1.1.1 Measurement

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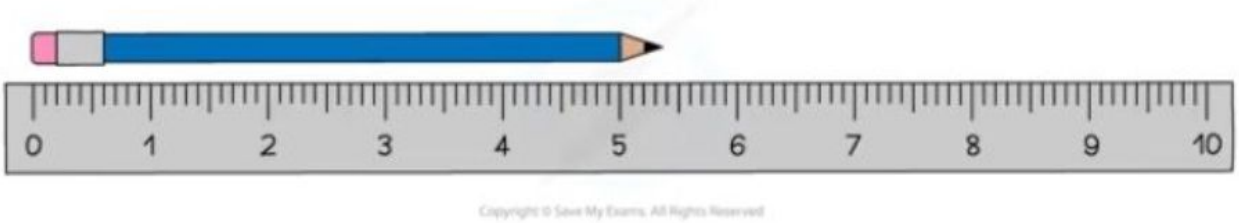
TEST YOURSELF

Distance & Volume

- Rulers can be used to measure small distances of a few cm. They are able to measure to the nearest mm



A ruler can measure small distances to the nearest mm

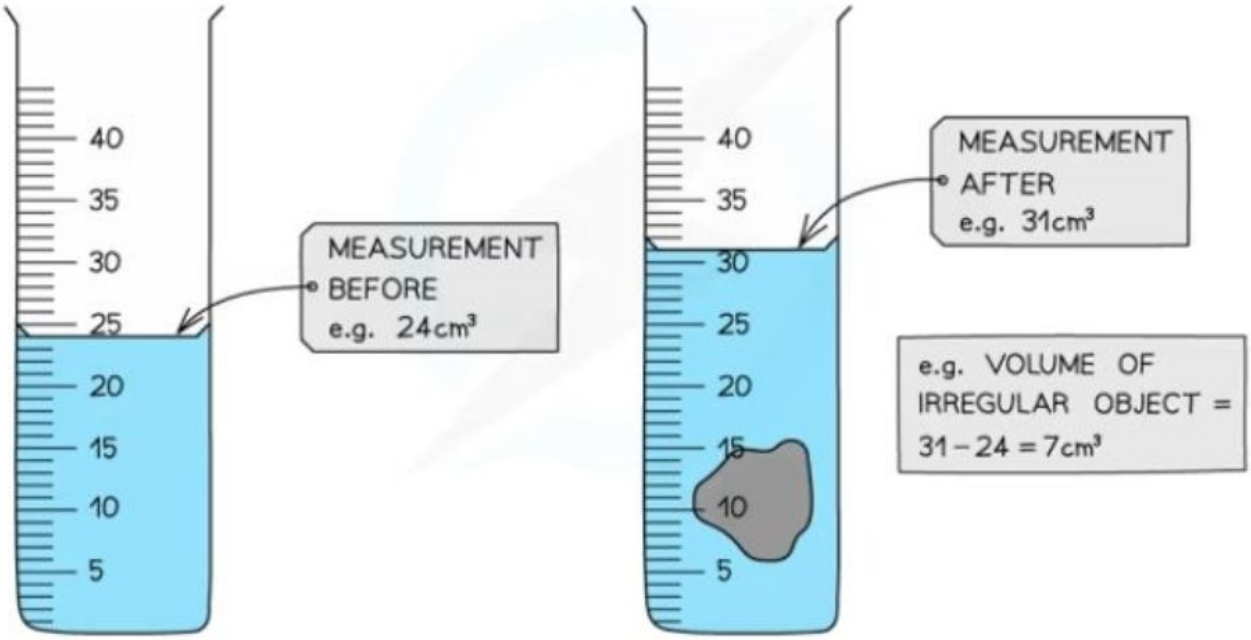
- When measuring larger distances (of a few metres) a tape measure is more appropriate or, when measuring even larger distances, a trundle wheel

Trundle wheels can be used to measure lo distances

- Measuring cylinders can be used to measure the volume of liquids or, by measuring the change in volume, the volume of an irregular shape

ALWAYS MEASURE FROM THE BOTTOM OF THE MENISCUS

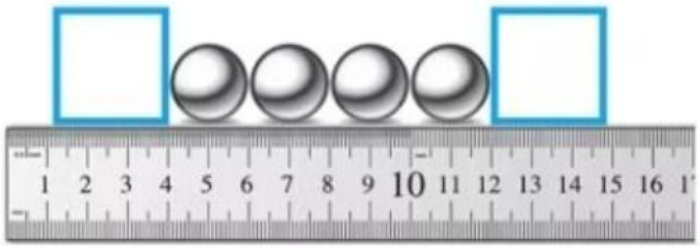
VOLUME OF IRREGULAR OBJECT = MEASUREMENT AFTER – MEASUREMENT BEFORE = ANSWER



Measuring cylinders can be used to determine the volume of a liquid or an irregular shaped solid

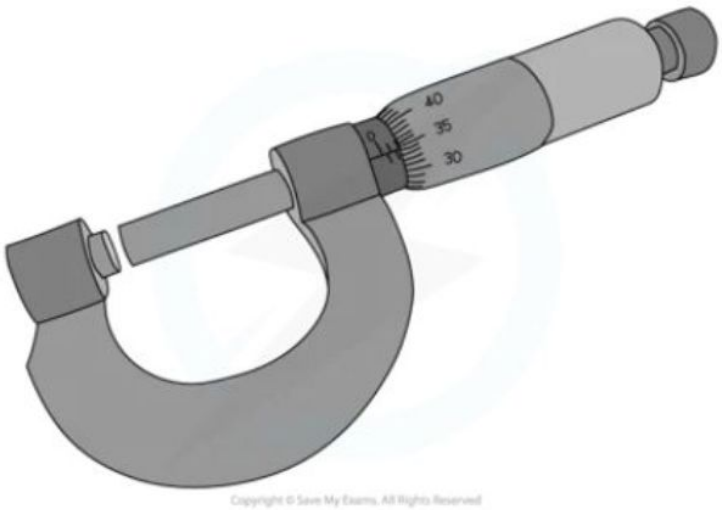
LENGTH & TIME - MEASUREMENT & MULTIPLE READINGS

The diagram shows four identical ball-bearings, placed between two blocks on a steel ruler. Calculate the diameter of one ball-bearing?



Micrometer Screw Gauge

- When measuring very small distances (less than a centimetre) a micrometer is the most appropriate instrument



Micrometers can be used to measure very small distances

- Micrometers can measure distances to the nearest $1/100^{th}$ of a mm

Time

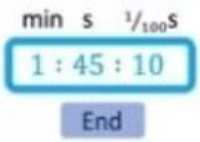
- Stop-clocks and stopwatches can be used to measure time intervals
- An important factor when measuring time intervals is human reaction time. This can

- Stop-clocks and stopwatches can be used to measure time intervals
- An important factor when measuring time intervals is human reaction time. This can have a significant impact upon measurements when the measurements involved are very short (less than a second)

LENGTH & TIME - MEASUREMENT - TIME

save my exams

A stopwatch is used to time how long a runner take to complete a lap of a $400m$ track. The images below give the readings on the stopwatch at the start and end of the lap.
How long (in seconds) did it take the runner to complete the lap?



Multiple Readings

- Suppose you have to measure the thickness of a sheet of paper. The thing that you are trying to measure is so small that it would be very difficult to get an accurate answer
- If, however, you measure the thickness of 100 sheets of paper you can do so much more accurately. Dividing your answer by 100 will then give an accurate figure for the thickness of one sheet
- This process of taking a reading of a large number of values and then dividing by the number, is a good way of getting accurate values for small figures, including (for example) the time period of a pendulum – measure the time taken for 10 swings and then divide that time by 10