

**Math League 12200 (high school), selected questions**

Sprint 1 _____ Melody gives away pencils to classrooms, and each box of pencils has 12 pencils. In the first building, Melody gives away 12 boxes of pencils, and in the second building, Melody gives away 18 boxes of pencils. How many total pencils did Melody give away in both buildings?

Sprint 2 _____ Compute the product $1\frac{1}{2} \cdot 2\frac{1}{3} \cdot 3\frac{1}{7}$

Sprint 3 _____ Dong Ho is running a local fair where the ticket price is \$2 per child and \$5 per adult. If there are ten times as many adults who bought tickets for the fair as there are children, and the total revenue from tickets one day is \$780, how many adults bought tickets for the fair?

Sprint 5 _____ A cube has side length 2. What is the positive numerical difference between the sum of the lengths of its edges and its surface area?

Sprint 6 _____ Jeremiah's plant is 9 inches tall at noon on Thursday. For the next two weeks, the plant grows by 1 inch every 48 hours. Jeremiah plans on cutting the plant once the plant reaches 15 inches tall. On what day of the week should Jeremiah cut the plant?

Sprint 7 _____ The Dream Kingdom has 86 members in its parliament, and in order to pass a law, at least 75% of the parliament must vote "Yes". In a recent vote, a food law did not pass, and would have passed if and only if at least 3 more members had voted "Yes". How many members voted "Yes" in that vote?

Sprint 16 (modified) _____ On a remote island, there are 4 people, each of whom is either a truth-teller (and only says true statements) or a liar (and only says false statements). Each person on the island makes one statement describing each other person on the island, saying whether that person is a truth-teller or liar, for a total of 3 statements per person. Compute the maximum possible number of these statements that can call the other person a liar.

Sprint 20 (modified) _____ A square table can fit up to four chairs around it, one for each edge. Meri adjoins 6 of these tables together to form one rectangular table. The maximum number of



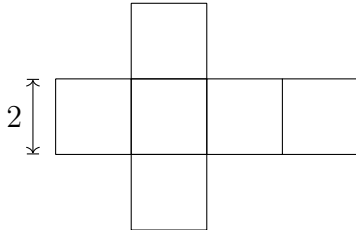
chairs that can fit around this large table is N , one for each edge of a small table comprising the sides of the large table. Compute the sum of all possible values of N .

Target 1 (modified) _____ Nico received a jar of 90 jellybeans as a gift. The colors of the jellybeans are red, green, and blue. Upon eating 7 red jellybeans, 10 blue jellybeans, and 13 green jellybeans from the jar, Nico observed that there are an equal number of remaining jellybeans of each color. How many green jellybeans were originally in the jar before Nico ate any?

Target 7 _____ Hardworking Hudson works 40 hours per week (Monday-Friday). Each weekday, he works an integer number of hours between 7 and 10, inclusive. He also never works fewer hours than he did the day before. In how many different ways can he distribute his work hours between the five weekdays?

Math League 12300 (high school), selected questions

Sprint 1 _____ The “net” shown below is of a 3D figure where all the faces are squares. The side lengths are marked as shown. What is the volume of the 3D figure formed by the net?



Sprint 2 _____ Kyle’s teacher assigns him to do all odd-numbered problems from Problem 1 to Problem 19 inclusive. How many problems must Kyle do for homework?

Sprint 3 _____ Andrew wants to sign up for a special cup where his monsters can fight other participants’ monsters. The only monsters that can participate in the cup are monsters whose ID number is at most 151 and whose power level is at most 1500. The table below lists the ID number and power level of his six favorite monsters. How many of these monsters can participate in the cup?

| Name | ID Number | Power Level |
|-----------|-----------|-------------|
| Blasty | 9 | 1472 |
| Big Ounce | 6 | 1792 |
| Ferno | 391 | 1373 |
| Holmes | 25 | 969 |
| Pirouette | 648 | 1675 |
| Sarpal | 131 | 1550 |

Sprint 4 _____ Of the five descriptions below, which describe quadrilaterals that CANNOT exist? (It could be one, multiple, all, or none.)

- I. A parallelogram with exactly 3 obtuse angles
- II. A rhombus with exactly 4 right angles
- III. A trapezoid with at least 2 angles with equal measure
- IV. A rectangle with no right angles
- V. A quadrilateral with all angles of different measure



Sprint 6 _____ Chelina is currently at Page 13 of a humanities text but hasn't read the page yet. She starts reading on Monday but has to finish Page 100 by Friday of the same week. She plans to read the same number of pages every day until the day before the due date, but because the discussion is on Friday, she does not plan on reading any pages on Friday. How many pages does Chelina need to read every day in order to reach the goal?

Sprint 7 _____ Each of the side lengths of a certain quadrilateral is either 5 or 22, and its perimeter is an odd number. What is the perimeter of the quadrilateral?

Sprint 9 _____ The side lengths of a rectangle with area 25 are whole numbers, and the diagonals of this rectangle are not perpendicular. What is the perimeter of this rectangle?

Sprint 12 _____ An infused drink is made by putting some combination of sliced fruits in a dispenser filled with water. If the choices of fruits to include are peaches, pomelos, and persimmons, how many different kinds of infused drinks can be made? (At least one type of fruit must be used.)

Power 1(a) _____ How many total digits are in the base-10 written representation of all integers from 1 to 100, inclusive? Do not include leading zeros.

Power 1(b) _____ How many total digits are in the base-10 written representation of all integers from 1 to 1000, inclusive? Do not include leading zeros.

Power 1(c) _____ How many total digits are in the base-10 written representation of all integers from 1 to 10000, inclusive? Do not include leading zeros.

Power 2(a) _____ How many total zeros are in the base-10 written representation of all integers from 1 to 100, inclusive? Do not include leading zeros.

Power 2(b) _____ How many total zeros are in the base-10 written representation of all integers from 1 to 1000, inclusive? Do not include leading zeros.

Power 2(c) _____ How many total zeros are in the base-10 written representation of all integers



from 1 to 10000, inclusive? Do not include leading zeros.

Power 6 (modified) _____ For each of the digits 1 through 9, how many total copies of that digit are in the base-10 written representation of all integers from 1 to 100, inclusive? Or 1 to 1000? (Original: 1 to 10^n)

Power 8(b) (modified) _____ How many total ones are in the base-2 written representation of all integers from 1 to 16, inclusive? How many total digits? What about 1 to 32, or 1 to 64? (Note: base-2 is also known as “binary”; instead of the base-10 column values of 1, 10, 100, etc., moving from right to left, the column values are 1, 2, 4, 8, etc.; for example, counting from 1 to 5, the base-2 representations are 1, 10, 11, 100, 101.)

Target 1 _____ On a field trip, Steve brought 100 students to lunch at Kay’s Cafe to get hamburgers, which can either be gluten-free or not gluten-free. The regular hamburgers cost \$5.50 each, while the gluten-free hamburgers cost \$7.50 each. One-fourth of the students have a gluten allergy, so they must get gluten-free hamburgers. (Other students may have either option.) How many dollars is the positive difference between the minimum and maximum cost of giving lunch to all the students?

Target 3 _____ A cylinder has radius 13 and height 37. A plane perpendicular to the circular faces of the cylinder slices through the cylinder while passing through the centers of the circular faces. Compute the perimeter of the resulting cross section.

Target 6 (modified) _____ A plane figure composed of four equilateral triangles joined along 3 of their edges can be folded up along those edges into a regular tetrahedron. Given that each equilateral triangle has sides of length 3cm each, what is the total outer perimeter of this figure?

Team 1 _____ Yuyao draws line segment \overline{AB} . He then draws a circle with radius AB and center A and a circle with radius AB and center B , and then he marks the two intersections of the circles as points C and D . He then draws \overline{CD} and marks the intersection of \overline{AB} and \overline{CD} as point X . Compute the degree measure of $\angle AXC$.

Team 2 _____ Wei thinks of a number. She writes down that number, the result when the number is rounded up to the nearest ten, and the result when the number is rounded up to the nearest



hundred. Finally, she adds up the three written numbers and gets a result of 1737. What number was Wei thinking of?

Team 4 (modified) _____ At a party with 10 people, 5 of them are introverted and the other 5 of them are extroverted. Each of the 5 extroverted people shakes hands exactly once with every other person. However, the introverted people do not take part in any additional handshakes. In total, how many handshakes take place?