



Advanced Mathematics Support Programme

Primed for action!

What are these?

$$\sqrt[3]{125} \quad / \quad 8^\circ \quad / \quad \sqrt{400}$$

$$(0.2 \times 15)^2 \quad / \quad \sqrt[3]{27} \quad / \quad \frac{120}{6}$$

$$\frac{1080}{54} \quad / \quad \sqrt[3]{64} \quad / \quad 2^4 - 2^2$$

Make your own date...

- Can you write any date using sums?
- What about tomorrow's date?
- What about your birthday?

You could send your birthday to your teacher

Prime Numbers

On a piece of paper, write down the first 8 prime numbers

Prime Numbers

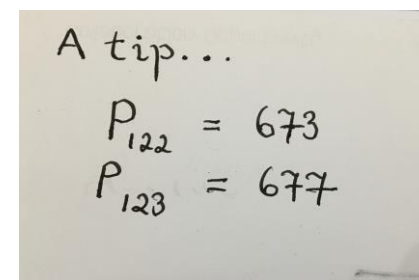
- The first 8 prime numbers are
2, 3, 5, 7, 11, 13, 17, and 19

- Prime numbers have their own ordered code:

P₁	2	P₅	11
P₂	3	P₆	13
P₃	5	P₇	17
P₄	7	P₈	19

Dates with Prime Numbers

Can you work out the date below? Prime numbers are used to express the date.

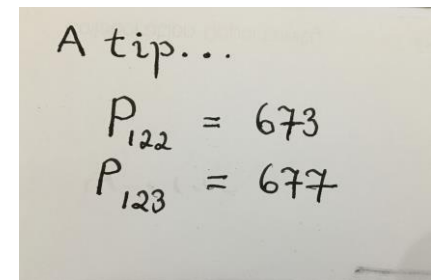


- $$P_8 - P_1 / (P_2)^2 / 3P_{122}$$

Dates with Prime Numbers - Answer

Here is the solution to the last slide...

- $P_8 - P_1 / (P_2)^2 / 3P_{122}$
- $(19 - 2) / 3^2 / (673 \times 3) \rightarrow 17 / 9 / 2019$
- 17th September 2019



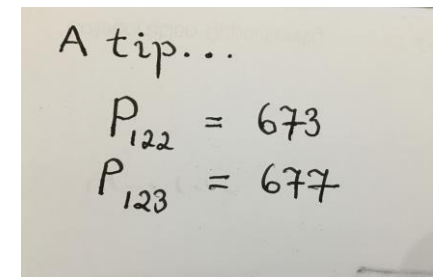
Dates with Prime Numbers 2

Can you work out this date?

- $$(P_1)^3 - P_4 \ / \ \sqrt{(P_4^2 - P_6)} \ / \ 3P_{123} - P_5$$

What about this date?

- $$(P_2)^3 \ / \ \sqrt[3]{(2P_4)^2 - P_6^2} \ / \ 3P_{122}$$



Extension: Using P_1 to P_8 and P_{122} P_{123} as code, please try and create any date as a prime number. Be inventive, creative and use your initiative!

Dates with Primes Numbers 2 - Answers

- $(P_1)^3 - P_4 / \sqrt{(P_4^2 - P_6)} / 3P_{123} - P_5$
- $8 - 7 / \sqrt{7^2 - 13} / 2031 - 13 \rightarrow 1^{\text{st}} \text{ June } 2020$

A tip...

$$P_{122} = 673$$

$$P_{123} = 677$$

- $(P_2)^3 / \sqrt[3]{(2P_4)^2 - P_6^2} / 3P_{122}$
- $3^3 / \sqrt[3]{14^2 - 13^2} / 2019 \rightarrow 27^{\text{th}} \text{ March } 2019$

Nearly ready for a YouTube Clip?

- It is almost time to watch a YouTube video about gaps between prime numbers.
- Before the video try this short task first...
- There are 25 prime numbers between 1 and 100. Can you find an easy way of listing them? Remember to use the Prime Number code P_n ... Give it a go!

Enjoy the video

- [Numberphile](#) 'Sexy Primes' (please click on the word Numberphile)
- Just for fun, using the prime numbers between 0 and 100 that you listed before watching the video, you might want to list all of
 - the cousin primes
 - As well as the twin primes
 - Maybe too, the sexy primes & any triplets?
 - How about Octomus Primes?

Investigation 1

- Three Panda Bears are given 51 bamboo shoots to share.
- Each Panda may only receive an odd number of bamboo shoots. How many different combinations of sharing these bamboo shoots can you find?
- How many different combinations can you find using prime numbers only? (Yes, you can use P_1). Start by sharing as many bamboo shoots as you can amongst the 3 Pandas. You cannot use the same prime number twice!
- Send your teacher your solution!

Investigation 1 continued...

- Exhausted yet? – try using the same prime number twice or three times, e.g. 17.
- Then, try sharing a prime number of bamboo shoots across 4 Pandas.
- Now, can you find any cousin, twin or sexy primes in your list?

Adapted from White Rose Maths

Investigation 2

- Both 4 and 8 can be written as the sum of two prime numbers ($4 = 2+2$, $8 = 5+3$). How many numbers less than 20 cannot be written as the sum of two prime numbers?
- How many of these are twin or cousin primes?
- Why is there never a gap of 7 between 2 prime numbers?

Adapted from: <https://nrich.maths.org/6239>

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