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SIEVE of ERATOSTHENES

Use the Sieve of Eratosthenes to investigate **primes, composites, multiples,** and **prime factorizations.**

Who was Eratosthenes?

Eratosthenes, a Greek mathematician, invented the "sieve method" for finding prime #'s about 22 000 years ago. This activity explores a variation of Eratosthenes' sieve.

Getting Started…

- **One is neither prime nor composite.** To show this, mark an X through the '1' box.

- The first **prime number** is **2**. Colour the diamond in which 2 is located **ORANGE.**
- Use **RED** to colour the **upper-left corner** of the key and upper-left corner of all squares containing multiples of 2 (skip count by 2 OR *multiples* of 2).
  - The numbers with just a corner coloured "fell through the sieve"!

…. What was the first multiple of 2 that "fell through" the sieve? Answer: ________

- The next prime number is **3**. Colour the diamond surrounding the 3 **ORANGE**.
- Use **BLUE** to colour the **upper-right corner** of the key and the upper-right corner of all squares containing multiples of 3 *(skip count by 3 OR* multiples *of 3)*.

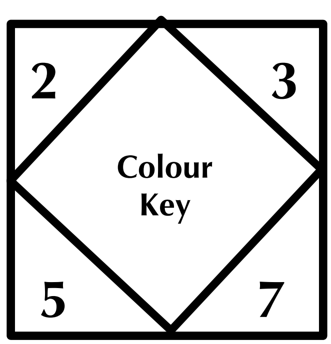
- Repeat this process for prime numbers **5** and **7**. Colour the diamonds surrounding these numbers **ORANGE**.

- Use **GREEN** to colour the **lower-right corners** of the key and of the squares containing multiples of 5 (skip count by 5 OR *multiples* of 5).
- Use **YELLOW** to colour the **lower-left corners** of the key and of the squares containing multiples of 7 (skip count by 7 OR *multiples* of 7).

… What are the first multiples of 5 that fell through the sieve? _________ And 7? _________

- Finally, use **ORANGE** to colour the diamond surrounding all the numbers in the grid that are in squares with *no corners coloured*. These numbers are all ***PRIME NUMBERS***!

Use this key to show the correct colour-coding.



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<u>Application & Reasoning</u>

Using your completed colour-coded sieve, respond to the following questions in detail to demonstrate your full understanding.

1. How do you know that 2, 3, 5, and 7 are ***prime numbers***?

2. How can you tell this from the way the sieve is coloured?

3. How can you identify ***composite numbers*** from the way the sieve is coloured?

Remember….

*When you coloured the multiples of 2, the number **4** was the first multiple of 2 that "fell through the sieve". When you coloured multiples of 3, the number **9** was the first multiple of 3 that fell through the sieve.*

4. What was the first multiple of 3 that fell through? Why wasn't 6 the first multiple of 3 to fall through?

5. When colouring multiples, what was….

   a) The first multiple of **5** that fell through the sieve? How do you know?

   b) The first multiple of **7** that fell through the sieve? How do you know?

   … *After colouring the multiples of 7, the next uncoloured number was 11.*

6. When you colour multiples of 11, what is the first number that will fall through the sieve?

7. When you colour multiples of any prime number, how is the first multiple that falls through the sieve *related* to that prime number?

8. If the grid went to **300**, what is the largest prime number you would reach (whose multiples must be coloured) before you can be *certain* that all of the remaining uncoloured numbers are prime?

9. What is the largest prime less than 100? Explain your answer.

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Sieve

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100