Name _____ Date _____

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

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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. Use algebra tiles to model each polynomial, then combine like terms.
Sketch the tiles for the simplified 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.

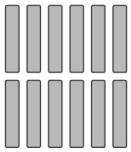
a) $3a^2 - 2a - 4 + 2a - 3a^2 + 5$
b) $7z - z^2 + 3 + z^2 - 7$
c) $d^2 + 3d + 1 + 4d^2 + 2$
d) $-6x^2 + 10x - 4 + 4 - 12x - 7x^2$

5. Identify the equivalent polynomials. Justify your responses.

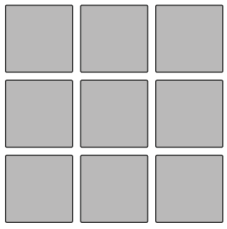
a) $-5y^2 - 3y - 4$
b) $10x - 1$
c) $1 + x - x^2$
d) $2y^2 - 4 - 16 - 7y^2 - 3y + 16$
e) $-7 + 5x - 7x - 8 + 14 + 12x$
f) $5x^2 + 7 + 4x - 6x^2 - 6 - x - 2x$

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

a)



b)



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Extra Practice 3

Lesson 5.3: Adding Polynomials

1. Use algebra tiles to model each sum. Sketch your tile model.
Record your answer symbolically.

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. Use algebra tiles if it helps.

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. Use algebra tiles if it helps.

a) $(-7x + 5)$
$+ (\underline{2x - 8})$

b) $(4x^2 - 3)$
$+ (\underline{-8x^2 - 1})$

c) $(x^2 - 4x + 3)$
$+ (\underline{-x^2 - 2x - 3})$

d) $(3x^2 - 4x + 1)$
$+ (\underline{-2x^2 + 4x + 1})$

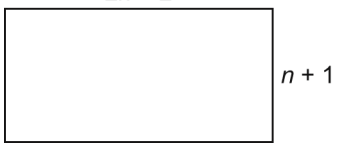
4. Add.

a) $(y^2 + 6y - 5) + (-7y^2 + 2y - 2)$ **b)** $(-2n + 2n^2 + 2) + (-1 - 7n^2 + n)$

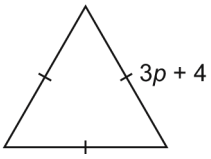
c) $(3m^2 + m) + (-10m^2 - m - 2)$ **d)** $(-3d^2 + 2) + (-2 - 7d^2 + d)$

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

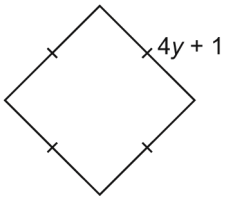
i)



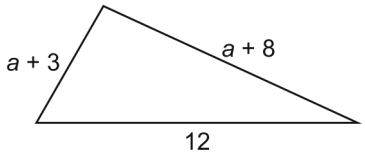
ii)



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.

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Extra Practice 4

Lesson 5.4: Subtracting Polynomials

1. Use algebra tiles. Sketch your tile model. Record your answer symbolically.

a) $(4x + 2) - (2x + 1)$ **b)** $(4x + 2) - (-2x + 1)$

c) $(4x + 2) - (2x - 1)$ **d)** $(4x + 2) - (-2x - 1)$

2. Use algebra tiles to model find each difference. Sketch your tile model. Record your answer symbolically.

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. Use a personal strategy to subtract. Check your answers by adding.

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) $(xy - x - 5y + 4y^2) - (6y^2 + 9y - xy)$

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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.

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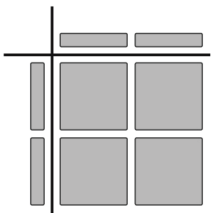
Extra Practice 6

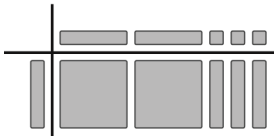
Lesson 5.6 Multiplying and Dividing a Polynomial by a Monomial

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

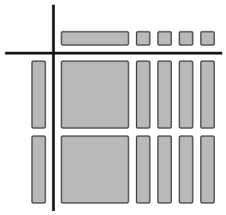
a)



b)



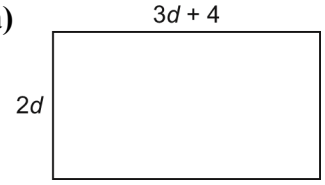
c)



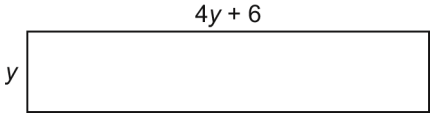
2. For each set of algebra tiles in question 1, write a division sentence.

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?

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Extra Practice Sample Answers

Extra Practice 1 – Master 5.19

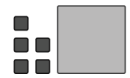
Lesson 5.1

1. $2m^2 + 1$, $-4x$, $0.25y^2$

2. **a)** coefficient –8; variable y; degree 1; no constant term
b) no coefficient; no variable; degree 0; constant term 12
c) coefficients –2, –1; variable b; degree 2; constant term 10
d) coefficient –1; variable b; degree 1; constant term –4

3. **a)** monomial **b)** trinomial
c) trinomial **d)** binomial

4. a and b; e and d; c and f

5. **a)**  **b)** 
c) 
d)  **e)** 

6. Answers will vary.
a) $3m + 4$ **b)** $-2y^2 + 5y - 1$

Extra Practice 2 – Master 5.20

Lesson 5.2

1. $-6w^2$, $3w^2$, $-w^2$; like terms have the same variable raised to the same exponent.

2. **a)** $6x + 6$ 
b) $-3y^2 + 3y - 2$ 
c) $3x^2 - 3$ 
d) $4y^2 + 1$ 

3. **a)** $5d - 5$ **b)** $-8 - 6k$
c) $-2a + 3$ **d)** $-p$

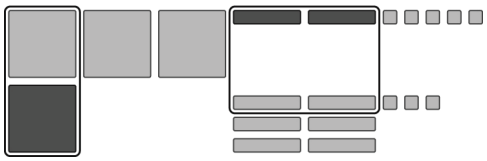
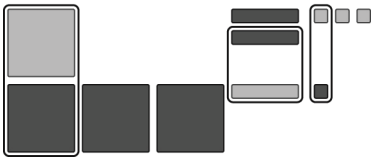
4. **a)** 1 **b)** $7z - 4$
c) $5d^2 + 3d + 3$ **d)** $-13x^2 - 2x$

5. a and d; b and e; c and f; each has the same terms with the same coefficients, variables raised to the same exponent.

6. **a)** $4x + 12$ **b)** $12x$

Extra Practice 3 – Master 5.21

Lesson 5.3

1. **a)** $2h + 4$ 
b) $-3a^2 + 4a$ 
c) $2y^2 + 4y + 8$ 
d) $2 - y - 2y^2$ 

2. **a)** $3x - 3$ **b)** $2b^2$
c) $-6y^2 + 8y$ **d)** $2n^2 + 4$

3. **a)** $-5x - 3$ **b)** $-4x^2 - 4$
c) $-6x$ **d)** $x^2 + 2$

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Extra Practice Sample Answers

4. **a)** $-6y^2 + 8y - 7$ **b)** $-n - 5n^2 + 1$
c) $-7m^2 - 2$ **d)** $-10d^2 + d$

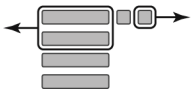
5. **a)** **i)** $(2n + 2) + (n + 1) + (2n + 2) + (n + 1)$
$= 6n + 6$
ii) $(3p + 4) + (3p + 4) + (3p + 4) = 9p + 12$
iii) $(4y + 1) + (4y + 1) + (4y + 1) + (4y + 1)$
$= 16y + 4$
iv) $(a + 8) + (a + 3) + (12) = 2a + 23$
b) **i)** $2(1) + 2 + 1 + 1 + 2(1) + 2 + 1 + 1 = 12$
$6(1) + 6 = 12$
ii) $3(1) + 4 + 3(1) + 4 + 3(1) + 4 = 21$
$9(1) + 12 = 21$
iii) $4(1) + 1 + 4(1) + 1 + 4(1) + 1 + 4(1) + 1$
$= 20$
$16(1) + 4 = 20$
iv) $1 + 8 + 1 + 3 + 12 = 25$
$2(1) + 23 = 25$

6. $(4r + 5 - 3r^2) - (-8 - 2r^2 + 2r) = 13 - r^2 + 2r$

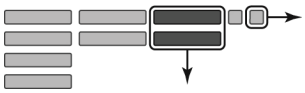
Extra Practice 4 – Master 5.22

Lesson 5.4

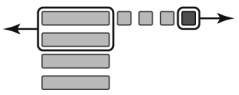
1. **a)** $2x + 1$;



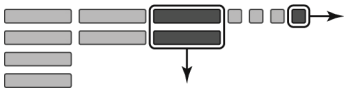
b) $6x + 1$;



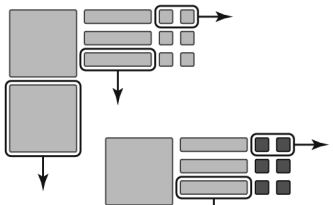
c) $2x + 3$;



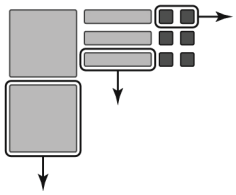
d) $6x + 3$;



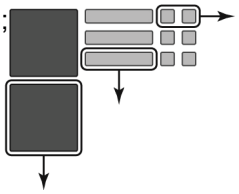
2. **a)** $s^2 + 2s + 4$



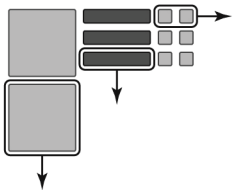
b) $s^2 + 2s - 4$;



c) $-s^2 + 2s + 4$;



d) $s^2 - 2s + 4$;



3. **a)** $-3x - 1$ **b)** $3 - 15w$
c) $-3x^2 - 2$ **d)** $-12z^2 + 1$

4. **a)** The student is incorrect because he changed the signs in the first polynomial.
b) $(3y^2 + 5y + 2) - (4y^2 + 3y + 2)$
$= 3y^2 + 5y + 2 - 4y^2 - 3y - 2$
$= 3y^2 - 4y^2 + 5y - 3y + 2 - 2$
$= -y^2 + 2y$

5. There are two possible answers.
$(4x + 1 - 3x^2) - (5x + 3) = -3x^2 - x - 2$, or
$(5x + 3) + (4x + 1 - 3x^2) = -3x^2 + 9x + 4$

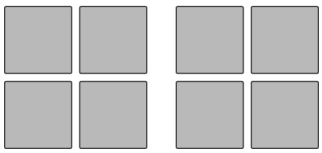
6. **a)** $mn - 7m - 8 + 6n$
b) $-a + 4b - 2a^2 - 7b^2$
c) $2xy - x - 14y - 2y^2$

Extra Practice 5 – Master 5.23

Lesson 5.5

1. **a)** $6b$ **b)** $-12h$
c) $8b^2$ **d)** $-4x^2$
e) $2y^2$ **f)** $6f$

$8b^2$:



2. **a)** $3d$ **b)** $-4d$
c) $-2d$ **d)** $3y^2$
e) $-7x^2$ **f)** $2q$

$(-20d) \div 5$:

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Extra Practice and Activating Prior Knowledge Sample Answers

3. **a)** $12a + 8$ **b)** $-3d^2 - 6d$
c) $8c^2 - 4c + 6$
d) $-12n^2 + 6n - 6$
e) $15m^2 - 18m - 21$

4. **a)** The negative signs were omitted on the first polynomial when (–2) was distributed; $(-5k^2)(-2) + (-k)(-2) + (-3)(-2) = 10k^2 + 2k + 6$

5. **a)** $2v + 2$ **b)** $5k^2 - 3k$
c) $-5 + 2n$ **d)** $3x^2 - x + 1$
e) $-1 + y - 2y^2$

6. The divisor is –4, when writing the quotient expression as a sum of three fractions, each denominator should be –4, rather than 4; $3r^2 + 2r + 4$

Extra Practice 6 – Master 5.24

Lesson 5.6

1. **a)** $2a(2a) = 4a^2$
b) $r(2r + 3) = 2r^2 + 3r$
c) $2y(y + 4) = 2y^2 + 8y$

2. **a)** $4a^2 \div 2a = 2a$
b) $(2r^2 + 3r) \div r = 2r + 3$
c) $(2y^2 + 8y) \div 2y = y + 4$

3. **a)** $2d(3d + 4) = 6d^2 + 8d$
b) $y(4y + 6) = 4y^2 + 6y$

4. **a)** $(6d^2 + 8d) \div 2d = 3d + 4$
b) $(4y^2 + 6y) \div y = 4y + 6$

5. **a)** $3v^2 + v$ **b)** $15c^2 + 6c$
c) $48y + 24y^2$ **d)** $-25p - 10p^2$
e) $-7km + 3m$ **f)** $r + 10r^2$

6. **a)** $2x + 1$ **b)** $-2w + 1$
c) $-3 - 2q$ **d)** $4z + 2$
e) $4c - 2$ **f)** $-3y + 2$

7. **a)** The solution is incorrect, because in writing the fraction for the second term $\frac{-9x}{-3x}$, the negative sign was omitted in the numerator. Also, the student did not simplify the last fraction correctly; it should be $4y$.
b) $4x + 3 + 4y$

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1. **a)** 20 **b)** 20 **c)** 0
2. **a)** –4, –1, 2 **b)** 2, 17, 42
c) 11, 28, 51
3. **a)** –16 **b)** –16 **c)** –24

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4. **a)** 6 **b)** $-b + 3$
c) $2g + 12$

5. **a)** 

b) 

c) 

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Evaluating Algebraic Expressions **Quick Review**

$3x + 5y + 2$ is an algebraic expression. The letters x and y are called variables and are used to represent any set of numbers.
When we replace a variable with a number in an algebraic expression, we *evaluate* the expression. That is, we find the value of the expression for a particular value of each variable.

Example 1
a) Evaluate $6y + 3$ for $y = 4$. **b)** Evaluate $2x^2 - 1$ for $x = -2$.

Solution
a) $6y + 3$ means 6 times a number, then add 3.
Replace y with 4 in the expression $6y + 3$.
Then use order of operations.
$6y + 3 = 6 \times 4 + 3$ Multiply first.
$= 24 + 3$ Add.
$= 27$
b) $2x^2 - 1$ means 2 times a number squared, then subtract 1.
Replace x with -2 in the expression $2x^2 - 1$.
Then use order of operations.
$2x^2 - 1 = 2 \times (-2)^2 - 1$ Exponents first.
$= 2 \times 4 - 1$ Multiply.
$= 8 - 1$ Subtract.
$= 7$

Check

1. Evaluate each expression by substituting for the value indicated.
a) $p + 8$, for $p = 12$ **b)** $4w + 8$, for $w = 3$ **c)** $2r - 8$, for $r = 4$

2. Evaluate the following expressions for $x = 1$, $x = 2$, then $x = 3$.
Show the steps you used to find each result.
a) $3x - 7$ **b)** $5x^2 - 3$ **c)** $3x^2 + 8x$

3. Find the value of the following polynomials when $a = -2$ and $b = 4$.
a) $2a - 3b$ **b)** $a^2 - 2b - 12$ **c)** $a^2 - 2b^2 - 2a$

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Using Models to Represent Algebraic Expressions **Quick Review**

One yellow unit tile represents +1.
One red tile represents –1.
The yellow variable tile represents any variable such as x or a.
The red variable tile represents $-x$ or $-a$.

Example 2

Write the expression represented by these tiles:

a)

b)

c)

Solution

a) There are two positive variable tiles; the expression is $2n$.
b) There are five negative variable tiles; the expression is $-5x$.
c) There are three negative variable tiles and two positive unit tiles; the expression is $-3m + 2$.

Check

4. Write the expressions represented by these tiles.

a)

b)

c)

5. Use algebra tiles to illustrate each of the following expressions.
a) $-6y$ **b)** $-5x + 1$ **c)** $-2w + 4$