Grade 7/8 Math Circles
November 28/29/30, 2017
Math Jeopardy

Introduction

This lessons covers all of the material (except graph theory) 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!

Series and Polygonal Numbers

$100 What is the sum of the natural numbers from 21 to 519?

$200 What is the sum of the odd numbers from 1 to 1001?

$300 True or False? The triangular numbers follow the pattern: odd odd, even, even odd, odd, even, even...etc.

$400 Find two square numbers that are also triangular numbers (*Excluding zero!*).

$500 What is the general sum of any two consecutive triangular numbers T_n and T_{n+1}? Make sure you simplify your answer!

Angles and Circles

$100 What is the circumference of a semi-circle if its diameter is 4 units?

$200 If a circle had 400° instead of 360°, what would be the equivalent to 45°?

$300 Convert $\dfrac{270}{\pi}°$ to radians.

$400 What is the length of an arc that subtends an angle of 3 radians from the center of a circle with a radius of 2.5 units?

$500 How many full rotations does a wheel of radius 22" make if it comes to a stop 150 meters from its starting point?

Probability

$100 When rolling a 27-sided die (with the numbers 1 to 27), what is the probability of getting a number less than 9?

$200 What is the probability of flipping a coin 5 times, and getting 3 heads, a tail and then another head, in that order?

$300 If you roll a 6-sided die twice, what is the probability that you will get two numbers that add up to 8?

$400 A medical test has a 40% chance of detecting a disease correctly. If 100 people are tested at random, how many have the disease?

$500 In a room of 25 people, what probability is the closest to the probability of two people sharing a birthday?

    a) 0%

    b) 25%

    c) 50%

    d) 75%

    e) 100%

Scientific Equations

$100 Traveling at a speed of 30 kilometers per hour, how many minutes would it take to travel 1,500 meters?

$200 The speed of sound in air is about 343 meters per second. If you hear thunder 8 seconds after seeing a lightening bolt, approximately how far away was the bolt?

$300 One of Albert Einstein's famous equations is $E = mc^2$. From this, what equations can be used to solve for m and c?

$400 If given voltage V, current I, resistance R and power P, what are two other *distinct* ways to write the power equation if $V = IR$ and $P = VI$?

$500 The Moon has a mass of about 7.35×10^{22} kilograms, and a radius of about 1,700 kilometers. What is its density in grams per cubic centimeter $\left(\frac{g}{cm^3}\right)$?
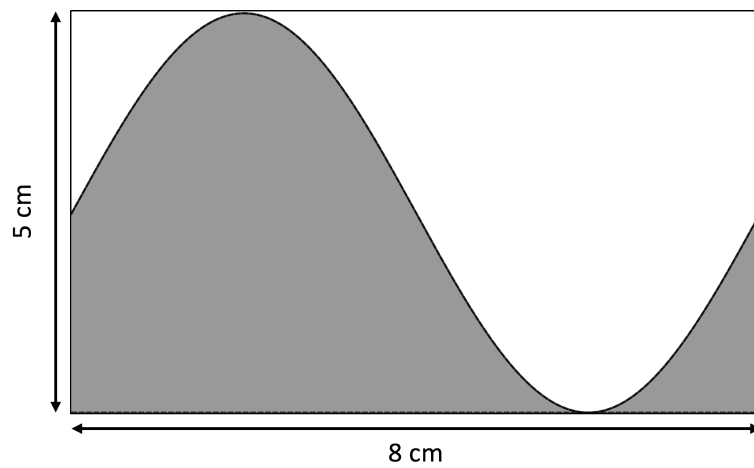
Estimations

\$100 Estimate the value of 209.75×3932.1625.

\$200 Estimate the value of $2^{300} \times \pi^{20}$.

\$300 Estimate the area of this shape:

\$400 Estimate how many centimeters the average fingernail grows per year.

\$500 Estimate the value of:

$$\frac{(\pi^{2\sqrt{2}})^{\pi}}{\pi^2} + 2,500$$

The Scale of Numbers

$100 Sort these three numbers from smallest to largest: $2 \uparrow\uparrow 4$, 67 million, and 7.92×10^9.

$200 Using the numbers 2, 5 and 7, what is the exponent tower that you can make with the largest value?

$300 Skewe's Number can be written as $S_k = 10^{10^{10^{34}}}$. What is the smallest n such that $2 \uparrow\uparrow\uparrow n$ is larger than S_k?

$400 What is the value of n in the following equation:

$$(2 \uparrow\uparrow\uparrow 3) \times (2 \uparrow\uparrow 4) \times (4 \uparrow\uparrow 2) = 2^n$$

$500 What is the smallest magnitude number you can make with BEDMAS operations and the numbers: π, $\sqrt{2}$, 0.5, and 10 all at most once each?

Final Jeopardy

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

If the big circle in this diagram has an area of 50 cm^2, what is the area of the *un-shaded* region (i.e. everything that is white and inside the perimeter of the square)?