

3.1 Introduction to Solving Equations – Part I



Go to <http://en.wikipedia.org/wiki/Equation>.

Read the introduction and the section titled “Knowns and Unknowns”. Take notes that will help you to understand the instructions below.

Notes

Activity 1 – Draw a circle around all equations. Cross-out expressions.

$3x + 1 = 11$	$5x + 3$	$10 + y$	$15 + w = 2w - 15$
$x + 2 + 3x$	$2(y + 4) = 18$	$5x$	$\frac{1}{2}x + 10 = 14$
$2x + 10 + 3x = 15$	$20x + 10$	$x = 11$	$4w + 3w + 10$

Class Notes – State the expression that is on the left side of each equation. If possible, simplify it.

LP#1 $3x + 1 = 11$	$15 + w = 2w - 15$	$2(y + 4) = 18$
LP#2 $\frac{1}{2}x + 10 = 14$	$10y - 6y = 16$	$2x + 10 + 3x = 15$

Class Notes – State the expression that is on the right side of each equation. If possible, simplify it.

LP#3 $2x + 8 = 22$	$15 = 5(w - 10)$	$5 + y = 21 - 3y$
LP#4 $16 + z = 5z - 3z + 10$	$5x = 25$	$30 = 18 + x - 10$

Class Notes – State the unknown in each equation.

LP#5 $2x + 8 = 22$	$16 + z = 5z - 3z + 10$	$5 + y = 21 - 3y$
LP#6 $5 + y = 21 - 3y$	$15 = 5(w - 10)$	$\frac{1}{2}x + 10 = 14$
LP#7 $5x = 25$	$10y - 6y = 16$	What is another term we can use to describe the unknown in an equation?

Review – State whether each is an expression or an equation. If possible, simplify each expression and each expression in each equation.

R#1 $21 + a$	$5(x + 10) = 20$
R#2 $6x + 8 = 20$	$4w + 3 + w = 18$
R#3 $10 + p = 2p - 20$	$2k + 12 + 8k$

Homework – State whether each is an expression or an equation.

- 1) $4x - 7$ 2) $4(y + 8) = 36$ 3) $15x + 13$ 4) $5x + 13 + 6x = 18$
 5) $10x - 4 - 7x = 20$ 6) $9x + 2$ 7) $3(y - 5) = 33$ 8) $6x - 2 - x$
 9) $5x + 2 - 3x + 7$ 10) $4x + 10 + 5 = 35$ 11) $3y + 10y$ 12) $6(y - 10) = 60$

State the expression that is on the left side of each equation. If possible, simplify it.

- 13) $13y - 9y = 20$ 14) $5(y + 3) = 15$ 15) $16 + 2w = 3w - 16$ 16) $11x + 9 + 3 = 43$
 17) $45 + 5w = 10w - 75$ 18) $30 + 2w = 4w - 30$ 19) $5y - 3y = 8$ 20) $6(y + 4) = 54$
 21) $4(y - 5) = 36$ 22) $13y - 9y = 44$ 23) $10 + 3w = 5w - 22$ 24) $15y - 9y = 36$

State the expression that is on the right side of each equation. If possible, simplify it.

- 25) $6x + 24 = 66$ 26) $30 = 10(w - 8)$ 27) $17 + 3z = 7z + z - 3$ 28) $8 + 3y = 24 - y$
 29) $3 + 6y = 19 + 2y$ 30) $11 + 3z = 5z - z + 5$ 31) $10x + 40 = 80$ 32) $90 = 30(w + 2)$
 33) $45 = 5(w - 1)$ 34) $15 - y = 31 - 5y$ 35) $24 = 3(w + 2)$ 36) $6 + 3z = 7z - 3z$

Synthesis

Convert each expression into an equivalent expression containing radical coefficients.

- 37) $3x + 10$ 38) $6x - 10$ 39) $5a + 2b - 4$ 40) $9y + 10x$ 41) $7m + n + 13$

Convert each expression into an equivalent expression containing decimal coefficients.

- 42) $\frac{3}{4}x + 5$ 43) $\frac{1}{8}x - 6$ 44) $\frac{2}{9}a + \frac{1}{2}b - 3$ 45) $\frac{3}{10}y + \frac{3}{8}x$ 46) $\frac{7}{9}m + 3$

Convert each expression into an equivalent expression containing fractional coefficients.

- 47) $0.25x + 9$ 48) $0.375x - 10$ 49) $0.11a + 0.2b - 4$ 50) $0.5y + 0.7x$ 51) $0.625m - 5$

3.2 Introduction to Solving Equations – Part II

Later in this unit we will be solving linear equations. Before we begin solving, we need to know how to identify a linear equation. Most linear equations are first-degree equations. First-degree equations contain a variable in which the highest exponent is one.

Class Notes – State the degree of each equation. Identify the equation as linear or nonlinear.

LP#1 $x + 3 = 10$	$3w - 15 = 2w + 3$	$y^2 - 36 = 0$	$3z + z = 28$
LP#2 $x^2 = 25$	$10z + 2 = 12z - 1$	$100 = 4w^2$	$x^3 = 342$
LP#3 $w = 13$	$y^4 = 16$	$x + 25 = 40 - 3x$	$x^2 - x = 12$

Review – State the degree of each equation. Identify the equation as linear or nonlinear.

R#1 $2x - 6 = 30$	$10 = m^2 - 3m$
R#2 $c^4 = 81$	$7z - 1 = 2z + 9$
R#3 $x^3 = 125$	$x + 8 = 24 - x$

Homework – State the degree of each equation. Identify the equation as linear or nonlinear.

- 1) $6x + 4 = 34$ 2) $200 = 8w^2$ 3) $9z + 20 = 11z - 6$ 4) $x^3 = -125$
- 5) $3z + 8 = 7z - 4$ 6) $x^3 = 8$ 7) $250 = 10w^2$ 8) $15x + 45 = 60$
- 9) $12 = w^2 + w$ 10) $11x + 6 = 28$ 11) $3x^3 = 24$ 12) $z + 12 = 7z - 6$

Synthesis

Rewrite each first-degree equation into an equivalent equation containing radical coefficients. Rewrite each second-degree equation into an equivalent equation containing fractional coefficients.

- 13) $6z + 24 = 3z$ 14) $6 = 0.25m^2 - 0.5m$ 15) $x + 21 = 4x - 3$
- 16) $0.1p^2 - 0.5 = 0.4p$ 17) $2x + 0.5x = 7.5$ 18) $40 = \sqrt{0.25k^2} - 0.6k$

3.3 Solving First-Degree Equations Involving One Step – Part I

Class Notes – A solution to each equation is given. Check to see if the solution is correct or incorrect.

LP#1 $x + 5 = 8$ $x = 3$	$x - 8 = 7$ $x = 18$	$4x = 36$ $x = 8$	$\frac{x}{9} = 3$ $x = 27$
LP#2 $75 = 100 - x$ $x = 15$	$19 + x = 52$ $x = 33$	$\frac{x}{22} = 3$ $x = 66$	$156 = 12x$ $x = 12$



Go to <http://en.wikipedia.org/wiki/Equations#Properties>. Read the section titled “Properties”.

State which property to use here.	Solve each equation here.
	$x + 6 = 79$
	$x - 9 = 37$
	$5x = 65$

Class Notes – Solve each first-degree equation and check. If you do not solve an equation, explain why.

LP#3 $y + 8 = 20$	$x - 6 = 10$	$x^2 + 1 = 26$
LP#4 $m - 10 = -2$	$h^4 + h = 6$	$y + 96 = 56$
LP#5 $3t = 24$	$4x^3 = 32$	$-36 = 4b$
LP#6 $200 = 2x^2$	$-42 = -7x$	$-2d = 84$

Class Notes – Solve each equation for x .

LP#7 $x - m = p$	$w = x + y$	$h + x = k$
LP#8 $6x = r$	$c = -11x$	$15p = 3x$

Review – Solve each first-degree equation and check. If you do not solve an equation, explain.

R#1 $15x = 60$	$x - 15 = 49$	$k^3 + 1 = 28$
R#2 $10 - w = 87$	$m^2 = m + 6$	$\frac{x}{14} = 9$

R#3 $4p^2 = 100$	$8k = 96$	$76 + x = 32$
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Homework –

Solve each first-degree equation and check. If you do not solve an equation, explain.

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|-------------------|------------------------|------------------------|------------------------|
| 1) $x - 8 = 32$ | 2) $18 - y = 52$ | 3) $10x^3 = 90$ | 4) $56 + b = 29$ |
| 5) $p - 18 = 92$ | 6) $24 - w = 68$ | 7) $67 + x = 23$ | 8) $124 + k = 18$ |
| 9) $x^2 + 5 = 54$ | 10) $f + 76 = 27$ | 11) $212 + v = 197$ | 12) $131 + g = 17$ |
| 13) $6x = 54$ | 14) $\frac{x}{12} = 4$ | 15) $13y = 65$ | 16) $k^4 + 10 = k$ |
| 17) $9w = 108$ | 18) $\frac{x}{5} = 21$ | 19) $20x = 140$ | 20) $\frac{x}{21} = 6$ |
| 21) $7k = 98$ | 22) $\frac{x}{6} = 14$ | 23) $96 = 6x^2$ | 24) $\frac{x}{14} = 3$ |
| 25) $32 + m = 18$ | 26) $56 - d = 102$ | 27) $\frac{x}{18} = 6$ | 28) $4m = 76$ |

Solve each equation for x .

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|-----------------|-----------------|-----------------|
| 29) $x + m = p$ | 30) $w = x - y$ | 31) $h - x = k$ |
| 32) $3x = r$ | 33) $c = -7x$ | 34) $25p = 5x$ |

Synthesis

Simplify both sides of the equation. Do not solve.

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| 35) $20(x - 6) + 8 = 4 + x - 116$ | 36) $4(y + 7) - 3 = y + 30 - 5$ | 37) $-15 + 10w + 4 = 2(6w - 8) + 2$ |
| 38) $5(v - 2) = 8(v - 4)$ | 39) $2(x + 5) = 4(x - 10)$ | 40) $3(m + 6) = 6(m + 12)$ |

A solution for x is given for each equation. Check to see if the solution is correct or incorrect.

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|-----------------|--------------|-----------------|-----------------------|
| 41) $x + y = w$ | 42) $3x = r$ | 43) $p - x = m$ | 44) $\frac{x}{8} = h$ |
| $x = w - y$ | $x = 3r$ | $x = m - p$ | $x = 8h$ |

3.4 Solving First-Degree Equations Involving One Step – Part 2

Fractions are commonly used to represent division. The equations below are written using a division symbol. Rewrite each equation using a fraction.

LP#1 $h \div 4 = 6$	$b \div 3 = 25$	$-13 = d \div 7$
LP#2 $-9 = g \div 4$	$31 = a \div 2$	$x \div 11 = 7$



Go to <http://en.wikipedia.org/wiki/Equations#Properties>. Read the section titled “Properties”. Which of the five properties must we use when solving the equation $x \div 7 = 21$?

State which property to use here.	Solve the equation here.
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Class Notes – Solve each first-degree equation and check. If you do not solve an equation, explain why.

LP#3 $h \div 3 = 14$	$n^2 \div 4 = 9$	$8 = x \div 7$
LP#4 $\frac{y}{5} = 9$	$\frac{x}{6} = 30$	$\frac{w^2}{11} = 5$

LP#5 $10 = \frac{g}{-4}$	$\frac{n}{-6} = -12$	$\frac{k}{-7} = 121$
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Class Notes – Solve each equation for x .

LP#6 $n = x \div m$	$\frac{x}{y} = z$	$x \div h = g$
LP#7 $\frac{x}{b} = 4a$	$\frac{x}{de} = c$	$5r = \frac{x}{jk}$

Review – Solve each first-degree equation and check. If you do not solve an equation, explain.

R#1 $x \div 5 = 10$	$\frac{y^2}{8} = 2$	$\frac{w}{3} = 12$
R#2 $p^2 \div 12 = 5$	$x \div 2 = 27$	$\frac{k}{13} = 5$
R#3 $\frac{h}{8} = 17$	$x^2 \div 5 = 5$	$\frac{w}{20} = 16$

Homework –

Solve each first-degree equation and check. If you do not solve an equation, explain.

1) $x \div 11 = 154$ 2) $y \div 6 = 108$ 3) $z \div 7 = 84$ 4) $x \div 14 = 60$

5) $m^2 \div 2 = 18$ 6) $x \div 3 = 76$ 7) $p^2 \div 3 = 12$ 8) $x \div 7 = 16$

9) $\frac{k}{4} = 36$ 10) $\frac{m}{9} = 54$ 11) $\frac{b}{8} = 75$ 12) $\frac{k}{2} = 99$

13) $\frac{h}{24} = 14$ 14) $\frac{p^2}{5} = 78$ 15) $\frac{j}{25} = 12$ 16) $\frac{x^2}{3} = 23$

Synthesis

Simplify both sides of the equation. Do not solve.

17) $5(x - 3) + 2 = 6 + x + 20$ 18) $2(y + 9) - 5 = 3y + 15 - 8$ 19) $10 + 7w - 15 = 6(3w - 11) - 3$

20) $7(v - 4) = 10(v - 6)$ 21) $8(x + 11) = 10(x - 16)$ 22) $4(m + 7) = 7(m + 13)$

3.5 Solving First-Degree Equations Involving Multiple Steps – Part 1

When the left side and right side of an equation are completely simplified, then the equation is ready to be solved. Using two operations is necessary to solve a multi-step equation. To solve the equation, we must make use of the order of operations (PEMDAS). However, when solving the equation we complete any addition/subtraction, first, then multiplication/division.

Class Notes – Solve each first-degree equation and check. If you do not solve an equation, explain why.

Set 1 $3x + 2 = 8$	$5x - 6 = 9$	$4m = 10 = 26$
Set 2 $5 + \frac{d}{2} = 37$	$\frac{p}{3} + 9 = -8$	$\frac{w^2}{11} + 10 = 15$

Set 3 $13 = 19 + 2n$	$6x^2 + 10 = 226$	$\frac{k}{-4} + 10 = -40$
Set 4 $3k - 11 = 10$	$\frac{n}{7} - 6 = 7$	$39 = 4d + 7$

Review – Solve each first-degree equation and check. If you do not solve an equation, explain.

R#1 $2x - 7 = 17$	$\frac{m}{5} + 15 = 19$	$5x + 7 = -38$
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R#2 $6x - 4 = 20$	$4x - 3 = 13$	$\frac{d}{12} - 1 = 2$
R#3 $4x + 1 = 49$	$\frac{k}{7} - 3 = 4$	$3x - 9 = 12$

Homework –

Solve each first-degree equation and check. If you do not solve an equation, explain.

1) $7 + 2x = 27$ 2) $10 - 2x = 28$ 3) $-3x + 6 = 6$ 4) $-7x + 7 = -77$

5) $7x - 4 = 24$ 6) $4x + 8 = 4$ 7) $2x + 5 = 9$ 8) $1 - 5x = -59$

9) $5x + 4 = -41$ 10) $3x - 8 = 1$ 11) $7x + 7 = 84$ 12) $-6 + 3x = 27$

13) $-2x + 7 = -11$ 14) $6 - 2x = -8$ 15) $3x + 7 = 28$ 16) $6x - 10 = 26$

Synthesis

TBD

3.6 Solving First-Degree Equations Involving Multiple Steps – Part 2

Reviewing the Distributive Property

State whether the following statements are true or false. If false, correct the statement.

LP#1 $3(x + 4) = 3x + 12$	$6(y + 7) = 6y + 7$	$4(n + 2) = 4n + 8$
LP#2 $-3(x + 5) = -3x + 15$	$-6(w - 9) = -6w + 54$	$-5(m + 9) = -5m - 9$
LP#3 $(y - 3)(-4) = -4y + 12$	$(a - 7)(6) = y - 42$	$(a + b)(5) = 5a + 5b$
LP#4 $-5(y + 1) = -5 - 5$	$3(x + 4) = 3x + 12$	$-2(y + 5) = -2y - 10$

Complete the rule below.

Let a , b , and c represent real numbers,

$$a(b + c) =$$

Class Notes – Solve each first-degree equation and check. If you do not solve an equation, explain why.

LP#5 $2(x + 3) = -16$	$28 = 4(m + 5)$	$120 = 15(w - 2)$
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LP#6 $8(y - 1) = 64$	$-4(p - 9) = -48$	$14(4 - d) = -168$
LP#7 $6 = -3(x - 1)$	$2(p - 20) = 8$	$4 = 4(b - 2)$

Review – Solve each first-degree equation and check. If you do not solve an equation, explain.

R#1 $5(6x - 7) = -35$	$4(1 - 5x) = -56$	$-4(1 - 6x) = 164$
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R#2 $5(x - 1) = 20$	$6(10 + x) = 132$	$-6(7x + 10) = -144$
R#3 $-2(6x + 9) = -150$	$3(3 + 6x) = 225$	$-6(1 + 4x) = 90$

Homework –

Solve each first-degree equation and check. If you do not solve an equation, explain.

1) $-5(-5 - x) = -45$ 2) $4(10 + 2x) = 64$ 3) $-7(4 - x) = 7$ 4) $7(4x - 4) = 140$

5) $3(2x + 8) = 60$ 6) $-6(x - 6) = 36$ 7) $7(-3x + 10) = 196$ 8) $-3(x - 2) = 33$

9) $4(x + 4) = -16$ 10) $4(3 + 2x) = 76$ 11) $6(4x - 2) = 156$ 12) $6(x + 3) = 30$

13) $7(1 + x) = 21$ 14) $3(2x - 10) = -90$ 15) $7(4x + 7) = 357$ 16) $7(-6x - 6) = 84$

Synthesis

TBA

3.7 Solving First-Degree Equations Involving Multiple Steps – Part 3



Activity for 3.4 - Logically sort the following numbers into 6 different groups. Each group may contain only 5 numbers. First, use a piece of scrap paper then fill in the notes with the rest of the class.

9 $3x$ $10y^2$ x^2 -11 $-4y$ $7x^2$ $3y$ -1 xy
 $9y^2$ $12xy$ xy $-6x$ $-2x^2$ $-y^2$ $21x$ y $-8x^2$ $-8y^2$
 $5xy$ -5 x $6y^2$ $-3y$ 18 $-13x^2$ $14xy$ $10x$ $-17y$

Group 1	Group 2	Group 3
Group 4	Group 5	Group 6

After you have logically sorted each term into a group, add all the terms together and circle the sum.

Class Notes – Solve each first-degree equation and check. If you do not solve an equation, explain why.

LP#1 $8x - 2x = 30$	$8y - 4y = -10$	$x + 6 = 31 - 4x$
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<p>LP#2 $5y - 10 = -3y + 6$</p>	$5 + 3m^2 - m = 1$	$13 = w - 2w + 6$
<p>LP#3 $29 = 4n^2 - 7 - n^2 + 6$</p>	$-4 + a = 5 - 2a + 3$	$10 - 4x + x - 6 = -23$

Review – Solve each first-degree equation and check. If you do not solve an equation, explain.

<p>R#1 $4x + 10 + 2x = 70$</p>	$-3 = -7x + 5x - 5$	$5 + 3x + 5x = -11$
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R#2 $7x - 2 - 5x = 6$	$3x + 5 - 4x = -1$	$x + 1 + 3x = -39$
R#3 $6x + 7 - 2x = -33$	$1 + 4x + 6x = 101$	$2x - 7 + 6x = 73$

Homework –

Solve each first-degree equation and check. If you do not solve an equation, explain.

- 1)** $81 = 6x + 5x + 4$ **2)** $3x + 4 + 2x = 59$ **3)** $39 = 4x + x + 4$ **4)** $7x + 5 + 6x = 18$
5) $9 - 5x - 5x = -21$ **6)** $4x + 7 + 3x = 28$ **7)** $4x + 3 + 2x = 57$ **8)** $3 + 3x + 5x = 43$
9) $1 = 4x - 2x - 3$ **10)** $-71 = -6x - 2x + 9$ **11)** $56 = 5x + 4x + 2$ **12)** $2x - 2 + 6x = 38$
13) $5x + 9 + 6x = 64$ **14)** $4x - 9 + 6x = 91$ **15)** $2x + 5 - 4x = -5$ **16)** $4x - 7 + x = -12$

Synthesis

TBA

3.8 Solving First-Degree Equations – More Practice

Class Notes – Classify each equation as a single-step first-degree equation, multi-step first-degree equation, or not a first-degree equation. Then solve each first-degree equation and check. If you do not solve an equation, explain why.

LP#1 $x + 10 = 6$	$3(m + 10) = -24$	$4w + 4 = 32$
LP#2 $-4y + 20 = 56 + 2y$	$1 + 7m^2 - m = 10$	$-6b = 72$
LP#3 $55 = \frac{d}{8}$	$15 - y = 32$	$10 = 2(m - 15)$

LP#4 $36 = 4n^2$	$-4(k + 11) = 48$	$20 = 5x + 10$
LP#5 $4g - 2(g - 2) = 12$	$5(3c - 2) - 24 = 16$	$22 = x - 18$

Review – Solve each first-degree equation as single-step or multi-step. Solve and check.

R#1 $10 + x = 8$	$5x = 20$	$4x - 7 = -31$
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R#2 $2x + 1 = 17$	$3 = -x + 3x + 7$	$4 + 6x - 7x = -6$
R#3 $x + 8 = -47 - 4x$	$-7x + 1 = -87 + 4x$	$-5(-9 - 7x) = 185$

Homework –

Solve each first-degree equation and check. If you do not solve an equation, explain.

- 1)** $x + 3 = 15$ **2)** $-5x + 7 = 12$ **3)** $3x + 8 = 20$ **4)** $-9 + 6x + 5x = 24$
5) $-5 = -4x + 7x - 5$ **6)** $5x + 9 + x = -63$ **7)** $6 + 6x + x = 27$ **8)** $-6x + 7 = -84 + 7x$
9) $3x + 9 = 4x + 16$ **10)** $6x + 4 = 3 + 5x$ **11)** $7x + 8 = 18 - 3x$ **12)** $5x - 4 = 2x - 28$
13) $3(2x - 3) = 63$ **14)** $2(8 + 7x) = 72$ **15)** $3(5x - 10) = -150$ **16)** $-4(10 + 2x) = -136$
17) $-7x = -49$ **18)** $2 + 7x = 37$ **19)** $-1 + 2x = -23$ **20)** $-27 = -4x - 5x + 9$
21) $8 - 4x - x = 18$ **22)** $7x + 4 + 2x = 13$ **23)** $-4x + 7 + 5x = 12$ **24)** $6x + 9 = 9 + 5x$

Synthesis

TBA