GEOMETRY

The purpose of the packet is to help you review and reinforce concepts/topics that are necessary for Geometry. This packet has been designed to provide a review of Algebra I skills that are essential for student success in Geometry. It also contains a review of Geometry concepts students should have previously learned. All work must be shown and final answers should be circled. Students must show work that supports their understanding. Students will be given a grade for completing the packet correctly. It may be necessary to seek assistance on some questions/concepts... that is fine! Websites that may be of assistance: www.mathforum.org/dr.math Use this web site if you have a math questions that you need answered.

- www.allmath.com
  This website will provide you with links to games, reference, general math help and resources. www.mathforum.com This online community includes teachers, students, researchers, parents and educators who have an interest in math and math education. The site includes Ask Dr. Math, Problems of the Week, discussion groups and much more.
- www.AAAmath.com.
  Customized by grade level and topic, AAA Math features explanations of various mathematical topics, practice problems and fun, challenging games. www.coolmath.com This fully interactive site and allows the user to sharpen basic math skills, play games and explore new math concepts.
- www.figurethis.org
  Created by the National Council of Teachers of Mathematics, this site helps families enjoy mathematics outside school through a series of fun and engaging challenges.

Algebra I Topics

Equations
Variables and Expressions
Solving Equations
Solving for a Variable
Rates, Ratios, and proportions

Functions
Graphing Relationships
Relations and Functions
Writing Functions
Graphing Functions
Scatter Plots and Trend Lines
Arithmetic Sequences

Linear Functions
Identifying Linear Functions
Using Intercepts
Rate of Change and Slope
The Slope Formula
Direct Variation
Slope-Intercept Form
Point-Slope Form
Slopes of Parallel and Perpendicular Lines
Transforming Linear Functions

Systems of Equations
Solving Systems by Graphing
Solving Systems by Substitution
Solving Systems by Elimination
Solving Special Systems

Polynomials
Special Products of Binomials
Multiplying Polynomials
Adding and Subtracting Polynomials

Factoring Polynomials
Factors and Greatest Common Factors
Factoring by GCF
Factoring x^2+bx+c
Factoring Special Products

Quadratic Functions and Equations
Solving Quadratic Equations by Factoring
Solving Quad Equations by Using Square Roots
The Quadratic Formula
Completing the Square

Geometry Topics

Angles
Angle Relationships
Triangle Angle Sum

Plane Figures
Area
Perimeter/Circumference
Similarity
Pythagorean Theorem

Solid Figures
Volume
Similarity

Solve each equation.

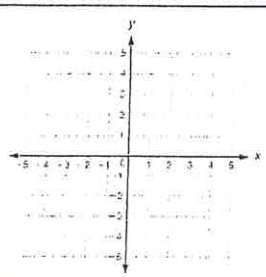
1. $-x-9=x+3$	2. $7r-4+2r=12+7r$
3. $-5-4(n+3)=-19-3n$	4. $-3(3-k)=3(k+3)$

Solve for the indicated variable.

5. $d=rt$ for r	6. $ax+by+c=0$ for y
7. $A=\frac{e+f}{2}$ for e	8. $3k+7n=p$ for k

Use intercepts to graph the line described by the equation.

9. $4x+3y=-12$



Find the slope of the line.

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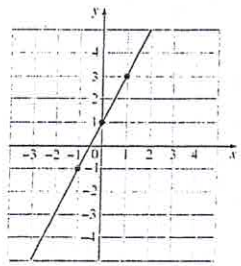

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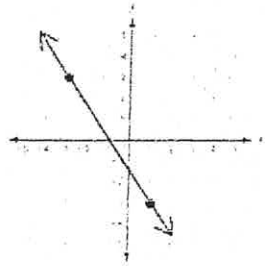

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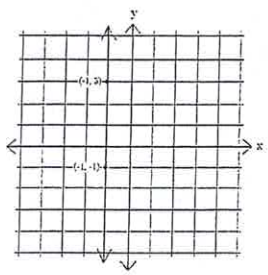

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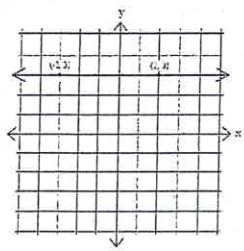


Find the slope of the line that contains each pair of points.

14. $(3,10)$ and $(2,5)$

15. $(12,-2)$ and $(0,6)$

Find the slope of the line described by each equation.

16. $5x+4y=40$

17. $7x+42=2y$

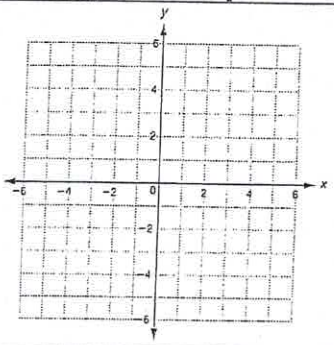
Write the equation that describes each line in slope-intercept form.

18. slope = 8; y-intercept = -6

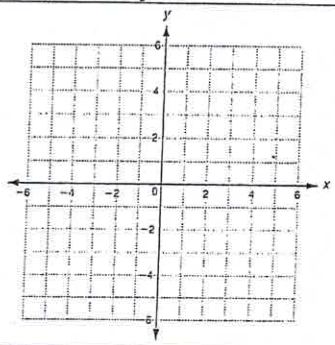
19. slope = $-\frac{1}{2}$, $(8,-1)$ is on the line

Write each equation in slope-intercept form. Then graph the line described by the equation.

20. $y + x = 3$



21. $5x - 2y = 10$



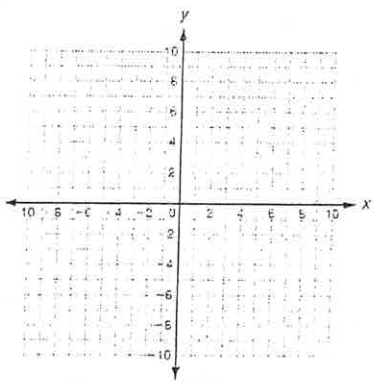
Write an equation in point-slope form for the line with the given slope that contains the given point.

22. slope = 4; (5, 6)

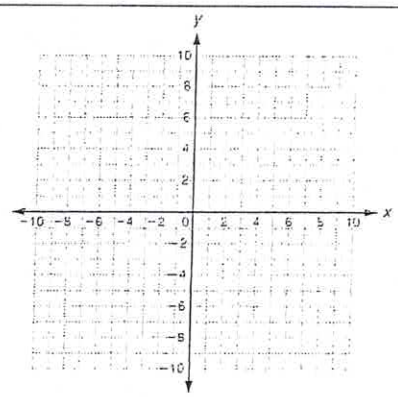
23. slope = –3; (7, –2)

Graph the line described by each equation.

24. $y - 3 = \frac{2}{3}(x + 1)$

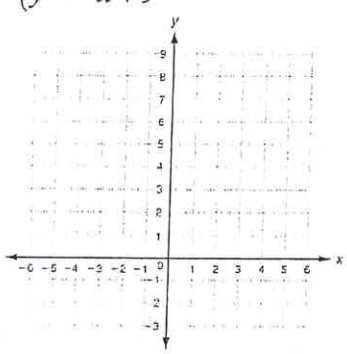


25. $y + 4 = -3(x - 4)$

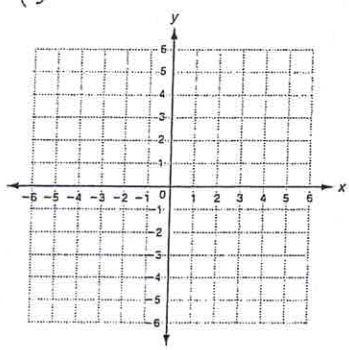


Solve each system by graphing.

26. $\begin{cases} y = 2x + 3 \\ y = -x + 9 \end{cases}$ Solution: _____



27. $\begin{cases} y = -3x + 4 \\ y = 2x + 4 \end{cases}$ Solution: _____



Solve each system by substitution.

28. $\begin{cases} y = 3x + 4 \\ y = 4x + 5 \end{cases}$

29. $\begin{cases} -2x + 2y = 4 \\ 4x + 3y = -15 \end{cases}$

Solve each system by elimination.

30. $\begin{cases} x + 6y = -8 \\ 7x + 2y = 24 \end{cases}$

31. $\begin{cases} 9x + 6y = 12 \\ -18x - 8y = -4 \end{cases}$

Evaluate each expression for the given value(s) of the variable(s).

32. $(3t)^{-3}$ for $t = 2$

33. $4x^{-2}y^{0}$ for $x = 7$ and $y = -4$

Add or subtract.

34. $12x^2 + 11y^2 - 5x^2$

35. $(-8k^2 + 5) - (3k^2 + 7k - 6)$

Multiply.

36. $-4x\left(x^2-5x+7\right)$	37. $(y-7)(y-4)$
38. $(x-4)^2$	39. $(5x+2)^2$

Factor each polynomial. (GCF)

40. $12c^3-5c$	41. $6x^2-18x+6$

Factor each polynomial.

42. $x^2+11x+28$	43. x^2-8x+7
44. $x^2-2x-24$	45. $x^2+4x-21$
46. $1-9x^2$	47. $64x^2-1$

Use the Zero Product Property to solve each equation. Check your answer.

48. $(x-4)(x-3)=0$	49. $x(x+13)=0$

Solve each quadratic equation by factoring. Check your answer.

50. $x^2+2x-15=0$	51. $x^2-5x-6=0$

Solve using square roots. Check your answer.

52. $x^2=64$	53. $x^2=900$
54. $9x^2+20=189$	55. $0=49x^2-16$

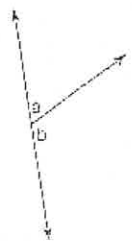
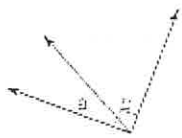
Solve by completing the square.

56. $x^2+10x=-21$	57. $-x^2+6x-3=0$

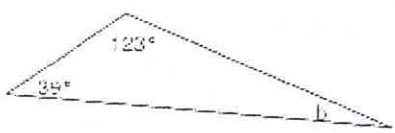
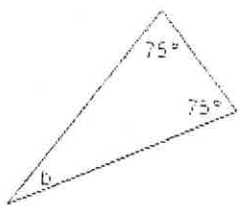
Solve using the Quadratic Formula.

58. $x^2+7x-6=0$	59. $2x^2-x-11=0$

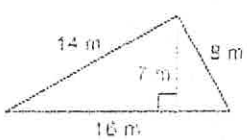
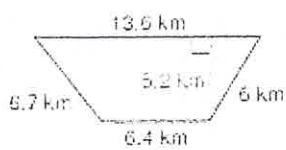
Name the relationship(s): complementary, supplementary, vertical, or adjacent.

60.	61.
	
62.	63.
	

Find the measure of angle *b*.

64.	65.
	

Find the perimeter of each figure.

66.	67.
	

Find the area of each figure.

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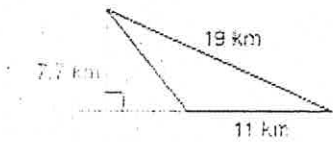

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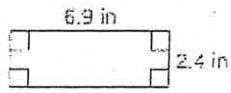

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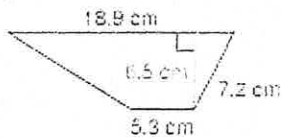

Find the area and circumference of each circle.

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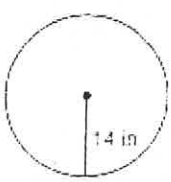

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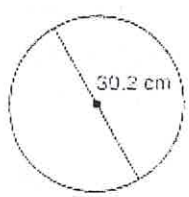

Use the Pythagorean Theorem to find the missing length.

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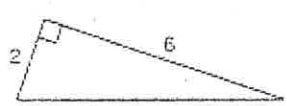

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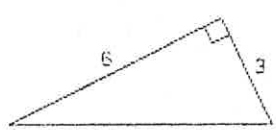

The polygons in each pair are similar. Find the scale factor of the smaller figure to the larger figure.

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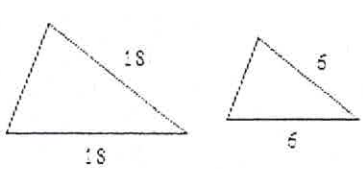

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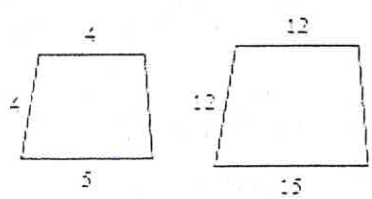

Find the volume of each figure – see formulas below.

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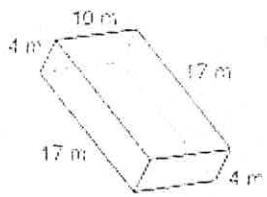

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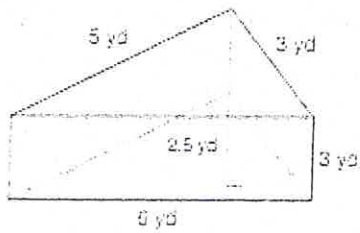

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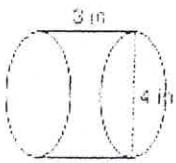

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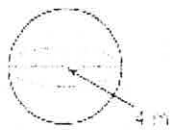

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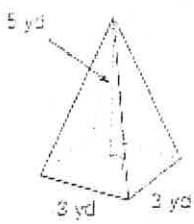

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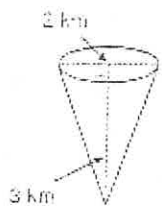


Volume Formulas		
Prism	**Pyramid**	**Cylinder**
$V = Bh$	$V = \frac{1}{3}Bh$	$V = \pi r^2 h$
Cube	**Cone**	**Sphere**
$V = s^3$	$V = \frac{1}{3}\pi r^2 h$	$V = \frac{4}{3}\pi r^3$

Part I: Simplifying Expressions and Combining Like Terms

Order of Operations Review:

When an expression contains more than one operation, the operations must be performed in a certain order.

I. Evaluate any expressions inside grouping symbols like ( ) or [ ]
II. Evaluate exponents
III. Perform multiplication and division in order from left to right
IV. Perform addition from left to right.

Many people remember this using either of the following acronyms:

- PEMDAS

  (Parenthesis, Exponents, Multiplication, Division, Addition Subtraction)
  Some people use this saying to remember PEMDAS:
  Please Excuse My Dear Aunt Sally

- GEMS

  (Grouping Symbols, Exponents, Multiplication & Division, Subtraction & Addition)

Examples:

Simplify $4^2 - 7 - 2 \cdot 5 + 3$.

$4^2 - 7 - 2 \cdot 5 + 3$	*Identify powers.*
$16 - 7 - 2 \cdot 5 + 3$	*Evaluate 4^2.*
$16 - 7 - 2 \cdot 5 + 3$	*Identify multiplication and division.*
$16 - 7 - 10 + 3$	*Evaluate $2 \cdot 5$.*
$23 - 10 - 3$	*Start at the left and perform each addition and subtraction in order.*
$13 - 3$	
16	

Simplify the expression $6^2 - 3(5 - 1) - 2$.

$6^2 - 3(5 - 1) - 2$	
$6^2 - 3 \cdot 4 - 2$	*Evaluate $5 - 1$.*
$36 - 3 \cdot 4 - 2$	*Evaluate 6^2.*
$36 - 12 - 2$	*Evaluate $3 \cdot 4$.*
$24 - 2$	*Add and subtract from left to right.*
26	

The following symbols are also considered as grouping symbols when using the order of operations.

Symbol	Example
Absolute-value	$\lvert 2 - 3 \rvert$
Radical	$\sqrt{3 + 6}$
Fraction Bar	$\frac{2 + 7}{4 - 1}$

Evaluate each expression.

|1| $1 + 4 \cdot 6 - 3$	|2| $2 + (10 - 1) \div 3$	|3| $\frac{15+3}{9} \cdot -5 - (-2)$	|4| $\frac{(-8+3) \cdot 2 - (-2)}{-4}$
|5| $(10-7)^2 - \frac{-18}{-3}$	|6| $\frac{-27-8}{5(10-9)}$	|7| $-9 \cdot 5 - (10 - (-7)^2)$	|8| $-4\left(5 \cdot -\frac{30}{6} + 9\right)$

Evaluate each expression using the values given.

|9| $z + y^2 - \frac{x}{3}$ use $x = -9, y = -3$, and $z = -4$

|10| $y - z + \frac{z^2}{4}$ use $y = -9$ and $z = 2$

Simplifying Expression with Variables Review:

Combining like terms:

- Terms may only be combined (added/subtracted) if they are like terms. Like terms may have different coefficients (the number multiplied in front of the variable) but must have all of the same variable(s) and all of the same exponents.
  - Examples

Like Terms	Not Like Terms
$4x^2, 7x^2$	$3m, 5m^3$
$12y, 18y$	$12y, 12xy$
$5ab^2, -ab^2$	$st^4, 3s^4t$

Simplify $24x^3 - 4x^3$.

$24x^3 - 4x^3$

$20x^3$ *Subtract the coefficients only.*

In order to combine like terms, you might use some of the following properties:

- Associative Property of Addition/Multiplication:
  - If all terms share the same operation, the operation may be applied in any order with the same result.
  - Examples:

$2x + 5 + 3x + 7 = 2x + 3x + 5 + 7$	$(6 \cdot 2) \cdot ½ = 6 \cdot (2 \cdot ½)$

- Distributive Property:
  - If there is a single term multiplied (outside parenthesis) to an expression inside parenthesis, the term may be distributed and multiplied separately to each term inside the parenthesis.
  - **Don't forget that when a negative is outside of the parenthesis, it is equivalent to distributing a -1 to the expression inside the parenthesis**
  - Examples:

Simplify $4(x + y) + 5x - 9$.

$4x + 4y + 5x - 9$ *Distribute 4.*

$4x + 5x + 4y - 9$ *Use the Commutative Property.*

$9x + 4y - 9$ *Add the like terms 4x and 5x.*

$9x + 4y - 9$ *No other terms are like terms.*

Simplify: $3(2x + 7)$

$3(2x + 7)$

$3 \cdot 2x + 3 \cdot 7$

$6x + 21$

Simplify: $4 - (7 - 6x)$

$4 - (7 - 6x)$

$4 + -1 \cdot 7 + -1 \cdot -6x$

$4 - 7 + 6x$

$6x - 3$

Simplify: $2x(3x^2 + 5x - 4 + 6x)$

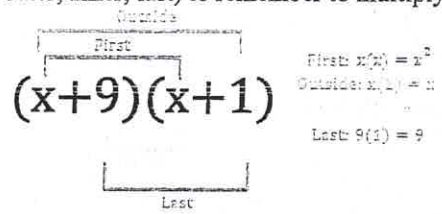
$2x(3x^2 + 5x - 4 + 6x)$

$6x^3 + 10x^2 - 8x + 12x^2$

$6x^3 + 10x^2 + 12x^2 - 8x$

$6x^3 + 22x^2 - 8x$

  - If there are expressions being multiplied that both have more than one term, you must be sure to distribute every term in the first expression to every term in the second expression
    - When multiplying two binomials (expressions that each have two terms) many use the acronym F.O.I.L. (first, outer, inner, last) to remember to multiply all terms.



  - Examples:

Simplify: $(x + 3)(2x - 7)$

$(x + 3)(2x - 7)$

$x \cdot 2x + x \cdot -7 + 3 \cdot 2x + 3 \cdot -7$

$2x^2 - 7x + 6x - 21$

$2x^2 - x - 21$

Simplify: $(2x + 1)(3x^2 + 2x - 3)$

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

$2x \cdot 3x^2 + 2x \cdot 2x + 2x \cdot -3 + 1 \cdot 3x^2 + 1 \cdot 2x + 1 \cdot -3$

$6x^3 + 4x^2 - 6x + 3x^2 + 2x - 3$

$6x^3 + 4x^2 + 3x^2 - 6x + 2x - 3$

$6x^3 + 7x^2 - 4x - 3$

Simplify each of the following expressions.

|1| $7m + 1 + 7m + 4$	|2| $10 - 7p + p - 5$
|3| $6(5x + 7) - 7$	|4| $-6(-8a + 9) + 4a$
|5| $-2(-1 + 6m) + 8m$	|6| $-3k - 3(5k + 7)$
|7| $-7k(1 - 8k) + 5k(-3 - 2k)$	|8| $7a(1 + 8a) - 8a(a + 9)$
|9| $(6 + 5n) + (4n - 8)$	|10| $(5x - 3x^2) - (7x + 8x^2)$
|11| $(k + 5k^2) + (k + 4 - 7k^2)$	|12| $(5v^2 + 7v^3) - (6v^3 - 2v^2 - 8)$
|13| $(3n - 2 - 8n^2) + (7 - 8n - 7n^2)$	|14| $(1 - 4a - 5a^3) - (6 + a^3 + 4a)$
|15| $(2x - 7)(x + 6)$	|16| $(2x - 6)(8x - 1)$
|17| $(x + 6)(8x - 3)$	|18| $(b + 1)(3b - 8)$
|19| $(7x + 8y)(8x + y)$	|20| $(7x - 6y)(2x + 8y)$
|21| $(5p + 6)(3p^2 + p + 6)$	|22| $(7x + 5)(4x^2 + 8x + 5)$

Simplifying Exponential Expressions

Exponent Rules:

To simplify expressions with exponents, you must follow these exponent rules:

Rule:	Rule:	Example:
Product Rule: when terms with the same base are multiplied, you add the exponents	$a^x \cdot a^y = a^{x+y}$	$2^5 \cdot 2^2 = 2^{5+2} = 2^7$ $a^5b^2 \cdot a^3b^2 = a^{5+3}b^{2+2} = a^8b^4$
Quotient Rule: When terms with the same base are divided, you subtract the exponents (numerator exponent – denominator exponent)	$\frac{a^x}{a^y} = a^{x-y}$	$\frac{4^3}{4^6} = 4^{3-6} = 4^{-3}$ $\frac{a^5b^8c^9}{a^4b^3} = a^{5-4}b^{8-3}c^9 = ab^5c^9$
Power Rule: When a term is raised to another exponent, you multiply the exponents.	$(a^x)^y = a^{x \cdot y}$	$(2^2)^3 = 2^{2 \cdot 3} = 2^6$
Power of a Product/Quotient Rule: When a group of variables being multiplied or divided is being raised to a power, you may distribute the exponent and use power rule for each variable.	$(a^xb^x)^y = a^{x \cdot y} \cdot b^{x \cdot y}$ $\left(\frac{a^x}{b^x}\right)^y = a^{x \cdot y} \cdot b^{x \cdot y}$	$(a^3b^2)^4 = a^{3 \cdot 4}b^{2 \cdot 4} = a^{12}b^8$ $\left(\frac{a^5b^2}{c}\right)^3 = \frac{a^{5 \cdot 3}b^{2 \cdot 3}}{c^{1 \cdot 3}} = \frac{a^{15}b^6}{c^3}$
Zero Exponent: Anything raised to the zero power is equal to one.	$a^0 = 1$	
Negative Exponents: A negative exponent is equivalent to taking the reciprocal of the base of the exponent and applying the absolute value of the exponent.	$\left(\frac{a}{b}\right)^{-x} = \left(\frac{b}{a}\right)^x$	$(a^2)^{-3} = \left(\frac{1}{a^2}\right)^3 = \frac{1^3}{a^{2 \cdot 3}} = \frac{1}{a^6}$ $\left(\frac{a^4}{a^6}\right)^{-2} = \left(\frac{a^6}{a^4}\right)^2 = \frac{a^{6 \cdot 2}}{a^{4 \cdot 2}} = \frac{a^8}{a^6} = a^2$

Remember that the Order of Operations still applies here – parenthesis must always be taken care of first

Simplify each of the following expressions. Your answers should include only positive exponents.

|1| $(4xy)^2$

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

|3| $4u^{-2}v^0 2u^{-2}$

|4| $(y^4)^{-1}$

|5| $(x^3)\cdot(2x^{-1})^0$

|6| $\left(\frac{2x^3}{2x^{-4}y^{-4}}\right)^2$

|7| $\frac{(b^2)^3}{a^0\cdot 2a^{-3}b^2}$

|8| $\frac{(2ab)^3}{2a^2b^4\cdot a^3b^3}$

|9| $a^{-2}b^3\cdot(2b)^4$

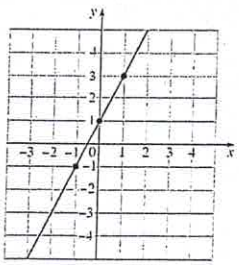
|10| $\frac{4x^4}{3x^4y^{-3}}$

|11| $\frac{(a^4b^{-3})^0}{2ba^{-2}}$

|12| $x^{-4}y^2\cdot(x^0y^0)^{-3}$

Find the slope of the line.

10.



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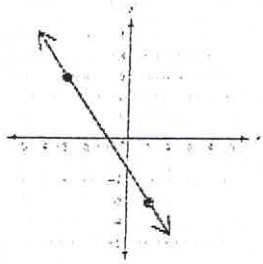

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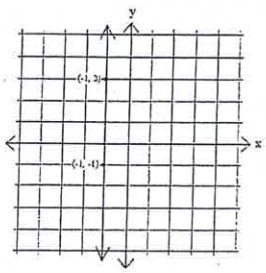

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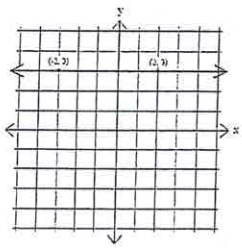


Find the slope of the line that contains each pair of points.

14. $(3,10)$ and $(2,5)$

15. $(12,-2)$ and $(0,6)$

Find the slope of the line described by each equation.

16. $5x+4y=40$

17. $7x+42=2y$

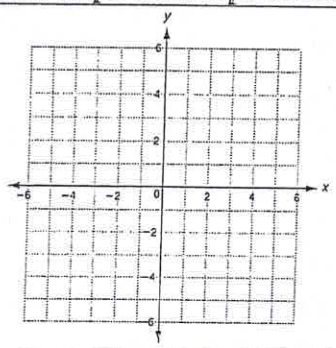
Write the equation that describes each line in slope-intercept form.

18. slope = 8; y-intercept = -6

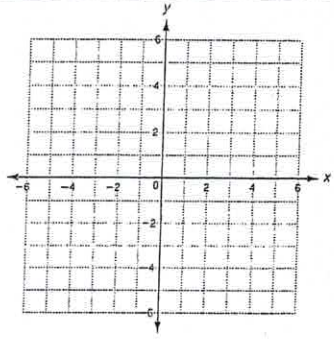
19. slope = $-\frac{1}{2}$, $(8,-1)$ is on the line

Write each equation in slope-intercept form. Then graph the line described by the equation.

20. $y + x = 3$



21. $5x - 2y = 10$



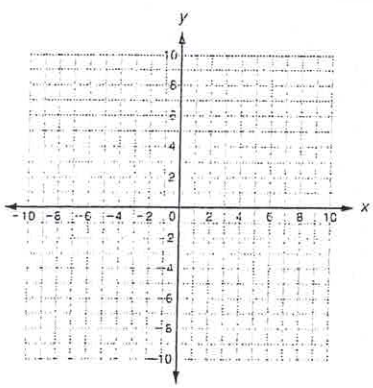
Write an equation in point-slope form for the line with the given slope that contains the given point.

22. slope = 4; (5, 6)

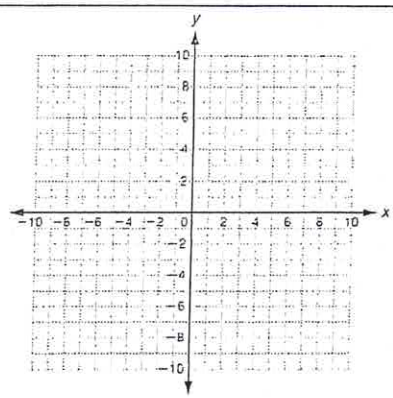
23. slope = −3; (7, −2)

Graph the line described by each equation.

24. $y - 3 = \frac{2}{3}(x + 1)$

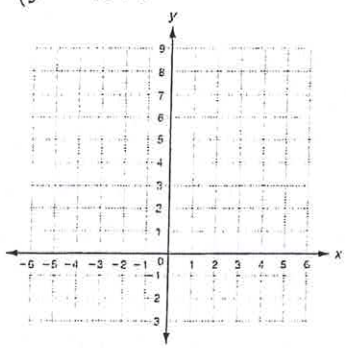


25. $y + 4 = -3(x - 4)$

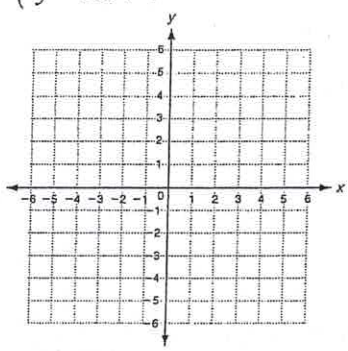


Solve each system by graphing.

26. $\begin{cases} y = 2x + 3 \\ y = -x + 9 \end{cases}$ Solution: _____



27. $\begin{cases} y = -3x + 4 \\ y = 2x + 4 \end{cases}$ Solution: _____



Solve each system by substitution.

28. $\begin{cases} y = 3x + 4 \\ y = 4x + 5 \end{cases}$

29. $\begin{cases} -2x + 2y = 4 \\ 4x + 3y = -15 \end{cases}$

Solve each system by elimination.

30. $\begin{cases} x + 6y = -8 \\ 7x + 2y = 24 \end{cases}$

31. $\begin{cases} 9x + 6y = 12 \\ -18x - 8y = -4 \end{cases}$

Evaluate each expression for the given value(s) of the variable(s).

32. $(3t)^{-3}$ for $t = 2$

33. $4x^{-2}y^{0}$ for $x = 7$ and $y = -4$

Add or subtract.

34. $12x^2 + 11y^2 - 5x^2$

35. $\left(-8k^2 + 5\right) - \left(3k^2 + 7k - 6\right)$

Multiply.

36. $-4x(x^2-5x+7)$	37. $(y-7)(y-4)$
38. $(x-4)^2$	39. $(5x+2)^2$

Factor each polynomial. (GCF)

40. $12c^3-5c$	41. $6x^2-18x+6$

Factor each polynomial.

42. $x^2+11x+28$	43. x^2-8x+7
44. $x^2-2x-24$	45. $x^2+4x-21$
46. $1-9x^2$	47. $64x^2-1$

Use the Zero Product Property to solve each equation. Check your answer.

48. $(x-4)(x-3)=0$	49. $x(x+13)=0$

Solve each quadratic equation by factoring. Check your answer.

50. $x^2+2x-15=0$	51. $x^2-5x-6=0$

Solve using square roots. Check your answer.

52. $x^2=64$	53. $x^2=900$
54. $9x^2+20=189$	55. $0=49x^2-16$

Solve by completing the square.

56. $x^2+10x=-21$	57. $-x^2+6x-3=0$

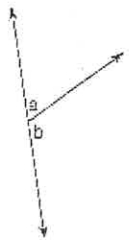
Solve using the Quadratic Formula.

58. $x^2+7x-6=0$

59. $2x^2-x-11=0$

Name the relationship(s): complementary, supplementary, vertical, or adjacent.

60.



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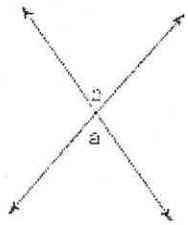

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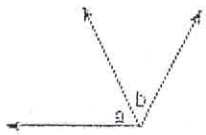

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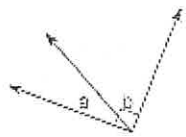
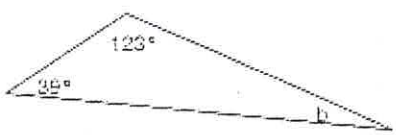


Find the measure of angle *b*.

64.



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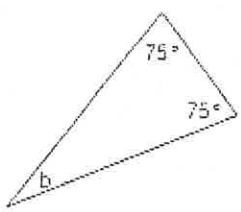
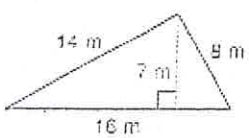
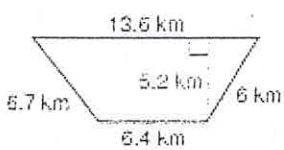


Find the perimeter of each figure.

66.

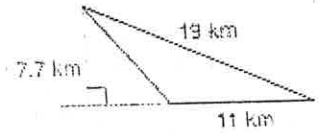


67.



Find the area of each figure.

68.



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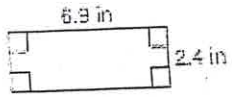
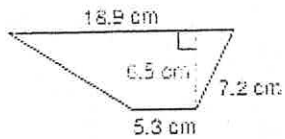


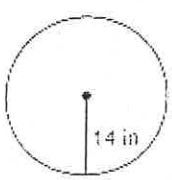
70.

71.



Find the area and circumference of each circle.

72.



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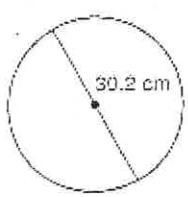
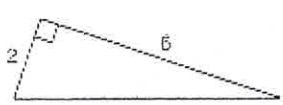


Use the Pythagorean Theorem to find the missing length.

74.



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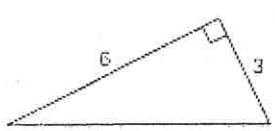
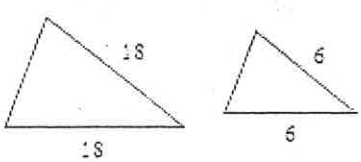


The polygons in each pair are similar. Find the scale factor of the smaller figure to the larger figure.

76.



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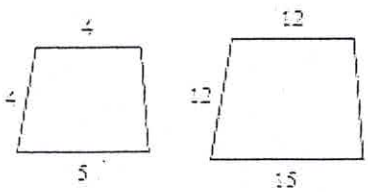
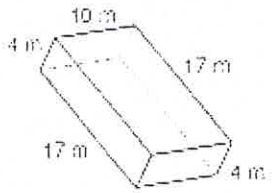


Find the volume of each figure – see formulas below.

78.



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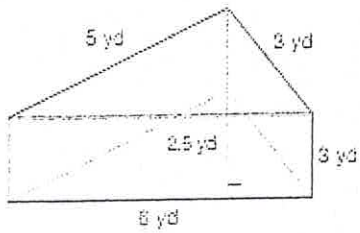

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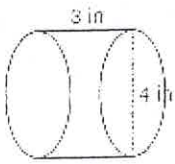

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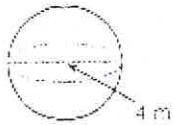

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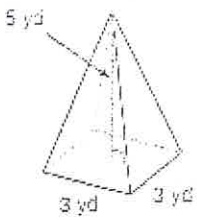

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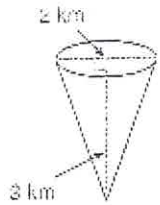

Volume Formulas		
Prism $V = Bh$	**Pyramid** $V = \frac{1}{3}Bh$	**Cylinder** $V = \pi r^2 h$
Cube $V = s^3$	**Cone** $V = \frac{1}{3}\pi r^2 h$	**Sphere** $V = \frac{4}{3}\pi r^3$