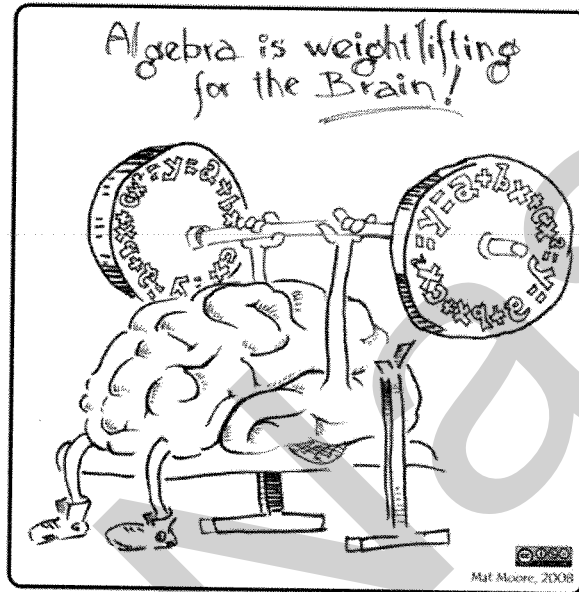


# Booklet #2

## Secondary 3

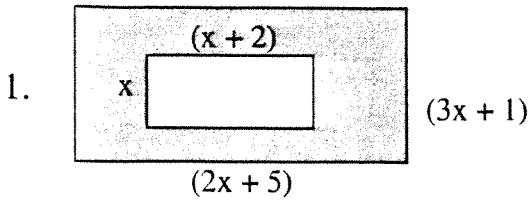


Polynomial Geometry  
Common Factor  
Numerical Value  
Interval Notation  
Equations  
Math Phrases  
Inequalities

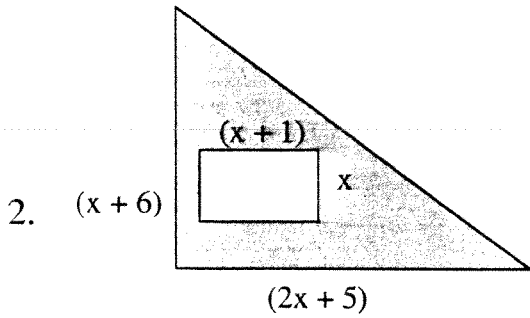
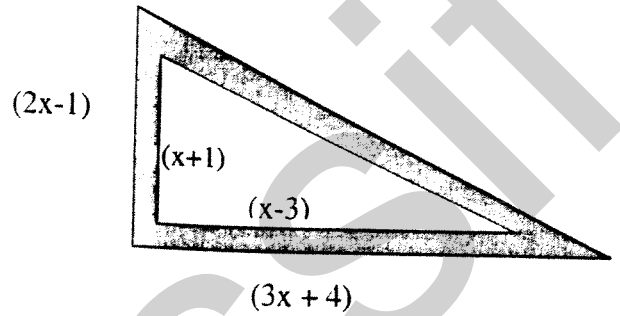
**Mrs. Nassif**

# Polynomial Geometry Worksheet

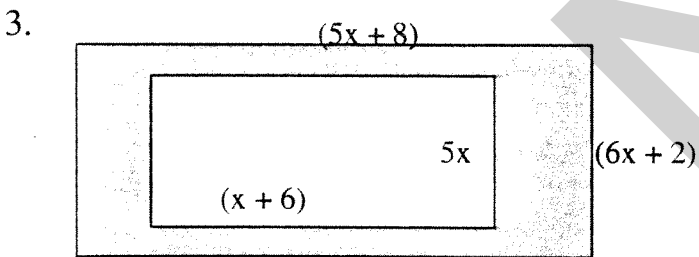
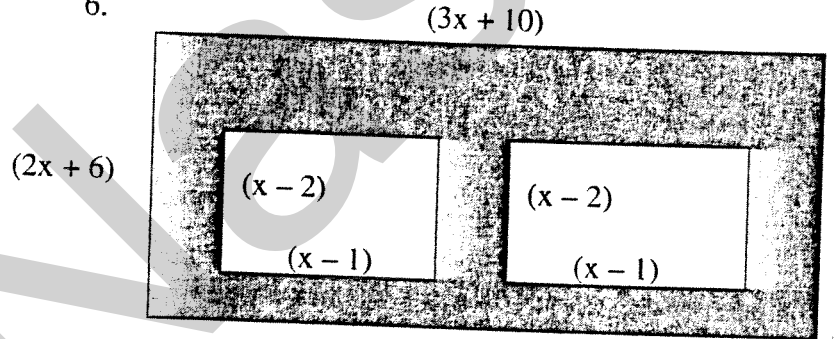
Find the area of the shaded region for each figure. Show all work.



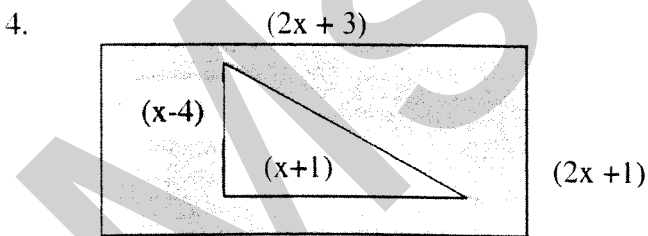
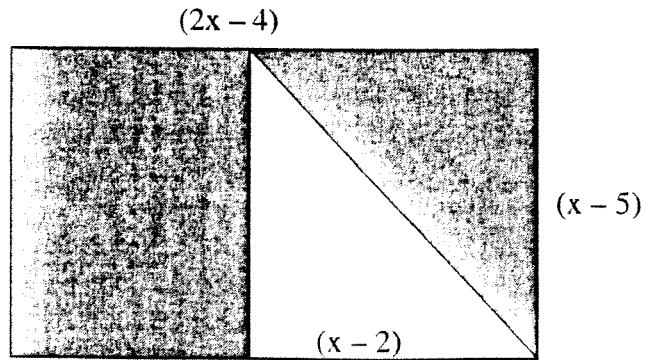
5.



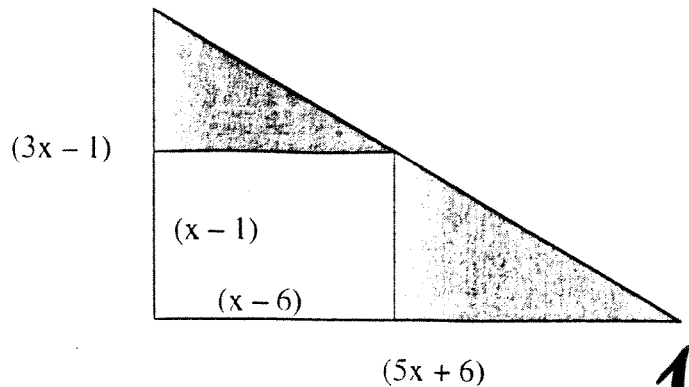
6.



7.



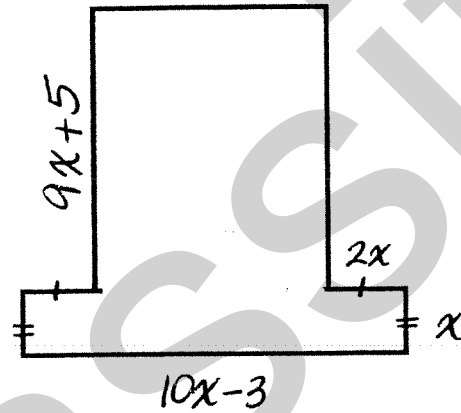
8.



# Polynomial Geometry

1) Tommy has a driveway that must be rebuilt and worked on. Study the diagram of his driveway below:

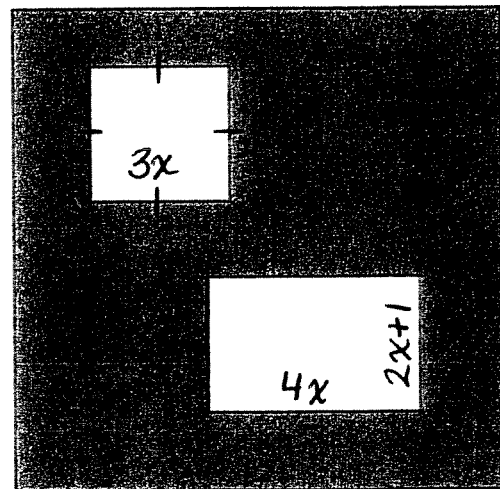
- Tommy wants to put a cement border around his lot, how many meters of cement will he need to do this?



- Tommy also wants to repave his driveway. How many square meters of gravel will he need to repave the surface of the driveway?

2) Study the diagram below:

- What is the perimeter of the large square?

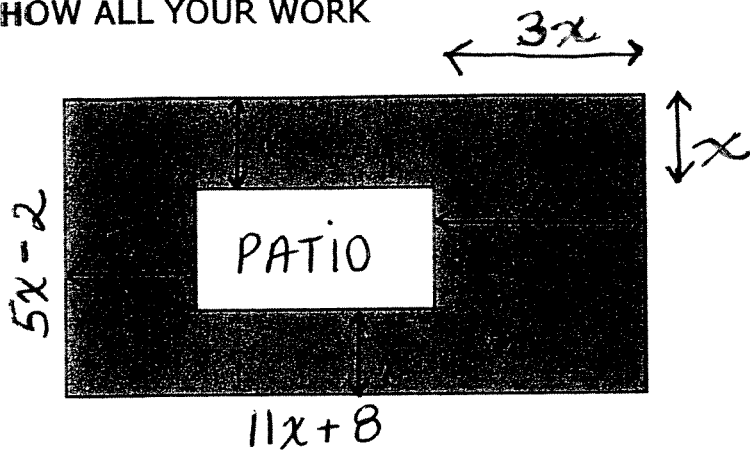


- What is the area of the large square?

- What is the area of the shaded region?

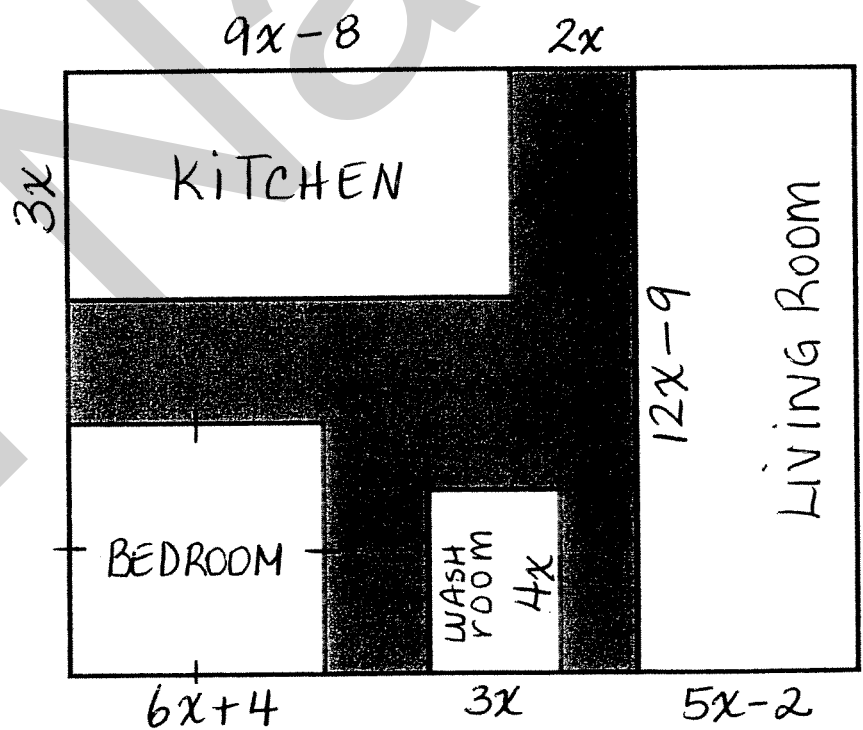
- 3) Maureen needs new grass for her backyard. Her rectangular patio is located exactly in the middle of the yard. **How much grass does Maureen need for her backyard, which is represented by the shaded region?**

SHOW ALL YOUR WORK



- 4) The diagram below represents the layout of Dena's condo. **Determine how much hallway space she has** (represented by the shaded region).

SHOW ALL YOUR WORK



# Numerical Value

EXAMPLE: Calculate the value of each expression by substituting for the variables in each.

1.  $3x^2 - 5y = ?$ , if  $x = 2$ ,  $y = -3$

$$3(2)^2 - 5(-3)$$

$$3(4) - 5(-3)$$

$$12 + 15 = 27$$

2.  $7a^3 - 3b^2 = ?$ , if  $a = -2$ ,  $b = -3$

$$7(-2)^3 - 3(-3)^2$$

$$7(-8) - 3(9)$$

$$-56 - 27 = -83$$

A. Calculate the numerical value of each expression by substituting each variable with the appropriate number.

1.  $x^2 - y^2$ , if  $x = 2$ ,  $y = 3$

2.  $4a^2 + 4ab - b^2$ , if  $a = 2$ ,  $b = 3$

3.  $(a - b)^3$ , if  $a = 3$ ,  $b = 1$

4.  $(3x)^3$ , if  $x = -1$

~~X~~  $x/2 + x/3 + x/4$ , if  $x = 1$

6.  $a(b + c) \div (ac)$ , if  $a = 2$ ,  $b = 3$ ,  $c = 4$

7.  $5x^2 - 6y^3$ , if  $x = -2$ ,  $y = -3$

8.  $2x^3 - 3x^2 - 4x$ , if  $x = -3$

9.  $(a + b)^2(a - b)$ , if  $a = 2$ ,  $b = 1$

10.  $1 \div (3 - t)$ , if  $t = -3$

11.  $(x + y)(x - y)^2$ , if  $x = 2$ ,  $y = 1$

12.  $3x^2 + 5x + 9$ , if  $x = -2$

13.  $a^3 - b^2 - 2c$ , if  $a = -1$ ,  $b = -2$ ,  $c = -3$

14.  $3a^2 - ab - bc$ , if  $a = 1$ ,  $b = 2$ ,  $c = 3$

15.  $x^2 - y^2$ , if  $x = 2$ ,  $y = 1$

16.  $(2m^2 - 4m + 3) \div (7 - m)$ , if  $m = -1$

17.  $-y^2 - 5y$ , if  $y = 0.5$

18.  $4t^5 - 3t^2 + t + 2$ , if  $t = -0.5$

19.  $a^3 - 3a^2 - 4$ , if  $a = -3$

20.  $-2b^2 + b$ , if  $b = 4$

## Evaluating Expressions

Find the numerical value.

1)  $y \div 2 + x$ ; use  $x = 1$ , and  $y = 2$

3)  $p^2 + m$ ; use  $m = 1$ , and  $p = 5$

5)  $m + p \div 5$ ; use  $m = 1$ , and  $p = 5$

7)  $z(x + y)$ ; use  $x = 6$ ,  $y = 8$ , and  $z = 6$

9)  $p^3 + 10 + m$ ; use  $m = 9$ , and  $p = 3$

11)  $p^2m \div 4$ ; use  $m = 4$ , and  $p = 7$

13)  $z - (y \div 3 - 1)$ ; use  $y = 3$ , and  $z = 7$

15)  $p - (9 - (m + q))$ ; use  $m = 4$ ,  $p = 5$ , and  $q = 3$

17)  $2(p + 4) - (m + n)$ ; use  $m = 4$ ,  $n = 2$ , and  $p = 5$

19)  $x^3 \div 3 - y$ ; use  $x = 3$ , and  $y = 1$

21)  $12k - h^2$ ; use  $h = 2$ , and  $k = 3$

23)  $2 + r - (5 - q) + p$ ; use  $p = 2$ ,  $q = 2$ , and  $r = 5$

25)  $\frac{y}{2} + x + 4 + z + y$ ; use  $x = 7$ ,  $y = 2$ , and  $z = 4$

2)  $a - 5 - b$ ; use  $a = 10$ , and  $b = 4$

4)  $y + 9 - x$ ; use  $x = 1$ , and  $y = 3$

6)  $y^2 - x$ ; use  $x = 7$ , and  $y = 7$

8)  $x + y + y$ ; use  $x = 9$ , and  $y = 10$

10)  $6q + m - m$ ; use  $m = 8$ , and  $q = 3$

12)  $y - (z + z^2)$ ; use  $y = 10$ , and  $z = 2$

14)  $(y + x) \div 2 + x$ ; use  $x = 1$ , and  $y = 1$

16)  $(a^2 - b) \div 6$ ; use  $a = 5$ , and  $b = 1$

18)  $y - (4 - x - y \div 2)$ ; use  $x = 3$ , and  $y = 2$

20)  $pn + (n + m)^2$ ; use  $m = 1$ ,  $n = 4$ , and  $p = 6$

22)  $p + m + n + m^2$ ; use  $m = 4$ ,  $n = 5$ , and  $p = 5$

24)  $y - z + xz \div 6$ ; use  $x = 3$ ,  $y = 4$ , and  $z = 4$

26)  $c \times \frac{bc}{4} - (7 - a)$ ; use  $a = 4$ ,  $b = 8$ , and  $c = 5$

# Common Factor

C. Factor each of the following by removing a common factor.

1.  $2x + 2y$

2.  $ab + ac$

3.  $3x + 4x$

4.  $x^2y + 3y^2$

5.  $x^2y + x^2z$

6.  $3xy + 4xyz$

7.  $3x + 3y + 3z$

8.  $15y^2 + 20a + 30b$

9.  $4x + 6a$

10.  $10y - 5$

11.  $15ax - 3a$

12.  $a^3x^2 - a^2x^2 - qx$

13.  $14y^4 - 35y^3 - 42y^2$

14.  $12y^4 + 18y^6$

15.  $-6x^8 + 9$

16.  $2ax - 2bx - 2cx$

17.  $-9x^3 + 33x^2 - 6x + 12$

18.  $-100x^4 - 1000x^3 - 10\,000x$

19.  $2x^3 - 10x^2 + 12x$

20.  $4y^3 + 8y^2 - 4y$

21.  $8x^2 - 24x + 96$

22.  $-63y^5 + 15y^3 - 27y^2 + 45y$

23.  $-10ey^5 - 30e^2y^2 + 45ey - 15e$

24.  $36a^7x^4 - 42a^9x^2$

25.  $4y^3 - 2ay^2$

26.  $-3y^4 - 6y^3 + 21y^2$

27.  $4x^2 - 2x + 12$

28.  $3x^3 - 9x^2 + 6x$

29.  $30y^4 - 18y^3 - 6y^2$

30.  $7x - 28$

31.  $42a^2b^2 + 7ab + 6b$

32.  $3x^2 + 12x + 9$

33.  $100 - 1000$

34.  $44a - 33b + 22c$

35.  $4ab^2 - ab^2c$

36.  $27x^3 - 18x^5 + 45x^4$



Common factor each of the following polynomials.

1.  $13x + 91$

2.  $12x^2 - 6x - 3$

3.  $-130y + 20a + 5$

4.  $6x^3 + 12x^2 - 6x$

5.  $-9x^3 - 9y^2 + 36y$

6.  $30a^2x^2 - 18a^3x$

7.  $7ax^3 + 35ax^2 - 147ax$

8.  $-b^2x^3 + 2bx^2 + b^2x - 7bx$

9.  $24x^5 - 18x^4 - 6x^3 + 9x^2 + 30x$

10.  $-10aby^3 - 20aby^2 + 10aby$

11.  $13a^3x^3 + 26a^2x^2 - 26ax$

12.  $6x^6 - 7x^4 + 2x^3 - x^2 + 5x$

13.  $-90cy^3 + 27c^2y^2 + 81c^2y - 9cy$

14.  $m + m^4 + 6m^2$

15.  $y^8 - 3y^6$

16.  $6at^5 - 7xt^3 + 8yt^2 + t$

17.  $5x^5 + x^3 - 7x$

18.  $3y^4 + 6y^3 - 21y^2$

19.  $-7y^5 + 42y^4 + 35y^3 + 14y^2$

20.  $-16y^6 + 24y^5 - 72y^4 + 8y^3 - 40y^2$

21.  $4ab^2 - ab^2c$

22.  $5xy^2 - 7x^2y$

23.  $3ax + 12a$

24.  $5x + 20$

25.  $2x^2 + 2xy$

26.  $72a^3b + 63ab^2$

27.  $5a + 5b - 5c^2$

28.  $32x^2 + 24y^2 + 16z^2$

# Interval Notation

Draw the graphic representation of each interval.

1)  $] -10, -2 [$

2)  $] 1, 2 ]$

3)  $] 2, 5 [$

4)  $[ 3, \infty [$

5)  $[ -100, -50 ]$

6)  $[ -80, 40 [$

7)  $] -\infty, 50 [$

8)  $] 25, 50 [$

9)  $[ 45, \infty [$

10)  $] 38, 100 [$

11)  $] -\infty, 50 ]$

12)  $[ -32, \infty [$

13)  $[ -15, 30 ]$

14)  $[ 14, 20 ]$

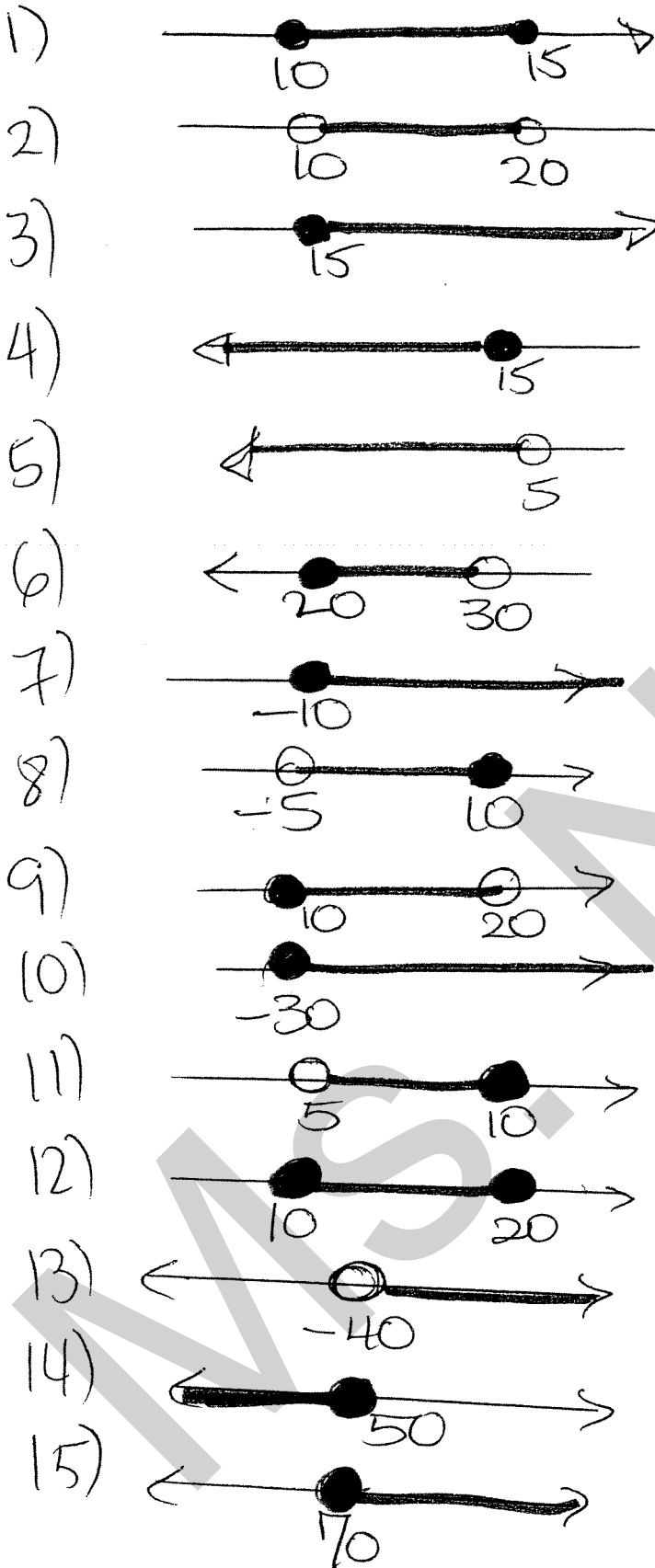
15)  $[ -8, -5 ]$

16)  $[ -10, \infty [$

17)  $[ -3, 5 ]$

18)  $] -\infty, \infty [$

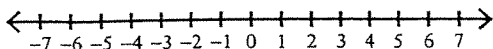
Write in interval notation



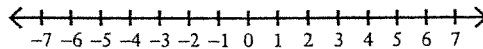
# GRAPHING INEQUALITIES

Draw a graph for each inequality.

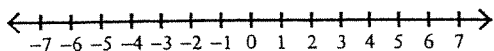
1)  $x \leq 6$



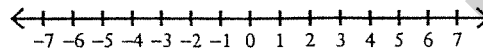
2)  $k \leq -2$



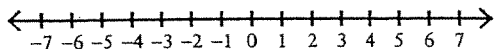
3)  $a \leq 4$



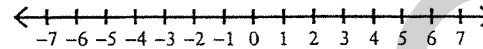
4)  $x \geq 3$



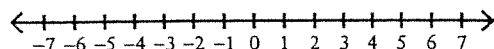
5)  $m < 2$



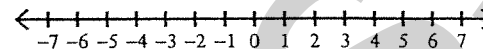
6)  $p \geq 5$



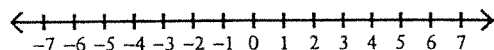
7)  $k \leq 5$



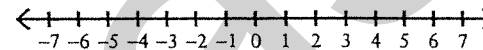
8)  $b > -6$



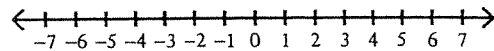
9)  $x < 6$



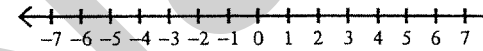
10)  $m > 1$



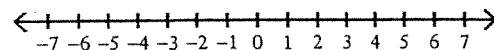
11)  $m < 2$



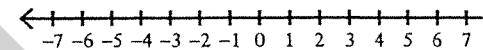
12)  $t > -3$



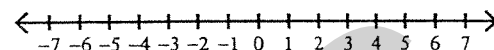
13)  $n \geq 2$



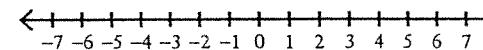
14)  $b > 2$



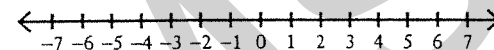
15)  $b \leq 4$



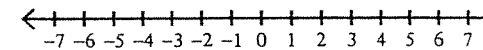
16)  $m \geq 3$



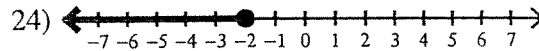
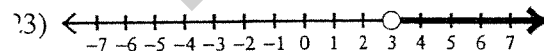
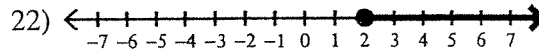
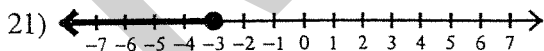
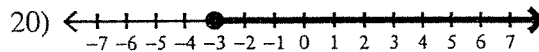
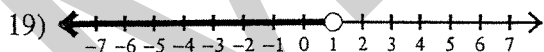
17)  $r \leq 7$



18)  $c < 0$



Write an inequality for each graph.



# 1 STEP EQUATIONS

1.)  $x - 7 = -18$

3.)  $x + 6 = 4$

5.)  $-3 = x - 3$

7.)  $x - 1 = 6$

9.)  $16 = x + 8$

11.)  $x / 6 = -1$

13.)  $6x = 24$

15.)  $10 + x = 15$

17.)  $x + 2 = 1$

19.)  $5 = x - 5$

21.)  $15 = x + 3$

23.)  $x - 1 = -3$

25.)  $-9 + x = 2$

27.)  $20 = x + 10$

29.)  $5 + x = 7$

31.)  $-9 + x = -18$

33.)  $6x = -48$

35.)  $x + 10 = 22$

37.)  $x / -3 = -5$

39.)  $x / 6 = 5$

41.)  $10 = x + 1$

43.)  $x + 10 = -2$

45.)  $x - 6 = -15$

47.)  $9 + x = 11$

49.)  $5x = -50$

2.)  $x - 4 = -15$

4.)  $x - 5 = -14$

6.)  $-7x = -42$

8.)  $x + 5 = 16$

10.)  $x / -5 = 2$

12.)  $4x = 48$

14.)  $4 + x = 0$

16.)  $x + 8 = 4$

18.)  $x / 4 = 4$

20.)  $x / 5 = 3$

22.)  $x + 6 = -4$

24.)  $2x = 0$

26.)  $x / -7 = 6$

28.)  $x / -3 = -4$

30.)  $x + 9 = 13$

32.)  $x / 5 = -3$

34.)  $x + 10 = 17$

36.)  $x - 2 = 0$

38.)  $2x = -2$

40.)  $9 + x = 15$

42.)  $2x = -8$

44.)  $x + 2 = 8$

46.)  $2 = x + 5$

48.)  $x + 7 = 19$

50.)  $x - 2 = -10$

- 51.)  $x - 3 = 4$
- 53.)  $x - 5 = 6$
- 55.)  $3x = 24$
- 57.)  $x + 6 = 5$
- 59.)  $x - 2 = 9$
- 61.)  $x - 8 = -18$
- 63.)  $6x = 12$
- 65.)  $-4x = -40$
- 67.)  $15 = x + 5$
- 69.)  $9 + x = -2$
- 71.)  $x / 5 = 4$
- 73.)  $-7x = -77$
- 75.)  $-4x = -40$
- 77.)  $x + 5 = 5$
- 79.)  $x + 9 = -3$
- 81.)  $x + 6 = 13$
- 83.)  $8 + x = 17$
- 85.)  $5x = 35$
- 87.)  $-5x = -45$
- 89.)  $x + 9 = 9$
- 91.)  $14 = x + 4$
- 93.)  $x + 5 = 2$
- 95.)  $-7x = -42$
- 97.)  $x + 3 = 4$
- 99.)  $2x = -12$
- 52.)  $x + 10 = 21$
- 54.)  $-4x = 28$
- 56.)  $x + 5 = 6$
- 58.)  $-9 + x = 2$
- 60.)  $x - 6 = -13$
- 62.)  $x / -4 = 2$
- 64.)  $-14 = x - 6$
- 66.)  $x - 7 = -9$
- 68.)  $-3x = -24$
- 70.)  $x + 9 = 9$
- 72.)  $x + 7 = 14$
- 74.)  $2 + x = 3$
- 76.)  $9 = x + 10$
- 78.)  $x + 2 = -6$
- 80.)  $3x = 33$
- 82.)  $1 + x = 13$
- 84.)  $x + 5 = 3$
- 86.)  $x / 7 = -1$
- 88.)  $4x = 32$
- 90.)  $9 + x = 13$
- 92.)  $x / 6 = -4$
- 94.)  $-3 = x - 7$
- 96.)  $10 + x = 19$
- 98.)  $x + 1 = 4$
- 100.)  $x / 6 = -6$

# SOLVING 1 STEP EQUATIONS

When solving **Type I** equations algebraically, we use the opposite operation that is displayed to determine what value our **variable** (letter) has. Addition is the opposite operation of subtraction, and multiplication is the opposite operation of division. There are 4 kinds of Type I equations that we will be solving and the examples below show how each type is solved.

## TYPE 1 (ADDITION)

$$\begin{aligned}x + 6 &= 8 \\x &= 8 - 6 \\x &= 2\end{aligned}$$

## TYPE 1 (SUBTRACTION)

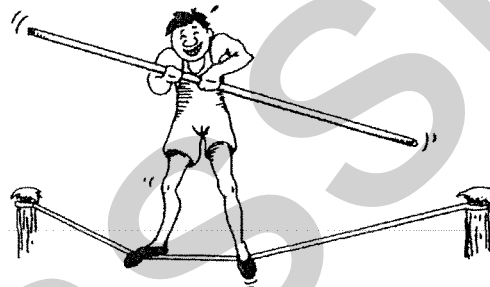
$$\begin{aligned}x - 8 &= 4 \\x &= 4 + 8 \\x &= 12\end{aligned}$$

## TYPE 1 (MULTIPLICATION)

$$\begin{aligned}5x &= -35 \\5x &= \frac{-35}{5} \\x &= -7\end{aligned}$$

## TYPE 1 (DIVISION)

$$\begin{aligned}\frac{x}{3} &= -8 \\x &= \frac{-8}{3} \\x &= -24\end{aligned}$$



(Note that in each case above we removed the number beside the letter by using the opposite operation. But when we have a division type question we do a special type of opposite operation called **cross-multiplication**.)

A. Solve the following showing all steps.

1.  $x + 6 = 12$

2.  $x - 7 = 8$

3.  $\frac{x}{6} = 9$

4.  $5x = 30$

5.  $x + 10 = 4$

6.  $\frac{x}{-3} = -6$

7.  $-5x = 20$

8.  $\frac{5}{8}x = -9$

9.  $4 + x = 13$

10.  $x - 8 = -30$

11.  $\frac{x}{-3} = -3$

12.  $14x = -3$

13.  $5x = -76$

14.  $7x = \frac{-3}{4}$

15.  $-7 + x = 13$

16.  $x + \frac{1}{2} = \frac{3}{4}$

17.  $-9x = -16$

18.  $\frac{-3}{4}x = 12$

19.  $\frac{x}{0.3} = -0.8$

20.  $x + 1.6 = -0.07$

21.  $x + 6.3 = -14$

22.  $\frac{4}{3}x = 7$

23.  $0.01x = -0.01$

24.  $\frac{x}{1.2} = 5.3$

25.  $x - 10 = 0.003$

26.  $\frac{7}{3}x = \frac{3}{4}$

27.  $x - 9 = -30$

28.  $x + 9 = -1.6$

# SOLVING 1 STEP EQUATIONS

1.  $4x = 56$

2.  $-2x = -15$

3.  $x + 0.36 = 9$

~~4.~~  $\frac{2}{3} + x = 9$

5.  $2.4y = 7.2$

6.  $z + 72 = 18$

7.  $5.3 + m = 7.9$

8.  $d + 52 = 62.5$

9.  $\frac{6}{7}x = 42$

10.  $\frac{x}{7} = 9.2$

11.  $-9y = 2.7$

12.  $\frac{x}{2} = 1.6$

13.  $\frac{1}{2}x = -8$

14.  $7x = 8.2$

15.  $x + 2.9 = 2.7$

16.  $7.9 = x - 1.5$

17.  $56 = -7y$

18.  $2.34 = n + 1.7$

~~19.~~  $3\frac{1}{2}x = 6\frac{2}{3}$

20.  $-5y = 35$

~~21.~~  $x + \frac{3}{4} = \frac{7}{8}$

22.  $5.1x = -306$

23.  $x + 4.2 = 2.5$

24.  $\frac{x}{4} = 2.3$

~~25.~~  $2\frac{1}{4}x = -9$

26.  $x + 5.3 = 16.2$

27.  $3x = 5$

28.  $x - 6.5 = 6.5$

29.  $\frac{-3}{4}x = 15$

30.  $\frac{x}{0.8} = -6$

~~31.~~  $y + 1\frac{1}{8} = 3\frac{3}{4}$

32.  $-1.75x = -3.5$

33.  $\frac{x}{-2.1} = -0.6$

34.  $\frac{z}{16} = 4$

~~35.~~  $x - \frac{5}{3} = \frac{7}{8}$

~~36.~~  $x - 3\frac{1}{2} = -5\frac{2}{3}$

37.  $x + 8 = -8$

38.  $x - 1.2 = 6.3$

39.  $\frac{x}{9} = 15$

40.  $x + 6 = 15.6$

41.  $-6x = 7$

42.  $4x = 1.3$

43.  $\frac{x}{3} = 1.3$

44.  $x + 0.7 = 8.6$

45.  $5.3k = 1.2$

46.  $17x = \frac{-3}{4}$

47.  $\frac{6}{7}x = -14$

48.  $6.5n = -30$



## One-Step Equations

Solve each equation.

1)  $26 = 8 + v$

3)  $15 + b = 23$

5)  $m + 4 = -12$

7)  $m - 9 = -13$

9)  $v - 15 = -27$

11)  $-104 = 8x$

13)  $-6 = \frac{b}{18}$

15)  $\frac{v}{8} = 2$

17)  $-15x = 0$

19)  $21 = -7n$

21)  $-126 = 14k$

23)  $-16 + x = -15$

25)  $-17 = x - 15$

27)  $\frac{v}{7} = 8$

29)  $-7 + m = 8$

2)  $3 + p = 8$

4)  $-15 + n = -9$

6)  $x - 7 = 13$

8)  $p - 6 = -5$

10)  $n + 16 = 9$

12)  $14b = -56$

14)  $10n = 40$

16)  $16 = \frac{k}{11}$

18)  $-17x = -204$

20)  $\frac{m}{4} = -13$

22)  $-143 = -11x$

24)  $-5 = \frac{a}{18}$

26)  $n - 8 = -10$

28)  $a + 11 = 20$

30)  $18 + m = 8$

# SOLVING 2 STEP EQUATIONS

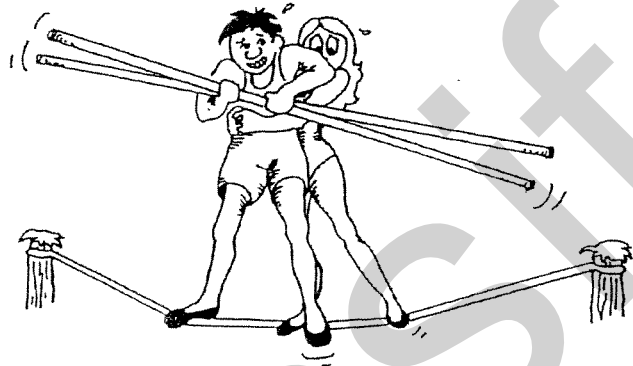
A Type II equation will require you to do two opposite or inverse operations to solve for the variable (letter). Always do the opposite of any addition or subtraction first, then proceed to do the inverse operation of any multiplication or division, as shown in the examples below.

## EXAMPLE #1

$$\begin{aligned} 5x - 9 &= 8 \\ 5x &= 8 + 9 \\ 5x &= 17 \\ \frac{5x}{5} &= \frac{17}{5} \\ 5 & \quad 5 \\ x &= 3.4 \end{aligned}$$

## EXAMPLE #2

$$\begin{aligned} \frac{x}{5} + 7 &= 9.3 \\ \frac{x}{5} &= 9.3 - 7 \\ \frac{x}{5} &= 2.3 \\ \frac{x}{5} \cdot 5 &= \frac{2.3}{1} \\ x &= 11.5 \end{aligned}$$



A. Solve the following.

1.  $3x + 2 = 14$

2.  $\frac{x}{-3} + 4 = 10$

~~3.  $x + 3 = 3 \frac{4}{5}$~~

4.  $\frac{1}{2}x - 8 = 16$

5.  $5x - 0.9 = 2$

~~6.  $\frac{1}{2}x + \frac{3}{4} = \frac{7}{8}$~~

7.  $1.2x - 1.2 = 8.4$

8.  $\frac{2}{7}x - 5 = 15$

9.  $\frac{x}{7} - 8 = 10$

10.  $4x + 8 = 4$

11.  $\frac{4}{5}x = 60$

12.  $0.2x + 0.3 = 1.4$

13.  $\frac{x}{5} + 3 = -8$

14.  $12 = \frac{x}{8} + 5$

15.  $\frac{x}{8} + 5 = -12$

16.  $-18x + 5 = 13.2$

17.  $5x - 3 = 18$

18.  $\frac{x}{7} - 8 = -10$

19.  $14 = 3x - 5$

20.  $\frac{x}{5} + 18 = 5$

21.  $4x + 7 = 0.07$

22.  $\frac{2}{3}x - 8 = 8$

23.  $-13x + 3 = 6$

24.  $-4.2x + 4 = -8$

# SOLVING 2 STEP EQUATIONS

1.  $3x - 5 = 10$

2.  $\frac{x}{6} + 3 = 7$

3.  $4x - 5 = 7$

4.  $-5x - 6 = 13$

5.  $8x + 3 = -4$

6.  $\frac{x}{6} + 6 = -9$

7.  $-4x - 9 = -113$

8.  $\frac{x}{-3} + 6 = -9$

9.  $-3x + 7 = 21$

10.  $\frac{4}{3}x + 7 = 50$

11.  $0.6x + 0.3 = 0.1$

12.  $\frac{5}{3}x + 7 = 42$

13.  $-8.2x + 5 = 17$

14.  $27 = -9x + 9$

15.  $\frac{7}{3}x - 6 = 6$

16.  $\frac{2}{3}x + 5 = 5$

17.  $5x - 3 = 20$

18.  $\frac{-3}{4}x + 6 = -11$

19.  $3.1x + 4 = 16$

~~20.~~  $\frac{-3}{9}x + \frac{1}{3} = \frac{4}{3}$

21.  $-0.6x + 7 = 14$

22.  $\frac{0.8x + 5}{0.6} = 2$

23.  $15x + 4 = 10$

24.  $10x + 0 = 10$

25.  $3x - 5 = 6$

26.  $-7x - 7 = -7$

27.  $2x + 2 = 2$

28.  $\frac{3}{4}x + 5 = 20$

29.  $-3x - 8 = 20$

30.  $20x - 5 = 18$

31.  $3x + 2 = 11$

32.  $\frac{x}{6} - 8 = -10$

33.  $4x + 8 = 4$

~~34.~~  $x - 3.0 = 3\frac{4}{5}$

35.  $\frac{4}{5}x = 60$

36.  $0.2x + 3.1 = 4.1$

37.  $\frac{x}{8} + 5 = -1.2$

38.  $-3a + 9 = 27$

39.  $5x - 3 = 18$

40.  $14 = 3x - 6$

41.  $27 = 5 + 2x$

42.  $35 = -3x + 2$

43.  $\frac{3}{4}x - 5 = 20$

44.  $0.5 = 0.5x - 10$

45.  $40x + 80 = -120$

46.  $17x + 19 = 19$

47.  $-x + 13 = 19$

48.  $2x - 7 = 0.7$

## Two-Step Equations

Solve each equation.

1)  $6 = \frac{a}{4} + 2$

2)  $-6 + \frac{x}{4} = -5$

3)  $9x - 7 = -7$

4)  $0 = 4 + \frac{n}{5}$

5)  $-4 = \frac{r}{20} - 5$

6)  $-1 = \frac{5+x}{6}$

7)  $\frac{v+9}{3} = 8$

8)  $2(n+5) = -2$

9)  $-9x + 1 = -80$

10)  $-6 = \frac{n}{2} - 10$

11)  $-2 = 2 + \frac{v}{4}$

12)  $144 = -12(x+5)$

13)  $-15 = -4m + 5$

14)  $10 - 6v = -104$

15)  $8n + 7 = 31$

16)  $-9x - 13 = -103$

17)  $\frac{n+5}{-16} = -1$

18)  $-10 = -10 + 7m$

19)  $-10 = 10(k-9)$

20)  $\frac{m}{9} - 1 = -2$

21)  $9 + 9n = 9$

22)  $7(9+k) = 84$

23)  $8 + \frac{b}{-4} = 5$

24)  $-243 = -9(10+x)$

# SOLVING TYPE 3 EQUATIONS

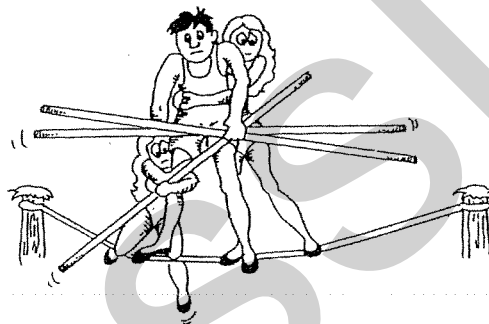
A **Type III** equation is one where there is more than one group of variables (letters). To solve a Type III equation you should first collect and place all the **variables** (letters) on the left side of the equal sign or equation, and all the **constants** (numbers) on the right side of the equal sign or equation by using opposite operations. That means if an 'x' term is on the right side of the equal sign, bring it over to the left side by using the opposite sign. Likewise, if a number is being added or subtracted on the left side of an equation, bring it over to the right side by using the opposite sign as shown in the two examples below.

## EXAMPLE #1

$$\begin{aligned} 5x - 3 &= 3x + 14 \\ 5x - 3x &= 14 + 3 \\ 2x &= 17 \\ \frac{2x}{2} &= \frac{17}{2} \\ x &= 8.5 \end{aligned}$$

## EXAMPLE #2

$$\begin{aligned} 6x - 4.3 + 3x &= 86.2 - 1x \\ 6x + 3x + 1x &= 86.2 + 4.3 \\ 10x &= 90.5 \\ \frac{10x}{10} &= \frac{90.5}{10} \\ x &= 9.05 \end{aligned}$$



Solve the following.

1.  $3x + 8x = 44$

2.  $7x - 3x = 44$

3.  $-2x - 8x = -100$

~~4.~~  $\frac{1}{3}y + \frac{2}{3}y = 14$

5.  $-3.2a + 5a = 90$

~~6.~~  $12 = \frac{3}{4}x + \frac{5}{4}x$

7.  $7x - 5x = -20$

8.  $3x - 10x = 15$

9.  $4x + 3.2x = 18$

10.  $7x + 6 = 12$

11.  $5x - 3 = 2x + 8$

12.  $-5x - 3 = -2x + 8$

13.  $-\frac{2}{3}x + 5 = 7$

14.  $4x + 3 = 9x + 7$

~~15.~~  $\frac{1}{2}x + 2 = \frac{3}{4}x + 7$

16.  $0.4x + 8 = 0.6x - 7$

17.  $6x + 1.2 = 9x + 2$

~~18.~~  $\frac{6}{7}x - 2 = \frac{2}{7}x + 8$

~~19.~~  $\frac{1}{3}x + 20 = x + 4$

~~20.~~  $\frac{1}{2}a + 9 = 2a - 6$

21.  $0.02x + 7 = 0.03x + 5$

22.  $5x - 10 = 25x + 3$

23.  $7x - 10 = 3x + 14$

24.  $0.1y + 0.01 = 0.01y + 0.1$

25.  $3x + 10 + 5x = 90$

26.  $6x - 5 - 2x = 7 + 1$

27.  $16 + 45x = 39x + 310$

28.  $7x - 3 - 2x = 8$

29.  $8x + 4x + 5x = 7$

30.  $2x - 3 = 6x + 4x$

## Multi-Step Equations

Solve each equation.

1)  $-20 = -4x - 6x$

2)  $6 = 1 - 2n + 5$

3)  $8x - 2 = -9 + 7x$

4)  $a + 5 = -5a + 5$

5)  $4m - 4 = 4m$

6)  $p - 1 = 5p + 3p - 8$

7)  $5p - 14 = 8p + 4$

8)  $p - 4 = -9 + p$

9)  $-8 = -(x + 4)$

10)  $12 = -4(-6x - 3)$

11)  $14 = -(p - 8)$

12)  $-(7 - 4x) = 9$

13)  $-18 - 6k = 6(1 + 3k)$

14)  $5n + 34 = -2(1 - 7n)$

15)  $2(4x - 3) - 8 = 4 + 2x$

16)  $3n - 5 = -8(6 + 5n)$

17)  $-(1 + 7x) - 6(-7 - x) = 36$

18)  $-3(4x + 3) + 4(6x + 1) = 43$

19)  $24a - 22 = -4(1 - 6a)$

20)  $-5(1 - 5x) + 5(-8x - 2) = -4x - 8x$

## Solving Multi-Step Equations

Solve each equation.

1)  $4n - 2n = 4$

2)  $-12 = 2 + 5v + 2v$

3)  $3 = x + 3 - 5x$

4)  $x + 3 - 3 = -6$

5)  $-12 = 3 - 2k - 3k$

6)  $-1 = -3r + 2r$

7)  $6 = -3(x + 2)$

8)  $-3(4r - 8) = -36$

9)  $24 = 6(-x - 3)$

10)  $75 = 3(-6n - 5)$

$$11) -3(1+6r) = 14 - r$$

$$12) 6(6v+6) - 5 = 1 + 6v$$

$$13) -4k + 2(5k-6) = -3k - 39$$

$$14) -16 + 5n = -7(-6 + 8n) + 3$$

$$15) 10p + 9 - 11 - p = -2(2p + 4) - 3(2p - 2)$$

$$16) -10n + 3(8 + 8n) = -6(n - 4)$$

$$17) 10(x+3) - (-9x-4) = x - 5 + 3$$

$$18) 12(2k+11) = 12(2k+12)$$

$$19) -12(x-12) = -9(1+7x)$$

$$20) -11 + 10(p+10) = 4 - 5(2p+11)$$



## Review of Equations

Solve each equation.

1)  $3n + 4n = -14$

2)  $9 = -7m + 1 - 6$

3)  $-24 = 5r + 3r$

4)  $-6x - 6x = 12$

5)  $-36 = 6(2 - 8n)$

6)  $-6 + 5(-1 - b) = 19$

7)  $-14 = -(-2x + 2)$

8)  $51 = 7(-1 + 2v) + 2$

9)  $7(1 + 5n) + 6(1 + 4n) = 13$

10)  $73 = -6(k - 7) + 6(k + 5)$

11)  $-6(3 - 3a) - 8(6a + 5) = 32$

12)  $-9 + 4r = 4r - 3 - 6$

13)  $6x - 2x + 8 = x + 5$

14)  $4n + 5n + 15 = 5n + 7n$

$$15) 4m + 3 = 13 - m$$

$$16) 5p + 5 = 4 + 4p$$

$$17) 8 + 6x = 8 + 8x + 7 + 3$$

$$18) -5b + 24 = -8(b - 6) + 6b$$

$$19) 3(7r - 7) = -6 + 6r$$

$$20) -(1 - 5x) + 8 = -17 + 2x$$

$$21) -5n - 4(-7 - 4n) = 36 + 7n$$

$$22) 2(-7a + 6) = -16 - 7a$$

$$23) -8(2 + 7n) = -6n + 34$$

$$24) -7(x + 3) = -2(x + 3) - 5x$$

$$25) -4(v - 2) = -4(v - 8) - 8v$$

$$26) 2(x + 8) = -3(x + 3)$$

$$27) -7(-1 + 3a) = 5(3 - 5a)$$

$$28) 4k + 7(-4 - 2k) = -2(k - 2)$$

# Writing Algebraic Expressions

Express each phrase as an algebraic expression.

1. add 43 to a number $n$	2. a number $x$ divided into 25
3. 7 times a number $e$	4. take away a number $c$ from 16
5. difference of a number $q$ and 24	6. product of a number $r$ and 41
7. 13 more than a number $j$	8. a number $a$ less 49
9. a number $v$ decreased by 28	10. a number $b$ multiplied by 46
11. 30 minus a number $h$	12. a number $u$ divided by 36
13. quotient of 23 and a number $e$	14. 8 less than a number $y$
15. subtract a number $m$ from 19	
17. sum of a number $z$ and 34	18. 3 increased by a number $p$
19. 33 increased by a number $u$	20. add 6 to a number $k$
21. take away a number $f$ from 20	22.
23. sum of a number $b$ and 35	24. a number $x$ times 44
25. a number $w$ decreased by 12	26. a number $j$ minus 10
27. 32 less a number $t$	28. 48 multiplied by a number $q$
29. 4 divided by a number $s$	30. difference of a number $c$ and 2

## Algebra

Express each phrase as an algebraic expression.

1. a number $v$ increased by 6	2. 43 minus a number $g$
3. difference of 47 and a number $u$	4. quotient of a number $t$ and 5
5. sum of 22 and a number $f$	6. 11 decreased by a number $r$
7. 4 less a number $m$	8. 38 less than a number $q$
9. take away 16 from a number $j$	
11. 35 divided into a number $p$	12. a number $s$ multiplied by 26
13. subtract 45 from a number $u$	
15. a number $h$ plus 30	16. 34 more than a number $v$
17. a number $z$ times 9	18. product of 18 and a number $g$
19. subtract 48 from a number $e$	20. add a number $d$ to 14
21. product of a number $x$ and 33	22. quotient of a number $f$ and 27
23. a number $r$ less than 29	24. a number $b$ decreased by 20
25. take away a number $y$ from 24	26. difference of 37 and a number $k$
27. 13 plus a number $c$	28. a number $m$ increased by 25
29. 15 times a number $t$	30. sum of a number $w$ and 42

# Algebra

Express each phrase as an algebraic expression.

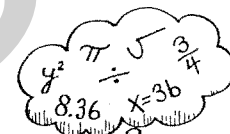
1. 12 more than the quotient of 16 and a number $y$	2. 10 times the sum of a number $q$ and 49
3. 2 less than the product of 3 and a number $r$	4. 2 increased by a number $z$
5. a fourth of the difference of 38 and a number $s$	6. 31 multiplied by a number $t$
7. 10 less than a number $h$ times 42	8. 6 times the sum of a number $q$ and 9
9. 5 plus a number $p$ less than 26	10. 11 plus a number $d$ times 12
11. 3 more than the difference of a number $e$ and 48	12. 5 less than the product of a number $w$ and 17
13. 47 more than a number $m$	14. 12 more than the quotient of 15 and a number $y$
15. 10 more than the product of a number $u$ and 28	16. 3 plus 34 times a number $v$
	18. 10 less than the quotient of a number $c$ and 13
	20. 9 less than 18 times a number $x$
21. half the difference of 20 and a number $b$	22. 8 less than the product of a number $k$ and 22
23. 12 times the quotient of a number $g$ and 43	24. 45 minus a number $a$
25. 9 less than a number $f$ times 25	26. a number $s$ decreased by 7
27. 5 plus 8 multiplied by a number $y$	28. a fifth of the sum of 10 and a number $q$

#### 4.1 TRANSLATION (MATHEMATICS ↔ ENGLISH)

The language of mathematics is similar to any other language, complete with nouns, verbs, adjectives, adverbs, phrases, sentences, etc. and grammar.

A mathematical phrase or word problem can be translated into an algebraic equation and then solved mathematically. Some common mathematical phrases and equations are listed below.

MATHEMATICS	ENGLISH EQUIVALENT
+	plus, add, increase, greater than, larger, augment
-	subtract, minus, negative, decrease, less than, reduce, diminish
×	times, of, multiply
÷	divided, goes into, a certain number of parts
=	equal, equal to, is, results in, gives you, makes
x, a, q, t, p, y, z, n, d, g, m, etc.	a number, an age, a quantity, a mass, a volume, a certain amount, etc.
8y	eight times a number, a number times eight
x + 2	a number increased by two, two larger than a number, etc.
d - 4	a number decreased by four, four less than a number, a number reduced by four, etc.
5x + 3 = 12	Five times a number plus three equals twelve.
(x)(x) or x <sup>2</sup>	a number times itself, a number squared
k - 3 < 4	If three is subtracted from a number the difference is less than four.



Write English phrases or sentences for the following mathematical phrases or sentences.

1.  $18 + x$

2.  $x + 18$

3.  $\frac{1}{2}x$

4.  $(13 + x) \div 3$

5.  $(3j)(7)$

6.  $7 - x$

7.  $x - 6$

8.  $6 - x$

9.  $12 - m + 19$

10.  $\frac{1}{5} + 3$

11.  $x, x + 1, x + 2$

12.  $x + x^2 + x^3$

13.  $\frac{x}{9}$

14.  $\frac{1}{2}x$

15.  $4x > 24$

16.  $\frac{1}{3}x \div 7$

17.  $-x$

18.  $x + 2x + 3x = 26$

# TRANSLATE

Translate each English phrase into an algebraic expression.

1. An unknown number squared \_\_\_\_\_
2. A number of coins tripled \_\_\_\_\_
3. One-fifth of a number decreased by eight \_\_\_\_\_
4. Six times a number diminished by seven \_\_\_\_\_
5. Four years subtracted from a person's age \_\_\_\_\_
6. Thirty-five is added to a number \_\_\_\_\_
7. A certain quantity doubled \_\_\_\_\_
8. A distance plus half the distance \_\_\_\_\_
9. An unknown number is subtracted from sixty-two \_\_\_\_\_
10. A sum of money quadrupled \_\_\_\_\_
11. An angle is increased by nine degrees \_\_\_\_\_
12. Half a horse's mass decreased by fifteen \_\_\_\_\_
13. The negative of a number \_\_\_\_\_
14. A certain number is cubed and the result multiplied by six \_\_\_\_\_
15. A person's age increased by eight \_\_\_\_\_
16. A number is tripled and the result doubled \_\_\_\_\_
17. Ten times the cube of a certain number \_\_\_\_\_
18. The sum of a number and its square \_\_\_\_\_
19. An unknown number of dollars is doubled and the result increased by thirty-seven \_\_\_\_\_
20. Seven is increased by half a number \_\_\_\_\_
21. An age plus twice this age is tripled \_\_\_\_\_
22. One-sixth of the length of a rectangle \_\_\_\_\_
23. An unknown number is added to three decimal five \_\_\_\_\_

# TRANSLATE

C. Translate each of the following English sentences into an algebraic sentence.

1. The square of a certain number diminished by eight is greater than three times the number.

\_\_\_\_\_

2. When a number of pennies is divided by fifty-two and thirty-nine is added to the quotient, the result is three hundred sixty-four.

\_\_\_\_\_

3. Seven times a person's age increased by nine is twenty-seven.

\_\_\_\_\_

4. When fifteen kilometres are added to a certain distance, the result is thirty-six kilometres.

\_\_\_\_\_

5. Nine more than a number is two hundred fifty-five.

\_\_\_\_\_

6. Six less than twice a number is less than thirty-six.

\_\_\_\_\_

7. An angle plus forty-seven degrees is thirty-two degrees less than twice that angle.

\_\_\_\_\_

8. When a certain number is subtracted from ninety-eight, the result is fifty-two.

\_\_\_\_\_

9. If sixty-three is subtracted from one-third of a number, the difference is sixty-six.

\_\_\_\_\_

~~10.~~ The sum of three consecutive numbers is twelve.

\_\_\_\_\_

11. Six times a person's age is twenty-four.

\_\_\_\_\_

12. A number plus one-quarter of this number is greater than or equal to sixty-three.

\_\_\_\_\_

13. If a number is subtracted from fifty-three, the result is greater than thirty-six.

\_\_\_\_\_

14. Forty-three is five more than two times a number.

\_\_\_\_\_

15. When a certain number is subtracted from one hundred seventy-eight and the difference multiplied by eighteen, the product is six hundred seventy-eight.

\_\_\_\_\_

16. We get twenty-four when we subtract thirty-eight times a number from twenty-six times a number.

\_\_\_\_\_

17. If twice an unknown number is increased by forty-four, the result is one hundred thirty-two.

\_\_\_\_\_



# TRANSLATE

B. Write English phrases for the following mathematical expressions or sentences.

1.  $3x - 2 = 10$

2.  $4(n)$

3.  $n + 16 = 32$

4.  $5 - 2n = 15$

5.  $3x - 2$

6.  $2x - 7 = 3$

7.  $n + 5$

8.  $5 + n$

9.  $x - 7$

10.  $7 - x$

C. Write a mathematical phrase or sentence for each of the following. (DO NOT SOLVE)

1. Sixteen is added to a number \_\_\_\_\_
2. A certain number increased by eight \_\_\_\_\_
3. A number doubled \_\_\_\_\_
4. A number increased by nine is equal to twelve \_\_\_\_\_
5. The sum of fourteen and a number is twenty-eight \_\_\_\_\_
6. Fifteen reduced by a number \_\_\_\_\_
7. A number subtracted from fifty-four is forty \_\_\_\_\_
8. The difference between a number and twenty-four is eleven \_\_\_\_\_
9. Twelve is added to twice a certain number \_\_\_\_\_
10. A number tripled \_\_\_\_\_
11. A number divided by three is equal to seven \_\_\_\_\_
12. If you decrease a number by nine, the result is thirteen \_\_\_\_\_
13. A certain number less five, is two \_\_\_\_\_
14. Eighteen greater than a number will be twenty-six \_\_\_\_\_
15. A number plus twice the same number is twenty-four \_\_\_\_\_
16. A certain number is tripled when fourteen is added \_\_\_\_\_
17. A number tripled is diminished by six \_\_\_\_\_
18. If an unknown number is divided by eight, the quotient is six \_\_\_\_\_
19. A number diminished by seven is twenty-five \_\_\_\_\_
20. The product of seven and a number is thirty-five \_\_\_\_\_
21. One half of an unknown number is increased by nine \_\_\_\_\_
22. Three times a number equals the number increased by four \_\_\_\_\_
23. Three times a number less six is twelve \_\_\_\_\_
24. Five more than a number is seven less than four times a number \_\_\_\_\_

---

Solve the following.

1. If you multiply a number by four and add eight to the product, the result is twenty. What is the number?
2. A number is equal to the product of eleven and twelve, increased by twenty-one. What is the number?
3. A certain number doubled, increased by nine, is twenty-one. What is the number?
4. Twenty-six, increased by what number, will result in forty-eight?
5. Twice a number decreased by fourteen is thirty. What is the number?
6. If you divide a number by three and subtract four from the quotient, the result is two. Find this number.
7. Three numbers are  $2x$ ,  $x + 1$  and  $x + 2$ . Their sum is thirty-one. Find the three numbers.
8. Three times a certain number equals the number increased by four. What is the number?
9. One-half of a number plus two is fourteen. What is the number?
10. If a number is divided by eight and seven is added to the quotient, the result is fifteen. What is the number?

# SOLVING INEQUALITIES

Solve each of the following inequalities

1.  $2x < 10$

2.  $5x - 5 > 4x + 4$

3.  $-7x \leq 14$

4.  $-2x + 8 > 3x + 9$

5.  $6x + 3 < 3x + 1$

6.  $5x - 3 \leq 7x + 7$

7.  $2x + 15 < 3x + 16$

8.  $4x - 8 < -6$

9.  $6x + 8 > 2(4x - 5)$

10.  $3a + 3a - 13a < -7$

11.  $3a + 7 \leq 2(a - 3)$

12.  $3(12x - 5) < 2(13x + 6)$

13.  $5(3x - 4) \geq -8$

14.  $8(3x - 5) < -4x + 2$

15.  $4x + 86 \geq 6x - 1$

16.  $8.3x + 2 \leq 4.3x + 52$

17.  $2x + 9 < 11$

18.  $8x < -32$

19.  $9x + 1 > 7x + 2$

20.  $x - 5 \leq 15 + 2x$

21.  $6x - 14 \leq -16$

22.  $-5x + 8 \leq 4x + 7$

23.  $-5x + 3 < 3x - 9$

24.  $-5(2x + 3) > 2(4.5x + 3)$

25.  $0.6x - 0.3 < 0.4x + 0.5$

26.  $\frac{4x + 3}{6x} < \frac{1}{3}$

## EQUATIONS AND INEQUALITIES REVIEW

Solve each of the following.

- |                                |  |   |
|--------------------------------|--|---|
| 1. $0.625x + 0.75 = 7$         | 2. $11.6 - 2.4x = 2$                           | <del>3.</del> $\frac{2}{3}x - 3\frac{3}{4} = 11$            |
| 4. $\frac{x}{6} = \frac{7}{8}$ | <del>5.</del> $\frac{x}{3} + \frac{2x}{4} = 9$ | <del>6.</del> $\frac{x+2}{2} + \frac{3x}{2} = \frac{5x}{2}$ |
| 7. $-0.27x = 2.7$              | 8. $0.5x + 7 = 1.5$                            | 9. $6x - 16 > -2x$  |
| 10. $5(3 - x) = 35$            | 11. $-6(2x + 1) \leq 12$                       | 12. $2x + 4 = 5x + 2$                                       |
| 13. $10x - 4 = 14x + 12$       | 14. $y + 2(y + 3) = 12$                        | 15. $-6(2 + y) < 2(3y - 6)$                                 |
| 16. $7x \geq 30 + 2x$          | 17. $6x - 15 = x$                              | 18. $3x + 2x + x \leq -18$                                  |
| 19. $12 - 4x = 6x$             | 20. $9x - 40 \leq 3x + 2$                      | 21. $5(12 - 3x) > 15(x + 8)$                                |
| 22. $3 - 4(2x + 2) = 8$        | 23. $10x = 3(5 - x) - 20$                      | 24. $(25 - x) - (3x + 2) = 0$                               |

B. Solve each of the following.

- |   |                                       |  |
|---|---------------------------------------|--|
| 1. $12(y - 2) = 84$   | 2. $25 - 3x = 4x - 3$                 | 3. $0.6x - 1 = 5 - 0.2x$                                   |
| 4. $\frac{3x - 6}{4} = \frac{5x - 10}{10}$  | 5. $5a + 25 = 2(2a) + 20$             | 6. $(z + 1) - 4(z - 4) = 5$                                |
| 7. $\frac{2x - 8}{4} = \frac{7x - 14}{14}$  | <del>8.</del> $x + \frac{x}{2} = 18$  | 9. $\frac{3}{x} = \frac{7}{4}$                             |
| 10. $3m - 2 = 4$  | 11. $\frac{x}{4} = \frac{2x}{3}$      | <del>12.</del> $k - \frac{k}{2} - \frac{k}{3} = 2$         |
| 13. $\frac{-2(x)}{3} \leq 16$   | 14. $10 - 2x \geq 14$                 | 15. $-6x + 15 < -24$                                       |
| 16. $8x + 20 \leq 12x - 16$   | 17. $\frac{3x}{4} = 9$                | 18. $\frac{x}{0.2} = 4$                                    |
| <del>19.</del> $3x - \frac{1}{4} = \frac{1}{4} - x$   | 20. $\frac{(x + 6)}{x} = \frac{5}{2}$ | 21. $50(x) + 25(2x) + 10(5x) = 500$                        |
| 22. $\frac{3(x + 2)}{3} < \frac{5}{6}$  | 23. $5x + 15 < 6(x + 3)$              | <del>24.</del> $\frac{1}{2}(x + 10) = \frac{1}{4}(x + 20)$ |
| <del>25.</del> $\frac{4}{100} \left[ \frac{2x}{3} \right] + \frac{5}{100} \left[ \frac{x}{3} \right] = 780$ | 26. $32 + 90x = 78x + 310$            |  |