Vocabulary Practice Workbook – 4th ESO

UNIT 1. REAL NUMBERS

1. Multiple Choice Questions

a) a whole number or its opposite
Divisor
Ratio
Integer
Radical

b) a number that is the product of identical
square root
Imaginary numbers
square number
Real numbers

c) a comparison of two qualities.
Divisor
Ratio
Radical
Pi

d) the postive number that when multplied by itself equales a product
square root
square number
Integer
Ratio

e) a number that can be written with an integer in the numerator and positive integer in the dominator
Rational numbers
Imaginary numbers
Irrational numbers
Real numbers

f) the nonnegative square root of a number
Principal Square root
square root
Irrational numbers
Negative square

2. True/False Question

a) Irrational numbers → a number that can be written with an integer in the numerator and positive integer in the dominator

True False

b) Prime factorization → a way of expressing a whole number as a product of its prime factors

True False

c) Real numbers → a number that can be written with an integer in the numerator and positive integer in the dominator

True False

d) Negative square → an imaginary number that shows the square root of a negative square number

True False

e) Radical → an expression in the form of the square root of a.

True False

f) Pi → the circumference of any circle divided by its diameter

True False

3. Match each term below with its correct definition.

Term	Definition
Divisor	an expression in the form of the square root of a.
Imaginary numbers	numbers that involve the imaginary unit 1 defined as the square root
Integer	a whole number or its opposite
Irrational numbers	numbers that cannot be expressed in the form where a and b are integers and b
Pi	a number that can be written with an integer in the numerator and positive integer in the dominator
Prime factorization	the circumference of any circle divided by its diameter
Radical	a number that is the product of identical factors
Ratio	a comparison of two qualities.
Rational numbers	the set of numbers that include rational and irrational numbers
Real numbers	the positive number that when multiplied by itself equals a product
square number	a way of expressing a whole number as a product of its prime factors
square root	the number by which the dividend is divided

UNIT 2. POWERS AND ROOTS

1. Match each exponent property with its name.

$(x^m) \times (x^n) = x^{(m+n)}$	power of a product
$(x^m) / (x^n) = x^{(m-n)}$	negative exponent
$(x^m)^n = x^{(m \times n)}$	quotient law
$(xy)^m = x^m \times y^m$	power of a power
$(x/y)^m = x^m / y^m$	product law
$x^{(-m)} = 1 / x^m$	power of a quotient

2. Write a verbal phrase for the following numerical expression and solve it.

$\sqrt[3]{8}$	= 2	The cube or third root of eight equals two
$100^{\frac{1}{2}}$	=	
$\left(\frac{-1}{64}\right)^{\frac{2}{3}}$	=	
$\left(-5x^{\frac{2}{5}}\right)\left(-2x^3\right)$	=	
$\left(16a^{\frac{4}{3}}b^{\frac{1}{2}}\right)^{-\frac{1}{2}}$	=	
$\frac{3x^{\frac{1}{5}}}{9x^{\frac{1}{2}}}$	=	
$\sqrt[4]{x^6}$	=	

UNIT 3. POLYNOMIALS AND ALGEBRAIC FRACTIONS

1. Fill in the gaps with the following words:

algebraic fractions	degree of a term	terms	polynomial
factors	constant term	variable	value
degree of a polynomial	monomial	constant	

Functions can be categorized and the simplest type is a polynomial function.

1. When numbers are added or subtracted, they are called _____. This is a sum of three terms. (In algebra, we speak of a "sum," even though a term may be subtracted.)

$$4x^2 + 7x - 8$$

When numbers are multiplied, they are called _____. This is a product of three factors.

$$1. \quad (x + 1)(x + 2)(x + 3)$$

2. A _____ is a symbol that takes on values. A _____ is a number. Thus if x is the variable and has the value 4, then $5x + 1$ has the value 21.

3. A _____ is a symbol that has a single value. The beginning letters of the alphabet a, b, c, etc. are typically used to denote constants, while the letters x, y, z , are typically used to denote variables. For example, if we write

$$y = ax^2 + bx + c,$$

we mean that a, b, c are constants (i.e. fixed numbers), and that x and y are variables.

4. A _____ in x is a single term of the form ax^n, where a is a real number and n is a whole number.

The following are monomials in x:

$$5x^3 , \quad -6.3x, \quad 2.$$

We say that the number 2 is a monomial in x, because $2 = 2x^0 = 2 \cdot 1$.

5. A _____ in x is a sum of monomials in x.

$$5x^3 - 4x^2 + 7x - 8.$$

The variable of the polynomial, in this case x, is also called the argument of the polynomial. Here is a polynomial with argument t :

$$t^2 - 5t + 1.$$

6. The _____ is the sum of the exponents of all the variables in that term.

In functions of a single variable, such as x, the degree of a term is simply the exponent. The term $5x^3$ is of degree 3 in the variable x. This term $2xy^2z^3$ is of degree $1 + 2 + 3 = 6$ in the variables x, y, and z.

Here are all possible terms of the 4th degree in the variables x and y:

$$x^4, \quad x^3y, \quad x^2y^2, \quad xy^3, \quad y^4.$$

In each term, the sum of the exponents is 4. As the exponent of x decreases, the exponent of y increases.

7. The leading term of a polynomial is the term of highest degree. The leading term of this polynomial $5x^3 - 4x^2 + 7x - 8$ is $5x^3$.

8. The leading coefficient of a polynomial is the coefficient of the leading term. The leading coefficient of that polynomial is 5.

9. The _____ is the degree of the leading term. The degree of this polynomial $5x^3 - 4x^2 + 7x - 8$ is 3.

Here is a polynomial of the first degree: $x - 2$.

1 is the highest exponent.

10. The _____ of a polynomial is the term of degree 0; it is the term in which the variable does not appear. The constant term of this polynomial $5x^3 - 4x^2 + 7x - 8$ is -8.

11. The general form of a polynomial shows the terms of all possible degree. Here, for example, is the general form of a polynomial of the third degree:

$$ax^3 + bx^2 + cx + d$$

Notice that there are four constants: a, b, c, d.

12. A polynomial function has the form $y =$ A polynomial

A polynomial function of the first degree, such as $y = 2x + 1$, is called a linear function; while a polynomial function of the second degree, such as $y = x^2 + 3x - 2$, is called a quadratic.

13. _____ are fractions whose numerator (top) and denominator (bottom) are both algebraic expressions.

UNITS 4 & 5. EQUATIONS AND INEQUATIONS

1. Write a numerical expression for the following verbal phrase.

a) Twice the difference of negative seven and four

Because "twice" means to multiply by two and "difference" refers to subtraction, the numerical expression is 2(-7 – 4).

b) The product of negative twelve and three

c) The sum of negative twenty and sixteen

d) The quotient of thirty-three and negative eleven

e) Twice the sum of ninety and negative twenty-two

2. Write a verbal phrase for the following numerical expression.

$8 + X < 12$	
$2 \cdot X = 20$	
$3 \cdot X$	
$X/2 > 9$	
$X/3 = 6$	
$X + 4 - 6 = 21$	
$2 \cdot X + 5 = 8$	
$X \cdot 6 = -48$	
$X - 9 = 1$	
$23 + X \geq 12$	
$-8Y + 2X = 152$	
$X/3 + 1 = 67$	
$X + X - 6 \leq 21$	
$21 \cdot X + 5 < -7$	
X^2	
$X^2 - 9X + 1 \geq 0$	
$X^2 = 49$	

3. Select the algebraic equation that correctly represents the given sentence.

A. Twice a number is twenty-eight.

a) $x + 2 = 28$

b) $2x = 28$

c) $28 = \frac{x}{2}$

d) None of the above.

B. The quotient of thirty-nine and a number is three.

a) $39w = 3$

b) $\frac{39}{w} = 3$

c) $39 - w = 3$

d) None of the above.

C. Five less than three times a number is forty-six.

a) $5 - 3t = 46$

b) $3t - 5 = 46$

c) $\frac{5}{3t} = 46$

d) None of the above.

D. Three is twenty-one, divided by the sum of a number and five.

a) $3(m+5) = 21$

b) $3m + 5 = 21$

c) $3 = \frac{21}{m} + 5$

d) None of the above.

E. Eric had $197 in his savings account before he was paid his weekly salary. His current savings balance is $429. How much money does Eric earn each week?

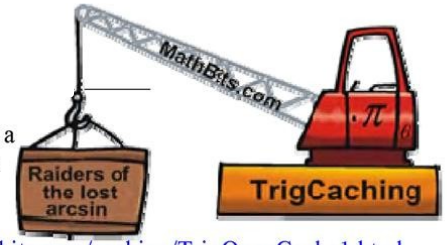
a) $197 + 429 = n$

b) $197 + n = 429$

c) $197n = 429$

d) None of the above.

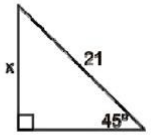
Answer Sheet
Show all work. There is a printable "Certificate" in the last box.
To start, go to



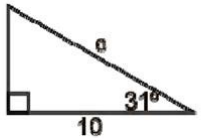
http://mathbits.com/caching/TrigOpenCache1.html

Box 1:

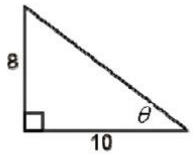
1. Find x to the *nearest tenth*:



2. Find c to the *nearest tenth.*



3. Find theta to the *nearest degree*.



Box 2:

1.

2.

3.

4.

Box 3:

1.

2.

3.

Box 4:

1.

2.

Box 5:

1.

2.

Box 6:

1.

2.

3. amplitude = _____ frequency = _____

Box 7:

1.

2.

3.

Box 8:

1. 2.

3. 4.

5.

Box 9:

1. 2. 3.

Box 10: Complete this URL of the winning box!
http://MathBits.com/Caching/ T_____.html

Remember that there is a printable "Certificate".

UNIT 8. VECTORS

1. Classify each word according with its meaning. You can choose to do it on line on the web bellow.

right
adjacent
perimeter
n-gon
midpoint
coplanar
line
linear pair
regular
convex
vertical
complementary

plane
obtuse
concave
supplementary
acute
relative error
line segment
degree
precision
point
collinear
congruent

undefined terms _____

measurement _____

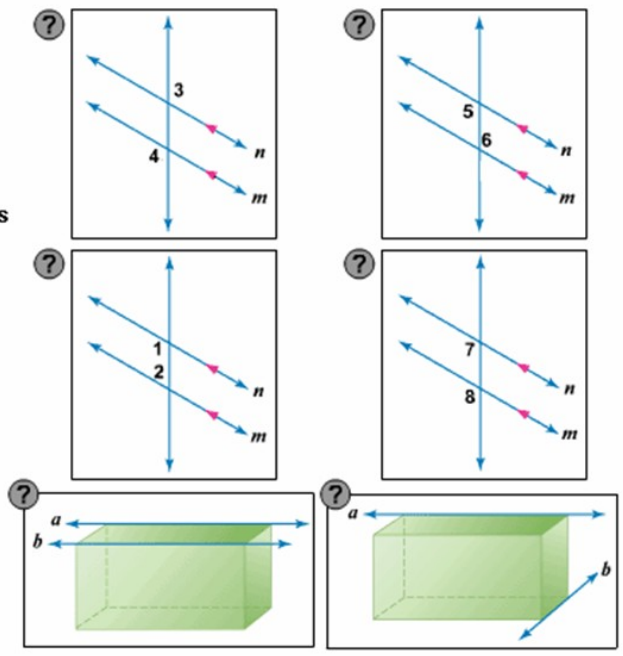
angles _____

pairs of angles _____

polygons _____

2. Match each word with the appropriate graph. You can choose to do it on line on the web bellow.

1. skew lines
2. parallel lines
3. alternate interior angles
4. corresponding angles
5. alternate exterior angles
6. consecutive interior angles



UNITS 9, 10 & 11. FUNCTIONS

1. Fill in the gaps.

When working with equations that have two (1)_____, the coordinate plane is an important tool. It's a way to draw pictures of equations that makes them easier to understand.

To create a coordinate plane, start with a sheet of graph paper. Next, draw a (2)_____ line. This line is called the x-axis and is used to locate values of x. To show that the axis actually goes on forever in both directions, use small arrowheads at each end of the line. Mark off a number line with (3)_____ in the center, positive numbers to the (4)_____, and negative numbers to the (5)_____.

Next draw a (6)_____ line that intersects the x axis at zero. This line is called the y-axis and is used to locate the values of y. Mark off a number line with zero in the center, (7)_____ numbers going upwards, and (8)_____ numbers going downwards. The point where the x and y axes intersect is called the origin. The origin is located at (9)_____ on the x axis and zero on the y axis.

Locating Points Using Ordered Pairs
We can locate any point on the coordinate plane using an ordered pair of numbers. We call the ordered pair the coordinates of the point. The coordinates of a point are called an ordered pair because the order of the two (10)_____ is important.

The first number in the ordered pair is the (11)_____ coordinate. It describes the number of units to the left or right of the origin. The second number in the ordered pair is the (12)_____ coordinate. It describes the number of units above or below the origin. To plot a point, start at the (13)_____ and count along the x axis until you reach the x coordinate, count right for positive numbers, left for negative. Then count up or down the number of the y coordinate (up for (14)_____, down for (15)_____.)

Quadrants
To make it easy to talk about where on the coordinate plane a point is, we divide the coordinate plane into four sections called quadrants.

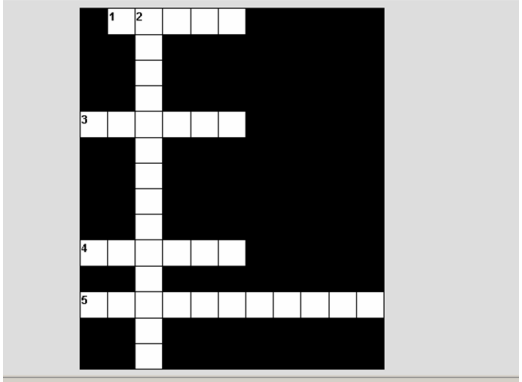
Points in Quadrant 1 have positive x and positive y coordinates.
Points in Quadrant 2 have (16)_____ x but (17)_____ y coordinates.
Points in Quadrant 3 have (18)_____ x and (19)_____ y coordinates.
Points in Quadrant 4 have (20)_____ x but (21)_____ y coordinates.

horizontal left negative negative negative negative negative negative numbers origin positive positive positive positive right variables vertical x y zero zero

2. Match each word with its translation in Spanish.

COORDINATE PLANE	EJES CARTESIANOS
DEPENDENT VARIABLE	VARIABLE DEPENDIENTE
INDEPENDENT VARIABLE	FUNCIÓN
FUNCTION	PAR ORDENADO
SET OF POINTS	VARIABLE INDEPENDIENTE

3. Complete the Crossword.



Across:

1
The steepness or slant o a line

3
The horizontal number line on a coordinate plane

4
The vertical number line on a coordinate plane

5
The value of y at the point where the line crosses the y axis

Down:

2
The equation of any straight line

3. Read the following text and underline the key vocabulary.

A function is a mathematical relationship between two sets of real numbers. These sets of numbers are related to each other by a rule that assigns each value from one set to exactly one value in the other set. For example, suppose we choose the letter x to stand for the numbers in one set and the letter y for the numbers in the second set. Then, for each value we assign to x, we can find one and only one comparable value of y.

An example of a function is the mathematical equation $y = 3x + 2$. For any given value of x, there is one and only one value of y. If we choose 5 for the value of x, then y must be equal to 17 ($3 \cdot 5 + 2 = 17$). Or if we choose 11 for the value of x, then y must be equal to 35 ($3 \cdot 11 + 2 = 35$).

The standard notation for a function is $y = f(x)$ and is read "y equals f of x." Functions can also be represented in other ways, such as by graphs and tables. Functions are classified by the types of rules that govern their relationships: algebraic, trigonometric, logarithmic, and exponential.

Words to Know

Dependent variable: The variable in a function whose value depends on the value of another variable in the function.

Independent variable: The variable in a function that determines the final value of the function.

Inverse function: A function that reverses the operation of the original function.

Just as we add, subtract, multiply, or divide real numbers to get new numbers, functions can be manipulated as such to form new functions. Consider the functions $f(x) = x^2$ and $g(x) = 4x + 2$. The sum of these functions $f(x) + g(x) = x^2 + 4x + 2$. The difference of $f(x) - g(x) = x^2 - 4x + 2$. The product and quotient can be obtained in a similar way.

In addition to a mathematical equation, graphs and tables can be used to represent a function. Since a function is made up of two sets of numbers—each of which is paired with only one other number—a graph of a function can be made by plotting each pair on an x, y coordinate system known as the Cartesian coordinate system. Graphs are helpful because they make it easier to visualize the relationship between the domain and the range of the function.

Classification of functions

Functions are classified by the type of mathematical equation that represents their relationship. Algebraic functions are the most common type of function. These are functions that can be defined using addition, subtraction, multiplication, division, powers, and roots. Examples of algebraic functions include the following: $f(x) = x + 4$ and $f(x) = x/2$ and $f(x) = x^3$.

Two other common types of functions are trigonometric and exponential (or logarithmic) functions. Trigonometric functions deal with the sizes of angles and include the functions known as the sine, cosine, tangent, secant, cosecant, and cotangent. Exponential functions can be defined by the equation $f(x) = b^x$, where b is any positive number except 1. The variable b is constant and is known as the base.

An example of an exponential function is $f(x) = 10^x$. Notice that for values of x equal to 1, 2, 3, and 4, the values of f(x) are 10, 100, 1,000, and 10,000. One property of exponential functions is that they change very rapidly with changes in the independent variable.

The inverse of an exponential function is a logarithmic function. In the equation $f(x) = 10^x$, one procedure is to set certain values of x (as we did in the example above) and then find the corresponding values of f(x). Another possibility is to set certain values of f(x) and find out what values of x are needed to produce those values. This process is using the exponential function in reverse and is known as a logarithmic function.

Applications

All types of functions have many practical applications. Algebraic functions are used extensively by chemists and physicists. Trigonometric functions are particularly important in architecture, astronomy, and navigation. Financial institutions often use exponential and logarithmic functions.

UNIT 12. STATISTICS

1. Match the English words on the left with the Spanish translation on the right.

MEAN	GRÁFICA
LINE GRAPH	DATOS
AVERAGE	GRÁFICA DE LÍNEAS
GRAPH	GRÁFICA DE COORDENADAS
MODE	PUNTO MEDIO
STEM-AND-LEAF PLOT	ENTRE EXTREMOS
DATA	MODA
MEDIAN	GRÁFICA PICTÓRICA
RANGE	ESPACIO DE ALCANCE
SCALE	ESCALA
LINE PLOT	GRÁFICA DE TALLO Y HOJA
PICTOGRAPH	PROMEDIO

2. Match each word on the left with its definition on the right.

AVERAGE	A COLLECTION OF NUMERIC VALUES REPRESENTING THE OUTCOMES OF AN EXPERIMENT
DATA SET	A GENERIC WORD THAT CAN BE USED TO DESIGNATE THE MEAN, MODE, MEDIAN, WEIGHTED MEAN, ETC OF A DATA SET
LOWER QUARTILE	THE MEDIAN OF THE SUBSET OF DATA LESS THAN THE MEDIAN OF ALL THE VALUES IN THE DATA SET, OR THE NUMBER THAT FALLS BETWEEN THE FIRST AND SECOND QUARTERS OF THE DATA
INTERQUARTILE RANGE	THE MOST COMMON OR FREQUENT VALUE (MORE THAN ONE MODE IS ALLOWED)
MEAN	THE SUM OF THE DATA DIVIDED BY THE NUMBER OF ELEMENTS IN THE LIST
MEDIAN	THE DIFFERENCE BETWEEN THE UPPER QUARTILE AND THE LOWER QUARTILE, INCLUDES THE MIDDLE HALF OF THE DATA
MODE	THE MIDDLE VALUE OF THE DATA WHEN IT IS SORTED IN INCREASING ORDER (IF THERE ARE AN EVEN NUMBER OF ELEMENTS, THE MEDIAN FALLS HALFWAY BETWEEN THE MIDDLE TWO VALUES)
SAMPLE SIZE	ANY VALUE MORE THAN 1.5 TIMES THE IQR ABOVE THE UPPER OR BELOW THE LOWER QUARTILE, A REAL LONESOME OUTSIDE VALUE
OUTLIER	THE LARGEST VALUE SUBTRACT THE SMALLEST VALUE, HOW FAR THE DATA STRETCHES
RANGE	THE NUMBER OF DATA VALUES, DENOTED N
VARIANCE	FOUND BY SUBTRACTING THE MEAN FROM EACH VALUE, SQUARING THE DIFFERENCES AND SUMMING THEM UP TOGETHER, THEN DIVIDING BY THE TOTAL NUMBER OF OBSERVATIONS

3. Fill in the gaps with the appropriate word from the list below.

_____ is the collection of methods used in planning an experiment and analyzing data in order to draw accurate conclusions. The complete set of data elements is the _____. A _____ is a portion of a population selected for further analysis.

A dictionary defines data as facts or figures from which conclusions may be drawn

_____ data are nonnumeric and _____ data are numeric.

_____ most often refers to the arithmetic mean, but is actually ambiguous and may be used to also refer to the mode, median, or midrange. Mean most often refers to the arithmetic mean.

The _____ is obtained by summing all elements of the data set and dividing by the number of elements. _____ is the data element which occurs most frequently. The _____ is the middle element when the data set is arranged in order of magnitude.

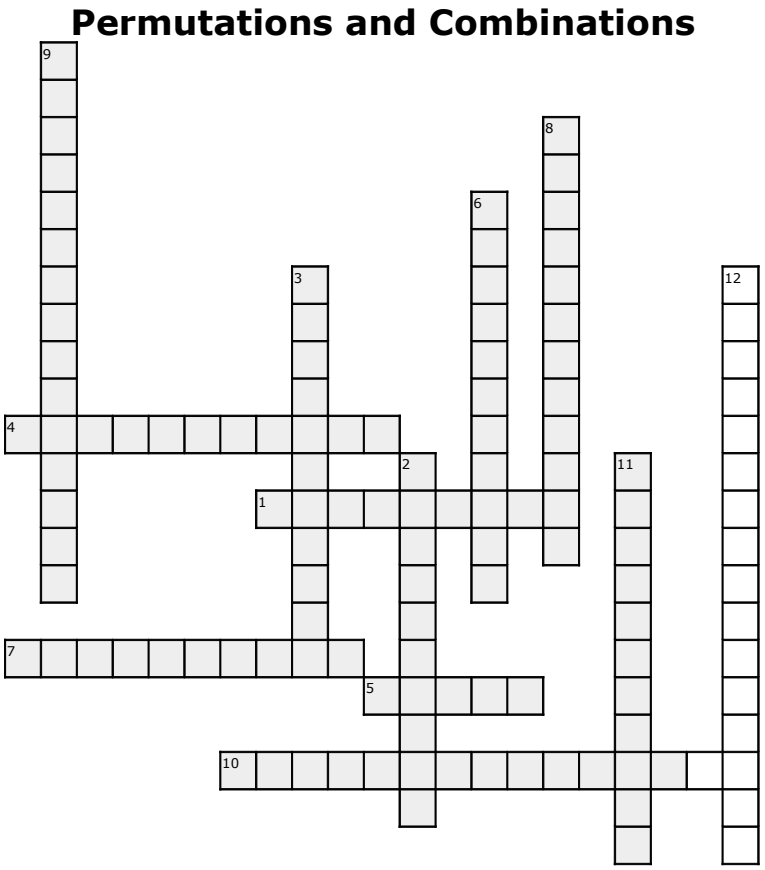
A _____lists in one column the data categories or classes and in another column the corresponding frequencies. _____contains the relative frequency instead of absolute frequency. _____ contain frequencies which are cumulative for subsequent classes.

A _____ has the same shape and horizontal scale as a histogram, but the vertical scale is now the relative frequency and a _____ depicts data by using pictures of an object.

STATISTICS	POPULATION	AVERAGE	SAMPLE
QUALITATIVE	FREQUENCY TABLE	MODE	MEDIAN
QUANTITATIVE	PICTOGRAPH	RELATIVE FREQUENCY TABLE	CUMULATIVE FREQUENCY TABLES
ARITHMETIC MEAN	HISTOGRAM		

UNIT 13. COMBINATORICS

1. Complete the crossword puzzle below

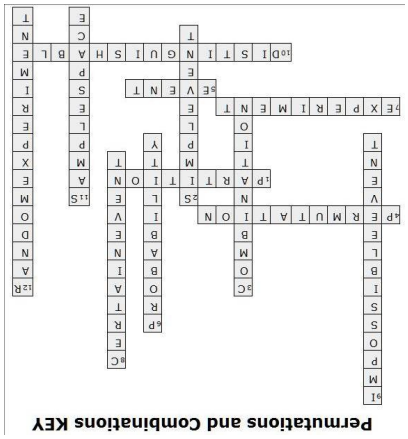


Across:

1. Division of the elements
4. When order matters
5. The set of outcomes from a random experiment
7. A method by which observations are made
10. If one cannot be obtained from the other by interchanging the positions of elements of the same kind

Down:

2. An outcome which cannot be broken down
3. When order doesn't matter
6. The mathematical study of chance and random processes
8. An event with a probability of 1
9. An event with a probability of 0
11. The set of all possible outcomes for a given experiment
12. The act of rolling a fair die, flipping an honest coin, or randomly selecting a card from a deck



UNIT 14. PROBABILITY

1. Match each word on the left with its definition on the right.

Experiment		one or more outcomes of an experiment
Outcome		a situation involving chance or probability that leads to results called outcomes
Event		the measure of how likely an event is
Probability		P(A) = The Number Of Ways Event A Can Occur / The Total Number Of Possible Outcomes
Probability Of An Event		the result of a single trial of an experiment

2. Read each question below and select your answer

A. Which of the following is an experiment?
- □ Tossing a coin.
- □ Rolling a single 6-sided die.
- □ Choosing a marble from a jar.
- □ All of the above

B. Which of the following is an outcome?

- □ Rolling a pair of dice.
- □ Landing on red.
- □ Choosing 2 marbles from a jar.
- □ None of the above.

C. Which of the following experiments does NOT have equally likely outcomes?

- □ Choose a number at random from 1 to 7.
- □ Toss a coin.
- □ Choose a letter at random from the word SCHOOL.
- □ None of the above.

D. What is the probability of choosing a vowel from the alphabet?

- □ 21/26
- □ 5/26
- □ 1/21
- □ None of the above.

E. A number from 1 to 11 is chosen at random. What is the probability of choosing an odd number?

- □ 1/11
- □ 5/11
- □ 6/11
- □ None of the above.