



Pearson BTEC Level 1/Level 2 Tech Award in Engineering

Sample Assessment Material

**Component 3: Responding to an
Engineering Brief**

First teaching September 2017

Version 1.1

Edexcel, BTEC and LCCI qualifications

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Part 1 Set task

Part 1 of the set task requires learners to carry out a practical activity and then complete a task and answer booklet. This must be completed in the assessment period timetabled by Pearson.

The teacher notes provided in this document give information on the process for the practical activity. It is the responsibility of centres to resource and trial the practical investigation before it is undertaken by learners in the supervised period.

Practical activity

Learners must not see the teacher notes. A separate task and answer booklet will be available for learners at the beginning of the supervised period. The set task brief provides all the necessary information for learners to conduct the practical activity and includes a table for learners to record their results and observations.

Centres will be required to supervise learners when they carry out the practical activity. However, teachers cannot provide guidance during this. The practical activity, including Activity 1a, should take approximately one hour.

Learners must record their results and observations independently. They must do this in the task and answer booklet provided. Learners will need to refer to their results and observations obtained when carrying out activities.

Learners must observe safe practice when carrying out practical activities. It is the responsibility of centres to carry out risk assessments for all practical activities.

Preparation of practical activity

Preparation of the practical activity and the equipment needed will be provided for each assessment. Items should only be assembled by the teacher where this is specifically stated in these instructions.

Practical activity preparation and set up

The scenario is about an organisation that produces strong and durable elasticated ropes.

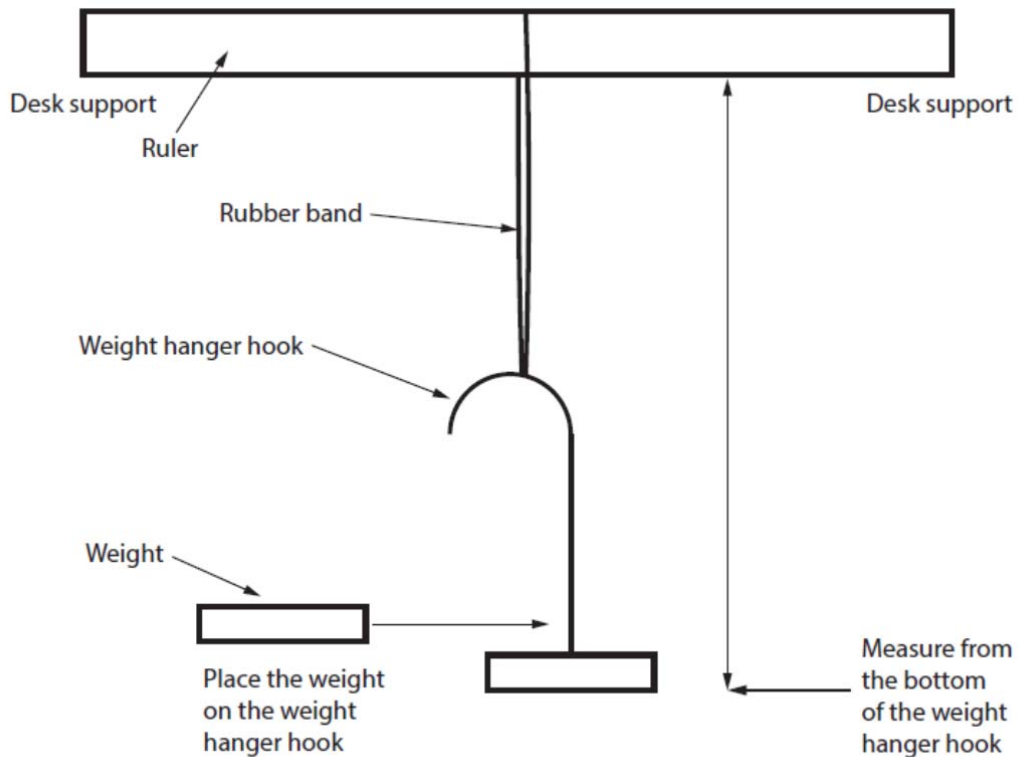
List of equipment

- 300 mm wooden or 1 metre plastic ruler for weight support
- Two rubber bands of different sizes
- Weight hanger hook
- 50 g and 100 g weights
- Metre ruler or tape measure for measurement

You are required to carry out a demonstration using the instructions below for learners to observe.

Instructions for setting up the equipment

- Position two work benches so that the rulers are adequately supported by the benches and will allow sufficient space for the activity to take place.
- Place the ruler equally between the work benches.
- Loop two rubber bands of different sizes around the ruler.



Instructions for demonstrating testing of rubber bands

- Place the weight hanger hook onto one of the rubber bands.
- Measure the distance from the bottom of the wooden/plastic ruler to the bottom of the weight hanger hook.
- Place a weight onto the weight hanger hook and support the weight as it stretches the rubber band.
- Measure the distance from the bottom of the wooden ruler to the bottom of the weight hanger hook.
- Repeat if necessary to allow all learners to view.

Write your name here

Surname	Other names
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Centre Number

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Learner Registration Number

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Pearson BTEC Level 1 / Level 2 Award

Engineering

Set task: Responding to an Engineering Brief Part 1

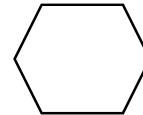
Sample assessment material for first teaching September 2017

This is Part 1 of the set task for learners to carry out the practical process and complete the activity.
This task and answer booklet contains material for the completion of the practical process and activity based on this under supervised conditions.
Part 1 of the set task is out of 30 marks.
This task and answer booklet is specific to each series and this material must be issued only to learners who have been entered to take the task in the specified series.
This booklet should be kept securely until the start of the 2 hour supervised assessment period.
The set task should be undertaken in the period timetabled by Pearson.

Level

1/2

Total Marks



Supervised
hours

2

<Insert Specification Image>

Paper Reference (s)

XXXX/XX

PXXXXXA

Instructions for teachers

This assessment is made up of two parts. **Part 1** consists of a practical process and associated activity.

Both parts of the set task are completed during a one week period timetabled by Pearson. **Part 1** is to be completed in one session of 2 hours within the first four days of the timetabled period. **Part 2** is to be completed in one session on the Friday of the timetabled period.

The practical process requires a demonstration by the teacher. This should be carried out immediately before the start of the supervised session and does not make up part of the 2 supervised hours.

Learners' practical process is undertaken in the supervised hours given. Learners will need access to the materials as listed in the *Instructions for teachers* document.

Learners must then complete the activity using this task and answer booklet. Learners should take calculators into the supervised session.

This is a formal external assessment and must be conducted with reference to the instructions in this task and answer booklet and the *Information for Conducting External Assessments (ICEA)* document, to ensure that the supervised session is conducted correctly and that learners have the opportunity to carry out the required activities independently.

Teachers are responsible for maintaining security and for reporting issues to Pearson. In particular:

- only permitted materials can be brought into the supervised environment
- materials must be kept securely and no items removed from the supervised environment.

After the session, the teacher will confirm that all learner work has been completed independently as part of the authentication submitted to Pearson.

Outcomes for submission

Part 1 task and answer booklet should be kept securely and submitted with the Part 2 task and answer booklet.

Each learner must complete an authentication sheet.

Instructions for learners

Check that these materials have been provided for you:

- 300 mm wooden or 1 metre plastic supporting ruler for weight support
- two rubber bands of different sizes
- weight hanger hook
- 50 g and 100 g weights
- metre ruler or tape measure for measurement.

Before the task begins you will have a demonstration by your teacher. Observe the demonstration carefully in order to complete the set task. You should take notes and refer to your notes to complete the set task as given in the set task information.

Read the set task information carefully.

You must plan your time and submit all the required evidence at the end of the supervised session. Your centre will advise of the timing for the supervised session.

You will complete this set task under supervision and your work will be kept securely during any breaks taken.

You must work independently throughout the supervised session and must not share your work with other learners.

You may use a calculator when carrying out the activities.

Outcomes for submission

You must complete the set tasks in this task and answer book.

You must complete an authentication sheet.

Engineering brief

Helicopters are often used to deliver emergency food or medical supplies. It is important that the supplies can be delivered quickly and safely to drop zones so that the supplies can be unloaded and used by aid workers.

Engineers are investigating using elasticated ropes to lower the supplies from the helicopter to the ground to see how high they would need to hover. You have been asked to carry out research to model different types of elasticated ropes.



© Paula Bronstein/Getty Images

Within your organisation you have been asked to investigate how rubber bands of different length and thickness respond to different loads.

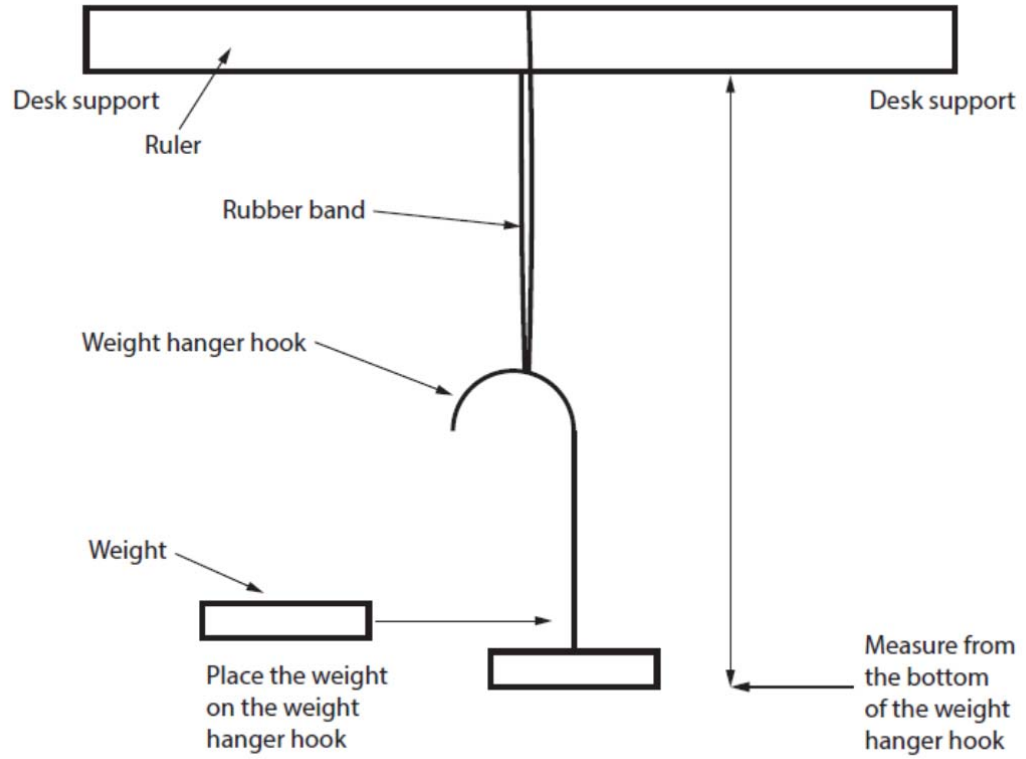
The following materials have been provided for you:

- 300 mm wooden or 1 metre plastic supporting ruler for weight support
- two rubber bands of different sizes
- weight hanger hook
- 50 g and 100 g weights
- metre ruler or tape measure for measurement.

You can refer to your notes from the teacher demonstration.

Follow this testing process and record your results in Activity 1a.

1. Move the first rubber band to the centre of the supporting ruler.
2. Place the weight hanger hook onto the first rubber band.
3. Measure the distance from the bottom of the supporting ruler to the bottom of the weight hanger hook.
4. Record the extension of the rubber band in the table in Activity 1a. Make sure you record the unit for the extension measurement.
5. Choose the amount of weight to add to the hanger.
6. Place the weight onto the weight hanger hook and support the weight as it stretches the rubber band.
7. Measure the distance from the bottom of the supporting ruler to the bottom of the weight hanger hook.
8. Record the load and extension in the table in Activity 1a.
9. Repeat stages 5–8 as many times as necessary.
10. Note anything else you observed about the effect of adding weights to the weight hanger hook, other than the extension of the rubber band.



11. Repeat stages 1–10 for the second rubber band.

You should spend 45 minutes carrying out your investigation.

Activity 1a: Recording results and observations from your tests

Record **all** your results in the table and give observations of the effect of adding weights to the weight hanger hook, other than the extension of the rubber band.

Add the missing unit to the extension columns on the tables.

Rubber band 1	
Load (grams)	Extension [....]
Rubber band 2	
Load (grams)	Extension [....]

Record any other observations you made about the effect of adding weights to the weight hanger hook other than the extension of the rubber band.

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You should spend 15 minutes completing the table for Activity 1a.

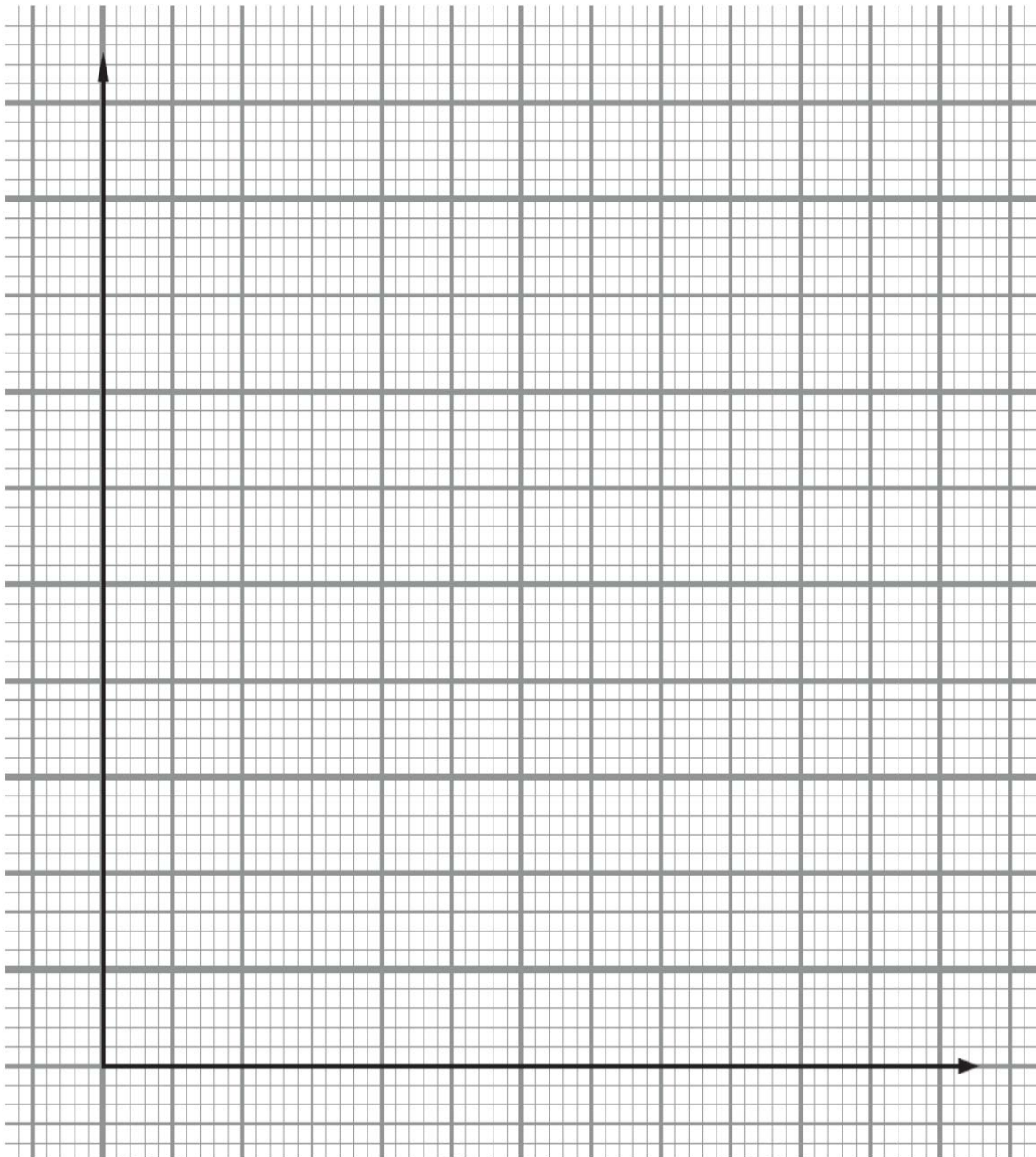
(Total for Activity 1a = 6 marks)

Activity 1b: Processing results

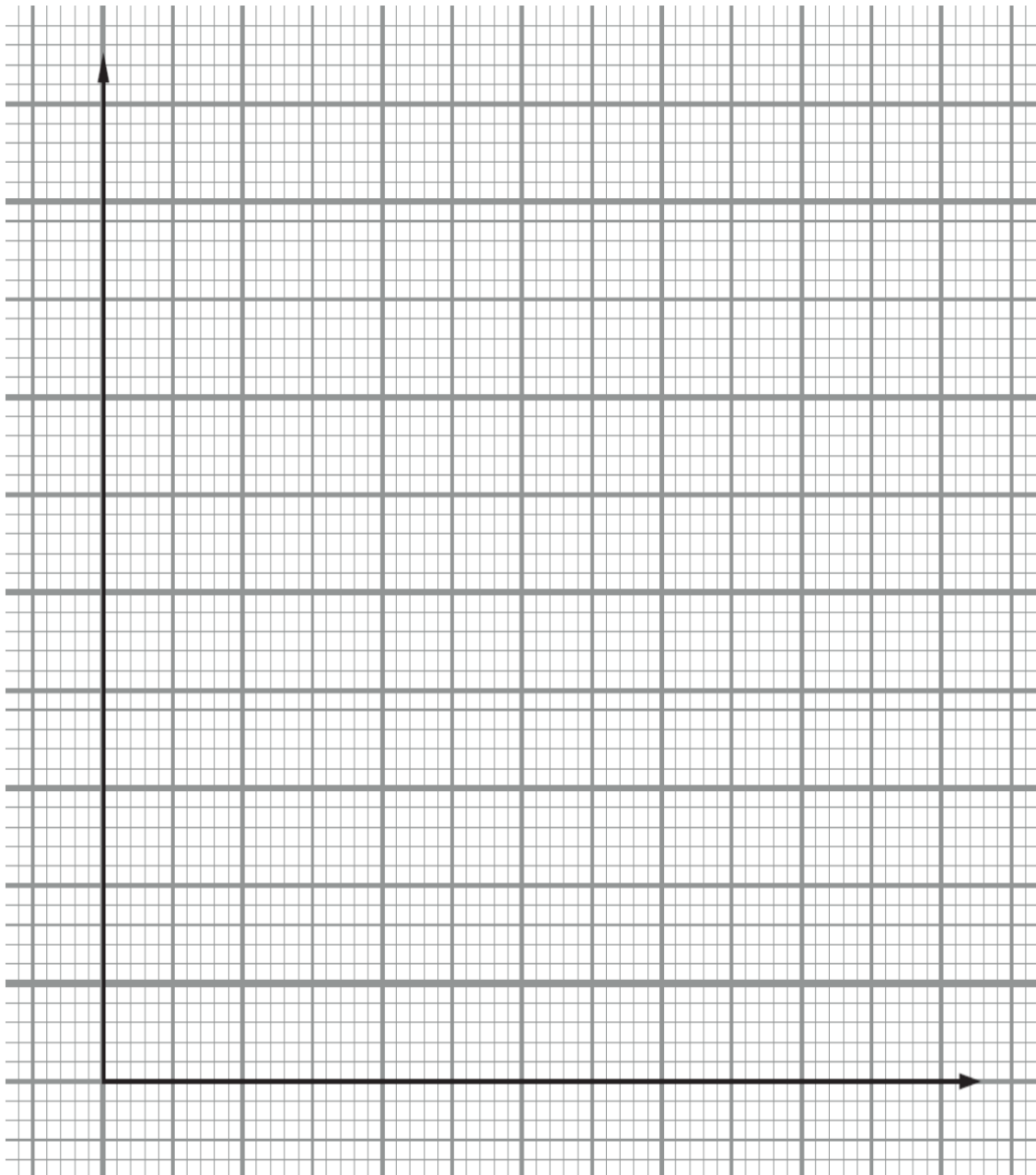
Draw a graph of load against extension and plot a line of best fit for each rubber band.

Use the headings and units from your tables in Activity 1a to label each axis.

Rubber band 1



Rubber band 2



You should spend 20 minutes completing Activity 1b.

(Total for Activity 1b = 8 marks)

Activity 1c: Drawing conclusions

Compare the patterns in your tables and graphs.

What conclusions can be drawn from your data?

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You should spend 20 minutes completing Activity 1c.

(Total for Activity 1c = 8 marks)

Activity 1d: Evaluation

Think about the testing process you have just carried out.

What problems did you encounter with setting up the test, carrying out the test and recording results?

If you carried out the test again, what would you do differently?

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You should spend 20 minutes completing Activity 1d.

(Total for Activity 1d = 8 marks)

Write your name here

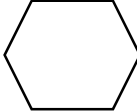
Surname	Other names
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Centre Number

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Learner Registration Number

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Pearson BTEC Level 1 / Level 2 Award	
<h1>Engineering</h1> <p>Set task: Responding to an Engineering Brief Part 2</p>	Level 1/2
Sample assessment material for first teaching September 2017	Total Marks 
<p>This is Part 2 of the set task. This task and answer booklet contains material for the completion of Part 2 of the set task under supervised conditions. Part 2 of the set task is out of 30 marks. This task and answer booklet is specific to each series and this material must be issued only to learners who have been entered to take the task in the specified series. This booklet should be kept securely until the start of the 1.5 hour supervised assessment period. This set task should be undertaken in the period timetabled by Pearson.</p>	Supervised hours 1.5

<Insert Specification Image>

Paper Reference (s)

XXXX/XX

PXXXXXA

This assessment is made up of two parts. **Part 1** consists of a practical process and associated activity. **Part 1** must be taken before **Part 2**. **Part 2** consists of two written activities.

Both parts of the set task are completed during a one week period timetabled by Pearson. **Part 1** is to be completed in one session of 2 hours within the first four days of the timetabled period. **Part 2** is to be completed in one session on the Friday of the timetabled period.

This task and answer booklet contains **Part 2** of the set task. Learners do not need to make any notes from **Part 1** to **Part 2**.

Part 2 must be completed under supervised conditions within a 1.5 hour supervised session.

Learners must complete **Part 2** of the set task using this task and answer booklet. Learners should take calculators into the supervised session.

This is a formal external assessment and must be conducted with reference to the instructions in this task and answer booklet and the *Information for Conducting External Assessments (ICEA)* document, to ensure that the supervised session is conducted correctly and that learners have the opportunity to carry out the required activities independently.

Teachers are responsible for maintaining security and for reporting issues to Pearson. In particular:

- only permitted materials can be brought into the supervised environment
- during any permitted break and at the end of the session, materials must be kept securely and no items removed from the supervised environment.

After the session, the teacher will confirm that all learner work has been completed independently as part of the authentication submitted to Pearson.

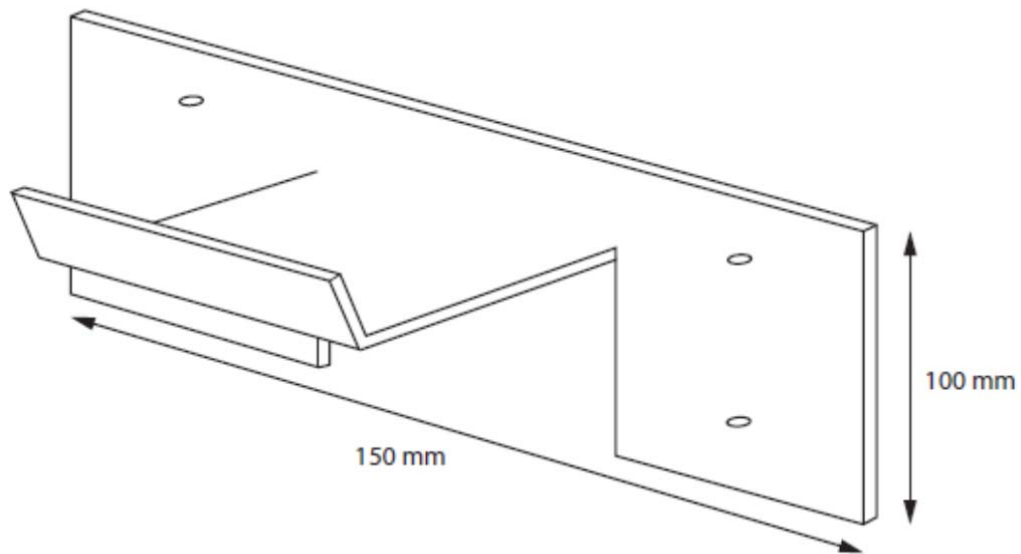
Outcomes for submission

Part 1 and Part 2 task and answer booklets should be submitted to Pearson at the same time.

Each learner must complete an authentication sheet.

Engineering brief

A customer wants to place an order with your engineering company to make 1000 small hooks to store insulated electrical cables. The cables will be wound around the hook. An engineer at your company designs and makes the hook shown below as a possible solution. The hook is made from 1.6 mm thick aluminium.



To make the hook, the engineer:

- marked out the holes, the cuts and the bends
- drilled the holes
- cut the aluminium using tin snips
- bent the aluminium using formers and a mallet.

You must complete ALL activities in Part 2.

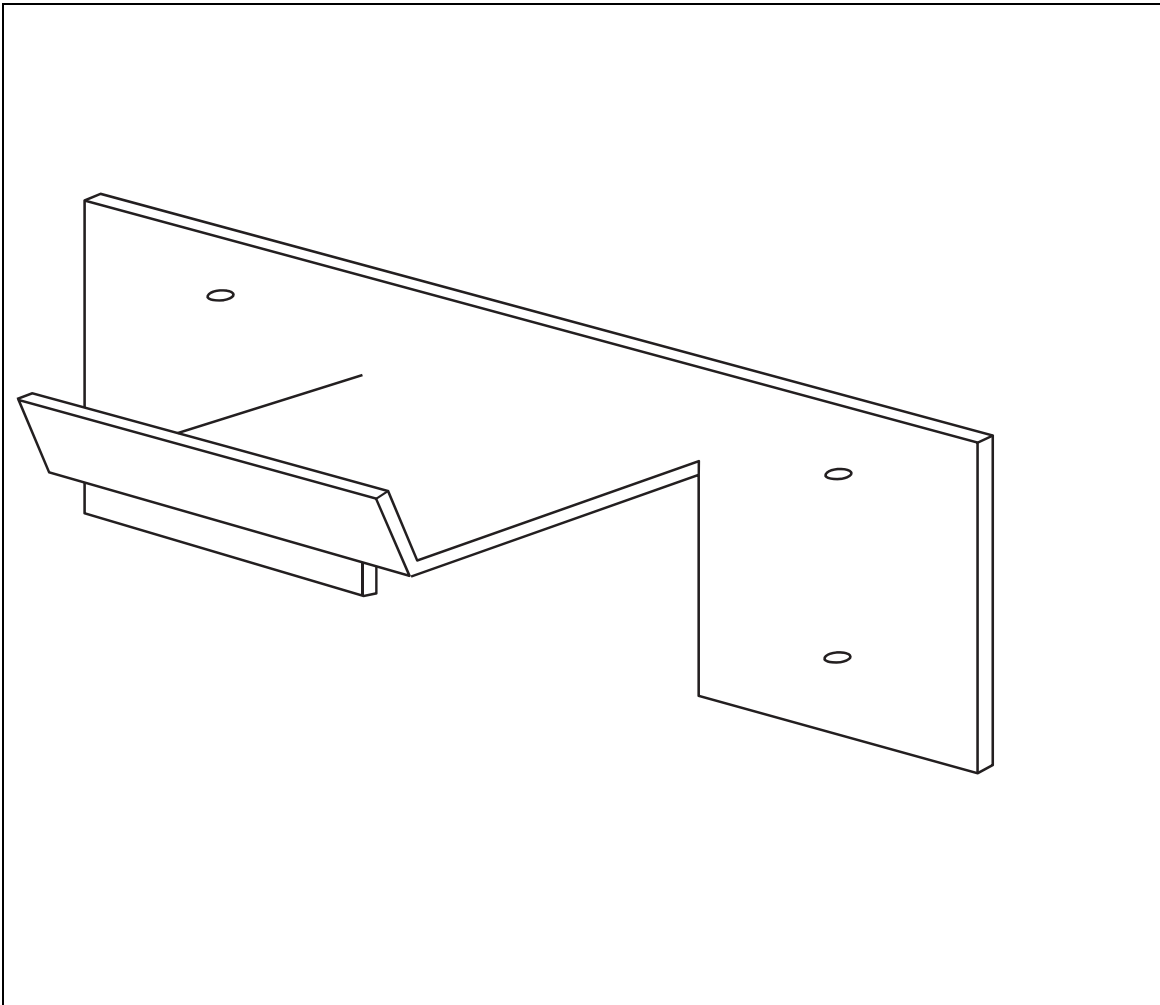
Activity 2a: Evaluation

Explain the issues with the design of the hook.

Think about how the hook is made and how it will be used.

Write your answer in the line space provided on the next page.

You may annotate the diagram to identify the issues with the design of the existing hook.



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A series of horizontal dotted lines for writing.

You should spend 20 minutes completing Activity 2a.

(Total for Activity 2a = 8 marks)

Activity 2b: Redesign

Within your organisation you have been asked to consider different ways to manufacture these brackets. They would consider different designs and processes to make it.

Sketch a design idea for the hook that is an improvement on the existing hook.

Idea



Set task information

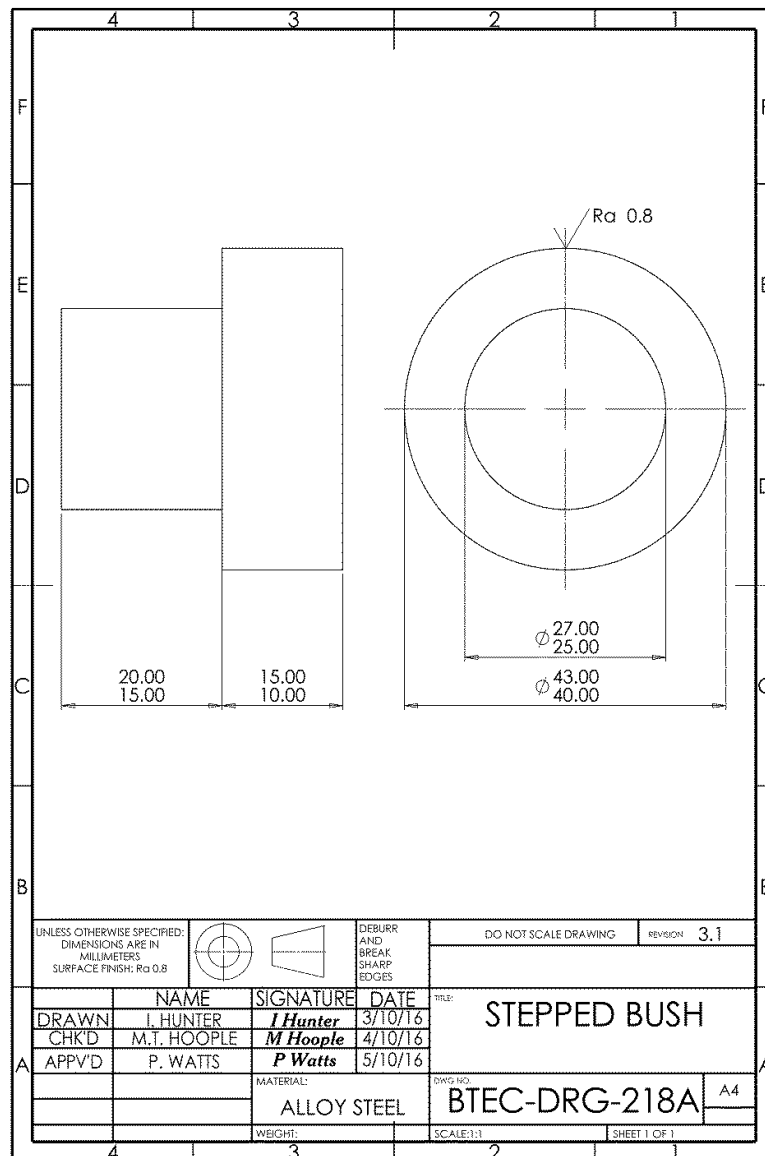
Engineering brief

Your engineering organisation is interested in quality assurance.

You have been asked to review a drawing and the production data to try to understand why issues have been occurring during the production of a turned component.

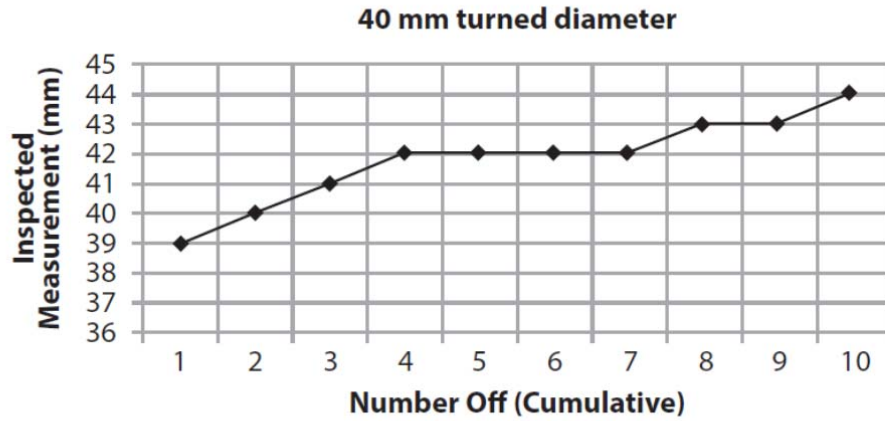
The component will be manufactured in batches of 100 and is made of titanium.

The drawing for the component is shown below.



The first ten components have been produced by an engineer.

The line graph gives inspected measurement data for the 40 mm turned diameter.



The table gives data for the surface roughness of the first ten components.

Sample number	Surface roughness (μm)
1	0.75
2	0.8
3	0.9
4	0.85
5	1.0
6	1.2
7	1.2
8	1.4
9	1.5
10	1.6

Lined writing area consisting of multiple horizontal dotted lines for student response.

You should spend 40 minutes completing Activity 3.

(Total for Activity 3 = 12 marks)

TOTAL PAPER = 60 MARKS

**Component 3: Responding to an Engineering Brief –
sample mark grid**

General marking guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Mark grids should be applied positively. Learners must be rewarded for what they have shown they can do, rather than be penalised for omissions.
- Examiners should mark according to the mark grid, not according to their perception of where the grade boundaries may lie.
- All marks on the mark grid should be used appropriately.
- All the marks on the mark grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should be prepared to award zero marks, if the learner's response is not rewardable according to the mark grid.
- Where judgement is required, a mark grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the mark grid to a learner's response, a senior examiner should be consulted.

Specific marking guidance

The mark grids have been designed to assess learners' work holistically.

When using a levels-based mark grid, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner's response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band depending on how they have evidenced each of the descriptor bullet points.

Part 1

Activities 1a, 1b and 1c require the use of two sets of data. Responses that use only one set of data will be limited to the marks from Band 1 in each marking grid.

Activity 1a – Results and observations (6 marks)			
Band 0	Band 1	Band 2	Band 3
0	1–2	3–4	5–6
No rewardable content.	<p>The results demonstrate a limited understanding of testing procedures, including:</p> <ul style="list-style-type: none"> • data recorded with limited precision and consistency, and may use inappropriate units • results that may be insufficient or at inappropriate increments • simple and generic observations recorded about the testing process. 	<p>The results demonstrate some understanding of testing procedures, including:</p> <ul style="list-style-type: none"> • data recorded with consistency and using the appropriate units but may lack precision • sufficient results at appropriate increments for some of the testing process • some detailed observations about the testing process but are not always relevant. 	<p>The results demonstrate a comprehensive understanding of testing procedures, including:</p> <ul style="list-style-type: none"> • data recorded with precision and consistency using the appropriate units • sufficient results at appropriate increments throughout the testing process • a range of relevant and detailed observations recorded about the testing process.

Activity 1b – Processing results (8 marks)			
Band 0	Band 1	Band 2	Band 3
0	1–2	3–5	6–8
No rewardable content.	<p>Demonstrates limited understanding of data representation techniques by plotting graphs with significant inaccuracies. Graphs include:</p> <ul style="list-style-type: none"> • inappropriate annotation of headings and units • choice of scaling is inappropriate to the data and used inconsistently • plots of tabulated data that include significant inaccuracies • insufficient data plotted to represent results and to produce appropriate lines/curves. 	<p>Demonstrates some understanding of data representation techniques by plotting graphs with minor inaccuracies. Graphs include:</p> <ul style="list-style-type: none"> • appropriate annotation of headings and units • choice of scaling is appropriate to the data but is not used consistently • plots of tabulated data that include minor inaccuracies • sufficient data plotted to represent results but inappropriate lines/curves produced. 	<p>Demonstrates comprehensive understanding of data representation techniques by plotting accurate graphs. Graphs include:</p> <ul style="list-style-type: none"> • appropriate annotation of headings and units • choice of scaling is appropriate to the data and used consistently • accurate plots of tabulated data • sufficient data plotted to represent results and to produce appropriate lines/curves.

Activity 1c – Conclusions (8 marks)			
Band 0	Band 1	Band 2	Band 3
0	1–2	3–5	6–8
No rewardable content.	<ul style="list-style-type: none"> Attempts to describe the patterns in the tables and graphs but is superficial or does not reflect results. Draws limited conclusions not specifically based on a comparison between patterns in the tables and graphs, with minimal reference to data. 	<ul style="list-style-type: none"> Mostly accurate description of the patterns in the tables and graphs, with some reference to data. Draws mostly valid conclusions based on a comparison between patterns in the tables and graphs, supported by some reference to data. 	<ul style="list-style-type: none"> Accurate description of patterns in the tables and graphs with detailed reference to data. Draws valid conclusions based on a comparison between patterns in the tables and graphs, supported by detailed reference to data.

Activity 1d – Evaluation (8 marks)			
Band 0	Band 1	Band 2	Band 3
0	1–2	3–5	6–8
No rewardable content.	<ul style="list-style-type: none"> Demonstrate a limited understanding of problems with the testing method used/results obtained. Demonstrate a limited understanding of how the process of testing could be improved. 	<ul style="list-style-type: none"> Demonstrate some understanding of problems with the testing method used/results obtained. Demonstrate some understanding of how the process of testing could be improved. 	<ul style="list-style-type: none"> Demonstrate a comprehensive understanding of problems with the testing method used/results obtained. Demonstrate a comprehensive understanding of how the process of testing could be improved.

Part 2

Learners may provide evidence through annotation on the diagram or written prose in the answer space. Neither method is preferred. Evidence must be credited if the marking criteria have been met.

Activity 2a – Evaluation (8 marks)			
Band 0	Band 1	Band 2	Band 3
0	1–2	3–5	6–8
No rewardable content.	Produce a superficial evaluation of the existing product that: <ul style="list-style-type: none"> identifies issues with the existing design that are not entirely relevant demonstrates limited understanding of issues in relation to the brief. 	Produce a reasoned evaluation of the existing product that: <ul style="list-style-type: none"> identifies mostly relevant issues with the existing design demonstrates some understanding of issues in relation to the brief. 	Produce a developed and reasoned evaluation of the existing product that: <ul style="list-style-type: none"> identifies relevant issues with the existing design demonstrates comprehensive understanding of issues in relation to the brief.

Learners may choose either design idea as the best solution. Learners are not marked on this choice. Learners are assessed on justification of their choice.

Activity 2b – Redesign (10 marks)			
Band 0	Band 1	Band 2	Band 3
0	1–3	4–7	8–10
No rewardable content.	<ul style="list-style-type: none"> • Basic ideas that partially address the brief and offer minimal improvement on the original. • Limited justification for the chosen design solution. • Limited justification for the chosen processes. 	<ul style="list-style-type: none"> • Ideas that address the brief and offer partial improvement on the original. • A reasoned justification for the chosen design solution. • A reasoned justification for the chosen processes. 	<ul style="list-style-type: none"> • Ideas that fully address the brief and show an improved design approach to the original. • A developed and reasoned justification for the chosen design solution. • A developed and reasoned justification for the chosen processes.

Activity 3 – Drawing conclusions (12 marks)				
Band 0	Band 1	Band 2	Band 3	Band 4
0	1–3	4–6	7–9	10–12
No rewardable content.	<ul style="list-style-type: none"> Provides a limited interpretation of the resource material with minimal reference to the data. Attempts to identify some issues associated with the problem but these may not be relevant. Demonstrates a limited understanding of the causes of the issues. Suggestions, if present, are not valid or supported and may not link to the issues or potential causes. 	<ul style="list-style-type: none"> Provides a partially valid interpretation of the resource material with some reference to the data but this will lack detail. Identifies some relevant issues associated with the problem. Demonstrates some understanding of the causes of the issues but may lack detail. Gives partially valid suggestions about how the issues could be resolved with an attempt to make logical links to the potential causes. 	<ul style="list-style-type: none"> Provides a mostly valid interpretation of the resource material with some detailed reference to the data. Identifies some issues associated with the problem. Demonstrates some detailed understanding of the causes of the issues. Gives mostly valid suggestions about how the issues could be resolved by making some logical links with the potential causes. 	<ul style="list-style-type: none"> Provides a valid interpretation of the resource material with detailed reference to the data. Comprehensively identifies relevant issues associated with the problem. Demonstrates a comprehensive and detailed understanding of the causes of the issues. Gives valid suggestions about how the issues could be resolved by making logical links with the potential causes throughout.