Mission Math Utah

Spring Competition

Middle School Division: Multiple Choice

March 17, 2018

Name: _____

School: _____

Grade: _____

General Information

- Do not open your test until you are instructed to do so by the proctor.
- This section contains **30 multiple choice problems**. You will have exactly **40 minutes** to work on them.
- Electronic devices, including calculators, must be turned off.

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. There will be 5 answer choices for each question. **Circle only one answer.**
- Correctly fill out the information above in a legible manner.

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. You are not penalized for guessing, so take an educated guess on any ones you are not able to solve. Check your work once you are done. You may only turn your test in after 30 minutes.

1. Alex planted 8 strawberry plants. How many more plants does Alex need in order to fill a row of 13 plants?

   (A) 3 **(B)** 4 **(C)** 5 **(D)** 6 **(E)** 7

2. Which of the following numbers is different from all the others?

   (A) $\frac{3}{4} \times \frac{2}{3}$ **(B)** $(\frac{1}{2})^2$ **(C)** 0.25 **(D)** $\frac{1}{12} + \frac{1}{6}$ **(E)** 25%

3. Blaine has 10 books which are either orange, green, or purple. If 5 books are orange and 2 books are green, how many books are purple?

   (A) 1 **(B)** 2 **(C)** 3 **(D)** 4 **(E)** 5

4. Michael has 6 fruity pebbles, which are twice as many fruity pebbles as Jim has. Pam has 8 more fruity pebbles than Jim, and Kevin has twice as many fruity pebbles as Pam. How many fruity pebbles does Kevin have?

   (A) 6 **(B)** 8 **(C)** 20 **(D)** 22 **(E)** 40

5. What is the measure of the angle that is formed by the minute hand and the hour hand on a clock at exactly 3 PM?

   (A) 15° **(B)** 30° **(C)** 45° **(D)** 60° **(E)** 90°

6. St. Olaf and St. Patrick are thinking of numbers. St. Olaf adds their numbers together and notices that the result is the same as his original number. What was St. Patrick's number?

   (A) -10 **(B)** 0 **(C)** 5 **(D)** 10 **(E)** 20

7. Which of the following numbers is less than its reciprocal?

   (A) -2 **(B)** -1 **(C)** -0.5 **(D)** 1 **(E)** 2

8. A student has 4 different assignments to do in 2 days. She wants to do 2 each day. How many different ways can she break up the assignments?

   (A) 3 **(B)** 6 **(C)** 9 **(D)** 12 **(E)** 24

9. In a right triangle, what is the arithmetic mean, in degrees, of the measures of the two smallest angles?

   (A) 15° **(B)** 30° **(C)** 45° **(D)** 60° **(E)** 90°

10. James has twice as many marbles as Jacob. Jacob has one third as many marbles as Max. Max has 36 marbles. How many marbles does James have?

    (A) 3 **(B)** 6 **(C)** 12 **(D)** 18 **(E)** 24

11. A square has area 36. A circle's radius has the same length as the square's side. What is the area of the circle?

    (A) 6π **(B)** 9π **(C)** 12π **(D)** 36π **(E)** 144π

12. Annie, Barton, Clive, Dan, and Elijah are sitting together on a row of 5 seats. Dan is not sitting next to Elijah, but is sitting next to Barton. Annie is next to Clive and Barton, and Elijah has an edge seat. Who is sitting in the middle?

    (A) Annie **(B)** Barton **(C)** Clive **(D)** Dan **(E)** Elijah

13. 50% of a number is 1 more than 40% of the same number. What is that number?

    (A) 8 **(B)** 9 **(C)** 10 **(D)** 11 **(E)** 12

14. How many positive three-digit integers are there in which each of the three digits is prime?

(A) 9 **(B)** 16 **(C)** 27 **(D)** 64 **(E)** 144

15. Alasdair has 10 cards numbered 1 through 10. He pulls out two cards without putting them back. What is the probability that he first pulls out an even number, and then a prime number?

(A) $\frac{1}{5}$ **(B)** $\frac{19}{90}$ **(C)** $\frac{2}{9}$ **(D)** $\frac{7}{30}$ **(E)** $\frac{11}{45}$

16. How many integers x satisfy $x^2 < |7x|$?

(A) 13 **(B)** 14 **(C)** 15 **(D)** 16 **(E)** 17

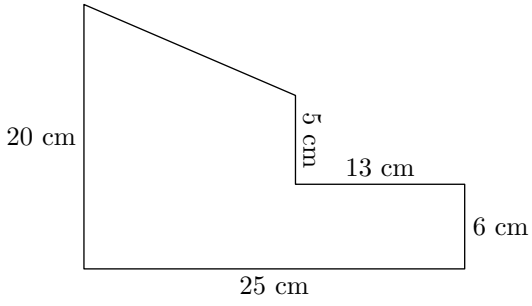
17. There are 10 sticks on a hill. After half of the sticks are broken in half, how many sticks are on the hill?

(A) 13 **(B)** 15 **(C)** 17 **(D)** 20 **(E)** 25

18. Mr. Dodge asked each of the 30 students in his class whether they preferred Vanilla or Chocolate Ice Cream. 20 students chose Vanilla, 11 students chose Chocolate, and 6 students chose neither. How many students liked both flavors?

(A) 1 **(B)** 7 **(C)** 31 **(D)** 24 **(E)** 25

19. Find the perimeter of the following shape:

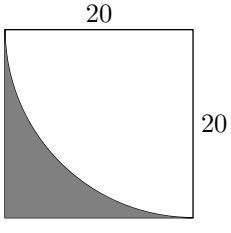


(A) 72 cm **(B)** 78 cm **(C)** 84 cm **(D)** 90 cm **(E)** 96 cm

20. A standard 6 sided die and a standard 8 sided die are rolled at the same time. What is the probability that the 6 sided die shows a greater number than the 8 sided die?

(A) $\frac{1}{4}$ **(B)** $\frac{13}{48}$ **(C)** $\frac{5}{16}$ **(D)** $\frac{1}{3}$ **(E)** $\frac{1}{2}$

21. Which integer is closest to the area of the shaded region?

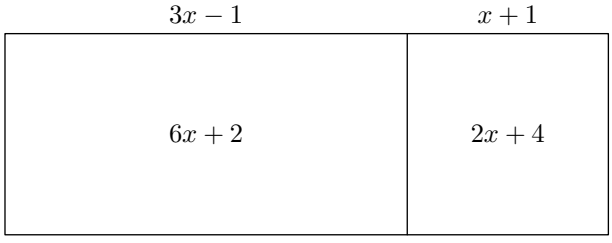


(A) 85 **(B)** 86 **(C)** 90 **(D)** 99 **(E)** 100

22. The factorial function $n!$ is the product of the integers from 1 to n; for example, $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$. Which of the following numbers is a perfect square?

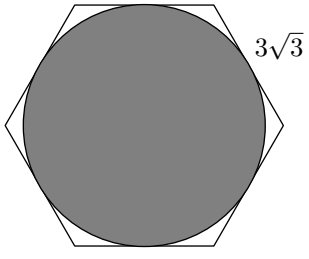
(A) 14!15! **(B)** 15!16! **(C)** 16!17! **(D)** 17!18! **(E)** 18!19!

23. The long side of a rectangle is cut into segments of length $x+1$ and $3x-1$, as shown, making rectangles of area $2x+4$ and $6x+2$. What is the area of the rectangle?



(A) 10 **(B)** 20 **(C)** 25 **(D)** 30 **(E)** 33

24. What is the area of a circle inscribed inside a regular hexagon with side length $3\sqrt{3}$?



(A) $\frac{27}{2}\pi$ **(B)** $\frac{81}{4}\pi$ **(C)** 27π **(D)** $\frac{81}{2}\pi$ **(E)** 81π

25. What is the greatest common divisor of 41^2-16 and 35^2-4?

(A) 1 **(B)** 3 **(C)** 37 **(D)** 38 **(E)** 111

26. The Apollo 11 space mission left Earth at about 2:00 pm on July 16, 1969. After landing humans on the moon for the first time, it returned at 5:00 pm a few days later. Which of the following could be the number of hours in the duration of the Apollo 11 mission?

(A) 195 **(B)** 205 **(C)** 215 **(D)** 225 **(E)** 235

27. Jihu writes a perfect square on a chalkboard. She increases the number by 50% and the result is a perfect cube. She then increases this number by 50%, obtaining a perfect fourth power. If the smallest possible original number is $2^a \cdot 3^b$, what is ab?

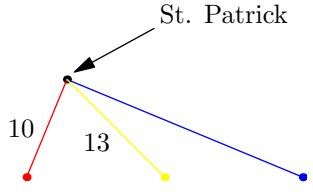
(A) 8 **(B)** 12 **(C)** 16 **(D)** 20 **(E)** 24

28. Saydee notes that $2^{20} = 1,048,576$. What is the closest integer to

$$1,000,000\left(\frac{1}{2}+\frac{1}{4}+\frac{1}{8}+\cdots+\frac{1}{2^{18}}+\frac{1}{2^{19}}\right)?$$

(A) 999,998 **(B)** 999,999 **(C)** 1,000,000 **(D)** 1,000,001 **(E)** 1,000,002

29. In a field, a red pole and a blue pole are 26 meters apart, with a yellow pole halfway between them. A red leash, blue leash, and yellow leash are attached to the corresponding-colored poles on one end, and St. Patrick the dog on the other end. If the red leash is 10 meters long and the yellow leash is 13 meters long, how many meters long is the blue leash?



(A) 18 **(B)** 20 **(C)** 22 **(D)** 24 **(E)** 26

30. Hallie the blind leprechaun sits atop the third in a straight row of five pots of gold in a field of clover. The middle three pots of gold are empty, and the outside pots are full. Whenever Hallie enters an empty pot of gold she exits on a rainbow either north, south, east, or west, each with probability 1/4. If Hallie ever takes a rainbow north or south, she falls into the clover, and going west or east takes her to the next pot of gold in that direction. What is the probability that Hallie lands in one of the full pots of gold before falling into the clover?

(A) $\frac{1}{8}$ **(B)** $\frac{1}{7}$ **(C)** $\frac{1}{4}$ **(D)** $\frac{1}{3}$ **(E)** $\frac{1}{2}$