

01

P is a prime number, 'n' is a positive integer and $n + p = 2020$. If LCM of 'n' and 'p' is 38019, then find the values of 'p' and 'n'.

Given that 'P' is a prime number and LCM of n, p is 38019

$$38019 = 3 \times 19 \times 23 \times 29$$

The prime factors has to be grouped into two parts 'n' and 'p'. So that 'p' is a prime and $n + p = 2020$

We know that 'p' is a prime. We should check for P, the alternatives are 3, 19, 23, 29

$$\text{when } P = 3, n = \frac{38019}{3} = 12673 \Rightarrow n = 12673; p = 3 \text{ } \vdash n + p = 12676$$

$$\text{when } P = 19, n = \frac{38019}{19} = 2001, \Rightarrow n = 2001; p = 19 \Rightarrow n + p = 2020$$

Therefore $n = 2001$ and $p = 19$

02

Is there a two digit number ab such that $ab - ba$ is a prime number.

$$ab = 10a + b$$

$$ba = 10b + a$$

$$ab - ba = 10a + b - 10b - a$$

$$= 9a - 9b = 9(a - b)$$

$$\Rightarrow ab - ba \text{ has '9' as a factor}$$

$$\Rightarrow ab - ba \text{ can never be a prime number}$$

03

The diagram below is to be completed so that each box contains a whole number, the total of the numbers in the thirteen boxes is 2020 and the sum of the numbers in any three consecutive boxes is always the same. In how many different ways is it possible to complete the diagram in this way ?

	180										85	
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Let the numbers in the 1st and 3rd be x and y

x	180	y									85	
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Sum of 1st three numbers = $x + 180 + y$

number in the fourth box must be x again, as the number in the twelfth box is 85, we may deduce that y is 85

number in the 13 boxes are

$x, 18, 85, x, 180, 85, x, 180, 85, x, 180, 85, x$

$$\Rightarrow 5x + 720 + 340 = 2020$$

$$5x = 960$$

$$x = 192$$

04

The number 64 has the property that it is divisible by its units digit. How many whole numbers between 10 and 50 have this property ?

Twelve numbers ending with 1, 2 or 5 have this property

They are 11, 12, 15, 21, 22, 25, 31, 32, 35, 41, 42 and 45.

In addition, we have 33, 24, 44, 36 and 48 for a total of 17

(Note : 20, 30, 40 are not divisible by 0, since division by 0 is not defined)

05

If $a \times b = 2$, $b \times c = 24$, $c \times a = 3$ and a , b and c are all positive. What is the value of $a + b + c$?

From the three equations, we see that $(abc)^2 = 2 \times 24 \times 3 = 144$

Since abc is positive, $abc = 12$

Then from the first equation we get $c = 6$, from second equation

we get $a = \frac{1}{2}$ and from the third equation we get $b = 4$

Therefore $a + b + c = 10\frac{1}{2}$

06

Two brands of chocolate are available in packs of 24 and 15 respectively. If I need to buy an equal number of chocolates of both kinds, then what is the least number of boxes of each kind I would need to buy?

HCF of 24 and 15 is 3

$$24 \div 3 = 8$$

$$15 \div 3 = 5$$

$$\begin{array}{r} 15 \overline{)24} \quad (1 \\ \underline{15} \\ 9 \end{array}$$

$$\begin{array}{r} 9 \overline{)15} \quad (1 \\ \underline{9} \\ 6 \end{array}$$

$$\begin{array}{r} 6 \overline{)9} \quad (1 \\ \underline{6} \\ 3 \end{array}$$

$$\begin{array}{r} 3 \overline{)6} \quad (2 \\ \underline{6} \\ 0 \end{array}$$