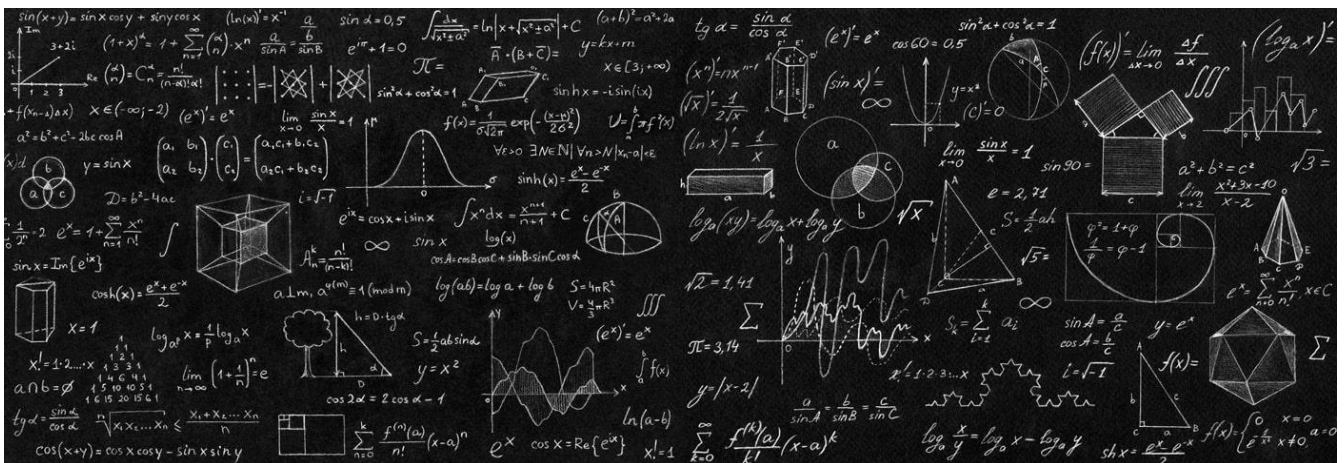


A Level Further Maths



The Further Maths course is divided into the following three areas:

<u>Pure (2/3 of content)</u>	<u>Mechanics (1/6 of content)</u>	<u>Statistics (1/6 of content)</u>
<p>What is assessed:</p> <p>Proof</p> <p>Complex numbers</p> <p>Matrices</p> <p>Further algebra and functions</p> <p>Further calculus</p> <p>Further vectors</p> <p>Polar coordinates</p> <p>Hyperbolic functions</p> <p>Differential equations</p> <p>Numerical methods</p> <p>The Exam:</p> <p>Paper 1 and Paper 2, both two hours</p>	<p>What is assessed:</p> <p>Forces and energy</p> <p>Momentum</p> <p>Circular motion</p> <p>Centres of mass</p> <p>The Exam:</p> <p>One paper, one hour long</p>	<p>What is assessed:</p> <p>Discrete and continuous random variables</p> <p>Hypothesis testing</p> <p>Random processes</p> <p>T-tests</p> <p>The Exam:</p> <p>One paper, one hour long</p>

The rest of this booklet has a section for each of the next three weeks containing problem solving questions based upon GCSE knowledge as well as some interesting reading related to Further Maths content. Once you have completed the problem solving questions, please email your solutions to Mr Butterworth (pbutterworth@samuelward.co.uk).

Super-curricula reading

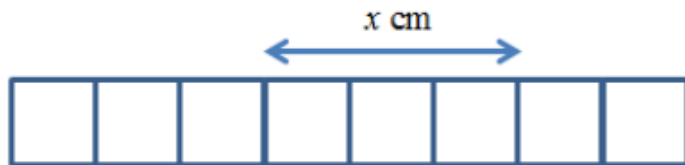
<https://plus.maths.org/content/maths-minute-polar-coordinates>

<https://plus.maths.org/content/maths-minute-escape-velocity>

<https://plus.maths.org/content/maths-minute-some-linear-programming>

Problem solving questions to be submitted to Mr Butterworth

1. Dividing a number by 3 gives the same result as subtracting 24 from the number. What is the number?
2. The rectangle below is made up of squares as shown:



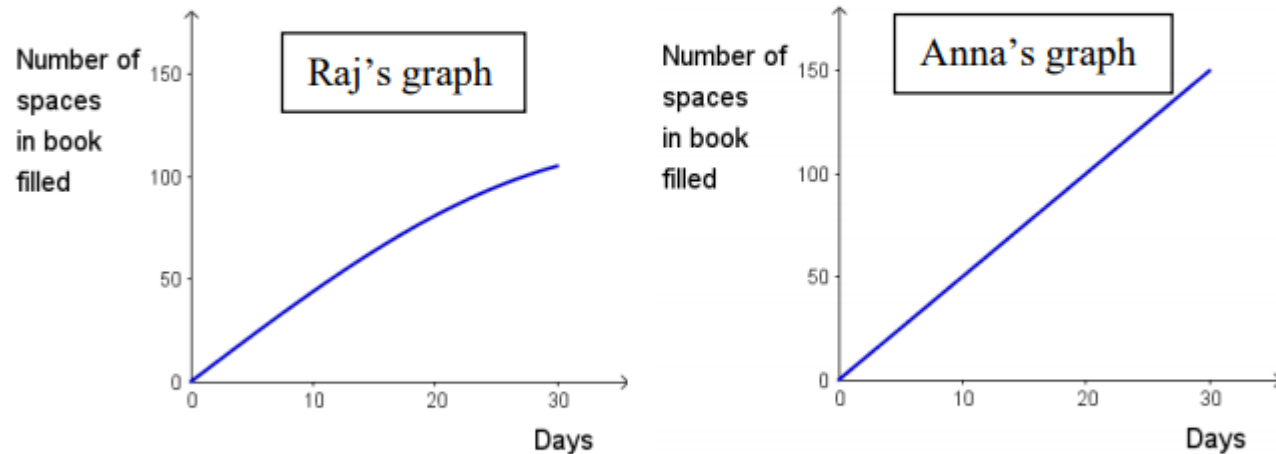
The perimeter of the rectangle is 54cm. What is the value of x ?

3. At a coffee shop Americanos cost £1.90. Cappuccinos cost £2.40. Maddie bought two Americanos and some cappuccinos. She paid with a £20 note and received £9.00 change. How many cappuccinos did she buy?
4. The ratio of the side lengths in this rectangle is 3:1. The perimeter of the rectangle is 40 cm. What is its area?



5. Raj and Anna both decide to collect football stickers for a book with spaces for 150 different stickers. They will both buy a packet of five stickers each day. Each packet contains a random selection of the 150 stickers they need.

Before they start both Raj and Anna draw a graph which predicts how many spaces they will have filled in terms of the number of days passed, for the first 30 days. They are shown below.



Which of the graphs above is most likely to represent the number of spaces filled in their book in terms of the number of days that have passed? What has been overlooked in the graph which is least likely to be accurate?

6. Jamila has taken five out of six tests. The maximum mark in each test is 20. So far her average (mean) mark is 12. Is it possible for her to increase her average mark to above 15 after she has taken the final test?

Week 2

Super-curricula reading

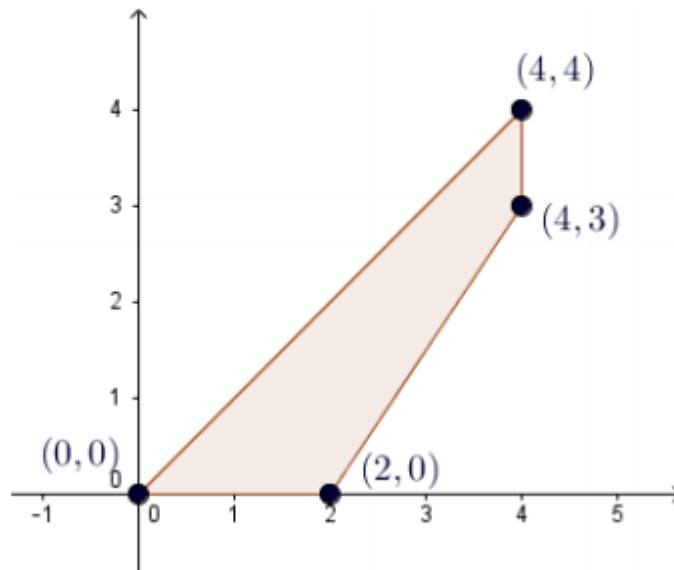
<https://plus.maths.org/content/maths-minute-fibonacci-sequence>

<https://plus.maths.org/content/maths-minute-eulers-identity>

<https://plus.maths.org/content/maths-minute-golden-ratio>

Problem solving questions to be submitted to Mr Butterworth

2. Calculate the shaded area in the diagram below:



3. The first part of a table is shown below. Which row of the table contains the number 2020?

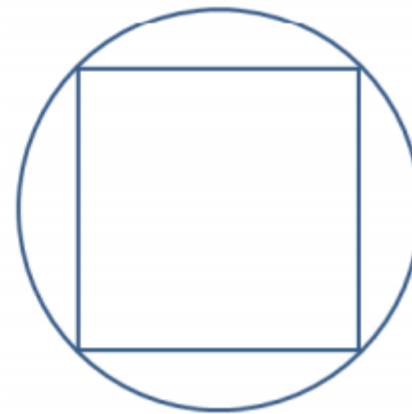
Row			
1	5	10	15
2	20	25	30
3	35	40	45
4	50	55	60
5	65	70	75

7. The diagram shows a square and a circle.

The corners of the square are on the circle.

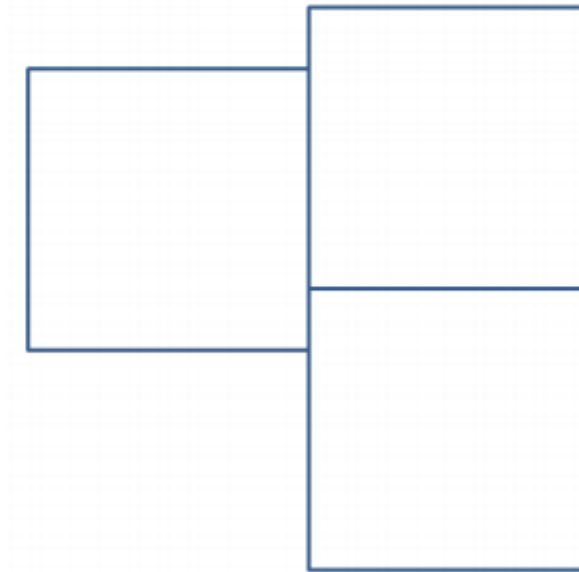
The perimeter of the square is 20 cm.

Find the exact value of the area of the circle.



8. A list of numbers has average (mean) value 18. When the number 23 is added to the list the average becomes 19. How many numbers were in the list to begin with?

9. The three squares in the diagram are identical. The perimeter of the shape shown is 32 cm. What is the area of each square?



Super-curricula reading

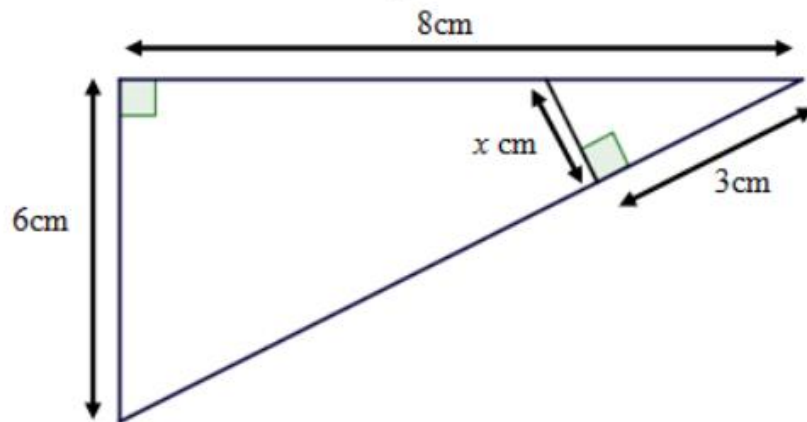
<https://plus.maths.org/content/node/6855>

<https://plus.maths.org/content/maths-minut-flipping-pancakes>

<https://plus.maths.org/content/maths-minute-square-root-2-irrational>

Problem solving questions to be submitted to Mr Butterworth

1. A bag contains 140 balls of various colours. If 30 red balls are added to the bag the proportion of red balls in the bag is doubled. How many red balls were in the bag to begin with?
2. In how many ways can 45 be written as the sum of consecutive positive integers?
3. Find the value of x in the diagram below.



4. How many positive integers leave a remainder of 11 when divided into 1000?