

2017 HSC Metal and Engineering Marking Guidelines

Section I

Multiple-choice Answer Key

Question	Answer
1	D
2	C
3	C
4	A
5	A
6	A
7	B
8	B
9	B
10	D
11	A
12	A
13	B
14	A
15	D

Section II

Question 16 (a)

Criteria	Marks
<ul style="list-style-type: none"> Correctly identifies the reading 	1

Sample answer:

14.8 mm

Question 16 (b)

Criteria	Marks
<ul style="list-style-type: none"> Correctly identifies the name of the graduated device and ONE of its applications 	2
<ul style="list-style-type: none"> Correctly identifies the name of the graduated device OR <ul style="list-style-type: none"> Correctly identifies one of the device's applications 	1

Sample answer:

<i>Name of graduated device</i>	<i>Application</i>
Vernier caliper	Measuring inside diameter, outside diameter and depth of an object

Question 16 (c)

Criteria	Marks
<ul style="list-style-type: none"> Correctly identifies all of the dimensions 	4
<ul style="list-style-type: none"> Correctly identifies both the shaft and hole dimensions for THREE of the four (size, limits or tolerance) 	3
<ul style="list-style-type: none"> Correctly identifies both the shaft and hole dimensions for TWO of the four (size, limits or tolerance) 	2
<ul style="list-style-type: none"> Correctly identifies both the shaft and hole dimensions for ONE of the four (size, limits or tolerance) 	1

Sample answer:

	<i>Shaft</i>	<i>Hole</i>
Nominal size	27 000	27 000
Basic size	27 000	27 000
Upper limit	26 980	27 040
Lower limit	26 960	27 000
Tolerance	0.020	0.04

Question 16 (d)

Criteria	Marks
<ul style="list-style-type: none"> • Provides characteristics and features of TWO types of measurement errors 	4
<ul style="list-style-type: none"> • Provides characteristics and features of ONE type of measurement error and sketches in general terms ONE other type of measurement error 	3
<ul style="list-style-type: none"> • Sketches in general terms TWO types of measurement errors <p>OR</p> <ul style="list-style-type: none"> • Provides characteristics and features of ONE type of measurement error 	2
<ul style="list-style-type: none"> • Provides basic information regarding measurement errors 	1

Sample answer:

Parallax error is caused by the incorrect use of a graduated device when the line of sight is not at right angles to the surface of the graduations.

Reading error occurs when the reader misinterprets the position of the graduation that determines the measurement being taken.

Answers could include:

Alignment error will always occur when measuring tools are not aligned at correct angles to the work being measured.

Calibration errors can occur with any graduated device. If the starting point is not correct it should be properly adjusted where possible or otherwise allowed for when a reading is being taken.

Question 17 (a)

Criteria	Marks
• Correctly identifies the tool name	1

Sample answer:

Prick punch

Question 17 (b)

Criteria	Marks
• Outlines the use of ONE punch	2
• Identifies the use of ONE punch	1

Sample answer:

A centre punch is used for marking centres of holes for locating drilling points.

Answers could include:

A prick punch is used when marking out, to permanently and accurately witness marks for further processes.

Question 17 (c)

Criteria	Marks
• Provides a clear explanation of how punches are maintained to ensure safe working order	4
• Describes how punches are maintained to ensure safe working order	3
• Outlines some of the dangers of poorly maintained punches or outlines a maintenance procedure	2
• Provides general information regarding punches or safety	1

Sample answer:

Regular maintenance includes grinding the mushroomed head off and oiling punches when storing to reduce any surface rust that may occur. Rust could lead to infection in the user. Impact tools such as punches are unsafe to use if they have mushroomed heads. This is because the head of the tool might shatter on impact into sharp fragments that are dangerous to the workers in the vicinity.

Question 18 (a)

Criteria	Marks
• Provides differences between the quality systems	2
• Provides information on one quality system	1

Sample answer:

Quality assurance is planning to meet customers' requirements. Quality control is inspecting and testing products and services.

Question 18 (b)

Criteria	Marks
• Explains benefits that occur when adopting quality systems	4
• Describes benefits that occur when adopting quality systems	3
• Outlines benefits that occur when adopting quality systems OR • Describes one benefit OR • Provides an extensive list of benefits	2
• Provides an example of a benefit	1

Sample answer:

A company benefits from quality systems by producing better quality products that meet customer specifications, increasing company reputation. They reduce wastage of materials making the operation more profitable. Errors are picked up as they occur which saves time and money.

Answers could include:

- More profitable
- Higher customer satisfaction
- Better company reputation
- Higher turnover
- Workers understand the standard of work they need to be produce.

Question 19 (a)

Criteria	Marks
<ul style="list-style-type: none"> Provides the correct tolerance 	1

Sample answer:

± 0.5 mm

Question 19 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides the correct working out and answer 	2
<ul style="list-style-type: none"> Provides inaccurate working out with correct answer OR <ul style="list-style-type: none"> Provides some correct working out with incorrect answer OR <ul style="list-style-type: none"> Provides correct answer only 	1

Sample answer:

$$MD = 52$$

$$52 \times \pi \div 2 = 81.68$$

$$+ 50 + 50 = 181.68$$

$$\times 12 = 2180.17 \text{ mm}$$

OR

$$MR \text{ (mean radius)} = 26$$

$$26 \times \pi = 81.68$$

$$+ 50 + 50 = 181.68$$

$$\times 12 = 2180.17 \text{ mm}$$

Question 19 (c)

Criteria	Marks
<ul style="list-style-type: none"> Explains why the thread needs to be cut prior to bending 	2
<ul style="list-style-type: none"> Identifies that the thread needs to be cut prior to bending 	1

Sample answer:

Both ends of the material need to have the thread produced (cut) prior to bending as the stock handle would hit the opposite leg if bent prior.

Question 19 (d)

Criteria	Marks
<ul style="list-style-type: none"> Provides the steps required, in a logical sequence, to successfully mark out and efficiently manufacture the clamp including all of the required tools 	6
<ul style="list-style-type: none"> Provides the steps required, in a logical sequence, to mark out and manufacture the clamp including most of the tools required 	5
<ul style="list-style-type: none"> Provides some appropriate steps in a logical sequence, including some of the tools required 	3–4
<ul style="list-style-type: none"> Lists some steps of the marking out AND/OR the manufacturing process AND/OR some of the tools required 	1–2

Sample answer:

<i>Sequence of steps – marking out</i>	<i>Tools required</i>
<ol style="list-style-type: none"> Calculate and mark length of flat bar $12.5 + 52 + 12.5 = 77$ mm Find and mark the centres of the flat bar (width) $25 \div 2 = 12.5$ mm and (length) $77 \div 2 = 38.5$ mm Mark 26 mm either side of the centre line to find hole centres Punch centres where lines intersect Using dividers set at 12.5 mm scribe the radii at both ends 	<ul style="list-style-type: none"> Scribe Engineer’s square Steel rule Jenny calipers Engineer’s hammer Centre punch Spring dividers
<i>Sequence of steps – manufacturing</i>	<i>Tools required</i>
<ol style="list-style-type: none"> Cut the flat bar to length Drill both holes at 11 mm Produce the radii De-burr all edges 	<ul style="list-style-type: none"> Hacksaw Files Machine vice 11 mm high speed twist drill Pedestal drill Personal protection equipment

Section III

Question 20

Criteria	Marks
<ul style="list-style-type: none"> Shows a well developed understanding of the link between workplace conduct and productivity Provides a logical and cohesive response, using relevant workplace examples and precise industry terminology 	13–15
<ul style="list-style-type: none"> Shows the link between workplace conduct and productivity Provides a clear and organised response, using relevant workplace examples and specific industry terminology 	10–12
<ul style="list-style-type: none"> Demonstrates a sound understanding of workplace conduct and productivity Uses general industry terminology AND/OR relevant workplace examples 	7–9
<ul style="list-style-type: none"> Demonstrates a basic understanding of different types of workplace conduct using some industry terminology 	4–6
<ul style="list-style-type: none"> Provides limited information relating to workplace conduct AND/OR productivity 	1–3

Answers could include:

- Regular attendance at the workplace increases the amount of work that can be completed, increasing productivity and profit.
- Punctuality is important to ensure that staff are on site at the allocated time which increases the amount of time spent working and productivity.
- Maintaining an orderly workspace improves productivity as time is not wasted looking for tools or materials, workspace is safer as trip hazards are reduced and the products can be produced to a higher standard with clear workspaces.
- Appropriate personal presentation standards for the industry and job role create a higher calibre of presentation to customers and ensures all staff are dressed in the correct clothing specific to the job being produced, for example safety footwear and welding protective clothing.
- Cooperativeness in the workplace allows for smoother interactions between internal and external customers to communicate and interact in the same space efficiently.
- Self-confidence in the work being produced increases the quantity of work being completed and accuracy of the work produces higher quality products.
- Self-respect and respect for all staff and customers produce a more collegial and harmonious environment where staff are comfortable working together without any fear of harassment in the workplace.
- Acceptance of constructive criticism allows for the level of workmanship to improve and the final products to be produced to a higher calibre increasing sales and company image.
- Willingness for self-improvement allows for potential movement in the corporation ladder and improvements in produced products as skill levels are higher.

Section IV

Question 21 (a)

Criteria	Marks
• Explains the purpose of the sign	2
• Provides a valid point regarding the sign	1

Sample answer:

Emergency assembly point – this is the location where all persons must meet when an emergency situation has been identified and an evacuation is called.

Question 21 (b)

Criteria	Marks
• Demonstrates a thorough understanding of the considerations of how the sign should be mounted and displayed	3
• Demonstrates a sound understanding of the considerations of how the sign should be mounted and displayed	2
• Provides a relevant point relating to the sign and its mounting	1

Sample answer:

The emergency information sign should be displayed in its green colour and in plain sight with no obstructions and off the ground. It should be kept in good condition in a safe location and away from any potential risks. The location of the sign should be in an area that is large enough for all persons to assemble on site and easy to get to in the case of an emergency.

Question 21 (c)

Criteria	Marks
• Explains a range of processes and policies that can be used to minimise the risk of workplace injury	9–10
• Describes a range of processes and policies that can be used to minimise the risk of workplace injury	7–8
• Outlines policies that can be used to minimise the risk of workplace injury	5–6
• Provides information on processes and/or policies to minimise the risk of workplace injury	3–4
• Provides general information on safety process and/or policies	1–2

Answers could include:

- Develop an emergency plan to ensure that all staff are aware of the processes to be followed in the event of an emergency.
- Conduct regular training sessions on evacuation procedures to ensure that all staff are familiar with the emergency plan and procedures.
- Schedule regular checking to ensure that all signage and equipment is in good working order, which will help prevent injury.
- Check Australian Standards to ensure equipment complies.
- Educate staff on appropriate use of all equipment to reduce the risk of accidents.
- Develop and display signage including standard operating procedures to warn staff of possible risks.
- Provide appropriate PPE, such as eye and ear protection, to reduce the risk of injury and long-term exposure to risk.
- Develop a Health and Safety policy and form a Work, Health and Safety Committee to recognise, monitor and/or control risk.

2017 HSC Metal and Engineering Mapping Grid

Section I

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
1	1	MEM18001C — Use hand tools 1.1 – page 83								X
2	1	MEM09002B — Interpret technical drawing 2.5 – page 20	X							
3	1	MEM18002B — Use power tools/hand held operations 1.1 – page 89								X
4	1	MEM09002B — Interpret technical drawing 1.1 – page 18	X							
5	1	MEM13014A — Apply principles of workers health and safety in the work environment 1.1 – page 38							X	
6	1	MEM18002B — Use power tools/hand held operations 1.4 – page 91						X	X	
7	1	MEM12024A — Perform computations 1.3 – page 32			X					
8	1	MEM12024A — Perform computations 1.1 – page 31			X					
9	1	MEM13014A — Apply principles of workers health and safety in the work environment 1.2 – page 41	X					X	X	
10	1	MEM13014A — Apply principles of workers health and safety in the work environment 2.1 – page 46			X			X		
11	1	MEM12023A — Correct and appropriate measuring techniques are used 2.1 – page 25							X	
12	1	Induction — Employment conditions 3 – page 13							X	
13	1	MEM13014A — Apply principles of workers health and safety in the work environment 1.1 – page 38	X	X					X	
14	1	MEM12023A — Performing engineering measurements 1.2 – page 24	X		X				X	

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
15	1	Apply quality procedures 1.2 – page 66	X	X					X	

Section II

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
16 (a)	1	MEM12023A — Perform engineering measurements 2.1 – page 25								X
16 (b)	2	MEM12023A — Perform engineering measurements 1.2 – page 24							X	X
16 (c)	4	MEM12023A — Perform engineering measurements 1.2 – page 24	X		X					
16 (d)	4	MEM12023A — Perform engineering measurements – page 22	X		X					
17 (a)	1	MEM18001C — Use hand tools 1.1 – page 83							X	X
17 (b)	2	MEM18001C — Use hand tools 1.1 – page 83							X	
17 (c)	4	MEM18001C — Use hand tools 1.1 – page 83					X	X	X	
18 (a)	2	MEM15002A — Apply quality systems 1.1 – page 60						X	X	
18 (b)	4	MEM15024A — Apply quality procedures 2.2 – page 68		X		X				
19 (a)	1	MEM09002B — Interpret technical drawing 2.2 – page 19–20	X							
19 (b)	2	MEM12024A — Perform Computations 1.2 – page 32			X					
19 (c)	2	MEM14004A — Plan to undertake a routine task 2.2 – page 56			X		X		X	X
19 (d)	6	MEM14004A — Plan to undertake a routine task 2.2 – page 56			X		X		X	X

Section III

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
20	15	MEM16007A — Work with others in a manufacturing, engineering or related environment 1.1 – page 71	X	X		X		X		

Section IV

Question	Marks	Unit of competency / Element of competency	Employability skills (Please put an X where appropriate)							
			Communication	Teamwork	Problem-solving	Initiative and enterprise	Planning and organising	Self-management	Learning	Technology
21 (a)	2	MEM13014A — Apply principles of workers health and safety in the work environment 1.6 – page 44	X							
21 (b)	3	MEM13014A — Apply principles of workers health and safety in the work environment 1.6 – page 44					X	X	X	
21 (c)	10	MEM13014A — Apply principles of workers health and safety in the work environment 1.1 – page 38–39				X	X		X	