10

Mathematics

Quarter 2 – Module 2
Problems Involving Polynomial Function

DepED
DEPARTMENT OF EDUCATION

About the Module

This module was designed and written with you in mind. It is here to help you master the skills in solving problems involving polynomial function. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

This module is divided into three lessons, namely:

Lesson 1 – Evaluating Polynomial Function
Lesson 2 – Solving Problems Involving Polynomial Function
(Evaluating Polynomial Function)
Lesson 3 – Solving Problems Involving Polynomial Function
(Operations on Polynomial Function)

After going through this module, you are expected to:

1. evaluate polynomial functions;
2. recall operation on polynomials;
3. identify the steps in solving problems involving polynomial functions; and
4. solve problems involving polynomial function.

What I Know (Pre-Test)

Instructions: Read each item carefully. Choose the letter of the correct answer and write it on a separate answer sheet.

1. Simplify: $(2x^3 - 4x^2 + 8x + 12) + (x^3 + 5x^2 - 7x + 10)$
   A. $3x^3 + x^2 + x + 22$ C. $3x^3 - 9x^2 + x + 22$
   B. $3x^3 + x^2 - x + 22$ D. $3x^3 - 9x^2 - x + 22$

2. Evaluate $f(x) = 7x^2 + 4x - 8$ when $x = -2$.
   A. 28 B. 20 C. 12 D. 6

3. Evaluate $h(x) = x^3 - 2x^2 + 3x - 10$ when $x = 3$.
   A. 8 B. -8 C. 4 D. – 4

4. The average fuel (in gallons) consumed by an individual vehicle is modeled by the function $f(t) = t^3 + 10t + 300$, where t is the number of years. Find the average fuel consumed by an individual for 6 years.
   A. 986 B. 576 C. 466 D. 216

5. A researcher predicts that the population of Philippines will be 12.3 million in 2012 and will increase by about .13 million per year until 2022. This expressed as $f(x) = 0.13x + 12.3$, where x is the number of years since 2012. what will be the estimated population 5 years after?
   A. 15.2 *million* B. 14.12 *million* C. 13.50 *million* D. 12.95 *million*

6. A phone manufacturer determines that its profit, P, in pesos, can be modeled by the function $P(x) = x^3 + 5x^2 + 3x + 1$, where x represents the number of phones sold. What is the profit when $x = 10$?
   A. 1 531 B. 5 531 C. 10 531 D. 50 531

7. A researcher establishes that a patient's reaction time, R in minutes, to a dose of a particular drug is $R(d) = d^3 + 3d^2 - 8$, where d is the amount of drug, in milliliters, that absorbed in the patient's blood. Find the patient's reaction time when $d = 3$.
   A. 192 B. 92 C. 60 D. 46

8. The volume of a rectangular solid is represented by $V(x) = 2x^3 + x^2 - 2x - 1$. The length of the solid is given by $l(x) = 2x + 1$, and the width is given by $w(x) = x + 1$. What expression represents the height of the solid?
   A. $x - 1$ B. $x - 2$ C. $x - 3$ D. $x - 4$

9. A pool is being filled with a large water hose. The height of the water in a pool is determined by the function $F(x) = 7x^2 - 5x + 10$. Previously, the pool had been filled up with a different hose. Then, the height was determined by the function $P(x) = 3x^2 - 6x - 4$. What polynomial represents the difference in the height of the water in the pool between two hoses?
   A. $4x^2 - 11x + 14$ C. $4x^2 + x + 14$
   B. $4x^2 - 11x + 6$ D. $4x^2 + x + 6$

10. The length of a rectangle is represented by the function $L(x) = x^2 - 2$, and its width is represented by $W(x) = 2x + 3$. Write the polynomial function that represents the area of the rectangle.

A. $2x^3 + 3x^2 - 4x - 6$ C. $2x^3 - 3x^2 - 4x - 6$

B. $2x^3 + 3x^2 + 4x - 6$ D. $2x^3 - 3x^2 + 4x - 6$

11. A painter must add the areas of two walls to determine the amount of paint needed. The area of the first wall is modeled by $f(x) = x^3 + 3x^2 - 9x + 1$, and the area of the second wall is modeled by $g(x) = 5x^2 + 7x - 3$. What polynomial represents the total area of two walls?

A. $x^3 + 2x^2 - 2x - 2$ C. $x^3 + 8x^2 - 2x - 2$

B. $x^3 + 2x^2 - 16x - 2$ D. $x^3 + 8x^2 - 16x - 2$

12. The distance covered by a bicycle is modelled by the polynomial function $D(x) = x^3 + 3x^2 - 13x + 6$. The time taken by the bicycle to cover the distance is given by the function $T(x) = x - 2$. Find the polynomial function that represents the speed of the bicycle.

A. $S(x) = x^2 + 5x - 3$ C. $S(x) = x^2 - 5x - 3$

B. $S(x) = x^2 + 5x + 3$ D. $S(x) = x^2 - 5x + 3$

13. Alexa has a rectangular garden. The length of the garden is represented by $l(x) = 4x - 3$ and the width is represented by $w(x) = 2x + 1$. What polynomial represents the perimeter of the rectangle?

A. $8x^2 + 10x - 3$ B. $8x^2 - 2x - 3$ C. $12x + 8$ D. $12x - 4$

For numbers 14-15, refer to the problem below.

> The length of a rectangular prism is modeled by $l(x) = 3x - 1$, the width is $w(x) = 2x + 3$ and the height is modeled by $h(x) = 2x$.

14. What polynomial function represents the volume of the rectangular prism?

A. $V(x) = 12x^3 + 14x^2 + 6x$ C. $V(x) = 12x^3 - 14x^2 - 6x$

B. $V(x) = 12x^3 + 14x^2 - 6x$ D. $V(x) = 12x^3 - 14x^2 + 6x$

15. What is the volume of the rectangular prism if $x = 2$?

A. 164 B. 152 C. 140 D. 52

Lesson 1 Monday	**Evaluating Polynomial Function**

What I Need to Know

At the end of this lesson, you are expected to:

- evaluate polynomial functions.

What's In

From your previous lesson, polynomial function is a function defined by

$$f(x) = a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \cdots + a_1 x + a_0 = 0,$$

where, $a_n \neq 0$, n is a nonnegative integer and the coefficients $a_0, a_1, \ldots, a_n$ are real numbers. The function is also denoted as $y = f(x)$, where x is the input of the function and y is the value of the function. The leading term is $a_n x^n$, a_0 is the *constant term*; $a_0, a_1, \ldots, a_n$ are the *coefficients*, and a_n is the *leading coefficient*.

What's New

EVALUATING POLYNOMIAL FUNCTION

Evaluate $f(x) = 4x^2 + 7x + 3$ when $x = 2$.

from: http://www.clipartbest.com/clipart-xcg7r7kcA

What Is It

In the previous activity, we need to evaluate $f(x) = 4x^2 + 7x + 3$ when $x = 2$.

Here are the steps required in **Evaluating Polynomial Functions.**

Step 1: Replace the value of x in the function with the given value.
Step 2: Use the order of operation to simplify the function.

Solutions:

Step 1: Replace the value of x in the function with the given value. Since the given value of x is 2, replace the value of x with 2.

$$f(\boldsymbol{x}) = 4\boldsymbol{x}^2 + 7\boldsymbol{x} + 3$$
$$f(\boldsymbol{2}) = 4(\boldsymbol{2})^2 + 7(\boldsymbol{2}) + 3$$

Step 2: Use the order of operation to simplify the function.

$$f(\boldsymbol{2}) = 4(\boldsymbol{2})^2 + 7(\boldsymbol{2}) + 3$$
$$f(\boldsymbol{2}) = 4(4) + 14 + 3$$
$$f(\boldsymbol{2}) = 16 + 14 + 3$$
$$\boxed{f(\boldsymbol{2}) = 33}$$

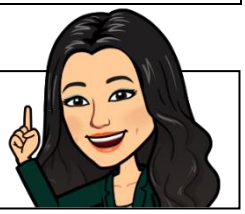
Illustrative Examples:

Ex. 1. Evaluate $f(x) = -4x^2 + 8x + 5$ when $x = 3$.

Solutions:

***Step 1**:* Replace the value of x in the function with the given value. Since the given value of x is 3, replace the value of x with 3.	$f(x) = -4x^2 + 8x + 5$ $f(3) = -4(3)^2 + 8(3) + 5$
***Step 2*:** Use the order of operation to simplify the function.	$f(3) = -4(3)^2 + 8(3) + 5$ $f(3) = -4(9) + 24 + 5$ $f(3) = (-36) + 24 + 5$ $\boldsymbol{f(3) = -7}$

*Note: The order of operation follows **PEMDAS.** PEMDAS is an acronym for parenthesis, exponents, multiplication, division, addition and subtraction.*



Ex. 2. Given $g(x) = 3x^3 + x^2 + x$, find $g(-2)$.

Solutions:

***Step 1**:* Replace the value of x in the function with the given value. in this case, we will replace the value of x with -2.	$g(x) = 3x^3 + x^2 + x$ $g(-2) = 3(-2)^3 + (-2)^2 + (-2)$
***Step 2*:** Use the order of operation to simplify the function.	$g(-2) = 3(-2)^3 + (-2)^2 + (-2)$ $g(-2) = 3(-8) + 4 + (-2)$ $g(-2) = (-24) + 4 + (-2)$ $\boldsymbol{g(-2) = -22}$

Ex. 3. Given $h(x) = x^7 - 2x^5 + x^2 - 10$, find $h(-1)$.

Solutions:

***Step 1**:* Replace the value of x in the function with the given value. in this case, we will replace the value of x with -1.	$h(x) = x^7 - 2x^5 + x^2 - 10$ $h(-1) = (-1)^7 - 2(-1)^5 + (-1)^2 - 10$
***Step 2*:** Use the order of operation to simplify the function.	$h(-1) = (-1)^7 - 2(-1)^5 + (-1)^2 - 10$ $h(-1) = (-1) - 2(-1) + 1 - 10$ $h(-1) = (-1) + 2 + 1 - 10$ $\boldsymbol{h(-1) = -8}$

What's More

Activity 1. NOW IT'S YOUR TURN!

Instructions: Evaluate the following polynomial function with the given value of x.

1. Evaluate $f(x) = x^2 + 7x + 9$ when $x = 4$.
2. Evaluate $g(x) = x^2 + 4x - 3$ when $x = -2$.
3. Evaluate $h(x) = x^3 - x^2 + 4x + 5$ when $x = 2$.
4. Evaluate $f(x) = 4x^5 - 2x^2 + 5x - 7$ when $x = 1$.
5. Evaluate $P(x) = x^6 + 3x^3 - 2x^2 + 8x + 5$ when $x = -1$.

What I Need to Remember

Write your insight/learning about the lesson being studied.

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Lesson 2 Tuesday

Solving Problems Involving Polynomial Function (Evaluating Polynomial Function)

What I Need to Know

At the end of this lesson, you are expected to:

- identify the steps in solving problems involving polynomial function, and
- solve problems involving polynomial function.

What's In

In evaluating polynomial function for a given value, substitute the value of x and find its numerical value.

Example: Evaluate $f(x) = x^2 - 5x - 9$ when $x = 3$.

Solutions:

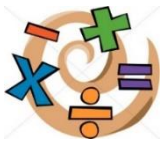
Step 1*:* Replace the value of x in the function with the given value. in this case, we will replace the value of x with 3.	$f(x) = x^2 - 5x - 9$ $f(3) = (3)^2 - 5(3) - 9$

***Step 2*:** Use the order of operation to simplify the function.	$f(3) = (3)^2 - 5(3) - 9$ $f(3) = 9 - 15 - 9$ $\boldsymbol{f(3) = -15}$

What's New

The polynomial function $f(t) = 20t^2 + 400$ gives the height of an object t seconds after it is dropped from a 400 foot tall bridge.

Find the height after $\boldsymbol{t = 3}$ seconds.



What Is It

It is very important to master the skills in evaluating polynomial function since we will use it in solving problems involving polynomial function.
Let us answer the previous activity.

The polynomial function $f(t) = 20t^2 + 400$ gives the height of an object t seconds after it is dropped from a 400 foot tall bridge.

Find the height after $\boldsymbol{t = 3}$ seconds.

Solutions:
Follow the steps in evaluating polynomial function.
Step 1: Replace the variable with the given value; and
Step 2: Use the order of operation to simplify the function.

Step 1: Replace the value of t with 3.

$$f(t) = 20t^2 + 400$$
$$f(3) = 20(3)^2 + 400$$

Step 2: Use the order of operation to simplify the function.

$$f(3) = 20(3)^2 + 400$$
$$f(3) = 20(9) + 400$$
$$f(3) = 180 + 400$$
$$f(3) = 580$$

Therefore, the height of an object 3 seconds after it is dropped from a 400 foot tall bridge is 580.

Let us try these word problems.

Illustrative Examples

Ex. 1. A demographer predicts that the population, P, of a town t years from now can be modeled by the function $P(t) = 4t^3 + 2t^2 + 150t + 10\,000$. What will the population of the town be two (2) years from now?

Solutions:
Step 1: Replace the value of t with 2.

$$P(t) = 4t^3 + 2t^2 + 150t + 10\,000$$
$$P(2) = 4(2)^3 + 2(2)^2 + 150(2) + 10\,000$$

Step 2: Use the order of operation to simplify the function.

$$P(2) = 4(2)^3 + 2(2)^2 + 150(2) + 10\,000$$
$$P(2) = 4(8) + 2(4) + 300 + 10\,000$$
$$P(2) = 32 + 8 + 300 + 10\,000$$
$$P(2) = 10\,340$$

Therefore, the population of the town two years from now will be 10 340.

Ex. 2. A car manufacturer determines that its profit, P, in millions of pesos, can be modeled by the function $P(x) = 20x^3 + 35x^2 + 4x - 2$, where x represents the number of cars sold. What is the profit when $x = 150$?

Solutions:
Step 1: Replace the value of x with 150.

$$P(x) = 20x^3 + 35x^2 + 4x - 2$$
$$P(150) = 20(150)^3 + 35(150)^2 + 4(150) - 2$$

Step 2: Use the order of operation to simplify the function.

$$P(150) = 20(150)^3 + 35(150)^2 + 4(150) - 2$$
$$P(150) = 20(3\,375\,000) + 35(22\,500) + 600 - 2$$
$$P(150) = 67\,500\,000 + 787\,500 + 600 - 2$$
$$P(150) = 68\,288\,098$$

Thus, the profit when x = 150 is 68 288 098.

Ex. 3. The total number of hexagons in a honeycomb can be modeled by the function $f(r) = 3r^2 - 3r + 1$, where r is the number of rings and $f(r)$ is the number of hexagons. Find the total number of hexagons in a honeycomb with 6 rings.

Solutions:
Step 1: Replace the value of r with 6.

$$f(r) = 3r^2 - 3r + 1$$
$$f(6) = 3(6)^2 - 3(6) + 1$$

Step 2: Use the order of operation to simplify the function.

$$f(6) = 3(6)^2 - 3(6) + 1$$
$$f(6) = 3(36) - 18 + 1$$
$$f(6) = 108 - 18 + 1$$
$$f(6) = 91$$

Thus, the total number of hexagons in a honeycomb with 6 rings is 91.

What's More

Activity 2. NOW IT'S YOUR TURN!

Instructions: Solve the following word problems.

1. The average fuel (in gallons) consumed by an individual vehicle is modeled by the function $f(t) = 0.5t^3 + 15.3t + 480$, where t is the number of years. Find the average fuel consumed by an individual for 5 years.

2. A doll manufacturer determines that its profit, P, in pesos, can be modeled by the function $P(x) = 100x^2 + 300x + 150$, where x represents the number of dolls sold. What is the profit from the sale of 50 dolls?

3. A medical researcher establishes that a patient's reaction time, R in minutes, to a dose of a particular drug is $R(d) = 2d^3 + d^2 + 10$, where d is the amount of drug, in milliliters, that absorbed in the patient's blood. Find the patient's reaction time when $d = 5$.

What I Need to Remember

Write your insight/learning about the lesson being studied.

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Lesson 3 Wednesday	**Solving Problems Involving Polynomial Function (Operations on Function)**

What I Need to Know

At the end of this lesson, you are expected to:

- perform the indicated operations on function.

What's In

Functions can be added, subtracted, multiplied and divided.

Rules on simplifying polynomials.

1. In adding polynomials, add the terms that are similar.
2. In subtracting polynomials, change the sign of the subtrahend then proceed to addition.
3. In multiplying polynomials, use Distributive Property of Multiplication over Addition and laws of exponent.
4. In dividing polynomials, determine the factors of the numerator and denominator then simplify.

What's New

Can you simplify the following polynomials?

1. $(x^2 + 4x - 4) + (x^2 - 3x + 5)$
2. $(3x^2 - 8x + 6) - (2x^2 + 2x - 2)$
3. $(x + 1)(x - 1)$
4. $\frac{x^2-25}{x+5}$

What Is It

Let us recall the rules on simplifying polynomials.

1. In adding polynomials, add the terms that are similar.
   $(x^2 + 4x - 4) + (x^2 - 3x + 5) = (x^2 + x^2) + [4x + (-3x)] + [(-4) + 5]$
   $= 2x^2 + x + 1$
2. In subtracting polynomials, change the sign of the subtrahend then proceed to addition.
   $(3x^2 - 8x + 6) - (2x^2 + 2x - 2) = (3x^2 - 8x + 6) + (-2x^2 - 2x + 2)$
   $= [3x^2 + (-2x^2)] + [(-8x) + (-2x)] + [6 + 2]$
   $= x^2 - 10x + 8$
3. In multiplying polynomials, use Distributive Property of Multiplication over Addition and law of exponent.
   $(x + 1)(x - 1) = x(x - 1) + 1(x - 1)$
   $= x^2 - x + x - 1$
   $= x^2 - 1$
4. In dividing polynomials, determine the factors of the numerator and denominator then simplify.
   $\frac{x^2-25}{x+5} = \frac{(x+5)(x-5)}{x+5} = \frac{\cancel{(x+5)}(x-5)}{\cancel{x+5}} = x - 5$

In the same manner, we will follow these rules when we solve word problems involving operations on polynomial functions.

Illustrative Examples

Ex. 1. The number of laptops sold by a shop can be modeled by the expression $F(t) = 2t + 5$ and the price per laptop is modeled by an expression $P(t) = t^2 + 3t + 6$, where t is the number of months in a year. If we use this model, what is the total amount of revenue generated by the shop at t months?

Solutions:

Identify what operation is being used. The amount of revenue is equal to the number of items sold times the price per item. Thus, we will use multiplication.

$Revenue = Number\ of\ Laptops\ sold\ x\ Price\ Per\ Laptop$
$Revenue = F(t) \cdot P(t)$
$Revenue = (2t + 5)(t^2 + 3t + 6)$
$Revenue = 2t(t^2 + 3t + 6) + 5(t^2 + 3t + 6)$ *By Distributive Property*
$Revenue = 2t^3 + 6t^2 + 12t + 5t^2 + 15t + 30$ *Multiply*
$Revenue = 2t^3 + (6t^2 + 5t^2) + (12t + 15t) + 30$ *Combine like terms*
$Revenue = 2t^3 + 11t^2 + 27t + 30$ *Simplify*

Thus, the revenue can be modeled by $2t^3 + 11t^2 + 27t + 30$.

Ex. 2. The area of the rectangle is modeled by $R(x) = x^3 - 2x^2 + 3x - 6$ and the width of the rectangle is modeled as $W(x) = x - 2$. What polynomial function represents the length of the rectangle?

Solutions:
The area of a rectangle is equal to length times width. Since the given is the area of the rectangle and its width, we will solve for the length.

$$Area\ of\ a\ rectangle = Length\ x\ Width \qquad Solve\ for\ the\ length$$

$$\frac{Area\ of\ a\ rectangle}{Width} = \frac{Length\ x\ \cancel{Width}}{\cancel{Width}} \qquad Divide\ both\ side\ by\ width$$

$$Length = \frac{Area\ of\ a\ rectangle}{Width}$$

Substitute the function of the area of the rectangle and its width. In this problem, we will be dividing two functions.

$$Length = \frac{Area\ of\ a\ rectangle}{Width}$$

$$Length = \frac{R(x)}{W(x)} \qquad By\ Substitution$$

$$Length = \frac{x^3 - 2x^2 + 3x - 6}{x - 2}$$

$$Length = \frac{(x^2 + 3)(x - 2)}{x - 2} \qquad Factor\ the\ numerator$$

$$Length = \frac{(x^2 + 3)\cancel{(x - 2)}}{\cancel{x - 2}} \qquad Simplify$$

$$Length = x^2 + 3$$

Thus, the length of the rectangle can be modeled by the function $L(x) = x^2 + 3$.

Ex. 3. The average cost of a cellphone in the year 2000 can be modeled by the function $C(t) = 3t^2 + 5t - 200$ where t is the number of years. By 2010 the average cost had changed, so it can be modeled by $C(t) = 5t^2 + 10t + 450$. Find the difference in the average cost for a cellphone between 2010 and 2000.

Solutions:
Identify what operation is being used. In this problem, we will use subtraction.

$$Difference = (5t^2 + 10t + 450) - (3t^2 + 5t - 200)$$

Change the sign of the subtrahend and proceed to addition.

$$Difference = (5t^2 + 10t + 450) + (-3t^2 - 5t + 200)$$

Combine like terms.

$$Difference = [5t^2 + (-3t^2)] + [10t + (-5t)] + (450 + 200)$$
$$Difference = 2t^2 + 5t + 650$$

Therefore, the difference in average cost for a cellphone between 2010 and 2000 can be modeled by $Difference = 2t^2 + 5t + 650$.

Ex. 4. John must get the sum of the areas of two plots of land to determine the amount of seed to plant. Plot P can be modeled by $P(x) = 4x^2 - 3x + 10$, and the area of plot F can be modeled by $F(x) = x^2 + 8x - 3$. Write the function that represents the total area of both plots of land.

Solutions:
Since we will get the sum of the two plots of land, we will add both functions.

$H(x) = Plot\ P + Plot\ F$ *Let* $H(x)$*be the sum of both plots of land*
$H(x) = (4x^2 - 3x + 10) + (x^2 + 8x - 3)$ *By Substitution*
$H(x) = (4x^2 + x^2) + [(-3x) + 8x] + [10 + (-3)]$ *Combine like terms*
$H(x) = 5x^2 + 5x + 7$

Thus, the function that represents the total area of both plots of land is $H(x) = 5x^2 + 5x + 7$.

What's More

Activity 3. NOW IT'S YOUR TURN!
Instructions: Solve the following word problems.

1. The length of a rectangle is represented by the function $L(x) = x + 3$, and its width is represented by $W(x) = 2x - 5$. Write the polynomial function that represents the area of the rectangle.

2. The volume of a rectangular solid is represented by $V(x) = 4x^3 + 2x^2 - 2x$. The length of the solid is given by $l(x) = 2x$, and the height is given by $h(x) = x + 1$. Find the function that represents the width of the solid.

3. A pool is being filled with a large water hose. The height of the water in a pool is determined by the function $F(x) = 9x^2 + 3x - 5$. Previously, the pool had been filled up with a different hose. Then, the height was determined by the function $P(x) = 6x^2 - 2x + 3$. Write a function that determines the height of the water in the pool if both hoses are on at the same time.

What I Need to Remember

Write your insight/learning about the lesson being studied.

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Thursday	**Word Search**

What I can do

Activity 4

Directions: *Find the words related to our lesson. The words maybe written forward, backward, upward, downward, horizontally, vertically or diagonally.*

POLYNOMIAL FUNCTION

C	M	F	L	I	B	O	A	I	I	N	O	A	L
T	P	O	L	Y	N	O	M	I	A	L	S	S	U
N	O	I	T	A	C	I	L	P	I	T	L	U	M
C	L	T	U	U	I	S	I	U	P	A	O	B	E
V	N	P	I	A	A	I	E	N	R	D	S	S	U
U	F	O	O	S	O	S	C	T	O	D	L	T	O
T	E	N	I	E	I	E	M	U	B	I	I	I	N
N	U	S	O	T	O	U	L	C	L	T	T	T	E
A	L	O	M	A	C	N	L	L	E	I	O	U	O
T	A	L	A	U	A	N	T	D	M	O	U	T	L
O	V	V	L	L	E	I	U	O	L	N	U	E	U
N	L	E	I	A	L	T	N	F	T	T	A	T	I
O	M	I	U	V	S	O	L	U	T	I	O	N	O
A	L	T	I	E	C	P	U	E	V	I	I	M	E

SOLVE
ADDITION
MULTIPLICATION
FUNCTION
SOLUTION
EVALUATE
PROBLEM
VALUE
POLYNOMIAL
SUBSTITUTE

Play this puzzle online at : https://thewordsearch.com/puzzle/1795782/

Friday

Solving Problems Involving Polynomial Function: Assessment

Assessment (Post Test)

Instructions: Read each item carefully. Encircle the letter of the best answer.

1. Evaluate $f(x) = 7x^2 + 4x - 8$ when $x = -2$.
   A. 28 B. 20 C. 12 D. 6

2. Evaluate $h(x) = x^3 - 2x^2 + 3x - 10$ when $x = 3$.
   A. 8 B. -8 C. 4 D. -4

3. Simplify: $(2x^3 - 4x^2 + 8x + 12) - (x^3 + 5x^2 - 7x + 10)$
   A. $x^3 + x^2 + 15x + 2$ C. $x^3 - 9x^2 + 15x + 2$
   B. $x^3 + x^2 + x + 2$ D. $x^3 + 9x^2 + x + 2$

4. A phone manufacturer determines that its profit, P, in pesos, can be modeled by the function $P(x) = x^3 + 5x^2 + 3x + 1$, where x represents the number of cars sold. What is the profit when $x = 10$?
   A. 1 531 B. 5 531 C. 10 531 D. 50 531

5. A researcher establishes that a patient's reaction time, R in minutes, to a dose of a particular drug is $R(d) = d^3 + 3d^2 - 8$, where d is the amount of drug, in milliliters, that absorbed in the patient's blood. Find the patient's reaction time when $d = 3$.
   A. 192 B. 92 C. 60 D. 46

6. The average fuel (in gallons) consumed by an individual vehicle is modeled by the function $f(t) = t^3 + 10t + 300$, where t is the number of years. Find the average fuel consumed by an individual for 6 years.
   A. 986 B. 576 C. 466 D. 216

7. A researcher predicts that the population of Philippines will be 12.3 million in 2012 and will increase by about .13 million per year until 2022. This expressed as $f(x) = 0.13x + 12.3$, where x is the number of years since 2012. what will be the estimated population 5 years after?
   A. 15.2 *million* B. 14.12 *million* C. 13.50 *million* D. 12.95 *million*

For numbers 8-9, refer to the problem below.

The length of a rectangular prism is modeled by $l(x) = 3x - 1$, the width is $w(x) = 2x + 3$ and the height is modeled by $h(x) = 2x$.

8. What polynomial function represents the volume of the rectangular prism?
   A. $V(x) = 12x^3 + 14x^2 - 6x$
   C. $V(x) = 12x^3 - 14x^2 - 6x$
   B. $V(x) = 12x^3 + 14x^2 + 6x$
   D. $V(x) = 12x^3 - 14x^2 + 6x$

9. What is the volume of the rectangular prism if $x = 2$?
   A. 164 B. 152 C. 140 D. 52

10. The length of a rectangle is represented by the function $L(x) = x^2 - 2$, and its width is represented by $W(x) = 2x + 3$. Write the polynomial function that represents the area of the rectangle.
   A. $2x^3 + 3x^2 - 4x - 6$
   C. $2x^3 - 3x^2 - 4x - 6$
   B. $2x^3 + 3x^2 + 4x - 6$
   D. $2x^3 - 3x^2 + 4x - 6$

11. A painter must add the areas of two walls to determine the amount of paint needed. The area of the first wall is modeled by $f(x) = x^3 + 3x^2 - 9x + 1$, and the area of the second wall is modeled by $g(x) = 5x^2 + 7x - 3$. What polynomial represents the total area of two walls?
   A. $x^3 + 2x^2 - 2x - 2$
   C. $x^3 + 8x^2 - 2x - 2$
   B. $x^3 + 2x^2 - 16x - 2$
   D. $x^3 + 8x^2 - 16x - 2$

12. The number of laptops sold by a shop can be modeled by the expression $F(t) = 4t - 3$ and the price per laptop is modeled by an expression $P(t) = 2t + 1$, where t is the number of months in a year. If we use this model, what is the total amount of revenue generated by the shop at t months?
   A. $8t^2 + 10t - 3$ B. $8t^2 - 2t - 3$ C. $12t + 8$ D. $12t - 4$

13. Alexa has a rectangular garden. The length of the garden is represented by $l(x) = 4x - 3$ and the width is represented by $w(x) = 2x + 1$. What polynomial represents the perimeter of the rectangle?
   A. $8x^2 + 10x - 3$ B. $8x^2 - 2x - 3$ C. $12x + 8$ D. $12x - 4$

14. The volume of a rectangular solid is represented by $V(x) = 2x^3 + x^2 - 2x - 1$. The length of the solid is given by $l(x) = 2x + 1$, and the width is given by $w(x) = x + 1$. What expression represents the height of the solid?
   A. $x - 1$ B. $x - 2$ C. $x - 3$ D. $x - 4$

15. A pool is being filled with a large water hose. The height of the water in a pool is determined by the function $F(x) = 7x^2 - 5x + 10$. Previously, the pool had been filled up with a different hose. Then, the height was determined by the function $P(x) = 3x^2 - 6x - 4$. What polynomial represents the difference in the height of the water in the pool between two hoses?
   A. $4x^2 - 11x + 14$
   C. $4x^2 + x + 14$
   B. $4x^2 - 11x + 6$
   D. $4x^2 + x + 6$

Answer Key

Remember: This portion of the module contains all the answers. Your **HONESTY** is required.

Activity 1.

1. $f(4) = 53$
2. $g(-2) = -7$
3. $h(2) = 17$
4. $f(1) = 0$
5. $P(-1) = -7$

Activity 2

1. $f(t) = 0.5t^3 + 15.3t + 480$

$f(5) = 0.5(5)^3 + 15.3(5) + 480$
$f(5) = 0.5(125) + 76.5 + 480$
$f(5) = 62.5 + 76.5 + 480$
$f(5) = 619$

Therefore, the average fuel consumed by an individual for 5 years is 619 gallons.

2. $P(x) = 100x^2 + 300x + 150$

$P(50) = 100(50)^2 + 300(50) + 150$
$P(50) = 100(2\,500) + 15\,000 + 150$
$P(50) = 250\,000 + 15\,000 + 150$
$P(50) = 265\,150$

Thus, the profit from the sale of 50 dolls is 265 150 pesos.

3. $R(d) = 2d^3 + d^2 + 10$

$R(5) = 2(5)^3 + (5)^2 + 10$
$R(5) = 2(125) + 25 + 10$
$R(5) = 250 + 25 + 10$
$R(5) = 285$

Therefore, the patient's reaction time when the amount of drug is 5 milliliters is 285 minutes.

Activity 4

Activity 3.

1. $A(x) = l(x) \cdot w(x)$

$A(x) = (x+3)(2x-5)$
$A(x) = x(2x-5) + 3(2x-5)$
$A(x) = 2x^2 - 5x + 6x - 15$
$A(x) = 2x^2 + x - 15$

2. $V(x) = l(x) \cdot w(x) \cdot h(x)$

$$w(x) = \frac{V(x)}{l(x) \cdot h(x)}$$
$$w(x) = \frac{4x^3 + 2x^2 + 2x}{(2x)(x+1)}$$
$$w(x) = \frac{(2x)(x+1)(2x-1)}{(2x)(x+1)}$$
$$w(x) = 2x - 1$$

3. $Sum = 15x^2 + x - 2$

References

Books

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Images

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Avatars

The avatars used in this module are created using Bitmoji application.

Congratulations!

You are now ready for the next module. Always remember the following:

1. Make sure every answer sheet has your
   - *Name*
   - *Grade and Section*
   - *Title of the Activity or Activity No.*
2. Follow the date of submission of answer sheets as agreed with your teacher.
3. Keep the modules with you and return them at the end of the school year or whenever face-to-face interaction is permitted.