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Centre for Education in
Mathematics and Computing

Grade 6 Math Circles

November 28/29, 2017

Math Jeopardy

Introduction

This lessons covers all of the material (except Spatial & Visual thinking) that we have went through this term. We will be working in groups to complete these problems in the style of a fun game of Jeopardy!

Questions will vary in difficulty with \$100 questions tending to be the easiest, and \$500 questions tending to be the hardest. Do your best, good luck and have fun!

Logic and Math Puzzles

\$100 A basket contains 12 red socks and 2 black socks. When picking random socks from the basket, how many socks need to be taken to guarantee getting a matching pair?

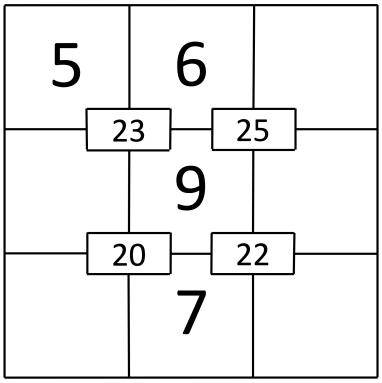
Answer: 3 Socks.

\$200 Using exactly four fours, and $+, -, \times, \div$ *and*(), create the numbers 20 and 15.

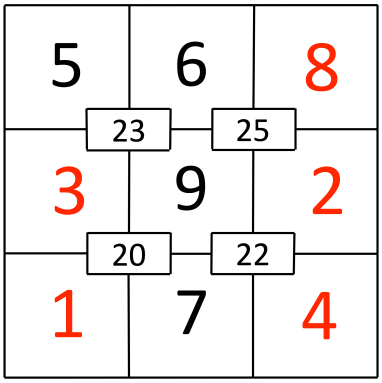
Answer:

$$20 = (\tfrac{4}{4} + 4) \times 4$$
$$15 = (4 \times 4) - (\tfrac{4}{4})$$

\$300 Which number must be in the bottom right corner of this Sujiko?



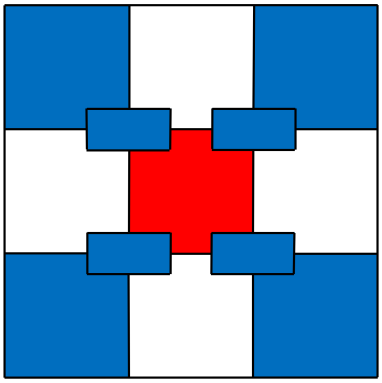
Answer: 4. (Remember to use the rule about adding diagonal numbers).



$400 If a magic square is created by using the numbers 1 to 9, what will be the sum of the terms along each row, column and diagonal?

Answer: 15.

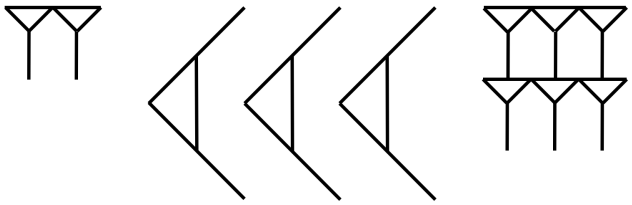
$500 What will be the sum of the blue squares, minus two times the red square in this Sujiko?



Answer: 90. (Again, use the rule about adding opposite diagonals).

Ancient Mathematics

$100 What is the value of this Babylonian number?



Answer: 9,006

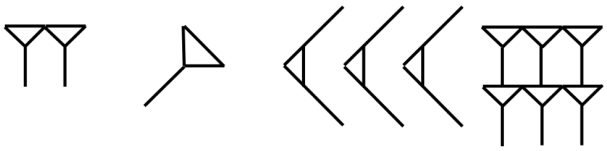
$200 Name one drawback of Egyptian Hieratic numerals?

Answer: One of the following:

1. The symbols are difficult to draw.
2. You'd need an infinite number of symbols to represent every number.
3. The are no clear rules for basic math operations.

$300 How would you write 7,236 in Babylonian numerals?

Answer:



$400 How many pencil strokes does it take to construct 2 perpendicular lines using a straightedge and a compass?

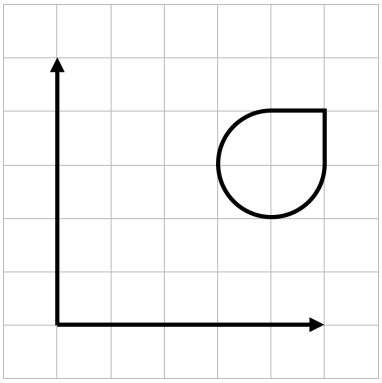
Answer: 4

$500 What numbers appear to be carved into the Ishango Bone and why are they important?

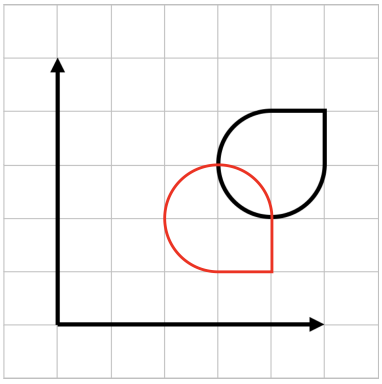
Answer: The sequence of prime numbers 11, 13, 17 and 19 are carved into the Ishango Bone.

Shapeshifting

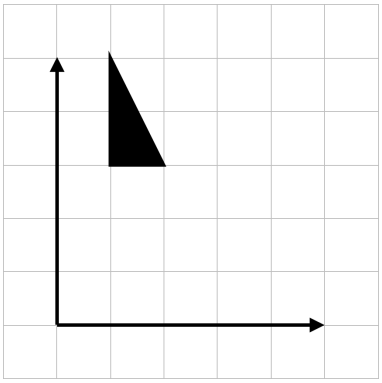
$100 This shape has a vertex at (5,4). Where will it be after the shape is rotated by 90° clockwise around (3,3)?



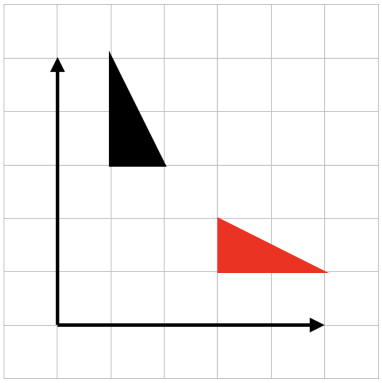
Answer: (4,1)



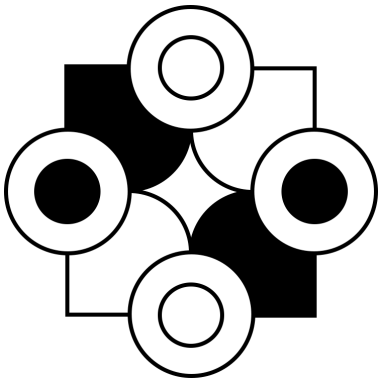
$200 Where will the 3 points of this triangle be after being reflected across the line made by (0,0) and (5,5)?



Answer: (3,2), (3,1) and (5,1)

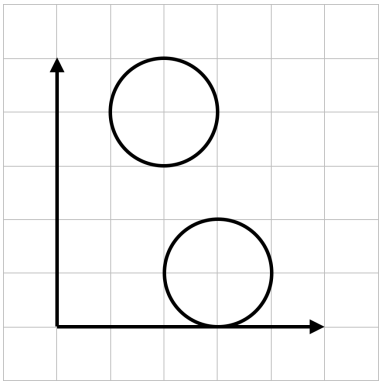


$300 How many rotational and bilateral symmetries does this object have?

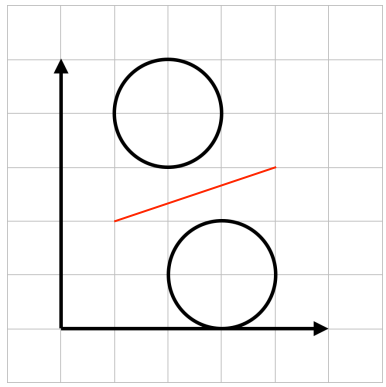


Answer: The given figure has no bilateral symmetries and exactly 1 rotational symmetry.

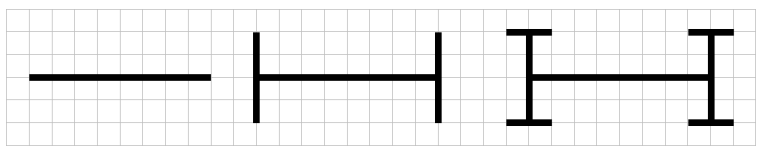
$400 What 2 points create the line that has reflected this object?



Answer: The points (1,2) and (4,3).



$500 Here are the first 3 iterations of a fractal. What is the total length of this fractal after n steps, considering that the first step has a length of 8?



Answer: $8n$

Estimations

No calculators allowed!

$100 Estimate the value of $\frac{7}{13}$ to 1 decimal place (round down).

Answer: 0.5

$200 The speed of light is 3×10^8 meters per second. What is its order of magnitude?

Answer: 8

$300 Approximate $\sqrt{37}$ to 1 decimal place (round up).

Answer: 6.1

$400 Write 12,902,871,192,202.145 in scientific notation.

Answer: $1.2902871192202145 \times 10^{13}$

$500 Which is bigger, 2.79×10^{12} or 39.921×10^{11}?

Answer: (b) (39.921×10^{11}) is bigger.

Algorithms

$100 True or false: A bubble sort algorithm isn't used often because it is very inefficient.

Answer: True.

$200 True or false: Comparing two items in a list usually takes more time than swapping the same two items.

Answer: False

$300 How many comparisons does a bubble sort algorithm make when run on the following list: {A, B, D, C, E}?

Answer: A bubble sort algorithm makes 4 comparisons when run on the above list.

Actually, it makes 8 - if you consider the fact that a pass through the list without any swaps is how the computer running the algorithm *knows* to stop sorting.

$400 How many swaps does a selection sort algorithm make on the following list: {B, E, C, D, A}? (Do not count self swaps).

Answer: 2 swaps.

$500 True or false: In the Game of Life, it is possible to make an algorithm that tells you if it's possible to get a given final state from another given initial state.

Note: This question is the **Daily Double** i.e. worth $1000.

Answer: False. As mentioned in class, this is the idea of **decidability**.

Cool Geometry

$100 True or false: The Pythagorean Theorem says that in a right triangle, $(Base)^2 + (Hypotenuse)^2 = (Height)^2$.

Answer: False

$200 What is the sum of the exterior angles of a regular pentagon?

Answer: $360°$. Remember the question asks for the sum of *exterior angles* and not interior angles.

$300 What is the sum of the interior angles of a heptagon (7 sides)?

Answer: $900°$. You can get this by using the angle sum formula with $n = 7$.

$400 The sum of the interior angles of a polygon is $1620°$. How many sides does it have?

Answer: 11 sides. You can get this answer by using the angle sum formula backwards to find the number of sides. An 11-sided polygon is called a **Hendecagon**.

$500 Can 8 units, 15 units and 17 units be the sides of a right triangle?

Answer: Yes. 8, 15 and 17 are Pythagorean triplets and so can be the sides of a right triangle.

Final Jeopardy

Getting this final question correct will *double* your current score!

There are three boxes. One is labeled "Apples", another is labeled "Oranges" and the last one is labeled "Apples and Oranges".

You know that each and every box is labeled incorrectly. If you're allowed to pick only 1 fruit from 1 box, which box will you pick from to determine the proper labeling of each box?

Answer: The box labeled 'Apples and Oranges'.

This is because all the labels are guaranteed to be wrong. So if you picked a fruit from the box labeled 'Apples and Oranges' and it turned out to be an apple, you know that the box labeled 'Apples' contains oranges.

Similarly, if you'd picked an orange from the box labeled 'Apples and Oranges', you know that the box labeled 'Oranges' contains apples.