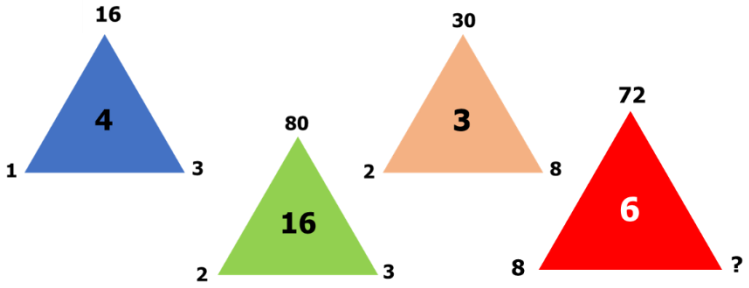
GRADE 10 MATHEMATICS **2024 CB-RAT**

INSTRUCTIONS: Read and understand each question. Shade the circle that corresponds to the letter of the correct answer on the provided answer sheet.

1. **TRIAD DEFINES ME:** Puzzle is the activity that a teacher cannot go away with. This is primarily because it increases the production of dopamine, a chemical that regulates mood, memory and concentration. Below is a puzzle used by a teacher in his class using a triangle, where each vertex is assigned to a number and the number at the center is derived using the numbers. Using the rule establish of the first 3 triangles presented, what is the missing number of the triangle below?



A.3 B. 4 C. 5 D. 6

2. 3, 6 and x -2 are the first three terms of a sequence. If these terms are that of an arithmetic sequence, what is the value of x?

A.10 B. 11 C. 12 D. 13

3. **TAKE IT SLOW:** Jane is a runner since she was 10 and it is her practice to jog each day to improve her cardio-vascular fitness. A month ago, she had to undergo knee surgery. Now she was instructed to return to her jogging program slowly. Below is the table of how Jane's jogging program will look like as approved by his physical therapist. How many weeks will it be before Jane is up to jog an hour and 20 minutes?

WEEK NO.	DURATION OF JOGGING (in minutes)
1	8
2	14
3	20
4	26

A.11 weeks B. 12 weeks C. 13 weeks D. 14 weeks

4. 2k + 1, 3k +4, and 7k + 6 are first 3 terms of a sequence. For what value(s) k will these terms be that of geometric sequence?

A.2, -1 B. -2, 1 C. 2,1 D. -2, -1

5. The first and fourth terms of a geometric sequence are 3 and 154. If two geometric means are inserted between these terms, what is the second geometric means to be inserted?

A.9 B. 12 C. 36 D. 48

6. Which of the following statements is TRUE when comparing a geometric sequence and an arithmetic sequence?

A. In geometric sequence the difference between any consecutive terms is constant, while in arithmetic sequence the ratio between any two consecutive terms is constant.

B. In geometric sequence the ratio between any consecutive terms is constant, while in arithmetic sequence the difference between any two consecutive terms is constant.

C. In both geometric and arithmetic sequences, the difference between any two consecutive terms is constant.

D. In both geometric and arithmetic sequences, the ratio between any two consecutive terms is constant.

7. If the polynomial $\boldsymbol{3x^2 + 5x - bx - 45}$ is exactly divisible by $\boldsymbol{x - 3}$. What is the value of b?

A.-17 B. -16 C. 16 D. 17

8. A polynomial $\boldsymbol{P(x) = x^4 + ax^3 - 11x^2 - bx + 28}$ when divided by $\boldsymbol{x - 1}$ or $\boldsymbol{x - 2}$ has no remainder. What is the value of $\boldsymbol{a}$ and $\boldsymbol{b}$?

A. $a = 6, b = 24$ C. $a = -6, b = -24$

B. $a = -6, b = 24$ D. $a = 6, b = -24$

9. If $\boldsymbol{x - 2}$ is a factor of $\boldsymbol{f(x) = x^2 - 12x^2 + 44x - 48}$, then what are the other factors of $\boldsymbol{f(x)}$?

A. $x - 6$ C. $x - 6$ and $x - 4$

B. $x - 4$ D. $x + 6$ and $x + 4$

For numbers 10-12, consider the scenario below.

A well-known Filipino mobile legend gamer Billy Alfonso decided to conduct tournament for aspiring mobile legend gamers. On his first tournament, he had 22 participating teams joined. He wants to increase the number of participating teams every time he will hold a tournament by 6 teams.

10. If single elimination is used in the 8th ML Tournament of Billy Alfonso, how many games will be played before the Championship round?

A.31 B. 30 C. 29 D. 28

11. If 1 day before the tournament, 4 teams decided to withdraw from playing because some of their teammates is not available on that date. How many participating teams are in Billy Alfonso's 10th ML tournament?

A. 75 B. 71 C. 66 D. 62

12. How many teams are participating on the 4th tournament?

A. 40 B. 44 C. 48 D. 52

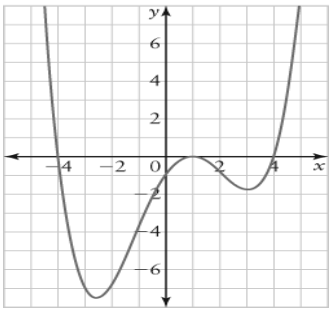
13. Classify $-3x^5 + 4x^3 + x^2 + 9 = 0$ by its degree and its number of terms.

A. quartic, binomial
B. quartic, four terms
C. quintic, four terms
D. quintic, binomial

14. The floor area of Mang Ador's house is 108 sq. meters. The length is 6 meters longer than twice its width. What are the dimensions of the Mang Ador's floor?

A. 2 m by 54 m
B. 4 m by 27 m
C. 6 m by 18 m
D. 9 m by 12 m

15. Which functions in factored form best represents the graph at the right? *(Each grid line represents one unit.)*



A. $f(x) = (x-4)(x+1)(x+1)(x+4)$

B. $f(x) = (x-4)(x+1)(x+1)(x+4)$

C. $f(x) = (x-1)(x+1)(x+4)(x+4)$

D. $f(x) = (x-4)(x-1)(x+4)(x+1)$

16. Jelly and Macky were separately asked by their teacher on whether the given expression represents a polynomial or not. Below are the polynomials given to them and their answer. Are their answers correct? Why?

JELLY	NO	$\mathbf{3\sqrt{x} + 18x - 5}$
MACKY	NO	$\mathbf{8 - 13x - 5x^{-2}}$

A. Only Jelly got the correct answer because a polynomial can have radical but not negative exponent.

B. Only Macky got the correct answer because a polynomial can have negative exponent but not radical.

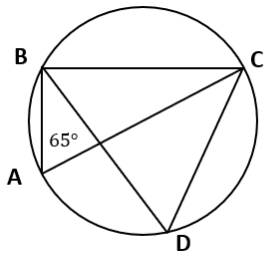
C. Yes! They are both correct because a polynomial cannot have negative exponent and must not have radical or fractional exponent.

D. No! They are both wrong because their given expressions are that of a polynomial.

For numbers 17-19, consider the scenario below.

A, B, C and D are points on the circumference of a circle. $\overline{AC}$ is the diameter of the circle and ∠BAC measures 65° as shown at the right.

17. What is the relationship of ∠BDC and ∠BAC?



A. They are supplementary angles.

B. They are complementary angles.

C. They are congruent angles.

D. They are linear pair.

18. What is the measure of angle BCA?

A. 70 B. 50 C. 35 D. 25

19. What is the measure of arc BC?

A. 55 B. 65 C. 110 D. 130

20. Joseph was instructed to draw a circle inside a square with a side length of 8 inches. If this circle is tangent to each of the sides of the square, what is the area of the constructed circle?

A. 18 sq. in. B. 16 sq. in. C. 14 sq. in. D. 12 sq. in.

21. In a pie chart representing the monthly expenses of the Rizal family, the measure of the central angle corresponding to their food expenses is 90°. If their monthly income is Php 40,000.00, how much of it is spent for food?

A. P 5000 B. P 10000 C. P 20000 D. P 30000

22. Edgar designed a semicircle arch made of bent iron for their gate's entrance. Suppose the diameter of the semicircle is 4 meters, which of the following should be the length of the iron before bending to avoid wastage?

A. π meters B. 2π meters C. 3π meters D. 4π meters

23. What is the equation of the circle whose center is at $(5,0)$ and has a radius of 5?

A. $x^2 + (y - 5)^2 = 25$ C. $x^2 + (y - 5)^2 = 5$

B. $x^2 + y^2 = 25$ D. $(x - 5)^2 + y^2 = 25$

24. What is its center-radius form of the equation given below?

$$\boldsymbol{x^2 + y^2 + 4x + 4y - 28 = 0}$$

A. $(x + 2)^2 + (y + 2)^2 = 36$ C. $(x - 2)^2 + (y + 2)^2 = 36$

B. $(x - 2)^2 + (y - 2)^2 = 36$ D. $x^2 + y^2 = 36$

25. A circle with an equation of $\boldsymbol{(x - 2)^2 + (y - 5)^2 = 9}$ has a graph whose center is located at _____.

A. Quadrant I B. Quadrant II C. Quadrant III D. Quadrant IV

26. What is the radius of the circle with an equation of $x^2 + y^2 - 6x + 8y - 11 = 0$?

A. 3 B. 4 C. 5 D. 6

27. Which of the following equations represents the smallest circle?

A. $x^2 + y^2 = 4$ C. $x^2 + y^2 = 1$

B. $x^2 + y^2 = 9$ D. $x^2 + y^2 = 16$

28. Which point is NOT on the graph of the circle $(x - 4)^2 + (y - 1)^2 = 5$?

A. (6, 2) B. (1, 3) C. (2, 2) D. (4, 1)

29. In how many ways can Mitzi create a 4-letter anagram from the word CREATOR?

A. 11 B. 24 C. 28 D. 42

30. Which of the following situation does not illustrate permutation?

A. Arranging 3 different mathematics books in a shelf.

B. A teacher selected 2 student leaders from a group of 5 students.

C. 4 campers sitting around a campfire.

D. Shoe is the anagram for hose.

For numbers 31-32, consider the scenario below.

> Mitzi, a content creator focusing on mathematics, was receiving a good amount of attention from a certain social media platform. This led her creations to be monetize by that certain social media platform and earned a good amount of money.

31. To add security to her account, Mitzi wants to change her password which is GRADE45 but with the same letters and number. In how many ways she can do that?

A. 120 B. 240 C. 5040 D. 5400

32. Due to her fame, Mitzi, together with her sister, was invited to a celebration attended by various content creators. There, they are assigned on circular tables. In how many ways can Mitzi and her sister sit around a circular table together with 4 different content creators given that Mitzi and her sister should sit side by side?

A. 24 B. 48 C. 120 D. 720

33. Which of the following situation illustrate that order of arrangement of the objects is important?

A. Choosing 3 desserts from a menu of 10.

B. Picking a team of 7 people from a group of 15.

C. Choosing what to wear from 4 cargo pants and 5 t-shirts

D. Selecting first, second and third placer out of ten runners in a race.

34. Which of the following situation illustrate combination?

A. Arranging books in a shelf.

B. Creating password for a social media account.

C. Forming different numbers from 5 given digits.

D. Forming a 5-man group from 13 members.

35. Which of the following situations does not illustrate a combination?

A. Enumerating 5 sets of meals out of 10 sets from a menu.

B. Fixing schedule of tourists for 5 days in Siquijor.

C. Listing the first 5 players from a group of 14 for a basketball match.

D. Selecting 3 songs from 10 choices for a singing contest.

36. Which of the following statement bests describe the difference of permutation from combination?

A. Order is both important to permutation and combination

B. Permutation - order doesn't matter; combination- order is important

C. Permutation - order matters; Combination - order doesn't matter

D. Permutation - deals with selection; Combination - deals with the arrangement

For number 37-39, consider the scenario below.

> Sir Jayson, an Esports enthusiast, plans to create an official team for the mobile game Mobile Legends: Bang Bang. 15 players applied for the team but only 6 will be chosen as the official players for the team.

37. In how many ways can Sir Jayson choose 6 individuals from the players who applied for the team if there is an additional of 2 players for those who applied?

A. 5, 005 B. 12, 376 C. 3, 603, 600 D. 8, 910, 700

38. If Sir Jayson groups the player applicants into 3 teams with 5 members each team and let them play with each other, How many games will each team play in a round robin format?

A. 1 B. 2 C. 3 D. 4

39. Given that Sir Jayson already identified 3 players from the 15 player applicants, in how many ways can he choose players to fill in the remaining slots?

A. 924 B. 455 C. 220 D. 66

40. The local weather forecaster said that there is a 40% chance of rain tomorrow. What is the probability that it will not rain tomorrow?

A. 0.4 B. 0.6 C. 40 D. 60

41. Which of the following statements describe intersection of events in drawing cards?

A. Drawing four face cards

B. Drawing a face card or a red card

C. Drawing a face card and a red card

D. Drawing a face card of all suits alternately

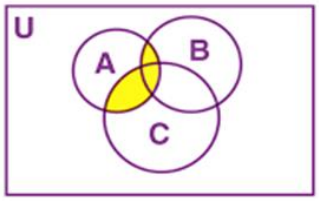
42. Based on the figure at the right, what does the shaded portion indicates?

A. Intersection

B. Union

C. Sample Space

D. Complement



43. If A = {1, 2, 3, 4} and B = {4, 5, 6, 7} , then which sets represent A or B?

A. {1, 2, 3, 4}

B. {4, 5, 6, 7}

C. {1, 2, 3, 5, 6, 7}

D. {1, 2, 3,4, 5, 6, 7}

44. A box contains 7 black marbles, 8 white marbles, and 5 yellow marbles. If a marble is drawn at random, what is the probability of getting a black or a yellow marble?

A. 0.25 B. 0.40 C. 0.60 D. 0.65

45. A letter is randomly chosen from the word "ACHIEVE". What is the probability that a letter A or E is selected?

A. 0.14 B. 0.29 C. 0.43 D. 0.57

46. On his 1st birthday, Anthony was given 500 as a present by his godmother Cleo. For every birthday thereafter, Cleo gave Anthony 250 more than on his previous birthday. This money was saved by Anthony's mother will be given to him at the right time. If today is Anthony's birthday and was given by her mother the amount of Php 7,750.00, how old is Anthony?

A. 31 B. 32 C. 33 D. 33

47. A ball is dropped from a height of 20 feet. If the ball loses 25 % of its height after each bounce, how far will it have travelled before coming to rest?

A. 120 ft B. 130 ft C. 140 ft D. 150 ft

48. The height of the rectangular box is 7 cm more than the width and the length is 9 more than its width. If the volume of the cellphone box is 154 cm, what are the dimensions of the box?

A. 2 cm by 5 cm by 11 cm
C. 3 cm by 5 cm by 11 cm
B. 2 cm by 5 cm by 11 cm
D. 3 cm by 7 cm by 11 cm

49. A polynomial function is defined to be $\boldsymbol{f(x) = (x + 3)(x - 2)^2}$. Which choice describes the graph's behavior at the x-axis?

A. The graph only touches the x-axis at x = -3, but crosses the x-axis at x = 2.

B. The graph only touches the x-axis at x = 3, but crosses the x-axis at x = -2.

C. The graph only touches the x-axis at x = 2, but crosses the x-axis at x = -3.

D. The graph only touches the x-axis at x = -2, but crosses the x-axis at x = 3.

For number 50-51, consider the scenario below.

> Mady is creating an open box out from a cardboard. This box can be made by cutting a square 4 cm by 4 cm at each corner. The length of the box is twice its width.

50. If the volume of this box is 256 cubic centimeters, what is the dimension of the card board?

A. 12 cm by 20 cm
C. 14 cm by 20 cm
B. 12 cm by 24 cm
D. 14 cm by 28 cm

51. Which function models the capacity of this box if the measurement of its width is $\boldsymbol{x}$ cm long?

A. $V(x) = 2(x - 4)(2x - 4)$
C. $V(x) = 2(x + 4)(2x + 4)$
B. $V(x) = 4(x - 8)(2x - 8)$
D. $V(x) = 4(x + 8)(2x + 8)$

52. If the center of a circle is located at (10, 6) and it passes through the point (4, 14), what is the length of its radius?

A. 6 B. 10 C. 14 D. 18

53. A map is drawn on a grid where 1 unit is equivalent to 1km. The land area of San Isidro is in a circular form with its center located at (2, 3). If the boundaries are located at 15 km radius, which point is not within the boundaries?

A. (-1, 8) B. (-4, 5) C. (3, -15) D. (10, 1)

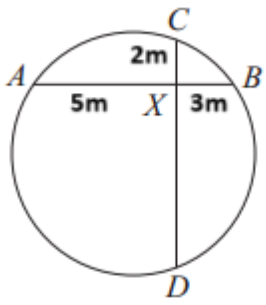
54. On a training facility intended for swimming, a pair of ropes was tied across their circular pool to serve as guide for the children who are practicing how to swim. The ropes intersect at the interior of the pool with three segments formed measuring 2m, 3m, and 5 m as illustrated in the figure below. What is the measure of the missing segment?

A. 6 m

B. 6.5 m

C. 7 m

D. 7.5 m



55. What do you call the events that do not have something in common?

A. Mutually exclusive events

B. Not Mutually exclusive events

C. Independent events

D. Dependent Events

56. Which of the following situations are mutually exclusive events when a card is drawn at random from a standard deck of 52 cards?

A. A 4 or a heart

B. A 4 or a jack

C. A 4 or a club

D. A jack or a face card

57. The Talakag NHS - Senior High School Department plans to create a grievance committee for SHS students. In how many ways can a committee of 9 students be chosen from 8 Grade 11 Students and 10 Grade 12 students if there must be 5 Grade 12 Students in the committee?

A. 8, 568 B. 17, 640 C. 48, 620 D. 62, 040

58. In a graduating class of 100 students, 54 will study mathematics, 60 will study physics, and 35 will study both mathematics and physics. If one of these students is selected at random, What is the probability that the student will study physics but NOT mathematics?

A. 0.21 B. 0.25 C. 0.35 D. 0.60

59. If there is 40% chance that Von will buy a laptop, 70% chance that he will buy a desktop computer, and 28% chance that he will buy a laptop and a desktop computer, what is the probability that he will buy a laptop or a desktop computer?

A. 30% B. 42% C. 68% D. 82%

60. A bag contains 5 red marbles, 7 blue marbles, and 3 yellow marbles. A marble is drawn at random and the color is noted and then put back inside the box. Then, another marble is drawn at random. What is the probability that both are blue?

A. 0.19 B. 0.20 C. 0.22 D. 0.23

61. Identify the next number in the sequence 7, 15, 24, 34, __.

A. 43 B. 44 C. 45 D. 46

62. Which of the following sequences illustrate an arithmetic sequence?

i. 3, 8, 13, 18,... ii. 3, 6, 18, 54,… iii. 7, 12, 19, 26,...

A. i only B. ii only C. i and ii D. i and iii

63. What is the arithmetic mean of 3 and 15?

A. 10 B. 9 C. 8 D. 7

64. 3, 6 and x -2 are the first three terms of a sequence. If these terms are that of a geometric sequence, what is the value of x?

A. 10 B. 11 C. 12 D. 13

65. The first term of a sequence is 6. In this sequence, the next terms after the first are generated by multiplying 3. Is the sequence generating an arithmetic sequence or geometric sequence? Justify your answer.

A. This sequence is arithmetic because each term after the first is obtained by adding a common difference of the previous term.

B. This sequence is geometric because each term after the first is obtained by multiplying a common ratio of the previous term.

C. This sequence is neither arithmetic nor geometric because the terms are not related by a common difference or common ratio.

D. This sequence is neither arithmetic nor geometric because the third and the succeeding terms of the sequence is obtained by getting the sum of the consecutive previous terms.

66. What is the sum of 1+1/3 +1/9+1/27+…?

A. 0.50 B. 0.75 C. 1.25 D. 1.50

67. Which of the following set up is correct when $\boldsymbol{2x^3 - 3x^2 + 6x - 8}$ is divided by $\boldsymbol{x - 5}$ using synthetic division?

A. $-5 \big| \begin{array}{cccc} 2 & -3 & 6 & 8 \end{array}$

B. $-5 \big| \begin{array}{cccc} 2 & 3 & -6 & 8 \end{array}$

C. $5 \big| \begin{array}{cccc} 2 & -3 & 6 & 8 \end{array}$

D. $5 \big| \begin{array}{cccc} 2 & 3 & -6 & 8 \end{array}$

68. If $\boldsymbol{f(3) = 0}$ then which of the following statement about $\boldsymbol{f(x)}$ is true?

A. $\boldsymbol{x + 3}$ is a factor of $\boldsymbol{f(x)}$

B. $\boldsymbol{x - 3}$ is a factor of $\boldsymbol{f(x)}$

C. $\boldsymbol{3}$ is the remainder of $\boldsymbol{f(x)}$

D. -3 is a zero of $\boldsymbol{f(x)}$

69. The area of the rectangle is $\boldsymbol{2x^3 + 5x^2 - x - 6}$ sq. cm. Write a polynomial that best represent its width, if its length is $\boldsymbol{2x^2 + x - 3}$ cm.

A. x - 3 cm B. x + 3 cm C. x + 2 cm D. x - 2 cm

70. Which of the following represents a polynomial function in one variable?

A. $P(x) = x^4 + 5y$

B. $P(x) = x^{-4} + 5$

C. $P(x) = \sqrt[4]{x} + 5$

D. $P(x) = x^4 + 5x$

71. A cyclist A travels 15 kph faster than cyclist B. How will you represent the speed of cyclist B if the speed of cyclist A is x kph?

A. $15x$ B. $\frac{15}{x}$ C. $x - 15$ D. $x + 15$

72. Which of the following is/are polynomials in one variable?

$$\boldsymbol{i.\, f(x) = 8x^3 - 5x^2 - 2x + 3}$$
$$\boldsymbol{ii.\, f(x) = 7x^3\, y^2 - 6xy^3 - 5}$$
$$\boldsymbol{iii.\, f(x) = 4x^4 - 2x^3 + 7x^2 - x - 6}$$

A. i only B. ii only C. i and ii D. i and iii

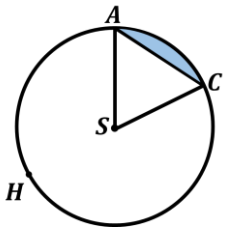
73. What is the end behavior of the graph of $\boldsymbol{P(x) = -x^3 + 3x^2 + 5}$?

A. The graph rises to the left and falls to the right.
B. The graph rises to the right and falls to the left.
C. The graph rises to the left and to the right.
D. The graph falls to the left and to the right.

74. Which of the following statements is TRUE about sector of a circle?

A. Region bounded by chord and major arc.
B. Region bounded by an arc which is 180 degrees in measure.
C. Region of the circle bounded by an arc and the segment joining endpoints.
D. Region bounded by an arc of the circle and the two radii to the endpoints of the arc.

75. The segment of a circle is the region bounded by an arc and the segment joining endpoints. In figure at the right, which of the following is considered the segment of circle S?



A. The region enclosed by segment SC and arc AHC.
B. The region enclosed by the segment AS and arc AC.
C. The region enclosed by the segment AC and arc AC.
D. The region enclosed by segment AC and arc AHC.

76. Find the center and radius of the circle with an equation of $\boldsymbol{x^2 + y^2 = 16}$?

A. $C\ (0,0);\ r = 4$
B. $C\ (0,0);\ r = 16$
C. $C\ (1,1);\ r = 4$
D. $C\ (1,1);\ r = 16$

77. What is the location of the center of a circle define by the equation $\boldsymbol{(x+6)^2 + (y+4)^2 = 9}$?

A. Quadrant I
B. Quadrant II
C. Quadrant III
D. Quadrant IV

78. What is the center of the circle defined by $\boldsymbol{(x-5)^2 + (y-9)^2 = 16}$?

A. $(5, 9)$
B. $(-5, 9)$
C. $(-5, -9)$
D. $(5, -9)$

79. What is the radius of the circle with an equation of $\boldsymbol{(x-8)^2 + y^2 = 49}$?

A. 7
B. 8
C. 41
D. 49

80. Which part of a circle is NOT needed to sketch its graph?

A. center
B. radius
C. radius point
D. chord

81. What do you call the absolute order of an arrangement of objects?

A. Combination B. Distinction C. Permutation D. Repetition

82. What do you call the number of ordered arrangements of non-distinct objects?

A. Circular Permutation C. Permutation of Distinct Objects

B. Objective Permutation D. Permutation of Non-distinct Objects

83. What is the value of P(5, 3)?

A. 6 B. 20 C. 60 D. 120

84. What do you call the way of selecting a subset from the given set where order does not matter?

A. Combination B. Integration C. Permutation D. Simulation

85. What is the value of C(6, 4)?

A. 15 B. 24 C. 30 D. 360

86. Teacher Edd, as a Esports coach, would like to select 5 players for the incoming Cluster meet out of the 25 prospect players. This situation is an example of _____.

A. Combination B. Differentiation C. Permutation D. Selection

87. What do you call the possible result in an experiment?

A. Event B. Outcome C. Sample Space D. Set

88. Choosing a "King" from a standard deck of cards is an example of _____.

A. Event B. Outcome C. Sample Space D. Set

89. What do you call a set that contains all of the elements that are in at least one of the two events?

A. Intersection B. Possibilities C. Union D. Universal

90. If A = { g } is the event that the child is a girl and B = { b } is the event that it is a boy, then A U B should be _____.

A. {g} B. {b} C. {g, b} D. { }