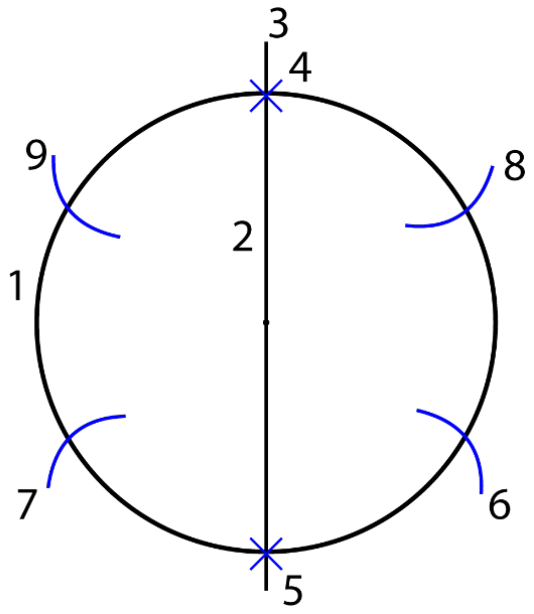
Teacher

This supports Outcome 4

Judgement statements

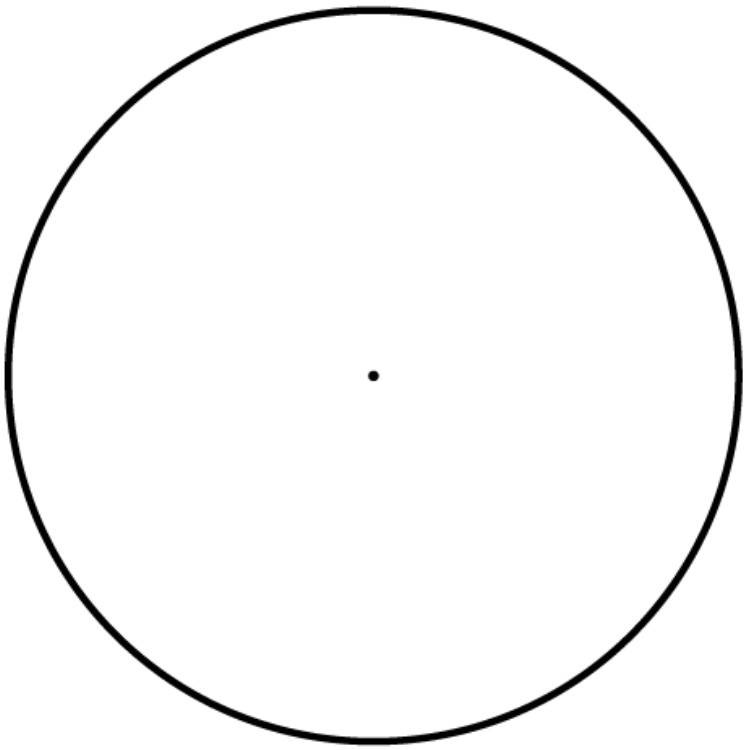
- ☐ The student constructs a 6-hole PCD.
- ☐ Construction working details are shown on the diagram.
- ☐ The numbers in the example answer are shown as the order the student may carry the steps out in and will not be on the student's answer.
- ☐ The student's answer may differ from the example answer but must be valid.

Example answer



6. Construct an 8-hole pitch circle diameter on the diagram below using only a pair of compasses and a straight edge. ☑

Show your working on the diagram.



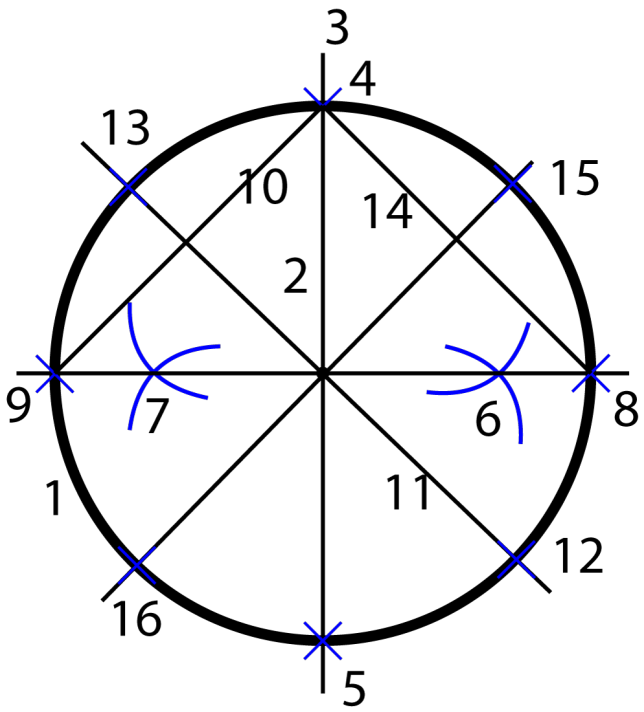
Teacher

This supports Outcome 4

Judgement statements

- ☐ The student constructs an 8-hole PCD.
- ☐ Construction working details are shown on the diagram.
- ☐ The numbers in the example answer are shown as the order the student may carry the steps out in and will not be on the student's answer.
- ☐ The student's answer may differ from the example answer but must be valid.

Example answer



7. Divide the line below into **three** equal parts using only a pair of compasses and a straight edge. ☑

Show your working on the diagram.

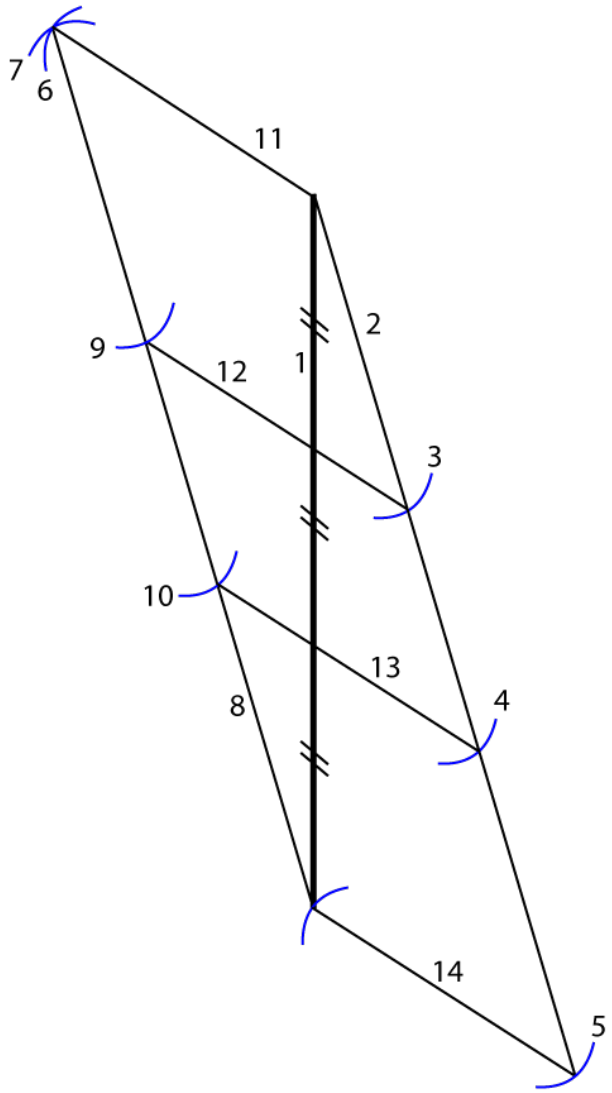
Teacher

This supports Outcome 4

Judgement statements

- ☐ The student divides the line into three equal parts.
- ☐ Construction working details are shown on the diagram.
- ☐ The numbers in the example answer are shown as the order the student may carry the steps out in and will not be on the student's answer.
- ☐ The student's answer may differ from the example answer but must be valid.

Example answer



8. Divide the line below into **four** equal parts using only a pair of compasses and a straight edge. ☑

Show your working on the diagram.

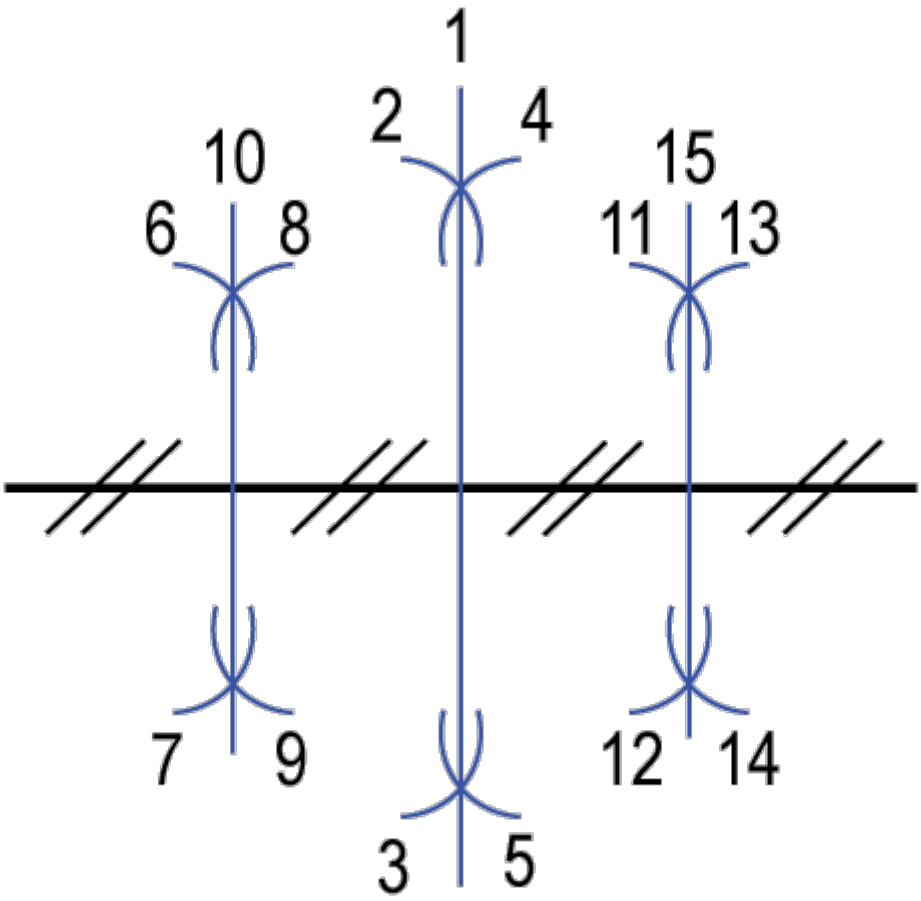
Teacher

This supports Outcome 4

Judgement statements

- ☐ The student divides the line into four equal parts.
- ☐ Construction working details are shown on the diagram.
- ☐ The numbers in the example answer are shown as the order the student may carry the steps out in and will not be on the student's answer.
- ☐ The student's answer may differ from the example answer but must be valid.

Example answer



You have reached the end of Task Sheet 3.

Part B: Teacher to complete this section	
I confirm the student:	☑
1. Has produced **two** mechanical engineering orthographic drawings (**one** detail drawing and **one** assembly drawing), either manually or using CAD, as described in Part A of Task Sheets 1 and 2, in accordance with drawing standards.	☑
2. Drawings have been produced in third angle projection.	☑
3. Front, plan, and side views have been included and labelled.	☑
4. Any scaling, dimensions and tolerances have been included.	☑
5. Has constructed the **eight** geometric details, as described in Part A of Task Sheet 3, following good drawing practices.	☑
6. The student only used a pair of compasses and a straight edge for Task Sheet 3.	☑
7. Completed all tasks and provided answers in accordance with drawing standards.	☑
8. The attached **two** orthographic and **eight** geometric drawings have been completed by the student.	☑
Please provide specific comments on the student's ability to produce orthographic drawings, and construct geometric details manually.	
Any comments support the student's competency.	

Teacher name and title	Teacher clearly identified	**Signature**	Signed by teacher
Phone / email	Contact details recorded	**Date**	Date recorded

You have reached the end of the Task Sheets.

Appendix

Guidance information

Conditions

» People credited with this unit standard can demonstrate knowledge of drawing principles; interpret mechanical engineering drawings; produce mechanical engineering orthographic drawing in third angle; construct geometric details manually.

» All explanations must be in accordance with references listed below.

» The evidence must clearly show the student has demonstrated their knowledge about simple mechanical engineering machining operations and simple fabrication operations in MaPS Environment.

» Student completes all assessment tasks themselves and uses their own words when answering questions.

» Demonstrated knowledge must be within the context of mechanical engineering and aligned with accepted industry practice. All tasks must be completed in accordance with workshop procedures.

Definitions

» *CAD* – Computer Aided Drawing.

» *Geometrical construction* – constructing of lines, angles, line segments, and geometric shapes, using only straight edge and a compass.

» *Interpretation* – the recognition and understanding of features shown graphically in the drawing.

» *Manually* – produced by hand using non-electronic drawing instruments.

» *MaPS* refers to Manufacturing pathways skills.

» *MaPS environment* refers to any workshop or context where work or activities related to the Manufacturing and Engineering sector take place.

» *MaPS project* refers to a project undertaken in a MaPS environment under general supervision, using a range of tools, equipment, and materials, and involving standard processes.

» *Specifications* – detail that defines an object being made; commonly communicated by annotated and dimensioned drawings; by written description, or by other communication media. External references may also be used to specify objects such as tables or industry standards.

References

The assessment tasks must be completed in accordance with:

» *Safety in Technology Education: A Guidance Manual for New Zealand Schools 2017* and any subsequent versions of this document, available from Ministry of Education website.

» *SAA/SNZ HB1:1994, Technical drawing for students*. Available from Standards New Zealand.

» Boundy, A. W. 2011, *Engineering Drawing, 8th ed*., McGraw-Hill Inc, Australia, ISBN 0071016767.

Legislation

The following legislation (law) applies to this unit standard:

» Health and Safety at Work Act 2015 and supporting Regulations.

Visit www.legislation.govt.nz for the latest NZ laws.