Core Maths Bridging Task

If you are reading this then you are interested in taking Core Maths in year 12. Good choice. It is an interesting and relevant course, designed to build on your Maths skills from GCSE. Amongst other things will look at new statistical techniques like the ones used in Biology, Chemistry, Physics, Geography, PE, Sociology, Psychology, Food tech and many other sixth form courses.

The course is only one year long, so any preparation now will have a big effect on your understanding, enjoyment and achievement.

To help you the Maths dept have made available some Mathswatch assignments that cover the GCSE skills part of the course. Then there are two extra challenges that give me more of a taste of the main part of the course. Both require some independent thinking from you:

The box problem

This is an investigation, so unlike anything you have done at GCSE. Instead of your teacher telling you exactly what to do, you have the freedom to decide how to proceed yourself. Start by trying to understand the situation. Why do the cut-out shapes have to be squares? How does the remaining shape fold to become a box? Experiment with the size of the cut-outs and get some data. A big part of the Core Maths course is improving how clearly you present your Mathematical thoughts, so think about somebody reading your work. Is it laid out with care? Is it easy to follow the decisions that you have made?

Email Mr Gore with questions, or just if you want someone to look over your finished project.

Fermi problems

Enrico Fermi was an American scientist who developed a method for answering questions where you don't have enough data to get an accurate answer. The most famous question answered in this way is "How many intelligent civilisations exist in the galaxy?.

For more information see https://en.wikipedia.org/wiki/Fermi_problem and for a worked example see https://www.grc.nasa.gov/www/k-12/Numbers/Math/Mathematical_Thinking/fermis_piano_tuner.htm

Included here are 32 Fermi problems for you to try yourself. The better ones are numbers 3, 6, 8, 9, 12, 19, 25 but you are free to choose whichever you like. Again, email Mr Gore or Mr Kussel with questions or to show off your finished work.

Good luck!

Maths dept.

Some Fermi Questions

Fermi questions often require students to make reasonable assumptions and estimates about the situation in order to come up with an approximate answer. Students should be reminded of the need to be able to explain and justify what they did when coming up with their solutions. Students' answers may differ from each other, but if students have made sensible estimates and assumptions then the different answers should be "close" to each other. Take advantage of opportunities to discuss students' different solution strategies and the effect of assumptions and estimates. You can also invent your own Fermi questions based on class experiences (e.g., after a trip to the zoo you might ask students how many fish are consumed by the seals in one year).

1) How many people could you fit into the classroom? How many soccer balls?

2) How old are you if you are a million seconds old? A million hours old? A million days old?

3) Could you fit $1,000,000 worth of $1 coins in your classroom? What about a billion dollars worth of $1 coins?

4) How much money is spent in the school canteen each day? In a week? Over the year?

5) If all the people in Australia joined hands and stretched themselves out in a straight line, how long would it reach?

6) How long would it take to count to a million?

7) If all the people in the world moved to Victoria, how crowded would it be?

8) How many cups of water are there in a bath tub? What about in an Olympic pool?
9) How many grains of rice are in a 10kg bag?

10) How many pages would be needed to show a million stars? **********

11) How many children are needed to have a mass the same as an elephant?

12) How many packets are needed to measure a single line of M&Ms to a distance of 100m?

13) How many jelly beans fill a bucket?

14) How long would it take to drive to the moon (if you could!)?

15) What is the total mass in kilograms of all the students in your school?

16) What is the weight of garbage thrown away by each family every year?

17) How many pizzas are eaten by our class in one year?

18) If you had a stack of $2 coins as tall as Mt Kosciusko, what would it be worth? Could you fit all the coins in your bedroom?

19) How far could you walk in one year?

20) How much water does your household use each week? Can you answer this without using a water bill?

21) How many blades of grass on a school oval?

22) Spend exactly $1,000,000 using things for sale in the newspaper

23) How much paper is used at our school each week?

24) Imagine the earth is at one end of the school oval and the moon is at the other end. How far away is the sun?

25) How many beats will your heart make in a lifetime?

26) How many bricks are there in one wall of the classroom? The whole school?

27) How many books are read by children in our school/class in one year? About how many pages is that?

28) What distance will a ball point pen write?

29) How many times did the wheel of the bus turn on the class excursion?

30) How big a block of chocolate could you make using all the chocolate eaten by the class in a year?

31) How long would our class have to save to buy a car?

32) Get students to pose their own questions …

Sharing and discussing strategies is paramount to this work.

Some useful information:

Radius of the earth: about 6,400 km
Distance of the earth from the sun: about 150 million km
Distance of the moon from the earth: about 380,000 km
Population of the world: about 6 billion
Population of Australia: about 20 million
Population of Melbourne: about 3.5 million
Area of Tasmania: about 68000 square km
Area of Victoria: about 228000 square km
Area of Australia: about 7,700,000 sq. km
Height of Mt Kosciusko: 2230m

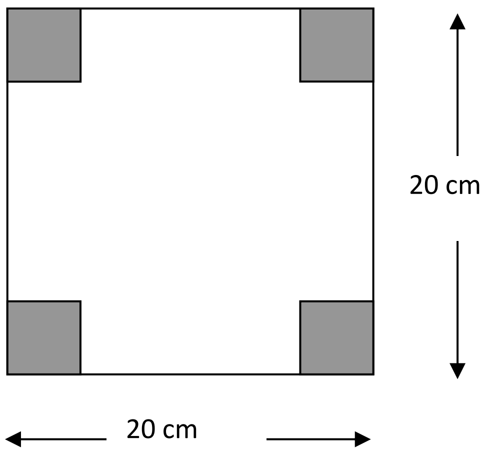
The box problem

In this task you are going to investigate how to make a box of maximum volume from a given rectangle of card.

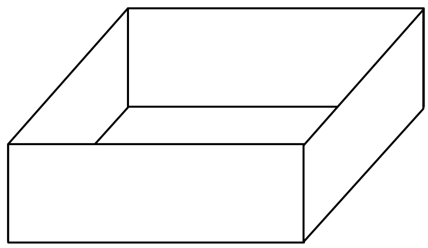
Your ultimate objective is a method that enables you to work out a box of maximum volume for any size of rectangle.

However, we will start with a 20cm by 20cm square.

The basic approach is to cut square pieces (e.g. 4cm) from each corner:



The sides are then folded to form an open box.



Questions to check understanding:

- Why do the cut-outs have to be square?
- If the cut-outs are 4cm squares, how deep is the box?
- What are the other dimensions of the box?
- What is the volume of the box?

Main tasks

1. Investigate further to find the size of cut-out that produces the box of greatest volume from a 20cm by 20cm square of card.
2. Extend your method to cope with any size rectangle of card.

You may wish to present your solution in the form of a spreadsheet or by using graphing software.

Maths Practice before starting Core Maths

Written Methods (Please show all your working. Do not use a calculator)

1. 345.2 + 239.5

2. 534.9 – 248.2

3. 593 ÷ 4

4. 346 x54

5. 29.3 x 8.2

Videos:

Fractions (Simplify your answers where possible and show all working. Do not use a calculator)

1. $\frac{4}{5} - \frac{1}{5}$

2. $\frac{1}{2} + \frac{1}{4}$

3. $\frac{2}{5} + \frac{1}{3}$

4. $\frac{7}{8} - \frac{1}{4}$

5. $1\frac{1}{3} + 2\frac{1}{4}$

6. $3\frac{2}{5} - 1\frac{3}{10}$

7. $\frac{3}{10} \times \frac{5}{9}$

8. $\frac{3}{4} \times \frac{2}{5}$

9. $12 \times \frac{1}{4}$

10. $9 \times \frac{2}{43}$

11. $5 \times \frac{1}{3}$

12. $\frac{2}{5} \div 3$

Videos: **http://tinyurl.com/fractionsadd**, **http://tinyurl.com/fraction-mult**

Percentages ***(Please show all your working. Do not use a calculator)***

1. 10% of 52

2. 1% of 456

3. 5% of 482

4. 11% of 520

5. 75% of 84

Videos:

Solving equations

1. $2x + 3 = 15$ **2.** $\frac{x}{5} - 7 = 3$ **3.** $3x + 5 = 2x + 25$

Videos:

Forming equations

1). A gardener is planting flowers. He plants **t** tulips.

a). He plants 10 more daisies than he does tulips. Write down an expression for the number of daisies planted.

b). He actually planted 37 daisies. Use this information to form an equation.

c). Solve this equation to find out the number of tulips planted.

Probability

A bag contains only red, green and blue counters.

The table shows the probability that a counter chosen at random from the bag will be red or will be green.

Colour	Red	Green	Blue
Probability	0.5	0.3	

Mary takes a counter at random from the bag.

(a) Work out the probability that Mary takes a blue counter.

....

The bag contains 50 counters.

(b) Work out how many green counters there are in the bag.

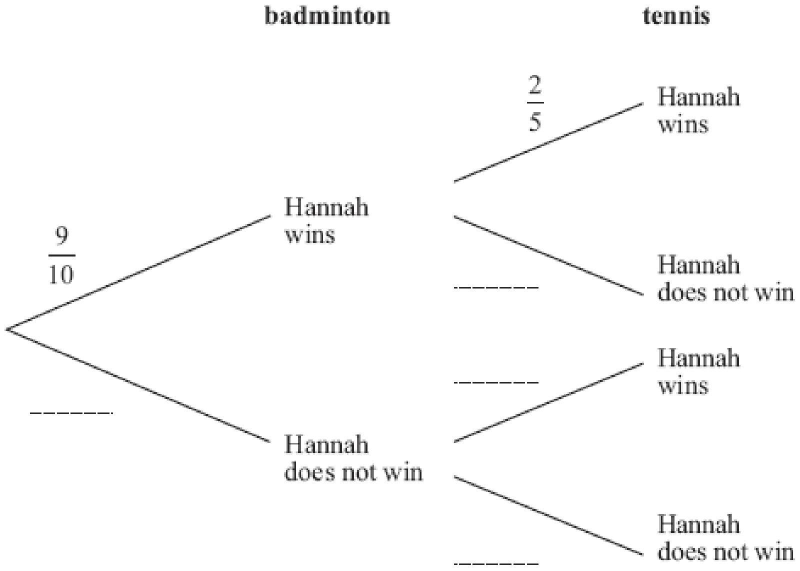
....

Hannah is going to play one badminton match and one tennis match.

The probability that she will win the badminton match is $\frac{9}{10}$

The probability that she will win the tennis match is $\frac{2}{5}$

(a) Complete the probability tree diagram.



(b) Work out the probability that Hannah will win **both** matches.

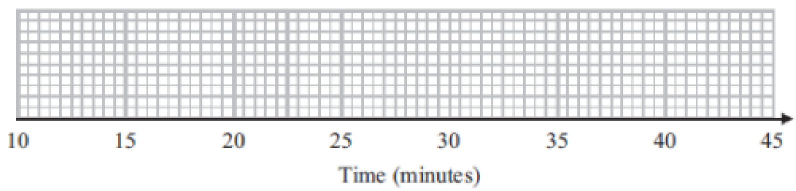
Boxplots

Sameena recorded the times, in minutes, some girls took to do a jigsaw puzzle.

Sameena used her results to work out the information in this table.

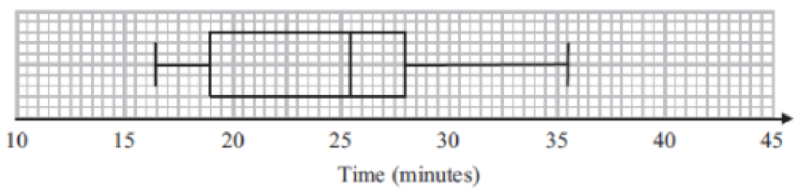
	Minutes
Shortest time	18
Lower quartile	25
Median	29
Upper quartile	33
Longest time	44

(a) On the grid, draw a box plot to show the information in the table.



(2)

The box plot below shows information about the times, in minutes, some boys took to do the same jigsaw puzzle.



(b) Compare the distributions of the girls' times and the boys' times.