



Mission Math Utah

# Spring Competition

## Middle School Division: Free Response Test

March 16, 2019

Name: \_\_\_\_\_

### General Information

- Do not open this test until you are instructed to do so.
- This section contains **10 free response questions**. You will have exactly **20 minutes** to work on them.
- On the provided answer form, write the answer you think is correct in the given answer blanks.
- The answer to each question is a positive integer.
- Electronic devices, including calculators, must be turned off.
- You may do any work you want on this test, and you may keep the test once you are finished.

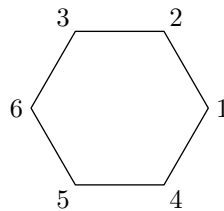
### Grading

- Each correct answer will be worth 2 points.
- Each incorrect or blank answer will be worth 0 points.
- Only answers marked on the provided answer form will be scored.

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These problems are meant to be challenging. Don't worry if you are unable to solve a problem. Try to focus on the problems you think you may be able to solve. You are not penalized for guessing, so **take an educated guess on any problems you are not able to solve**. If you finish before the time is up, use the remaining time to check your work.

1. Creon made \$210 from shoveling driveways in January. If he charges \$15 for each driveway he shovels, how many driveways did he shovel in January?
2. What is the largest three-digit number that is not a multiple of 3 or 7, and whose digits are all different and odd?
3. The angles of a triangle, in degrees, are three consecutive integers. What is the degree measure of the largest angle?
4. Adam and Billy each write two or three poems every day. Over a period of time, Adam wrote 27 poems while Billy wrote 37. How many days were in this period of time?
5. A rectangular box has faces with areas of 6, 14 and 21 square centimeters. What is the volume of the box, in cubic centimeters?
6. The vertices of a regular hexagon are labeled with the numbers 1 through 6 so that the sum of the numbers on each pair of opposite vertices is constant. One such labeling is shown. Rotations and reflections are considered to be *different* labelings. How many labelings are possible?



7. The number  $n$  is a positive integer such that both  $n+8$  and  $n-8$  are squares of nonnegative integers. What is the sum of all of the possible values of  $n$ ?

8. What is the least positive integer  $n$  such that  $10,920n$  is a perfect square?
9. Rob, Sophia, and Tabitha begin running towards the end of a rainbow at the same time. Rob runs for 8 minutes, then rests for 3 minutes, then runs for 8 minutes, rests for 3, and so on. Sophia follows the same pattern as Rob, running for 30 minutes and resting for 4 minutes at a time. Tabitha follows this pattern as well, running for 45 minutes, then resting for 5 minutes at a time. What is the least amount of minutes, after starting, after which all three runners will be resting?
10. In  $\triangle ABC$ ,  $\angle A = 60^\circ$  and  $BC = 12$ . The inscribed circle of  $\triangle ABC$  meets  $\overline{AB}$ ,  $\overline{BC}$ , and  $\overline{CA}$  at points  $R$ ,  $S$ , and  $T$  respectively. If  $RT = 5$ , what is the perimeter of  $\triangle ABC$ ?

