Warm Up
Grade 9

Determine the product or the quotient.

a) $(9r^3xy)(4r^2y - 2x)$

b) $(-7m^4n^2 + 2mn - 10n^2)(-3mn)$

c) $\dfrac{80t^5 + 14t^4 - 18t}{-2t}$

d) $(-12x^2 + 6x - 5) + (4x^2 - 8x - 1)$

e) $(3x^2 - 12x + 7) - (5x^2 - 12x - 8)$

Warm Up
Grade 9

Determine the product or the quotient.

a) $(9r^3xy)(4r^2y - 2x)$

b) $(-7m^4n^2 + 2mn - 10n^2)(-3mn)$

b) $(-3mn)(-7m^4n^2 + 2mn - 10n^2)$

c) $\frac{80t^5 + 14t^4 - 18t}{-2t}$

e) $(-12x^2 + 6x - 5) + (4x^2 - 8x - 1)$

d) $(3x^2 - 12x + 7) - (5x^2 - 12x - 8)$

Warm Up Grade 9

Determine the product or the quotient.

a) $(9r^3xy)(4r^2y - 2x)$

$36r^5xy^2 - 18r^3x^2y$

b) $(-7m^4n^2 + 2mn - 10n^2)(-3mn)$

$21m^5n^3 - 6m^2n^2 + 30mn^3$

c) $\dfrac{80t^5 + 14t^4 - 18t}{-2t}$

$\frac{80t^5}{-2t} + \frac{14t^4}{-2t} - \frac{18t}{-2t}$

$-40t^4 - 7t^3 + 9$

d) $(3x^2 - 12x + 7)(5x^2 - 12x - 8)$

$3x^2 - 12x + 7 - 5x^2 + 12x + 8$

$3x^2 - 5x^2 - 12x + 12x + 7 + 8$

$-2x^2 + 15$

e) $(-12x^2 + 6x - 5) + (4x^2 - 8x - 1)$

$-12x^2 + 6x - 5 + 4x^2 - 8x - 1$

$-12x^2 + 4x^2 + 6x - 8x - 5 - 1$

$-8x^2 - 2x - 6$

MATH 9 SKILLS CHECKLIST **NAME:**_____
UNIT 4 – POLYNOMIALS
M. Burns

GENERAL CURRICULUM OUTCOME (GCO): **Patterns and Relations (PR) – Represent algebraic expressions in multiple ways.**

SPECIFIC CURRICULUM OUTCOMES (SCOs): **PR5, PR6 and PR7**

__1.__ **(PR5) Demonstrate an understanding of polynomials (limited to polynomials of degree less than or equal to 2).**

ACHIEVEMENT INDICATORS:

_____ **Create a concrete model or a pictorial representation for a given polynomial expression.**

Ex.: Model $3x^2 + 4$ using algebra tiles. **MODEL:** 

_____ **Write the expression for a given model of a polynomial.**

Ex.: Identify the polynomial represented by the following collection of algebra tiles: 

ANSWER: $-3x^2$

_____ **Identify the variables, degree, number of terms and coefficients, including the constant term, of a given simplified polynomial expression.**

Ex.: $4m^2 - n - 7$

VARIABLES:	m and n	NUMERICAL COEFFICIENTS:	4 and -1
DEGREE:	2	CONSTANT TERM:	-7
NUMBER OF TERMS:	3		

_____ **Describe a situation for a given first degree polynomial expression.**

Ex.: Let "x" represent the height of a student.
Ex.: Let "2a" represent the length of one side in an equilateral triangle.

_____ **Match equivalent polynomial expressions given in simplified form.**

Ex.: $4x - 3x^2 + 2$ is equivalent to $-3x^2 + 4x + 2$

2. **(PR6) Model, record and explain the operations of addition and subtraction of polynomial expressions concretely, pictorially and symbolically (limited to polynomials of degree less than or equal to 2).**

ACHIEVEMENT INDICATORS:

_____ **Identify like and unlike terms.**

Ex.: From the list, which terms are "like" $8x^2$?

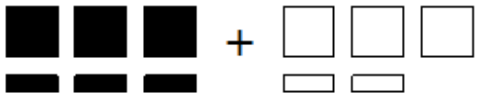
$-3x$; $5x^2$; 4 ; $3x$; 9 ; $-11x^2$; $7x$; -3

ANSWERS: $\mathbf{5x^2}$ and $\mathbf{-11x^2}$

_____ **Model addition of two given polynomial expressions concretely or pictorially and record the process symbolically.**

Ex.: Use algebra tiles to model the sum of the binomials below then record your answer symbolically.

$(-3x^2 - 3x) + (3x^2 + 2x)$:



$= -3x^2 + 3x^2 - 3x + 2x$
$= -x$

_____ **Apply a personal strategy for addition and subtraction of given polynomial expressions and record the process symbolically.**

Ex.: $(-2a^2 + a - 1) - (a^2 - 3a + 5)$

$= (-2a^2 + a - 1) + (-a^2 + 3a - 5)$ **(ADD the OPPOSITE of each term in the 2nd polynomial.)**
$= -2a^2 + a - 1 - a^2 + 3a - 5$
$= -2a^2 - a^2 + a + 3a - 1 - 5$
$= -3a^2 + 4a - 6$

_____ **Identify the error(s) in a given simplification of a given polynomial expression.**

Ex.: A student incorrectly subtracted $(2x^2 + 5x + 10) - (x^2 - 3)$ like this:

$(2x^2 + 5x + 10) - (x^2 - 3)$
$= 2x^2 + 5x + 10 - x^2 - 3$
$= x^2 + 2x + 10$

Identify the errors and correct them.

ANSWER: The student forgot to add the opposite of the second polynomial, then grouped unlike terms (5x and -3). They should have done the following:

$(2x^2 + 5x + 10) - (x^2 - 3)$
$= (2x^2 + 5x + 10) + (-x^2 + 3)$
$= 2x^2 + 5x + 10 - x^2 + 3$
$= x^2 + 5x + 13$

3. **(PR7) Model, record and explain the operations of multiplication and division of polynomial expressions (limited to polynomials of degree less than or equal to 2) by monomials concretely, pictorially and symbolically.**

ACHIEVEMENT INDICATORS:

_____ **Apply a personal strategy for multiplication and division of a given polynomial expression by a given monomial.**

Ex.: $2x(-3x + 5)$
$= -6x^2 + 10x$

Ex.: $\frac{24d^2 - 12d}{-12d}$
$= -2d + 1$

_____ **Provide examples of equivalent polynomial expressions.**

Ex.: Are $5j^2 + 20$ and $5(j^2 + 4)$ equivalent expressions?

ANSWER: Yes, these are equivalent expressions because $5(j^2 + 4) = 5j^2 + 20$.

_____ **Identify the error(s) in a given simplification of a given polynomial expression.**

Ex.: A student incorrectly multiplied $-3d(-2d + 9)$ like this:

$-3d(-2d + 9)$
$= 6d - 27$

Identify and correct the errors.

ANSWER: The student did not multiply the variables in their work. They should have done the following:

$-3d(-2d + 9)$
$= 6d^2 - 27d$

VOCABULARY:

_____ variable

_____ expression

_____ term

_____ constant term

_____ (numerical) coefficient

_____ polynomial

_____ monomial

_____ binomial

_____ trinomial

_____ degree

_____ equivalent polynomials

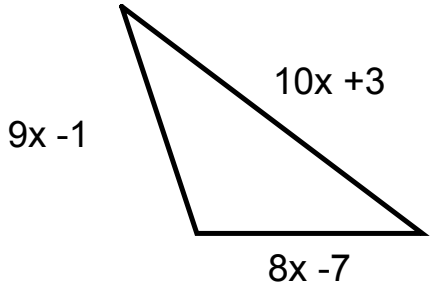
_____ like terms

_____ unlike terms

_____ algebra tiles

Warm Up

a) Given the following shape determine the perimeter.



b) Determine the perimeter of the triangle when x = 2. (Show your work)

$P = 27x - 5$

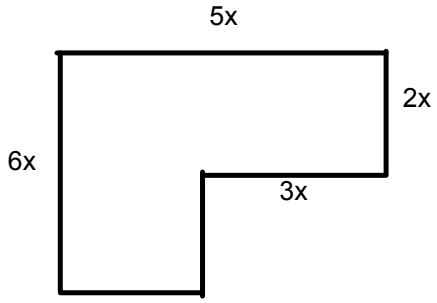
$P = 27(2) - 5$

$P = 54 - 5$

$P = 49$

Warm Up

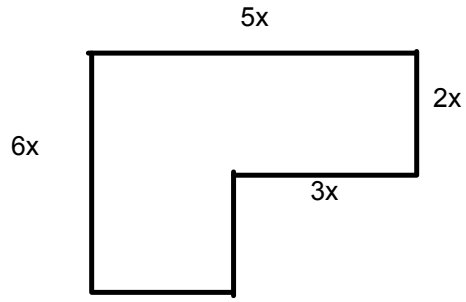
a) Given the following shape determine the area.

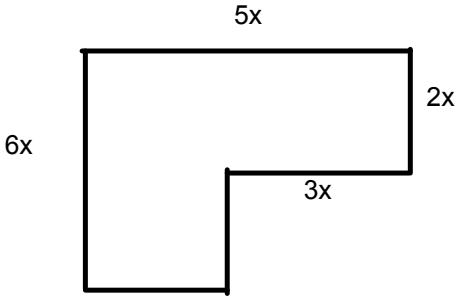


b) Determine the area of the shape when x = 3. (Show your work)

Warm Up

a) Given the following shape determine the area.





b) Determine the area of the shape when x = 3. (Show your work)

$A = 18x^2$

$= 18(3)^2$

$= 18(9)$

$= 162$

Warm Up
Grade 9

1) Write a polynomial that matched the description:

variable": y,
Degree: 8
Trinomial
Constant: +4

2) What do I add to $16x^2 + 2x - 1$ to get $18x^2 - 5x + 7$ as the result?

$$16x^2 + 2x - 1$$
$$+ (\quad\quad)$$
$$18x^2 - 5x + 7$$

Add the following

$(5x^2 + 12x - 10) + (-7x^2 - 15x + 19)$

$5x^2 - 7x^2 \quad + 12x - 15x \quad - 10 + 19$

$-2x^2 - 3x + 9$

Subtract the following:

$$(21y^2 - 10y + 14) - (2y + y^2 - 4)$$

$21y^2 - 10y + 14 - 2y - y^2 + 4$

$21y^2 - 1y^2 \quad -10y - 2y \quad +14 + 4$

$$20y^2 - 12y + 18$$

$(3x^2y)(-12x)$

$= -36x^3y$

$(2xy)\quad(3x^3y - 4x^2y^2)$

$6x^4y^2 \quad - 8x^3y^3$

$10 \div 2 = 5$

a) $(45x^5 - 72x) \div 9x$

$\frac{45x^5}{9x} - \frac{72x}{9x}$

$5x^4 - 8$

$(2x^3 + 4x) \div 4x^2$

$\frac{2x^3}{4x^2} + \frac{4x^1}{4x^2}$

$0.5x + 1x^{-1}$

$0.5x + \frac{1}{x^1}$

$$x^{-n} = \frac{1}{x^n}$$

$14x^3y^6 \div 2x^2y^6$

Class/Homework

Pg 259 - 261
#2
#6
#9
#10
#11
#12 a, d
#15 a, e, g,h
#16
#19 b
#22 a,c,h,k,l
#24 a
#26 a,c,e,g
#28 b, d, f
#29 a, b

Check Answers in back of textbook

Pg 262
Questions 1 to 8

Wednesday (Extra practice 1-6)

Master 5.19

Extra Practice 1

Lesson 5.1: Modelling Polynomials

1. Identify the polynomials in the following expressions.
   a) $2m^2 + 1$ b) $3x^{\frac{1}{2}}$ c) $-4x$ d) $\frac{1}{x^2+x}$ e) $0.25y^2$
2. Name the coefficients, variable, degree, and constant term of each polynomial.
   a) $-8y$ b) 12 c) $-2b^2 - b + 10$ d) $-4 - b$
3. Identify each polynomial as a monomial, binomial, or trinomial.
   a) $19t$ b) $g - 4g^2 + 5$ c) $-1 + xy + y^2$ d) $4 - 11w$
4. Identify the equivalent polynomials.
   a) $-h^2 - 3 + 4h$ b) $-3 + 4h - h^2$
   c) $5m - 3$ d) $-2 + y^2 + 5xy$
   e) $y^2 + 5xy - 2$ f) $-3 + 5m$
5. Use algebra tiles to model each polynomial. Sketch the tiles.
   a) $-5 + y^2$ b) $2x - 1$ c) $-3a^2 - 2a + 1$ d) $3z$ e) $v^2 - 4v$
6. Write a polynomial to match the following conditions.
   a) 2 terms, degree 1, with a constant term of 4
   b) 3 terms, degree 2, with the coefficient on the 2nd degree term –2

Master 5.20

Extra Practice 2

Lesson 5.2: Like Terms and Unlike Terms

1. From the list, identify terms that are like $2w^2$. Explain how you know they are like terms.
$-5w, -6w^2, -2, 4w, 3w^2, -w^2, 11w, 2$

2. Simplify each polynomial.

a) $4 + x + 1 + 5x + 1$
b) $-3y^2 + 3y - 2$
c) $2x^2 + 8 - 11 - 4x^2 + 5x^2$
d) $3y + 7y^2 + 1 - y - 2y - 3y^2$

3. Simplify each polynomial.

a) $7d - 2d + 1 - 6$
b) $-5 - 3 - k - 5k$
c) $-4 + 2a + 7 - 4a$
d) $3p - 6 - 4p + 6$

4. Simplify each polynomial.

a) $3a^2 - 2a - 4 + 2a - 3a^2 + 5$
b) $7z - z^2 + 3 + z^2 - 7$
c) $d^2 + 3d + 1 + 4d^2 + 2$
d) $-6x^2 + 10x - 4 + 4 - 12x - 7x^2$

5. Identify the equivalent polynomials. Justify your responses.

a) $-5y^2 - 3y - 4$
b) $10x - 1$
c) $1 + x - x^2$
d) $2y^2 - 4 - 16 - 7y^2 - 3y + 16$
e) $-7 + 5x - 7x - 8 + 14 + 12x$
f) $5x^2 + 7 + 4x - 6x^2 - 6 - x - 2x$

6. Write a polynomial to represent the perimeter of each rectangle.

a)

b)

Master 5.21

Extra Practice 3

Lesson 5.3: Adding Polynomials

1. Add these polynomials.
   a) $(-4h+1)+(6h+3)$
   b) $(2a^2+a)+(-5a^2+3a)$
   c) $(3y^2-2y+5)+(-y^2+6y+3)$
   d) $(3-2y+y^2)+(-1+y-3y^2)$

2. Add these polynomials.
   a) $(x-5)+(2x+2)$
   b) $(b^2+3b)+(b^2-3b)$
   c) $(y^2+6y)+(-7y^2+2y)$
   d) $(5n^2+5)+(-1-3n^2)$

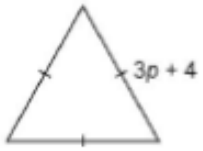
3. Add these polynomials..
   a) $(-7x+5)$ + $(2x-8)$
   b) $(4x^2-3)$ + $(-8x^2-1)$
   c) (x^2-4x+3) + $(-x^2-2x-3)$
   d) $(3x^2-4x+1)$ + $(-2x^2+4x+1)$

4. Add.
   a) $(y^2+6y-5)+(-7y^2+2y-2)$
   b) $(-2n+2n^2+2)+(-1-7n^2+n)$
   c) $(3m^2+m)+(-10m^2-m-2)$
   d) $(-3d^2+2)+(-2-7d^2+d)$

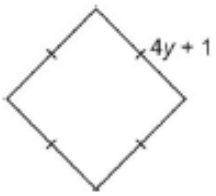
5. a) For each shape below, write the perimeter as a sum of polynomials and in simplest form.

   i)

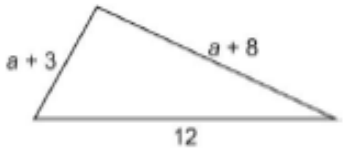
   ii)



   iii)



   iv)



   b) Use substitution to check each answer in part a.

6. The sum of two polynomials is $4r+5-3r^2$. One polynomial is $-8-2r^2+2r$; what is the other polynomial? Explain how you found your answer.

Master 5.22

Extra Practice 4

Lesson 5.4: Subtracting Polynomials

1. Simplify the following
   a) $(4x + 2) - (2x + 1)$
   b) $(4x + 2) - (-2x + 1)$
   c) $(4x + 2) - (2x - 1)$
   d) $(4x + 2) - (-2x - 1)$

2. Simplify the following
   a) $(2s^2 + 3s + 6) - (s^2 + s + 2)$
   b) $(2s^2 + 3s - 6) - (s^2 + s - 2)$
   c) $(-2s^2 + 3s + 6) - (-s^2 + s + 2)$
   d) $(2s^2 - 3s + 6) - (s^2 - s + 2)$

3. Simplify the following
   a) $(2x + 3) - (5x + 4)$
   b) $(4 - 8w) - (7w + 1)$
   c) $(x^2 + 2x - 4) - (4x^2 + 2x - 2)$
   d) $(-9z^2 - z - 2) - (3z^2 - z - 3)$

4. A student subtracted
   $(3y^2 + 5y + 2) - (4y^2 + 3y + 2)$ like this:
   $= 3y^2 - 5y - 2 - 4y^2 - 3y - 2$
   $= 3y^2 - 4y^2 - 5y - 3y - 2 - 2$
   $= -y^2 - 8y - 4$
   a) Explain why the student's solution is incorrect.
   b) What is the correct answer? Show your work.

5. The difference between two polynomials is $(5x + 3)$. One of the two polynomials is $(4x + 1 - 3x^2)$. What is the other polynomial? Explain how you found your answer.

6. Subtract.
   a) $(mn - 5m - 7) - (-6n + 2m + 1)$
   b) $(2a + 3b - 3a^2 + b^2) - (-a^2 + 8b^2 + 3a - b)$
   c) $(xy - x - 5y + 4y^2) - (6y^2 + 9y - xy)$

Master 5.23

Extra Practice 5

Lesson 5.5: Multiplying and Dividing a Polynomial by a Constant

1. Multiply. Sketch the tiles for one product.
   a) $2(3b)$ b) $-2(6h)$ c) $4(2b^2)$
   d) $-2(2x^2)$ e) $-2(-y^2)$ f) $-3(-2f)$

2. Divide. Sketch the tiles for one division statement.
   a) $12d \div 4$ b) $-20d \div 5$ c) $8d \div -4$
   d) $12y^2 \div 4$ e) $-14x^2 \div 2$ f) $-10q \div -5$

3. Determine each product.
   a) $4(3a + 2)$ b) $(d^2 + 2d)(-3)$
   c) $2(4c^2 - 2c + 3)$ d) $(-2n^2 + n - 1)(6)$
   e) $-3(-5m^2 + 6m + 7)$

4. Here is a student's solution for a multiplication question.
   $(-5k^2 - k - 3)(-2)$
   $= -2(5k^2) - 2(k) - 2(3)$
   $= -10k^2 - 2k - 6$
   a) Explain why the student's solution is incorrect.
   b) What is the correct answer? Show your work.

5. Determine each quotient.
   a) $(16v + 16) \div (8)$ b) $(25k^2 - 15k) \div (5)$
   c) $(20 - 8n) \div (-4)$ d) $(18x^2 - 6x + 6) \div (6)$
   e) $(7 - 7y + 14y^2) \div (-7)$

6. Here is a student's solution for a division question.
   $(-12r^2 - 8r - 16) \div (-4)$
   $= \frac{-12r^2}{4} + \frac{-8r}{4} + \frac{-16}{4}$
   $= -3r^2 - 2r + 4$
   a) Explain why the student's solution is incorrect.
   b) What is the correct answer? Show your work.

Master 5.24

Extra Practice 6

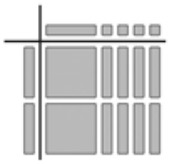
Lesson 5.6 Multiplying and Dividing a Polynomial by a Monomial

1. Write the multiplication sentence modelled by each set of algebra tiles.

a)

b)

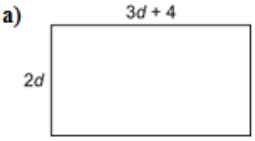
c)



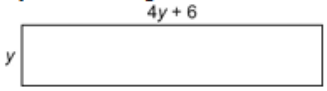
2. For each set of algebra tiles in question 1, write a division sentence.

3. Write the multiplication sentence modelled by each rectangle.

a)



b)



4. For each rectangle in question 4, write a division sentence.

5. Multiply.

a) $v(3v + 1)$ **b)** $3c(5c + 2)$ **c)** $(8 + 4y)(6y)$

d) $5p(-5 - 2p)$ **e)** $(7k - 3)(-m)$ **f)** $(-1 - 10r)(-r)$

6. Divide.

a) $(6x + 3) \div 3$ **b)** $(14w - 7) \div -7$ **c)** $(-15 - 10q) \div 5$

d) $(8z^2 + 4z) \div 2z$ **e)** $(12c^2 - 6c) \div 3c$ **f)** $(9xy - 6x) \div -3x$

7. Here is a student's solution for a division question.

$(-12x^2 - 9x - 12xy) \div (-3x)$

$= \frac{-12x^2}{-3x} + \frac{9x}{-3x} + \frac{-12xy}{-3x}$

$= 4x^2 - 3 + 4xy$

a) Explain why the student's solution is incorrect.

b) What is the correct answer?