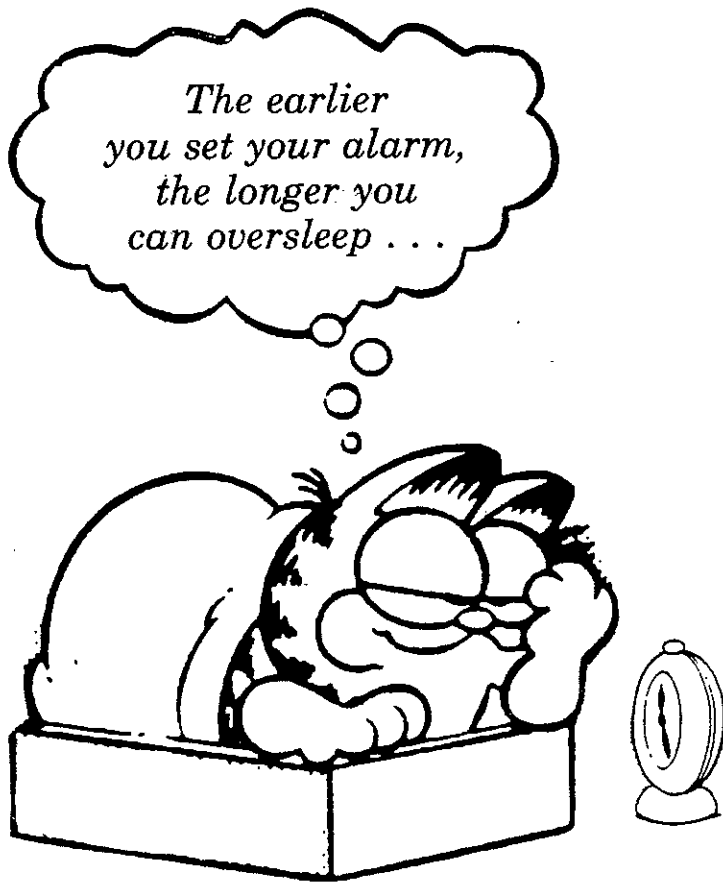


Friendship Jr. High School  
Accelerated Math Program

# *Algebra*



# 2

UNIT #4

Monomials

UNIT #5

Polynomials

UNIT #6

Factoring

# Monomials

## Lesson 4.1

### MULTIPLYING MONOMIALS & POWERS OF MONOMIALS

A monomial is a number, a variable, or a product of numbers and variables.

The following are examples of monomials:

$$-9 \quad y \quad 7a \quad 3x^3 \quad 4mn^2$$

The following are not examples of monomials:

$$m+n \quad \frac{x}{y} \quad 3a-4ab \quad \frac{1}{x^2}$$

When multiplying monomials with the same base, add the exponents:

$$a^x \cdot a^y = a^{x+y}$$

$$1 \bullet (x^3)(x^2)$$

$$(x^3)(x^2) = x^{3+2} = \boxed{x^5}$$

$$2 \bullet (3a^2)(4a)$$

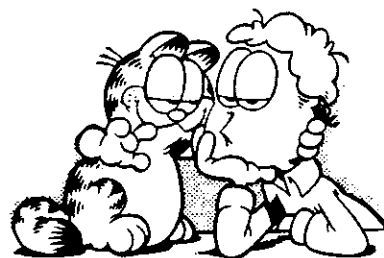
$$(3a^2)(4a) = 12a^{2+1} = \boxed{12a^3}$$

$$3 \bullet (a^3b^2)(a^2b^4)$$

$$a^{3+2} b^{2+4} = \boxed{a^5b^6}$$

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

$$-30x^{2+3+1}y^{2+4} = \boxed{-30x^6y^6}$$



When raising a power to a power, multiply the exponents:

$$(a^x)^y = a^{xy}$$

$$5 \bullet (3a^2b)^3$$

$$(3a^2b)^3 = 3^3 a^{2 \cdot 3} b^3 = \boxed{27a^6b^3}$$

$$6 \bullet (-x^2y^4)^3$$

$$(-x^2y^4)^3 = \boxed{-x^6y^{12}}$$

A negative raised to an odd power will be negative

$$7 \bullet (-a^3b)^4$$

$$(-a^3b)^4 = \boxed{a^{12}b^4}$$

A negative raised to an even power is positive

$$8 \bullet (9b^4y)^2(-b^2)^3$$

$$(81b^8y^2)(-b^6) = \boxed{-81b^{14}y^2}$$

$$9 \bullet \left(-\frac{1}{2}x^3y\right)^2\left(-\frac{1}{2}xy^3\right)^3$$

$$\left(\frac{1}{4}x^6y^2\right)\left(-\frac{1}{8}x^3y^9\right) = \boxed{-\frac{1}{32}x^9y^{11}}$$

$$10 \bullet (-3a^2)^3(-ab^3)^2\left(-\frac{2}{3}b\right)^2$$

$$(-27a^6)(a^2b^6)\left(\frac{4}{9}b^2\right)$$

$$\boxed{-12a^8b^8}$$

$$2 \bullet \left(-\frac{1}{2}a^3b\right)^2(-2ab^4)^3 - \left(-\frac{1}{3}a^4b^5\right)^2(18ab^4)$$

$$\left(\frac{1}{4}a^6b^2\right)(-8a^3b^{12}) - \left(\frac{1}{9}a^8b^{10}\right)(18ab^4)$$

$$(-2a^9b^{14}) - (2a^9b^{14}) = \boxed{-4a^9b^{14}}$$

$$3 \bullet \left[ \left(-\frac{2}{3}a^3bc\right)^2 \right]^2$$

$$\left[ \frac{4}{9}a^6b^2c^2 \right]^2 = \boxed{\frac{16}{81}a^{12}b^4c^4}$$

$$4 \bullet \left[ \left(\frac{1}{2}xy^3\right)^3(4x) \right]^3$$

$$\left[ \left(-\frac{1}{8}x^3y^9\right)(4x) \right]^3$$

$$\left[ -\frac{1}{2}x^4y^9 \right]^3$$

$$\boxed{-\frac{1}{8}x^{12}y^{27}}$$



## Lesson 4.2

### COMBINING MONOMIALS & SIMPLIFYING MONOMIALS

Simplify:

$$1 \bullet (-3x^2y)^2(-xy^3)^3 - (x^3y^4)^2(xy^3)$$

$$(9x^4y^2)(-x^3y^9) - (x^6y^8)(xy^3)$$

$$(-9x^7y^{11}) - (x^7y^{11}) = \boxed{-10x^7y^{11}}$$

## Lesson 4.3

### NEGATIVE EXPONENTS & DIVIDING MONOMIALS

When simplifying with negative exponents:

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

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

Simplify:

$$1 \bullet n^{-3} = \boxed{\frac{1}{n^3}}$$

$$2 \bullet x^0 y^{-2} = \boxed{\frac{1}{y^2}}$$

$$3 \bullet \frac{3}{5} a^2 b^{-3} = \boxed{\frac{3a^2}{5b^3}}$$

$$4 \bullet \frac{1}{2} n^0 m^{-2} = \boxed{\frac{1}{2m^2}}$$



Dividing monomials  
with the same base:

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

$$5 \bullet \frac{m^8}{m^3} = m^{8-3} = \boxed{m^5}$$

$$6 \bullet \frac{n^3}{n^{-2}} = n^{3-(-2)} = \boxed{n^5}$$

$$7 \bullet \frac{6an^3}{12a^2n} = \boxed{\frac{n^2}{2a}}$$



$$8 \bullet \frac{-8x^3y^2z}{x^2y^{-4}z^2} = \boxed{\frac{-8xy^6}{z}}$$

$$9 \bullet \frac{8a^{-3}b^2c^{-1}}{-12ab^{-5}c^2} = \boxed{\frac{-2b^7}{3a^4c^3}}$$

$$10 \bullet \frac{-15x^{-3}y^2z^{-1}}{-5x^{-5}y^{-1}z} = \boxed{\frac{3x^2y^3}{z^2}}$$

$$11 \bullet \frac{n^{x+y}}{n^{x-y}} = n^{(x+y)-(x-y)}$$

$$n^{x+y-x+y} = \boxed{n^{2y}}$$

$$12 \bullet \frac{x^{2a+1}}{x^{a+4}} = x^{(2a+1)-(a+4)}$$

$$x^{2a+1-a-4} = \boxed{x^{a-3}}$$

$$13 \bullet \frac{3ab^{2x+y}}{a^{-2}b^{x+3y}} = 3a^3b^{(2x+y)-(x+3y)}$$

$$3a^3b^{2x+y-x-3y} = \boxed{\frac{3a^3x^{-2y}}{3ab}}$$

## Lesson 4.4 SCIENTIFIC NOTATION

Scientific notation is used to express very large and very small numbers. The format used:

a number with one digit left of the decimal point      ten to a power

Example: The sun is 93,000,000 miles from the earth.  
 $93,000,000 = 9.3 \times 10^7$

Express in scientific notation:

1● 5684  
 $5684. = \boxed{5.684 \times 10^3}$

2● .0013  
 $.0013 = \boxed{1.3 \times 10^{-3}}$

3● 543.5  
 $543.5 = \boxed{5.435 \times 10^2}$

4●  $.16 \times 10^3$   
 $.16 \times 10^3 = \boxed{1.6 \times 10^2}$

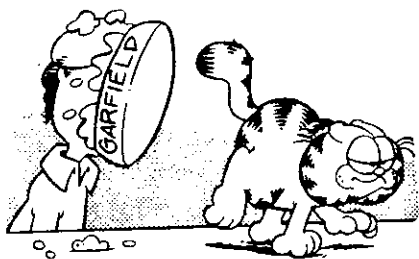
Use the following method to determine the exponent:

If you make the number larger, make the exponent smaller

$$.345 \times 10^{-2} = 3.45 \times 10^{-3}$$

If you make the number smaller, make the exponent larger

$$268 \times 10^4 = 2.68 \times 10^6$$



Express in decimal notation:

5●  $.246 \times 10^5$   
 $.24600 = \boxed{24,600}$

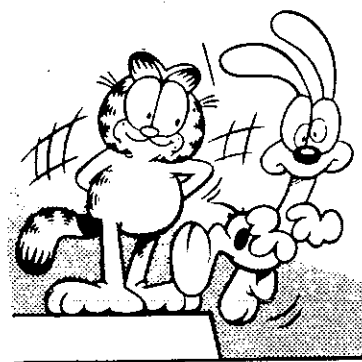
6●  $153.2 \times 10^{-4}$   
 $.01532 = \boxed{.01532}$

Evaluate in scientific notation:

7●  $(2 \times 10^3)(3.2 \times 10^4) = 6.4 \times 10^7$

8●  $(.03 \times 10^{-2})(.5 \times 10^6)$

$$.015 \times 10^4 = 1.5 \times 10^2$$



9●  $\frac{8.4 \times 10^7}{2.1 \times 10^2} = \boxed{4 \times 10^5}$

10●  $\frac{32 \times 10^3}{.08 \times 10^7} = 400 \times 10^{-4}$   
 $\boxed{4 \times 10^{-2}}$

# Lesson 4.5

## SOLVING AGE PROBLEMS

Define a variable (using a chart if helpful) and set up an equation to solve:

- 1● Maria is 8 years older than Jose. Carla is 2 years younger than Maria. The sum of Maria's age and Jose's age is 38. How old is Jose?

	<u>now</u>
Maria	$n+8$
Jose	$n$
Carla	



Note: Carla's age is not needed to solve

$$(n+8) + (n) = 38$$

$$2n + 8 = 38$$

$$2n = 30 \quad n = \boxed{15 \text{ yrs. old}}$$

- 2● Mark is  $\frac{1}{3}$  the age of his father. 6 years ago, his father was 5 times his age. How old is Mark now?

	<u>now</u>	<u>6 yrs ago</u>
mark	$n$	$n-6$
Father	$3n$	$3n-6$

$$3n-6 = 5(n-6)$$

$$3n-6 = 5n-30$$

$$24 = 2n \quad n = \boxed{12 \text{ yrs old}}$$

- 3● Bill is 25 and Walter is 16. How many years ago was Bill twice Walter's age?

	<u>now</u>	<u>x yrs ago</u>
Bill	25	$25-x$
Walter	16	$16-x$

$$25-x = 2(16-x)$$

$$25-x = 32-2x$$

$$x = \boxed{7 \text{ yrs. ago}}$$



- 4● Ralph is 6 years older than Alice. 6 years ago, Alice was  $\frac{3}{4}$  Ralph's age. How old will Ralph be in 4 years?

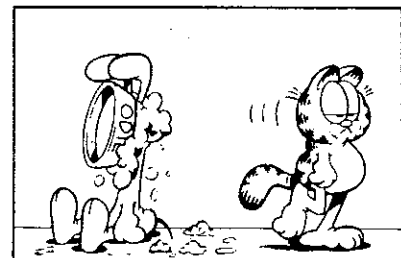
	<u>6 yrs ago</u>	<u>now</u>	<u>In 4 yrs</u>
Alice	$3n$	$3n+6$	
Ralph	$4n$	$4n+6$	$4n+10$

$$4n = 3n + 6$$

$$n = 6$$

Ralph in 4 years:

$$4n+10 = \boxed{34 \text{ yrs. old}}$$



# Lesson 4.6

## SOLVING MIXTURE PROBLEMS

- 1● Hal has 40 ml of a 25% copper sulfate solution. How many ml of a 60% solution should be added to raise the concentration of copper sulfate to 40%?

$n$  = ml of the 60% solution to be added

$$\left(\begin{array}{c} \text{Starting} \\ \text{Solution} \end{array}\right) \left(\begin{array}{c} \% \text{ Copper} \\ \text{Sulfate} \end{array}\right) + \left(\begin{array}{c} \text{Solution} \\ \text{Added} \end{array}\right) \left(\begin{array}{c} \% \text{ Copper} \\ \text{Sulfate} \end{array}\right) = \left(\begin{array}{c} \text{Final} \\ \text{Solution} \end{array}\right) \left(\begin{array}{c} \% \text{ Copper} \\ \text{Sulfate} \end{array}\right)$$

$$(40)(.25) + (n)(.6) = (40+n)(.4)$$

$$10 + .6n = 16 + .4n$$

$$.2n = 6$$

$$n = 30$$

30 ml must be added

- 2● How much water must be added to 50 ml of a 70% acid solution to produce a 50% acid solution?

$n$  = water to be added

$$\left(\begin{array}{c} \text{Starting} \\ \text{Solution} \end{array}\right) \left(\begin{array}{c} \% \text{ of} \\ \text{Acid} \end{array}\right) + \left(\begin{array}{c} \text{Water} \\ \text{Added} \end{array}\right) \left(\begin{array}{c} \% \text{ of} \\ \text{Acid} \end{array}\right) = \left(\begin{array}{c} \text{Final} \\ \text{Solution} \end{array}\right) \left(\begin{array}{c} \% \text{ of} \\ \text{Acid} \end{array}\right)$$

$$(50)(.7) + (n)(0) = (50+n)(.5)$$

$$35 + 0 = 25 + .5n$$

$$10 = .5n$$

$$n = 20$$

20 ml of water must be added



- 3● How much pure nickel must be added to 30 kg of a 40% nickel alloy to raise the concentration of nickel to 60%?

$n$  = pure nickel to be added

$$\begin{aligned} \left( \begin{array}{c} \text{Starting} \\ \text{Alloy} \end{array} \right) \left( \begin{array}{c} \% \text{ of} \\ \text{Nickel} \end{array} \right) + \left( \begin{array}{c} \text{Alloy} \\ \text{Added} \end{array} \right) \left( \begin{array}{c} \% \text{ of} \\ \text{Nickel} \end{array} \right) &= \left( \begin{array}{c} \text{Final} \\ \text{Alloy} \end{array} \right) \left( \begin{array}{c} \% \text{ of} \\ \text{Nickel} \end{array} \right) \\ (30) (.4) + (n) (1) &= (30+n) (.6) \end{aligned}$$

$$12 + n = 18 + .6n$$

$$.4n = 6$$

$$n = 15 \quad \boxed{15 \text{ kg of pure nickel}}$$

- 4● How much water should be evaporated from 90 l of a 20% salt solution to raise the concentration of salt to 30%?

$n$  = water to be evaporated

$$\begin{aligned} \left( \begin{array}{c} \text{Starting} \\ \text{Solution} \end{array} \right) \left( \begin{array}{c} \% \text{ of} \\ \text{Salt} \end{array} \right) - \left( \begin{array}{c} \text{Water to be} \\ \text{Evaporated} \end{array} \right) \left( \begin{array}{c} \% \text{ of} \\ \text{Salt} \end{array} \right) &= \left( \begin{array}{c} \text{Final} \\ \text{Solution} \end{array} \right) \left( \begin{array}{c} \% \text{ of} \\ \text{Salt} \end{array} \right) \\ (90) (.2) - (n) (0) &= (90-n) (.3) \end{aligned}$$

$$18 - 0 = 27 - .3n$$

$$-9 = -.3n$$

$$n = 30 \quad \boxed{30 \text{ l of water}}$$

- 5● Use a chart to build an equation when solving more complex age problems:

Mickey is  $\frac{3}{5}$  as old as Judy.  
Mickey's age 3 years ago is  $\frac{1}{3}$  Judy's age 7 years from now. How old will Mickey be next year?

	now	3 yrs ago	In 7 yrs
Mickey	$3n$	$3n-3$	
Judy	$5n$		$5n+7$



$$3(3n-3) = 5n+7$$

$$9n-9 = 5n+7$$

$$4n = 16$$

$$n = 4$$

$$\text{Mickey now: } 3n = 12$$

$$\text{Mickey next year: } \boxed{13 \text{ yrs old}}$$



# Lesson 4.7

## MORE MIXTURE PROBLEMS

Define a variable and use an equation to solve:

- 1● Sue sold 105 tickets for the game. Adult tickets cost \$2.50 and student tickets cost \$1.10. If she collected \$202.30, how many tickets of each kind did she sell?

$$\begin{aligned}\text{Adult tickets} &= n \\ \text{Student tickets} &= 105 - n\end{aligned}$$

$$(2.50)(n) + (1.10)(105 - n) = 202.30$$

$$2.5n + 115.5 - 1.1n = 202.30$$

$$1.4n = 86.8$$

$$n = 62$$

$$105 - n = 43$$

62 adult tickets  
43 student tickets



- 2● Chocolate cherries sell for \$3.25 a pound. Chocolate caramels sell for \$2.75 a pound. How many pounds of caramels should be combined with 3 pounds of cherries to produce a mixture that sells for \$3.05 a pound?

$$n = \text{pounds of caramels}$$

$$(3.25)(3) + (2.75)(n) = (3.05)(3+n)$$

$$9.75 + 2.75n = 9.15 + 3.05n$$

$$.6 = .3n$$

$$n = 2 \quad \boxed{2 \text{ pounds of caramels}}$$

- 3● Mike has 20 coins in nickels and dimes and a total of \$1.60. How many of each coin did he have?

$$\text{nickels} = n$$

$$\text{dimes} = 20 - n$$

$$(5)(n) + (10)(20 - n) = 160$$

$$5n + 200 - 10n = 160$$

$$-5n = -40$$

$$n = 8$$

$$20 - n = 12$$

8 nickels  
12 dimes

- 4● Ozzie has \$3.50 in coins. He has twice as many dimes as nickels and four fewer quarters than dimes. How many quarters does he have?

$$\text{nickels} = n$$

$$\text{dimes} = 2n$$

$$\text{quarters} = 2n - 4$$

$$(5)(n) + (10)(2n) + (25)(2n - 4) = 350$$

$$5n + 20n + 50n - 100 = 350$$

$$75n = 450$$

$$n = 6$$

$$2n = 12$$

$$2n - 4 = 8$$

8 quarters

- 5● Audrey has \$3.85 in nickels, dimes, and quarters. She has five more nickels than dimes and 25 coins in all. How many quarters?

$$\text{nickels} = n+5$$

$$\text{dimes} = n$$

$$\text{quarters} = 25 - (n+n+5) \\ 20 - 2n$$

$$5(n+5) + 10(n) + 25(20-2n) = 385$$

$$5n + 25 + 10n + 500 - 50n = 385$$

$$-35n = -140$$

$$n = 4$$

$$\text{quarters } (20-2n) = \boxed{12 \text{ quarters}}$$

## Lesson 4.8

### SOLVING PERCENT PROBLEMS DISCOUNT & SALES TAX

- 1● The number of club members increased from 9 to 12. Determine the percent increase.

$$\frac{\text{increase}}{\text{org. amt.}} = \frac{3}{9} = \frac{n}{100}$$

$$n = 33\frac{1}{3}$$

$$\boxed{33\frac{1}{3} \% \text{ increase}}$$



- 2● The price decreased from \$30 to \$24. Find the percent decrease.

$$\frac{\text{decrease}}{\text{org. amt.}} = \frac{6}{30} = \frac{n}{100} \quad n = 20$$

$$\boxed{20\% \text{ decrease}}$$

- 3● Use the decimal method to determine the price after sales tax is added:

How much will you pay for a \$14.95 sweater after 7% sales tax is added?

$$(14.95)(1.07) = 15.9965$$

$$15.9965 \approx \boxed{\$16.00}$$

- 4● Use the proportion method to determine the price before sales tax is added:

After a 5% sales tax is added on, Matt paid \$34.23 for an electric fan. What was the price before tax?

$$\frac{\text{after tax}}{\text{org. price}} = \frac{34.23}{n} = \frac{105}{100}$$

$$105n = 3423$$

$$n = 32.6$$

$$\boxed{\$32.60}$$

Note: The proportion method is easier for "after tax" problems.

- 5● Use the proportion method to solve rate of discount problems:

Lance bought shoes for \$20.91. If the shoes were on sale at 15% off, how much did he save?

$$\frac{\text{selling price}}{\text{org. price}} = \frac{20.91}{n} = \frac{85}{100}$$

$$85n = 2091$$

$$n = 24.6$$

Discount is original price minus selling price.

$$\text{Discount} = 24.60 - 20.91$$

**\$3.69**



# 4.1 Prob

## MULT. MONOMIALS & POWERS

Multiply and simplify:

- ①  $(3a^2b)(2ab^5)$
- ②  $(4x^2y^3)(2xy^6)$
- ③  $(3x^4)(-2x^4y^3)$
- ④  $(-8x^3y)(2x^4)$
- ⑤  $(3x^4y)(4x^2y^2)$
- ⑥  $(-2x^2y)(-6x^4y^7)$
- ⑦  $(-3x^5y)(2x^4)$
- ⑧  $(-2n^4y^3)(3ny^4)$
- ⑨  $(3x^2y^2z)(2x^2y^2z^2)$
- ⑩  $(r^2xy)(-2r^3x)$
- ⑪  $(5a^2b^2c)(-7a^3)$
- ⑫  $(2am^3n)(-3am^4)$

Simplify:

- ⑬  $(5^3)^3$
- ⑭  $(10^2)^2$
- ⑮  $[(-5)^2]^3$
- ⑯  $[(-4)^2]^2$
- ⑰  $(x^4)^3$
- ⑱  $(m^2)^5$
- ⑲  $(-y^3)^6$
- ⑳  $(-m^5)^2$

- ②①  $(4xy)^2(-3x)$     ②⑦  $(-2a^2b^3)^4$   
 ②②  $(2a)^2(3y)$     ②⑧  $(-6a^3x^5)^2$   
 ②③  $(2a)^3(-3b)$     ②⑨  $(4ab)^2(a^3b)^4$   
 ②④  $(-3ab)^3(2b^2)$     ③⑩  $(-3x^2y)^2(2x)^3$   
 ②⑤  $(4x^2y^3)^3$     ③①  $(\frac{2}{3}x^2y)^2(\frac{1}{2}y^3)^2$   
 ②⑥  $(3ab^4)^3$     ③②  $(\frac{1}{2}a^2b^3)^3(-2ab)^2$

- ⑬  $(x+y^5)^2$   
 ⑭  $(a^2b^4)^3$   
 ⑮  $(-xy)^5$   
 ⑯  $(-xy)^4$   
 ⑰  $6(ab^2)^3(5a)^2$   
 ⑱  $3(m^3n^2)^4(-n^2)^5$   
 ⑲  $(-2x^2)^3(\frac{1}{2}y^2)^2$   
 ⑳  $(-\frac{3}{10}y^2)^2(10y^2)^3$   
 ㉑  $(-3x^2y)^3(x^3) - 3(x^2y)^2(x^5y)$   
 ㉒  $(-2a^2b)^2(ab)^3 - 2(a^2b)^3(ab^2)$   
 ㉓  $(3ab)^2(2a^2b) + 5a^3(ab^3)$   
 ㉔  $(-2x^2)^3(x^2y)^2 - (-2x^5y)^2$   
 ㉕  $\left[(-\frac{1}{2}x^2y)^2\right]^3$     ㉖  $\left[(-\frac{1}{2}a^3b)^3\right]^3$



## 4.2 Prob

### COMBINING & SIMPLIFYING



Multiply and simplify:

- ①  $(r^2s)(r^4s^3)$   
 ②  $(a^2b)(ab^4)$   
 ③  $(ab)(ac)(bc)$   
 ④  $(m^2n)(am)(an^2)$   
 ⑤  $(-27ay^3)(-\frac{1}{3}ay^3)$   
 ⑥  $(\frac{1}{2}a^2)(6ab^2)$   
 ⑦  $(-\frac{5}{6}c)(12a^3)$   
 ⑧  $(-\frac{1}{8}a)(-\frac{1}{6}b)(48c)$   
 ⑨  $(2a^4)(2a^3b^2)(-3ab^3)$   
 ⑩  $(4m^3n^2)(-m^4n^5)(2mn)$

Simplify:

- ⑪  $[(-2)^3]^2$     ⑫  $[(-1)^5]^3$

## 4.3 Prob

### NEG. EXPONENTS & DIVIDING

Simplify:

- ①  $m^{-8}$     ④  $n^{-5}m^0$   
 ②  $x^{-3}$     ⑤  $\frac{1}{2}x^3y^{-6}$   
 ③  $r^0s^4$     ⑥  $\frac{2}{3}a^{-7}b^{-4}$

$$\textcircled{7} c^0 d^{-2} e^{-1}$$

$$\textcircled{8} x^5 y^0 z^{-5}$$

$$\textcircled{9} \frac{1}{x^{-4}}$$

$$\textcircled{10} \frac{3}{r^{-3}}$$

$$\textcircled{11} \frac{a^{-4}}{b^{-3}}$$

$$\textcircled{12} \frac{r^{-5}}{k^{-1}}$$

$$\textcircled{13} \frac{n^8}{n^5}$$

$$\textcircled{14} \frac{w^9}{w^2}$$

$$\textcircled{15} \frac{n^{-2}}{n^4}$$

$$\textcircled{16} \frac{x^{-3}}{x^6}$$

$$\textcircled{17} \frac{an^6}{n^5}$$

$$\textcircled{18} \frac{xy^7}{y^4}$$

$$\textcircled{19} \frac{-a^4 b^8}{a^4 b^7}$$

$$\textcircled{20} \frac{-x^3 y^3}{x^3 y^6}$$

$$\textcircled{21} \frac{a^2 b^2}{a^4 b^5}$$

$$\textcircled{22} \frac{n^3 m^5}{n^7 m}$$

$$\textcircled{23} \frac{30x^4 y^7}{-6x^{13} y^2}$$

$$\textcircled{24} \frac{24a^3 b^6}{-2a^2 b^2}$$

$$\textcircled{25} \frac{16a^0 b^4 c}{-4bc^3}$$

$$\textcircled{26} \frac{-8a^3 b^7}{a^2 b^6}$$

$$\textcircled{27} \frac{24x^2 y^{-3} z}{-8x^3 y z^{-2}}$$

$$\textcircled{28} \frac{14a^2 b^{-1} c^{-2}}{21a^{-1} b c^2}$$

$$\textcircled{29} \frac{27a^4 b^{-3} c^9}{-15a^{-3} b^{-5} c}$$

$$\textcircled{30} \frac{-b^{-1} c d^2}{4a^{-1} b c^2 d^{-2}}$$

$$\textcircled{31} \frac{x^{2a}}{x^{a+1}}$$

$$\textcircled{32} \frac{3n^{x+y}}{3n^{x-y}}$$

$$\textcircled{33} \frac{2ab^{3n+2}}{a^{-1} b^{n-1}}$$

$$\textcircled{34} \frac{5x^2 y^{2n+3}}{x^{-2} y^{n-2}}$$

$$\textcircled{35} \frac{3a^3 b^{2+n}}{a^2 b^{n+1}}$$

## Review

$$\textcircled{36} (3a^2 b)(-4a^3 bc)$$

$$\textcircled{37} (2x^2 y)^2 (-2xy^3)^3$$

$$\textcircled{38} a\left(\frac{1}{4}a\right)(-2a)^2(-2a^2)^3$$

$$\textcircled{39} (3x^2 y)^2 (-2xy^2) + (3xy)^3 (x^2 y)$$

$$\textcircled{40} (-2a^2 b)^3 - (-3a^3 b)^2 + (-2a^2)^3 (-3b^2)$$

$$\textcircled{41} (-3y^2)^3 (y^{-3})$$

$$\textcircled{42} (-2x^2)^4 (x^{-5})$$

## 4.4 Prob SCIENTIFIC NOTATION



Express in scientific notation:

$$\textcircled{1} 4293$$

$$\textcircled{2} 240,000$$

$$\textcircled{3} 389,500$$

$$\textcircled{4} 5280$$

$$\textcircled{5} .000319$$

$$\textcircled{6} .004296$$

$$\textcircled{7} .0092$$

$$\textcircled{8} .00031$$

$$\textcircled{9} 32 \times 10^5$$

$$\textcircled{10} .284 \times 10^3$$

$$\textcircled{11} 450 \times 10^{-4}$$

$$\textcircled{12} .3 \times 10^{-2}$$

Express in decimal notation:

$$\textcircled{13} 1.085 \times 10^4$$

$$\textcircled{14} 2.77 \times 10^3$$

$$\textcircled{15} 1.4 \times 10^{-5}$$

$$\textcircled{16} 3.45 \times 10^{-2}$$

Evaluate in scientific notation:

$$(17) (2 \times 10^5)(30 \times 10^{-8})$$

$$(18) (4 \times 10^2)(15 \times 10^6)$$

$$(19) (3.1 \times 10^{-2})(.21 \times 10^5)$$

$$(20) (.2 \times 10^{-3})(.34 \times 10^{-2})$$

$$(21) \frac{4.8 \times 10^3}{1.6 \times 10^1}$$

$$(22) \frac{5.2 \times 10^5}{1.3 \times 10^2}$$

$$(23) \frac{1.32 \times 10^{-6}}{2.4 \times 10^2}$$

$$(24) \frac{2.31 \times 10^{-2}}{3.3 \times 10^{-9}}$$

$$(25) \frac{4.25 \times 10^4}{.05 \times 10^7}$$

$$(26) \frac{28 \times 10^{-3}}{.14 \times 10^5}$$

### Review

$$(27) (-2x^3y)(-3xyz)$$

$$(28) \left(-\frac{1}{2}a^2y^3\right)^2(2ay^4)^3$$

$$(29) (a^2b)^3(bc) + (-2ab^2)(ac)(-a)^3$$

$$(30) \frac{12a^2b^{-4}c}{-3a^{-4}b^{-6}c^2}$$

$$(31) \frac{-6a^{-4}bc^5}{8b^{-2}c^3}$$

$$(32) -3a^2b^{-3}c^{-2}$$

$$(33) \frac{n^{3a+2}}{n^{a-3}}$$

$$(34) \frac{a^{2k+3}}{a^{2k-2}}$$

HAVE YOU KICKED YOUR DOG TODAY?



$$(35) \frac{3mn^{x-y}}{m^{-2}n^{x+y}}$$

$$(36) (-2x^{-2})^3(x^{-3})$$

# 4.5 Prob

## SOLVING AGE PROBLEMS

Use an equation (and chart if needed) to solve:

- ① Abe is 3 years older than Mindy. The sum of their ages is 39. What are their ages now?
- ② Charlie is 14 years younger than Jack. The sum of their ages is 74. How old are they now?
- ③ Twelve years ago, Thea was 7 years old. In 8 years, Thea will be 3 times as old as Nancy. Nancy is 2 years younger than Cindy. How old is Nancy now?
- ④ The sum of David's age and Ben's age is 40. Ann is 3 years older than David. David is 4 years older than Ben. How old is David?
- ⑤ Barney is 54 years old and Hugh is 38. How many years ago was Barney 3 times as old as Hugh?
- ⑥ Hector is now 28 and Henry is 8. In how many years will Hector be twice Henry's age?
- ⑦ Eight years ago, the sum of Pete's age and Matt's

age was 26. Matt is 4 years older than Pete. How old is Pete now?

- ⑧ Dana is 3 years younger than Natalie. In 7 years, the sum of their ages will be 63. How old are they now?
- ⑨ Shannon is 8 years younger than Susie. In 6 years, Shannon will be  $\frac{4}{5}$  as old as Susie. How old is Susie now?
- ⑩ Jennifer is 12 years younger than Jim. 6 years ago, Jennifer was  $\frac{1}{3}$  as old as Jim. How old will Jim be in 2 years?

### Review

Simplify:

⑪  $(-4x^3y)^3(-\frac{1}{2}xy^2z^3)^4$

⑫  $\frac{-6a^2b^{-3}c^{-1}}{-2ab^2c^{-2}}$

⑬  $\frac{-2x^{-3}yz^{-2}}{4xy^{-3}z^{-5}}$

⑭  $\frac{3x^na^{2a-1}}{x^{-2n}a^{a+2}}$



Evaluate in sci. notation:

⑮  $(20 \times 10^3)(3.5 \times 10^{-5})$       ⑯  $\frac{3.4 \times 10^{-3}}{.017 \times 10^{-2}}$

# 4.6 Prob

## MIXTURE PROBLEMS

Establish a key and use an equation to solve:

- ① Matt has 500 ml of a 60% silver nitrate solution. How many ml of a 30% solution should be added to obtain a 50% solution?
- ② How many liters of an 80% salt solution should be added to 90 l of a 40% salt solution to obtain a 50% solution?
- ③ A chemist has 2.5 l of a 70% acid solution. How much water should be added to obtain a 50% acid solution?
- ④ How much pure copper must be added to 50 kg of a 12% copper alloy to raise the copper content to 20%?
- ⑤ If 300 ml of a lemonade mix is 10% lemon juice, how many ml of 90% lemon juice should be added to raise the concentration of lemon to 40% in the lemonade mix?
- ⑥ 90 kg of a silver alloy contains 60% silver. How much of a 25% alloy should be added to reduce the

silver content to 40%?

- ⑦ 75 l of solution contains 40% salt. How much water should be evaporated to raise the concentration of salt to 50%?
- ⑧ Molly has 48 ml of a 25% acid solution. How much water should be added to obtain a 15% solution?

### Review

Simplify:

⑨  $(-\frac{2}{3} a^2 b^3)^2 (-\frac{3}{2} a b^3)^3$

⑩  $(-ab)^3 - (2a^2 b)(ab^2)$

⑪  $\frac{-2x^{-2}y z^{-3}}{x^3 y^{-2} z^{-5}}$

⑫  $\frac{-6a^{x+3}}{2a^{x+5}}$



Evaluate in scientific notation:

⑬  $\frac{43 \times 10^3}{.05 \times 10^{-5}}$

⑭  $(35 \times 10^7)(25 \times 10^{-4})$

Solve:

- ⑮ Syd is  $\frac{5}{6}$  of Mandy's age. Syd's age 4 years ago is  $\frac{1}{3}$  of Mandy's age 6

years from now. How old will Syd be next year?

- ⑯ Jan is  $\frac{2}{3}$  of Karyn's age. Jan's age 8 years ago is  $\frac{2}{5}$  of Karyn's age 4 years from now. Jan is how many years younger than Karyn?

## 4.7 Prob

### MORE MIXTURE PROBLEMS

Use an equation to solve:

- ① How much coffee costing \$3 a pound should be mixed with 5 pounds of coffee costing \$3.50 a pound to obtain a mixture that costs \$3.25 a pound?
- ② Theatre tickets cost \$2.50 for children and \$3.50 for adults. The price for 8 tickets was \$23. How many adult tickets were purchased?
- ③ Adrienne has 5 more dimes than nickels. In all, she has \$2.30. How many nickels does she have?
- ④ Lois has 27 coins in nickels



and dimes. In all, she has \$1.90. How many of each?

- ⑤ Drew has twice as many quarters as nickels and three more dimes than nickels. He has \$4.20 in all. How many of each does he have?
- ⑥ Jackie has 42 coins in nickels, dimes, and quarters. If he has 8 more nickels than dimes and \$7.15 in all, how many of each does he have?

### Review

- ⑦ How many kg of a 70% nickel alloy should be added to 60 kg of a 20% nickel alloy to obtain a 50% alloy?
- ⑧ How much pure alcohol should be added to 30 l of a 20% alcohol solution to produce a 60% solution?

Simplify:

⑨  $(-2a^{-3}bc)^2(abc)$

⑩  $\frac{-4ab^2c^{-3}}{-ab^{-2}c^{-1}}$

⑪  $\frac{9n^{6-2x}}{-n^{8-2x}}$



Express in scientific notation:

- ⑫ .0000532      ⑬ 43,600,000

Evaluate in scientific notation:

⑭  $(32 \times 10^4)(12 \times 10^{-8})$

⑮  $\frac{6.4 \times 10^{-3}}{.08 \times 10^{-7}}$

Establish a chart and make an equation to solve:

- ⑯ Jim is  $\frac{2}{5}$  as old as Tammy. 4 years ago, Jim was  $\frac{1}{7}$  as old as Tammy will be 8 years from now. How old was Tammy 2 years ago?

## 4.8 Prob

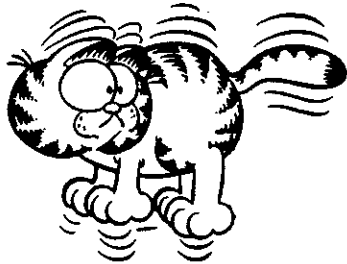
### PERCENT PROBLEMS, DISCOUNT & SALES TAX

Use an equation to solve:

- ① The number of club members increased from 10 to 12. Find the percent increase.
- ② A watch sells for \$15 after it was marked down from the original price of \$20. Find the percent decrease.

③ The price decreased from \$50 to \$40. Determine the percent decrease.

④ Sam has 16 coins. He started with 8. Find the percent increase.



⑤ How much will you pay for a \$12 shirt after 6% sales tax is added?

⑥ How much will you pay for a \$3.35 book after 7% sales tax is added?

⑦ Sharon paid \$92.04 for new school clothes. This included 4% sales tax. What was the cost before the tax was added?

⑧ Millie paid \$45.10 including  $7\frac{1}{2}\%$  tax for a pair of jeans. What was the price before tax?

⑨ Jason paid \$13.96 for a gift that was on sale for 20% off. What was the amount of discount?

⑩ If a camera sells for \$18.36 after a 15% discount, what was the amount of discount?



## Review

Use an equation to solve:

⑪ Mike is 18 and Elaine is 14. How many years ago was Elaine  $\frac{2}{3}$  as old as Mike?

⑫ How much of a 60% salt solution should be added to 16l of a 25% solution to produce a 40% solution?

⑬ How many pounds of cashews at \$1.60 a pound should be combined with 4 pounds of pecans at \$1.80 a pound to produce a mixture that sells for \$1.68 a pound?

⑭ Deanna has 35 coins in all. She has 3 more nickels than dimes. How many quarters does she have if her coins total \$2.90?



Simplify:

⑮  $[(-a^2b^{-2}c)^2]^3$

⑯  $(-3x^2y)^{-2}(3x^2y)^3$

⑰  $(2a^2b^3)^2(ab) - (-2ab)^3(ab^2)^2$

⑱  $\frac{-6a^{-3}bc^{-2}}{-4ab^{-2}c^{-6}}$

# Unit 4 REVIEW PROBLEMS

Simplify:

①  $(a^3)(a^2b)$       ④  $(4a^2b)^3$   
 ②  $(3ab)(-4a^2b^3)$       ⑤  $(-\frac{1}{3}b^2)^4$   
 ③  $(-4a^2x)(-5a^3x^4)$       ⑥  $(-3x^{-2}y^2)^3(xy^{-2})$

⑦  $(-2a^2b)^3(a^{-2}b) - 3(-a^2b^2)^2$   
 ⑧  $(-3xy^2)^3(2xy) + (\frac{1}{2}x^2y)^2(12y^5)$

⑨  $\frac{3a^3bc^2}{18a^2b^3c^4}$       ⑪  $\frac{35b^{-2}}{14b^{-3}}$   
 ⑩  $\frac{(3y)^0}{2a^{-2}}$       ⑫  $\frac{-4ab^{-2}c^3}{2a^3b^{-5}c}$

⑬  $(\frac{1}{2}a^{-2}b)^3(4ab^3)^2$   
 ⑭  $(2x^3y^{-1})^4(-\frac{1}{2}x^{-3}y)^5$

⑮  $\frac{3x^{4n-1}}{x^{n+3}}$       ⑯  $\frac{-10n^{a+3}}{5n^{4-2a}}$

Express in scientific notation:

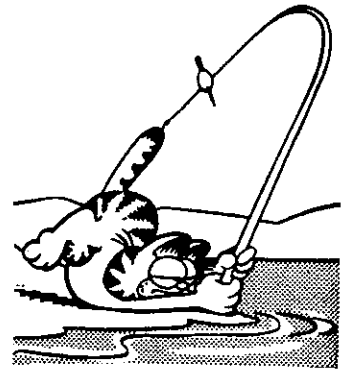
⑰ 240,000      ⑱ ,000314

Evaluate in scientific notation:

⑲  $(22 \times 10^3)(3.4 \times 10^{-5})$       ⑳  $(4.1 \times 10^2)(35 \times 10^{-6})$

⑳  $\frac{5.4 \times 10^{-2}}{.09 \times 10^{-6}}$

㉑  $\frac{.35 \times 10^3}{700 \times 10^7}$



Solve:

㉒ Janice is 4 years older than Jimmy. 4 years ago, Jimmy was  $\frac{3}{4}$  as old as Janice. How old will Janice be in 2 years?

㉓ Jack is twice as old as Jill. Next year, Jill will be  $\frac{2}{3}$  as old as Jack was 3 years ago. How many years older is Jack?

㉔ Sarah paid \$46.41 for new gym shoes. This included 5% sales tax. What was the price before tax?

㉕ Marcie paid \$34.24 for a table lamp. If the price included 7% tax, how much tax was added?

㉖ How many ml of an 80% acid solution should be added to 36 ml of a 40% solution to obtain a 50% solution?

㉗ How much copper should be added to 80 kg of a 50% silver alloy to reduce the concentration of silver to 20%?

②⑨ Student tickets sell for \$2.10 and adult tickets sell for \$3.75. If 16 tickets are purchased for \$38.55, how many are student tickets?

③⑩ How many pounds of peanuts at 80¢ per pound should be mixed with 5 pounds of walnuts at \$1.40 per pound to produce a mixture that sells for \$1.05 per pound?

③⑪ Stan has 2 more dimes than nickels and a total of 18 coins. He has \$2.80 in all. How many quarters?

③⑫ Grace has 2 more dimes than nickels and exactly as many quarters as she has nickels and dimes combined. If she has \$3.95, how many dimes does she have?

## Unit 4

# SKILL CHECK

Simplify:

①  $(-3a^2b)^2(-2ab^2)^3$

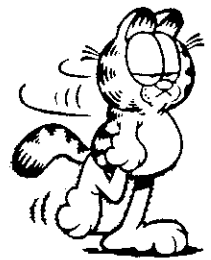
②  $(-2a^3b)^2 - (-4a^2b^2)(a^4)$

③  $\frac{-2x^{-2}yz^4}{6x^{-5}y^2z^{-2}}$

Express in scientific notation:

④ 48,296.3

⑤ .00046



Evaluate in scientific notation:

⑥  $(4 \times 10^{-3})(21 \times 10^8)$

⑦  $\frac{19.55 \times 10^{-7}}{.23 \times 10^{-4}}$

Solve:

⑧ Jason is 4 years older than Don. 6 years from now, Jason will be 3 times the age that Don was 2 years ago. How old is Jason now?

⑨ \$13.44 is the cost after 6% tax is added. How much before tax?

⑩ How much pure copper must be added to 12 kg of a 20% copper alloy to make a 50% copper alloy?

⑪ Notebooks cost \$.79 and pens cost \$.63. If 18 items are purchased for \$11.98, how many were pens?

⑫ There are 20 coins that total \$2.40. There is one more dime than

nickel. How many quarters?

Simplify:

$$\textcircled{13} \left(\frac{1}{3} x^3 y^{-2}\right)^2 (-6 x^{-2} y)^2$$

$$\textcircled{14} \frac{6 x^{2n-3}}{-3 x^{n+1}}$$

## Unit 4 REMEDICATION

Simplify:

$$\textcircled{1} (-2a^3b^2)^3 (-ab^2)^2$$

$$\textcircled{2} (-3xy^2)^2 - (6y)^2 \left(\frac{1}{2}xy\right)^2$$

$$\textcircled{3} \frac{-4a^{-3}b^{-2}c}{-12a^{-7}b^3c^{-4}}$$

Express in scientific notation:

$$\textcircled{4} 580,000$$

$$\textcircled{5} .00103$$

Evaluate in scientific notation:

$$\textcircled{6} (2.5 \times 10^6)(.32 \times 10^{-9})$$

$$\textcircled{7} \frac{54.4 \times 10^{-2}}{1.6 \times 10^{-6}}$$

Solve:

$\textcircled{8}$  Judy is twice Alice's age. Three years from now, Judy will be three times Alice's age three years ago. How old is Alice now?

$\textcircled{9}$  \$36.12 is the cost after 5% tax is added. What was the cost before tax?

$\textcircled{10}$  How much water must be added to 24 ml of a 60% salt solution to lower the concentration to 20%?

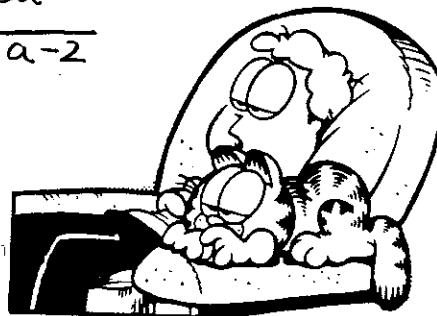
$\textcircled{11}$  16 paperback books are purchased for \$27. If the books sell for \$1.50 and \$2.25, how many of each are purchased?

$\textcircled{12}$  36 coins total \$4.00. There are 4 more dimes than quarters. How many nickels?

Simplify:

$$\textcircled{13} \left(-\frac{2}{5} a^3 b^{-3}\right)^2 (-5ab)^3$$

$$\textcircled{14} \frac{-8n^{3a+3}}{-4n^{a-2}}$$



# Unit 4

## EXTRA PRACTICE

Simplify:

①  $(3n^2)(5n^4)$

②  $(xy^2z^3)(x^4yz^2)$

③  $(3a)(-2a^2bc^2)(-ab^3)$

④  $(6x^2yz^3)(-2xy^3z)$

⑤  $(-6ab)(-ab^2c^3)(-\frac{1}{2}ac^2)$

⑥  $(x^3y^2)^3$

⑦  $(-3ab^2c)^2(-4ab)(-2ab^3c^2)$

⑧  $\frac{-10x^{-2}y^{-1}}{-15xy^{-3}}$

⑨  $\frac{8n^{x-3y}}{-4n^{3x+2y}}$

Solve

- ⑩ The number of players on the team decreased from 32 to 28. Find the percent decrease.

Express in scientific notation:

⑪ 93,200,000

Evaluate in scientific notation:

⑫  $(2 \times 10^{-6})(14 \times 10^{-3})$

⑬  $\frac{34.1 \times 10^{-6}}{3.1 \times 10^{-2}}$

Solve:

- ⑭ There are 22 coins worth \$3.30. If there are 4 more nickels than dimes, how many quarters?

- ⑮ Jay is 12 years older than Devin. 3 years from now, Devin will be half as old as Jay was last year. How old will Devin be next year?

- ⑯ Nicole paid \$15.37 after a 6% was added on. What was the original price?

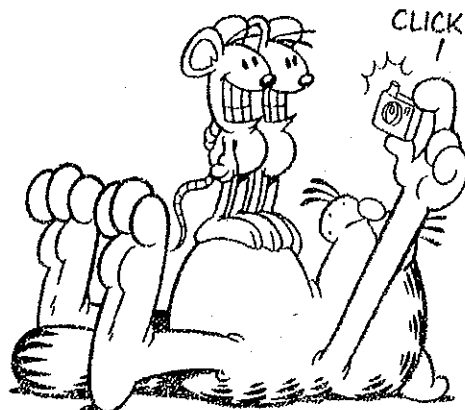
- ⑰ How many kg of a 25% salt solution should be added to 10 kg of a 60% solution to lower the concentration to 30%?

- ⑱ Mrs. Burgess purchased 20 books for her classroom. If \$108 was spent on hard cover books @ \$9.25 each and paperbacks @ \$3.75 each, how many paperbacks were purchased?

- ⑲ Andre is 3 years older than Tim. 6 years ago, Tim was only  $\frac{3}{4}$  as old as Andre. How old will Tim be in 2 years?

Simplify:

⑳  $(-\frac{1}{4}x^2y^3)^2(-8xy^3)$



# Polynomials

## Lesson 5.1

### DEFINING & ORDERING POLYNOMIAL EXPRESSIONS

A term is a number, variable, product or quotient of values.

An expression is a series of terms that are separated by + or - signs.

Identify as a term or expression:

- 1● a)  $-6abc$
- b)  $2x+3xy+y^2$
- c)  $\frac{1}{2}m + \frac{n}{x}$
- d)  $a+3$

A polynomial is a monomial or sum of monomials:

monomial      one term

binomial      two terms

trinomial      three terms

Identify which expressions are polynomials:

- 2● a)  $-3x^2 + \frac{1}{3}y^2$
- b)  $n - \frac{1}{3}m + \frac{m}{n}$
- c)  $\frac{-2ax^2y}{3}$

The degree of a monomial is the sum of the exponents of its variables.

The degree of a polynomial is the greatest of the degrees of its terms.

The degree of a constant is 0. The degree of the value 0 is undefined.

Determine the degree:

- 3● a)  $8x^2$
- b)  $ab^2c$
- c)  $2^3x$
- d)  $3x^2+2xy^3$
- e)  $5a^3-2ab+3$
- f)  $-5$
- g)  $0$



Arrange in ascending order of  $x$ :

4●  $-3x^2y + 5 - 2x + 4x^4y$

$5 - 2x - 3x^2y + 4x^4y$

Arrange in descending order of  $x$ :

5●  $\frac{2}{3}xy - y^3 + 4x^4 - 2x^2y^3$

$4x^4 - 2x^2y^3 + \frac{2}{3}xy - y^3$

Add or subtract:

6●  $(4n^2 - 3mn + 2m^2) + (8n^2 + mn - 5m^2)$

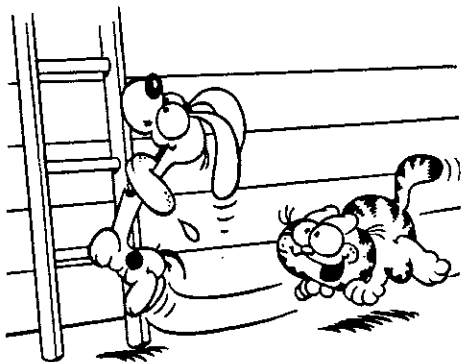
$12n^2 - 2mn - 3m^2$

7●  $(\frac{1}{3}a^2 - ab + \frac{3}{10}b^2) - (\frac{7}{3}a^2 - ab + \frac{4}{5}b^2)$

$\frac{1}{3}a^2 - ab + \frac{3}{10}b^2 - \frac{7}{3}a^2 + ab - \frac{4}{5}b^2$

$-\frac{6}{3}a^2 - \frac{5}{10}b^2 = -2a^2 - \frac{1}{2}b^2$

Be sure to distribute the "-" sign. Be sure to simplify all fractions.



## Lesson 5.2

### ADDING, SUBTRACTING, & MULTIPLYING POLYNOMIALS

Find the sum in column form:

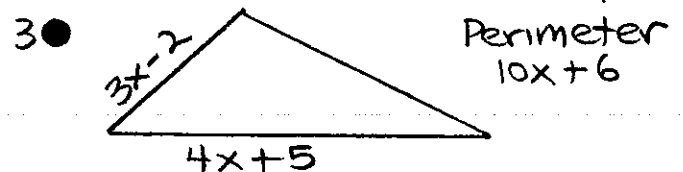
$$\begin{array}{r} 5a + 7b - 2c + d \\ 3a \quad \quad + 4c - 3d \\ \hline 6a - 2b - 2c + d \\ \hline 8a + 5b \quad - d \end{array}$$

Find the difference in columns:

$$\begin{array}{r} 3x^2 + y \quad - xy \\ 5x^2 - 2y + 3z - 4xy \\ \hline 3x^2 + y \quad - xy \\ -5x^2 + 2y - 3z + 4xy \\ \hline -2x^2 + 3y - 3z + 3xy \end{array}$$

change signs  
& add  
←

Find the missing side:



Add the two sides and subtract from the perimeter.

$(3x - 2) + (4x + 5) = 7x + 3$

$(10x + 6) - (7x + 3) = 3x + 3$

missing side:  $3x + 3$



Two angles are complements if the sum of their measures is 90.

Two angles are supplements if the sum of their measures is 180.

Find the complement of each angle:

4● a) 35       $90 - 35$        $\boxed{55}$

b)  $3n$        $90 - 3n$        $\boxed{90 - 3n}$

c)  $4x - 10$        $90 - (4x - 10)$        $\boxed{100 - 4x}$

Find the supplement of each angle:

5● a) 28       $180 - 28$        $\boxed{152}$

b)  $5x$        $180 - 5x$        $\boxed{180 - 5x}$

c)  $n + 13$        $180 - (n + 13)$        $\boxed{167 - n}$

Find the product:

6●  $2x(3xy - x^2 + 2x^2y)$

$\boxed{6x^2y - 2x^3 + 4x^3y}$

7●  $-3a^2b(\frac{1}{3}ab + 2a^3 - \frac{5}{6}ab^2)$

$\boxed{-a^3b^2 - 6a^5b + \frac{5}{2}a^3b^3}$

8●  $-\frac{1}{2}xy(6x^3y - \frac{1}{2}x^2 + \frac{2}{3}xy^3)$

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

## Lesson 5.3

### USING "FOIL" TO MULTIPLY BINOMIALS

Use FOIL to multiply binomials:

First Outer Inner Last

$$\begin{aligned} (x+5)(x+7) \\ x^2 + 7x + 5x + 35 \\ x^2 + 12x + 35 \end{aligned}$$

1●  $(3x-5)(5x+2)$

$15x^2 + 6x - 25x - 10$

$\boxed{15x^2 - 19x - 10}$



2●  $(2a+b)(3a-4b)$

$6a^2 - 8ab + 3ab - 4b^2$

$\boxed{6a^2 - 5ab - 4b^2}$

3●  $(8n + \frac{1}{4})(4n - \frac{1}{2})$

$32n^2 - 4n + n - \frac{1}{8} = \boxed{32n^2 - 3n - \frac{1}{8}}$

Use column form when finding the product of a binomial and a trinomial:

4●  $(2x+5)(3x^2-5x+4)$

$6x^3 - 10x^2 + 8x$

$\quad + 15x^2 - 25x + 20$

$\hline 6x^3 + 5x^2 - 17x + 20$

5●  $(2n+3)(n^2+3n+8)$

$$\begin{array}{r} 2n^3 + 6n^2 + 16n \\ + 3n^2 + 9n + 24 \\ \hline 2n^3 + 9n^2 + 25n + 24 \end{array}$$

8●  $(a^{4n}+b^n)(a^{4n}-b^n)$

$$\boxed{a^{8n} - b^{2n}}$$

9●  $(2x^a-3y^{3a})(2x^a+3y^{3a})$

$$\boxed{4x^{2a} - 9y^{6a}}$$

## Lesson 5.4

### SPECIAL PRODUCTS

Binomial squared:

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a-b)^2 = a^2 - 2ab + b^2$$

Product of a sum and difference:

$$(a+b)(a-b) = a^2 - b^2$$

Find each product:

1●  $(x+3)^2$   $\boxed{x^2 + 6x + 9}$

2●  $(3x+4y)^2$   $\boxed{9x^2 + 24xy + 16y^2}$

3●  $(3n-2m)^2$   $\boxed{9n^2 - 12mn + 4m^2}$

4●  $(x^{4n}-y^{3n})^2$   $\boxed{x^{8n} - 2x^{4n}y^{3n} + y^{6n}}$

5●  $(3a^x+5n^{3x})^2$   $\boxed{9a^{2x} + 30a^x n^{3x} + 25n^{6x}}$

6●  $(3x+4)(3x-4)$   $\boxed{9x^2 - 16}$

7●  $(4n-m)(4n+m)$   $\boxed{16n^2 - m^2}$

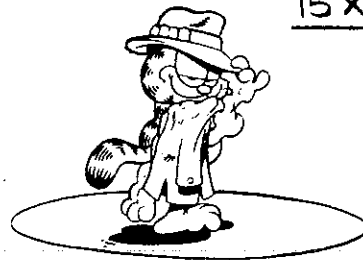
## Lesson 5.5

### DIVIDING POLYNOMIALS

Divide:

1●  $(10x^2 + x - 21) \div (5x - 7)$

$$\begin{array}{r} 2x + 3 \\ 5x - 7 \overline{) 10x^2 + x - 21} \\ \underline{10x^2 - 14x} \phantom{- 21} \\ 15x - 21 \\ \underline{15x - 21} \\ 0 \end{array}$$



2●  $(10x^2 - 3x - 15) \div (2x - 3)$

$$\begin{array}{r} 5x + 6 + \frac{3}{2}x - 3 \\ 2x - 3 \overline{) 10x^2 - 3x - 15} \\ \underline{10x^2 - 15x} \phantom{- 15} \\ 12x - 15 \\ \underline{12x - 18} \\ 3 \end{array}$$

3 •  $(a^3 - 8) \div (a - 2)$

$$\begin{array}{r}
 a^2 + 2a + 4 \\
 a - 2 \overline{) a^3 \phantom{+ 2a^2} - 8} \\
 \underline{a^3 - 2a^2} \phantom{+ 4a} \\
 2a^2 \phantom{+ 4a} \\
 \underline{2a^2 - 4a} \phantom{+ 8} \\
 4a - 8 \\
 \underline{4a - 8} \\
 0
 \end{array}$$



Use the special product forms to work with more complex binomials.

Binomial squared:

6 •  $(3x^{2n+3} - 4y^{x-2})^2$

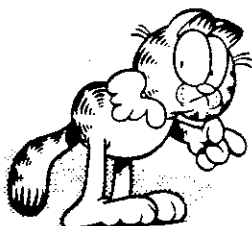
$$9x^{4n+6} - 24x^{2n+3}y^{x-2} + 16y^{2x-4}$$

7 •  $(a^{3n} + 6b^{2n-3})^2$

$$a^{6n} + 12a^{3n}b^{2n-3} + 36b^{4n-6}$$

4 •  $(3a^4 - b^4) \div (a - b)$

$$\begin{array}{r}
 3a^3 + 3a^2b + 3ab^2 + 3b^3 + \frac{2b^4}{a-b} \\
 a - b \overline{) 3a^4 \phantom{+ 3a^3b} - b^4} \\
 \underline{3a^4 - 3a^3b} \phantom{+ 3ab^2} \\
 3a^3b \phantom{+ 3b^3} \\
 \underline{3a^3b - 3a^2b^2} \phantom{+ 3b^3} \\
 3a^2b^2 \phantom{+ 3b^3} \\
 \underline{3a^2b^2 - 3ab^3} \phantom{+ 3b^3} \\
 3ab^3 - b^4 \\
 \underline{3ab^3 - 3b^4} \\
 2b^4
 \end{array}$$



Product of a sum and difference:

8 •  $(3n^{2x} - m^{x+3})(3n^{2x} + m^{x+3})$

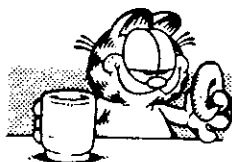
$$9n^{4x} - m^{2x+6}$$

9 •  $(5a^{2n-1} + 3b^{n+4})(5a^{2n-1} - 3b^{n+4})$

$$25a^{4n-2} - 9b^{2n+8}$$

5 •  $(6x^4 - 16x^3 + 15x^2 - 18x + 4) \div (2x^2 - 4x - 1)$

$$\begin{array}{r}
 3x^2 - 2x + 5 + \frac{9}{2x^2 - 4x - 1} \\
 2x^2 - 4x - 1 \overline{) 6x^4 - 16x^3 + 15x^2 - 18x + 4} \\
 \underline{6x^4 - 12x^3 - 3x^2} \phantom{- 18x + 4} \\
 -4x^3 + 18x^2 - 18x \phantom{+ 4} \\
 \underline{-4x^3 + 8x^2 + 2x} \phantom{+ 4} \\
 10x^2 - 20x + 4 \\
 \underline{10x^2 - 20x - 5} \\
 9
 \end{array}$$



## Lesson 5.6

### SOLVING MOTION PROBLEMS

For motion problems:  
 $R \times T = D$

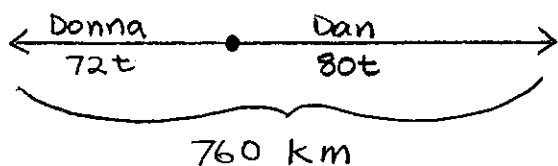
Rate  $\times$  Time = Distance

- 1● Dan and his wife Donna leave home at the same time and travel in opposite directions. Dan drives 80 kmh (km per hour) and Donna drives 72 kmh. In how many hours will they be 760 km apart?

$$r \cdot t = d$$

Dan  $80 \cdot t = 80t$

Donna  $72 \cdot t = 72t$



$$80t + 72t = 760$$

$$152t = 760$$

$$t = 5$$

5 hours

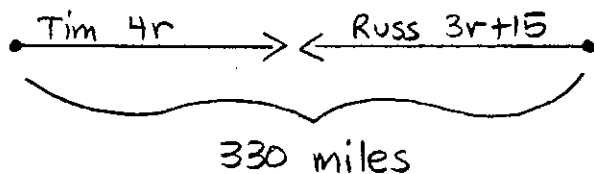


- 2● Ashton and Fremont are 330 miles apart. Tim leaves Ashton at 9:30 AM and Russ leaves Fremont at 10:30 AM. If Russ drives 5 mph faster and they pass each other at 1:30 PM, how fast is Russ driving?

$$r \cdot t = d$$

Tim  $r \cdot 4 = 4r$

Russ  $(r+5) \cdot 3 = 3r+15$



$$4r + (3r + 15) = 330$$

$$7r + 15 = 330$$

$$7r = 315$$

$$r = 45 \quad r + 5 = \boxed{50 \text{ mph}}$$

- 3● At 8:00 AM Peggy leaves home driving 35 mph. A half hour later, Doug discovers she left her suitcase, so he drives 50 mph to catch her. If Doug is delayed 15 minutes by a flat tire, at what time will he catch Peggy?

Doug: starts  $\frac{1}{2}$  hour later  
delayed  $\frac{1}{4}$  hour

Doug drives  $\frac{3}{4}$  hour less

$$r \cdot t = d$$

Peggy  $35 \cdot t = 35t$

Doug  $50 \cdot (t - \frac{3}{4}) = 50t - \frac{75}{2}$

Peggy  $\xrightarrow{35t}$

Doug  $\xrightarrow{50t - \frac{75}{2}}$

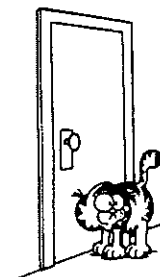
$$35t = 50t - \frac{75}{2}$$

$$-15t = -\frac{75}{2}$$

$$t = 2\frac{1}{2}$$

$$8:00 \text{ AM} + 2\frac{1}{2} \text{ AM}$$

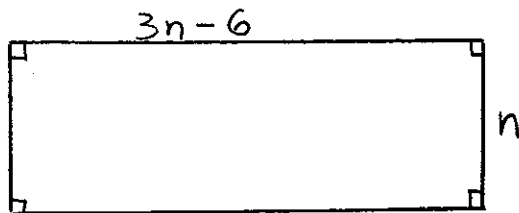
Doug will catch her at 10:30 AM



# Lesson 5.7

## SOLVING PROBLEMS WITH AREA & PERIMETER

- 1● The length of a rectangle is 6 inches less than 3 times its width. The perimeter is 28 inches. Find the dimensions.



$$2(n) + 2(3n-6) = 28$$

$$2n + 6n - 12 = 28$$

$$8n - 12 = 28$$

$$8n = 40$$

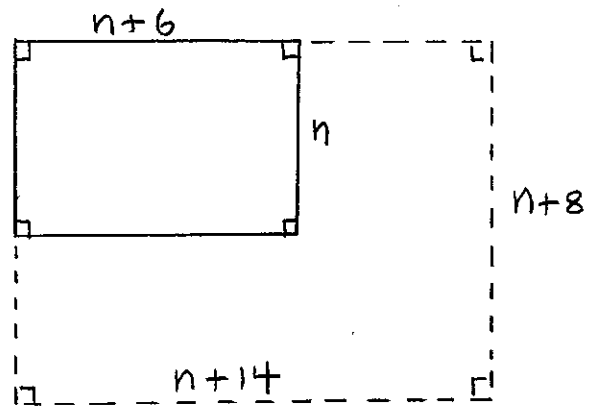
$$n = 5$$

$$3n - 6 = 9$$

5 by 9 in.

- 2● Mr. and Mrs. Danley planned to build a rectangular deck that is 6 feet longer than it is wide. If they can afford the extra material, they would like to extend the deck 8 feet on two of the sides. This would increase the area by  $272 \text{ ft}^2$ . What are the original dimensions planned for the deck?

Note: Difference between large and small rectangle =  $272 \text{ ft}^2$



$$(n+14)(n+8) - n(n+6) = 272$$

$$(n^2 + 22n + 112) - (n^2 + 6n) = 272$$

$$n^2 + 22n + 112 - n^2 - 6n = 272$$

$$16n + 112 = 272$$

$$16n = 160$$

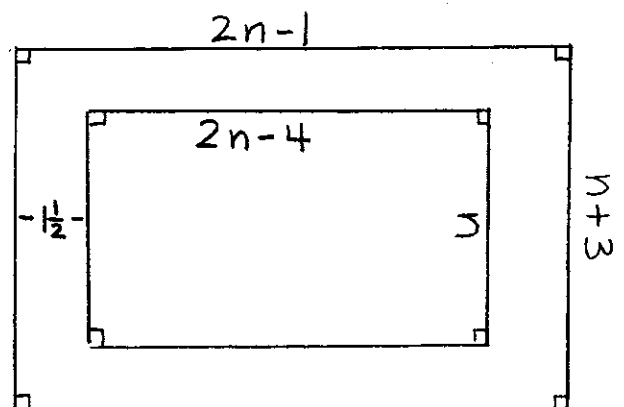
$$n = 10$$

$$n + 6 = 16$$

10 by 16 feet



- 3● The length of a rectangular painting is 4 inches less than twice its width. It fits exactly inside a frame that is  $\frac{1}{2}$  inches all the way around. The frame has an area of  $69 \text{ in}^2$ . What is the length of the painting?



$$(2n-1)(n+3) - n(2n-4) = 69$$

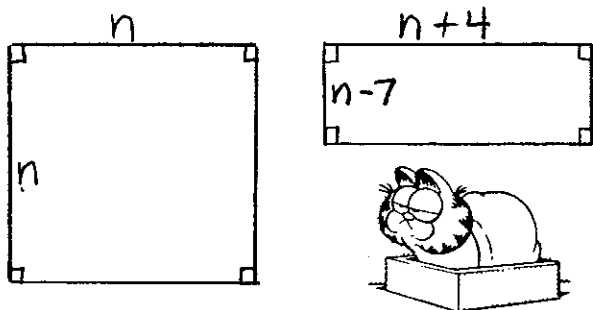
$$(2n+5n-3) - (2n^2-4n) = 69$$

$$2n^2+5n-3 - 2n^2+4n = 69$$

$$9n = 72$$

$$n = 8 \quad 2n-4 = \boxed{12 \text{ inches}}$$

- 4● If the length of a square is increased by 4cm and the width is decreased by 7cm, the area is decreased by  $64 \text{ cm}^2$ . What is the area of this smaller rectangle?



$$n^2 - (n-7)(n+4) = 64$$

$$n^2 - (n^2 - 3n - 28) = 64$$

$$n^2 - n^2 + 3n + 28 = 64$$

$$3n = 36$$

$$n = 12$$

rectangle dimensions

$$n+4 = 16$$

$$n-7 = 5 \quad 16 \text{ by } 5 \text{ cm}$$

$$\text{area } 16 \times 5 = 80$$

$$\boxed{80 \text{ cm}^2}$$

## Lesson 5.8

### SOLVING PROBLEMS WITH INVESTMENT & INTEREST

$$\text{Simple Interest: } I = PRT$$

$$\text{Interest} = \text{Principal} \times \text{Rate} \times \text{Time}$$

- 1● Dennis invested \$15,000, part at 12% and part at 15%. He earned a total of \$1995 in interest. How much was invested at each rate?

$$n = \$ \text{ invested at } 12\%$$

$$(.12)(n) + (.15)(15,000 - n) = 1995$$

$$.12n + 2250 - .15n = 1995$$

$$-.03n = -255 \rightarrow n = 8500$$

$$\boxed{\$8500 \text{ at } 12\%, \$6500 \text{ at } 15\%}$$

- 2● Corey invested \$7000, part at 8% and part at 12%. He earned \$360 more on the 12% investment. How much did he invest at 8%?

$$n = \$ \text{ invested at } 8\%$$

$$(.12)(7000 - n) = (.08)(n) + 360$$

$$840 - .12n = .08n + 360$$

$$-.20n = -480$$

$$n = 2400$$

$$\boxed{\$2400 \text{ at } 8\%}$$

add \$360 to smaller investment to equalize the interest

# 5.1 Problems

## DEFINING & ORDERING POLYNOMIAL EXPRESSIONS

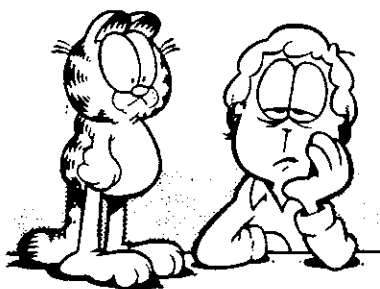
Identify as a term or an expression:

- ①  $n^2 + 3m$       ⑤  $a^2 + 3b + \frac{1}{c}$   
 ②  $\frac{3}{a} + b - c$       ⑥  $\frac{2}{3}xy^2z$   
 ③  $5x^2y$       ⑦  $12ab^2$   
 ④  $\frac{1}{3}m^2n$       ⑧  $2a^2 + \frac{1}{3}b - \frac{a}{b}$

- ⑨ In 1-8 above, indicate which terms or expressions are polynomials.

Identify as a monomial, a binomial, or a trinomial:

- ⑩  $5x^2y + 3x + 7$       ⑭  $x^2 - \frac{x}{2} + \frac{1}{3}$   
 ⑪  $4t^2 + 3t$       ⑮  $5a^2b^3$   
 ⑫  $8$       ⑯  $-12$   
 ⑬  $4x^2 + 3y^2z$       ⑰  $3a^2x - 5a$



Determine the degree of each polynomial:

- ⑱  $11x^2$   
 ⑲  $x + 2y^2 + 3z^3$   
 ⑳  $29n^2 + 17n^2t^2$   
 ㉑  $4^3xy + 9xz^2 + 17rs$   
 ㉒  $2xy^2z + 5xyz^5 + x^4$   
 ㉓  $n^2 + r^3 + s^{14} + c^2$   
 ㉔  $3^3xy + 5x$

Arrange in ascending order of  $x$ :

- ㉕  $-7 + x^2 + 4x$   
 ㉖  $-6x + x^5 + 4x^3 - 20$   
 ㉗  $2x^3 + 5ax + a^3$   
 ㉘  $21p^2x + 3px^3 + p^4$

Arrange in descending order of  $x$ :

- ㉙  $5b + \frac{2}{3}bx + b^3x^3$   
 ㉚  $4x^3y + 3xy^4 - x^2y^3 + y^4$   
 ㉛  $7a^3x - 8a^3x^3 + 27 + \frac{2}{3}x^2$   
 ㉜  $\frac{3}{4}x^3y - x^2 + 4 + \frac{2}{3}x$

Add or subtract:

- ㉝  $(5ax^2 + 3ax - 5x) + (2ax^2 - 5ax + 7x)$   
 ㉞  $(\frac{5}{7}a^2 - \frac{3}{4}a + \frac{1}{2}) - (\frac{3}{7}a^2 + \frac{1}{2}a - \frac{1}{2})$

continued

$$\textcircled{35} \left(\frac{3}{8}m^2 - 4m + \frac{2}{3}\right) + \left(\frac{5}{8}m^2 - 2m + \frac{1}{3}\right)$$

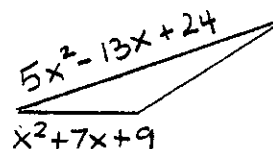
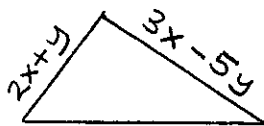
$$\textcircled{36} (n^2 + 3n - 7) + (3n^2 - 4n + 8)$$

$$\textcircled{37} (3mn^2 + 3mn - n^3) - (5mn^2 + mn + 2n^3)$$

$$\textcircled{38} (x^3 - 3x^2y + 4xy^2 + y^3) - (7x^3 + x^2y - 9xy^2 + y^3)$$

$$\textcircled{6} P = 7x + 2y$$

$$\textcircled{7} P = 11x^2 - 29x + 10$$



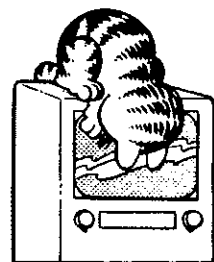
Find the complement of each angle:

$$\textcircled{8} 70$$

$$\textcircled{9} 3x$$

$$\textcircled{10} x - 2$$

$$\textcircled{11} 2x + 40$$



Find the supplement of each angle:

$$\textcircled{12} 45$$

$$\textcircled{14} 8x - 10$$

$$\textcircled{13} 2x$$

$$\textcircled{15} 5x + 130$$

## 5.2 Problems

### ADDING, SUBTRACTING, & MULTIPLYING POLYNOMIALS

Find each sum in column form:

$$\textcircled{1} \begin{array}{r} 4a + 5b - 6c + d \\ 3a - 7b + 2c + 8d \\ 2a - b \quad \quad + 7d \end{array}$$

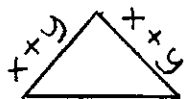
$$\textcircled{2} \begin{array}{r} 2x^2 - 5x + 7 \\ 5x^2 + 7x - 3 \\ x^2 - x + 11 \end{array}$$

Find each difference in column form:

$$\textcircled{3} \begin{array}{r} 5x^2 - 4 \\ 3x^2 + 8x + 4 \end{array} \quad \textcircled{4} \begin{array}{r} 2a - 7 \\ 5a^2 + 8a - 11 \end{array}$$

Find the missing side given the perimeter:

$$\textcircled{5} P = 3x + 3y$$



Find each product:

$$\textcircled{16} 5x^2y(3x^2 - 7xy + y^2)$$

$$\textcircled{17} 4m^2(9m^2n + mn - 5n^2)$$

$$\textcircled{18} 7a^2b^2(a^4 - 5a^2b + 6b^2)$$

$$\textcircled{19} 2x^2(9x^2y - 7xy + y^2)$$

$$\textcircled{20} -8xy(4xy + 7x - 14y^2)$$

$$\textcircled{21} -7ab(ab + 11a^2b - 11b^2)$$

$$\textcircled{22} -\frac{1}{3}x(9x^2 + x - 5)$$

$$\textcircled{23} \frac{2}{5}a(10a^2 - 15a + 8)$$

continued



$$\textcircled{24} -\frac{3}{4}ab^2\left(\frac{1}{3}b^2 - \frac{4}{9}b + 1\right)$$

$$\textcircled{25} -\frac{1}{3}xy(12x^2 + 8xy - \frac{2}{3}y^2)$$

### Review

Identify as a term or expression:

$$\textcircled{26} 3n^2mp$$

$$\textcircled{27} 5a^2 + 2ab + 6b^2$$

Indicate if the following are polynomials. For each polynomial, identify as a monomial, binomial, or trinomial:

$$\textcircled{28} 4x - \frac{3}{4}x^2$$

$$\textcircled{29} 2a^2bc^3$$

$$\textcircled{30} 2a^2 + \frac{3a}{c} - 1$$

$$\textcircled{31} 4x^2 - 2xy + 3y^2$$



Determine the degree of each polynomial:

$$\textcircled{32} n - 2p^2$$

$$\textcircled{33} 12^2x^4y^5 + xy^6$$

Arrange in descending order of  $x$ :

$$\textcircled{34} 11x^2 + 7ax^3 - 3x + 2$$

Be sure to know how "descending" differs from "ascending"

## 5.3 Problems

### MULTIPLYING POLYNOMIALS USING "FOIL"

Multiply and simplify:

$$\textcircled{1} (2x + 3y)(5x + 2y)$$

$$\textcircled{2} (7y - 1)(2y - 3)$$

$$\textcircled{3} (5m + 2n)(8m - 3n)$$

$$\textcircled{4} (5r - 7s)(4r + 3s)$$

$$\textcircled{5} (2x - \frac{1}{2})(6x + \frac{1}{2})$$

$$\textcircled{6} (3x + \frac{1}{4})(6x - \frac{1}{2})$$

$$\textcircled{7} (5a + 3)(3a + 1)$$

$$\textcircled{8} (8a + 3)(5a + 4)$$

Multiply in column form:

$$\textcircled{9} (3x + 5)(2x^2 - 5x + 11)$$

$$\textcircled{10} (4n + 5)(3n^2 + 8n - 9)$$

$$\textcircled{11} (4x - 3y)(3x^2 + 5xy + y^2)$$

$$\textcircled{12} (5x - 2y)(6x^2 - 5xy + 9y^2)$$

### Review

Identify as a term or expression:

$$\textcircled{13} 2x^2 - 3xy$$

$$\textcircled{14} 9mn^2$$

Identify as a monomial, binomial, trinomial, or a non-poly nomial :

⑮  $4x^2 - 2xy + 3y^2$

⑯  $2x - 3y$       ⑰  $\frac{4ab}{c}$

Determine the degree of each poly nomial :

⑱  $3xy^2z$       ⑲  $8^2xy^3 - 1$

⑳  $-8$       ㉑  $0$

㉒  $3a^2b^3 - 2c^4$       ㉓  $4xy^2z + 6x^2yz^3$

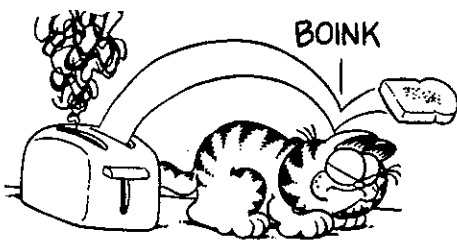
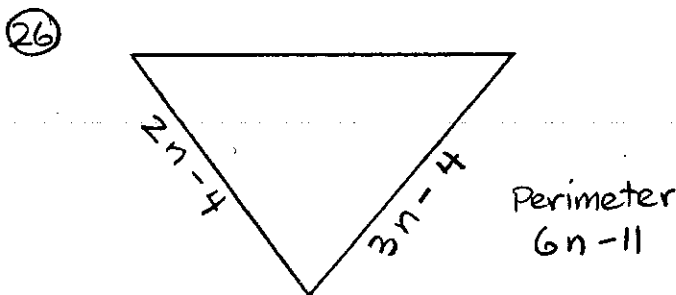
Arrange in ascending order of n :

㉔  $-2mn^3 + 15 - 3mn + n^2$

Find the complement :

㉕  $3x - 15$

Find the missing side :



# 5.4 Problems

## SPECIAL PRODUCTS

Find each product :

①  $(4x+y)^2$

②  $(6m+2n)^2$

③  $(2a-b)^2$

④  $(4x-9y)^2$

⑤  $(3x+5)(3x-5)$

⑥  $(8a+2b)(8a-2b)$

⑦  $(2n-m)(2n+m)$

⑧  $(5a+3b)(5a-3b)$

⑨  $(3x+2)(3x-2)$

⑩  $(4n-1)^2$

⑪  $(x^{3a} + y^{3a})^2$

⑫  $(x^{3n} - y^{2n})^2$

⑬  $(2n^{3x} - m^x)^2$

⑭  $(a^n + 5x^{2n})^2$

⑮  $(a^{2n} - b^{5n})(a^{2n} + b^{5n})$

⑯  $(x^{2n} + y^n)(x^{2n} - y^n)$

⑰  $(x^{3n} + 2y^{5n})(x^{3n} - 2y^{5n})$

⑱  $(a^{3x} - 3b^{4x})(a^{3x} + 3b^{4x})$



### Review

Multiply and simplify :

⑲  $(3n-4)(2n+5)$

⑳  $(2x+3y)(3x+y)$

㉑  $(x+2y)(2x^2+3xy+5y^2)$

Subtract:

$$\textcircled{22} \begin{array}{r} 2a^2 - 3ab + 5b^2 \\ 4a^2 - 2ab + 7b^2 \end{array}$$

Find the  
Supplement:

$$\textcircled{23} x + 13$$

multiply:

$$\textcircled{24} -2a^2b(3a^2 - 2ab + \frac{1}{2}b^2)$$



## 5.5 Problems

### DIVIDING POLYNOMIALS

$$\textcircled{1} (2x^3 - 7x^2 + 16x - 15) \div (2x - 3)$$

$$\textcircled{2} (4a^3 - 11a^2 - 31a - 7) \div (4a + 1)$$

$$\textcircled{3} (3x^3 + 8x^2 + x - 7) \div (x + 2)$$

$$\textcircled{4} (6n^3 + 5n^2 + 12) \div (2n + 3)$$

$$\textcircled{5} (x^3 + 64) \div (x + 4)$$

$$\textcircled{6} (27a^3 - 8b^3) \div (3a - 2b)$$

$$\textcircled{7} (x^3 - 27y^3) \div (x^2 + 3xy + 9y^2)$$

$$\textcircled{8} (x^4 - y^4) \div (x - y)$$

$$\textcircled{9} (x^4 + x^3 - 4x^2 + 16x - 10) \div (x^2 - 2x + 4)$$

$$\textcircled{10} (6a^4 - 11a^3 - a^2 + 10a + 1) \div (3a^2 - 4a + 2)$$

### Review

Determine the degree for  
these polynomials:

$$\textcircled{11} 6a^3b^2 - 2ac^5$$

$$\textcircled{12} -3^3a + 1$$

Subtract:

$$\textcircled{13} (4n^2 - 3mn + 2m^2) - (4n^2 - 2mn - m^2)$$

Find the complement:

$$\textcircled{14} 6a^2 - 2a + 1$$

Find each product:

$$\textcircled{15} -\frac{1}{3}ab^2(9ab^2 - 3a^2b - 12)$$

$$\textcircled{16} (3n + 5)^2$$

$$\textcircled{17} (2a - 7b)(2a + 7b)$$

$$\textcircled{18} (4n + 5)(3n - 8)$$



$$\textcircled{19} (x^{3n} - 2y^{n+3})^2$$

$$\textcircled{20} (4a^x + 3a^{2x-1})(4a^x - 3a^{2x-1})$$

$$\textcircled{21} (3n^{3x+2} + m^{x-1})^2$$

$$\textcircled{22} (5x^{3a-2} + 2y^{a+4})(5x^{3a-2} - 2y^{a+4})$$

# 5.6 Problems

## SOLVING MOTION PROBLEMS

Use charts and diagrams to solve each problem:

① Two trains leave Bridgeport at the same time - one traveling north and the other south. The first train travels 40 mph and the second at 30 mph. In how many hours will the trains be 245 miles apart?

② Two cyclists are traveling in the same direction on the same course. One travels 20 mph and the other 14 mph. After how many hours will they be 15 miles apart?

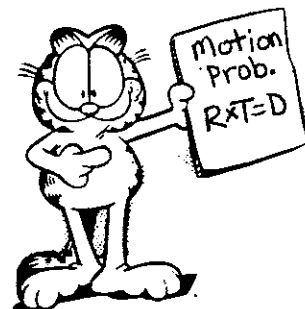
③ Jason's boat leaves the pier at 9:00 AM at 8 mph. A half hour later, Sharon's boat leaves the same pier traveling in the same direction at 10 mph. At what time will Sharon's boat catch up to Jason's?

④ An express train travels 80 kph (km per hour) from Clarksville to Whitfield. A passenger train traveling at 48 kph takes two hours longer to make the same trip. How far apart are the cities of Clarksville and Whitfield?

⑤ Two planes leave the Dallas airport and fly in opposite directions. They leave at the exact same time with one plane flying 80 mph faster than the other. After three hours, they are 2940 miles apart. What is the rate of each plane?

⑥ Jake left home on his bicycle for a long distance ride. Abbey left three hours later on her motorcycle carrying Jake's lunch. Her speed was 42 mph. If Abbey catches up to Jake in  $1\frac{1}{2}$  hours, how fast was Jake traveling?

⑦ Ike and Melissa leave home at 10:30 AM on their bicycles traveling in opposite directions. Melissa rides 2 kph faster than Ike. If they are 110 km apart at 3:30 PM, how fast is Melissa riding?



⑧ At the same time that Kris leaves Baltimore, Amy leaves Detroit. The cities are 510 miles apart. Amy drives 5 mph faster than Kris. How fast is Kris driving if they pass each other in 6 hours?

## Review

Find each product using FOIL or special product rules:

⑨  $(3n+8)(3n-8)$

⑩  $(2x-5y)^2$

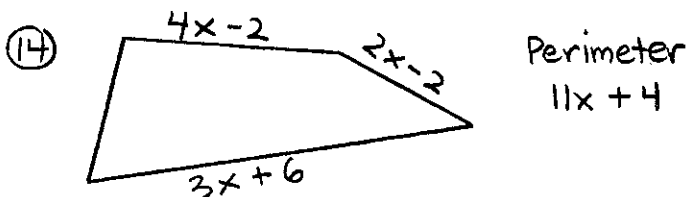
⑪  $(3n-4m)(n-3m)$

⑫  $(4x^{n+1}-2y^{3n})^2$

⑬  $(3a^{4x+2}-b^{x-3})(3a^{4x+2}+b^{x-3})$



Find the measure of the missing side:



Divide:

⑮  $(3x^3-y^3) \div (x-2y)$

# 5.7 Problems

## SOLVING PROBLEMS WITH AREA & PERIMETER

① The length of a rectangle is 4 feet more than twice the width. The perimeter is 116 feet. Find the dimensions.

② The length of a rectangle is

3 cm less than 4 times its width. The perimeter is 54 cm. Determine the area.

③ The second side of a triangle is twice the length of the first. The third side is 3 cm less than the second side. If the perimeter is 37 cm, what are the side measures?

④ An isosceles triangle has a base 17 cm shorter than the congruent sides. If the perimeter is 91 cm, what is the measure of the base?

⑤ A rectangular garden is 5 feet longer than twice its width. It has a sidewalk 3 feet wide on two adjacent sides. The area of the sidewalk is  $213 \text{ ft}^2$ . Find the dimensions of the garden.

⑥ Mrs. Mason has a concrete patio in the backyard with a length 2 feet more than its width. If she enlarges the patio by 4 feet on two adjacent sides, the area of the patio will increase by  $80 \text{ ft}^2$ . What are the original dimensions of the patio?

⑦ A rectangular photo is 2 cm longer than it is wide. It fits exactly in a frame that is 1 cm all the way around and has an area of  $32 \text{ cm}^2$ . What are the dimensions of the photo?

⑧ A square garden is surrounded by a  $2\frac{1}{2}$  foot wide sidewalk. The area of the sidewalk is

145 ft.<sup>2</sup> what is the area of the garden?

- ⑨ The length of a rectangle is 20 yards greater than its width. If the length is decreased by 5 yards and the width increased by 4 yards, the area remains unchanged. Find the original length.
- ⑩ The length of a rectangle is 7cm less than twice its width. If the length is increased by 11cm and the width decreased by 6 cm, the area decreases by 40 cm.<sup>2</sup> Find the original area.

### Review

- ⑪ Michele drove from the lake to Uncle Ray's cabin in 3 hours. Chris, driving 12 mph faster, made the same trip - leaving 30 minutes later and arriving 15 minutes earlier. How far is it from the lake to the cabin?

Multiply / Divide :

- ⑫  $(3x + 7y)(3x - 7y)$
- ⑬  $(5n - m)(2n + 3m)$
- ⑭  $(3a^{2x-4} - 4b^{x+3})^2$
- ⑮  $(16n^4 - 10) \div (2n + 1)$

# 5.8 Problems

## SOLVING PROBLEMS WITH INVESTMENT & INTEREST

- ① Michele invested \$10,000 for one year, part at 8% and part at 12%. Her total interest for the year was \$944. How much did she invest at each rate?

- ② Steve invested a total of \$7,200 for one year, part at 10% and part at 14%. His total interest for the year was \$960. How much did he invest at each rate?



- ③ Fred invested \$5000 for one year, part at 9% and the balance at 12%. His 9% investment earned \$198 more than the 12% investment. How much did he invest at 9%?
- ④ Angela wants to invest \$8500, part at 14% and part at 12%. If she earns the same amount of interest from both investments, how much should she invest at each rate? (Round to nearest 1¢)
- ⑤ Charlotte invested her money, part at 8% and part at 12%. She invested \$1500

more in the 8% investment, but she earned the same amount of interest for the year from both investments. How much did she invest at 12%?

- ⑥ Ken invested \$7525, part at 16% and part at 11%. He earned twice as much interest on the money invested at 11%. How much did he invest at 16%?

### Review

- ⑦ Art leaves the office at 10:00 AM driving 50 mph. At 11:30 AM, Jennifer leaves the office driving in the same direction at 45 mph. At what time will they be 100 miles apart?
- ⑧ A garden has a length 4 feet more than twice its width. The garden is surrounded by a sidewalk that is  $2\frac{1}{2}$  feet wide. The sidewalk has an area of  $195 \text{ ft}^2$ . What are the dimensions of the garden?

Multiply / Divide:

- ⑨  $(3x-y)^2$   
 ⑩  $(5n^{x+2} + m^{3x})^2$   
 ⑪  $(3a-2)(3a+2)$   
 ⑫  $(3x^3 - 2x^2 + 11x - 20) \div (x^2 - x + 4)$



## Unit 5 REVIEW PROBLEMS

Arrange both expressions in a) ascending order of  $x$  and b) descending order of  $x$ :

- ①  $ax^2 - 5x^3 + a^2x - 3$   
 ②  $3x^4 - x + x^2 - 5$

Determine the degree:

- ③  $4a^4bc - 5ab^2 + 12^4c^3$   
 ④  $2^3x^2y^3z - 18 + xy^3$

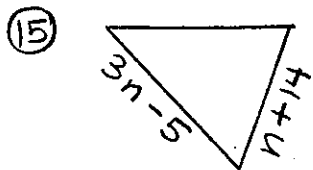
Determine the simplified answer:

- ⑤  $(x^2 - 6xy + 7y^2) - (3x^2 + xy - y^2)$   
 ⑥  $(2x^2 - 5x + 7) - (3x^3 + x^2 + 2)$   
 ⑦  $7xy(x^2 + 4xy - 8y^2)$   
 ⑧  $\frac{1}{2}a^2b(8b^2 - 6ab + 10a^2)$   
 ⑨  $(4x-3)(x+4)$   
 ⑩  $(2a-5b)(4a+3b)$   
 ⑪  $(x-4)(x^2+5x-7)$   
 ⑫  $(a+b)(a^2-2ab+3b^2)$

Determine the a) complement and b) supplement:

- ⑬  $2x-4$       ⑭  $3n+7$

Find the missing side:



Perimeter  
 $5n-4$



Perimeter  
 $6x+2$

Determine the product using special product forms:

⑰  $(3n+2)^2$

⑱  $(7a-4b)^2$

⑲  $(3x-4y)(3x+4y)$

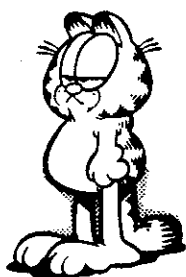
⑳  $(5n+9)(5n-9)$

㉑  $(x^{2n}-y^{3n-2})^2$

㉒  $(3a^{n+3}+4b^{3n-1})^2$

㉓  $(2n^{3x}-3m^{x+1})(2n^{3x}+3m^{x+1})$

㉔  $(5a^{2n-1}+4b^{4n})(5a^{2n-1}-4b^{4n})$



Determine the quotient:

㉕  $(2x^3-15x^2+28x-20) \div (x-5)$

㉖  $(6n^3-13n^2+14n-14) \div (2n-3)$

㉗  $(a^3-7b^3) \div (a-2b)$

㉘  $(x^3+2y^3) \div (x+y)$

Solve:

㉙ Karen leaves home driving

32 mph. A half hour later, her sister Gail leaves from the same place driving 40 mph in the same direction. If Karen leaves home at 1:00 pm, at what time will Gail be 12 miles ahead?

⑳ Sue drives south at 30 mph. Sharon leaves a half hour later driving 45 mph due north. If Sue leaves at 4:30 pm, when will they be 165 miles apart?

㉑ Brenda invested \$9000, part at 8% and part at 12%. If she earned \$200 more on the 8% investment, how much was invested at that rate?

㉒ Ben invested \$10,500, part at 10% and part at 6%. If he earned \$90 more on the 10% investment, how much did he invest at 6%?

㉓ The length of a room is 12 feet less than twice its width. What are the dimensions if the perimeter of the room is 42 feet?

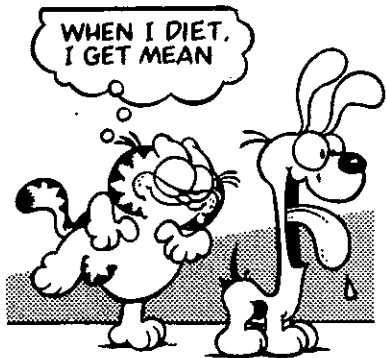
㉔ The length of a rectangle is 4 cm more than 3 times its width. What is the length if the perimeter is 72 cm?

㉕ Bill is making a picture frame that is 4 inches



longer than it is wide. The frame is 2 inches all the way around. The area of the frame is  $192 \text{ in.}^2$

- a) What are the inside dimensions of the frame?
- b) What are the outside dimensions?



③⑧ A square counter top was needed to finish the kitchen. When plans changed, the length of the top was increased by 8 inches and the width was decreased by 6 inches. The change decreased the area by  $8 \text{ in.}^2$ . What was the area of the original top?

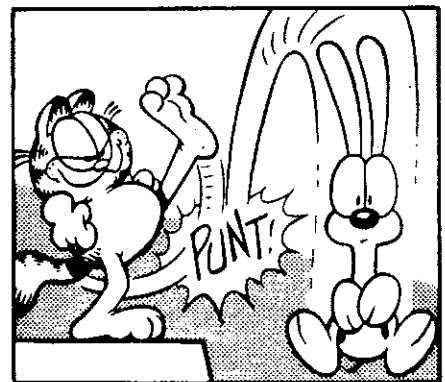
③⑨ Alisha drove 252 miles to her aunt's house at 42 mph. Her brother Greg left 15 minutes later and arrived 30 minutes earlier. How fast was he driving?

④⑩ Bob is driving 40 mph. After Bob has driven 30 miles, Jack starts driving in the same direction. At what rate must Jack drive to catch up to Bob after Jack has been driving for 5 hours?

Note: The above problem is a challenging one. One like it is not on the test, but understanding this problem will help you with all motion problems.

③⑥ Sandra's garden is 3 feet longer than it is wide. She plans to put a 3-foot wide sidewalk on just two adjacent sides of the garden. If the sidewalk has an area of  $72 \text{ ft.}^2$ , what are the dimensions of the garden?

③⑦ A rectangle has a length 5 cm less than 3 times its width. If the length is decreased by 4 cm and the width is increased by 8 cm, the area is increased by  $48 \text{ cm.}^2$ . What is the area of the original rectangle?



## Unit 5 SKILL CHECK

- ① Put in descending order of  $n$ :

$$16n^4m^2 - 3 + 2n^3 + 4nm - 2n^2m^3$$

- ② Determine the degree:

$$4a^2b^2c - 3a^4b^3 + 2ab^3c$$

Determine the simplified answer:

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

④  $(3n - 2)(n^2 - 6n + 4)$

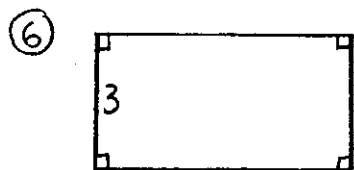
Determine the angle:

- ⑤ Complementary and supplementary to:

$$(3n + 6)^\circ$$



Determine the length:



Perimeter  
 $14n + 8$

Determine the product:

⑦  $(3n^x - m^{3x+1})^2$

⑧  $(4a - 3b)(4a + 3b)$

Determine the quotient:

⑨  $(8x^3 - 4y^3) \div (2x + y)$

Solve:

- ⑩ Andy leaves home at 3:00 PM driving 40 mph. Pam leaves at 3:30 PM driving in the opposite direction. At what time will they be 570 miles apart if Pam is driving 60 mph?

- ⑪ George builds a sidewalk that is 3 feet wide to completely surround a garden. The garden's length is 4 feet less than twice its width. If the sidewalk has an area of  $174 \text{ ft}^2$ , what are the dimensions of the garden?

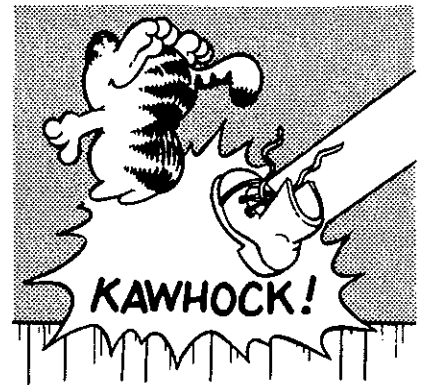
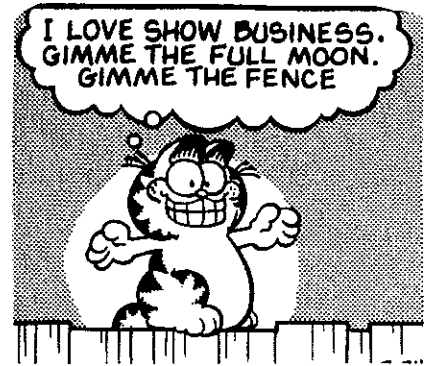
- ⑫ Aimee invests \$6500. If she earns twice as much from her 10% investment as from her 8% investment, how much did she invest at each rate?

- ⑬ Sally has a square patio. If she increases the length by 4m and decreases the width by 5m, the area will decrease by  $30 \text{ m}^2$ . What is the original area?

Continued



- ④ A plane flies between two cities over a distance of 2100 miles at 420mph. Another plane leaves the airport 30 minutes later and arrives one hour earlier. How fast does the second plane travel?



## Unit 5 REMEDIATION

- ① Put in descending order of  $x$ :

$$14xy - 2y^3 + 3x^2y - 2x^3$$

- ② Determine the degree:

$$3xyz - x^2y^2z + 4x^3y$$



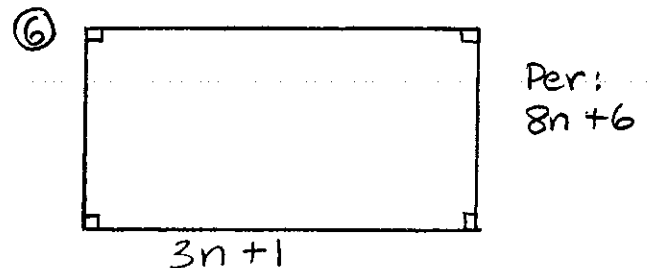
Determine the simplified answer:

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

Determine the angle:

- ⑤ Complementary to  $(3x - 2)^\circ$  and supplementary to the same angle.

Find the missing side:



Determine the product:

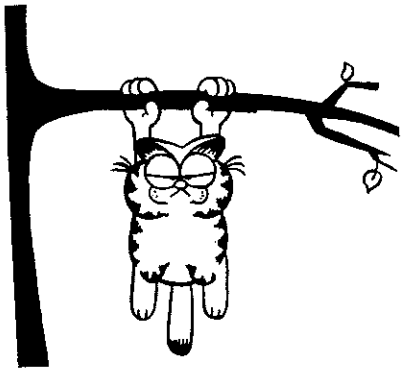
- ⑦  $(5x^{2n} - y^{n-3})^2$   
 ⑧  $(3a - b)(3a + b)$

Determine the quotient:

⑨  $(4a^4 - b^4) \div (a + b)$

Solve:

- ⑩ Jennifer leaves home at 2:00 PM driving 30 mph. After she has driven 45 miles, Sam leaves from the same place driving in the opposite direction. If Sam is driving 10 mph faster than Jennifer, at what time will they be 150 miles apart?



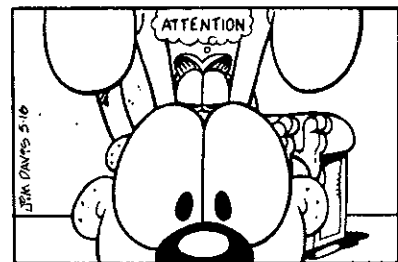
- ⑪ Michele makes a picture frame that is  $1\frac{1}{2}$  inches wide all the way around. If the picture that fits inside is 4 inches longer than it is wide and the frame has an area of  $69 \text{ in}^2$ , what are the dimensions of the picture and the outside of the frame?

- ⑫ Audrey invests \$10,000, part at 8% and part at 12%.

After one year, her 12% investment has earned much more than the 8% investment. He has earned \$48 more than 3 times as much. How much has been invested at each rate?

- ⑬ Carolyn's rectangular garden has a length 4 feet greater than twice its width. If the length is decreased by 2 feet and the width is increased by 5 feet, the area is increased by  $58 \text{ ft}^2$ . Determine the original area.

- ⑭ Farmer Brown drives to town at 36 mph and returns home at 48 mph. If his total driving time is  $3\frac{1}{2}$  hours, how far is his home from town?



## Unit 5

## EXTRA PRACTICE

① Put in descending order of  $x$ :  
 $2xy^2 - x^2y + 4y^2 + 2x^3$

② Determine the degree:  
 $3abc^2 - 2a^2b^3 - ab^2$   
 Simplify:

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

④  $(n-2)(n-5)$

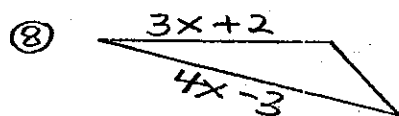
⑤  $2x^2(3x - x^2 + 4)$

⑥  $(2x-3)(x^2-3x+4)$

Given  $\angle (4n-5)^\circ$

- ⑦ a) Name the complement  
 b) Name the supplement

Determine the third side:



Perimeter =  $8x+2$

Determine the product:

⑨  $(3a-5)^2$

⑩  $(4x+3)(4x-3)$

Determine the quotient:

⑪  $(3x^2 - xy - 2y^2) \div (x-y)$

⑫  $(5a^3 - 2b^3) \div (a-b)$

Solve:

- ⑬ Two cyclists are riding in the same direction. Harry is travelling at 14 mph and Jack at 8 mph. If they started riding at 1:15 pm, at what time will they be 21 miles apart?

- ⑭ Sarah leaves the campsite at the same time as Amber. Sarah is driving 8 mph faster. After 3 hours of driving in opposite directions, they are 204 miles apart. How fast is Amber driving?

- ⑮ The length of a rectangular storage closet is 3 feet less than twice its width. The perimeter of the room is 30 feet. Find the dimensions.

- ⑯ A picture frame is 4 inches all the way around. The picture is 2 inches longer than it is wide. If the area of the frame is  $240 \text{ in}^2$ , find the dimensions of the picture.

- ⑰ The length of a rectangle is 6 cm more than its width. If the length is increased by 4 cm and the width is decreased by 3 cm, the area is decreased by  $42 \text{ cm}^2$ . Find the original area.

- ⑱ Jennifer invested \$12,000 part at 6% and the rest at 8%. If \$880 interest was earned in total, how much money was invested at 8%?

⑲  $(a^{3x} - b^{2x-1})^2$

- ⑳ A plane flies between two cities over a distance of 1040 miles at 260 mph. Another plane leaves 15 minutes later and arrives 30 minutes earlier. How fast is the second plane flying?

# Factoring Expressions

## Lesson 6.1 FACTORS & MULTIPLES

GCF: Product of all the common prime factors to the highest common power.

LCM: Product of all the different prime factors to their highest power.

Determine the GCF and LCM for each monomial:

1●  $12a^2b, 24a^3bc, 40ab^2c^2$

$12 = 2^2 \cdot 3$

$24 = 2^3 \cdot 3$

$40 = 2^3 \cdot 5$

GCF:  $2^2$

LCM:  $2^3 \cdot 3 \cdot 5$

$GCF = 4ab \quad LCM = 120a^3b^2c^2$

2●  $28xy, 30z, 35n^2$

$28 = 2^2 \cdot 7$

$30 = 2 \cdot 3 \cdot 5$

$35 = 5 \cdot 7$

GCF: 1

LCM:  $2^2 \cdot 3 \cdot 5 \cdot 7$

$GCF = 1 \quad LCM = 420xyzn^2$

Use a factor tree as needed

## Lesson 6.2 COMMON FACTORS

When factoring, always start by taking out the GCF.

Factor each expression:

1●  $10y^2 + 15y$

$5y(2y + 3)$

2●  $21ab^2 - 33a^2bc$

$3ab(7b - 11ac)$

3●  $12a^5b + 8a^3 - 24a^3c$

$4a^3(3a^2b + 2 - 6c)$

4●  $6x^3y^2 + 14x^2y + 2x^2$

$2x^2(3xy^2 + 7y + 1)$

5●  $\frac{3}{4}x^2y - \frac{1}{4}xy^2$

$\frac{1}{4}xy(3x - y)$

- or -

$xy(\frac{3}{4}x - \frac{1}{4}y)$



# Lesson 6.3

## FACTORING THE DIFFERENCE OF PERFECT SQUARES

Difference of Perfect Squares

$$a^2 - b^2 = (a + b)(a - b)$$

State whether each binomial is the difference of perfect squares:

1 ●  $y^4 - 25$   yes  $8a^2 - b^2$   no

$4b^2 - c^2$   yes  $x^2 - 1$   yes

$x^2 + y^2$   no  $\frac{4}{25}x^2 - 9$   yes

Factor each polynomial:

2 ●  $a^2 - c^2$    $(a+c)(a-c)$

3 ●  $4n^2 - 1$    $(2n+1)(2n-1)$

4 ●  $16x^2 + 9y^2$   not factorable

5 ●  $\frac{1}{4}a^2 - \frac{9}{25}b^2$    $(\frac{1}{2}a + \frac{3}{5}b)(\frac{1}{2}a - \frac{3}{5}b)$

6 ●  $n^4 - 4$    $(n^2+2)(n^2-2)$

7 ●  $3x^2 - 27y^2$   
 $3(x^2 - 9y^2) =$    $3(x+3y)(x-3y)$

8 ●  $x^3 - 16xy^2$   
 $x(x^2 - 16y^2) =$    $x(x+4y)(x-4y)$

9 ●  $5n^5 - 5n$

$5n(n^4 - 1)$

$5n(n^2 + 1)(n^2 - 1)$

$5n(n^2 + 1)(n + 1)(n - 1)$

10 ●  $3a^{10}b^2 - 3a^2b^2$

$3a^2b^2(a^8 - 1)$

$3a^2b^2(a^4 + 1)(a^4 - 1)$

$3a^2b^2(a^4 + 1)(a^2 + 1)(a^2 - 1)$

$3a^2b^2(a^4 + 1)(a^2 + 1)(a + 1)(a - 1)$

11 ●  $\frac{16}{3}m^2 - \frac{25}{3}n^2$

$\frac{1}{3}(16m^2 - 25n^2)$

$\frac{1}{3}(4m + 5n)(4m - 5n)$



12 ●  $(m+n)^2 - n^2$

$[(m+n) + n][(m+n) - n]$

$(m+2n)(m)$

13 ●  $(2a+b)^2 - (a+3b)^2$

$[(2a+b) + (a+3b)][(2a+b) - (a+3b)]$

$(2a+b+a+3b)(2a+b-a-3b)$

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

Treat the quantities as variables and use dif. of perfect squares

# Lesson 6.4

## FACTORING PERFECT SQUARE TRINOMIALS

Perfect Square Trinomial  
 $4a^2 + 12ab + 9b^2 = (2a + 3b)^2$

State whether each is a perfect square trinomial:

- 1●  $x^2 + 2x + 1$  yes
- $a^2 + 2ab + b^2$  yes
- $4x^2 + 2x + 1$  no
- $9n^2 - 6n + 1$  yes
- $9y^2 - 10y + 4$  no
- $4x^2 - 20xy + 25y^2$  yes

Factor each polynomial:

- 2●  $x^2 + 22x + 121$   $(x + 11)^2$
- 3●  $16a^2 + 72a + 81$   $(4a + 9)^2$
- 4●  $m^2 - 6mn + 9n^2$   $(m - 3n)^2$
- 5●  $16x^2 - 28xy + 49y^2$  not factorable
- 6●  $18x^2 - 24x + 8$   
 $2(9x^2 - 12x + 4) =$   $2(3x - 2)^2$
- 7●  $4a^2b + 16ab^2 + 16b^3$   
 $4b(a^2 + 4ab + 4b^2) =$   $4b(a + 2b)^2$

# Lesson 6.5

## FACTORING $x^2 + bx + c$

Demonstration:  $(x+3)(x+7)$

FOIL  $\rightarrow x^2 + 10x + 21$

sum  $\leftarrow$   $\rightarrow$  factors  
 $3+7$   $3 \cdot 7$

Factoring Trinomials  
 $x^2 + 6x + 5 = (x+5)(x+1)$   
 $a^2 - 8ab - 20b^2 = (a-10b)(a+2b)$

Factor each trinomial:

- 1●  $y^2 + 8y + 12$   $(y+6)(y+2)$
- 2●  $a^2 - 9a + 18$   $(a-6)(a-3)$
- 3●  $y^2 + 5y - 14$   $(y+7)(y-2)$
- 4●  $x^2 + 8x + 8$  not factorable
- 5●  $a^2 - 3ab - 28b^2$   $(a+4b)(a-7b)$

6●  $4a^3 - 12a^2b - 40ab^2$

$4a(a^2 - 3ab - 10b^2)$

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



7●  $(a-b)^2 + 4(a-b) - 60$

$[(a-b)+10][(a-b)-6]$

$(a-b+10)(a-b-6)$



$$8 \bullet (2x+y)^2 - 3(2x+y) - 54$$

$$[(2x+y)-9][(2x+y)+6]$$

$$\boxed{(2x+y-9)(2x+y+6)}$$

$$9 \bullet 2xy^3 - 14xy^2 - 60xy$$

$$2xy(y^2 - 7y - 30)$$

$$\boxed{2xy(y-10)(y+3)}$$

$$2[2x(a+3c) + b(a+3c)]$$

$$\boxed{2(a+3c)(2x+b)}$$

$$3 \bullet 15x - 3xy + 4y - 20$$

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

multiply by (-1) twice

$$3x(5-y) - 4(5-y)$$

$$\boxed{(5-y)(3x-4)} \quad \text{or} \quad \boxed{(y-5)(4-3x)}$$

## Lesson 6.6

### FACTOR BY GROUPING

Factor By Grouping

$$3xy - 21y + 5x - 35$$

$$3y(x-7) + 5(x-7)$$

$$(x-7)(3y+5)$$

$$4 \bullet 8x^3 - 8x + 12 - 12x^2$$

$$4[2x^3 - 2x + 3 - 3x^2]$$

$$4[2x(x^2-1) + 3(1-x^2)]$$

$$4[2x(x^2-1) - 3(x^2-1)]$$

$$4(x^2-1)(2x-3)$$

$$\boxed{4(x+1)(x-1)(2x-3)}$$

Factor each polynomial:

$$1 \bullet 8x^2y - 5x - 24xy + 15$$

$$x(8xy-5) - 3(8xy-5)$$

$$\boxed{(8xy-5)(x-3)}$$

$$2 \bullet 4ax + 12xc + 2ba + 6bc$$

$$2[2ax + 6xc + ba + 3bc]$$

continued

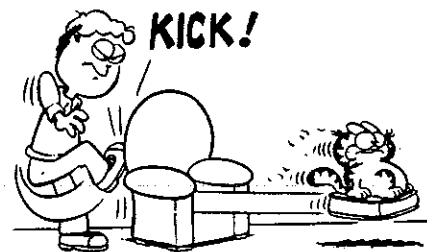
$$5 \bullet a^4 - a^2b^2 + 4b^4 - 4a^2b^2$$

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

$$a^2(a^2-b^2) - 4b^2(a^2-b^2)$$

$$(a^2-b^2)(a^2-4b^2)$$

$$\boxed{(a+b)(a-b)(a+2b)(a-2b)}$$



# Lesson 6.7

## FACTORING $ax^2 + bx + c$

Factoring:  $ax^2 + bx + c$

$2x^2 + 7x + 6$        $2 \cdot 6 = 12$

$2x^2 + 4x + 3x + 6$        $\begin{matrix} \wedge \\ \textcircled{4} \textcircled{3} \end{matrix}$

$2x(x+2) + 3(x+2)$        $\begin{matrix} \text{sum} \\ 7 \end{matrix}$

$(x+2)(2x+3)$



Factor each expression completely:

1●  $3x^2 + 11x + 6$

$3 \cdot 6 = 18$   
 $\wedge$   
 $\textcircled{9} + \textcircled{2} = 11$

$3x^2 + 9x + 2x + 6$   
 $3x(x+3) + 2(x+3)$

$(x+3)(3x+2)$

2●  $5x^2 - 17x + 14$

$5 \cdot 14 = 70$   
 $\wedge$   
 $\textcircled{-10} + \textcircled{-7} = -17$

$5x^2 - 10x - 7x + 14$   
 $5x(x-2) - 7(x-2)$

$(x-2)(5x-7)$

3●  $8x^2 - 6xy - 9y^2$

$8 \cdot (-9) = -72$

$\wedge$   
 $\textcircled{-12} + \textcircled{6} = -6$

$8x^2 - 12xy + 6xy - 9y^2$

$4x(2x-3y) + 3y(2x-3y)$

$(2x-3y)(4x+3y)$



4●  $18a^2 + 33ab - 30b^2$

$3(6a^2 + 11ab - 10b^2)$

$6 \cdot (-10) = -60$

$\wedge$   
 $\textcircled{15} + \textcircled{-4} = 11$

$3[6a^2 + 15ab - 4ab - 10b^2]$

$3[3a(2a+5b) - 2b(2a+5b)]$

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

# 6.1 Problems

## FACTORS & MULTIPLES

Determine the GCF and LCM for each:

- ①  $6a^2$   $18b^2$   $9b^3$
- ②  $3ax$   $10bx$   $12cx$
- ③  $8b^4$   $5c$   $3a^2b$
- ④  $15abc$   $35a^2c$   $105a$
- ⑤  $8a^2b^2$   $12a^3c^2$   $14abc^2$
- ⑥  $20x^2yz$   
 $12xy^3$   
 $27xyz^2$
- ⑦  $28a^4bc$   $36ab^3$   $21b^2c$
- ⑧  $8n^3m^2$   $36n^4mp^2$   $24nm^3p$
- ⑨  $18a^2b^2$   $6b$   $42a^2b^3$
- ⑩  $24a^2b$   $28axy$   $36ay$
- ⑪  $60x^2y^2$   $35xz^3$   $28xy^4z$
- ⑫  $56x^3y$   $49ax^2$   $8xy^2$
- ⑬  $40n^3m^4$   $36n^2m^2$   $60n^5m^3$
- ⑭  $18xyz$   $30abc$   $54n$
- ⑮  $24m^2n^3$   $20mn^3$   $28m^3n^4$
- ⑯  $36a^2$   $28b^2$   $45c^2$

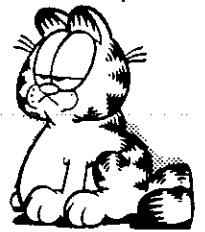


# 6.2 Problems

## COMMON FACTORS

Factor each expression:

- ①  $3x^2y + 9y^2 + 6$
- ②  $5a^2 + 10ab - 15b^2$
- ③  $2a^3b^2 - 16a^2b^3 + 8ab$
- ④  $3x^3y + 9xy^2 + 36xy$
- ⑤  $24x^2y^2 + 12xy + x$
- ⑥  $28a^2b^2c^2 + 21a^2bc^2 - 14abc$
- ⑦  $12ax + 20bx + 32cx$
- ⑧  $a + a^2b + a^3b^3$
- ⑨  $ax^3 + 5bx^3 + 9cx^3$
- ⑩  $14a^3x + 19a^3y + 11a^3z$
- ⑪  $6x^2 - 9xy + 24x^2y^2$
- ⑫  $\frac{1}{2}x^2 - \frac{1}{4}ax$
- ⑬  $\frac{2}{3}x + \frac{1}{3}y$
- ⑭  $\frac{4}{5}x^2y + \frac{3}{5}y^2$
- ⑮  $\frac{2}{5}a - \frac{2}{5}b + \frac{4}{5}c$



Review GCF and LCM

- ⑯  $32a^3b$   $40a^2bc$   $48a^2b^2c$
- ⑰  $25xy$   $45x^2$   $55y^2z^2$
- ⑱  $44n^3m^7$   $24n^2m^6$   $20n^3m^8$

# 6.3 Problems

## FACTORIZING THE DIFFERENCE OF PERFECT SQUARES

State whether each binomial is the difference of perfect squares:

- |                                  |                          |
|----------------------------------|--------------------------|
| ① $x^2 - y^2$                    | ⑦ $8c^2 - 7$             |
| ② $a^2 + b^2$                    | ⑧ $a^2 - 1$              |
| ③ $9x^2 - 5$                     | ⑨ $\frac{16}{25}x^2 + 1$ |
| ④ $36a^2 - 49$                   |                          |
| ⑤ $\frac{4}{9}a^2 - \frac{1}{4}$ |                          |
| ⑥ $b^2 - 25$                     |                          |



Factor each polynomial:

- |  |                                      |
|--|--------------------------------------|
| ⑩ $x^2 - y^2$                          | ⑲ $3a^3 - 12ab^2$                    |
| ⑪ $a^4 - b^2$                          | ⑳ $x^4 - 1$                          |
| ⑫ $x^2 - 1$                            | ㉑ $a^4 - b^4$                        |
| ⑬ $a^2 - 4b^2$                         | ㉒ $2x^8 - 2$                         |
| ⑭ $x^2 + y^2$                          | ㉓ $16ax^4 - a^5$                     |
| ⑮ $2a^2 - b^2$                         | ㉔ $15n^3 - 60m^2n$                   |
| ⑯ $\frac{4}{25}n^2 - \frac{1}{9}m^2$   | ㉕ $6a^2b - 24b^3$                    |
| ⑰ $\frac{1}{4}c^4 - \frac{49}{100}d^2$ | ㉖ $2xy^4 - 162x$                     |
| ⑱ $6m^2 - 24n^2$                       | ㉗ $\frac{2}{3}x^2 - \frac{8}{3}$     |
| ⑲ $5x^2 - 5y^2$                        | ㉘ $\frac{9}{2}x^2 - \frac{49}{2}y^2$ |

- |                   |                       |
|-------------------|-----------------------|
| ⑳ $(a+b)^2 - m^2$ | ㉓ $a^2 - (b-c)^2$     |
| ㉑ $(x-y)^2 - y^2$ | ㉔ $(a+b)^2 - (a-c)^2$ |
| ㉒ $p^2 - (m+n)^2$ | ㉕ $(x-y)^2 - (x+z)^2$ |

# 6.4 Problems

## FACTORIZING PERFECT SQUARE TRINOMIALS

State whether each is a perfect square trinomial:

- ①  $a^2 + 4a + 4$
- ②  $x^2 + 10x + 100$
- ③  $n^2 - 18n + 36$
- ④  $4x^2 + 24x + 36$
- ⑤  $9a^2 - 12ab + 4b^2$
- ⑥  $25x^2 + 15xy + 9y^2$

Factor each polynomial:

- ⑦  $a^2 + 12a + 36$
- ⑧  $b^2 + 10b + 25$
- ⑨  $121y^2 + 22y + 1$
- ⑩  $81n^2 + 36n + 4$
- ⑪  $25b^2 - 30b + 9$
- ⑫  $64x^2 - 72x + 81$

$$\textcircled{13} m^2 - 16mn + 64n^2$$

$$\textcircled{14} 9x^2 - 24xy + 16y^2$$

$$\textcircled{15} 25a^2 + 40a + 9$$

$$\textcircled{16} 144n^2 + 168n + 49$$

$$\textcircled{17} 3x^2 + 18x + 27$$

$$\textcircled{18} 2n^2 - 20n + 50$$

$$\textcircled{19} 6a^2 + 24ab + 24b^2$$

$$\textcircled{20} 12a^2 + 12ab + 3b^2$$

$$\textcircled{21} 3b^2 - 18bc + 27c^2$$

$$\textcircled{22} 2m^2 - 16mn + 32n^2$$

$$\textcircled{9} a^2 + 5a - 50$$

$$\textcircled{10} b^2 + 2b - 48$$

$$\textcircled{11} x^2 - 10x + 39$$

$$\textcircled{12} c^2 - 2cd - 8d^2$$

$$\textcircled{13} a^2 + 2ab - 3b^2$$

$$\textcircled{14} a^2 - 6ab - 32b^2$$

$$\textcircled{15} m^2 - mn - 6n^2$$

$$\textcircled{16} x^2 - 4xy - 5y^2$$

$$\textcircled{17} (a+b)^2 - 5(a+b) + 6$$

$$\textcircled{18} (x+y)^2 - 8(x+y) - 9$$

$$\textcircled{19} 3x^2 + 15x - 108$$

$$\textcircled{20} 5n^2 - 15n - 90$$

$$\textcircled{21} 4a^2 + 8ab - 12b^2$$

### Review

Factor each polynomial:

$$\textcircled{23} x^4 - 16$$

$$\textcircled{24} 162a^5 - 32ab^4$$

$$\textcircled{25} 98x^6 - 128y^8$$

$$\textcircled{26} (2x-y)^2 - (x+4y)^2$$

$$\textcircled{27} (a+b)^2 - (3a-2b)^2$$

$$\textcircled{28} 24a^2b + 8ab - 12ab^2$$

$$\textcircled{29} 9xy - 15x^2y^2 + 3xy^3$$

Determine GCF/LCM

$$\textcircled{30} 6abc, 15a^2c^3, 48ab^4c^2$$

## 6.5 Problems

### FACTORING $x^2 + bx + c$



Factor each trinomial (if possible):

$$\textcircled{1} y^2 + 12y + 27$$

$$\textcircled{2} x^2 + 9x + 20$$

$$\textcircled{3} m^2 - 12m + 27$$

$$\textcircled{4} b^2 - 11b + 28$$

$$\textcircled{5} c^2 + 3c + 6$$

$$\textcircled{6} r^2 - 12r + 20$$

$$\textcircled{7} a^2 + 22a + 21$$

$$\textcircled{8} c^2 + 10c + 20$$

### Review

Factor completely:

$$\textcircled{22} 3x^2 - 3y^2$$

$$\textcircled{23} 12ab^2 - 3a^3$$

$$\textcircled{24} c^2 + 10c + 25$$

$$\textcircled{25} 4ab^2 - 8abc + 4ac^2$$

$$\textcircled{26} 5x^2 - 20xy + 20y^2$$

$$\textcircled{27} (2a-3b)^2 - (a+5b)^2$$

$$\textcircled{28} (4x+3y)^2 - (x+y)^2$$

$$\textcircled{29} \frac{1}{2}ab^2 + \frac{1}{4}a^2b - \frac{3}{4}ab$$

Determine GCF/LCM:

$$\textcircled{30} 16a^2b^3, 18abc, 15bc^3$$

# 6.6 Problems

## FACTOR BY GROUPING

Factor each polynomial:

- ①  $a^2 - ab + 2ab - 2b^2$
- ②  $3x^2 + 9xy - 2xy - 6y^2$
- ③  $4ax + 3ay + 4bx + 3by$
- ④  $x^2 + 5xy + ax + 5ay$
- ⑤  $4n^2 + 12mn - 2mn - 6m^2$
- ⑥  $4y^3 + 4y^2 - 4y - 4$
- ⑦  $5x^3 + 10x^2 - 5x - 10$
- ⑧  $2a^3 - 2a^2b - 2ab^2 + 2b^3$
- ⑨  $ay - ab + cb - cy$
- ⑩  $3ax - 6bx + 8b - 4a$
- ⑪  $10a^2 - 8ab + 24b^3 - 30ab^2$
- ⑫  $3x^3 - 3xy^2 + 3y^3 - 3x^2y$

### Review

Factor completely:

- ⑬  $y^2 - 9y - 36$
- ⑭  $(a+b)^2 - 5(a+b) - 6$
- ⑮  $(x+y)^2 - 10(x+y) - 24$
- ⑯  $8a^2 - 32b^2$



- ⑰  $48a^4 - 3$
  - ⑱  $64b^2 + 16b + 1$
  - ⑲  $18a^2 - 48a + 32$
  - ⑳  $(2n+3x)^2 - (n+x)^2$
- Determine GCF and LCM:
- ㉑  $20xy^2z \quad 24x^3y^3 \quad 30x^2y^2z^2$

### Challenge

Factor completely:

- ㉒  $x^4 - x^2y^2 + 9y^2 - 9x^2$
- ㉓  $8a^6 - 8a^2 + 2 - 2a^4$

# 6.7 Problems

## FACTORING $ax^2 + bx + c$

- ①  $4b^2 + 5b - 6$
- ②  $4y^2 - 17y - 15$
- ③  $16a^2 - 38ab - 5b^2$
- ④  $20x^2 + 11xy - 4y^2$
- ⑤  $5b^2 - 13b - 10$
- ⑥  $15x^2 - 13xy + 2y^2$
- ⑦  $4y^2 - 10y + 6$
- ⑧  $9a^2 + 24ab + 12b^2$

Factor: GCF

- ⑨  $4xy^2 - 6x^2y + 2xy$   
⑩  $36a^2b^2 - 12ab$

Factor: Difference of Perfect Squares

- ⑪  $9x^4 - 16y^2$   
⑫  $3x^4 - 3$   
⑬  $2a^2 - 2(a-b)^2$

Factor: Perfect Square Trinomials

- ⑭  $y^2 + 14y + 49$   
⑮  $2x^2 - 20xy + 50y^2$   
⑯  $16a^2 - 12a + 9$

Factor:  $x^2 + bx + c$

- ⑰  $t^2 + 17t + 72$   
⑱  $2a^3b - 24a^2b + 70ab$   
⑲  $(a+b)^2 - 2(a+b) - 8$

Factor: Grouping

- ⑳  $3my - 3by - ab + am$   
㉑  $4ax - 4bx - 3by + 3ay$   
㉒  $7a^2m - 7b^2m + 5b^2y - 5a^2y$   
㉓  $6ab^2 - 15ab + 9a$

㉔  $2x^2 - 7xy + 3y^2$

㉕  $8a^2x^4 - 8a^2y^4 + 2b^2y^4 - 2b^2x^4$

Determine GCF and LCM

㉖  $18a^3bc^2$   $25a^2b^3c$   $42a^4bc$

Unit 6

## REVIEW PROBLEMS PART I

Determine GCF and LCM:

- ①  $6a^3bc$   
 $20ab^4c^2$   
 $45b^3c$



Factor: GCF

②  $3x^5y - 3x + 6xy$

Factor: Difference of Perfect Squares

③  $81a^4 - 16b^4$

Factor: Perfect Square Trinomial

④  $12a^2 + 12ab + 3b^2$

continued

Unit 6  
**REVIEW  
 PROBLEMS**  
 PART II

SLUP



Factor:  $x^2+bx+c$

- ⑤  $c^2-23c+60$   
 ⑥  $(x-y)^2-5(x-y)-24$

Factor: Grouping

- ⑦  $2ax+6xc+ya+3yc$   
 ⑧  $ab^2+mb^2-16a-16m$

Factor:  $ax^2+bx+c$

- ⑨  $3a^2-10ab-8b^2$   
 ⑩  $6y^2-19y+15$

Factor: Using all methods

- ⑪  $5n^2-30mn+45m^2$   
 ⑫  $5a^2-2a+3$   
 ⑬  $3x^2-3(x+y)^2$   
 ⑭  $2mn^2-22mn+48m$   
 ⑮  $6a^2-6ab+3cb-3ca$   
 ⑯  $3x^2+4x-15$   
 ⑰  $(a-b)^2+15(a-b)-54$   
 ⑱  $32a^4b-8a^2b$   
 ⑲  $3xk^2-3xm^2-4am^2+4ak^2$   
 ⑳  $10x^2-14xy+5xy-7y^2$   
 ㉑  $x^2y^2-y^2+z^2-x^2z^2$   
 ㉒  $3y^4-48$

Determine GCF and LCM:

- ⑳  $5x^3y^3$     ㉑  $18a^2b^2c^2$   
 $15xy^2z$      $25abc$   
 $12xy^4z^2$      $12c^3$

Factor (if possible):

- ㉒  $24a^2b-8a^4b^3c+32a^3c$   
 ㉓  $n^2-8n+16$   
 ㉔  $x^2-6x-27$   
 ㉕  $n^4-m^4$   
 ㉖  $8a^2b-10ab-12ab+15b$   
 ㉗  $5a^2-3ab+3b^2$   
 ㉘  $x^4-16y^4$   
 ㉙  $15a^2-15ab+5b^2-5ab$   
 ㉚  $12x^3+27x^2y-27xy^2$   
 ㉛  $32a^3b^2-8ab^4$   
 ㉜  $36x^2-48xy+16y^2$   
 ㉝  $8a^3-8a^2b-6ab+6a^2$   
 ㉞  $7n^8-7$   
 ㉟  $(x-y)^2-6(x-y)+9$   
 ㊱  $7a^2-22ab+3b^2$   
 ㊲  $x^6y-x^2y^5$   
 ㊳  $(2x+3y)^2-(x-y)^2$   
 ㊴  $3x^2b^2-12x^2+12a^2-3a^2b^2$





## Unit 6 SKILL CHECK

Determine the GCF and LCM:

①  $12n^3m$   $30n^2m^2x$   $54nm^3x^3$

Factor (if possible):

②  $n^2 - 12n + 35$

③  $4x^2 - 5xy - y^2$

④  $6xy - 3y^2 - 9xy + 18x^2$

⑤  $10a^3 - 45a^2b + 20ab^2$



⑥  $2ax - 6bx - 24b + 8a$

⑦  $3n^8 - 3$

⑧  $(2x - y)^2 - 10(2x - y) + 25$

⑨  $(3x + 2)^2 - (x - 3)^2$

⑩  $12a^2c^2 - 12a^2d^2 + 3x^2d^2 - 3x^2c^2$

⑪  $4a^2b^2 + 12abc - 20ac^2$

## Unit 6 REMEDIATION

Determine the GCF and LCM:

①  $75a^6bc^3$   
 $36ab^2c^2$   
 $8b^3c^3$



Factor  
(if possible):

②  $n^2 + 8n - 33$

③  $7a^2 - 8ab - b^2$

④  $4a^2x - 12a^2 - 24a + 8ax$

⑤  $6n^3 - 33mn^2 + 15m^2n$

⑥  $5ax^2 - 10bx^2 + 10by^2 - 5ay^2$

⑦  $5x^9 - 5x$

⑧  $(3n + 2m)^2 - 14(3n + 2m) + 49$

⑨  $(2a - 3b)^2 - (a + 5b)^2$

⑩  $3a^2n^2 - 12a^2 + 48b^2 - 12b^2n^2$

⑪  $15xy - 9x^2yz + 21xy^3$



## Unit 6

# EXTRA PRACTICE

Determine the GCF, LCM:

①  $16x^2yz, 18x^2y^3, 20x^3yz^2$

②  $12a^3b^2c^2, 36ab^3c^2, 30a^2bc$

Factor completely (only one expression is not factorable):

③  $8x^2 + 12xy^2 - 24x^3y$

④  $n^2 - 10n + 25$

⑤  $x^2 - 5x - 24$

⑥  $a^2 + 5ab + 6b^2$

⑦  $a^2 - 2b^2$

⑧  $12n^2 - 3n + 20n - 5$

⑨  $a^4 - 16b^4$

⑩  $4x^2 - 12xy - 3y^2 + xy$

⑪  $8x^2 - 10xy - 3y^2$

⑫  $2a^2 - 8b^2$

⑬  $3x^2 - 18xy + 27y^2$

⑭  $6a^2 - 16ab + 8b^2$

⑮  $6n^5 - 6n$

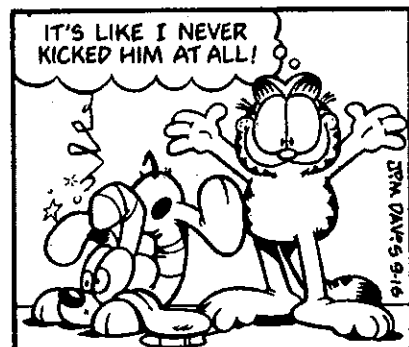
⑯  $(x+y)^2 - 6(x+y) + 9$

⑰  $20x^2 + 11x - 3$

⑱  $2x^3y - 2xy^3$

⑲  $(3x+y)^2 - (2x-5y)^2$

⑳  $3x^2a^2 - 3a^2y^2 + 12b^2y^2 - 12x^2b^2$



# Cumulative Review

## "A"

Problems

### QUARTER #2 REVIEW

Identify the property:

- ①  $2n + (3x + y) = (2n + 3x) + y$   
 ② If  $x = 3y$  and  $3y = 2c$ ,  
 then  $x = 2c$

Evaluate the expression:  
 $x = -3$ ,  $y = -2$

③  $\frac{2x - 3xy^2}{y^3 + 3xy}$



Solve the equation:

④  $4n - 3(2n - 1) = 1 - 3n$

Solve for  $x$ :

⑤  $4xy - 3ab = 3(x + y)$

Solve the inequality:

⑥  $3n - \frac{2n}{5} < 5(n - 4) - 4$

Solve and graph:

- ⑦  $2n - 3 < -7$  or  $3n + 4 > 10$   
 ⑧  $|2a - 8| + 4 \leq 12$

Simplify each expression:

- ⑨  $2xy(x - 3y) - 3y(x^2 + xy)$   
 ⑩  $(-3a^2b^{-2})^3 - 2a^1b^{-1}(ab)^{-5}$   
 ⑪  $\frac{-6x^3y^{-2}z^{-4}}{8x^5y^{-1}z^3}$   
 ⑫  $\frac{2n^{3x}}{n^{x+2}}$



Multiply or divide:

- ⑬  $(2x + 3)(5x - 4)$   
 ⑭  $(3a^3 - 2b^3) \div (a + b)$

Evaluate in scientific notation:

⑮  $\frac{.064 \times 10^{-7}}{.8 \times 10^{-2}}$

Determine the GCF and LCM:

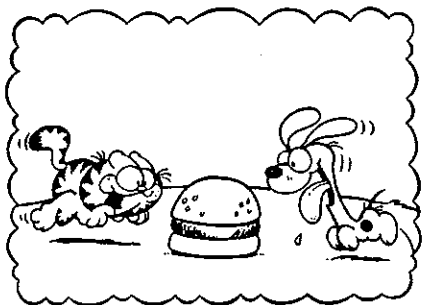
⑯  $14a^2b$   $60ab^3c$   $100ab^2c^2$

Factor completely:

- ⑰  $16xy^4 - x^5$   
 ⑱  $12a^2 + 10ab - 8b^2$   
 ⑲  $(3a + 2b)^2 - (a - 5b)^2$   
 ⑳  $a^2x^2 - 4a^2y^2 + 36y^2 - 9x^2$

Define a variable, set up an equation, and solve:

- (21) Four more than four times a number decreased by two less than a number is thirty-nine. Find the number.
- (22) Sharon earns a base salary of \$275 per week plus  $5\frac{1}{2}\%$  commission on sales. What were her sales if she takes home \$1056 during a three week period?
- (23) The sum of two consecutive positive odd integers is between -6 and 14. Find the integers.



- (24) Wesley has 24 coins in nickels, dimes, and quarters. He has two more dimes than nickels and \$2.20 in all. How many dimes?
- (25) A table lamp costs \$25.97 after 6% tax is added. What was the original cost of the lamp before sales tax?
- (26) How many liters of a 60%

acid solution should be added to 10L of a 20% solution to produce a 50% acid solution?

- (27) Liz is  $\frac{3}{4}$  as old as Jennifer. Liz's age 2 years ago was half what Jennifer's age will be 4 years from now. How much older is Jennifer?
- (28) Kevin left home at 1:00 PM driving 36 mph on his way to the campsite. His brother Joe left 30 minutes later and arrived 15 minutes earlier. If Joe drove 48 mph, at what time will he arrive at the campsite?
- (29) A photograph has a length 4 inches less than twice its width. If it fits exactly inside a frame that is  $1\frac{1}{2}$  inches all the way around, and the frame has an area of  $51 \text{ in}^2$ , what are the outside dimensions of the frame?

- (30) Amanda invested \$10,400, part at 10% and part at 8% annual interest. She earned twice as much on the 10% investment. Determine how much Amanda invested at 8% interest.



# "B"

## Problems

### QUARTER #2 REVIEW

Identify the property:

① If  $2n = 3m^2$  then  $3m^2 = 2n$

②  $\left(\frac{-2x}{y}\right)\left(\frac{-y}{2x}\right) = 1$

Evaluate the expression:  
 $a = -1$   $b = -2$   $c = 2$

③  $4ab - 2a^3bc$

Solve the equation:

④  $3x - \frac{x}{4} = 2(x-1) - 7$

Solve for  $n$ :

⑤  $4ab + 3n = m(n-2)$

Solve the inequality:

⑥  $\frac{3x+4}{7} \geq \frac{2(x+3)}{3}$

Solve and graph:

⑦  $n+4 < 2n+6 \leq 9-n$

⑧  $|4x-2| > 10$

Simplify each expression:

⑨  $2a(a-b) - a^2(b+1) - ab$

⑩  $(-4a^2b)^3 \left(\frac{1}{2}a^{-3}b^2\right)^3$

⑪  $\frac{-12a^2b^{-3}c^{-1}d^{-4}}{9ab^{-5}cd^{-2}}$

⑫  $\frac{4ab^{3n-1}}{2b^{n+4}}$

Multiply or divide:

⑬  $(4x+y)(2x-3y)$

⑭  $(x^4 - y^4) \div (x+2y)$

Evaluate in scientific notation:

⑮  $(2.5 \times 10^3)(8.2 \times 10^{-8})$

Determine GCF and LCM:

⑯  $15x^2y$   
 $50xyz$   
 $21yz^2$



Factor completely:

⑰  $3a^8 - 3$

⑱  $3a^3 - 13a^2b + 12ab^2$

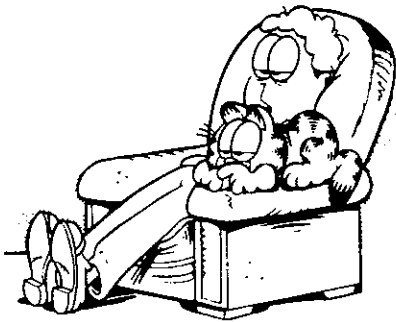
⑲  $(a+b)^2 - 6(a+b) + 9$

⑳  $18ny^2 - 9my^2 + 4mx^2 - 8nx^2$

continued

Define a variable, set up an equation, and solve:

- (21) The largest of three consecutive odd integers decreased by six less than twice the smallest is three. Find the middle integer.



- (22) Bill's weekly income includes \$190 in salary plus  $8\frac{1}{4}\%$  commission on sales. What were his sales if he takes home \$617.60 after two weeks?
- (23) Find an even integer if 3 less than twice the integer is between 12 and 20.
- (24) Lynnea has 22 coins in nickels, dimes, and quarters that total \$3.70. How many dimes are there if she has twice as many quarters as nickels?
- (25) Ted purchased a video for \$20.58 (including 5% tax). Determine the

price before tax.

- (26) How much water must be evaporated from 40ml of a 30% salt solution to raise the concentration to 75%?
- (27) Mark is  $\frac{2}{3}$  as old as Brad. Mark's age in 4 years is  $\frac{4}{5}$  Brad's age in 3 years. How old is Brad?
- (28) Sue leaves the park driving 30 mph at 2:30 PM heading due north. Ellen leaves the park 45 minutes later heading due south. At 5:00 PM, they are 145 miles apart. How fast is Ellen driving?
- (29) A photo has a length 3 inches less than twice its width. What are its dimensions if it fits into an  $85 \text{ in}^2$  rectangular frame with a uniform width of  $2\frac{1}{2}$  inches?
- (30) Melanie invested \$10,800, part at 10% and part at 15% annual interest. She earned \$120 more on the 15% investment. How much did she invest at each of the rates?



# "C"

## Problems

### QUARTER #2 REVIEW

Identify the property:

- ① If  $a^2 = 12$ , then  
 $a^2 + b^2 = 12 + b^2$
- ②  $0 = (5mn) + (-5mn)$

Evaluate the expression:  
 $m = -2$     $n = -1$

③  $4mn^2(3n-m)^2$

Solve the equation:

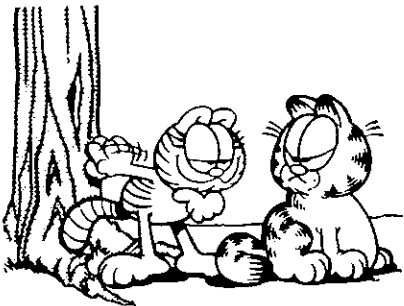
④  $2(2x+4) - 3 = 3x - \frac{x}{4}$

Solve for  $x$ :

⑤  $4y(x+3) = xy^2 - 1$

Solve the inequality:

⑥  $\frac{4n-5}{3} > 5(n-4)$



Solve and graph:

- ⑦  $2n-3 > 11$  or  $4-3n < 10$
- ⑧  $|x-4| - 3 \leq 13$

Simplify each expression:

- ⑨  $4ab - 2a(b-3a) - 4a^2 + ab$
- ⑩  $(\frac{1}{3}x^2y^{-1})^3 (9x^{-2}y^4)^2$
- ⑪  $\frac{-6a^3b^2c^{-4}d^{-3}}{-8a^2b^{-5}c^3d^{-6}}$
- ⑫  $\frac{2x^2y^{4n+3}}{xy^{n-2}}$

Multiply or divide:

- ⑬  $(3n-2m)(n-8m)$
- ⑭  $(8a^3-b^3) \div (2a+b)$

Evaluate in scientific notation:

⑮  $\frac{3.5 \times 10^5}{.007 \times 10^{-2}}$

Determine GCF and LCM

⑯  $16a^3b$     $24a^2b^2$     $100a^4b$

Factor completely:

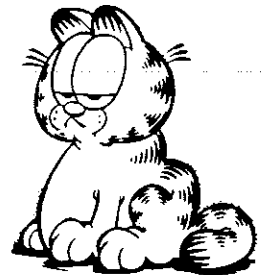
⑰  $16n^5 - m^4n$

- ⑱  $-6x^2 - 22xy + 8y^2$
- ⑲  $(3n-2m)^2 - (n+5m)^2$
- ⑳  $16a^4 - 16b^4 + x^4b^4 - x^4a^4$

Define a variable, set up an equation, and solve:

- ㉑ Two more than three times the larger of two consecutive even integers decreased by one less than the smaller integer is negative three. Find the larger integer.
- ㉒ Jan's weekly salary of \$230 is supplemented by  $6\frac{1}{2}\%$  commission on all sales. If he earns \$1560.90 over a four week period, what were his sales?
- ㉓ Four more than three times a negative odd integer is between -18 and 10. Determine the integer.
- ㉔ Julie has \$4.55 in nickels, dimes, and quarters. She has 4 more quarters than dimes and 30 coins in all. How many nickels does she have?
- ㉕ Jadzia paid \$45.05 for shoes (including 6% tax). What was the price before the tax was added?

- ㉖ How many kg of a 20% copper alloy should be added to 12 kg of a 60% alloy to produce a 25% alloy?
- ㉗ Beth is  $\frac{3}{5}$  as old as Marla. 4 years ago, Beth was  $\frac{1}{3}$  as old as Marla will be 4 years from now. How much older is Marla?
- ㉘ Charlie drove to Middleton at 48 mph. Emilio made the same trip at 40 mph but it took him one hour more. How far is it to Middleton?
- ㉙ A 2-foot wide sidewalk surrounds a rectangular garden. The length of the garden is 2 feet more than twice its width. What are the dimensions of the garden if the area of the sidewalk is  $84 \text{ ft.}^2$ ?
- ㉚ Jay invests \$8000, part at 8% and part at 12% annual interest. If he wants to earn the same amount from each investment, how much must he invest at 8% and how much must he invest at 12%?





## Quarterly Exam #2

# REMEDIATION & EXTRA PRACTICE

Identify the property:

①  $6.4 + 2.\bar{3} = \text{a rational}$   
 $3n \cdot (\frac{1}{3n}) = 1$

Evaluate the expression:

$x = -1$   $y = -3$

②  $4xy^2 - 2x^3$   
 $3xy - x^2y^2$

Solve for  $x$ :

③  $4x - 3y = 5xy + y^2$   
 $2y + x = 3xy + 7$

Solve the inequality:

④  $3n - \frac{2n}{4} \leq 5(n+2)$

$\frac{4n}{6} > 4 - 2(2n-5)$

Solve and graph:

⑤  $|2n-7| - 3 > 2$   
 $5 + |2n-1| \leq 6$

Simplify each expression:

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

⑦  $(-\frac{1}{3}a^2b^{-3})^2 (-3a^{-3}b)^3$   
 $(x^{-2}y^3z^{-1})^{-2} (x^2yz^{-3})^2$

⑧  $\frac{-12a^3b^{-2}c}{-18a^{-5}bc^{-2}}$   
 $\frac{4x^2y^{-3}z^{-1}}{-2x^{-3}y^{-5}z}$

multiply:

⑨  $(n+5)(2n-4)$   
 $(3x-y)(2x-5y)$

continued



Divide:

$$\textcircled{10} (5a^3 + 4b^3) \div (a - b)$$

$$(6x^3 + 13x^2y + 11xy^2 - 8y^3) \div (2x + y)$$

Evaluate in scientific notation:

$$\textcircled{11} \frac{560 \times 10^{-2}}{.08 \times 10^5}$$

$$\frac{.32 \times 10^{-6}}{25 \times 10^3}$$



Determine GCF & LCM:

$$\textcircled{12} 12a^2b^3c^4, 28ab^2c^5, 30a^3b^4c^2$$

$$9x^3y, 25x^2yz, 12y^2$$

Factor completely:

$$\textcircled{13} 32x^5y^2 - 2xy^6$$

$$3a^2 - 6ab + 3b^2$$

$$\textcircled{14} 2x^2 + 7xy - 15y^2$$

$$12a^2 + 14ab - 6b^2$$

Define a variable, set up an equation, and solve:

- $\textcircled{15}$  Josh has 3 more dimes than nickels and a total of 22 coins worth \$2.25. How many quarters?

Bud has twice as many quarters as dimes and twice as many dimes as nickels. If he has a total of \$2.50, how many nickels does he have?

- $\textcircled{16}$  How many ounces of an 80% acid solution should be added to 12 ounces of a 30% solution to produce a 50% solution?

How much water must be evaporated from 6 liters of a 25% salt solution to produce a 75% solution?

- $\textcircled{17}$  Jon leaves at 2:00 driving 45 mph, Lisa leaves 15 minutes later driving in the same direction. How fast must she drive to catch Jon by 6:00?

Scott leaves the park at 10:30 driving 36 mph. Brad leaves an hour

later driving in the opposite direction at 32 mph. At what time will they be 172 miles apart?

as Felipe. 2 years ago, Matty was half as old as Felipe will be 2 years from now. How old will Felipe be next year?

- ⑮ A photo with a length 2 inches more than its width fits exactly in a frame that is  $1\frac{1}{2}$  inches all the way around. If the area of the frame is  $33 \text{ in}^2$ , what are the dimensions of the photo?

A garden is 4 feet longer than it is wide. It is surrounded by a sidewalk that is 2 feet all the way around. If the area of the sidewalk is  $56 \text{ ft}^2$ , what are the outer dimensions of the sidewalk?

Factor completely:

⑯  $4a^2x^4 - b^2x^4 + b^2y^4 - 4a^2y^4$   
 $16y^2 - 16 + x^4 - y^2x^4$

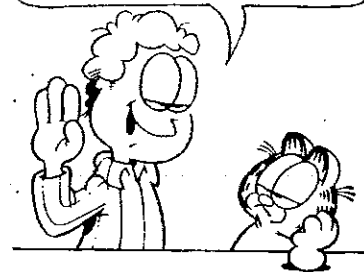
Solve:

- ⑰ Matty is  $\frac{7}{5}$  as old

Margaret is  $\frac{1}{4}$  as old as Judy. In 3 years, Margaret will be  $\frac{3}{4}$  as old as Judy was 4 years ago. How many years older is Judy?



I RESOLVE TO BE LESS GEEKY, AND MORE SOPHISTICATED



... HE SAID AS HE BLEW CHOCOLATE MILK BUBBLES INTO HIS BINKY THE CLOWN MUG

