



**B O A R D O F S T U D I E S**  
NEW SOUTH WALES

## **2012 HSC Metal and Engineering 'Sample Answers'**

When examination committees develop questions for the examination, they may write 'sample answers' or, in the case of some questions, 'answers could include'. The committees do this to ensure that the questions will effectively assess students' knowledge and skills.

This material is also provided to the Supervisor of Marking, to give some guidance about the nature and scope of the responses the committee expected students would produce. How sample answers are used at marking centres varies. Sample answers may be used extensively and even modified at the marking centre OR they may be considered only briefly at the beginning of marking. In a few cases, the sample answers may not be used at all at marking.

The Board publishes this information to assist in understanding how the marking guidelines were implemented.

The 'sample answers' or similar advice contained in this document are not intended to be exemplary or even complete answers or responses. As they are part of the examination committee's 'working document', they may contain typographical errors, omissions, or only some of the possible correct answers.

## Section II

### Question 16 (a)

*Sample answer:*

Welding symbol

### Question 16 (b)

*Sample answer:*

$$58 + 12 + 38 + \frac{50}{2} = 133 \text{ mm}$$

### Question 16 (c)

*Sample answer:*

The sleeve must not exceed the thickness of the tongue and can be slightly undersize. This is so the nut on the BALL can be tightened on to the tongue.

### Question 16 (d)

*Sample answer:*

AS 1100 standards comply with a worldwide standard. This means that adherence to these standards when drawing and manufacturing should allow component parts to fit together readily. Drawings can be prepared in any location and interpreted for manufacture anywhere in the world.

*Answer could include:*

- AS 1100 complies with international standards
- Assists in complying to standards in correct manufacture
- Parts will more readily fit together on assembly
- Correct and efficient manufacture of parts
- Allows for effective communication among manufacturers

**Question 17 (a)***Sample answer:*

<b>Sequence of steps – marking out</b>	<b>Tools</b>
<ul style="list-style-type: none"><li>• Mark a datum line 12.5 mm parallel to one side</li><li>• From one end mark 4 square lines across the mild steel strip at 12.5 mm, 37.5 mm, 89.5mm and 114.5 mm</li><li>• From one end centre punch the 2 centre points for the holes</li><li>• Measure 4 mm from both sides on all 4 corners to mark the chamfers</li></ul>	<ul style="list-style-type: none"><li>• steel rule</li><li>• scribe</li><li>• jenny caliper</li><li>• centre punch</li><li>• ball peen hammer</li></ul>

<b>Sequence of steps - manufacture</b>	<b>Tools</b>
<ul style="list-style-type: none"><li>• Cut chamfers using a hacksaw and finish the edge with a second cut file</li><li>• Place metal in the machine vice and drill the two holes – starting with a 3 mm drill then the 8.5 mm and finally drill one hole to 10.5 mm adding cutting lubricant when necessary</li><li>• Using a M10x1.5 taper tap and wrench, tap the 8.5 mm hole applying cutting compound when needed (ensure the tap is square to the metal)</li></ul>	<ul style="list-style-type: none"><li>• hacksaw</li><li>• second cut file</li><li>• pedestal drill</li><li>• machine vice</li><li>• drills 3 mm, 8.5 mm, 10.5 mm</li><li>• M10X1.5 taper tap</li><li>• tap wrench</li></ul>

**Question 17 (b)***Answers could include:*

- The bracket is in the correct position
- The bracket is square to the edge
- The bracket is centrally positioned
- The bolt screws in place
- The weld is as per specifications

**Question 18 (a)***Sample answer:*

Angle grinder

**Question 18 (b)*****Answers could include:***

Grinding: uses a thick disc that removes excess metal or smooths welds.

Cutting: uses a thin disc that cuts through metal bar or rod to a particular size.

Sanding: uses a disc made with abrasive cloth that cleans and smooths metal.

Polishing: uses a polishing mop that polishes metal when used with the correct polishing soap.

**Question 18 (c)*****Answers could include:***

Loose disc – will vibrate and potentially come off the machine and cause injury or damage or break.

Damaged disc – disc can break or damage the material.

Damaged power lead – can potentially cause electrocution to the user from exposed wires.

Damaged housing (body) – could injure the user's hand (cuts) or cause electrocution from exposed wires.

No guard – can potentially injure the operator with the disc touching them.

Damaged switch – could turn on or off at anytime potentially causing a kick back and injury to the operator.

**Question 18 (d)*****Answers could include:***

- Raise the alarm
- Inform the supervisor
- Evacuate the area
- Meet at the evacuation point
- Warn everyone
- Call emergency services (000)
- Fight fire if safe to do so with appropriate fire-fighting equipment
- Administer first aid to injured persons if qualified
- Cut off power if possible

**Question 19 (a)*****Sample answer:***

Chain dimensions are placed end to end. This is not as accurate as datum line dimensioning because the position of each feature depends on the neighbouring dimension. Datum line from dimensions all originate from the same coordinate. This is more accurate as the dimensions for each feature are independent.

**Question 19 (b)*****Sample answer:***

You need to know how to use the measuring device so that you know if it is appropriate for the task. The shape of the material and whether the measurement is an inside or outside size must also be considered. The job specifications, eg tolerances, also influence selection because you may need to use a digital device to get the accuracy needed.

**Question 19 (c)*****Sample answer:***

The company needs to ensure all measurements are done correctly so jobs are finished on time and within budget. Accurate measurement minimises waste, which is another cost saving for the company. A well-made article delivered on time enhances the company's reputation with its client. Company employees have pride in their workmanship, which contributes to a productive work environment.

## Section III

### Question 20

*Sample answer:*

Metal and engineering workplaces exhibit certain common features, but will also contain different features particular to that workplace.

For these reasons a workplace induction for all new employees is important. This induction would include a description of the company's activities, employment conditions, personal attributes and work ethics, appropriate conduct in the workplace and a familiarisation with the specific working environment.

An effective induction program would clearly describe the company ethos and expectations of all employees to the new employee. This program would ensure that the new employee was fully informed about workplace procedures, including emergency procedures and work practices.

The effective assimilation of a new employee into a metal and engineering workplace has benefits for all the stakeholders in the organisation. The company will benefit through the new employee contributing more effectively to the production processes within the company. This is of economic benefit to the company through increased productivity and income and a potential reduction in wastage because of incorrect procedures being followed. The new employee will communicate more effectively with current employees and with the supervisors, again improving efficiency. Work tasks are more likely to be completed correctly and internal customer needs are more likely to be met. The new employee would be made aware of workplace safety procedures, again benefiting all in the workplace by reducing the likelihood of an accident occurring.

A clear understanding of the position held by the new employee within the organisation and the career opportunities and training pathways available will benefit the new employee in developing their skills and expertise.

The acquisition of new skills and the capacity to proceed through a career pathway benefits to both the employee and the organisation.

## Section IV

### Question 21 (a)

*Sample answer:*

Various forms of safety signage are common throughout metal and engineering workplaces. Safety signs are displayed to provide easily recognisable information regarding safety risks. They use colour and graphics to be noticeable and clearly convey the information to all persons in the vicinity. They are very useful in a noisy environment where other forms of communication may be compromised.

### Question 21 (b)

*Sample answer:*

Safety signs fit into a range of different categories. The hearing and eye protection sign is blue and white in colour, which means it is a Regulatory Mandatory sign and it must be followed. It should be placed in an obvious position immediately adjacent to the area of the potential risk.

The MSDS sign is green and white in colour, which means it is an Emergency Information sign. It contains data on emergency information and must be placed directly near the area. The Caution Hot sign is yellow with black writing, which means it is a Hazard Warning sign. This sign conveys information that potential hazards are within the area and to be cautious of the potential hazard.

The Danger Oxygen No Smoking sign has a red oval on a black rectangle with black text on a white background, which means it is a Danger sign (life threatening hazard). These signs give the specific hazard and direct an action that must be followed to prevent a life threatening accident and must be placed in a highly visible area.

The No Access For Unauthorised Persons sign is a red circle and bar with a black symbol, which means it is a Prohibition sign. These signs give a direct instruction that must be followed and are placed directly at the source of the hazardous area.

**Question 21 (c)*****Sample answer:***

In order to ensure a safe workplace, risks in the working environment must be identified and appropriate measures taken to train and inform staff. The identification of potential risks may come from any person in the workplace and may be communicated to the employer directly or through a WH&S representative. It is the employer's responsibility to ensure that all necessary safety signage relevant to the identified risk is correctly displayed.

Once informed of a workplace risk and with the appropriate safety signage displayed all employees must follow the directions given by the signs, eg if the blue on white sign for hearing and eye protection is displayed in the grinding area this PPE must be worn at all times. Safety signage may be used in a broad range of applications in the workplace. Safety signs do not replace proper WH&S training, which the employer must provide. They are only a visual reminder of the risks and hazards in particular areas and situations in which staff may be working.

If an employee encounters a potential risk they should report the situation to help maintain a safe environment for all. This reporting may be through a WH&S representative who may be part of a WH&S committee. It is the responsibility of the representatives to report potential workplace hazards to the employer and to recommend action that should be taken. It should be decided by the WH&S representative how urgently and by what means this communication should take place eg a liquid spill should be signed as soon as possible with a Hazard Warning sign, black and yellow.