Examiners' Report/
Lead Examiner Feedback

January 2015

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 exam. For each question, there is a brief analysis of learner responses. You will also find some example learner responses at Level 2 Pass, Merit and now Distinction for some questions. We hope this will help you to prepare your learners for future examination series.

General Comments on Exam

This was the third examination for this unit and, overall, the paper produced a reasonable range of responses. Lower ability learners often gave inaccurate and/or simplistic responses to questions and therefore gained limited marks. The more demanding questions provided learners with an opportunity to apply their knowledge in response to an engineering scenario, and it was pleasing to see some extended answers that focused on the vocational context. Learners would, however, 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 limits and fits charts and critical path analysis. This was the second series where a drawing insert was used in conjunction with question 3. This again proved quite challenging for some learners but clearly those that were able to interpret this information scored reasonably well on all parts.

It was pleasing to see that learners were completing the multiple choice questions correctly; however, these are the questions that require the learner to put a cross in a box, as per the guidance at the beginning of the question paper. Learners still need to ensure that they are reasonably accurate when doing this and that they clearly mark lines through the box if they change their mind. Some learners still use ticks which could affect the scoring. Centres need to ensure that learners are following the instructions as recorded on the examination paper.

Question 1

This question was aimed at a range of aspects relating to interpreting health and safety information.

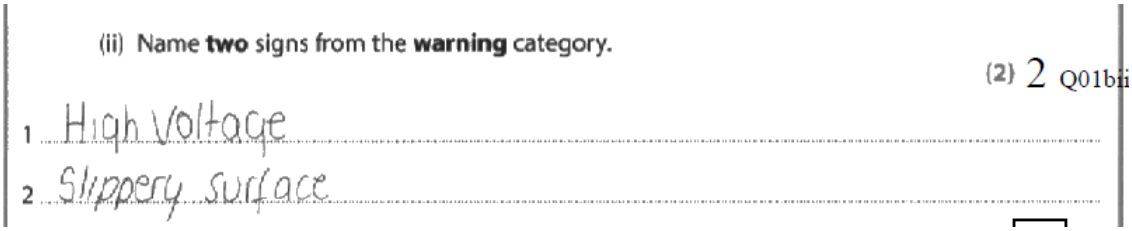
Targeted Specification Area: Learning Aim A.4

Q1(a): The majority of learners correctly identified the meaning of the safety sign as being 'Assembly Point'.

Q1(b)(i): Many learners were able to identify the correct colours used to display mandatory signs as being 'blue and white'.

Q1(b)(ii): Many learners were able to name two signs from the 'warning' category. The most common responses related to 'high voltage', 'flammable', trip hazard' and 'slippery surface'. Incorrect responses were also seen such 'eye protection' and 'ear protection' on numerous occasions, that are from the mandatory category.

2 mark example:


(ii) Name **two** signs from the **warning** category.

(2) 2 Q01bii

1 High Voltage

2 Slippery surface

Question 2

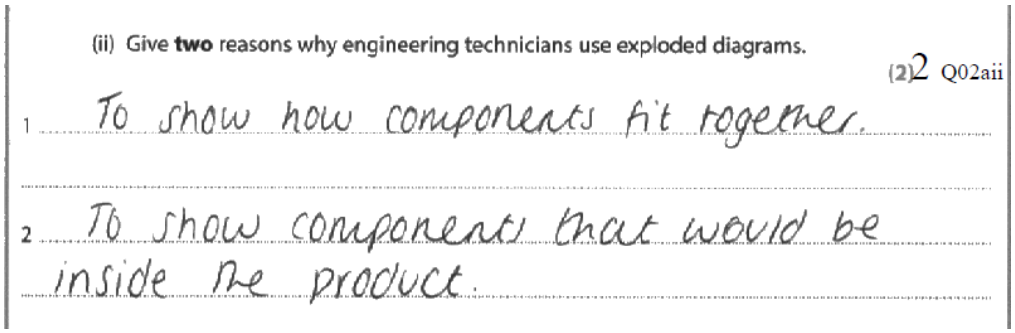
This question was aimed at (a) drawing types and (b) and their characteristics.

Targeted Specification Area: Learning Aim A.1

Q2(a)(i): Most learners were able to identify the correct drawing name for the orthographic projection drawing; however, there were many incorrect responses for the oblique drawing, with numerous learners suggesting that this was an isometric projection.

Q2(a)(ii): The majority of learners were able to score reasonably well here as many were clearly able to give simple reasons for the use of exploded diagrams. Typical correct responses centred around the mark scheme responses of 'able to see individual parts' and 'can clearly see how each part id assembled'. Learners who did not score well here often gave incorrect responses relating to an exploded diagram giving dimensional detail.

2 mark example:



(ii) Give **two** reasons why engineering technicians use exploded diagrams.

(2) 2 Q02aii

1 To show how components fit togeether.

2 To show components that would be inside the product.

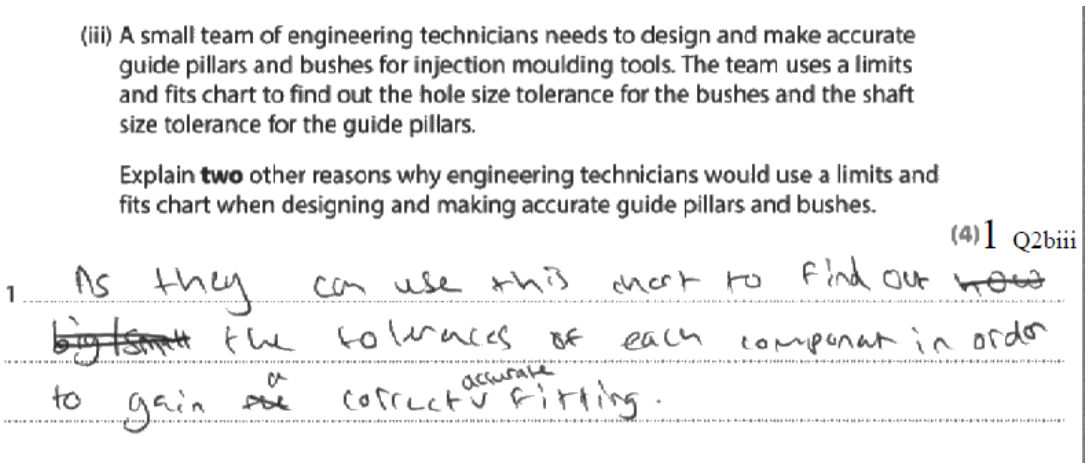
Targeted Specification Area: Learning Aim A.3

Q2(b)(i): The majority of learners scored well as they were clearly able to read the limits and fits chart to identify the correct tolerance for a g6 8mm diameter shaft as being -5 -14.

Q2(b)(ii): The majority of learners did not score any marks here as it was clear that they had no knowledge of how to interpret the limits and fits chart, which was needed in order to answer this question correctly. Many were able to identify the correct tolerance but then unable to apply this to the 28mm diameter to give an answer of 28.033mm. This activity is clearly identified in the unit content and centres need to teach learners how to use such a chart in order for them to interpret the information correctly.

Q2(b)(iii): Again this proved to be a challenging question for learners and reinforced the lack of knowledge and understanding to answer this question. Many learners simply stated reasons associated with 'finding out the hole size tolerance' which formed part of the question itself and therefore could not be credited. Many learners simple gave generic responses such as 'quick and easy to read' which also could not be credited. Where learners did score, it was usually associated with 'ensuring that parts would fit together correctly'.

1 mark example:



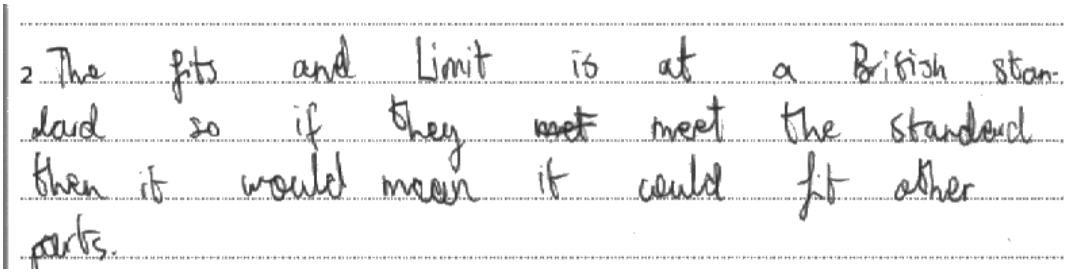
(iii) A small team of engineering technicians needs to design and make accurate guide pillars and bushes for injection moulding tools. The team uses a limits and fits chart to find out the hole size tolerance for the bushes and the shaft size tolerance for the guide pillars.

Explain **two** other reasons why engineering technicians would use a limits and fits chart when designing and making accurate guide pillars and bushes.

(4) 1 Q2biii

1 As they can use this chart to find out ~~how~~ ~~big~~ ~~small~~ the tolerances of each component in order to gain ~~a~~ ~~be~~ correct accurate fitting.

2 mark example:



Question 3

This question was aimed at testing knowledge of interpreting engineering drawings and drawing information. This question also saw the introduction of a drawing insert.

Targeted Specification Area: Learning Aim A.2

Q3(a): Many learners had clearly been taught about the different linetypes found on engineering drawings as most were able to identify a hidden detail line correctly.

Q3(b): Many learners were unable to identify the letters 'PCD' as being 'Pitch Circle Diameter'. There were far too many learners that left a blank space for this question and it is clearly an area that centres need to address.

Q3(c): Many learners were able to work out the correct length of 20mm for the missing dimension on the drawing insert.

Targeted Specification Area: Learning Aim A.1

Q3(d): This question proved to be quite a challenge for all learners and consequently learners did not score well here. Many of the responses were again not related to the drawing itself but still focused on the 'title block' with learners pointing out that there was no revision date present. Other incorrect responses saw learners stating that there was no 3D image available of the product or references were made to the missing dimension (E) which was answered in a previous question. These details were reported last series and yet there appears to be no significant improvement of using this insert to answer questions.

A typical incorrect response is shown below:

(d) There is no section view on the clamping unit drawing.

Explain **two** other errors on the clamping unit drawing that will cause a problem when interpreting information.

(4) 0 Q03d

1 It is not drawn to scale so the manufacturer will have to measure it out himself and them won't be able to compare it to the drawing. and ~~$~~

2 The title block isn't totally finished as it hasn't been revised and the scale is unknown which could mean that it isn't a professional drawing.

Where learners did score some marks, there were normally clear references to the incorrect linetype used for the hidden detail and no dimensional/angular detail for the tapers of the clamping unit. A number of learners used the grid reference frame to specify particular errors which is seen as good practice.

1 mark example:

2 no radius giving in square E,3

3 mark example: one low and one linked response

(d) There is no section view on the clamping unit drawing.

Explain **two** other errors on the clamping unit drawing that will cause a problem when interpreting information.

(4) 3 Q03d

1 The drawing on the bottom left is a plan view projection of the clamp and a third angle projection always has the plan view on the top left above the front view.

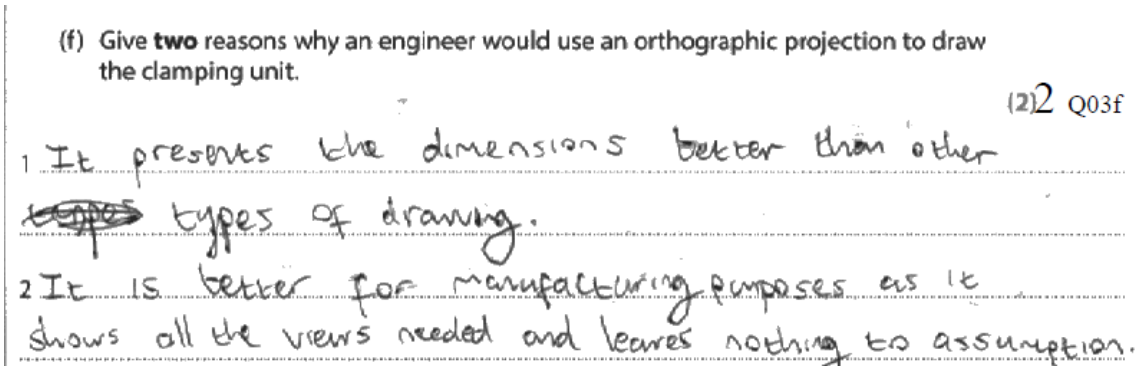
2 There is a chamfer on the base of the clamp and it is not specified as to what angle the chamfer is. If the angle is not known then the product cannot be made accurately.

Targeted Specification Area: Learning Aim A.2

Q3(e): The majority of learners did not score any marks here as they could not interpret the correct section view. Many learners chose the section where the holes contained cross hatching (C), whereas the correct view was the one that contained cross hatching across most of the product apart from the hole areas (B). This was a similar case to the previous exam series.

Q3(f): The majority of learners were able to score at least one mark here demonstrating learners knowledge of the reasons why orthographic projection are used. Many learners gave correct responses such as 'shows all the dimensions of the product', 'shows hidden detail' and 'can be viewed from different angles'; however, there was a typical incorrect response from learners 'easy to read/interpret' which orthographic projections are clearly not.

2 mark example:



(f) Give **two** reasons why an engineer would use an orthographic projection to draw the clamping unit.

(2) 2 Q03f

1 It presents the dimensions better than other types of drawing.

2 It is better for manufacturing purposes as it shows all the views needed and leaves nothing to assumption.

Question 4

This question was contextualised around a specialist car manufacturing company that uses critical path analysis. This context gave learners an opportunity to apply their knowledge and understanding about this previously explored area of the unit content.

Targeted Specification Area: Learning Aim B.2

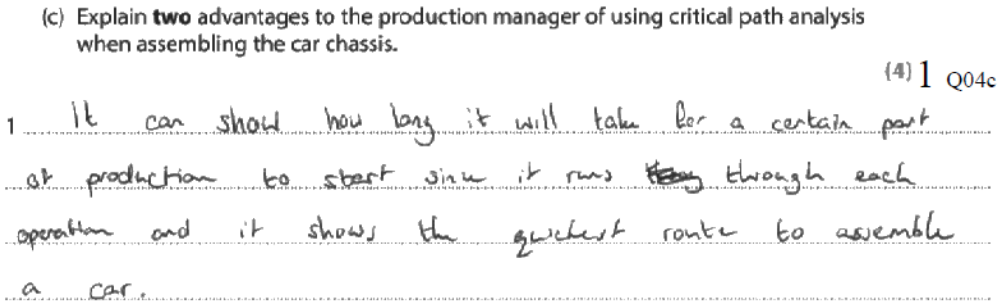
Q4(a): The majority of learners did not score any marks here as they could not interpret the path that identifies the most important activities, which can impact on the project schedule (B – ADJLM). Those learners that could identify this had clearly been taught critical path analysis and were able to gain a mark here.

Q4(b): Likewise the majority of learners were unable to recognise the latest start time for Activity H as being 19 hours. Again it was clear that many centres had not taught learners how to interpret the nodes in the diagram and this needs to be addressed as it can be found in the unit content.

Targeted Specification Area: Learning Aim B.2

Q4(c): Learners, again, did not score very well here. Typical incorrect responses focused on a description of the CPA rather than an advantage such as 'shows you all the routes of production' or 'shows the start time and finish time of each activity'. Learners appeared to have very limited knowledge of this topic. However, some learners were able to gain marks for linked responses centred around 'being able to identify the quickest route to allow the production manager to realign resources to critical activities to improve completion times'.

1 mark example:

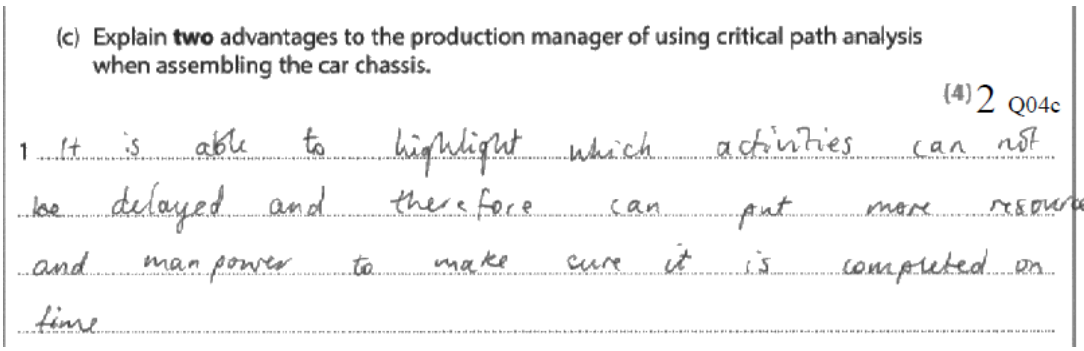


(c) Explain **two** advantages to the production manager of using critical path analysis when assembling the car chassis.

(4) 1 Q04c

1 It can show how long it will take for a certain part of production to start since it runs through each operation and it shows the quickest route to assemble a car.

2 mark example:



(c) Explain **two** advantages to the production manager of using critical path analysis when assembling the car chassis.

(4) 2 Q04c

1 It is able to highlight which activities can not be delayed and therefore can put more resources and man power to make sure it is completed on time

Question 5

This question was contextualised around a company that manufactures seals for a range of engineering sectors. Again, this context gave learners an opportunity to apply their knowledge and understanding to a range of questions.

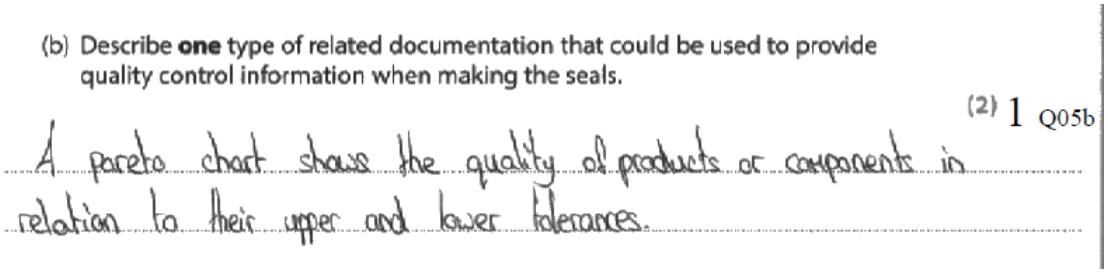
Targeted Specification Area: Learning Aim B.2

Q5(a): The majority of learners were able to score at least one mark here. Typical simplistic responses such as 'tools required', 'materials required' and 'processes needed to make the seals' were evident from learners. Incorrect

responses saw learners give generic responses such as ‘company name’ and ‘the date’ which although correct but not the requirements of the unit content.

Q5(b): The majority of learners were unable to score marks here. Many often gave responses such as ‘test reports’ or ‘production plans’ which have come from the question stem itself. Some learners were able to name a type of related documentation that could provide quality control information such as ‘engineering drawings’, ‘statistical process control’ and ‘Pareto charts’. Also some learners were able to give a linked response to types of related documents going beyond naming one with links mainly related to ‘Engineering drawings’ such as ‘contains dimensions and tolerances so that product can be checked against these’.

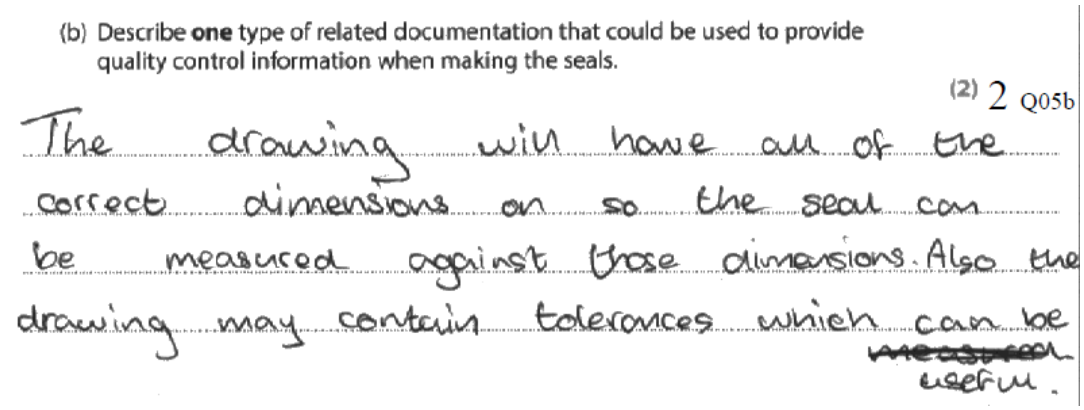
1 mark example:


(b) Describe **one** type of related documentation that could be used to provide quality control information when making the seals.

(2) 1 Q05b

A pareto chart shows the quality of products or components in relation to their upper and lower tolerances.

2 mark example:


(b) Describe **one** type of related documentation that could be used to provide quality control information when making the seals.

(2) 2 Q05b

The drawing will have all of the correct dimensions on so the seal can be measured against those dimensions. Also the drawing may contain tolerances which can be ~~measured~~ useful.

Q5(c): This proved to be a challenging question for the majority of learners. Many incorrect responses were seen here as learners had simply repeated the question and talked about ‘determining the suitability of the new material’. Where learners did score it was usually in the form of brief responses as shown below. There was often reference to ‘reduced failure of the seal’ or ‘improved safety’. The more able learners were expected to produce linked responses such as ‘test reports containing information about the properties of materials allowing engineers to determine how much pressure/force the seal could withstand’. It was clear that some learners have used or seen a test report during their studies but had limited knowledge of why they are used in this situation.

1 mark example:

(c) An engineer at DW7 Engineering needs to make a special seal for a forklift that operates in very cold conditions. The engineer has chosen a new material for the seal and decides to refer to a test report for the new material to determine its suitability.

Explain **one** reason why a test report was used in this situation to determine the suitability of the material.

(2) 1 Q05c

a test report was used in this situation to determine the suitability of the material as they need to ensure its strength and durability and its wear rate in the very cold conditions to prevent melting ~~or~~ another soon.

2 mark example:

(c) An engineer at DW7 Engineering needs to make a special seal for a forklift that operates in very cold conditions. The engineer has chosen a new material for the seal and decides to refer to a test report for the new material to determine its suitability.

Explain **one** reason why a test report was used in this situation to determine the suitability of the material.

(2) 2 Q05c

the test relort would include things like durability, malleability, toughness of the material. most importantly how it behaves under different exposures of temprature Because it has to be able to perform in very cold conditions.

Question 6

This question was again contextualised around a company manufacturing fabricated products for the marine industry. Again, this context gave learners an opportunity to apply their knowledge and understanding to a range of questions.

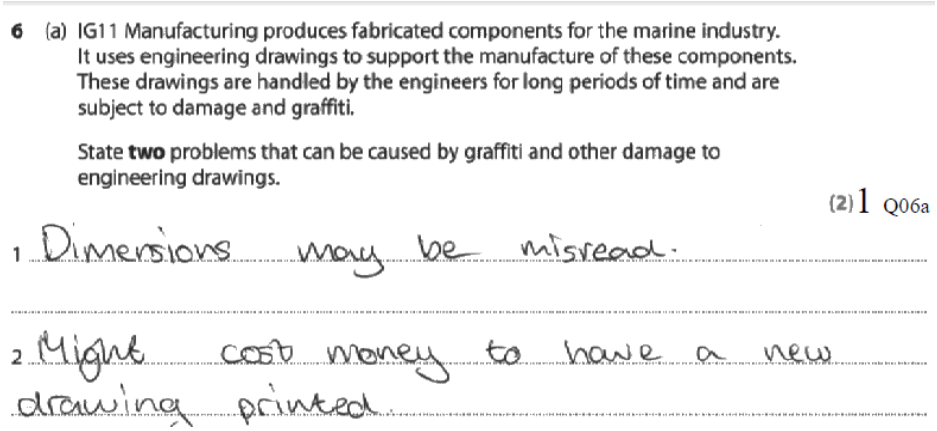
The majority of learners sitting the examination paper completed the final questions. This was pleasing as it is good examination technique for learners to at least attempt all questions.

Targeted Specification Area: Learning Aim B.3

Q6(a): The majority of learners were able to score at least one mark here. Typical simplistic responses such as ‘drawings will become difficult to read

or ‘graffiti could cover dimensions or part of the drawing’ were evident from learners. Incorrect responses focused on having to replace drawings and the associated cost and time of this (note that the below example was awarded one mark for the first response only).

1 mark example:



6 (a) IG11 Manufacturing produces fabricated components for the marine industry. It uses engineering drawings to support the manufacture of these components. These drawings are handled by the engineers for long periods of time and are subject to damage and graffiti.

State **two** problems that can be caused by graffiti and other damage to engineering drawings.

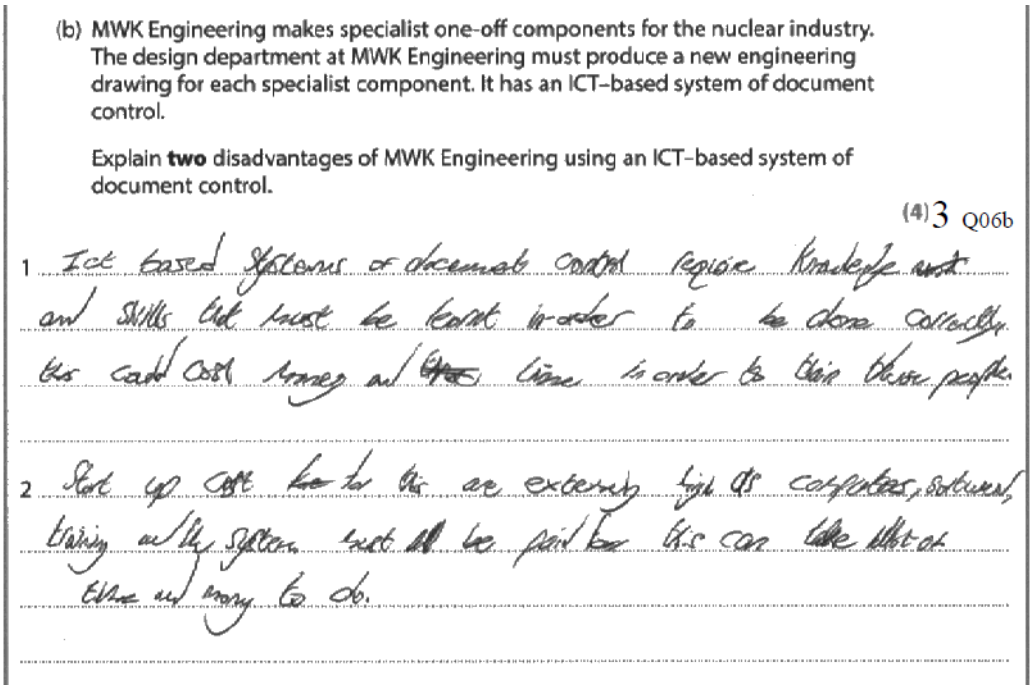
(2) 1 Q06a

1 Dimensions may be misread.

2 Might cost money to have a new drawing printed.

Q6(b): The majority of learners did not score well on this question. It was again clear that learners covered ICT based systems at some point during their studies but there was a lack of understanding of the ways this information could be used in the context of the question. Most learners gave incorrect generic responses such that focused on ‘hacking’, ‘file corruption’ or ‘loss of power’. Where learners did score marks it was again for brief responses to wasted maintenance costs or time as there would be no requirement to access one-off component drawings by those not involved in its design or manufacture.

3 mark example:



(b) MWK Engineering makes specialist one-off components for the nuclear industry. The design department at MWK Engineering must produce a new engineering drawing for each specialist component. It has an ICT–based system of document control.

Explain **two** disadvantages of MWK Engineering using an ICT–based system of document control.

(4) 3 Q06b

1 ICT based systems or document control require knowledge and skills that must be learnt in order to be done correctly this could cost money and time in order to train these people.

2 Set up cost to be as extremely high as computers, software, training and the system itself will be paid for this can take alot of time and money to do.

Targeted Specification Area: Learning Aim B.1/B.2

Q6(c): It was pleasing to see that the majority of learners attempted this question with a slight improvement on the success rate. There were simplistic implications mentioned from the lower ability learners with regard to 'reduced equipment failure', whilst identifying/describing 'excessive maintenance costs' and 'unnecessary machine overhaul' resulting in increased machine downtime. The learners showed limited knowledge of a planned maintenance scheduling.

The more able learners were expected to achieve higher marks by providing a balanced range of implications associated with planning maintenance scheduling, with points made relevant to the situation in the question. Some learners would show a good or developed understanding of this topic with a range of points described but not always balanced. Learners would consider the possibility of failure still occurring even if a plan was implemented, the interruption to production and the cost implications of that. Answers were well thought out and it was pleasing to see some learners suggesting both pros and cons in their final response along with a conclusion; nonetheless, most answers lacked the depth required for the higher marks. It was also pleasing to see that a number of learners had completed some kind of drafting during the exam prior to writing this final question as there were bullet pointed notes written above the final response which shows good planning; however, centres need to be aware that the majority credit is given for the extended writing response (please refer to the mark bands at the bottom of Q6c mark scheme).

Mark band 1 example:

(c) 7PX Engineering uses a lot of machinery that operates continuously when producing aluminium tubing. Maintenance procedures are currently carried out when the aluminium tubing machinery fails. 7PX Engineering is considering introducing a scheduled maintenance plan for its aluminium tubing machinery.

Discuss the impact for 7PX Engineering of using a scheduled maintenance plan when carrying out maintenance procedures for its aluminium tubing machinery.

(8) 3 Q06c

If scheduled maintenance plans are not used, then when the ~~aluminium tubing fails,~~ the machinery fails, it could potentially stop working for hours before it can be repaired through maintenance. If 7PX Engineering wants the machinery to operate continuously, then this issue ~~could~~ could be a major set-back and result in loss of potential profits.

If a scheduled maintenance plan is used, Mean time to failure charts can be used to predict when the machinery is going to fail and maintenance can be scheduled appropriately ahead of time. This means that the machinery may be able to operate continuously and the time it is stopped will be minimised so that the maximum amounts of aluminium tubing can be produced and profits will increase.

A scheduled maintenance plan will stop financial loses for 7PX Engineering.

Mark band 2 example:

(c) 7PX Engineering uses a lot of machinery that operates continuously when producing aluminium tubing. Maintenance procedures are currently carried out when the aluminium tubing machinery fails. 7PX Engineering is considering introducing a scheduled maintenance plan for its aluminium tubing machinery.

Discuss the impact for 7PX Engineering of using a scheduled maintenance plan when carrying out maintenance procedures for its aluminium tubing machinery.

(8) 5 Q06c

Having a scheduled maintenance plan would benefit 7PX as it will result in less unexpected breakdowns. This is because the machines will be maintained better as they will be checked more regularly. Having a maintenance plan also allows 7PX to put in place alternative production processes as they know when the machine will be out of operation due to maintenance work such as an oil change of parts replacement However this will not stop any unexpected breakdowns from happening but it will minimise them as the machine will be maintained better. The machine will also run more smoothly and produced better products if it is maintained more often. However having a maintenance plan may be more costly as more labour costs will be implied as well as parts costs as parts may be replaced which are not broken and could still perform the job Having planned maintenance may result in more down time and a loss of money for the company as maintenance will be carried out more often However the benefits outweight the costs as an unexpected breakdown may lost a long time and cost the business money

Grade Boundaries

Introducing external assessment

The new suite of 'next generation' NQF BTECs now include an element of external assessment. The external assessments for NQF BTEC Construction are timetabled paper-based examinations.

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).

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 wouldn't take into account that a test might be slightly easier or more difficult than any other.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link: http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspxGrade boundaries for this, and all other papers, can be found on the website on this link:
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Grade	Unclassified	Level 1 Pass	Level 2		
			Pass	Merit	Distinction
Boundary Mark	0	12	22	32	42

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