

## WMA Mathswell – Year 9 2019 – Problem Solving questions

### Question 1

Three consecutive odd numbers multiply to equal 29,667.

What is the smallest of these numbers?

### Question 2

Freddy the Frog has fallen down a particularly slimy well. By day he is able to climb 6 meters but by night as he rests, he slides back down 5 meters. The well is 50 meters deep from the water level to the top. How far does he have to climb to escape from the well?

### Question 3

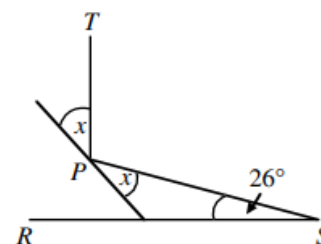
$$1 + 3 + 5 + 7 + \dots + 243 =$$

### Question 4

Anita sent an email to two of her friends. Everyone answered and copied the answer to all the others. A total of 6 emails were sent altogether. When she did the same with three of her friends, a total of 12 emails were sent altogether. How many emails are sent altogether if she sent an email to 10 friends and they all replied in the same manner?

### Question 5

A beam of light shines from point S, reflects off a reflector at point P, and reaches point T so that PT is perpendicular to RS. What is the size of angle  $x$ ?



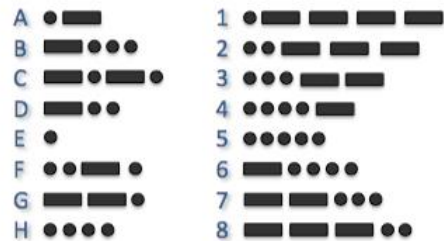
**Question 6**

Toothpicks are used to form squares in the pattern shown: Four toothpicks are used to form one square, seven to form two squares, and so on. If this pattern continues, how many toothpicks will be used to form 50 squares in a row?



**Question 7**

In Morse code, each symbol is either a dot or a dash. The Morse code was originally used around 1844 for distance communication by electrical currents in the wire, the telegraph. How many different sequences of 6 symbols are possible?

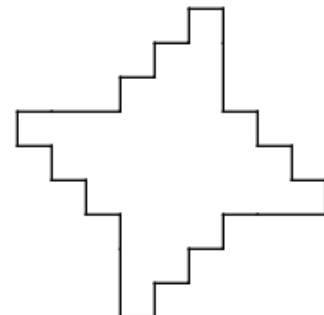


**Question 8**

How many digits are there in the product of  $2^{101} \times 5^{99}$  ?

**Question 9**

In the diagram adjacent edges are at right angles. The four longer edges are equal in length, and all of the shorter edges are also equal in length. The area of the shape is 528. What is the perimeter?



**Question 10**

How can you go from the number 11 to 25 by only multiplying by 2 or decreasing by 3 each step, in 7 steps?

**Question 11**

A car has a 4-digit integer price, which is written digitally (in digital numbers, like on your watch). While the salesmen isn't watching, the buyer turns the price upside down and gets the car for \$1626 less. How much did the car initially cost?

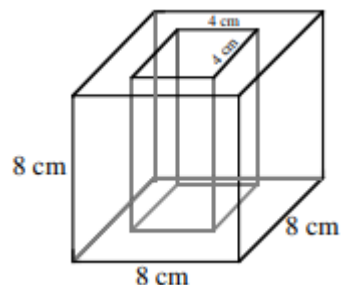


**Question 12**

The number 1000 can be written as the product of two positive integers, neither of which contains zeros. What is the sum of these two integers?

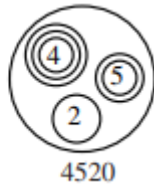
**Question 13**

An 8 cm cube has a 4 cm square hole cut through its centre, as shown. What is the remaining volume, in  $\text{cm}^3$ ...?

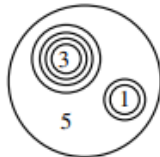


**Question 14**

1. In Circle Land, the numbers 207 and 4520 are shown in the following way:



In Circle Land, what number does the following diagram represent?



**Question 15**

In 2009, Usain Bolt set a record for the men's 100m sprint, running the race in 9.58 seconds. What is this as a speed in kilometres per hour?

**Question 16**

A number is Beprisque if it is the only natural number between a prime number and a perfect square (e.g. 10 is Beprisque but 12 is not). How many two-digit Beprisque numbers (including 10) are there?

**Question 17**

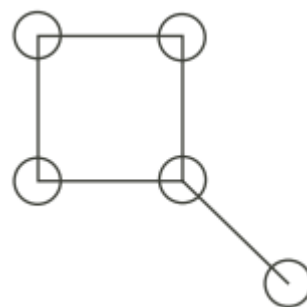
Let  $a, b, c$  and  $d$  be real numbers such that  $a + b + c + d = 2$  and

$$ab + bc + cd + da + ac + bd = 0.$$

Find the minimum value and the maximum value of the product  $abcd$ .

### **Question 18**

Five circles are drawn on a piece of paper and connected as shown. Each circle must be coloured red, blue or green. Two circles connected by a straight line may not be coloured the same. How many different ways are there to colour the circles?



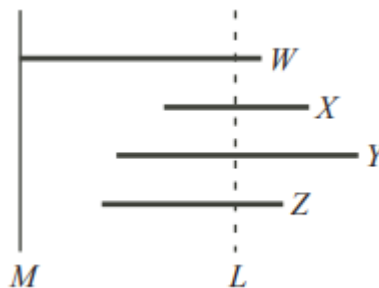
### **Question 19**

One cyclist leaves Town A and cycles at 20 km per hour towards Town B. Another cyclist leaves Town B and cycles at 30 km per hour towards Town A. The towns are 120km apart. They both started cycling at 12pm. At what time do they meet?

### **Question 20**

Four pieces of lumber are placed in parallel positions, as shown, perpendicular to line M:

- Piece W is 5 m long
- Piece X is 3 m long and its left end is 3 m from line M
- Piece Y is 5 m long and is 2 m from line M
- Piece Z is 4 m long and is 1.5 m from line M



A single cut, perpendicular to the pieces of lumber, is made along the dotted line L. The total length of lumber on each side of L is the same. What is the length, in metres, of the part of piece W to the left of the cut?