

Lesson 5

Number Theory : Year 9

5.1 REVISION

Calculator needed

Question 1

Write down the *hcf* and the *lcm* requested;

(i) $hcf \{12, 20\} =$ $lcm \{12, 20\} =$

(ii) $hcf \{12, 13\} =$ $lcm \{12, 13\} =$

(iii) $hcf \{66, 88\} =$ $lcm \{66, 88\} =$

(iv) $hcf \{30, 45\} =$ $lcm \{30, 45\} =$

[8 marks]

Question 2

Is 637 a prime number ?

Explain your answer

[3 marks]

Question 3

(i) List the first ten multiples of 12

(ii) List the first ten multiples of 15

(iii) Which is the first multiple that is common to both your part (i) and part (ii) lists ?

(iv) Is this number the *hcf* or the *lcm* ?

[6 marks]

Question 4

Write down a prime number that is even or, if there is not one, write NONE

[1 mark]

Question 5

(i) Write down all the factors of 24

(ii) Write down all the prime factors of 24

(iii) Write down the highest prime factor of 24

[4 marks]

Question 6

Which of the following pairs of numbers are coprime ?

(*coprime means have no common factors, except 1*)

(i) 4 and 9

(ii) 4 and 12

(iii) 4 and 13

[3 marks]

Question 7

(i) Write down three square numbers

(ii) Can a square number be prime ?

[4 marks]

Question 8

The **FUNDAMENTAL THEOREM OF ARITHMETIC** says that any number which is not prime can be written as a product of primes in, essentially, a unique way.

(i) What does the word unique mean ?

[1 mark]

(ii) Show a method that does not require a calculator to write 108 as a product of primes.
(You may check your answer using the FACT button on your calculator)

[4 marks]

(iii) Write 3575 as a product of primes.
You may use the FACT button on your calculator.

[2 marks]

(iv) Write 2 372 324 857 as a product of primes.
You may use the FACT button on your calculator.

[2 marks]

Question 9

Tom is trying to work out the highest common factor of 4200 and 10780
He's used the FACT button on his calculator and set out the results as follows;

$$4200 = 2 \times 2 \times 2 \times 3 \times 5 \times 5 \times 7$$

$$10780 = 2 \times 2 \times 5 \times 7 \times 7 \times 11$$

(i) Annotate the above, to show the factors in common.

[2 marks]

(ii) What is the $hcf\{4200, 10780\}$?

[2 marks]

(iii) What is the $lcm\{4200, 10780\}$?

[2 marks]

Both numbers are now doubled

That is, 4200 is doubled to 8400 and 10780 is doubled to 21560

(iv) What is the $hcf\{8400, 21560\}$?

[2 marks]

(v) What is the $lcm\{8400, 21560\}$?

[2 marks]

Question 10

Find the *highest common factor* of 350 and 375

(You may use the factorise button on your calculator if you wish)

[5 marks]

Question 11

Find the *lowest common multiple* of 90 and 140

(You may use the factorise button on your calculator if you wish)

[5 marks]

Question 12

The Goldback conjecture states that any even number greater than four can be written as the sum of two prime numbers.

Write the following even numbers as sums of two primes.

(a) 30

(b) 22

(c) 24

(d) 52

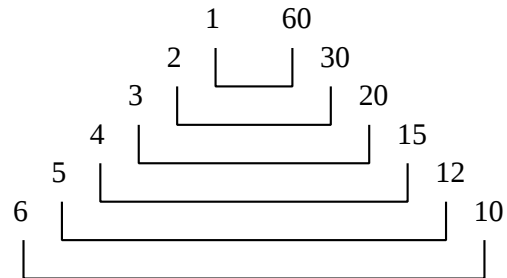
It is not known if the Goldback conjecture is true or not.

[4 marks]

Question 13

The number 60 has a lot of factors.

Here is a way of finding all twelve factors by making a factor pyramid.



So the factors of 60 are; 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 60

Build a factor pyramid to help find all the factors of 210

You may use your calculator in any way you like to help you build

[6 marks]

Question 14

Find the *highest common factor* of 96, 60 and 216

[6 marks]

Question 15

Find the *lowest common multiple* of 6, 8 and 14

[6 marks]

Question 16

(a) What is 19 times 11 ?

[1 mark]

Prof Eureka Fish claims to have a formula that generates prime numbers.
Here is his method;

Take the first x primes.

Multiply them all together.

Subtract 1.

The answer is a new prime.

(b) (i) Work out $2 \times 3 - 1$
Is it prime ?

[1 mark]

(ii) Work out $2 \times 3 \times 5 - 1$
Is it prime ?

[1 mark]

(iii) Work out $2 \times 3 \times 5 \times 7 - 1$
Is it prime ?

[1 mark]

(iv) Do you think the Prof is correct or not ?
Justify your answer.

[2 marks]