Washington State Math Championship

$\sqrt{2013}$

Ferndale Refinery

Blaine School District

Individual – 5th Grade

Instructions: Problems 1 – 10 are multiple choice and count towards your team score. Bubble in the letter on your answer sheet. Be sure to erase all mistakes completely.

1. If the time is currently 8:13pm, what time will it be in 212 minutes?

   (A) 10:25pm **(B)** 10:45pm **(C)** 11:25pm **(D)** 11:45pm **(E)** 12:25am

2. Which of the following expressions shows "twice the sum of two and the square of the sum of six and seven"?

   (A) $2+(6+7^2)$ **(B)** $2\times(2+(6+7)^2)$ **(C)** $2\times(6+7)^2+2$ **(D)** $2\times(2+(6+7))^2$
   (E) None of the above

3. Which of the following sale prices reflects the greatest percentage discount from its corresponding regular price?

   (A) Originally \$20, Now \$12
   (B) Originally \$50, Now \$35
   (C) Originally \$60, Now \$50
   (D) Originally \$80, Now \$60
   (E) Originally \$100, Now \$75

4. Which of the following shapes has the most lines of symmetry?

   (A) Equilateral triangle **(B)** Rectangle that is not a square **(C)** Regular pentagon
   (D) Isosceles trapezoid **(E)** Square

5. If you have the box sets of the *Twilight* series, *Harry Potter* series, *Hunger Games* series, and the *Diary of a Wimpy Kid* series, how many unique ways are there to arrange them on the shelf?

   (A) 4 **(B)** 12 **(C)** 16 **(D)** 24 **(E)** 256

6. Which of the following accurately describes the product of two prime numbers?

   (A) Always even **(B)** Always odd **(C)** Sometimes a prime number
   (D) Always a prime number **(E)** None of these

7. If n is some positive integer, what is the sum of the integers from 1 to n, inclusively?

   (A) n^2 **(B)** $2n$ **(C)** $2(n+1)$ **(D)** $n(n+1)$ **(E)** $\frac{n(n+1)}{2}$

8. Which of the following shapes *cannot* have more than two obtuse angles?

   (A) Obtuse triangle **(B)** Quadrilateral **(C)** Pentagon **(D)** Octagon
   (E) All four can have more than two obtuse angles

9. In how many unique ways can the letters in the word "GANGNAM" be arranged?

   (A) 49 **(B)** 630 **(C)** 840 **(D)** 2520 **(E)** 5040

10. Suppose you and nineteen of your friends are sitting in a circle. Beginning the counting with you, every 5^{th} person going around the circle sits down. If you consider yourself to be in the 1^{st} position, the next person to be the 2^{nd} position, and so on, which position will be the last one standing?

    (A) 1 **(B)** 2 **(C)** 4 **(D)** 7 **(E)** 19

Problems 11 – 30: Bubble in your answers on the answer sheet. Be sure to erase all mistakes completely. You do not need to bubble in leading zeros – the answer of "7" does not need to be answered as "007". If your answer is a fraction like $\frac{3}{16}$, bubble in 316.

11. The winter solstice is defined to be the day with the shortest time between sunrise and sunset. For Seattle, the winter solstice during the 2012-2013 winter was on December 21st with the sunrise at 7:55am and the sunset at 4:21pm. How many minutes passed between the sunrise and the sunset?

12. Suppose that Grandma Smith had a bucket of apples. She gave $\frac{1}{4}$ of them to Brae and $\frac{1}{3}$ of them to Johnny Gold. If the bucket had 36 apples to begin with, how many apples are now left in the bucket?

13. In preparation for your long weekend of math homework, you decide to go to the store and buy 2 pocket calculators that cost \$3.14 each, 5 erasers that cost \$0.29 each, and 1 bottle of pain medicine that costs \$6.99. How much change will you receive if you are paying with a \$20 bill? **Express your answer as a number of cents.**

14. At an ice cream shop, each ounce of ice cream that is personally made for you costs \$0.65. If you have \$20 in your pocket, and are required to leave a 15% tip on the bill, how many full ounces of ice cream can you buy?

15. Mary bought a pair of jeans that were initially discounted by \$15 because they were on sale, and then were marked down another 30% off of the sale price. If the final cost before tax was \$31.50, how much did the jeans cost before the sale? **Express your answer as a number of dollars.**

16. How many positive integral factors does 300 have?

17. Suppose that you have four pieces of string that measure 314 centimeters, 2 meters, 199 centimeters, and 1.2 meters. If you were to put the pieces of string end-to-end, how many meters long would the new piece of string be? **Express your answer as a decimal.**

18. If you can paint 6 square feet per minute, how many minutes would it take to paint a wall measuring 12 feet by 40 feet?

19. In a room of ostriches, which have two legs, and panda bears, which have four legs, there are a total of 32 legs. Assuming there can be as few as zero of an animal in the room, how many unique combinations of ostriches and/or pandas are possible?

20. If a, b, c, d, and e are each distinct integers between 0 and 4 inclusively, what is the greatest possible value of the following expression: $(a - b)^c + (d \times e)$?

21. In a set of three numbers, the sums of the numbers taken two at a time are 17, 20, and 23. What is the largest of the three numbers?

22. If there is a 35% probability that it will be rainy tomorrow, and a 60% probability that it will be windy tomorrow, what is the probability that it will be both rainy and windy tomorrow? **Express your answer as a percent.**

23. What is the positive difference between the sum of the first 50 positive even numbers and sum of the first 45 positive odd numbers?

24. Define a "prime-time" fraction to be a fraction whose numerator is a one-digit prime number and whose denominator is a two-digit prime number. What "prime-time" fraction is closest to $\frac{1}{10}$?

25. What is the perimeter of the figure with vertices at the points with coordinates $(2, 0), (8, 0)$, $(8, 8)$, and $(2, 8)$?

26. When handing back your \$9 in change, the cashier realized she had no more one dollar bills left, and had to give you the final \$2 all in coins. If she handed you 27 coins, none of which were dollar or half-dollar coins, what is the greatest number of pennies she could have handed you?

27. If a circle with a radius of 3 inches is centered at each corner of a square with a side length of 6 inches, what is the area of the square that does not overlap with one of the circles? **Express your answer to the nearest square inch.**

28. Suppose that two fair six-sided dice are rolled and the two numbers that are rolled are multiplied together. What is the probability that the product is a multiple of 3? **Express your answer as a reduced fraction.**

29. If a hexagon has angles measuring $x + 20, 2x, 3x - 1, 2x + 31, 3x - 15$, and $2x + 35$ degrees, what is the measure, in degrees, of the largest angle?

30. There are 24 different four-digit numbers that can be created using the each of the digits $2, 4, 6$, and 8 exactly once. Suppose that they were split up into two sets – the first set containing the 12 smallest numbers and the second set containing the 12 largest numbers. What is half of the positive difference between the largest number in the first set and the smallest number in the second set?

Washington State Math Championship

$\sqrt{2013}$

Ferndale Refinery

Blaine School District

Individual – 6th Grade

Instructions: Problems 1 – 10 are multiple choice and count towards your team score. Bubble in the letter on your answer sheet. Be sure to erase all mistakes completely.

1. If the time is currently 8:13pm, what time will it be in 212 minutes?

   (A) 10:25pm **(B)** 10:45pm **(C)** 11:25pm **(D)** 11:45pm **(E)** 12:25am

2. Which of the following expressions shows "twice the sum of two and the square of the sum of six and seven"?

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   (C) Originally \$60, Now \$50
   (D) Originally \$80, Now \$60
   (E) Originally \$100, Now \$75

4. Which of the following shapes has the most lines of symmetry?

   (A) Equilateral triangle **(B)** Rectangle that is not a square **(C)** Regular pentagon
   (D) Isosceles trapezoid **(E)** Square

5. If you have the box sets of the *Twilight* series, *Harry Potter* series, *Hunger Games* series, and the *Diary of a Wimpy Kid* series, how many unique ways are there to arrange them on the shelf?

   (A) 4 **(B)** 12 **(C)** 16 **(D)** 24 **(E)** 256

6. Which of the following accurately describes the product of two prime numbers?

   (A) Always even **(B)** Always odd **(C)** Sometimes a prime number
   (D) Always a prime number **(E)** None of these

7. If n is some positive integer, what is the sum of the integers from 1 to n, inclusively?

   (A) n^2 **(B)** $2n$ **(C)** $2(n+1)$ **(D)** $n(n+1)$ **(E)** $\frac{n(n+1)}{2}$

8. Which of the following shapes *cannot* have more than two obtuse angles?

   (A) Obtuse triangle **(B)** Quadrilateral **(C)** Pentagon **(D)** Octagon
   (E) All four can have more than two obtuse angles

9. In how many unique ways can the letters in the word "GANGNAM" be arranged?

   (A) 49 **(B)** 630 **(C)** 840 **(D)** 2520 **(E)** 5040

10. Suppose you and nineteen of your friends are sitting in a circle. Beginning the counting with you, every 5^{th} person going around the circle sits down. If you consider yourself to be in the 1^{st} position, the next person to be the 2^{nd} position, and so on, which position will be the last one standing?

    (A) 1 **(B)** 2 **(C)** 4 **(D)** 7 **(E)** 19

Problems 11 – 30: Bubble in your answers on the answer sheet. Be sure to erase all mistakes completely. You do not need to bubble in leading zeros – the answer of "7" does not need to be answered as "007". If your answer is a fraction like $\frac{3}{16}$, bubble in 316.

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12. Suppose that Grandma Smith had a bucket of apples. She gave $\frac{1}{4}$ of them to Brae and $\frac{1}{3}$ of them to Johnny Gold. If the bucket had 36 apples to begin with, how many apples are now left in the bucket?

13. In preparation for your long weekend of math homework, you decide to go to the store and buy 2 pocket calculators that cost \$3.14 each, 5 erasers that cost \$0.29 each, and 1 bottle of pain medicine that costs \$6.99. How much change will you receive if you are paying with a \$20 bill? **Express your answer as a number of cents.**

14. At an ice cream shop, each ounce of ice cream that is personally made for you costs \$0.65. If you have \$20 in your pocket, and are required to leave a 15% tip on the bill, how many full ounces of ice cream can you buy?

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16. How many positive integral factors does 300 have?

17. Suppose that you have four pieces of string that measure 314 centimeters, 2 meters, 199 centimeters, and 1.2 meters. If you were to put the pieces of string end-to-end, how many meters long would the new piece of string be? **Express your answer as a decimal.**

18. If you can paint 6 square feet per minute, how many minutes would it take to paint a wall measuring 12 feet by 40 feet?

19. In a room of ostriches, which have two legs, and panda bears, which have four legs, there are a total of 32 legs. Assuming there can be as few as zero of an animal in the room, how many unique combinations of ostriches and/or pandas are possible?

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21. In a set of three numbers, the sums of the numbers taken two at a time are 17, 20, and 23. What is the largest of the three numbers?

22. If there is a 35% probability that it will be rainy tomorrow, and a 60% probability that it will be windy tomorrow, what is the probability that it will be both rainy and windy tomorrow? **Express your answer as a percent.**

23. What is the positive difference between the sum of the first 50 positive even numbers and sum of the first 45 positive odd numbers?

24. Define a "prime-time" fraction to be a fraction whose numerator is a one-digit prime number and whose denominator is a two-digit prime number. What "prime-time" fraction is closest to $\frac{1}{10}$?

25. What is the perimeter of the figure with vertices at the points with coordinates $(2, 0), (8, 0)$, $(8, 8)$, and $(2, 8)$?

26. When handing back your \$9 in change, the cashier realized she had no more one dollar bills left, and had to give you the final \$2 all in coins. If she handed you 27 coins, none of which were dollar or half-dollar coins, what is the greatest number of pennies she could have handed you?

27. If a circle with a radius of 3 inches is centered at each corner of a square with a side length of 6 inches, what is the area of the square that does not overlap with one of the circles? **Express your answer to the nearest square inch.**

28. Suppose that two fair six-sided dice are rolled and the two numbers that are rolled are multiplied together. What is the probability that the product is a multiple of 3? **Express your answer as a reduced fraction.**

29. If a hexagon has angles measuring $x + 20, 2x, 3x - 1, 2x + 31, 3x - 15$, and $2x + 35$ degrees, what is the measure, in degrees, of the largest angle?

30. There are 24 different four-digit numbers that can be created using the each of the digits $2, 4, 6$, and 8 exactly once. Suppose that they were split up into two sets – the first set containing the 12 smallest numbers and the second set containing the 12 largest numbers. What is half of the positive difference between the largest number in the first set and the smallest number in the second set?

Washington State Math Championship

$\sqrt{2013}$

Ferndale Refinery

Blaine School District

Individual – 7th Grade

Instructions: Problems 1 – 10 are multiple choice and count towards your team score. Bubble in the letter on your answer sheet. Be sure to erase all mistakes completely.

1. Which of the following accurately describes the product of two prime numbers?

   (A) Always even **(B)** Always odd **(C)** Sometimes a prime number
   (D) Always a prime number **(E)** None of these

2. If n is some positive integer, what is the sum of the integers from 1 to n, inclusively?

   (A) n^2 **(B)** $2n$ **(C)** $2(n+1)$ **(D)** $n(n+1)$ **(E)** $\frac{n(n+1)}{2}$

3. Which of the following shapes *cannot* have more than two obtuse angles?

   (A) Obtuse triangle **(B)** Quadrilateral **(C)** Pentagon **(D)** Octagon
   (E) All four can have more than two obtuse angles

4. In how many unique ways can the letters in the word "GANGNAM" be arranged?

   (A) 49 **(B)** 630 **(C)** 840 **(D)** 2520 **(E)** 5040

5. Suppose you and nineteen of your friends are sitting in a circle. Beginning the counting with you, every 5^{th} person going around the circle sits down. If you consider yourself to be in the 1^{st} position, the next person to be the 2^{nd} position, and so on, which position will be the last one standing?

   (A) 1 **(B)** 2 **(C)** 4 **(D)** 7 **(E)** 19

6. Assuming you make the same initial investment for each of the following situations and never add more money, which would result in the most money over a 20-year period?

   (A) Doubles every 5 years **(B)** Increases 15% each year **(C)** Triples every 10 years
   (D) Increases 25% every two years **(E)** Impossible to determine

7. What is the x-intercept of the line $3x + 4y = 12$?

   (A) $(4, 0)$ **(B)** $(0, 3)$ **(C)** $(0, 0)$ **(D)** $(4, -3)$ **(E)** $(-4, 3)$

8. If you have a coin that is weighted such that heads is flipped 75% of the time and tails is flipped 25% of the time, which of the following is most likely to happen in 4 consecutive flips?

   (A) 4 heads **(B)** 3 heads **(C)** 2 heads **(D)** 1 head **(E)** 0 heads

9. If you were to write each of the base-ten numbers from 1 to 55 inclusive as base-8 numbers, how many times would the digit 7 be written?

   (A) 0 **(B)** 2 **(C)** 6 **(D)** 7 **(E)** 9

10. Suppose that an equilateral triangle, square, regular octagon, and a circle have equivalent perimeters/circumferences. Which has the greatest area?

    (A) Equilateral triangle **(B)** Square **(C)** Regular octagon **(D)** Circle
    (E) Cannot be determined

Problems 11 – 30: Bubble in your answers on the answer sheet. Be sure to erase all mistakes completely. You do not need to bubble in leading zeros – the answer of "7" does not need to be answered as "007". If your answer is a fraction like $\frac{3}{16}$, bubble in 316.

11. In a set of three numbers, the sums of the numbers taken two at a time are 17, 20, and 23. What is the largest of the three numbers?

12. If there is a 35% probability that it will be rainy tomorrow, and a 60% probability that it will be windy tomorrow, what is the probability that it will be both rainy and windy tomorrow? **Express your answer as a percent.**

13. What is the positive difference between the sum of the first 50 positive even numbers and sum of the first 45 positive odd numbers?

14. Define a "prime-time" fraction to be a fraction whose numerator is a one-digit prime number and whose denominator is a two-digit prime number. What "prime-time" fraction is closest to $\frac{1}{10}$?

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17. If a circle with a radius of 3 inches is centered at each corner of a square with a side length of 6 inches, what is the area of the square that does not overlap with one of the circles? **Express your answer to the nearest square inch.**

18. Suppose that two fair six-sided dice are rolled and the two numbers that are rolled are multiplied together. What is the probability that the product is a multiple of 3? **Express your answer as a reduced fraction.**

19. If a hexagon has angles measuring $x + 20, 2x, 3x - 1, 2x + 31, 3x - 15$, and $2x + 35$ degrees, what is the measure, in degrees, of the largest angle?

20. There are 24 different four-digit numbers that can be created using the each of the digits $2, 4, 6$, and 8 exactly once. Suppose that they were split up into two sets – the first set containing the 12 smallest numbers and the second set containing the 12 largest numbers. What is half of the positive difference between the largest number in the first set and the smallest number in the second set?

21. What is the positive difference between the values of x and y that satisfy the following two equations?

$$\begin{aligned} 3x - y &= 47 \\ 2x + 4y &= 92 \end{aligned}$$

22. There are five kids – Anna, Betty, Carlos, Danny, and Eduard – who are trying to organize themselves into a line to be next for four-square. If Anna must be ahead of Eduard in the line and Carlos always must be in the exact middle of the line, in how many unique ways can the kids line up?

23. Walker wanted to slowly train for a marathon. So, he decided to start by running 0.5 miles on the first day. On each of the 50 days that followed, he ran 0.5 miles more than the previous day. How many miles did he run over the course of his 51 days of training?

24. Suppose you and two of your friends each have a fair coin. If you all toss your coins, what is the probability that they do not all land on the same side? **Express your answer as a reduced fraction.**

25. The city of Blaine decided to attempt to make an extremely large pizza to help feed students at the yearly math competition. If the arc length, or crust, of a 15° slice of the pizza was 6π inches, what is the radius of the pizza? **Express your answer as a number of <u>feet</u>.**

26. How many integers between 1 and 10,000 are divisible by $2, 6, 12$, and 20?

27. Two cars are traveling north parallel to each other with a constant horizontal distance of 200 yards between them. They then suddenly veer 30 degrees in towards each other. How many yards will one of the cars travel before they collide?

28. How many integers x satisfy the following inequality?

$$2x^2 - 20x \leq 0$$

29. Your friend takes two cards of each suit – clubs, hearts, diamonds, and spades – and mixes them up together. You then draw two of the eight cards without replacement. What is the probability that you will draw two cards that are of the same suit? **Express your answer as a reduced fraction.**

30. A baker has two containers filled with a mix of dark and mint chocolate chips such that the total number of chocolate chips is equal in both containers. $\frac{3}{4}$ of the chocolate chips in Container A are dark and the rest are mint chocolate. In Container B, there are equal amounts of dark and mint chocolate chips. If you were to randomly grab $\frac{1}{5}$ of the chocolate chips from Container A and move them to Container B, then randomly grab $\frac{1}{5}$ of the chocolate chips from Container B and move them to Container A, what is the expected percentage of dark chocolate chips in Container A? **Express your answer to the nearest percent.**

Washington State Math Championship

$\sqrt{2013}$

Ferndale Refinery

Blaine School District

Individual – 8th Grade

Instructions: Problems 1 – 10 are multiple choice and count towards your team score. Bubble in the letter on your answer sheet. Be sure to erase all mistakes completely.

1. Which of the following accurately describes the product of two prime numbers?

   (A) Always even **(B)** Always odd **(C)** Sometimes a prime number
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