Mission Math Utah

Spring Competition

Middle School Division: Free Response

March 17, 2018

Name: _____

School: _____

Grade: _____

General Information

- Do not open your test until you are instructed to do so by the proctor.

- Correctly fill out the information above in a legible manner.

- This section contains **10 Free Response Questions**. You will have exactly **20 minutes** to work on them.

- Electronic devices such as graphing calculators, cell phones, or watches with calculators, are not permitted during this test.

Grading

- Each correct answer will be worth 1 points.

- Each incorrect answer will be worth 0 points.

- Each blank answer will be worth 0 points.
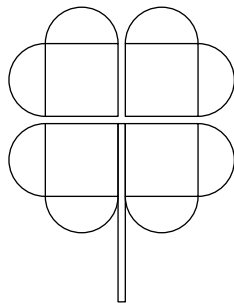
- Partial credit will not be awarded.

Answer Forms

- Answers must be marked clearly on the answer form in the allotted space.

- All answers must be expressed in the appropriate form as specified in the question. All answers should include units if necessary.

- Please write all answers legibly. Your answer will be marked incorrect if the graders are unable to understand your answer.

These problems are meant to be challenging. Don't worry if you are unable to solve a problem. Try to focus on the ones you think you may be able to solve. Check your work once you are done. You may only turn your test in after 15 minutes have passed.

1. There are 4 yellow stones and a number of blue stones in an urn. If 1/3 of the stones are yellow, how many are blue?

1. _____ stones

2. I have a number. I subtract 1, multiply by 2, divide by 3, and then add 4. I now have 10. What was my original number?

2. _____

3. A lily pad is growing in a pond and it doubles in size every day. After 20 days it covers the entire pond. After how many days does it cover half the pond?

3. _____ days

4. What is the probability of flipping a fair coin three times and getting exactly two heads? Express your answer as a common fraction.

4. _____

5. For how many positive two-digit integers is the sum of the digits a perfect square?

5. _____ integers

6. A four-leaf clover consists of a stem, of area 1 square inch, and four leaves. Each leaf is made of a square of side length 3 inches and two semicircles on the sides of the square. What is the area of the clover in square inches? Express your answer in terms of π.

6. _____ in^2

7. Dev, Tarun and Shilp are climbing Mount Everest and their trek is 60,000 feet long. Dev hikes at a rate of 3,000 ft per day, but takes 2 breaks of 4 days each. Tarun hikes at a rate of 5,000 ft per day, but takes 6 breaks of 2 days each. Shilp hikes at a rate of 8,000 ft per day, but takes 9 breaks of 2 days each. Who reaches the top of the mountain first?
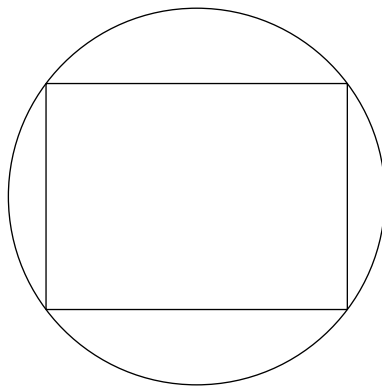
7. _____

8. Your friend Johnny bets that you can't guess the exact day and month that he was born. He gives you a few clues:

   - His birthday month consists of letters that can be scrambled in 120 different ways.

   - The day that he was born is a number that has 8 factors.

   - Adding together the day and the month of his birthday results in a number that is divisible by 7. (For example, July 6 would have a sum of $7 + 6 = 13$).

   When is Johnny's birthday? Express your answer in the form MM/DD.

8. _____

9. Alexa writes down on a blackboard all the positive integers where each consecutive pair of digits is a perfect square. For example, one of the numbers is 649 because the first two digits, 64, and the last two digits, 49, are both perfect squares. What is the largest number on her blackboard?

9. _____

10. A rectangle of perimeter 28 miles is inscribed in a circle of area 27π square miles. What is the area of the rectangle?

10. _____ mi^2

11. BONUS: On a scale of 1-10, how much do you love math?   11. _____