

Please check the examination details below before entering your candidate information

Candidate surname					Other names					
Pearson BTEC Level 1/Level 2 Tech Award	Centre Number					Learner Registration Number				
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<b>Supervised Window: Monday 4 February 2019 – Thursday 7 February 2019</b>										
Supervised hours: 2 hours					Paper Reference <b>21141K</b>					
<b>Engineering</b>										
<b>Component 3: Responding to an Engineering Brief</b>										
<b>Set task: Responding to an Engineering Brief Part 1</b>										
You do not need any other materials.										Total Marks

### Instructions

- Use **black ink** or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and learner registration number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- This is **Part 1** of the set task for learners to carry out and complete the practical activity.
- This task and answer booklet contains material for the completion of the practical activity 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.

### Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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## Instructions for teachers

This assessment is made up of two parts. **Part 1** consists of a practical 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 two 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 activity 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 two supervised hours. Learners are allowed to make notes up to a maximum of two sides of A4 during this demonstration, which they may use when they carry out the set task. These notes **do not** form part of the final submission.

The learners' practical activity 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
- learners must not have access to computers or the internet.

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.

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### Instructions for learners

Before the practical activity begins you will have a demonstration by your teacher. Observe the demonstration carefully in order to complete the practical activity. You should take notes, maximum of two sides of A4, and refer to your notes to complete the practical activity, as given in the set task information.

Check that this equipment has been provided for you:

- Newton Meter (initially set to zero, range 0 – 10N).
- A load carrier made from a 100mm square piece of wood with abrasive paper attached to one side, and a hook to allow the Newton Meter to be attached.
- 200mm by 500mm (approximately) piece of wood to act as a test surface
- Selection of different masses.

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.

You must not have access to computers or the internet.

### Outcomes for submission

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

You must complete an authentication sheet.



## Set task information

### Engineering Brief

Engineers use friction material in vehicle disc braking systems. These materials are used in cars, motorbikes and bicycles to reduce their speed.

Engineers are investigating using different types of friction material in the manufacture of disc braking systems. You have been asked to carry out research into different types of friction material.



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Within your organisation you have been asked to investigate how friction material affects the force needed to move an object.

The following equipment has been provided for you:

- Newton Meter (initially set to zero, range 0 – 10N).
- A load carrier made from a 100mm square piece of wood with abrasive paper attached to one side, and a hook to allow the Newton Meter to be attached.
- 200mm by 500mm (approximately) piece of unfinished wood to act as a test surface, this test surface should be appropriately secure e.g. clamped to desk, so it does not move during the practical activity.
- Selection of different masses.

You can refer to your notes from the teacher demonstration.

Appropriate health and safety procedures for this practical activity must be followed at all times.

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

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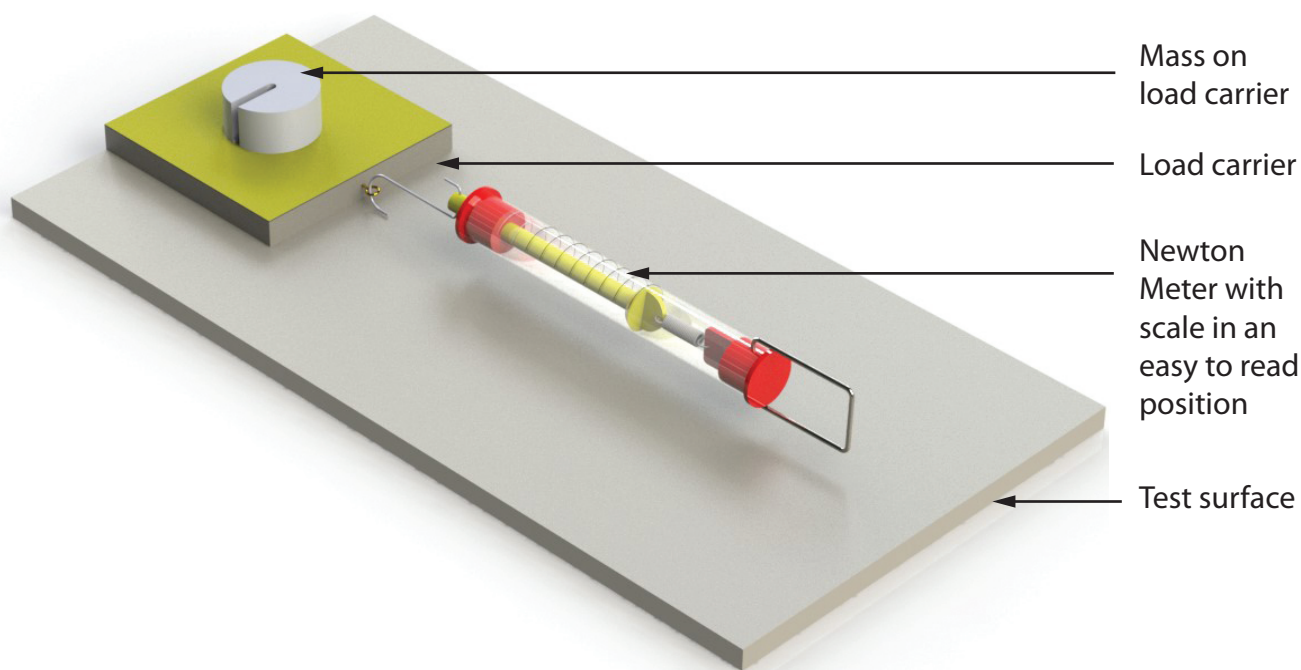
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1. Attach the Newton Meter to the hook on the load carrier.
2. Place the side of the load carrier with no abrasive paper on the wooden test surface, as shown below.
3. Choose a mass and place this in the centre of the load carrier.
4. Gradually pull the Newton Meter, at right angles to the load carrier and parallel to the wooden test surface. The load carrier should be slowly pulled across the surface, at a constant speed.
5. Observe the force shown by the Newton Meter when the load is moving.
6. Stop pulling the load carrier before it reaches the end of the test surface.
7. Return the load carrier to its starting position.
8. If necessary repeat steps 4 to 7.
9. Record the mass on the load carrier and the force shown by the Newton Meter when the load is moving at a constant speed.
10. Change the mass on the load carrier.
11. Repeat steps 4 to 10 as many times as necessary.
12. Note anything you have observed during the practical activity.
13. Repeat steps 3 to 11 as above but this time with the abrasive paper in contact with the wooden test surface.



**You should spend 45 minutes carrying out your practical activity.**

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**Activity 1a: Recording results and observations from your tests**

Record all your results in the table. Add the missing units to the columns on the tables.

Load carrier with non-abrasive side on test surface	
Mass on load carrier: [.....]	Force on Newton Meter: [.....]
Load carrier with abrasive side on test surface	
Mass on load carrier: [.....]	Force on Newton Meter: [.....]

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Record any other observations you made about the effect of pulling the Newton Meter other than the change in force.

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

**(Total for Activity 1a = 6 marks)**

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**Activity 1b: Processing results**

Draw a graph using the grids shown overleaf of each mass on the load carrier against the corresponding force shown on the Newton Meter and plot a line of best fit for both the non-abrasive and abrasive surfaces of the load carrier.

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

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**Non-abrasive Surface**



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**Abrasive Surface**



**You should spend 20 minutes completing Activity 1b.**

**(Total for Activity 1b = 8 marks)**

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### Activity 1c: Drawing conclusions

Compare the patterns in your tables and graphs.

What conclusions can be drawn from your data?

Handwriting practice area consisting of 20 horizontal dotted lines for writing conclusions.

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Handwriting practice area with 20 horizontal dotted lines.

**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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Area with horizontal dotted lines for writing.

**You should spend 20 minutes completing Activity 1d.**

**(Total for Activity 1d = 8 marks)**



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