Preliminary Round
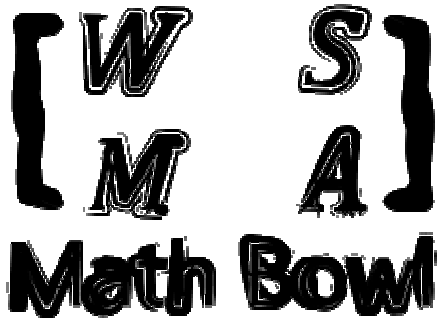
2nd Annual WSMA Math Bowl
April 28, 2012

Round 1

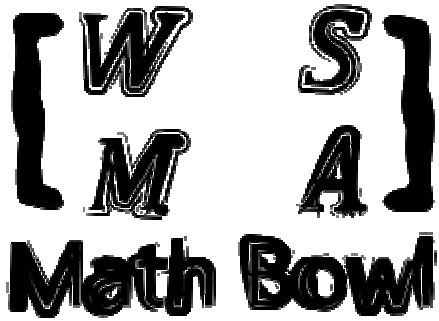Find the sum of the first 8 triangular numbers.

[WSMA]
Math Bowl
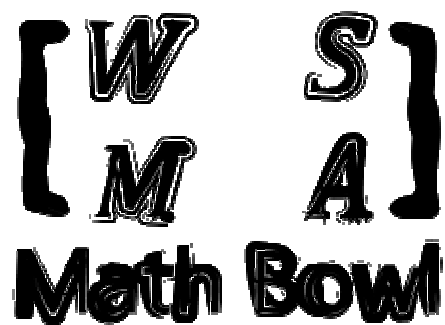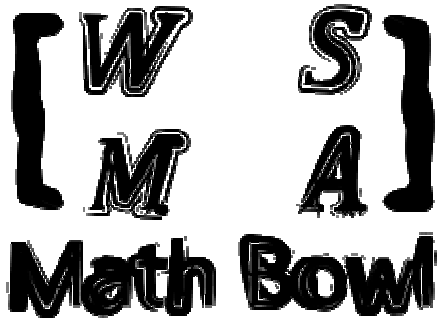
Find the product of the digits of 7^3.

Problem 3

The Mature One, the Grinch, the Gnome, Tweedledum and Tweedledee sit around a circular table and play a game of nim. How many distinct ways can they be seated around the table if rotations are not counted as distinct?
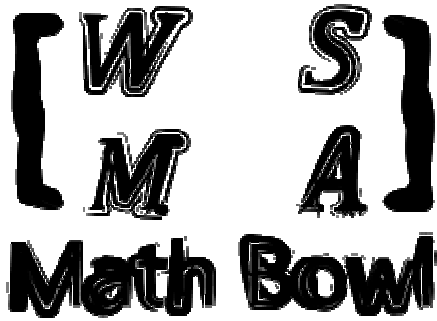
The flag of Zimmerland has five vertical stripes, randomly colored red, orange, or white. Given that the middle stripe must be red, what is the probability that no two neighboring stripes are the same color?

Arqun applied to 17 schools, and his admission is determined by a flip of a fair coin, where heads is admitted and tails rejected. In how many ways could he get into exactly 13 schools, given that he was adMITted to MIT?
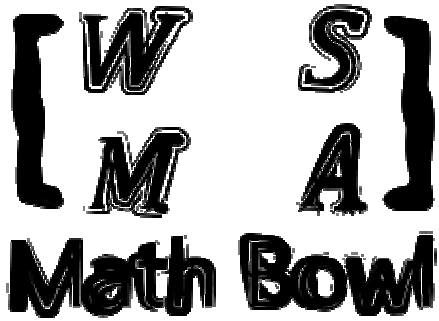
[W S M A] Math Bowl

Eff and Biho are running around a circular track in opposite directions. Eff completes a lap in 72 seconds, while Biho runs 3/4 of a lap in the same time. If they started at Point A at 12:17 pm and stopped when they both reached Point A during the same day at 1:29 pm, how many laps has Biho run?
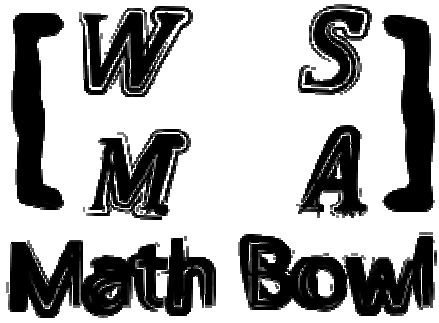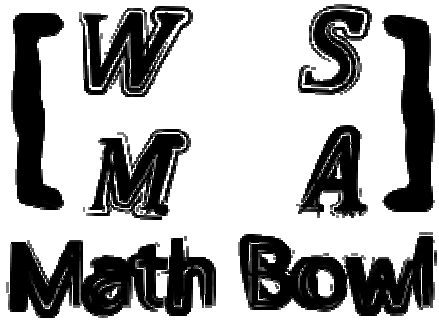
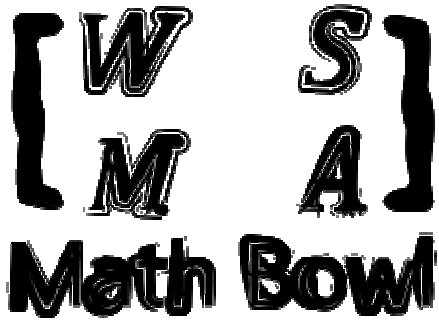Find the sum of the first 10 tetrahedral numbers.

Problem 8

Evaluate: ((M * A) / (T + H)) and express your answer as a common fraction given:

- M = the height of a triangle with area 91 and base 26

- A = the area of a circle with formula $x^2 + y^2 - 38x + 6y + 201 = 0$

- T = the number of edges on a pentagonal pyramid

- H = the maximum number of regions that a plane can be divided into using 5 straight lines
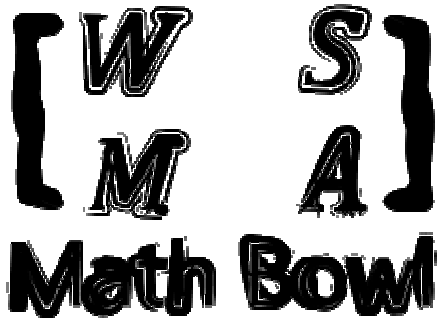
[W S
W S
M A]
Math Bowl

A beaver is tethered to a corner of a hexagonal greenhouse with side length 12 feet by a leash of 15 feet. What is the maximum area that the beaver can reach?
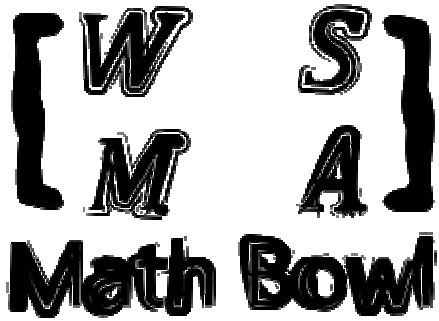
Problem 10

Which of the following statements are possible?
The sum of fourteen consecutive positive
integers:

A) Is an integer.

B) Is even.

C) Is odd.

D) Could be 98.

E) Could be 105.

Problem 11

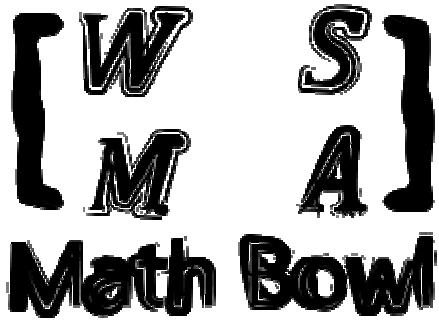The day before three days after tomorrow is Friday. What day of the week was it 198 days ago?

Alpha, Beta, Gamma, Delta, Epsilon, and Omega sit around a circular table and practice for their AP Calculus exam. If they randomly choose seats, what is the probability that star-crossed lovers Delta and Epsilon are not sitting next to each other?
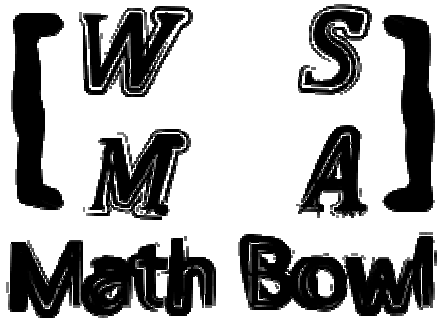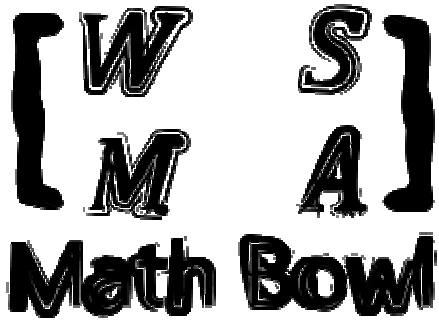
Round 2

Problem 1

Omega and Omicron are pushing a rock up a 100 foot-long slope. Working together, they can push the rock up 16 feet before getting into an argument, and the rock slips five feet before they catch it. If they continue this cycle until the rock reaches the top of the hill, during which number cycle do they reach the top?
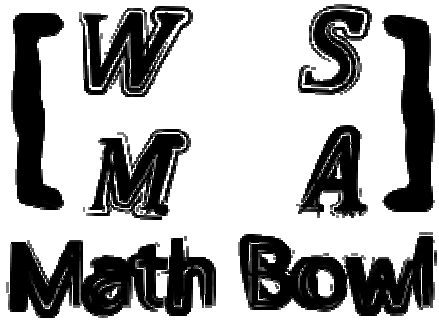
[W S]
[M A]
Math Bowl

Russell has a jar of chocolate chips. He gives away one-third to Peter, eats eighteen, gives Louis half of the remaining, then another half of the rest to Steven, and Ryan eats the remaining forty-three chocolate chips. How many cookies were in the jar to begin with?

What is the closest integer to the length of the longest line segment that can be contained inside a cylinder with radius 9 and height 80?
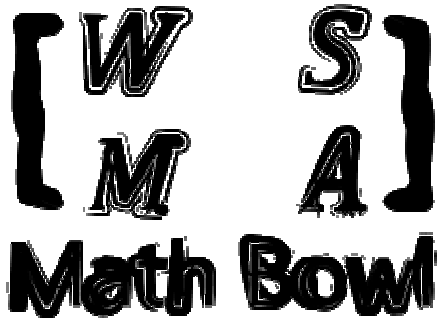
Every two days, Ben loses a pencil. Every three days, Ben breaks a pencil. Every eight days, Ben finds a pencil. Every eleven days, a mysterious benefactor gives Ben another pencil. If the most recent time that all four of these events occurred on the same day was Tuesday, on what day of the week is the next concurrence of all four events?
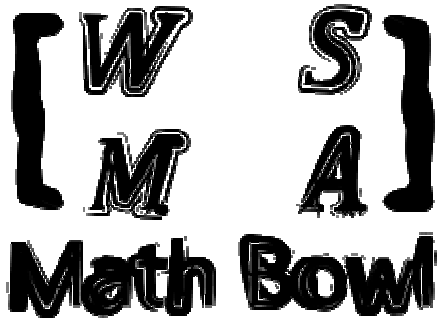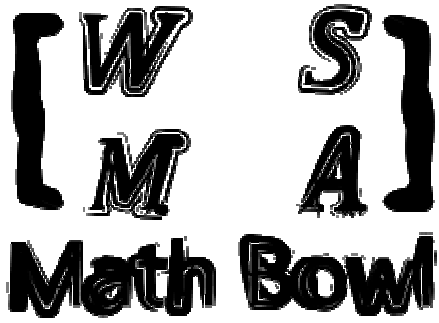
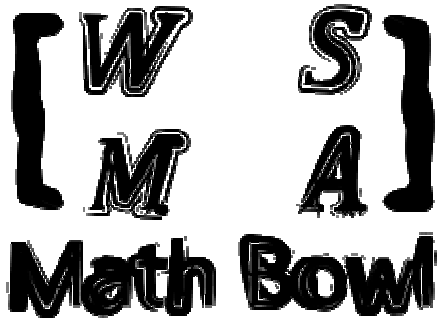Find the product of the digits of 6^4.

Problem 6

Let T be the right triangle with perimeter 12 and integral side lengths. Four years ago, Omega was twice Omicron's age. Now the ratio of Omega's age to Omicron's age is equivalent to the ratio of the hypotenuse to the shorter leg of T. What is the positive difference of their ages?
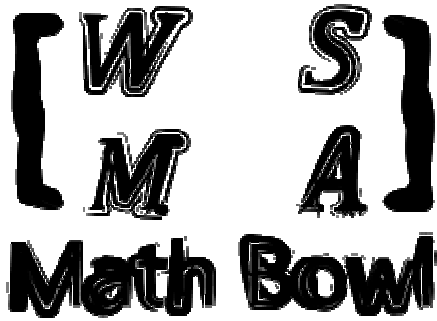
Problem 7

A regular N-gon has interior angles of 168°. Find N.

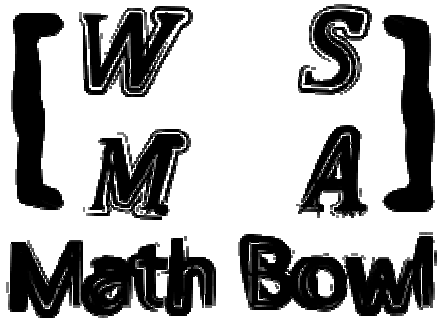During what month does the 212nd day of 2012 fall?

Pei has 5 cubes with side lengths 7, 4, 3, 1, and 1. She is going to glue them together, face to face, such that the resulting figure has the smallest possible surface area. What is this surface area?
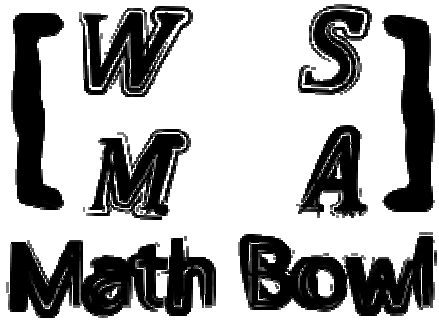
[W S
 M A]
Math Bowl

At Lambda High School, the class of 2012 has 200 members. Of these students, 100 are taking calculus, 120 are taking physics, and 50 are taking statistics. 72 are taking both calculus and physics, 10 are taking calculus and statistics, 20 are taking physics and statistics, and 3 are taking all three. If a senior from Lambda High is selected at random, what is the probability that this student is taking none of these three classes?
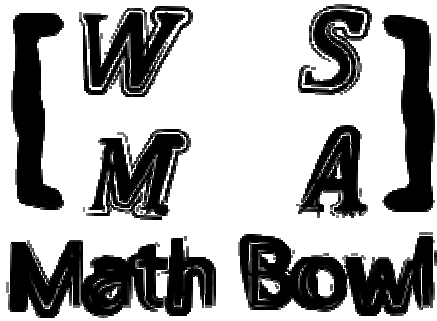
At Phi's Apple Orchard, every 15th apple is bruised, every 24th apple has worms, and every 33rd apple is unripe. The rest of the apples are perfect. In a shipment of 1800 apples, how many perfect apples are there?
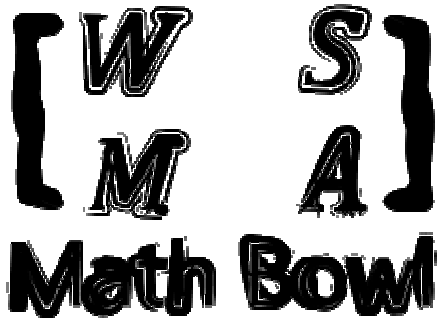
Problem 12

Sally is building snowmen. The first one she builds is 72 inches high. If each successive snowman she builds is 2/3 the height of the previous one, how many snowmen taller than one foot does she build?
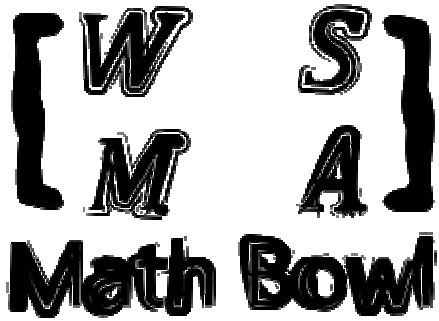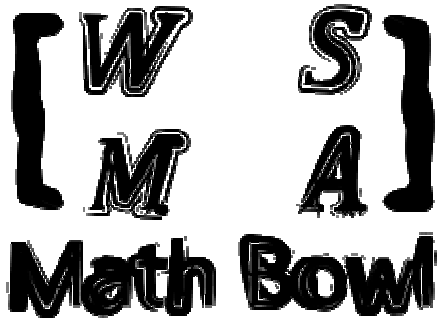
Round 3

Problem 1

If James disposes of two micropipet tips per well and one additional tip per plate, how many micropipet tips will he dispose when setting up four 96 well plates, where each plate contains 96 wells?
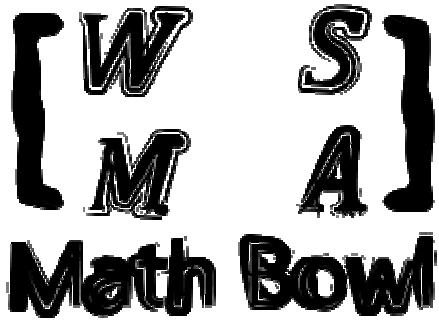
[W S M A] Math Bowl

If it takes Elena 18 minutes to drive to the lab, seven minutes less than twice that time to start her car from the time she wakes up and 2 minutes more than 1/3 of her drive time to get up the elevator after she parks, when will Elena arrive in the lab if she wakes up at 8:22 am? Express your answer in hours and minutes, and include am or pm.

[W S M A] Math Bowl

Compute the time in minutes between Sophia's arrival time and Elena's arrival time if Sophia arrives in the lab at 9:27 am and Elena, having overslept, arrives at 2:13 pm.
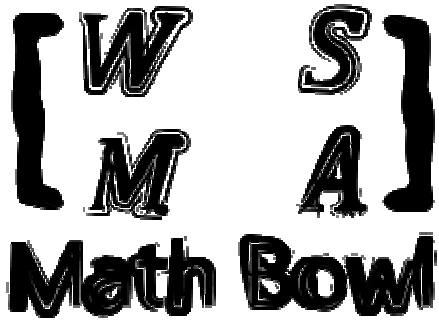
Problem 4

If it takes 3 minutes to complete a transaction at the LIRR ticket purchase station, how many minutes would a group of 12 students save if one student were to purchase all the tickets rather than each person purchasing a ticket separately?
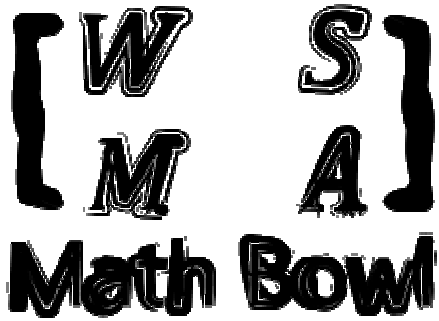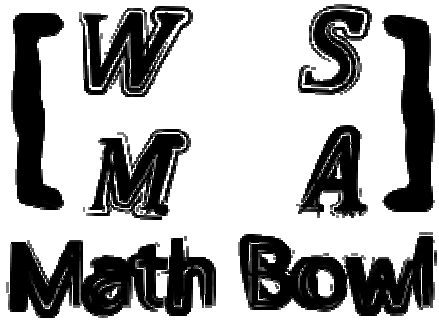
How much money does Alissa spend at the cafeteria per seven day week if, daily, breakfast costs $3, lunch costs $7, dinner costs $5, and she eats three meals per day?
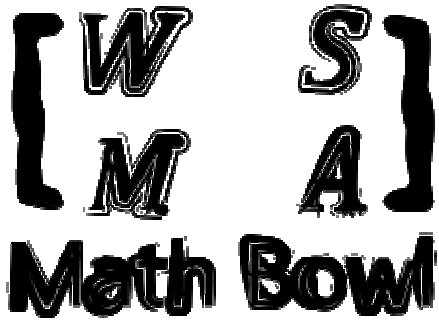
Problem 6

Compute the total amount of time spent on the road in hours and minutes if Woo Suk lives 3 minutes away from the hospital, the hospital is 43 minutes away from Cold Spring Harbor Laboratories, and Woo Suk makes a round trip, from his house to the hospital to Cold Spring Harbor back to the hospital and back home again.

Edison has twelve Erlenmeyer flasks of bacteria growing in 1.5 liters of LB that he needs to spin down. If he has six 1 liter jugs at his disposal, how many spin cycles will it take to completely process all the bacteria?
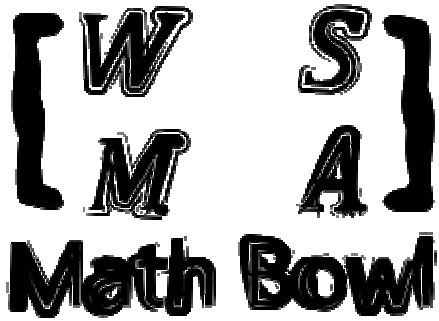
Problem 8

If Leah dispenses 26.88 milliliters of fluid into some 96 well plates where each well contains 70 microliters of fluid, calculate the number of plates she has prepared.
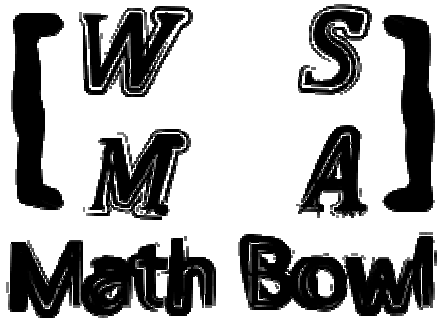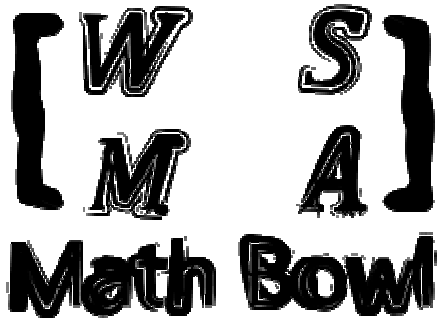
Yu wants to make a buffer containing 40 parts imidazole for every 1 million parts of the total solution. If he uses 0.8 milliliters of imidazole, what is the final volume of the buffer, in liters?
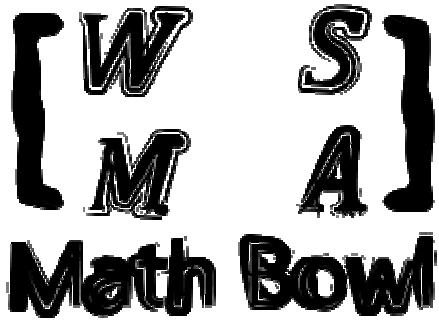
There are 6 available spaces in a Tetris tournament. How many ways are there for a 1st, 2nd, and 3rd place finish in a group of 9 friends?

A fly is located at a vertex of a rectangle with side lengths 5cm and 10cm. If the fly can walk only 1cm either horizontally or vertically per step, how many paths can the fly take walking 15cm to reach the other end?

[W S M A] Math Bowl

Ken is sleepwalking in the lab and encounters the FPLC. There are 4 input tubes and 4 output tubes. What is the probability that he correctly connects exactly one set of tubes?