MATHCOUNTS®

2020
■ **School Competition** ■
Target Round
Problems 1 & 2

Name _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This section of the competition consists of eight problems, which will be presented in pairs. Work on one pair of problems will be completed and answers will be collected before the next pair is distributed. The time limit for each pair of problems is six minutes. The first pair of problems is on the other side of this sheet. When told to do so, turn the page over and begin working. This round assumes the use of calculators, and calculations also may be done on scratch paper, but no other aids are allowed. All answers must be complete, legible and simplified to lowest terms. Record only final answers in the blanks in the left-hand column of the problem sheets. If you complete the problems before time is called, use the time remaining to check your answers.

Problem 1	Problem 2	Scorer's Initials

Raytheon

0
1
2
3
4
5
6
7
8
9

1. $ _____   Charles has opened a service, called Charlie's Chores, that performs various household chores for families in his neighborhood. The table shows the amount he charges for each chore and how many times he was hired to complete that chore in January. How much money in dollars did Charlie's Chores earn in the month of January?

Chore	Amount	Hires
1. clothes ironing	$9.50	10
2. dog walking	$7.50	12
3. kitchen cleaning	$12.00	7
4. snow shoveling	$14.00	5

2. _____ points   Sunil draws a regular hexagon and a convex quadrilateral on a sheet of paper, so that no side of the quadrilateral lies on the same line as a side of the hexagon. What is the maximum total number of points in which the sides of the quadrilateral can intersect the sides of the hexagon?

MATHCOUNTS®

2020

■ **School Competition** ■
Target Round
Problems 3 & 4

Name _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

Problem 3	Problem 4	Scorer's Initials

0
1
2
3
4
5
6
7
8
9

3. _____ days   Penelope and George go trick-or-treating together. Penelope gets 152 pieces of candy and George gets 124 pieces of candy. Penelope eats 5 pieces of candy every day, and George eats 4 pieces of candy every day. After how many days will George have the same amount of candy as Penelope?

4. _____ bushels   Rosie grows 160 bushels of corn per acre in a right triangular field, as shown, with perpendicular sides of lengths 660 feet and 1320 feet. Given that an acre equals 43,560 ft^2, what is the total number of bushels of corn that Rosie grows?

660 feet

1320 feet
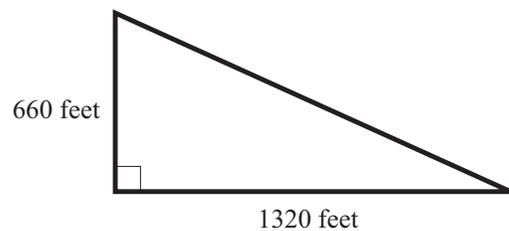
MATHCOUNTS®

2020

◼ **School Competition** ◼
Target Round
Problems 5 & 6

Name _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

Problem 5	Problem 6	Scorer's Initials

0
1
2
3
4
5
6
7
8
9

5. _____% A standard, six-sided die is rolled five times. What is the probability that the five rolls are either all the same or all different? Express your answer to the nearest hundredth of a percent.

6. _____ If $(0, 0)$, $(6, 2)$, $(-2, 6)$ and (a, b) are the coordinates of the vertices of a parallelogram, what is the least possible value for $a + b$?

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2020

■ **School Competition** ■
Target Round
Problems 7 & 8

Name _____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

Problem 7	Problem 8	Scorer's Initials

0
1
2
3
4
5
6
7
8
9

7. _____ orders   Alan, Ben and Craig, who have three distinct ages, are among five children running a race. Assuming there are no ties, in how many different orders can the five children finish the race with Alan, Ben and Craig in order from oldest to youngest?

8. _____   Let a *trime* be defined as a three-digit integer for which any two digits of the integer, ordered as they appear in the original integer, form a two-digit prime number. For example, 137 is a trime because 13, 17 and 37 are all prime numbers. However, 211 is not a trime because 21 is not prime. What is the greatest trime?

MATHCOUNTS®

2020
■ **School Competition** ■
Team Round
Problems 1–10

| 0 |
| 1 |
| 2 |
| 3 |
| 4 |
| 5 |
| 6 |
| 7 |
| 8 |
| 9 |

Team
Members _____ , Captain

_____

_____

_____

DO NOT BEGIN UNTIL YOU ARE INSTRUCTED TO DO SO.

This section of the competition consists of 10 problems which the team has 20 minutes to complete. Team members may work together in any way to solve the problems. Team members may talk to each other during this section of the competition. This round assumes the use of calculators, and calculations also may be done on scratch paper, but no other aids are allowed. All answers must be complete, legible and simplified to lowest terms. The team captain must record the team's official answers on his/her own competition booklet, which is the only booklet that will be scored. If the team completes the problems before time is called, use the remaining time to check your answers.

Total Correct	Scorer's Initials

1. _____ %

Zoo Animals
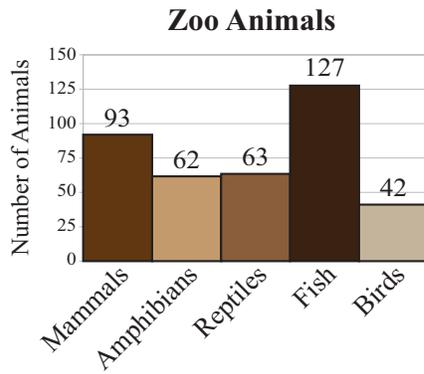
William counted all the animals he saw at the zoo. This graph shows the data he collected. Based on this, what percentage of the animals that William saw are mammals? Express your answer to the nearest hundredth.

2. _____ ways

How many ways are there to arrange the four integers 1, 2, 3 and 4 in a row so that no two adjacent numbers have a sum of 5?

3. _____

There are 93 sixth graders and 108 seventh graders entering a raffle. In each grade, the number of dog owners is twice the number of students who do not own a dog. What is the probability that a seventh grader who does not own a dog wins the raffle? Express your answer as a common fraction.

4. _____
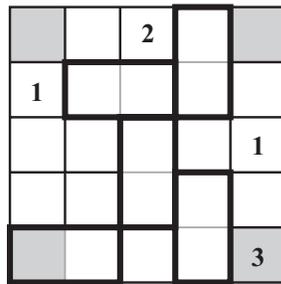
In the 5 × 5 grid shown, each row and each column is to contain the integers 1 through 5 exactly once with one integer per cell. The sum of the two integers in each outlined pair of cells is 5. What is the product of the integers in the four corner cells that are shaded?

5. _____ minutes

A satellite, located 400 km above Earth's surface, travels at a speed of 28,000 km/h. For simplicity, assume that Earth is a perfect sphere with circumference 40,075 km. How many minutes does it take the satellite to orbit Earth one time? Express your answer as a decimal to the nearest tenth.
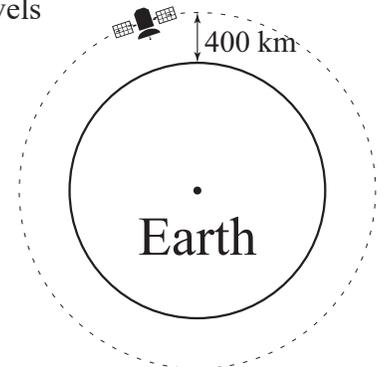
6. _____ Three children each live in one of three houses, equally spaced and arranged as shown. Each child is equally likely to live in any of the houses, and it is possible that a house has no children living in it. All three children will play in the house that minimizes the total distance they have to travel. What is the probability that they will play in house B? Express your answer as a common fraction.

A   **B**   **C**

7. _____ integers How many distinct positive integers n can be expressed as $n = ab$ for integers such that $1 \le a \le 10$ and $1 \le b \le 10$?

8. _____ ft² In the figure, square ABCD has side length 6 feet, and E is a point in the exterior of the square such that triangle ADE is equilateral. How many square feet are in the area of shaded triangle BEC? Express your answer as a decimal to the nearest tenth.

9. _____ units² What is the area of the quadrilateral ABCD as shown?
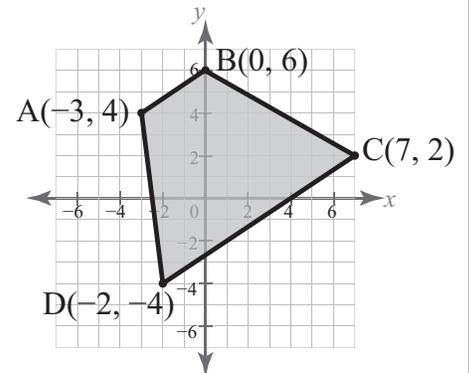
10. _____ integers How many of the first million positive integers share no common factors greater than 1 with 2020?