

NAME _____

NUMBER THEORY I

1. What is the greatest common factor (GCF) of 18 and 24? 1. _____
2. How many factors does 18 have? 2. _____
3. How many two-digit numbers are there whose digits have a sum that is a perfect square? 3. _____
4. Express 2007 as a base 6 numeral. 4. _____(6)
5. Express the binary number 111001_2 as a decimal (base ten) numeral. 5. _____
6. The pages of a magazine are numbered from 1 through 50. How many times was the digit 3 used? 6. _____
7. What is the least common multiple (LCM) of the numbers 8, 12 and 15? 7. _____
8. How many prime numbers are greater than 50 and less than 100? 8. _____
9. A palindrome is a number that reads the same forward as backward. How many three-digit numbers are palindromes? 9. _____
10. What is the units digit of the number named by 3^{2007} ? 10. _____

NAME _____

NUMBER THEORY II

1. Express the number 52 as a product of primes. Use exponents to express your answer whenever possible. 1. _____
2. How many natural numbers less than 100 have an odd number of factors? 2. _____
3. Find the smallest positive integer that gives a remainder of 5 when divided by 6, a remainder of 6 when divided by 7, and a remainder of 7 when divided by 8. 3. _____
4. Prime pairs are pairs of prime numbers that differ by 2, such as 5 and 7. What is the smaller of the first prime pair in which both numbers are greater than 80? 4. _____
5. How many counting numbers greater than 15 but less than 75 are relatively prime to 15? (Hint: 2 numbers are relatively prime if their greatest common factor is 1.) 5. _____
6. What is the sum of the reciprocals of the first three prime numbers? 6. _____
7. Find the sum of the odd whole numbers less than 40. 7. _____
8. What is the quotient of the least common multiple and the greatest common factor of the numbers 48 and 60? 8. _____
9. What is the sum of the first 5 composite numbers? 9. _____
10. What value can the digit "B" have to make the four-digit number 127B divisible by 18? 10. _____

NAME _____

NUMBER THEORY EXTENSION

1. What is the greatest common factor (GCF) of 16 and 36? 1. _____
2. Express 2012 as a base 6 numeral. 2. _____
3. Express the binary number $11001_{(2)}$ as a decimal numeral. 3. _____
4. What is the least common multiple (LCM) of the numbers 6, 15, and 32? 4. _____
5. How many prime numbers are less than 50? 5. _____
6. A palindrome is a number that reads the same forward and backward. How many three-digit palindromes are greater than 500? 6. _____
7. Express the number 56 as a product of primes. Use exponents to express your answer whenever possible. 7. _____
8. What value can the digit "B" have to make the four-digit number 135B divisible by 12? 8. _____
9. What is the sum of the first 5 prime numbers? 9. _____
10. Prime pairs are pairs of prime numbers that differ by 2 (like 5 and 7). What is the sum of the greatest prime pair less than 100? 10. _____
11. Numbers are considered abundant if the sum of their factors not including the number itself is greater than the number, deficient if the sum is less than the number, and perfect if the sum is equal to the number. What is the sum of the largest abundant, deficient and perfect numbers less than 25? 11. _____

NAME _____

CONSUMER MATH

1. Jane's car averages about 22 miles per gallon. She plans to drive 550 miles on her vacation. If gas cost \$3.05 per gallon, how much would she expect to pay for gas? 1. \$ _____
2. A mill is a thousandth of a dollar. If real estate taxes are increased by 8 mills per dollar, by how much would the taxes on a \$250,000 house increase? 2. \$ _____
3. A lunch bill at a restaurant is \$26.42. If a 15% tip is added, what will be the total cost of the lunch, rounded to the nearest cent? 3. \$ _____
4. Pat made 5 payments on a loan with each payment being twice the amount of the preceding one. If the total of all 5 payments was \$465, how much was the first payment? 4. \$ _____
5. What is the positive difference, expressed as a percent of the original price, between a 20% discount followed by a 30% discount, and a straight 50% discount? 5. _____%
6. A cassette tape plays about 50 minutes of music. A compact disc plays about one and a half hours of music and costs \$18. If it is assumed that the money spent on a recording is only for the amount of music it contains, how much should a cassette tape cost? 6. \$ _____
7. Target discounted their fine jewelry by 20%. For their holiday sale, they reduced the same jewelry by 10% of the discounted price. What was the total percent discount on their jewelry? 7. _____%
8. James has \$3000 in a savings account, which earns 5% compounded annually. How much money would he have in his account at the end of 5 years? Round your yearly answers to the nearest cent. 8. \$ _____
9. A recipe calls for 3 cups of flour to make 48 cookies. How much flour is needed to make 72 cookies. Express your answer as a decimal numeral. 9. _____
10. Sears buys sweaters for \$40 and sells them for \$55. What is the percent of increase? 10. _____

1. Sonia's car averages 23 miles per gallon. She drove 1035 miles on her vacation. If gas cost \$3.65 per gallon, how much did she pay for gas on her vacation? 1. _____
2. A bill at a restaurant is \$33.32. If a 20% tip is added, what will be the total cost of the lunch, rounded to the nearest cent? 2. _____
3. John made 5 payments on a loan, with each payment being twice the amount of the preceding one. If the total of all 5 payments was \$372, how much was the first payment? 3. _____
4. What is the positive difference, expressed as a percent of the original price, between a straight 30% discount and a 15% discount followed by another 15% discount? 4. _____
5. A store discounted their outdoor furniture by 30%. When summer ended they reduced the furniture again by 20% of the discounted price. What is the total percent discount of the outdoor furniture? 5. _____
6. Enrique has \$2500 in a savings account which earns 5% compounded annually. How much money will he have in his account at the end of 5 years? Round your yearly answers to the nearest cent. 6. _____
7. A recipe calls for $\frac{3}{4}$ cups of sugar to make 48 cookies. How much sugar is needed to make 80 cookies? Express your answer as a mixed number. 7. _____
8. A store buys belts for \$20 and sells them for \$27.50. What is the percent of increase? 8. _____
9. A bottle of bubble bath costs $\frac{3}{4}$ of the price of a bottle of shampoo. How many bottles of bubble bath can be purchased for the same price as 30 bottles of shampoo? 9. _____
10. A loan of \$400 is given for half a month. If Natalie is charged \$30 in interest, what is the annual rate of this loan? Express your answer as a percent. 10. _____

NAME _____

COUNTING TECHNIQUES, COMBINATORICS I

1. A student has a blue, a green, a white, a red, and a yellow shirt; and a pair of black, blue and brown pants. How many different outfits can he wear? 1. _____
2. How many different three-digit numbers can you write using the digits 1, 3, 5, and 7? Each digit may be used only once in each number. 2. _____
3. In how many different ways could one get exactly two heads if four fair coins are tossed? 3. _____
4. In how many distinct ways can the letters of the word **DOG** be scrambled? 4. _____
5. How many different subsets can you make with the following set: {1, 2, 3, 4}? 5. _____
6. How many different mathematics teams could be formed from a group of 10 students? A mathematics team consists of 4 students. 6. _____
7. In how many distinct ways can the letters in the word **LOLLIPOP** be scrambled? 7. _____
8. 6 points are placed on a circle. How many triangles, using any three of the points as vertices of the triangle can be formed? 8. _____
9. In how many ways can 6 keys be arranged on a ring? A Key has a front view and a back view. The two views are considered to be the same arrangement. 9. _____
10. How many three-digit natural numbers contain three different digits? 10. _____

NAME _____

COUNTING TECHNIQUES, COMBINATORICS II

1. ${}_5P_2$ is the notation for the number of permutations of a population of 5 objects taken two at a time, where order is important. Evaluate ${}_5P_2$. 1. _____
2. ${}_7C_3$ is the notation for the number of combinations of a population of 7 objects taken 3 at a time, where order is not important. Evaluate ${}_7C_3$. 2. _____
3. In how many different ways can the letters in the word **EGGS** be scrambled? 3. _____
4. In how many different ways can 5 different videos be placed side by side on a bookshelf? 4. _____
5. A social security card has numbers represented as _____. If 000 - 00 - 0000 is allowed, how many social security numbers are possible? 5. _____
6. Find the number of 6-letter permutations of the letters in the word **EUCLID** that end with the letter E or the letter D. 6. _____
7. If a red die and a green die are tossed, how many outcomes are possible? 7. _____
8. The license plates in Colorado have 3 numbers, followed by 3 letters. How many license plates can be made using this configuration, knowing that 000 - AAA could be used? 8. _____
9. A hand consists of 3 cards that are dealt from 7 cards numbered 1 to 7. How many different hands are possible? 9. _____
10. In a 10 question true or false test, how many different ways can the test be answered? 10. _____

NAME _____

COUNTING TECHNIQUES,
COMBINATORICS EXTENSION

1. A boy has a blue, a green, a red, and a black shirt and a pair of black, a pair of blue and a pair of brown pants. How many different outfits can he wear? 1. _____
2. How many different 3-digit numbers can be written using the digits 1, 2, 4, 5 and 7? Each digit may be used only once in each number. 2. _____
3. In how many distinct ways can the letters of the name KARA be scrambled? 3. _____
4. How many different 4-person teams could be formed from a group of 12 students? 4. _____
5. How many different subsets can you make with the following set {1, 3, 5, 7, 9}? 5. _____
6. A hand consists of 4 cards that are dealt from 9 cards numbered 1 to 9. How many different hands are possible? 6. _____
7. 5 friends sit in a circle. In how many ways can all of the 5 friends be seated? 7. _____
8. 6 soccer teams were paired to play games. How many different ways could the teams be paired? 8. _____
9. A caravan of 4 cars was driving to Colorado Springs. If a specific car always had to lead the caravan, in how many different orders could the cars drive? 9. _____
10. If two dice are tossed, how many different outcomes are possible where the sum of the dice is 6? 10. _____

NAME _____

PROBABILITY I

1. An urn contains 5 black marbles, 3 red marbles, and 2 white marbles. If one marble is drawn at random, what is the probability that it will be white? Express your answer as a common fraction. 1. _____
2. Two fair dice are rolled. What is the probability that the product of the two dice will be less than 16? Express your answer as a common fraction. 2. _____
3. A three-digit number is selected at random. What is the probability that at least one of the three digits is a prime number? Express your answer as a common fraction. 3. _____
4. A bag contains 5 red pencils and 3 blue pencils. 2 pencils are drawn from the bag without replacement. What is the probability that both of the pencils drawn are red? Express your answer as a common fraction. 4. _____
5. A coin is tossed 3 times. What is the probability that at least 2 tosses are heads? Express your answer as a common fraction. 5. _____
6. From a standard 52-card deck a card is drawn and then replaced in the deck. After the deck is shuffled, a second card is drawn. Find the probability that both cards are hearts. Express your answer as a common fraction. 6. _____
7. If the odds that an event will occur are 8:5, what is the probability the event will occur? Express your answer as a common fraction. 7. _____
8. From a 52-card deck, what is the probability that all 5 cards drawn are diamonds? 8. _____
9. A die is rolled 120 times. About how many times should the number 4 turn up on the roll of the die? 9. _____
10. If the probability of rain in Denver on Tuesday is .2, what is the probability that it will not rain in Denver on Tuesday? Express your answer as a common fraction. 10. _____

NAME _____

PROBABILITY II

1. In a deck of 52 cards, one card is drawn. What is the probability that the card is not an ace? Express your answer as a common fraction. 1. _____
2. A bag contains 6 red, 8 white, and 4 blue balls. A ball is drawn at random from the bag. What is the probability that the ball is red or blue? Express your answer as a common fraction. 2. _____
3. A box contains 1000 light bulbs, 900 good bulbs and 100 defective bulbs. If a bulb is chosen at random from the box, what is the probability that the bulb is defective? Express your answer as a common fraction. 3. _____
4. If rolling a single die, specify the sample space for the experiment. List as a set all the possible outcomes. 4. { _____ }
5. From a group of 5 boys and 3 girls, 3 students who play the cello are selected at random to represent their school. Find the probability that all 3 students selected are girls. Express your answer as a common fraction. 5. _____
6. A spinner is divided into tenths. The sections are numbered from 1 to 10. If the spinner is spun, find the probability that the number that turns up is a multiple of 4. Express your answer as a common fraction. 6. _____
7. Three coins are tossed. Find the probability that all coins come up heads. Express your answer as a common fraction. 7. _____
8. A bag contains 2 red, 4 yellow and 6 blue jelly beans. 2 jelly beans are drawn at random. Find the probability that neither is red. Express your answer as a common fraction. 8. _____
9. The letters A, B, C, D, E, F and G are written on separate cards. The cards are shuffled, and one card is drawn at random. What is the probability that a vowel is drawn. Express your answer as a common fraction. 9. _____
10. If two fair dice are tossed, what is the probability that both dice show the same number? Express your answer as a common fraction. 10. _____

NAME _____

PROBABILITY EXTENSION

1. A jar contains 4 blue marbles, 6 red marbles, 3 green marbles and 3 black marbles. If one marble is drawn at random, what is the probability it will be blue? Express your answer as a common fraction. 1. _____
2. Two fair dice are rolled. What is the probability that the sum of the two dice will be prime? Express your answer as a common fraction. 2. _____
3. A coin is tossed 3 times. What is the probability that exactly one toss is heads? Express your answer as a common fraction. 3. _____
4. If the odds that an event will occur are 6:5, what is the probability the event will occur? Express your answer as a common fraction. 4. _____
5. The letters from the word PROBABILITY are placed in a hat. What is the probability of selecting an "I" when you are choosing one letter without looking? 5. _____
6. 4 men with hats enter a room. The hats are put away and each man is randomly given a hat when they leave. What is the probability each man will get his own hat back? 6. _____
7. A box of 12 popsicles has an equal number of cherry, orange and grape. Alex likes everything but grape. What is the probability if he randomly selects a popsicle, it will be one he likes? 7. _____
8. A bag contains 15 blue marbles and 17 red marbles. If Marquel pulls a red marble out of the bag and keeps it, then pulls another marble from the bag, what is the probability the second marble will be red? 8. _____
9. A spinner is divided into 12 equal sections numbered 1 to 12. Find the probability the number that turns up when the spinner is spun is a multiple of 4. 9. _____
10. A card is randomly chosen from a deck of 52 cards. What is the probability of choosing a red card or a king? 10. _____

NAME _____

GEOMETRY: COORDINATE, PLANE, SOLID,
TRANSFORMATIONAL I

1. On a number line, what is the midpoint of the line segment whose coordinates are -10 and 26? 1. _____
2. What is the area of a right triangle whose sides have lengths of 10, 26 and 24? 2. _____
3. How many diagonals does a hexagon have? 3. _____
4. A square has an area of 121. What is the perimeter of the square? 4. _____
5. A circle graph shows how a family's monthly income is spent. If 30% of their income is spent on food, how many degrees are needed in the central angle of this portion of the graph? 5. _____
6. What is the sum of the measures of the interior angles of a convex polygon that has 7 sides? 6. _____
7. Given a square whose sides have lengths of 15, what is the area of the quadrilateral formed by joining the midpoints of the sides of the square? Express your answer as a decimal numeral. 7. _____
8. The angles of a triangle are in the ratio of 2:3:5. What is the measure of the largest angle? 8. _____
9. The perimeter of a rectangle is 50. If the width is 9, find its length. 9. _____
10. The base of a triangle is 4 cm. longer than twice its height. If the area is 63, find the length of the base. 10. _____

NAME _____

GEOMETRY: COORDINATE, PLANE, SOLID,
TRANSFORMATIONAL II

1. What is the perimeter of a right triangle whose hypotenuse measures 39 and one leg measures 36? 1. _____
2. The coordinate $(-5, 2)$ is in what quadrant? Express your answer a Roman numeral. 2. _____
3. A rectangular box is twice as long as it is wide. Its height and width are the same. If the volume of the box is 128 cubic inches, what is the length of the box? 3. _____
4. Find the area of an isosceles trapezoid whose bases measure 10 and 18 and whose legs measure 5. 4. _____
5. If the diagonal of a square is 10, what is the area of the square? 5. _____
6. What is the sum of the complement and the supplement of an angle whose measure is 54 degrees? 6. _____
7. What is the length of a diameter of a circle that has an area of 144π square units? 7. _____
8. What is the area of a regular hexagon if the length of each side is 4 cm.? Express your answer in simple radical form. 8. _____
9. The length of the radius of a circle is decreased by 10%. By what percent is the area of the circle decreased? 9. _____
10. What is the volume of a pyramid whose base is a 7 by 12 rectangle and whose height is 18? 10. _____

NAME _____

GEOMETRY: COORDINATE, PLANE, SOLID,
TRANSFORMATIONAL III

1. If the point $(6, 2)$ is reflected over the y -axis, the new coordinates are (x, y) . What is the sum of x and y ? 1. _____
2. The circumference of circle O is 75 , and the length of arc XYZ is 6.25 . What is the number of degrees in the measure of acute angle XOZ ? 2. _____
3. What is the volume of a circular cylinder if the diameter is 10 and the height is 12 ? Express your answer in terms of π . 3. _____
4. What is the number of units in the positive difference between the maximum and minimum possible perimeters of a rectangle with whole number dimensions and an area of 80 square units? 4. _____
5. A $3 \times 3 \times 3$ cube is painted black and then cut into unit cubes. How many unit cubes have exactly 2 sides painted? 5. _____
6. What is the surface area of a sphere whose diameter is 20 ? Express your answer in terms of π . 6. _____
7. Four interior angles of a pentagon have measure 72° , 125° , 36° and 156° . Find the measure in degrees of the fifth angle. 7. _____
8. What is the volume of a sphere whose diameter is 12 ? 8. _____
9. What is the distance between the points $(2, 7)$ and $(-3, 12)$ on a coordinate graph? Express your answer in simple radical form. 9. _____
10. Use Heron's formula to find the area of a triangle whose sides have lengths 5 , 8 , and 9 . Express your answer in simple radical form. 10. _____

NAME _____

GEOMETRY: COORDINATE, PLANE, SOLID
TRANSFORMATIONAL EXTENSION

1. How many diagonals are in an octagon? 1. _____
2. On a number line, what is the midpoint of the line segment with coordinates -5 and 32? 2. _____
3. What is the area of a right triangle with side lengths of 36, 48, and 60? 3. _____
4. A square has an area of 289. What is the perimeter of the square? 4. _____
5. The perimeter of a rectangle is 66. If the width is 6, find the length. 5. _____
6. A circle graph shows how a family's monthly income is spent. If 40% of their income is spend on housing, how many degrees are needed in the central angle of the housing portion of the graph? 6. _____
7. What is the perimeter of a right triangle whose hypotenuse measures 65 and one leg measures 52? 7. _____
8. The coordinate (-3, -2) is in what quadrant? 8. _____
9. What is the sum of the complement and supplement of an angle that measures 46 degrees? 9. _____
10. What is the length of the diameter of a circle that has an area of 400π square units? 10. _____
11. What is the volume of a pyramid whose base is a 6 by 10 rectangle and whose height is 15? 11. _____
12. What is the distance between the points (3, 6) and (-2, 10) on a coordinate graph? Express your answer in simple radical form. 12. _____
13. A family wants to fence in their yard that measures 72 ft by 120 ft. Each fence section is 8 ft long. How many fence sections will they need? 13. _____
14. If the point (-5, 3) is reflected over the x-axis, find the new coordinates (x, y). 14. _____
15. Find the area of an isosceles trapezoid whose bases measure 5 and 13 and whose legs measure 5. 15. _____