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Mathematics

Quarter 2 – Module 2:
Solving Problems Involving Polynomial Functions

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ADM

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Alternative Delivery Mode
Quarter 1 – Module 2: Solving Problems Involving Polynomial Functions
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Mathematics

Quarter 1 – Module 2:
Solving Problems Involving Polynomial Functions

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Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

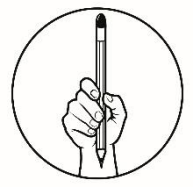
If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

What I Need to Know

This module was designed and written with you in mind. It is here to help you solve problems involving polynomial functions applying the concepts learned in the previous modules. 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 and answer this module is dependent on your ability.

After going through this module, you are expected to solve problems involving polynomial functions.



What I Know

Read each item carefully and write the CAPITAL letter that corresponds to your answer. Write your answer in a separate sheet of paper.

1. Evaluate $P(x) = 7x^3 + 6x^4 - 8x^6 + 6x + 11$ at $x = 0$.
   A. 11 B. 8 C. 7 D. 6

2. What is $f(3)$ if $f(x) = x^2 - 3x^3 + 2x^4 + 1$?
   A. 91 B. 10 C. 30 D. 3

3. If $P(x) = x^4 - 4x^2 + 3x + 2$, then $P(2)$ = _____.
   A. 2 B. 8 C. 14 D. 20

4. What is $B(x) + S(x)$ given that $B(x) = 7x^2 - 5x + 100$ and $S(x) = 20x^2 + 60x + 200$?
   A. $27x^2 + 55x + 300$ B. $27x^2 - 65x + 200$
   C. $17x^2 + 45x + 300$ D. $17x^2 - 45x + 300$

5. Write a polynomial to express the total value, $T(x)$, of $(x + 4)$ 20-peso bills, $(x - 3)$ 50-peso bills, $(x + 5)$ 100-peso bills, and $(x - 2)$ 200-peso bills.
   A. $T(x) = 20(x + 4) + 50(x - 3) + 100(x + 5) + 200(x - 2)$
   B. $T(x) = 20(x + 4) - 50(x - 3) - 100(x + 5) - 200(x - 2)$
   C. $T(x) = 20(x + 4) \times 50(x - 3) \times 100(x + 5) \times 200(x - 2)$
   D. $T(x) = 20(x + 4) \div 50(x - 3) \div 100(x + 5) \div 200(x - 2)$

6. Write the polynomial function, $P(x)$, whose zeros are 0, 4, and -6.

A. $P(x) = 2x(x^2 - 4x + 6)$ B. $P(x) = x(x - 4)(x + 6)$
C. $P(x) = x^2(x - 2)(x - 1)$ D. $P(x) = 2(x - 4)(x + 6)$

7. Which of the following is the polynomial function, $f(x)$, whose zeros are 6 and -4?

A. $f(x) = -6 + 4$ B. $f(x) = 6 - 4$
C. $f(x) = x^2 - 2x - 24$ D. $f(x) = x^2 + 2x + 24$

8. A grocer spent a total of $(a^3 + 5a^2 + 2a + 10)$ *pesos* in purchasing disinfectants worth $(a^2 + 2)$ *pesos per gallon*. How many gallons of disinfectant was purchased by the grocer?

A. $(a - 2)$ *gallons* B. $(a + 2)$ *gallons* C. $(a + 5)$ *gallons* D.$(a - 5)$ *gallons*

9. The area of a square garden is represented by $(x) = (36x^2 - 96x + 64)$ *square feet*. How long is one side?

A. $(6x + 8)$ *feet* B. $(6x - 8)$ *feet*
C. $(3x + 4)$ *feet* D. $(3x - 4)$ *feet*

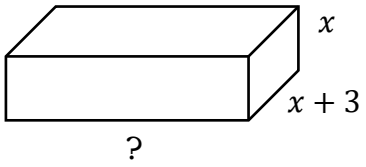
10. What is the perimeter of the garden in item 9?

A. $(24x - 32)$ *feet* B. $(24x + 32)$ *feet*
C. $(48x - 64)$ *feet* D. $(48x + 64)$ *feet*

11. The length of a rectangular garden is $(x + 5)$ and the width is x. Which of the following represents the area, $f(x)$, of the garden?

A. $f(x) = (x + 5x)$ *square units* B. $f(x) = (x^3 + 5)$ *square units*
C. $f(x) = (x^2 + 5x)$ *square units* D. $f(x) = (x + 5x^2)$ *square units*

12. The volume of a box is $V(x) = (2x^3 + 7x^2 + 3x)$ *cubic centimeters*. Which of the following expressions represents its length?



A. $(x + 1)$ *centimeters* B. $(x + 2)$ *centimeters*
C. $(2x + 1)$ *centimeters* D. $(2x + 2)$ *centimeters*

13. If the value of x in item 12 is 1, what is the actual volume of the box?

A. 9 *cubic cm* B. 10 *cubic cm* C. 11 *cubic cm* D. 12 *cubic cm*

14. A cube has an edge that is x *cm* long. What is its capacity?

A. x^3 *cu. cm* B. 4^3 *cu. cm* C. c^2 *cu. cm* D. x^2 *cu. cm*

15. The volume of a cube is 27 cm^3. What is the length of its edge?

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

Lesson 1 Solve Problems Involving Polynomial Functions

In your previous modules on polynomials, you learned to apply the solutions of one- and two-degree functions, the linear and quadratic functions, respectively. In this module, the focus is on solving problems using the solutions of polynomial functions of higher degrees like the cubic and quartic functions.

What's In

The ideas of relations and functions were first introduced to you when you were in Grade 8. Relations may be presented as a set of ordered pairs, through a table-of-values, by mapping or diagram, graphically, or by writing a rule or an equation. Not all relations are functions. All functions, on the other hand, are relations.

The relations described by the equations $y = x + 2$, $y = 2x^2 + x - 4$, and $y = -x^3$ are not mere relations but are functions since to every value of x there corresponds exactly one value of y.

The aforesaid equations are first degree, second degree, and third degree polynomial functions known as linear, quadratic, and cubic functions, respectively. Take note that, in general, a polynomial function, usually denoted by $P(x)$ or $f(x)$, is a function defined by

$$f(x) = a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \cdots + a_2 x^2 + a_1 x + a_0$$

where a_0, a_1, … ,a_n are real numbers, $a_n \neq 0$, and n is a positive integer.

Polynomial functions may seem abstract to many. Through this module, you will realize that this idea that may seem abstract is actually being used in fields other than mathematics – designing, manufacturing, business, economics, demographics, and many more. Your prior knowledge on the different formulas in geometry, evaluation of functions, and operations with functions will help you go a long way.

What's New

Study each illustration. Answer the questions that follow.

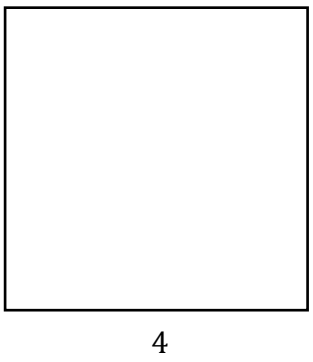


Figure 1
A square with side 4 units long

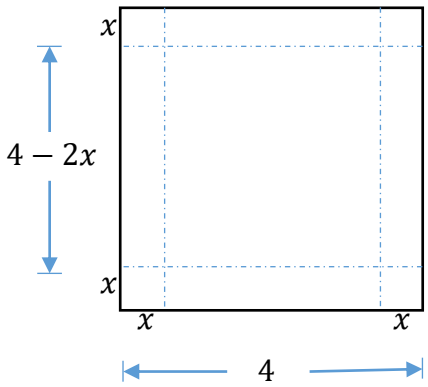
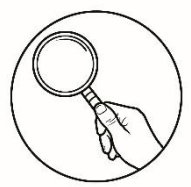


Figure 2
The square in figure 1 will be made into a box by folding it along the dotted lines.

1. What is the perimeter of the square in figure 1? _____
2. What is the area of the square in figure 1? _____
3. What is the volume of the resulting box in figure 2? _____

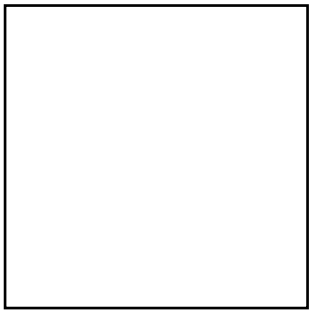


What is It

Let us consider the figures used and shown in *What's New*.

To get the perimeter of a square, we need to add the lengths of all the four sides or simply multiply the length of one side by four since all the sides of a square are congruent with each other. Thus, the perimeter, P, of a square with side, s, is computed using $P = 4s$. We can also conclude from this formula that the perimeter of a square depends on the measure of its side. Therefore, P is a function of s or $P(s) = 4s$.

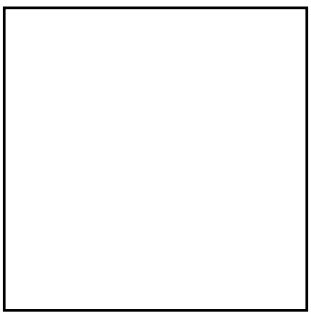
On the other hand, the area, A, of a square with side, s, is computed using $A = s^2$. From the formula, we can conclude that the area of a square depends on the length of its side. Thus, A is a function of s or $A(s) = s^2$.



$s = 4$

Solution: The perimeter of a square is computed by adding the lengths of all the sides of the square or by simply multiplying the length of the side by 4.

$$P(s) = 4s$$
$$P(4) = 4(4)$$
$$P(4) = 16\ units$$

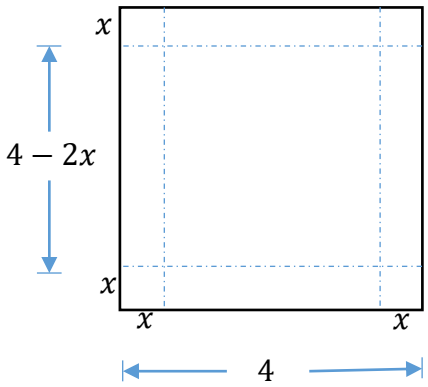


$s = 4$

Solution: The area of a square is computed by squaring the length of the side of a square. This means that the length of the side is multiplied by itself.

$$A(s) = s^2$$
$$A(4) = 4^2$$
$$A(4) = 4 \times 4$$
$$A(4) = 16\ square\ units$$

Furthermore, to compute for the volume or capacity of the box, we multiply the area of the base, B, with the height, x, of the box. Thus, the volume of the box is $V = Bx$ which when further solved will give us $V = 4x^3 - 16x^2 + 16x$. This again tells us that V depends on x. Thus, V is a function of x or $V(x) = Bx$ or that $V(x) = 4x^3 - 16x^2 + 16x$.



Solution: To compute the volume of the box, an example of a rectangular prism, multiply the area of the base of the box by the height of the box.

$$V(x) = Bx$$
$$= (4 - 2x)^2 x$$
$$= (16 - 16x + 4x^2)x$$
$$= 16x - 16x^2 + 4x^3$$
$$V(x) = (4x^3 - 16x^2 + 16x)\ cubic\ units$$

These three cases are basic applications of polynomial functions, the $P(s) = 4s$, $A(s) = s^2$, and $V(x) = 4x^3 - 16x^2 + 16x$. Now, let's take a look at more applications of polynomial functions.

Example 1: A cube has a capacity of 125 cm^3. What is the length of its edge?

Solution:

$V_{cube} =$	s^3	*Use the appropriate formula.*
$125\ cm^3 =$	s^3	*Substitute the given.*
$\sqrt[3]{125\ cm^3} =$	$\sqrt[3]{s^3}$	*Extract the cube roots.*
$5\ cm =$	s	*Simplify and write the final answer.*
$s =$	$5\ cm$	

Therefore, the length of the edge of the cube is $5\ centimeters$.

Example 2: Find the polynomial function which represent the volume of a rectangular prism and with the zeros $\{3, -3, 1\}$.

Solution: To find the function representing the volume of the prism, we use the formula $V_{r.\ prism} = lwh$. The zeros shall be transformed as factors and these factors will be substituted as the length, width, and height of the prism. Follow the steps below.

$V_{r.\ prism} =$	lwh	*Use the appropriate formula.*
$x = 3 \rightarrow \boldsymbol{x - 3};$	$x = -3 \rightarrow \boldsymbol{x + 3};\ x = 1 \rightarrow \boldsymbol{x - 1}$	*Write the zeros as factors.*
$=$	$(x - 3)(x + 3)(x - 1)$	*Substitute the given.*
$=$	$(x^2 + 9)(x - 1)$	*Multiply the binomials.*
$V_{r.prism} =$	$x^3 - x^2 - 9x + 9$	*Simplify.*

Therefore, the polynomial function that represents the volume of the rectangular prism is $\boldsymbol{V(x) = (x^3 - x^2 - 9x + 9)\ cubic\ units}$.

Example 3: A demographer predicts that the population, P, of a town t years from now can be modeled by the function $P(t) = 6t^4 - 5t^3 + 200t + 12{,}000$. What will the population of the town be two years from now?

Solution: The given function that modeled the population of the town shall be evaluated at $t = 2$. Follow the steps below.

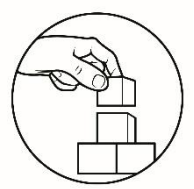
$P(t) =$	$6t^4 - 5t^3 + 200t + 12{,}000$	*Given Function*
$P(2) =$	$6(2)^4 - 5(2)^3 + 200(2) + 12{,}000$	*Evaluate $P(t)$ when $t = 2$..*
$=$	$6(16) - 5(8) + 200(2) + 12{,}000$	*Simplify.*
$=$	$96 - 40 + 400 + 12{,}000$	*Simplify.*
$P(2) =$	$12{,}456$	

Therefore, in two years, the town will be having a population of $12,456\ people$.

Example 4: The resulting weight, w, of a patient who has been sick for $n\ days$ can be modelled by the equation $w(n) = (0.1n^3 - 0.6n^2 + 110)\ pounds$. If a 125-$pound$ person has been ill for a week, how much weight did he lost?

$w(n) =$	$0.1n^3 - 0.6n^2 + 110$	*Given Function*
$w(7) =$	$0.1(7)^3 - 0.6(7)^2 + 110$	*Evaluate* $w(n)$ *when* $n = 7$.
$=$	$0.1(343) - 0.6(49) + 110$	*Simplify.*
$=$	$34.3 - 29.4 + 110$	*Simplify.*
$w(7) =$	$114.9\ pounds$	
$weight\ lost =$	$original\ weight - resulting\ weight$	*Formula*
$=$	$125\ pounds - 114.9\ pounds$	*Substitute the weights.*
$weight\ lost =$	$10.1\ pounds$	*Simplify.*

Therefore, the person has lost $10.1\ pounds$ for a week.



What's More

Read and analyze each situation very carefully. Answer the items as required.

1. The area of a *rotonda* is $21.98\ square\ feet$. What is the length of its diameter?
   Hints: $A_{circle} = \pi r^2$, $2r = d$, $\pi = 3.14$

2. Find the volume of a Rubik's cube if one of its sides measure $(x + 4)\ millimeters$.
   Hint: $V_{cube} = s^3$

3. Write the polynomial function, $P(x)$, with the zeros 2 of multiplicity three and -1.
   Hint: Write the zeros as factors.

4. A farmer has a poultry farm whose area is expressed by the polynomial function $(x) = (8x^2 + 97x + 12)\ square\ meters$. What is the actual land area of the poultry farm if $x = 3\ meters$?
   Hint: Evaluate the function for the given length.

5. Annie went to the grocery and bought items which cost $C(x) = 5x^4 + 2x^3 + 4x + 18\,pesos$. If x is $4.00\,pesos$, how much did Annie pay?
   Hint: Evaluate the function for the given amount.

6. A car manufacturer determines that the company's profit, P, can be modeled by the function $P(x) = x^4 + 2x - 3$, where x represents the number of cars sold. What is the profit when $x = 200$?
   Hint: Evaluate the function for the given number of cars sold.

What I Have Learned

Now that you know some of the many fields where polynomial functions are used, make a written reflection as to why you think polynomials are useful. Your thoughts must revolve around the theme $Polynomial{:}\,Very\ vital$. Cite concrete examples or circumstances to back up your ideas. Your concise, straight to the point, and substantial essay must be composed of four to seven sentences only.

Your output will be graded based from the rubric that follows.

	FOCUS The single controlling point made with an awareness of task about a specific topic.	**CONTENT** The presence of ideas developed through facts, examples, anecdotes, details, opinions, statistics, reasons, and/or explanations.	**ORGANIZATION** The order developed and sustained within and across paragraphs using transitional devices and including introduction and conclusion.	**STYLE** The choice, use and arrangement of words and sentence structures that create tone and voice.	**CONVENTIONS** Grammar, mechanics, spelling, usage and sentence formation.
4	Sharp, distinct controlling point made about a single topic with evident awareness of task.	Substantial, specific, and/or illustrative content demonstrating strong development and sophisticated ideas.	Sophisticated arrangement of content with evident and/or subtle transitions.	Precise, illustrative use of a variety of words and sentence structures to create consistent writer's voice and tone appropriate to audience.	Evident control of grammar, mechanics, spelling, usage and sentence formation.
3	Apparent point made about a single topic with sufficient awareness of task.	Sufficiently developed content with adequate elaboration or explanation.	Functional arrangement of content that sustains a logical order with some evidence of transitions.	Generic use of a variety of words and sentence structures that may or may not create writer's voice and tone appropriate to audience.	Sufficient control of grammar, mechanics, spelling, usage and sentence formation.
2	No apparent point but evidence of a specific topic.	Limited content with inadequate elaboration or explanation.	Confused or inconsistent arrangement of content with or without attempts at transition.	Limited word choice and control of sentence structures that inhibit voice and tone.	Limited control of grammar, mechanics, spelling, usage and sentence formation.
1	Minimal evidence of a topic.	Superficial and/or minimal content.	Minimal control of content arrangement.	Minimal variety in word choice and minimal control of sentence structures.	Minimal control of grammar, mechanics, spelling, usage and sentence formation.

RUBRICS BY JENNY TUAZON
BSE_MATH

rubric lifted from https://www.slideshare.net/jennytuazon01630/rubrics-in-essay

What I Can Do

Solve the given problem.

A company's profit in thousands of *pesos* is determined by the function $P(x) = -x\,(x - 10)\,(x - 30)$ where x stands for the number of branches it operates.

1. Evaluate the polynomial function for $x = 10$.

2. How much profit does the company make if it operates 20 branches?

3. Suppose the company runs 35 branches, how much revenue would it earn?

4. If you were the manager of the company, how many branches should you maintain? Explain.

Assessment

Read each item carefully and write the CAPITAL letter that corresponds to the correct answer. Use a separate sheet of paper for your responses.

1. Evaluate $P(x) = 7x^3 + 6x^4 - 8x^6 + 6x + 11$ at $x = 0$.

A. 7 B. 6 C. 8 D. 11

2. If $P(x) = x^4 - 4x^2 + 3x + 2$, then $P(2) =$ _____.

A. 2 B. 8 C. 14 D. 20

3. A grocer spent a total of $(a^3 + 5a^2 + 2a + 10)\,pesos$ in purchasing disinfectants worth $(a^2 + 2)\,pesos\,per\,gallon$. How many gallons of disinfectant was purchased by the grocer?

A. $(a - 2)\,gallons$ B. $(a + 2)\,gallons$
C. $(a + 5)\,gallons$ D. $(a - 5)\,gallons$

4. Write a polynomial to express the total value, $T(x)$, of $(x + 4)$ 20-*Peso* bills, $(x - 3)$ 50-*Peso* bills, $(x + 5)$ 100-*Peso* bills, and $(x - 2)$ 200-*Peso* bills.

A. $T(x) = 20(x + 4) + 50(x - 3) + 100(x + 5) + 200(x - 2)$
B. $T(x) = 20(x + 4) - 50(x - 3) - 100(x + 5) - 200(x - 2)$
C. $T(x) = 20(x + 4) \times 50(x - 3) \times 100(x + 5) \times 200(x - 2)$
D. $T(x) = 20(x + 4) \div 50(x - 3) \div 100(x + 5) \div 200(x - 2)$

5. Which of the following is the polynomial function, $f(x)$, whose zeros are 6 and -4?

A. $f(x) = -6 + 4$
B. $f(x) = 6 - 4$
C. $f(x) = x^2 - 2x - 24$
D. $f(x) = x^2 + 2x + 24$

6. A cube has an edge that is $x\ cm$ long. What is its capacity?

A. $x^3\ cu.cm$
B. $4^3\ cu.cm$
C. $c^2\ cu.cm$
D. $x^2\ cu.cm$

7. Write the polynomial function, $P(x)$, whose zeros are 0, 4, and -6.

A. $P(x) = 2x(x^2 - 4x + 6)$
B. $P(x) = x\,(x - 4)(x + 6)$
C. $P(x) = x^2(x - 2)\,(x - 1)$
D. $P(x) = 2\,(x - 4)(x + 6)$

8. The area of a square garden is represented by $(x) = (36x^2 - 96x + 64)$ $square\ feet$. How long is one side?

A. $(6x - 8)\ feet$
B. $(6x + 8)\ feet$
C. $(3x - 4)\ feet$
D. $(3x + 4)\ feet$

9. What is the perimeter of the garden in item 8?

A. $(48x - 64)\ feet$
B. $(48x + 64)\ feet$
C. $(24x - 32)\ feet$
D. $(24x + 32)\ feet$

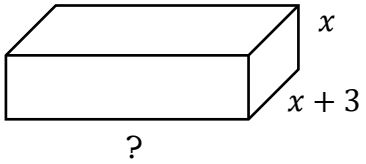
10. The length of a rectangular garden is $(x + 5)$ and the width is x. Which of the following represents the area, $f(x)$, of the garden?

A. $f(x) = (x + 5x)\ square\ units$
B. $f(x) = (x^3 + 5)\ square\ units$
C. $f(x) = (x^2 + 5x)\ square\ units$
D. $f(x) = (x + 5x^2)\ square\ units$

11. What is $B(x) + S(x)$ given that $B(x) = 7x^2 - 5x + 100$ and $S(x) = 20x^2 + 60x + 200$?

A. $27x^2 + 55x + 300$
B. $27x^2 - 65x + 200$
C. $17x^2 + 45x + 300$
D. $17x^2 - 45x + 300$

12. The volume of a box is $V(x) = (2x^3 + 7x^2 + 3x)\ cubic\ centimeters$. Which of the following expressions represents its length?

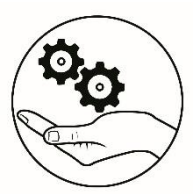


A. $(x + 1)\ centimeters$
B. $(x + 2)\ centimeters$
C. $(2x + 1)\ centimeters$
D. $(2x + 2)\ centimeters$

13. If the value of x in item 12 is 2, what is the actual volume of the box?
    A. 60 *cubic cm* B. 50 *cubic cm*
    C. 40 *cubic cm* D. 30 *cubic cm*

14. What is $f(3)$ if $f(x) = x^2 - 3x^3 + 2x^4 + 1$?
    A. 91 B. 10 C. 30 D. 3

15. The volume of a cube is 64 cm^3. What is the length of its edge?
    A. 2 *cm* B. 4 *cm* C. 6 *cm* D. 8 *cm*



Additional Activity

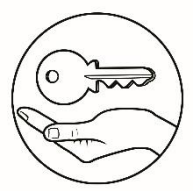
Solve the given problems correctly. Use a separate sheet for your responses.

1. The cost, C, in *pesos* of removing x percent of pollutants from the swimming pool in Rational Resort is given by the function $C(x) = 50x^2 - 100x + 45{,}000$. How much would it cost the resort to remove ____ percent of pollutants?
    a. 50

    b. 70

2. The number of tablets sold by a shop from March 2020 to September 2020 is modeled by the function $N(t) = 7t + 25$ and the income per tablet is given by $P(t) = 3t^2 + 3t + 36$, where t is the number of months. Based from these functions, what is the total amount of revenue, $R(t)$, generated by the shop ____?
    a. from March 2020 to September 2020

    b. at the end of the year if the same functions are applied



Answer Key

What I Know

1. A	6. B	11. C
2. A	7. C	12. C
3. B	8. C	13. D
4. A	9. B	14. A
5. A	10. A	15. A

What's New

1. $16\ units$
2. $16\ square\ units$
3. $(4x^3 - 16x^2 + 16x)\ cubic\ units$

What's More

1. $5.29\ feet$
2. $(x^3 + 12x^2 + 48x + 64)\ cubic\ feet$
3. $P(x) = x^4 - 5x^3 + 6x^2 + 4x - 8$
4. $A(3) = 375\ square\ meters$
5. $C(4) = 1{,}442.00\ Pesos$
6. $P(200) = 1{,}600{,}000{,}397\ Pesos$

Solutions:

1. $5.29\ feet$ $A_{circle} = \pi r^2$ $21.98 = 3.14r^2$ $\frac{21.98}{3.14} = \frac{3.14r^2}{3.14}$ $\sqrt{r^2} = \sqrt{7}$ $r = 2.6458\ feet$ $d = 2r = 2(2.6458)$ $d = 5.29\ feet$	4. $A(3) = 375\ square\ meters$ $A(x) = (8x^2 + 97x + 12)\ sq.meters$ $A(3) = (8(3)^2 + 97(3) + 12)\ sq.meters$ $A(3) = 375\ square\ meters$
2. $(x^3 + 12x^2 + 48x + 64)\ cu.mm$ $V_{cube} = s^3$ $= (x + 4)^3$ $= (x + 4)(x + 4)(x + 4)$ $V_{cube} = (x^3 + 12x^2 + 48x + 64)\ cu.mm$	5. $C(4) = 1{,}442.00\ pesos$ $C(x) = 5x^4 + 2x^3 + 4x + 18$ $C(4) = 5(4)^4 + 2(4)^3 + 4(4) + 18$ $C(4) = 1{,}442.00\ pesos$
3. $P(x) = x^4 - 5x^3 + 6x^2 + 4x - 8$ $x = 2\ of\ multiplicity\ 3 \rightarrow (x - 2), (x - 2), (x - 2)$ $x = -1 \rightarrow x + 1$ $P(x) = (x - 2)(x - 2)(x - 2)(x + 1)$ $= (x^3 - 6x^2 + 12x - 8)(x + 1)$ $P(x) = x^4 - 5x^3 + 6x^2 + 4x - 8$	6. $P(200) = 1{,}600{,}000{,}397\ pesos$ $P(x) = x^4 + 2x - 3$ $P(200) = 200^4 + 2(200) - 3$ $P(200) = 1{,}600{,}000{,}397\ pesos$

What I Can Do

1. $P(10) = zero\ Pesos$
2. The company would have a profit of 2,000,000 $Pesos$.
3. The company will not have a revenue. Instead, it will lose 4,375,000 $Pesos$.
4. If I were the manager of the company, I would maintain 22 $branches$ to have the maximum profit of 2,112,000 $pesos$.

Assessment

1. D
2. B
3. C
4. A
5. C
6. A
7. B
8. A
9. C
10. C
11. A
12. C
13. B
14. A
15. B

Additional Activity

1. a. $C(50) = 165{,}000$
   b. $C(70) = 283{,}000$
2. a. $R(7) = 15{,}096\ pesos$
   b. $R(10) = 34{,}770\ pesos$

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