



BOARD OF STUDIES
NEW SOUTH WALES

2013 HSC Metal and Engineering Marking Guidelines

Section I

Multiple-choice Answer Key

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

Section II

Question 16 (a)

Criteria	Marks
• Correctly identifies the symbol	1

Sample answer:

Datum symbol

Question 16 (b)

Criteria	Marks
• Provides correct answer with relevant working out	2
• Incorrect answer with correct data from drawing OR correct answer only	1

Sample answer:

$$25 - (10 + 6) = 9 \text{ OR } 28 - (10 + 6) = 12$$

That is screw length – (support plate thickness + base plate thickness) = protruding length

Question 16 (c)

Criteria	Marks
• Provides at least two examples of correct quality assurance checks	2
• Provides an example of a correct quality assurance check	1

Sample answer:

Hole centres in base plate and clamping plate must be the same.

Holes in both the base plate and clamping plate should be drilled square.

Holes are drilled to the correct size.

Holes are tapped square and to the correct thread size.

Question 16 (d)

Criteria	Marks
• Names and outlines both drawing types	4
• Names one drawing type and outlines both drawing types OR • Names both drawing types and outlines one drawing type	3
• Name both drawing types OR outlines both drawing types OR names and outlines one drawing type	2
• Names one of the drawing types OR outlines one of the drawing types	1

Sample answer:

The two drawing types used are detail and exploded pictorial. The detail drawing provides all the information required to manufacture the parts. The exploded pictorial drawing assists the fabricator in understanding how the parts relate to each other. Both drawing types are used to enable the correct manufacture and assembly of the parts.

Question 17 (a)

Criteria	Marks
<ul style="list-style-type: none"> Proposes the steps required, in a logical sequence, to successfully mark out and efficiently manufacture the base plate Names all relevant tools involved 	6
<ul style="list-style-type: none"> Proposes the steps required, in a logical sequence, to mark out and manufacture the base plate Names most tools involved 	5
<ul style="list-style-type: none"> Proposes some steps in a logical sequence Lists some tools necessary 	3–4
<ul style="list-style-type: none"> Lists some steps of the marking out AND/OR the manufacturing processes AND/OR some tools 	1–2

Sample answer:

Sequence of steps – marking out	Tools
<ul style="list-style-type: none"> Interpret drawing Apply marking medium Mark datum A / B From datum B mark parallel lines 15 mm and 60 mm From datum A mark parallel lines 10 mm and 50 mm Centre punch the four intersection points of the lines from datum A and datum B for drilling Mark centres for the R10 corner radius Use these centres to mark the radius with a pair of dividers Prick punch the radius lines. 	<ul style="list-style-type: none"> Engineers rule Engineers square Centre punch Ball pein hammer Jenny calipers Marking medium Dividers Scriber
Sequence of steps – manufacturing	Tools
<ul style="list-style-type: none"> Secure plate in drill vice for drilling Drill 2 x Dia 5 mm holes Drill 2 x Dia 8.5 mm holes Deburr holes Remove plate from drill vice and secure in bench vice for tapping Tap M6 and M10 holes square to surface Hacksaw excess material from radius corners then file to shape Finish edges with file as specified Finish-deburr as specified 	<ul style="list-style-type: none"> Hacksaw Files 5 mm drill bit 8.5 mm drill bit M6 tap M10 tap Drill vice Bench vice Cutting fluid Tap wrench Cutting compound

Question 17 (b)

Criteria	Marks
• Provides an appropriate explanation/s for consulting an MSDS	3
• Lists several reasons for having a MSDS or explains a reason for consulting a MSDS	2
• Identifies a reason for having an MSDS	1

Sample Answer:

A MSDS is an information sheet that has detailed information relating to chemical storage, composition and safety procedures and precautions to be followed. First aid procedures and how the product may affect health are also explained. A MSDS should be read and understood before using any substance. This will identify potential hazards and that the chemical is being used in the manner for which it was intended.

Question 18 (a)

Criteria	Marks
• Correctly names the file	1

Sample answer:

Flat file

Question 18 (b)

Criteria	Marks
• Outlines the process of cross filing	2
• Gives a feature of cross filing	1

Sample answer:

File should be held by the handle and the toe. File should move in slow full-length strokes along its length. Pressure should be applied on the forward stroke with relaxed pressure on the backwards stroke.

Question 18 (c)

Criteria	Marks
• Explains TWO or more features to be considered	2
• Explains one feature to be considered	1

Answers could include:

Length – The space in which to operate the file, the job size, teeth size consistent with file length

Shape – Shape of the file needs to be able to produce the desired finish/shape

Cut – The need to have a good finish, remove material quickly or prevent clogging

Grade/Coarseness of Cut – How quickly material needs to be removed and the required finish

Question 18 (d)

Criteria	Marks
• Describes the procedures for caring and maintaining files during and after use	3
• Outlines some procedures for caring and maintaining files during and/or after use	2
• Outlines a procedure for caring OR for maintaining files	1

Sample answer:

Store in a dry clean place

Protect cutting edges by not hitting files together, store so edges are protected from hitting other tools

Clean files for storage

Handle is fitted correctly

Rub chalk on face to stop clogging-pinning

Clean file face during filing

Do not use files for inappropriate tasks

Question 19 (a)

Criteria	Marks
• Names the feature shown and outlines its use	2
• Outlines the use of the feature shown OR names the feature shown	1

Sample answer:

The feature shown is a depth gauge, which enables the operator to set a desired drilling depth, which can be repeated for a series of holes.

Question 19 (b)

Criteria	Marks
• Outlines an advantage for both of the drill chucks shown	2
• Outlines an advantage for one of the drill chucks shown	1

Sample answer:

Chuck A – ease of operation, quick change of drill bits or other fittings, reduced injury risk from NOT having a chuck key

Chuck B – provides a tighter grip on drill or fitting

Question 19 (c)

Criteria	Marks
• Compares a SOP and SWMS demonstrating an understanding of their purpose, use, outcome and how they relate to each other	5
• Explains the use and purpose of both a SOP and a SWMS with limited reference to the other	4
• A limited explanation of both a SOP and a SWMS OR explains in detail either a SOP or a SWMS	3
• Briefly outlines either a SOP or a SWMS	2
• States the purpose of either a SOP or a SWMS	1

Sample answer:

Standard operating procedures, SOP, and safe work method statements, SWMS, although written for different purposes are similar in their development. Both documents have similar elements within them.

A SOP is a quality system document which has a set of instructions that describes the correct and safe use of a tool or piece of equipment. These instructions standardise the activity and provide an assurance that the work is completed safely and consistently.

A SWMS is a safety document that breaks down a particular task into steps so that possible hazards can be identified and relevant safety precautions put in place to minimise the hazard.

Both documents have WHS considerations embedded in them. Referring to a SOP can be part of a safety precaution outlined in a SWMS.

Question 20

Criteria	Marks
<ul style="list-style-type: none"> Demonstrates, in a well-reasoned and cohesive response, using relevant workplace examples and industry terminology, a thorough understanding of the causes of bullying, harassment and unfair access to opportunities and the roles all bodies have in overcoming such issues 	13–15
<ul style="list-style-type: none"> Demonstrates, in a clear and organised response, using some industry terminology, a sound understanding of the causes of bullying, harassment and the roles some of the bodies have in overcoming such issues 	10–12
<ul style="list-style-type: none"> Demonstrates a sound understanding of some of the causes of bullying, harassment and unfair access to opportunities and the roles some of the bodies have in overcoming such issues 	7–9
<ul style="list-style-type: none"> Briefly outlines some causes of bullying, harassment and unfair access to opportunities and the roles some of the bodies have in overcoming such issues OR Demonstrates an understanding of some of the causes of bullying, harassment and discrimination OR Demonstrates an understanding of the roles some of the bodies have in overcoming such issues 	4–6
<ul style="list-style-type: none"> Briefly outlines some features of bullying, harassment and unfair access to opportunities OR Displays a minimal understanding of the roles some of the bodies have in overcoming such issues 	1–3

Sample answer:

All employees have the right to a safe workplace where appropriate duty of care is exercised in regard to their health and wellbeing. This means that employees should not be exposed to discrimination or bullying. Issues left unresolved often escalate and become more serious when there is no real cause for a problem to exist in the first instance.

Workers may be exposed to verbal, physical, social or psychological harassment by any other person in the workplace including employers, supervisors or fellow workers.

Workers may also be denied opportunities in their workplace because of unfair discrimination. This may be because of a worker's age, sex, race, disability, sexual orientation, religion or other cultural reasons.

State and Federal Governments have over a long period enacted legislation to address issues of bullying, harassment and discrimination. This legislation includes:

- Anti-Discrimination Act 1977* (NSW)
- Sex Discrimination Act 1984* (Cth)
- Racial Discrimination Act 1975* (Cth)
- Disability Discrimination Act 1992* (Cth)
- Age Discrimination Act 2004* (Cth)

In addition to Governments, a range of independent authorities exist to oversee the implementation of legislation. These include the Workcover Authority NSW, the Anti-discrimination Board NSW, The Australian Human Rights Commission, and Fair Work Australia. Concerns regarding bullying or discrimination may be referred to any of these authorities for action. Workers may also approach union representatives for advice and

assistance. Employers unsure about how to deal with bullying in their organisation may refer to various employer associations for advice.

Organisations also exist which can help workers deal with the effects of bullying and harassment. These include various counselling groups such as helpline and beyond blue.

It is an employer's responsibility to provide a safe workplace. It is also an employer's responsibility to identify workplace hazards, as a part of WHS legislation, including psychological hazards which includes bullying and harassment.

Employers must make every effort to eliminate bullying through a Risk Assessment Process. Employers must therefore have procedures and processes in place to enable issues surrounding bullying and discrimination to be reported, investigated and resolved.

Employers have a legal responsibility to ensure that all workers have equal access to employment opportunities. Their role is to develop processes and procedures that allow employees to be considered on merit and work performance when being considered for workplace opportunities.

Supervisors have a role to make themselves aware of where bullying or discrimination may arise in a workplace and ensure that adequate steps are taken to minimise issues arising. This may include adequate workplace induction, sound training in accordance with company policy and developing effective communication networks within the workplace. They should remain a point of contact for reporting of unwanted incidents in the workplace. Supervisors also have the role of observing and recommending employees for various employment opportunities. This should be done in a manner which is free from discrimination or bias.

Employees need to make themselves aware of legislation and company policies relating to bullying and discrimination. Unwanted incidents should be reported. It is wise for an employee to keep a written record of events, keep a diary of when reports were made and to whom and what actions were taken. Employees should seek support from fellow employees to help overcome minor misunderstandings before they become more serious. Employees may ask the Workplace Health & Safety committee to intervene.

A workplace, which is free from bullying, harassment and unfair access to opportunities is of benefit to all involved. Employees who are free from stress are more likely to work industriously and with confidence. Absenteeism is reduced and ultimately company productivity is improved.

Bullying and harassment is against the law. Physical violence may be reported directly to the police. Other matters may be dealt with within the company or by various authorities. If you are forced to resign from a job because of bullying you may be entitled to Workers' Compensation.

Bullying, harassment and discrimination are very costly to Australian industry and every effort at all levels should be taken to firstly prevent and then quickly resolve issues.

Section IV

Question 21 (a)

Criteria	Marks
• Outlines a range of possible causes of manual handling injuries related to this task	3
• Lists some possible causes of manual handling injuries	2
• Names a possible cause of a manual handling injury	1

Sample answer:

Twisting and bending the torso

Difference between the working heights and worker's size and height

Frequent lifting or stretching over shoulder height

Insufficient rest periods

Pulling, pushing or rolling in awkward ways without firm support

Handling excessive weights

Stretching

Uncomfortable and awkward shapes

Poor grip and posture

Obstructions in pathways, aisles or work areas

Slippery or uneven surfaces

Carrying loads up stairways

Insufficient space to manoeuvre

Excessive work rates or sudden changes in work rates

Insufficient training in lifting techniques

Question 21 (b)

Criteria	Marks
<ul style="list-style-type: none">Explains the process that should be followed, and a range of strategies which could be implemented, to manage the risk of injury to workers	4
<ul style="list-style-type: none">Outlines the process that should be followed or provides a detailed range of strategies to manage the risk of injury to workers	3
<ul style="list-style-type: none">Partially outlines the process to minimise the risk of injury ORLists a range of possible strategies to minimise the risk of injury	2
<ul style="list-style-type: none">Names a possible strategy to minimise the risk of injury	1

Sample answer:

Once a risk assessment has identified the hazard the following action plan should be undertaken.

All the hazards found should be discussed and training offered to employees, if required. A list of all hazards found should be compiled. The priority in which these risks are addressed should be then determined.

If the hazard is very likely to occur and severely injure someone ie high (1 or 2) on the risk assessment, something should be done immediately. If the hazard is likely to occur and injure someone ie medium (3 or 4), attend to it as soon as possible. If it is low (5 or 6), something should be done when possible.

The next step would be to change the way the task is done. This control can be achieved if a team lift is performed.

You should also consider administrative controls. Factors that could be included would be the suitability of the people performing the manual work. For example physical size and the number of people involved. Providing enough time to complete the task.

Finally workers should be supplied with PPE. Even though this is the least effective control in this case it will be used in conjunction with the former controls. Examples of PPE should include steel capped boots, gloves, safety vests and other appropriate attire.

Question 21 (c)

Criteria	Marks
<ul style="list-style-type: none">Provides a comprehensive description of both a storage system and the benefits to the organisation	8
<ul style="list-style-type: none">Provides a comprehensive description of a storage system and some of the benefits to the organisation ORProvides a description of a storage system and a comprehensive range of benefits to the organisation	7
<ul style="list-style-type: none">Provides a description of both a storage system and a range of benefits to the organisation	5–6
<ul style="list-style-type: none">Provides an outline of both a storage system and some benefits to the organisation ORProvides a description of a storage system ORProvides a description of some benefits to the organisation	3–4
<ul style="list-style-type: none">Lists some features of a storage system ORLists some benefits to the organisation	1–2

Sample answer:

The metal lengths should be stored safely and securely. They should be placed so as to avoid damage to the material. Due to the fact that the metal is heavy, the racks should not be overloaded. This will prevent the chance of the racks collapsing or the metal falling down by itself. The metal should not protrude out at all or hinder any person that might walk past. The area around the racks should also be clear of any trip hazards and be kept clean at all times, to allow easy and unrestricted access to the material. Effective labelling of the products should also be considered.

The metal should be placed so that the lighter and smaller sections are on the higher parts of the rack and heavier or larger cross sections should be placed on the lower part of the rack. Similar sections should be placed together and different thicknesses of similar sections either in the same rack or below or above depending on weight.

Proper storage of the raw materials will lead to a lower risk of injury to workers, less wastage and improved productivity. These factors will lead to a cheaper product and more profit for the organisation.

A reduction in the risk of injury will allow the employer to maintain the current work force and workers will not be on workers compensation and the employer will not have to pay additional premiums for insurance.

Safe and efficient storage of materials will save time and reduce wasted time looking for material when workers require it for production. Additional labour resources will not be required to sort through the material to find the correct section. It will be easier to maintain inventory and rotate stock as workers will be able to see what material is still available and which material needs to be reordered. This will enable a consistent supply of required stock and reduce over ordering of certain cross sections of metal that are not used as frequently, hence minimising inefficient use of storage space.

There will be less chance of metal being damaged if properly stored. This will again reduce waste and extra costs will be avoided to the end product. Down time and lead time in production will be minimised as workers will have a steady supply of quality materials and

will not have to sit around waiting and stop production. This will maximise the output of the machinery and technology.

Off cuts and smaller pieces of metal need to be safely and systematically stored and labelled. Again, similar cross sections, sizes and lengths of metal should be placed in similar storage areas so as to preserve the quality of the material and minimise time for accessing the material and production. Off cuts should also be used where possible to avoid wastage of material.

Waste and scrap metal products should be collected and stored in appropriate bins for collection. Waste should be sorted and stored together to avoid cross contamination. It should then be sent to desired organisations for recycling.

Metal and Engineering

2013 HSC Examination 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	MEM12023A Perform engineering measurements Pg24								
2	1	MEM12023A Perform engineering measurements Pg24			X					
3	1	MEM18002B Use power tools hand held Pg92								
4	1	MEM18001C Use hand tools Pg83			X					
5	1	MEM09002B Interpret technical drawing Pg19								
6	1	MEM18001C Use hand tools Pg83 MEM18002B Use power tools hand held Pg89								
7	1	MEM09002B Interpret technical drawing Pg19								
8	1	MEM13014A Apply principles OHS in the work environment Pg46								
9	1	MEM12024A Perform computations Pg32			X					
10	1	MEM12023A Perform engineering measurements Pg25								
11	1	MEM15002A Apply quality systems Pg61								
12	1	MEM12023A Perform engineering measurements Pg24								
13	1	MEM13014A Apply principles OHS in the work environment Pg49								
14	1	MEM16007A Work with others in a manufacturing, engineering or related environment Pg75		X						
15	1	MEM15002A Apply quality systems Pg62								

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	MEM09002B Interpret technical drawing Pg18								
16 (b)	2	MEM09002B Interpret technical drawing Pg19 MEM12024A Perform computations Pg32			X					
16 (c)	2	MEM09002B Interpret technical drawing Pg20 MEM15024A Apply quality procedures Pg67					X			
16 (d)	4	MEM09002B Interpret technical drawing Pg18								
17 (a)	6	MEM14004A Plan to undertake a routine task Pg55					X			
17 (b)	3	MEM13014A Apply principles OHS in the work environment Pg38 MEM14004A Plan to undertake a routine task Pg55								
18 (a)	1	MEM18001C Use hand tools Pg83								
18 (b)	2	MEM18001C Use hand tools Pg83								
18 (c)	2	MEM18001C Use hand tools Pg83								
18 (d)	3	MEM18001C Use hand tools Pg86								
19 (a)	2	MEM18002B Use power tools hand held Pg89								
19 (b)	2	MEM18002B Use power tools hand held Pg89								
19 (c)	5	MEM14004A Plan to undertake a routine task Pg53 MEM15002A Apply quality systems Pg61								

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	Manufacturing engineering and related industry induction Pg 13–15	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)	3	MEM13014A Apply principles of OHS in the work environment Pg39 MEM15024A Apply quality procedures Pg66 MEM15002A Apply quality systems Pg61			X					
21 (b)	4	MEM13014A Apply principles of OHS in the work environment Pg39		X	X	X	X			
21 (c)	8	MEM15002A Apply quality systems Pg60 MEM15024A Apply quality procedures Pg68			X	X	X			