Peter's Problem 2020

Problem No. 1

A car travels 24 860 km. The driver rotated the 5 tyres (spare wheel included) so that each tyre got equal wear. How many kilometres did each tyre travel?

Problem No. 2

Using a certain code two of the words GLARE, LARGE and REGAL are written as 52314 and 41532.

(i) What is the third word which is not written in the code?

(ii) What word would be represented by the code 21325?

Problem No. 3

Log on to the website www.engineersweek.ie.
Click on the tab **'Get Involved'**, select **'Secondary Schools'** and view the video *'Women in Engineering'*.
How many engineers were named in the video?

Problem No. 4

A 24-hour digital clock shows 6 numbers for hours, minutes and seconds.
How many times in any 24 hours do all 6 digits change at the same time?

Problem No. 5

An electricity meter reads 58273. All digits are different. How many more units of electricity will have been used when the other 5 digits are first displayed together?

Problem No. 6

If the density of gold is 19.3 tonnes per m^3 and the price of gold is €44 per gram, find the value of a cube of gold the edges of which are 5cm long.

Problem No. 7

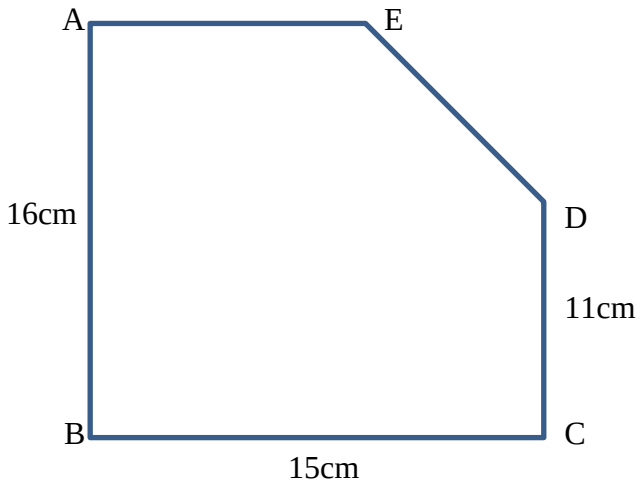
If you were to count the digits in the page numbers in a book, starting at Page 1, on what page would you be when you reached the 2020th digit?

Problem No. 8

For how many integers, n, is $\frac{n}{100-n}$ also an integer?

Problem No. 9

The diagram shows a pentagon ABCDE. The angles at A, B and C are right angles.
The lengths |AE| and |ED| are equal.



Find the area of the pentagon in the form $a\frac{b}{c}$.

Problem No. 10

Show that if p is a prime number greater than 3, then $p^2 - 1$ is always divisible by 24 with no remainder?

Problem No. 11

You have 10 stacks of 10 gold coins. All of the coins in one of these stacks are counterfeit; all the other coins are not. A real coin weighs 10 grams. A counterfeit coin weighs 11 grams. You have a modern digital scale that provides an accurate readout.

How can the fake pile be identified in one weighing?

Problem No. 12

How many 3- digit numbers are there where the sum of the three digits is 10?

Problem No. 13

Peter cycles a journey on a Greenway at an average speed of 12 km per hour. He returns to his starting point at an average speed of 20 km per hour with the wind at his back. What is his average speed for both journeys?

Problem No. 14

Each of the symbols represents a number. The addition totals for each row and column are given, except one.

Find the number represented by the ? symbol.

Σ	Π	Π	Σ	26
λ	Π	Σ	λ	25
Ω	Ω	Ω	Ω	?
λ	Π	Σ	Π	28
21	32	22	24	

Problem No. 15

Choose any 3-digit number where there is a difference of more than 1 between the first and third digits.
Reverse the order of all 3 digits in your number and subtract the smaller number from the greater number.
Reverse the order of all 3 digits in your answer and add these two numbers.
The answer is always 1089.
Why?

Problem No. 16

What is the next letter in the list A, C, G, M….?

Problem No. 17

I have two types of square tiles – one of side 1cm long and the other of side 2cm long. What is the area of the smallest square that I can form using equal numbers of each of the types of tile?

Problem No. 18

A brother and sister have asked their parents to put money aside for them for Christmas. Their parents said that they would put money aside for them every Saturday from when they returned to school on August 26th 2015 until they would go shopping on December 8th 2015.

They offer them the choice of saving €1 for the first week, €2 the second week, €3 the third week and so on for each of the children
or, 1 cent the first week, 2 cents the second week, 4 cents the third week and so on for the children to share equally.
The children chose the first option.
(i) How much did each child get for their Christmas shopping on December 8th?
(ii) How much more would have been saved for each of them if they had chosen the other option? Give the answer correct to the nearest 5 cent.

Problem No. 19

I want to buy a car in Northern Ireland and I respond to the following advertisement:

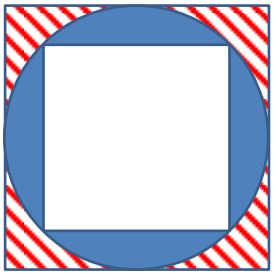
> FOR SALE: 2015 (Feb) Ford Focus 2.0, jet black, Titanium 145ps, automatic transmission, petrol engine, 5 door hatchback, 56789 miles. One careful owner. £10,500. No offers.

Vehicle Registration Tax (VRT) must be paid.

Use the internet to calculate
(a) the percentage rate of VRT quoted
(b) the Current OMSP (Open Market Selling Price)
(c) the amount of VRT calculated
(d) the net cost of the car in Euro, correct to the nearest euro, given that the exchange rate is €1 = 89p Sterling.

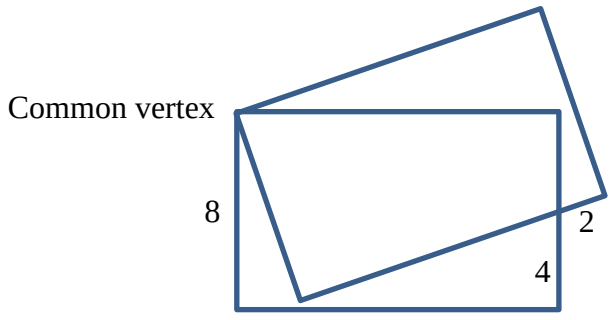
Problem No. 20

In the following diagram which is bigger, Area 1, the striped area between the circle and the outer square or Area 2, the solid coloured area between the circle and the inner square?



Problem No. 21

Two congruent rectangles have a common vertex and overlap, as shown in the diagram.



Find the area of the drawing that is not common to both rectangles.
Note: All measurements are in cm.