Examiners' Report/
Lead Examiner Feedback

Summer 2017

NQF BTEC Level 1/Level 2 Firsts in Engineering

Unit 9: Interpreting and Using Engineering Information (21174E)

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Introduction

This report has been written by the Lead Examiner for BTEC Engineering Unit 9 – Interpreting and Using Engineering Information. It is designed to help you understand how learners performed overall in the assessment. For each question, there is a brief analysis of learner responses. You will also find some example learner responses for some questions. We hope this will help you to prepare your learners for future examination series.

Grade Boundaries

What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade (Distinction, Merit, Pass and Level 1 fallback). The grade awarded for each unit contributes proportionately to the overall qualification grade and each unit should always be viewed in the context of its impact on the whole qualification.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark should be for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each test we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each test, because then it would not take into account that a test might be slightly easier or more difficult than any other.

Grade boundaries for this, and all other papers, are on the website via this link: qualifications.pearson.com/gradeboundaries

Grade	Unclassified	Level 1 Pass	Level 2		
			Pass	Merit	Distinction
Boundary Mark	0	9	19	29	39

General Comments on Exam

This was the eighth examination for this unit and the responses seen this year were comparable with that of the previous series. Responses achieving fewer marks still offer inaccurate and/or simplistic responses to questions and therefore gaining limited marks. The more demanding questions provided some learners with an opportunity to apply their knowledge in response to a range of engineering scenarios; however, most learners were not able to give extended answers that focused on the vocational context. Learners would continue to benefit from being taught examination skills and techniques as some continued to misread the questions and consequently they were not answered using an appropriate methodology. It was still evident that some centres had not covered the unit content in its widest sense as many learners struggled to gain marks for areas related to 'electronic component pin configurations', 'physical layout diagrams' and 'quality control information' when given an engineering context.

Many learners struggled to complete a number of the multiple choice questions correctly which was surprising as many aspects had been seen in previous series.

Question 1

This question was aimed at the identification of a range of abbreviations to represent drawing features and the use of related documentation.

Q1(a)

Targeted Specification Area: Learning Aim A.2

The majority of learners were unable to correctly identify the abbreviations used to represent drawing features as being 'Centre Line' and 'Internal'. Likewise learners found it difficult to identify 'CSK' as the abbreviation for Countersink. This was surprising as this part of the specification has been tested on numerous occasions.

Q1(b)

Targeted Specification Area: Learning Aim B.2

The majority of the learners were able to select 'timings' or 'speeds and feeds' as the correct answer but very few were able to achieve both marks. The question clearly references information found on a production but a number of learners opted for 'Gantt chart' which often accompanies a production plan.

Q1(c)

Targeted Specification Area: Learning Aim A.4

The majority of learners were also able to identify both health and safety signs as being 'First Aid' and 'Biohazard'. It was clear that nearly all the learners are familiar with health and safety signage.

Q1(d)

Targeted Specification Area: Learning Aim A.2

The symbol used to represent a mechanical component was a 'countersunk head screw'. A significant number of learners failed to identify this and gave responses such as 'torch' or just referred to the 'centreline' through the component.

1 mark response:

(d) Figure 1 shows a symbol used by engineers to represent a mechanical component. 1 Q01d

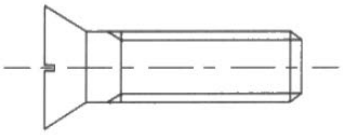

Figure 1

Name the mechanical component.

(1)

Screw.

Question 2

This question looked at how engineers interpret engineering drawings, tasks and other information. This question also tested learner's knowledge of using related documentation during tasks.

Q2(a)

Targeted Specification Area: Learning Aim A.1

Surprisingly, the majority of learners were unable to identify the orthographic projection as being 'First angle'. Many opted for 'Third angle', 'isometric' or 'oblique' which were all incorrect. Many learners stated the view positions such as 'top', 'end' and 'plan' but with no reference to the type of projection.

Q2(b)

Targeted Specification Area: Learning Aim A.3

The majority of the learners were able to select 'Bend allowance chart' or 'Data sheet for finishing materials' as the correct answer but very few were able to achieve both marks. The question clearly references manufacturing and yet learner opted for the distractors that focused on maintenance or servicing.

Q2(c)

Targeted Specification Area: Learning Aim B.2

Again, the majority of learners were not able to identify another piece of information that could be found on a schedule for manufacture. Correct responses included 'Gantt chart', 'deadlines' and 'Milestones'. Many learners simply left this question blank as they had no understanding of the concept.

Q2(d)

Targeted Specification Area: Learning Aim B.2

Over half the learners were unable to identify 'the starting point' or 'node' as the feature identified on the critical path analysis. Learners again misinterpreted this question and gave answers associated with the production of the parts.

Question 3

This question was aimed at interpreting and using information when manufacturing products.

Q3(a)

Targeted Specification Area: Learning Aim A.4

The majority of the learners were able to select 'Assembly sequence' or 'Treatments' as the correct answer but very few were able to achieve both marks. The question clearly references production details and yet learner opted for 'Assembly point' which was related to health and safety and therefore incorrect.

Q3(b)

Targeted Specification Area: Learning Aim B.2

The majority of learners again failed to identify a type of working instruction. Those learners who were correct gave responses such as 'Job cards', 'Operation sheets' or 'manufacturers manual'. These again are clearly referenced in the specification and have been tested through previous series. Incorrect responses included 'Blueprints' and 'Health and Safety Information'.

1 mark response:

(b) Engineers use a range of documents when carrying out activities, including working instructions.

1 Q03b

Name **one** example of working instructions.

(1)

Job Card

Question 4

This question was contextualised around engineering technicians using a range of documentation and sources of information when they are machining components or constructing and repairing circuits.

Q4(a)

Targeted Specification Area: Learning Aim A.1

The majority of learners correctly identified at least one piece of information that would be found on a component drawing. Typical responses included 'dimensions', 'materials used' and 'linetypes'.

2 mark response:

4 Engineering technicians use a range of documentation and sources of information when they are machining components or constructing and repairing circuits.

2 Q04

(a) One type of documentation used by engineering technicians is a component drawing.

State **two** pieces of information that would be found on a component drawing.

(2)

1 Material used

2 Dimensions

Or 2 mark response:

4 Engineering technicians use a range of documentation and sources of information when they are machining components or constructing and repairing circuits. 2 Q04a

(a) One type of documentation used by engineering technicians is a component drawing.

State **two** pieces of information that would be found on a component drawing.

(2)

1 Measurements for different components including length, breadth and volume.

2 Tolerances for when drilling holes in the component or for other machining work.

Q4(b)

Targeted Specification Area: Learning Aim A.3

Learners who had been taught about circuit component data sheets were able to gain at least one mark here for responses relating to 'to know where the components go' or 'stops the wrong components from being used'. Many learners gave incorrect responses about not making mistakes or making it easier to follow which are far too generic.

1 mark response:

(b) Explain **one** reason why an electronics engineering technician would refer to a circuit component data sheet when constructing electronic circuits. 1 Q04b

(2)

To ensure they are using the right materials and components for the circuit which ensures the functionality of the circuit.

2 mark response:

(b) Explain **one** reason why an electronics engineering technician would refer to a circuit component data sheet when constructing electronic circuits.

2 Q04b

(2)

So that they know the maximum voltage and current each component can handle, so that the correct resistors can be used, which can also be found by the included resistor colour codes.

Q4(c)

Targeted Specification Area: Learning Aim B.1

Learners who had been taught about exploded diagrams were able to gain at least one mark here for responses relating to 'mis-interpreting where the components go' or 'component location is confusing'. Some learners were able to give linked responses to gain both marks.

1 mark response:

(c) Electronics engineering technicians sometimes use exploded diagrams when constructing electronic circuits.

1 Q04c

Explain **one** disadvantage of using an exploded diagram when constructing a complex electronic circuit.

(2)

The exploded diagram would be hard to read as it would simply show an exploded circuit ~~diag~~ with no assemblies required (just attached onto a board) therefore, the construction technicians could misread it.

2 mark response:

(c) Electronics engineering technicians sometimes use exploded diagrams when constructing electronic circuits. 2 Q04c

Explain **one** disadvantage of using an exploded diagram when constructing a complex electronic circuit.

(2)

The exploded diagram may become to crowded with components and become extremely complex and hard to read clearly. All the components would be crowded together making it hard to add dimensions.

Q4(d)

Targeted Specification Area: Learning Aim A.3

Learners who had been taught about component pin configuration specifications were able to gain at least one mark here for responses relating to 'installing components in the correct way' or 'installation could cause safety problems'. Some learners were able to give linked responses to gain both marks.

1 mark response:

(d) Electronics engineering technicians carry out repairs on circuits. 1 Q04d

Explain **one** reason why an electronics engineering technician would need to refer to a component pin configuration specification when repairing electronic circuits.

(2)

As the technician will need the knowledge about which pin goes where, so the component pin configuration specification makes it easy for the technician when carring out repairs.

2 mark response:

(d) Electronics engineering technicians carry out repairs on circuits. 2 Q04d

Explain **one** reason why an electronics engineering technician would need to refer to a component pin configuration specification when repairing electronic circuits.

(2)

Because it allows him to understand which pins should be joined to his circuit which allows the pins to be used correctly and efficiently within the circuit, this helps to prevent mistakes and faults

Question 5

This question was contextualised around a company that designs and installs heating and ventilation systems for domestic and commercial customers. This context gave learners an opportunity to apply their knowledge and understanding to these questions.

Q5(a)

Targeted Specification Area: Learning Aim A.1

Most learners were able to select 'Schematic diagram' as a type of graphical representation.

Q5(b)

Targeted Specification Area: Learning Aim A.1

The majority of learners correctly identified at least one reason why installation technicians would need to refer to illustrations from manufacturers' manuals. Typical responses included 'shows how parts fit together' and 'to make sure the right components are being used'.

2 mark response:

(b) BT99 Thermal Engineering provides manufacturers' manuals to the technicians that install heating and ventilation systems. 2 Q05b

State **two** reasons why installation technicians would need to refer to illustrations from manufacturers' manuals.

(2)

1 A manufacturers' manual will contain information about how parts are fitted together which helps the technician.

2 It also shows the ~~fixing methods~~ parts/components to use for the give engineering task.

Q5(c)

Targeted Specification Area: Learning Aim A.1

Many learners were able to gain one mark by identifying a reason why the company would include a flow chart in the user guide. Typical responses included 'it provides a step by step guide for the user' and 'flow charts are easier to understand'. Some responses included linked explanations and were given both marks.

1 mark response:

(c) After completing the installation of a heating and ventilation system, BT99 Thermal Engineering provides the end user with a user guide containing diagrams, charts and drawings that relate to the system. 1 Q05c

Explain **one** reason why BT99 Thermal Engineering would include a flow chart in the user guide.

(2)

So if anything goes wrong in the machine they will know how to fix it or will know they need to get someone else to fix it because it is standardised and easy to understand

2 mark response:

(c) After completing the installation of a heating and ventilation system, BT99 Thermal Engineering provides the end user with a user guide containing diagrams, charts and drawings that relate to the system. 2 Q05c

Explain **one** reason why BT99 Thermal Engineering would include a flow chart in the user guide.

(2)

A flow chart shows how information are linked together through step-by-step process which uses standarised symbols, hence this helps the user guide to see the information of each process easily.

Q5(d)

Targeted Specification Area: Learning Aim BA.1

The majority of learners were unable to access this question and consequently gained very little reward. Typical low responses included 'users can check the location of components' or 'less chance of accidental damage to the system'. Occasionally some learners gave linked responses to achieve further marks.

2 mark response:

(d) For each completed installation, BT99 Thermal Engineering produces a physical layout diagram, which is also included in the user guide. 2 Q05d

Explain **two** advantages to the end user of the installation of including a physical layout diagram in the user guide.

(4)

1 The user can use the diagram to see how the system is setup for any future repair or maintenance.

2 The user can use it to see how the system works / functions.

4 marked response:

(d) For each completed installation, BT99 Thermal Engineering produces a physical layout diagram, which is also included in the user guide.

Explain **two** advantages to the end user of the installation of including a physical layout diagram in the user guide.

(4)

1 It allows technicians in the future to see where the different parts of the systems are which would allow them to improve, repair or maintain the system.

2 So that they can refer back to the manufacturer if there is a problem and can state where it is occurring rather than having to get a specialist to figure out where the problem is.

Question 6

This question was contextualised around a company that produces engineering drawings for a range of customers who do not have their own CAD technicians. Again, this context gave learners an opportunity to apply their knowledge and understanding to a range of questions.

Q6(a)

Targeted Specification Area: Learning Aim A.2

The majority of learners found this question very challenging, consequently this question was often left blank. It was very surprising that many of the learners did not recognise this as a linear tolerance. Many learners simply produced a division calculation which was incorrect. Others did give explanations of lengths between 135mm and 140mm.

1 mark response:

6 1BD-CAD produces engineering drawings for a range of customers who do not have their own CAD (Computer Aided Design) technicians. 1 Q06a

(a) 1BD-CAD uses the following notation to represent dimensions on drawings.

$$\frac{140}{135}\,\text{mm}$$

State the meaning of the notation shown.

(1)

The tolerance has to be between 135 mm - 140 mm.

Q6(b)

Targeted Specification Area: Learning Aim A.2

It was pleasing to see that the majority of learners were able to identify at least one of the geometric tolerances. The most popular being 'Angle' with a number successfully identifying 'Profile of a surface' as the other.

Q6(c)

Targeted Specification Area: Learning Aim B.3

Learners who had been taught about folding methods were able to gain at least one mark here for responses relating to 'damage through rips or creases' or 'information becoming harder to read or interpret'. Some learners were able to give linked responses to gain both marks.

1 mark response:

(c) 1BD-CAD can produce A1 size drawings that engineers use when working on a construction site. 1 Q06c

Explain **one** implication for engineers working on a construction site of not folding large engineering drawings in a specific way.

(2)

The papers may be damaged more easily on a construction site and could rip in half.

2 mark response:

(c) 1BD-CAD can produce A1 size drawings that engineers use when working on a construction site. 2 Q06c

Explain **one** implication for engineers working on a construction site of not folding large engineering drawings in a specific way.

(2)

The drawing may become damaged or will be hard to read/understand when ~~this~~ using it the next time.

Q6(d)

Targeted Specification Area: Learning Aim B.3

It was pleasing to see a number of responses achieving high marks for this question. This part of the specification has been tested in previous series but it did present a different challenge to many learners. Typical low responses included 'drawings would be lost' and 'drawing will need to be reproduced'. This was often linked to delays in manufacturing or loss of company reputation which gained further marks.

2 mark response:

(d) 1BD-CAD produces all of the engineering drawings for its customers using CAD software. The drawings are stored on the 1BD-CAD computer network. 2 Q06d

Explain **two** implications for customers if the original CAD drawings are corrupted and 1BD-CAD does not maintain a back-up system.

(4)

1 All the drawings would be lost and the company will be held responsible to fix the problem.

4 mark response:

(d) 1BD-CAD produces all of the engineering drawings for its customers using CAD software. The drawings are stored on the 1BD-CAD computer network. 4 Q06d

Explain **two** implications for customers if the original CAD drawings are corrupted and 1BD-CAD does not maintain a back-up system.

(4)

1 If the files are corrupted the drawings may be lost. This could cause a mistake in the production of components which could lead to catastrophic failure or loss of client trust.

2 A lack of component drawings could cause delays in production. This may cost 1BD-CAD lots of money as well as damaging clients trust and the companies reputation. It may also cause financial problems for the clients as they may have deadlines which need ~~to be met~~ meeting.

(Total for Question 6 = 9 marks) 9

Question 7

This question was contextualised around a company that manufactures precision components that are used in the biomedical engineering sector to assemble bionic limbs. Again, this context gave learners an opportunity to apply their knowledge and understanding to a range of questions.

Targeted Specification Area: Learning Aim B.2

The majority of learners found this question difficult. This was an unfamiliar context although SPC and Pareto charts have scored well in previous series. Typical correct responses gave basic description of SPC and Pareto chart use. Many learners misinterpreted the question and gave effects related to the production of the bionic limb itself rather than the reduction of faulty parts. For learners to achieve higher marks here, there needed to be a detailed consideration of the positive and negative aspects of both techniques coupled with a conclusion to show a developed understanding of quality control information.

Mark band 1 response:

7 BA9 Engineering is a manufacturer of precision components that are used in the biomedical engineering sector to assemble bionic limbs. The company monitors the quality of these components during manufacturing using quality control information such as Statistical Process Control (SPC) charts and Pareto charts. **2** Q07

Evaluate the effectiveness of using SPC charts and Pareto charts to reduce the quantity of faulty components produced by the company.

BA9 Engineering manfacture precion biomedical products they have to be accurate and by using quality contol processes such as Statistical Process Contol (SPC) charts and Pareto charts will mean they can ~~trace~~ see which sections of their manufacturing team are falling belocw standard and they would be able to try and improve these areas so they have a improved quality control.

Also by using SPC charts and Pareto charts the company will be able to see where any delays occur during production therefore delaying the whole manufacturing process this may result in decreased customer loyality due to delayed biomedical products. So if they improve this it will increase the rate of production and also increase customer loyality therefore becoming amore successful ~~com~~ engineering company.

(Total for Question 7 = 8 marks) **2**

Mark band 3 response:

7 BA9 Engineering is a manufacturer of precision components that are used in the biomedical engineering sector to assemble bionic limbs. The company monitors the quality of these components during manufacturing using quality control information such as Statistical Process Control (SPC) charts and Pareto charts. 7 Q07

Evaluate the effectiveness of using SPC charts and Pareto charts to reduce the quantity of faulty components produced by the company.

One advantage of using SPC and Pareto charts is that it allows BA9 to see which biomedical components are failing and when. This allows them to diagnose the causes of the fault. One disadvantage of using these quality control measures is that they don't actually solve the problem. Another advantage is that Pareto charts allow the company to prioritise certain failures. Another disadvantage is that it takes time and money to produce these documents. Another advantage is that they allow BA9 to keep track of how many products are faulty and what made them faulty which could be used to improve the production. A disadvantage to these documents is that they may become very complex and hard to read or interpret. An advantage is the number and causes of faulty products can be compared to other data e.g. last years. Another disadvantage is that they may not highlight anything that the company doesn't already know about the faulty products. Another advantage is that BA9 can see which stages of production need to be updated/improved sooner and which are more minor causes of faults. Overall I think that using SPC and Pareto charts may help the company highlight the causes of its faults however the charts alone won't help to reduce the number of faulty products, aka fixing the issues may also cost a lot of money and may not be viable for BA9.

(Total for Question 7 = 8 marks) 7

Summary

Based on their performance on this paper, learners should:

- Prepare for exams using all available material, including Past Papers and Sample Assessment Materials.
- Carefully read the questions before answering,
- Ensure that they have covered all aspects of the specification.

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