

## Welcome to KS5 Core Maths Desirable work

We would like every student who begins the Core Maths course in September to be fully engaged in expanding their thinking and trying to put their maths skill into context.

Once you have completed the Essential Workbooks we would love for you to explore the 5 tasks below.

### Task 1

Fermi Estimates

These are estimates of totals or amounts which are very difficult to guess. You build up final estimates using reasonable estimates of aspects of the problem and then combine these estimates appropriately to give you an overall estimate.

EXAMPLE Estimate the number of human heartbeats in the UK each year.

SOLUTION There are two key components to estimate here:

- a. The number of times a heart beats in a minute – estimate 80.
  - (you might have to measure your own pulse for a while if you didn't know).
  
- b. The population of the UK – estimate 60 million (a number you will get to know).
  - Now for one person in one year the number of beats will be:
    - $80 \times 60 \times 24 \times 365$  (can you work out why).
  - which is roughly  $100 \times 50 \times 20 \times 400 = 40$  million

So, for the population of the UK that would be 60 million x 40 million which is 24 with lots of zeros after it. Luckily this is a calculator qualification so your calculator will tell you this is (if you can remember what standard form is)

Now can you attempt a Fermi estimate for:

- a. How long you will spend on the phone in your lifetime.
  
- b. How many white cars there are in the UK?

## Task 2

### Percentages

Three batches of electrical resistors are analysed for defects:

- Batch 1 Out of 235 resistors, 12 are found to be substandard.
- Batch 2 Out of 470 resistors, 17 are found to be substandard.
- Batch 3 Out of 711 resistors, 29 are found to be substandard.

Calculate the percentage of substandard resistors in each batch.

Quality control requires that no more than 5% of resistors are substandard.

Which batches, if any, fail to meet this requirement?

## Task 3

Hashima, a coal-mining island in Japan, experienced a huge increase in population in the period after the Second World War.

In 1950, the population was 862. In 1952, the population was 3,243.

By way of contrast, the population of Huddersfield increased from 105,140 to 110,306 in the same period.

- Calculate the increase in population of both Hashima and Huddersfield.
- Calculate the percentage increase for the two places.
- In which location do you think the effect of the population rise was more significant? Explain your answer.

## Task 4

A Core Maths student is investigating how well people can estimate distances. Two students, Sarah and Arfan, estimate the length of the college's study centre to be 15m and 23m, respectively. The actual length is 21.4m. Calculate the percentage errors of the students, and state which one was more accurate.

## Task 5

An environmental pressure group has persuaded a local industry to change the way they operate. Fishermen report that 28 pike have been caught in a pond during the last year, into which the industry had previously deposited waste. If this represents a 40% increase, calculate the number of pike caught previously.