Name: _____

Start date: _____

Handin date: _____

MATH 9

Module 4

Polynomials

x^2+7x-3

$4a^3+7a^2+a$

nm^2-m

$3x-2$

5

Polynomials

MODULE 4: **What I need to know!!**	**Examples**	$\overline{G}$	G	$\underline{G}$
I can give examples of polynomial expressions.				
I can combine and simplify polynomial expressions using algebra tiles and/or by writing.	$2x + 6y + 3y + x^2 + 3x^2$			
I can add and subtract polynomial expressions.	$(2x - 3) + (3 + 7)$ $(2x - 3) - (x + 4 - 6)$			
I can multiply and divide monomials, binomials and trinomials.	$2(2x) =$ $-4(x+10) =$ $(x-4)(-3x+2) =$ $(2x-3)(x2 + 3x - 8) =$ $\frac{10x}{5} =$ $\frac{(2x+6)}{3}$			
I can show on paper how to set up and solve simple equations.	$x + 2 = 10$ $2x = 10$ $\frac{-x}{5} = -3$ $6x - 8 = -20$ $\frac{x}{2} + 8 = 13$ $5x = 8 + 3x$ $-2(x + 10) = -100$ $-5x + 15 = 3x + 7$			

$\overline{G}$ = Above Grade Level
I can teach this!!

G = At Grade Level
I got it!!

$\underline{G}$ = Below Grade Level
I do not understand yet...

4.1 Polynomials

Practice

1. *Classify each polynomial as a monomial, binomial, or trinomial.*

Polynomials	Examples
Monomial	$6x^2y$ OR $5b$ OR 38 (1 term)
Binomial	$3x^2 + 2y$ OR $7xy^2 + 3$ (2 terms)
Trinomial	$8x + 3y + 9z$ (3 terms)

a) $5xyz$ _____

b) $7x + 2y$ _____

c) $a - 2b + c$ _____

d) $x^2 + y^2$ _____

e) 23 _____

f) $x - y + 2$ _____

g) $5x^2 + 8$ _____

2. *State the degree of each monomial.*

Degree of a Monomial

- the sum of the exponents of its variables.

Monomial	Degree
$8x^4$	4
$2x^3y^2z^4$	$3 + 2 + 4 = 9$
$3c^2d^3e$	$2 + 3 + 1 = 6$

Degree: $2 + 2 = \square$

a) $25x^2y^2$ _____

b) $25x$ _____

c) 17 _____

d) $2x^2y^3$ _____

e) $-5x^3y^4$ _____

f) $-6xy^4x$ _____

3. *State the degree of each polynomial.*

Degree of a Polynomial

- term with the largest degree.

Polynomial	Degree
$8x^2 + 3x$ (Degree = 2, Degree = 1)	2
$x^2y^3 + xy^4 + x^2y^5$ (Degree: $2+3=5$, $1+4=5$, $2+5=7$)	7
$3x^3y^7 + 7xy^3 - 2xy$ (Degree: $3+7=10$, $1+3=4$, $1+1=2$)	10

Find degree of each term. Write largest degree.

a) $5x^2y^2 + 3xy^3$ _____

Degree: $2 + 2 = \square$ Degree: $1 + 3 = \square$

b) $3x + 2y - 5z$ _____

c) $x^4 + 2x^3 + 4$ _____

Degree = 0

d) $4x^4y^2 + 2x^3y^5$ _____

e) $3x - 2y + z^2$ _____

f) $25m^3n + 36m^3n^3$ _____

4. *Arrange the terms in each polynomial in descending powers of x.*

Descending Order
- largest power of x to smallest power of x

Examples:
a) $x^4 + 2x^3 + 3x^2 - 2x + 7$
b) $2x^5 - 6x^2 + 3$
c) $5x^2 + 7xy + 3y^2$

Look at x only.

a) $1 + x^3 + x^2 + x^5 = x^5 + x^{\square} + x^{\square} + 1$

b) $5 - 3x^3 + 2x = -3x^3 + \square + \square$

c) $14 + 6x^2 + 9x^4 =$ _____

d) $5x + 7x^4 + 4x^2 =$ _____

e) $5y^2 + 2xy - x^2 = \square + \square + 5y^2$

f) $-5x^2y + 3x^3y - 4x^4 =$ _____

5. *Arrange the terms in each polynomial in ascending powers of x.*

Ascending Order
- smallest power of x to largest power of x

Examples:
a) $7 - 2x + 3x^2 + 2x^3$
b) $3y^2 + 7xy + 5x^2$
c) $3 - 6x^2 + 2x^5$

a) $x^3 + x^2 + x^5 + 1 = 1 + x^2 + x^{\square} + x^{\square}$

b) $3x^2 - 2x^3 + 5x^5 + x - 2 =$ _____

c) $4x^4 + x^2 - 3x^3 + 5 - x =$ _____

d) $x^2 + x - 8 =$ _____

e) $3x^3 + x^4 + x - 1 =$ _____

f) $x^2 - 2xy - 3x^3 + 16 =$ _____ Look at x only.

g) $2x^3y + 3xy - x^5 =$ _____

Problems and Applications

6. *Identify each type of polynomial.*

a) $3x + 18 \rightarrow$ _____

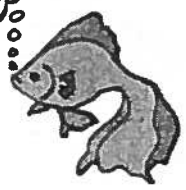
b) $x + y + z \rightarrow$ _____

c) $\frac{4\pi r^3}{3} \rightarrow$ _____

d) $\pi r^2 + 2\pi rh \rightarrow$ _____

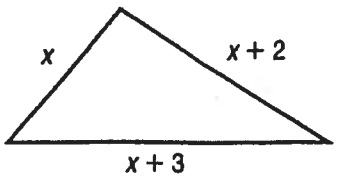
e) $4\pi r \rightarrow$ _____

Clues:
monomial
binomial
trinomial



7. *Find the perimeter of each figure.*

a)



P = sum of all sides

= ____ + ____ + ____

____

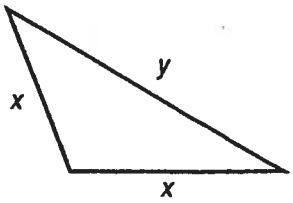
____

← Join like terms.

Circle the type of polynomial represented by the perimeter of the above triangle.

monomial *or* **binomial** *or* **trinomial**

b)



P = ____

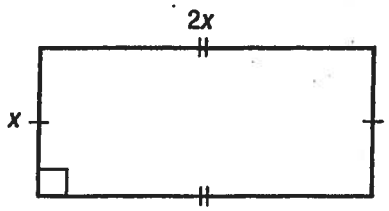
____

____

State the type of polynomial represented by the perimeter of the above triangle.

____

c)



____

____

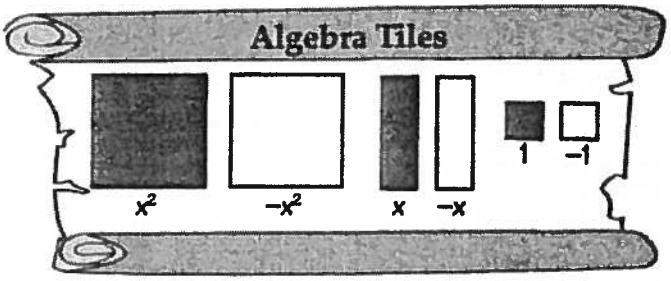
____

____

State the type of polynomial represented by the perimeter of the above rectangle.

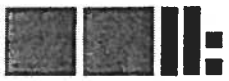
____

4.2 Adding Polynomials



Practice

1. *Find the sums of the expressions* **A** *and* **B**, *represented by the algebra tiles.*

a) **A:** 

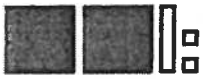
B: 

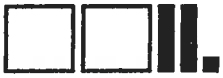
A + B = $\square x^2 + \square x + \square$

b) **A:** 

B: 

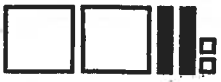
A + B = _____

c) **A:** 

B: 

A + B = _____

d) **A:** 

B: 

A + B = _____

2. *State the like terms in each expression.*

a) $2x + 3y - 4xy + 5x - 2y + 6xy$

Like terms: $2x$ and $5x$

$3y$ and $\square$

$-4xy$ and $\square$

b) $2a + 5a - 6b + 8b - 2c + 8c$

Like terms: _____

_____

_____

c) $3s^2 + 5s - 2 + 7s^2 + s - 3$

Like terms: _____

_____

_____

d) $2x + 4x^2 - 5x + 7 - 3x^2 - 10$

Like terms: _____

_____

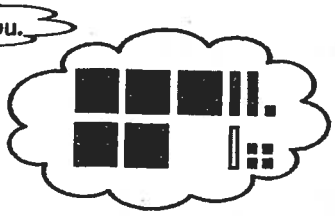
_____

3. *Add.*

Use algebra tiles to help you.

a) $x + 2$
$+ 3x + 4$

b) $3y^2 + 2y + 1$
$+ 2y^2 - y + 4$



c) $5x - 2y + 6$
$+ 3x - 6y + 9$

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

e) $5x^2 + 7x - 9$
$+ 4x^2 - 8x + 11$

f) $3y^2 - 8y + 3$
$+ 2y^2 + 8y - 9$

g) $3x^2 - 2x + 4$
$+ x^2 + x + 1$

4. *Add.*

a) $(3x + 1) + (4x - 2)$

$= 3x + 1 + 4x - 2$ Remove brackets.

$= 3x + 4x + \square - \square$ Collect like terms.

$= \square x - 1$ Add

b) $(x + 7) + (5x + 2)$

c) $(3x^2 + 5x - 4) + (x^2 - 7x + 2)$

$=$ _____

$= \square x^2 + x^2 + \square x - \square x - \square + \square$

$=$ _____

d) $(-y^2 + 7y - 5) + (2y^2 + 7y - 4)$

e) $(2y^3 - 3y^2 - 1) + (-4y^3 - 5y^2 + 3)$

f) $(5z + 6 - 3z^2) + (4 - 7z + 2z^2)$

g) $(3x^2 + 2y^2 - 5) + (4x^2 + 3y^2 - 11)$

h) $(5x^2 + 7x - 7) + (4x^2 - 8x + 2)$

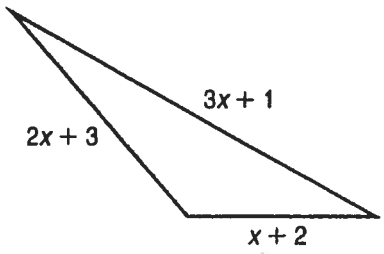
i) $(3y^2 - 8y + 3) + (2y^2 + 8y - 9)$

j) $(m^3 + 5m^2 + 3) + (4m^2 + 7)$

Problems and Applications

5. Show how these algebra tiles can be used to model an answer to
$(2x^2 - 3x + 4) + (2x - 3)$.

6. a) Write an expression in simplest form for the perimeter of the triangle.



P = **sum of all sides**

$= (3x + 1) + (x + 2) + (2x + 3)$

$=$ _____ Remove brackets.

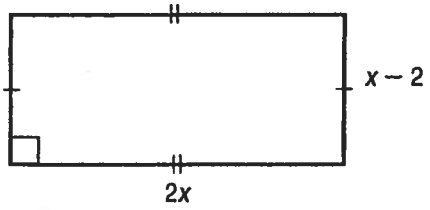
$=$ _____ Collect like terms.

$=$ _____ Add

b) If $x = 2$ cm, what is the perimeter? Substitute $x = 2$.

Sentence: *The perimeter is* ☐ *cm.*

7. a) Write an expression in simplest form for the perimeter of the rectangle.



b) If $x = 3$ cm, what is the perimeter?

Sentence: _____

4.3 Subtracting Polynomials

Practice

1. *Write the additive inverse.*

Polynomial	Additive Inverse
a) $x^2 + 5x - 7$	$-x^2 - 5x + 7$
b) $x^2 + 4x + 1$	
c) $x^2 - 2x - 3$	
d) $2x^2 + x - 5$	
e) $-3x^2 - 7x + 2$	

Write the opposite.

2. *Subtract.*

a) $(3x - 5) - (x + 2)$

$= (3x - 5) + (-x - 2)$ Write the opposite and add.

$= 3x - 5 - x - 2$ Remove brackets.

$= 3x - x - 5 - 2$ Collect like terms.

$= \square x - \square$ Add

b) $(x + 4) - (-x - 3)$

c) $(x + 5) - (3x - 1)$

d) $(3x - 5) - (x + 4)$

e) $(6x - 1) - (-2x + 1)$

f) $(x - 5) - (x + 4)$

3. *Subtract.*

Add the opposite.

a) $5x^2 + 3x - 5$ ..... $5x^2 + 3x - 5$
$2x^2 - 5x - 4$ (Additive inverse) → $-2x^2 + 5x + 4$
(Add) → _____

b) $-3x^2 + 5x - 7$ .....
$2x^2 + 3x - 3$ (Additive inverse) → _____
(Add) → _____

c) $-4x^2 - 4x + 3$ .....
$-3x^2 + 4x - 8$ ..... _____
(Add) → _____

d) $x^2 - 5x + 1$ .....
$x^2 - 5x + 6$ ..... _____
_____

e) $x^2 + 7x - 1$
$x^2 + 4x + 1$

f) $12x^3 + 3x^2 - 5x$
$9x^3 + 4x^2 - 4x$

_____

4. *Subtract.*

a) $(2y^2 + 3y - 5) - (2y^2 + 4y + 6)$

$= (2y^2 + 3y - 5) + (-2y^2 - 4y - 6)$ — Write the opposite and add.

$= 2y^2 + 3y - 5 - \_\_\_\_ - \_\_\_\_ - \_\_\_\_$ — Remove brackets.

$= 2y^2 - 2y^2 + 3y - 4y - 5 - 6$ — Collect like terms.

$= \_\_\_\_\_$ — Add

$= \_\_\_\_\_$ — Simplify

b) $(4s^2 + s - 2) - (-3s^2 + s - 5)$

c) $(y^2 - 5y + 3) - (-2y^2 + 7y + 5)$

d) $(4 + 2x - x^2) - (3 - 7x^2 + 5x)$

Write the opposite and add.

Remove brackets.

Collect like terms.

Add

Simplify

e) $(x^2 + 5x + 3) - (-x^2 - 7x + 11)$

f) $(3m^2 + 7m - 8) - (-m^2 + m - 1)$

g) $(-5y^2 + 7y - 12) - (3y^2 + 4y - 2)$

h) $(2t^2 + 3t + 6) - (-t^2 + 2t - 1)$

Problems and Applications

5. Complete the model using algebra tiles to show the answer to

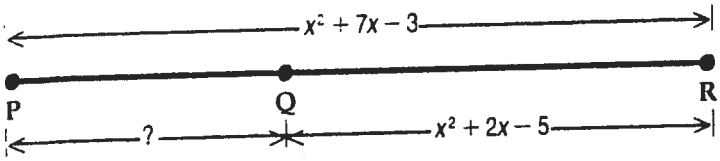
$(2x^2 - 2x + 1) - (-2x^2 + x + 2)$

$= ($  $) - ($  $)$

$= ($ $) + ($  $)$ ← Add the opposite.

$=$ _____

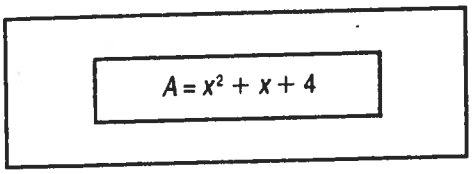
6. Find the length of PQ.



Hint: Subtract the polynomials.

Sentence: _____

7. The area of the large rectangle is $3x^2 + 2x + 1$. The area of the small rectangle is $x^2 + x + 4$. What is the area of the shaded region?



Hint: Subtract the polynomials.

Sentence: _____

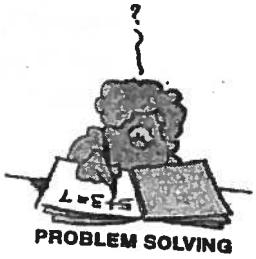
8. The additive inverse of the polynomial $2x^2 - 5x + 1$ is $-2x^2 + 5x - 1$. What is the sum of the polynomial and its additive inverse?

Sentence: _____

8. The additive inverse of the polynomial $2x^2 - 5x + 1$ is $-2x^2 + 5x - 1$. What is the sum of the polynomial and its additive inverse?

Sentence: _____

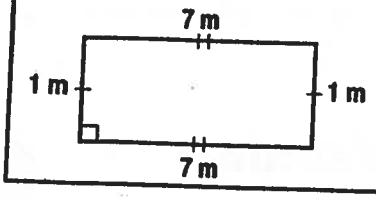
4.4 Problem Solving: Use a Diagram



Problems and Applications

1. How many different sized rectangles have a perimeter of 16 m?
The lengths of each side must be whole numbers.

One Rectangle:



$P = 2l + 2w$
$= (2 \times 7) + (2 \times 1)$
$= 14 + 2$
$= 16$ m

Draw the diagrams.

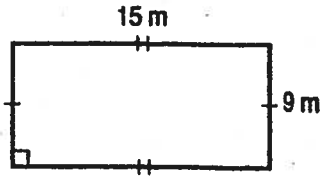
Sentence: _____

2. Roberto bought 3 stamps connected as shown.

In how many different ways can 3 stamps be connected to each other? Draw the ways!

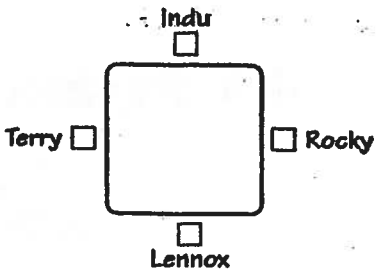
Sentence: _____

3. Lenore wants to fence a rectangular yard that measures 15 m by 9 m. She wants posts at the corners and every 3 m apart. How many posts does she need?



Sentence: _____

4. Terry, Rocky, Indu, and Lennox went out for dinner. They sat at a square table. In how many different ways can they sit at a square table if there must be one person on each side?



Sentence: _____

4.5 Multiplying Monomials by Monomials

Practice

1. *Multiply.*

a) $5x \times 3y$

$= 5 \times x \times 3 \times y$

$= 5 \times 3 \times x \times y$

$=$ _____ xy

b) $2m \times 3n$

c) $5s \times 7t$

d) $4a \times 6b$

e) $3x^2 \times 2y$

f) $4a \times 5b^2$

g) $4b \times 3c$

h) $3a \times 2b^2$

2. *Multiply.*

a) $(3x)(2y)$

$= 3 \times x \times 2 \times y$

$= 3 \times 2 \times x \times y$

$=$ _____ xy

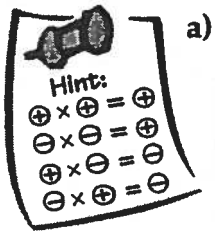
b) $(3a)(4b)$

c) $(5x^2)(2y^2)$

d) $(5ab)(3c)$

e) $(4x)(3y)$ f) $(6xy)(5z)$ g) $(2a^2)(2y^2)$ h) $(3a)(3b)$

3. *Multiply.*



a) $(3x^2)(-5y^2)$ b) $-2t^2(-4a)$ c) $(6ab)(-2c^2)$

d) $-8a^2(3y^2)$ e) $(5x)(5yz)$ f) $-2x^2(-4y^2)$

4. *Multiply.*

a) $(-2xy)(-7xy)$

$= (-2) \times x \times y \times (-7) \times x \times y$

$= (-2) \times (-7) \times x^1 \times x^1 \times y^1 \times y^1$ ← Collect like terms

$= \square\, x^{1+1} y^{1+1}$

$= \square\, x^{\square} y^{\square}$

b) $-5m^2(-2mn)$

c) $4s^2t^3(-3st)$

d) $(-3ab)(-2a^2b^4)$

e) $(-2s^2t^3)(-5s^4t^2)$

f) $(-5x^2y^2)(4xy^3)$

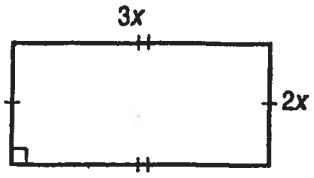
5. *Multiply.*

a) $(3a)(2a)(2a)$ b) $(7x)(3x)(x)$ c) $(5y)(2y)(3y)$

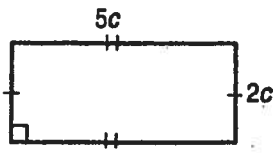
Problems and Applications

6. *Find the area of each figure.*

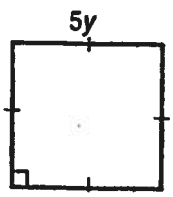
a)



b)



c)



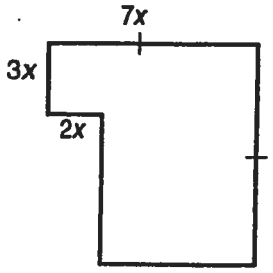
$A = l \times w$ Formula

$A = 3x \times 2x$ Substitute

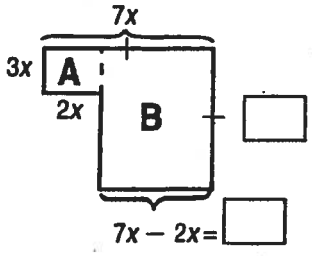
$A = 3 \times 2 \times x \times x$ Group like terms.

$A =$ ☐ x ☐ Multiply

7. *Find the area of each figure.*



First: *Divide figure into shapes and find lengths of sides.*



Second: *Find area of each shape.*

$A = l \times w$

Area of A $= 3x \times 2x$ **Area of B** $= 7x \times$ ☐

$=$ _____ $=$ _____

$=$ _____ $=$ _____

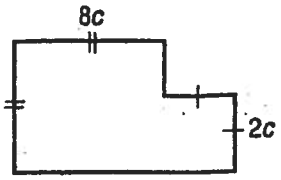
Third: *Find total area.*

Total Area = Area A + Area B

$=$ _____ + _____

$=$ _____

b)



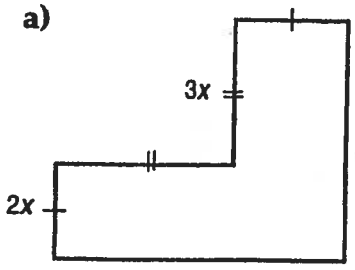
First: *Divide figure into shapes and find lengths of sides.*

Second: *Find area of each shape.*

Third: *Find total area.*

8. *Find the area of each figure.*

a)

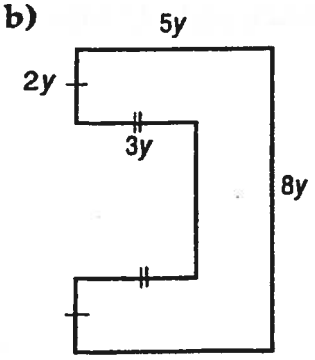


First: *Divide figure into shapes and find lengths of sides.*

Second: *Find area of each shape.*

Third: *Find total area.*

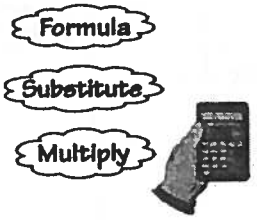
b)



9. To find the cost of making 24 hats, we use the expression $24xy$.

- x *is the time in minutes needed to make a hat.*
- y *is the cost of making a hat in dollars per minute.*

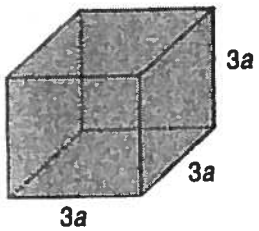
Use $x = 3$ and $y = 0.5$, to evaluate the above expression.



Sentence: _____

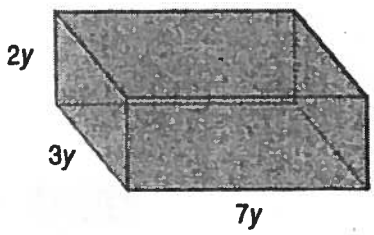
10. *Write an expression for the* ***volume*** *of each prism.*

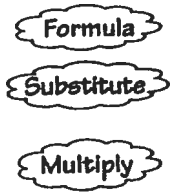
a)



$V = l \times w \times h$

b)





4.6 Problem Solving: Solve a Simpler Problem

Problems and Applications

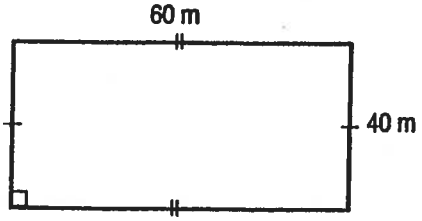
1. **How** would you **estimate** the number of listings in the white pages of a telephone book?

listings → names of people and their telephone numbers

2. **How** would you **estimate** the thickness of your *MATHPOWER™* student text?

3. **How** would you **estimate** how long it would take you to read a 150-page book?

4. Caroline wants to put a fence around her rectangular yard. The length of the yard is 60 m and the width is 40 m. The fence posts are to be 2 m apart **and** there must be a post at each corner. How many posts will she need?



Hint: Find how many posts are needed for a 6-m by 4-m yard.
Then, multiply answer by ☐.

Sentence: _____

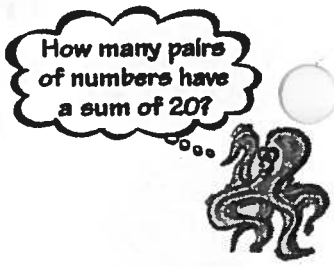
5. a) Find the sum of the first 10 odd numbers.

$$1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19$$

Add 1 and 19.

Hint: $1 + 19 = \square$

$3 + 17 = \square$



Sentence: _____

b) What is the sum of the first 20 odd numbers?

_____

6. Find the sum of the first 50 even numbers.

$$2 + 4 + 6 + 8 + \ldots + 96 + 98 + 100$$

_____

7. Each team had 9 players for the final game in a volleyball tournament. Before the game, each player shook hands with every player on the opposing team. How many handshakes were exchanged?

Hint: Try a smaller number of players.
How did you find your answer?

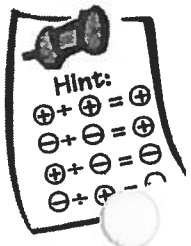
Sentence: _____

4.7 Dividing Monomials by Monomials

Practice

1. *Divide.*

a) $\frac{6x}{3}$ b) $\frac{-15a}{3}$ c) $\frac{24y}{8}$ d) $\frac{36m}{9}$ e) $\frac{-30x}{6}$



$= \left(\frac{6}{3}\right)\left(\frac{x}{1}\right)$

$= \square x$

f) $\frac{-25x}{5}$ g) $\frac{12x}{4x}$ h) $\frac{-18y}{3y}$ i) $\frac{24a}{a}$ j) $\frac{-32b}{-b}$

$= \left(\frac{12}{4}\right)\left(\frac{x}{x}\right)$

$= (\_\_\_\_)(1)$

$= \square$

2. *Divide.*

a) $\frac{15xyz}{5xy}$ b) $\frac{-18ab}{6a}$ c) $\frac{12pqr}{4pqr}$ d) $\frac{36abc}{-4a}$

$= \left(\frac{15}{5}\right)\left(\frac{x}{x}\right)\left(\frac{y}{y}\right)z$

$= (3)(1)(1)z$

$= \_\_\_\_\_$

3. *Divide.*

a) $25xy \div (5xy)$ b) $21xyz \div (3xyz)$ c) $9amn \div (amn)$ d) $36rst \div (3rs)$

Rewrite $\frac{25xy}{5xy}$

$=$

4. *Simplify.*

a) $5x^4y^2 \div (x^3y)$ b) $(-3a^3b^4) \div (ab)$ c) $18j^7k^7 \div (9j^4)$ d) $(-20x^5y^4) \div (4x^2y)$

Rewrite $\frac{5x^4y^2}{x^3y}$

Hint: Subtract exponents. $\frac{x^4}{x^3} = x^{4-3} = x^1 = x$

$= \left(\frac{5}{1}\right)\left(\frac{x^4}{x^3}\right)\left(\frac{y^2}{y}\right)$

$= \_\_\_\_\_$

5. *Simplify.*

a) $\frac{10a^6b^3}{5a^4b^2}$ b) $\frac{-15x^6y^8}{-5x^5y^7}$ c) $\frac{-12m^6n^2}{4m^3n^2}$ d) $\frac{20a^4b^6c}{15a^4b^6c}$

Reduce all fractions!

6. *Simplify. Express each answer with positive exponents.*

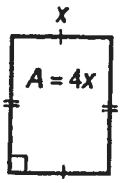
Example: $x^{-6} = \frac{1}{x^6}$

a) $a^{-5} = \frac{1}{a^{\square}}$ b) $y^{-2} = \square$ c) $z^{-1} = \square$ d) $x^{-18} = \square$

Problems and Applications

7. *Find the missing dimension in each rectangle.*

a)



$A = l \times w$

$4x = l \times x$

$\frac{4x}{\blacksquare} = \frac{l \times x}{\blacksquare}$

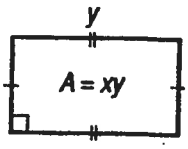
$\square$ = length

Formula

Substitute

Divide both sides by the same variable.

b)



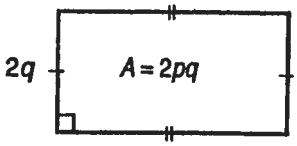
$A = l \times w$

$xy = y \times w$

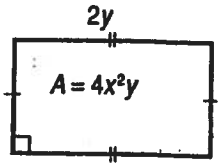
$\frac{xy}{\blacksquare} = \frac{y \times w}{\blacksquare}$

$\square$ = width

c)



d)



4.8 Problem Solving: Sequence the Operations

1. At ages 3, 4, and 5, a child learns 3 new words each day. About how many new words does a child learn in these 3 years?

First: *Find how many words a child learns in 1 year.*

1 year = 365 days

CHECK:

Second: *Find how many words a child learns in 3 years.*

Sentence: _____

2. The average person speaks about 125 words/min. How many words does the average person speak in 2.5 h?

Start: 1 h = _____ min.

CHECK:

Sentence: _____

3. Tamar and Ken left the service station at the same time and travelled in the same direction. Tamar drove at 90 km/h and Ken drove at 70 km/h.

a) How far did Tamar drive in 3.5 h?

$d = rt$

Sentence: _____

b) How far did Ken drive in 4 h?

_____

c) How far apart were they after 4.5 h?

First: *How far did Tamar drive in 4.5 h?*

Second: *How far did Ken drive in 4.5 h?*

Third: *Find the difference.*

Sentence: _____

4. Mohammed works at a restaurant during the summer. He earns \$6.00/h for up to 35 h/week. He earns *time-and-a-half* for each hour over 35 h/week. If he works 40 h in one week, how much does he earn?

Wages for 35 h

= _____ × _____

= \$ _____

# of hours of overtime

= _____ − _____

= _____ **hours**

Overtime pay for 1 hour

$= 6 + (\frac{1}{2} \times 6)$

= _____ + _____

= _____

Total Overtime Pay = # of h overtime × overtime pay for 1 h

= _____ × _____

= $ ☐

Total Pay = Wages for 35 h + Total overtime pay

= _____ + _____

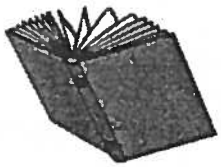
= ☐

Sentence: _____

5. What time will it be 168 h from now?

Sentence: _____

Review



1. *Classify each polynomial as a monomial, binomial, or trinomial.*

Polynomials	Examples
Monomial	$6x^2y$ OR $5b$ OR 38 (1 term)
Binomial	$3x^2 + 2y$ OR $7xy^2 + 3$ (2 terms)
Triomial	$8x + 3y + 9z$ (3 terms)

a) $xyz \rightarrow$ _____

b) $3x^2y^3 \rightarrow$ _____

c) $5xy^2 - 5xy \rightarrow$ _____

d) $x^2 + y \rightarrow$ _____

e) $ab^3 - b^2 + 1 \rightarrow$ _____

f) $3m^2n^3 + 5mn \rightarrow$ _____

g) $x^2 + 2x^4 + 5x^2 \rightarrow$ _____

h) $3x^3 - 5x + 3 \rightarrow$ _____

i) $x^2yz + 2yz \rightarrow$ _____

j) $b^2x^3 - 2x^3 - 4xy^2 \rightarrow$ _____

2. *State the degree of each polynomial.*

Degree of a Monomial

- the sum of the exponents of its variables.

Monomial	Degree
$8x^4$	4
$2x^3y^2z^4$	$3+2+4=9$
$3c^2d^3e$	$2+3+1=6$

Degree of a Polynomial

- term with the largest degree.

Polyomial	Degree
$8x^2 + 3x$ (Degree = 2; Degree = 1)	2
$x^2y^3 + xy^4 + x^2y^5$ (Degree: $2+3=5$; Degree: $1+4=5$; Degree: $2+5=7$)	7
$3x^3y^7 + 7xy^3 - 2xy$ (Degree: $3+7=10$; Degree: $1+3=4$; Degree: $1+1=2$)	10

a) $xyz \rightarrow$ _____ ($1+1+1=\square$)

b) $3x^2y \rightarrow$ _____ ($2+1=\square$)

c) $5x^2y - 5xy \rightarrow$ _____ ($2+1=\square$; $1+1=\square$; Use the highest sum.)

d) $x^2 + y \rightarrow$ _____

e) $ab^3 + b^2 + 1 \rightarrow$ _____

f) $3m^2n^3 + 5mn \rightarrow$ _____

g) $x^2 + 2x^4 + 5x^2 \rightarrow$ _____

h) $3x^3 - 5x + 3 \rightarrow$ _____

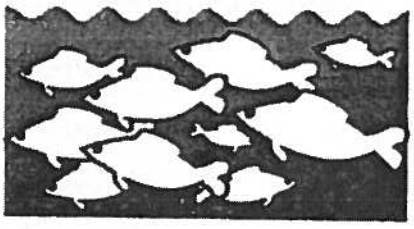
i) $x^2yz + 2yz \rightarrow$ _____

j) $b^2x^3 - 2x^3 - 4xy^2 \rightarrow$ _____

3. *Rewrite each polynomial with its powers in descending order.*

Descending Order

- largest power to smallest power



a) $x^2 + 3x - 5x^3 \rightarrow \underline{-5x^3 + x^{\square} + \square x}$

b) $5 + 2y^2 - 3y + y^4 \rightarrow$ _____

c) $2m + 6 - 3m^2 - m^4 + 6m^3 \rightarrow$ _____

d) $3 + x + x^2 + x^3 + x^4 \rightarrow$ _____

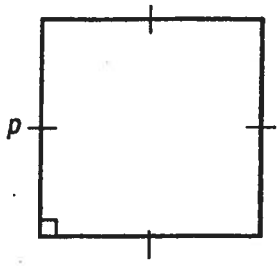
e) $y^5 - 2y^7 + 3y - 4y^2 + 5y^6 \rightarrow$ _____

4. **First:** *Find the perimeter of each figure.*

Second: *What type of polynomial is represented by each figure?*

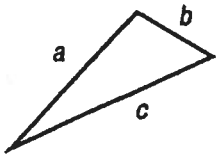
Types → monomial, binomial, trinomial

a)



Perimeter = the distance around the figure.

b)



Perimeter $= p + p + p + p$ (Join like terms.)

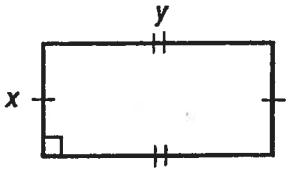
Perimeter $= \square p$

Perimeter = _____

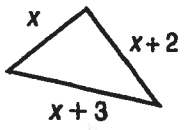
Type of polynomial → _____

Type: _____

c)



d)



Perimeter =

Type: _____

5. *Add.*

a) $(m^2 + 3m - 5) + (2m^2 - 5m + 7)$

$= m^2 + 3m - 5 + 2m^2 - 5m + 7$ (Remove brackets.)

$= m^2 + 2m^2 + 3m - \_\_\_\_ - 5 + \square$ (Collect like terms.)

$= \_\_\_\_ - \_\_\_\_ + \_\_\_\_$ (Add)

b) $(3a^2 + 5a - 2) + (a^2 + 3a + 4)$

6. *Add.*

a) $2x^3 - 3x^2 + 5x$

$\underline{\qquad\qquad -x^2 + 3x}$

$\square x^3 - \square x^2 + \square x$

b) $3x^2 - 7x + 5$

$\underline{-x^2 - x - 3}$

c) $-6a^2 - 2a + 7$

$\underline{6a^2 - a + 3}$

d) $7t^2 + 8t - 9$

$\underline{2t^2 - 9t - 1}$

7. *Subtract.*

a) $(5a^2 - 3a + 6) - (2a^2 + 3a + 7)$

$= (5a^2 - 3a + 6) + (-2a^2 - \square a - \square)$ Write the additive inverse.

$= \_\_\_\_\_$ Remove brackets.

$= 5a^2 - 2a^2 - 3a - \_\_\_\_ + 6 - \_\_\_\_$ Collect like terms.

$= \_\_\_\_ - \_\_\_\_ - \_\_\_\_$ Add

b) $(3m^2 + 5m + 1) - (2m^2 + 2m - 1)$

c) $(3x^2 + 2x - 5) - (x^2 + x + 1)$

d) $(-3n^2 - n - 7) - (-2n^2 + 3n - 4)$

e) $(5 + 3x + 2x^2) - (4 - 8x^2 + x)$

8. *Subtract.*

a) $5x^2 - 3x + 2$
$\underline{-\ x^2 - 2x + 4}$ → Rewrite with additive inverse. → $5x^2 - 3x + 2$
$\underline{+\ x^2 + 2x - 4}$
$\underline{\qquad\qquad}$ Add

b) $4x^2 - 7x + 5$
$\underline{-\ 3x^2 - 5x + 3}$ → Rewrite with additive inverse. →

c) $-5a^2 - 2a - 7$
$\underline{\ 6a^2 + 4a + 3}$

d) $7t^2 + 4t - 9$
$\underline{\ 2t^2 + 6t - 5}$

9. *Subtract.*

a) $(4x^2 + 6x + 4) - (-x^2 - 2x + 3)$

b) $(2m^2 + 8m - 9) - (-m^2 + 2m - 3)$

c) $(-4y^2 + 5y - 14) - (-5y^2 + 3y - 1)$

d) $(2x^3 - 3x^2 + 5x) - (x^2 - 3x)$

10. *Multiply.*

a) $(10x)(4y)$

$= 10 \times x \times 4 \times y$

$= (10 \times 4)(x \times y)$

$= \_\_\_\_\_ xy$

b) $(-3y)(5x)$

c) $(3x)(4x)$

d) $(-2a)(-5a)$

e) $(3xy)(5xy)$

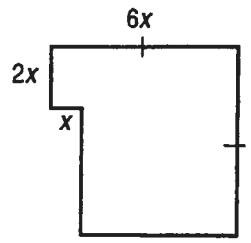
f) $a^2(ab)$

g) $4x^2(-2xy)$

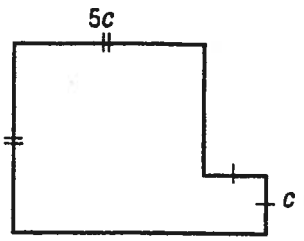
h) $(-s^2)(3s^3)$

11. *Find the area of each figure.*

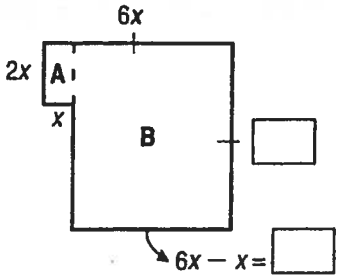
a)



b)



First: *Divide figure into shapes and find length of sides.*



Second: *Find area of each shape.*

$A = l \times w$

Area of **A** $= 2x \times$ ____

$=$ ☐

Area of **B** $= 6x \times$ ____

$=$ ☐

Third: *Add area* **A** *+ area* **B**.

Total area $=$ ☐ $+$ ☐

$=$ _____

12. *Divide.*

a) $\dfrac{20x^2y^4}{5xy^2}$ **b)** $\dfrac{16x^5y^6}{4x^5y^2}$ **c)** $\dfrac{45a^3b^3}{9ab}$ **d)** $\dfrac{-10a^4b^5}{5a^3b^3}$

$= \left(\dfrac{20}{5}\right)\left(\dfrac{x^2}{x}\right)\left(\dfrac{y^4}{y^2}\right)$

$=$ ____ $x^{2-1}y^{4-2}$

$=$ _____

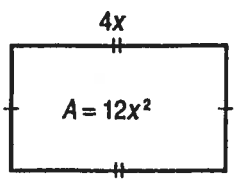
13. *Express each of the following with a positive exponent.*

Example: $x^{-6} = \frac{1}{x^6}$

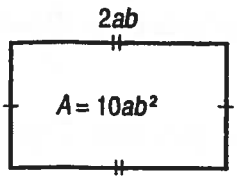
a) a^{-9} b) x^{-5} c) y^{-1} d) t^{-3}

14. *Find the missing dimensions.*

a)



b)



Divide

$A = l \times w$

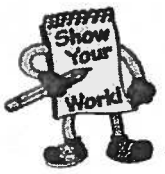
or $w = \frac{A}{l}$ or $l = \frac{A}{w}$

Problem Solving: Using the Strategies

Show all your work on looseleaf.

1. How many hours are in 1000 s?

2. a) What is the largest 2-digit number that is a perfect square?



Example: *49 is a perfect square because 7 × 7 = 49. 49 is also a 2-digit number.*

b) What is the largest 3-digit number that is a perfect square?

3. Find 3 consecutive numbers that have a sum of 33.

Examples of consecutive numbers:

7, 8 and 9 or 34, 35, 36 or $x, x + 1, x + 2$

4. Sue is 4 years older than Alex. The sum of their ages is 24. How old is Alex?

> **Hint:** *Let a = Alex's age.*
> *Then a + ☐ = Sue's age.*
> ***Now, write an equation and solve.***

5. Chicken pieces at a fast-food restaurant come in boxes of 6, 9, and 20. You can buy 21 pieces by buying 2 boxes of 6 pieces and 1 box of 9 pieces.

$6 + 6 + 9 = 21$

a) How can you buy 35 pieces?

b) How can you buy 32 pieces?

6. The sides of a **triangular** field are 20 m, 12 m, and 16 m. A fence is to be built around the field with a post in each corner and the posts are 4 m apart. How many fence posts are needed?

Draw a diagram.

DATA BANK

See pages 364 to 369 of your MATHPOWER™ student text.

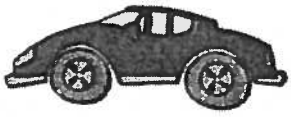
1. a) What is the driving distance from Halifax to Vancouver?

See page 366.

_____

b) If you average 80 km/h, how many hours would the trip take?

Divide



Sentence: _____

c) If you drive 9h/day, how many days will the trip take?

Sentence: _____

Chapter Check

1. *Classify each polynomial and state its degree.*

Types of polynomials: monomial, binomial, or trinomial.

	Type	Degree
a) $x^2 + 3x + 7$		
b) $3x^3 + x^2$		
c) $3x^3y^2$		
d) 200		

Add the powers.

2. *Arrange each of the following in descending powers of x.*

Descending Order
- largest power to smallest power of x

Examples:
a) $x^4 + 2x^3 + 3x^2 - 2x + 7$
b) $2x^5 - 6x^2 + 3$
c) $5x^2 + 7xy + 3y^2$

a) $1 + x^3 + x^5 + x^4 \rightarrow$ $x^5 + x^{\square} + x^{\square} + 1$

b) $5x^3 + 2x + x^4 \rightarrow$ _____

c) $x^3 - 3x^4 - 2x^2 \rightarrow$ _____

d) $3y^2 - 2xy + x^2 \rightarrow$ _____

Look only at the variable x.

3. *Add.*

a) $(5a^2 - x + 9) + (a^2 + x + 3)$

=

b) $(2b^2 - b + 7) + (3b - 4 - b^2)$

Remove brackets.

Collect like terms.

Add

4. *Subtract.*

a) $(6y^2 - 6x + 3) - (y^2 + 6x - 3)$

$= (6y^2 - 6x + 3) + (-y^2 - 6x + 3)$

$=$ _____

$=$ _____

$=$ _____

b) $(-3t^2 + 4t - 1) - (4 + 7t^2 + 4t)$

Write the additive inverse.

Remove brackets.

Collect like terms.

Add

5. *Add.*

a) $3x^2 + 2x - 7$
$\underline{5x^2 - 3x - 2}$

b) $2x^2 + 4x - 5$
$\underline{-3x^2 + 6x + 6}$

c) $10x^2 - 3x - 2$
$\underline{-2x^2 - x - 9}$

6. *Subtract.*

a) $7x^2 - 5x + 4$
$\underline{-3x^2 + 3x - 8}$ → Rewrite with additive inverse. → $7x^2 - 5x + 4$
$\underline{+3x^2 - 3x + 8}$
Add

b) $x^2 + 7x - 5$
$\underline{-2x^2 + 5x - 13}$

c) $5x^2 - 5x + 4$
$\underline{4x^2 - 3x + 5}$

7. *Multiply.*

a) $(-10x)(5y)$

$= -10 \times x \times 5 \times y$

$= -10 \times 5 \times x \times y$

$=$ _____ xy

b) $(2x)(3y)$

c) $(5x^2y)(-3xy^2)$

$= 5 \times x^2 \times y \times (-3) \times$ ____ $\times$ ____

$= (5 \times -3)(x^2 \times$ ____$)(y \times$ ____$)$

$=$ ____ $x^{2+1}y^{1+\square}$

$=$ ____ $x^{\square}y^{\square}$

8. *Divide.*

a) $\left(\dfrac{-6a^5b^3}{3ab^2}\right)$

$= \left(\dfrac{-6}{3}\right)\left(\dfrac{a^5}{a}\right)\left(\dfrac{b^3}{b^2}\right)$

Subtract exponents.

$=$ _____

b) $\left(\dfrac{-9j^5k^4}{-3j^2k^3}\right)$

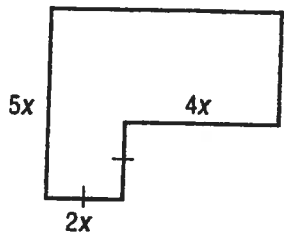
9. *Express each of the following with a postive exponent.*

a) x^{-5}

b) a^{-14}

c) y^{-1}

10. *Find the area of the figure.*



First: *Divide figure into shapes and find length of sides.*

Second: *Find area of each shape.*

Third: *Add area of each shape.*

Sentence: _____

11. *What expression is modelled by each group of algebra tiles?*

a) 

_____

b) 

_____

12. *Use algebra tiles to model each of the following.*

a) $3x^2 - 4x + 3$

b) $-x^2 + 2x - 4$