

Lesson 1 Number Phrases

PRE-ALGEBRA

Letters like a , b , n , x , and so on can be used to stand for numbers.

<i>word phrase</i>	<i>number phrase</i>	
Some number a added to 7	$7 + a$	If $a = 5$, then $7 + a = 7 + \underline{5}$ or $\underline{12}$.
Some number b decreased by 4	$b - 4$	If $b = 6$, then $b - 4 = \underline{6} - 4$ or $\underline{2}$.
The product of 3 and some number n	$3 \times n$ or $3n$	If $n = 2$, then $3n = 3 \times \underline{2}$ or $\underline{6}$.
15 divided by some number x	$\frac{15}{x}$ or $15 \div x$	If $x = 3$, then $15 \div x = 15 \div \underline{\quad}$ or $\underline{\quad}$.

Write a number phrases for each of the following.

 a

- Some number c subtracted from 11 _____
- A certain number d increased by 12 _____
- The product of some number n and 8 _____
- Eight divided by some number j _____

 b

- Five more than the number b _____
- Some number t divided by 2 _____
- Four less than some number x _____
- The product of $\frac{1}{2}$ and y _____

Complete the following.

- If $r = 3$, then $12 - r = \underline{\quad} - \underline{\quad}$ or $\underline{\quad}$.
- If $s = 9$, then $7 + s = \underline{\quad} + \underline{\quad}$ or $\underline{\quad}$.
- If $t = 3$, then $48 \div t = \underline{\quad} \div \underline{\quad}$ or $\underline{\quad}$.
- If $u = 72$, then $\frac{1}{4}u = \underline{\quad} \times \underline{\quad}$ or $\underline{\quad}$.
- If $v = 12$, then $4v = \underline{\quad} \times \underline{\quad}$ or $\underline{\quad}$.
- If $w = 6$, then $w - 6 = \underline{\quad} - \underline{\quad}$ or $\underline{\quad}$.
- If $x = 24$, then $\frac{x}{3} = \underline{\quad} \div \underline{\quad}$ or $\underline{\quad}$.

Lesson 2 Writing Equations

PRE-ALGEBRA

An **equation** like $x + 2 = 9$ states that both $x + 2$ and 9 name the same number.

<i>sentence</i>	<i>equation</i>	
The sum of some number and 2 is 9.	$x + 2 = 9$	$x = \underline{7}$ because $\underline{7} + 2 = 9$.
Twelve divided by some number is 6.	$12 \div x = 6$ or $\frac{12}{x} = 6$	$x = \underline{2}$ because $12 \div \underline{2} = 6$.
Seven decreased by some number is 5.	$\underline{\quad} - x = \underline{\quad}$	$x = \underline{\quad}$ because $\underline{\quad} - \underline{\quad} = \underline{\quad}$.

Write an equation for each of the following.

a

1. Some number a increased by 6 is 20. _____

2. Twenty divided by some number y is 4. _____

3. The sum of a certain number b and 7 is 14. _____

4. The product of 2 and some number n is 12. _____

b

A number p decreased by 7 is 15. _____

One half of a number t is equal to 14. _____

Twelve more than some number v is 18. _____

Some number d divided by 3 is equal to 14. _____

Complete the following.

5. $x + 8 = 12$ $x = \underline{\quad}$ because $\underline{\quad} + 8 = 12$.

6. $9r = 45$ $r = \underline{\quad}$ because $9 \times \underline{\quad} = 45$.

7. $6 = \frac{1}{2}d$ $d = \underline{\quad}$ because $6 = \frac{1}{2} \times \underline{\quad}$.

8. $b - 6 = 8$ $b = \underline{\quad}$ because $\underline{\quad} - 6 = 8$.

9. $w \div 3 = 2$ $w = \underline{\quad}$ because $\underline{\quad} \div 3 = 2$.

10. $e + 16 = 18$ $e = \underline{\quad}$ because $\underline{\quad} + 16 = 18$.

11. $35 = 27 + c$ $c = \underline{\quad}$ because $35 = 27 + \underline{\quad}$.

Lesson 3 Solving Equations (division) PRE-ALGEBRA

To solve an equation, you can divide both sides of it by the same non-zero number.

$$4m = 52$$

$$\frac{4m}{4} = \frac{52}{4}$$

$$\frac{1}{4} \frac{4m}{1} = \frac{13}{4} \frac{52}{1}$$

$$m = 13$$

Check

$$4m = 52$$

$$4 \times 13 = 52$$

$$52 = 52$$

$$13y = 100 - 9$$

$$\frac{13y}{13} = \frac{91}{13}$$

$$\frac{1}{13} \frac{13y}{1} = \frac{7}{13} \frac{91}{1}$$

$$y = \underline{\hspace{2cm}}$$

To change $4m$ to m ,
both sides were divided by _____.

To change $13y$ to y ,
both sides were divided by _____.

Solve each equation.

a
1. $3w = 12$

b
 $3b = 51$

c
 $8m = 100 - 4$

2. $72 = 2a$

$54 = 3c$

$96 - 20 = 4r$

3. $6e = 84$

$25s = 75$

$4d = 75 - 7$

4. $14x = 42$

$75 = 15m$

$3y = 100 - 28$

Study the first problem. Solve problems 2–5 in a similar way.

1. John bought several model kits for \$9 each. He spent \$36. How many kits did he buy?
 If x stands for the number of kits he bought, then $9x$ stands for the cost of all the kits.
 Equation: $9x = 36$ $x = 4$
 John bought 4 model kits.

2. A train travels 70 km/h. How long does it take for this train to make a 630-km trip? If x stands for the number of hours for the trip, then _____ stands for the total number of kilometres.
 Equation: _____ $x =$ _____
 It takes _____ h to make the trip.

3. 3 kg of apples cost \$2.34 (234¢). How much does 1 kg of apples cost?
 If x stands for the cost of 1 kg, then _____ stands for the cost of 3 kg.
 Equation: _____ $x =$ _____
 1 kg of apples costs _____ ¢.

4. Eight loaves of bread cost \$7.84 (784¢). How much does one loaf of bread cost?
 If x stands for the cost of one loaf, then _____ stands for the cost of eight loaves.
 Equation: _____ $x =$ _____
 One loaf of bread costs _____ ¢.

5. A board is 84 cm long. How many metres long is this board?
 If x stands for the number of metres, then _____ stands for the number of centimetres.
 Equation: _____ $x =$ _____
 The board is _____ m long.

1.

2.

3.

4.

5.

Lesson 4 Solving Equations (multiplication)

PRE-ALGEBRA

To solve an equation, you can multiply both sides of it by the same number.

$$\frac{a}{5} = 35$$

$$5 \times \frac{a}{5} = 5 \times 35$$

$$\frac{\cancel{5} \times a}{\cancel{5}} = 175$$

$$a = 175$$

To change $\frac{a}{5}$ to a , both sides were multiplied by _____.

Check

$$\frac{a}{5} = 35$$

$$\frac{175}{5} = 35$$

$$35 = 35$$

$$r \div 3 = 11 + 34$$

$$(r \div 3) \times 3 = 45 \times \underline{\hspace{2cm}}$$

$$r = \underline{\hspace{2cm}}$$

To change $r \div 3$ to r , both sides were multiplied by _____.

Solve each equation.

a

1. $\frac{a}{8} = 7$

b

$\frac{b}{13} = 9$

c

$\frac{c}{4} = 6 + 12$

2. $16 = \frac{r}{8}$

$8 = s \div 7$

$2 \times 9 = \frac{t}{5}$

3. $g \div 17 = 9$

$15 = \frac{h}{5}$

$7 \times 6 = \frac{j}{3}$

4. $\frac{m}{15} = 17$

$23 = \frac{n}{28}$

$p \div 19 = 3 \times 9$

Lesson 4 Problem Solving PRE-ALGEBRA

Study the first problem. Solve problems 2–5 in a similar way.

1. Joseph has $\frac{1}{4}$ the number of points he needs to win. He has 36 points. How many points does he need to win?

If x stands for the number of points needed to win,

then $\frac{1}{4}x$ or $\frac{x}{4}$ stands for the points he has now.

Equation: $\frac{1}{4}x = 36$ or $\frac{x}{4} = 36$ $x = 144$

Joseph needs 144 points to win.

2. Mia has $\frac{1}{3}$ the number of points she needs to win. She has 48 points. How many points does she need to win?

If x stands for the total number of points needed to win, then _____ stands for the points she has now.

Equation: _____ $x =$ _____

Mia needs _____ points to win.

3. Three students are absent. This is $\frac{1}{6}$ of the entire class. How many students are in the class?

If x stands for the total number of students, then

_____ stands for the number of students absent.

Equation: _____ $x =$ _____

There are _____ students in the class.

4. Alex drove 120 km and stopped for lunch. He had then travelled $\frac{1}{3}$ the total distance of his trip. What is the total distance of his trip?

If x stands for the total distance, then _____ stands for the distance he has already travelled.

Equation: _____ $x =$ _____

The total distance of the trip is _____ km.

5. Shea solved 12 problems. This was $\frac{1}{5}$ of all she has to solve. How many problems does she have to solve?

Equation: _____ $x =$ _____

She has _____ problems to solve in all.

1.

2.

3.

4.

5.

Lesson 5 Solving Equations (subtraction)

PRE-ALGEBRA

To solve an equation, you can subtract the same number from both sides of it.

$$\begin{array}{l}
 v + 18 = 47 \\
 v + 18 - 18 = 47 - 18 \\
 v + 0 = 29 \\
 v = 29
 \end{array}$$

Check

$$\begin{array}{l}
 v + 18 = 47 \\
 29 + 18 = 47 \\
 47 = 47
 \end{array}$$

To change $v + 18$ to v , _____ was subtracted from both sides.

$$\begin{array}{l}
 c + 6 = 43 + 8 \\
 c + 6 - \underline{\hspace{2cm}} = 51 - \underline{\hspace{2cm}} \\
 c + \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \\
 c = \underline{\hspace{2cm}}
 \end{array}$$

To change $c + 6$ to c , _____ was subtracted from both sides.

Solve each equation.

a

1. $d + 12 = 48$

b

$36 + e = 84$

c

$f + 14 = 18 + 18$

2. $38 = j + 13$

$27 = 9 + h$

$20 + 34 = 27 + l$

3. $12 + w = 76$

$114 = x + 38$

$300 - 30 = y + 50$

4. $200 + 50 = a + 212$

$27 + b = 170 + 3$

$100 - 2 = c + 43$

Lesson 5 Problem Solving PRE-ALGEBRA

Study the first problem. Solve problems 2–5 in a similar way.

1. A rectangle is 8 m longer than it is wide. If its length is 17 m, what is its width?
 If x stands for the number of metres wide, then $x + 8$ stands for the number of metres long.

Equation: $x + 8 = 17$ $x = 9$

The width of the rectangle is 9 m.

2. A rectangle is 27 cm longer than it is wide. If its length is 45 cm, what is its width?
 If x stands for the number of centimetres wide, then _____ stands for the number of centimetres long.

Equation: _____ $x =$ _____

The width of the rectangle is _____ cm.

3. Maria's score of 94 is 8 points higher than Su-Lin's score. What is Su-Lin's score?
 If x stands for Su-Lin's score, then _____ stands for Maria's score.

Equation: _____ $x =$ _____

Su-Lin's score is _____.

4. The 17 men at work outnumber the women by 5. How many women are at work?
 If x stands for the number of women at work, then _____ stands for the number of men at work.

Equation: _____ $x =$ _____

There are _____ women at work.

5. The 48-min trip to work was 19 min longer than the trip home from work. How long did it take for the trip home?
 If x stands for the number of minutes for the trip home, then _____ stands for the trip to work.

Equation: _____ $x =$ _____

The trip home took _____ min.

1.

2.

3.

4.

5.

Lesson 6 Solving Equations (addition) PRE-ALGEBRA

To solve an equation, you can add the same number to both sides of it.

$$\begin{aligned} t - 3 &= 15 \\ t - 3 + 3 &= 15 + 3 \\ t + 0 &= 18 \\ t &= 18 \end{aligned}$$

Check

$$\begin{aligned} t - 3 &= 15 \\ 18 - 3 &= 15 \\ 15 &= 15 \end{aligned}$$

$$\begin{aligned} b - 12 &= 14 + 3 \\ b - 12 + \underline{\hspace{2cm}} &= 17 + \underline{\hspace{2cm}} \\ b + \underline{\hspace{2cm}} &= \underline{\hspace{2cm}} \\ b &= \underline{\hspace{2cm}} \end{aligned}$$

To change $t - 3$ to t , _____ was added to both sides.

To change $b - 12$ to b , _____ was added to both sides.

Solve each equation.

 a

1. $b - 8 = 15$

 b

$x - 14 = 36$

 c

$c - 3 = 28 + 4$

2. $42 = r - 12$

$80 = e - 26$

$20 + 11 = f - 14$

3. $163 = a - 27$

$9 \times 9 = m - 38$

$t - 28 = 102$

4. $117 = w - 83$

$200 - 25 = g - 83$

$h - 75 = 100 + 56$

Study the first problem. Solve problems 2–5 in a similar way.

1. The temperature has fallen 12°C since noon. The present temperature is 17°C . What was the noon temperature?

If x stands for the noon temperature, then $\underline{x - 12}$ stands for the present temperature.

Equation: $\underline{x - 12 = 17}$ $x = \underline{29}$

The noon temperature was $\underline{29}^{\circ}\text{C}$.

2. The temperature has fallen 7°C since noon. The present temperature is 18°C . What was the noon temperature?

If x stands for the noon temperature, then _____ stands for the present temperature.

Equation: _____ $x =$ _____

The noon temperature was _____ $^{\circ}\text{C}$.

3. After selling 324 papers, Mr. Merk had 126 papers left. How many papers did he start with? If x stands for the number of papers he started with, then _____ stands for the number left.

Equation: _____ $x =$ _____

He had _____ papers to start with.

4. Andrew sold his football for \$15.50 (1550¢). This was 95¢ less than the original cost. What was the original cost?

If x stands for the original cost, then _____ stands for the amount he sold the football for.

Equation: _____ $x =$ _____

The original cost of the football was \$_____.

5. The width of a rectangle is 37 cm shorter than its length. The width is 75 cm. How long is the rectangle?

If x stands for the measure of the length, then _____ stands for the measure of the width.

Equation: _____ $x =$ _____

The rectangle is _____ cm long.

1.

2.

3.

4.

5.

Lesson 7 Solving Equations Review PRE-ALGEBRA

Solve each equation.

a

1. $4b = 30 + 30$

b

$13 + 26 = 3u$

c

$7v = 42 + 42$

2. $\frac{d}{5} = 100 - 40$

$10 - 3 = \frac{y}{32}$

$\frac{k}{37} = 10 - 8$

3. $g + 27 = 49 - 4$

$100 - 7 = 39 + x$

$43 = n + 12$

4. $p - 6 = 3 + 10$

$56 - 3 = k - 42$

$w - 39 = 90 + 3$

5. $x + 16 = 33 + 12$

$\frac{m}{14} = 14 - 4$

$12 + n = 56 + 8$

6. $7 \times 6 = 3t$

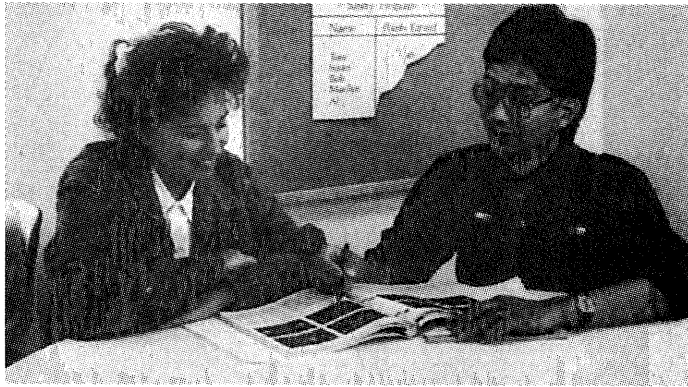
$d + 291 = 400 + 26$

$73 - 8 = n + 5$

7. $4 + 8 = \frac{q}{12}$

$g - 27 = 2 \times 45$

$\frac{x}{15} = 20 - 5$



Safety Program	
Name	Points Earned
Tom	48
Susan	
Bob	
Mallory	
Al	

The bulletin-board chart was torn and some information is missing. Help complete the chart by using the information in the following problems. Write an equation for each problem. Solve the equation. Answer the problem.

1. Tom has earned three times as many points as Susan. How many points has Susan earned?

Equation: _____ $x =$ _____

Susan has earned _____ points.

2. Tom has one third the number of points that Bob has. How many points does Bob have?

Equation: _____ $x =$ _____

Bob has _____ points.

3. The number of points that Tom has is 27 less than the number of points that Mallory has. How many points does Mallory have?

Equation: _____ $x =$ _____

Mallory has _____ points.

4. The number of points that Tom has earned is 27 more than the number of points that Al has earned. How many points has Al earned?

Equation: _____ $x =$ _____

Al has earned _____ points.

1.

2.

3.

4.

CHAPTER 3 PRACTICE TEST

Pre-Algebra Equations

NAME _____

Solve each equation.

a

1. $4m = 40$

b

$90 = 6n$

c

$42 - 20 = 2p$

2. $\frac{r}{6} = 7$

$15 = \frac{s}{13}$

$\frac{t}{2} = 40 + 3$

3. $a + 9 = 36$

$27 = 6 + b$

$14 + 20 = c + 4$

4. $x - 9 = 27$

$36 = y - 14$

$z - 6 = 30 + 12$

5. $42 + 18 = w + 20$

$72 + 18 = \frac{x}{6}$

$37 + 12 = y - 18$

6. $12d = 144$

$17 = \frac{e}{3}$

$30m = 3 \times 60$

Write an equation for the problem. Solve.

7. Five workers are absent today. This is one fourth of all workers. How many workers are there?

Equation: _____

There are _____ workers.

CHAPTER 4 PRETEST

Using Pre-Algebra

Complete the following.

a

1. $7x + 2x = \underline{\hspace{2cm}}$

2. $6a + 2a = \underline{\hspace{2cm}}$

b

$9y + y = \underline{\hspace{2cm}}$

$5b + b = \underline{\hspace{2cm}}$

c

$z + 2z = \underline{\hspace{2cm}}$

$c + 2c = \underline{\hspace{2cm}}$

Solve each equation.

3. $3r + r = 36$

$5s + s = 42$

$t + 3t = 52$

4. $d + d + 8 = 48$

$e + e + 6 = 74$

$f + f - 5 = 95$

5. $u + 2u + 1 = 10$

$v + 3v + 4 = 24$

$w + 5w + 2 = 50$

Solve each problem.

6. Jenna made four times as many widgets as Carmen. They made a total of 60 widgets. How many widgets did Carmen make?

Carmen made _____ widgets.

7. A car averages 72 km per hour. At that rate, how far can the car travel in 3 hours?

The car can travel _____ km.

6.

7.