Introduction

This lesson covers all of the material (except graph theory) that we have gone 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 $400^\circ$ instead of $360^\circ$, what would be the equivalent to $45^\circ$?

$300$ Convert $\frac{270}{\pi}^\circ$ 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 $22^\prime$ 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 $7.35 \times 10^{22}$ kilograms, and a radius of about 1,700 kilometers. What is its density in grams per cubic centimeter ($\frac{g}{cm^3}$)?
Estimations

No calculators allowed!

$100$ Estimate the value of $209.75 \times 3932.1625$.

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

$300$ Estimate the area of this shape:

![Graph of a shaded area between 5 cm and 8 cm]

$400$ 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 $7.92 \times 10^9$.

$200$ 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 $2 \uparrow\uparrow\uparrow\uparrow n$ 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: $\pi$, $\sqrt{2}$, 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)?