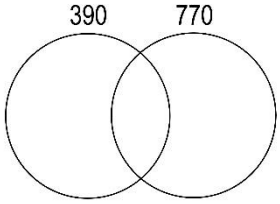
Prime Vault Act 3 – Circuli Secretorum

You have made it to the "Secret of the Circles". Combining prime factorisation and Venn diagrams is a simple way of accessing the Highest Common Factor (HCF) or Greatest Common Divisor (GCD). Use these powers to decrypt the next video link.

Clue 3

Question 1



Prime Factorisation:

390 = _____

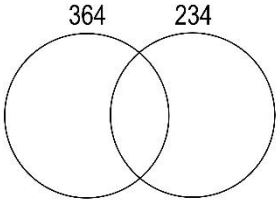
770 = _____

Common Prime Factors:

_____

Highest Common Factor: a = _____

Question 2



Prime Factorisation:

364 = _____

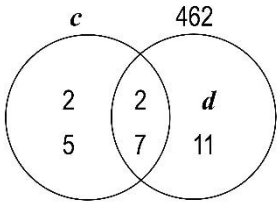
234 = _____

Common Prime Factors:

_____

Highest Common Factor: b = _____

Question 3



Prime Factorisation:

c = _____

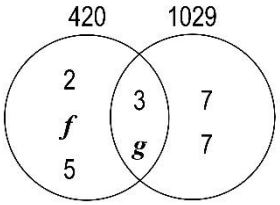
462 = _____

Common Prime Factors:

_____

Highest Common Factor: e = _____

Question 4



Prime Factorisation:

420 = _____

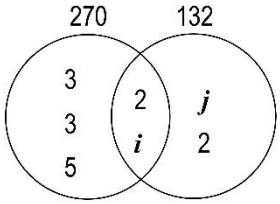
1029 = _____

Common Prime Factors:

_____

Highest Common Factor: h = _____

Question 5



Prime Factorisation:

270 = _____

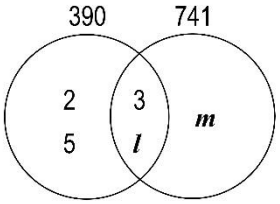
132 = _____

Common Prime Factors:

_____

Highest Common Factor: k = _____

Question 6



Prime Factorisation:

390 = _____

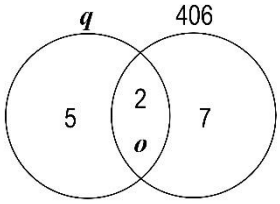
741 = _____

Common Prime Factors:

_____

Highest Common Factor: n = _____

Question 7



Prime Factorisation:

q = _____

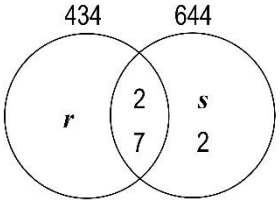
741 = _____

Common Prime Factors:

_____

Highest Common Factor: p = _____

Question 8



Prime Factorisation:

434 = _____

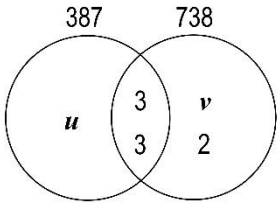
644 = _____

Common Prime Factors:

_____

Highest Common Factor: t = _____

Question 9



Prime Factorisation:

387 = _____

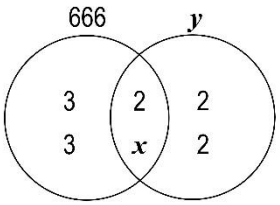
738 = _____

Common Prime Factors:

_____

Highest Common Factor: w = _____

Question 10



Prime Factorisation:

666 = _____

y = _____

Common Prime Factors:

_____

Highest Common Factor: z = _____

Use the results from the Venn diagrams to populate the table.

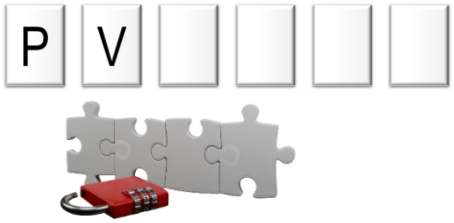
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
10	26	140	53	14	2	7	21	3	11	6	13	19	39	29
p	**q**	**r**	**s**	**t**	**u**	**v**	**w**	**x**	**y**	**z**				
290	58	31	23	14	43	41	9	37	296	74				

Use the table above to decrypt the code below and **complete** the link for the next video: https://youtu.be/

	29		23	**26***		**23***	14	37	19	**290***
0	o	1	s	B	-	S	r	x	m	Q

*Numbers in bold require their corresponding code to be capitalised.

> Another link for you to follow,
>
> This gentleman's riddle is hard to swallow.
>
> His age at the end followed by at the start
>
> Will allow you to continue onto the next part.



Video Link: https://youtu.be/0o1sB-SrxmQ

Riddle:

For six years in a row, the man exclaimed:
My age divided by my grandchild's is integer framed.
No remainders, no tricks, no divide gone wrong.
How old am I? Come, think along!

Solution:

"For six years in a row" = A sequence of 6 years, or the next 6 years.
"My age divided by my grandchild's is integer framed" = Grandchild's is a factor of the grandfathers.
"No remainders, no tricks …" = reinforces the above, the grandchild's age is a factor.
"How old am I?" = Need the grandfather's age when this sequence starts.
Using the Sieve – Students can establish that there is only one instance where 6 or more composite numbers occur in a row. { 90, 91, 92, 93, 94, 95, 96 }. There are lots of possible ages for the grandchild if the grandfather is 90, however, for 91 there are only 2 factors: 7, and 13. This means when the grandfather is 92, the grandchild will be either 8 or 14, neither of which is a factor of 92. This sequence of composite number doesn't work.

There is another alternative, a prime number can initiate the sequence if the grandchild's age is 1, reducing the requirement to find only 5 consecutive composite numbers. By starting with the grandchild's age, we know that the sequence starts with a prime number, the next is a multiple of 2, then a multiple of 3, a multiple of 4, then 5 and finally 6.

Possibilities:

{ 23 24 25 26 27 28 }	{ 31 32 33 34 35 36 }	{ 47 48 49 50 51 52 }
{ 53 54 55 56 57 58 }	{ 61 62 63 64 65 66 }	{ 73 74 75 76 77 78 }
{ 83 84 85 86 87 88 }	{ 89 90 91 92 93 94 }	

Aside from looking only at the realistic options, we know the 5th number must be a multiple of 5, this reduces the options to: {31 … 36} and {61 … 66}. The former requires 34 to be a multiple of 4, which it is not, leaving us to explore the second option:

61 ÷ 1 = 1, 62 ÷ 2 = 31, 63 ÷ 3 = 21, 64 ÷ 4 = 16, 65 ÷ 5 = 13 and 66 ÷ 6 = 11.

The grandfather is currently 61.

According the worksheet the code starts with “his age at the end” followed by his age at “the start’.

Final code: **P V 6 6 1**