

## Evaluating processes, drawing conclusions and making recommendations

### GETTING STARTED

Working in pairs, think about the types of test that can be carried out to evaluate and improve engineered components and products and associated manufacturing processes.

We have previously looked at how data can be collected and presented. The next stage is to interpret and analyse the data and use the results to recommend improvements to a product or process.

Data can be used for a range of purposes, including finding out how components perform, checking the properties of materials, and determining whether parts will fit together. You can collect such data using a range of methods, including the use of measuring equipment and gauges.

### Measuring equipment

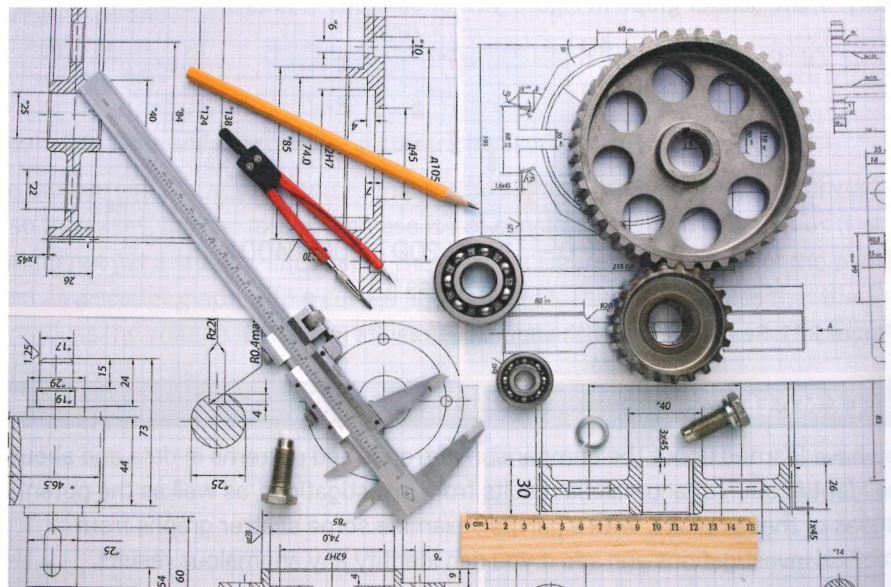
Depending on what you need to measure, you will use a range of measuring equipment. Some examples are shown in Table 3.6.

Table 3.6: Types of measuring equipment

Measurement	Equipment
Length/diameter	<ul style="list-style-type: none"> <li>Ruler: used for measuring lengths to a precision of 1mm</li> <li>Vernier callipers: used to measure the length or diameter of smaller components, to a precision of 0.02mm. Vernier callipers are used for very accurate measurements</li> <li>Micrometer: used to measure the dimensions of small components to a precision of 0.001mm</li> <li>Tape measure: used for larger length measurements</li> </ul>
Mass	<ul style="list-style-type: none"> <li>Balance: used to measure the mass of an object, e.g. beam balances for large masses and digital balances for smaller masses</li> </ul>
Time	<ul style="list-style-type: none"> <li>Stopwatch: used to measure time, to a precision of 0.01 seconds. (In reality, accuracy depends on the person operating the stopwatch.)</li> <li>Electronic systems: automatically start and stop when a sensor is actuated and are more accurate</li> </ul>

### LINK IT UP

Revisit the measurement skills covered in Component 2: Learning aim B.



A range of measuring equipment is usually needed to check components and parts



Sometimes it is not necessary to measure the exact size of a component. For instance, you may simply need to know whether a component and any of its features are correct, such as whether a drilled hole has a large enough diameter. To carry out checks like this, you could use a simple gauge.

## Gauges

Gauges provide a simple method of checking whether or not a component or part is fit for purpose and is within tolerance. One of the most common types of gauge for engineering activities is a go/no-go gauge.

Go/no-go gauges can be used for checking the diameters of holes.

- The 'go' gauge, coloured green, must be able to fit through the hole. If the 'go' gauge does not fit, the hole is too small. This would tell us that the hole needs to be drilled larger.
- If the 'no-go' gauge, coloured red, fits through the hole, this means the hole is too large and a smaller drill bit should have been used.
- If the hole is within tolerance, the 'go' gauge will fit in the hole and the 'no-go' gauge will not.

Measuring equipment and gauges can be used to check the lengths of components, the thicknesses of materials or the overall dimensions of a part. If parts are separated into those that are too small, those that are within tolerance, and those that are too big, then it will be easier to identify the causes of faults. This can help you to draw conclusions from the data.

In an engineering workshop where more than one person is making parts, it could be that a machine has been set up incorrectly or the wrong materials have been used. You can collect and analyse data and use the conclusions drawn to make recommendations to improve manufacturing processes.

### ACTIVITY

Working with a partner, check the accuracy of a sample of parts. For this, you need a go/no-go gauge and components created using engineering tools. Check the lengths of the components and divide them into categories of 'too small', 'too big' and 'within tolerance'.

Write down the reasons why you think the components were either 'too small' or 'too big'.

### CHECK MY LEARNING

You have looked at different methods of making and using measurements.

With your partner, think about how measured data can be used to make recommendations to improve manufacturing processes and outcomes.



## Learning aim A: assessment practice

### How you will be assessed

In this component, you will be assessed by completing a set task that consists of two parts, worth 60 marks in total. The task will be set and marked by Pearson examiners, and you will complete both parts of the assessment during a period of one week. You will be supervised during the assessment period, and you will have two hours for Part 1 and one and a half hours for Part 2.

For Part 1 of the set task, you will need to carry out a practical activity and then complete a task and answer booklet. You will be given a brief with all the necessary information you need to carry out the practical task, including a table in which to record your results and observations. These results are important as you will need to refer to them when carrying out the practical activities.

You will then carry out three activities based on the practical task. An additional task, consisting of two activities, will target higher-order planning, redesign and evaluation skills, and will relate to given scenarios. During the set task, you will need to show that you understand how to interpret information and use this to suggest improvements to an engineered product.

Note: You must always observe safe practices when carrying out practical activities.

Remember that the examiner who will be marking your set task does not know you, and the only way they will be able to assess your engineering skills is through the work that they see you have completed.

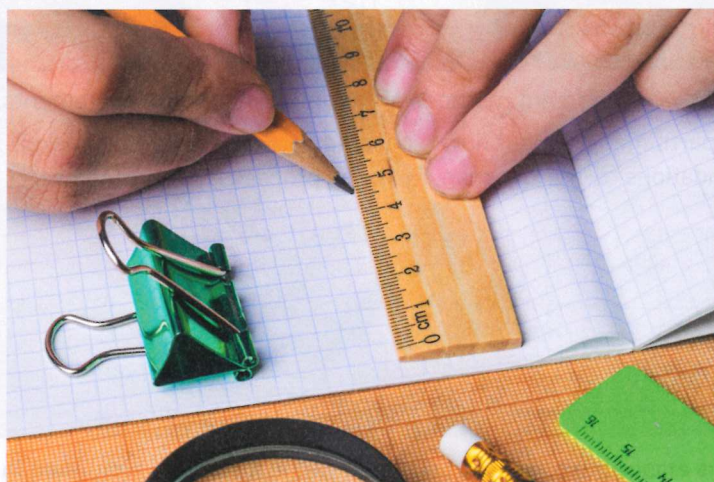
#### CHECKPOINT

##### Strengthen

- Describe four methods of presenting data graphically.
- Give an example of one type of work instruction and what it is used for.
- Which methods can be used to improve an engineered product?

##### Challenge

- Explain why an engineer might use a gauge when carrying out quality checks.
- Describe two advantages of using mechanical fixings for engineering products.
- Explain what should be done if data show anomalous results.





## ASSESSMENT ACTIVITY

## LEARNING AIM

A

You will be given information about how to prepare for and set up your investigation.

A scenario will be given to you, along with a list of the equipment that you will need.

Your teacher will demonstrate how you need to carry out the investigation, and then you will complete the set task on your own.

## TAKE IT FURTHER

Check that you have set up the equipment correctly and that you have recorded values with accuracy. Try to identify any patterns or trends in the data you have collected.

## TIP

When you are working on Part 1 of the set task, make sure that you watch the demonstration closely and set up the equipment that you will need correctly.