Solving Equations

Suggested time: 75 min

What's important in this lesson:
You will learn how to solve one-step and multi-step equations. You will apply those strategies.

Complete these steps:

1. Read the lesson portion of the package on your own.

2. Complete the exercises as they appear in the lesson.

3. Check your answers with the answer key that your teacher has.

4. Ask for help at any point during the lesson.

5. Complete the "Unit 1, Lesson 4 Solving Equations Assignment" and submit to your teacher for evaluation.

Hand-in the following to your teacher:

1. Unit 1, Lesson 4 Solving Equations Assignment

Questions for the teacher:

Diagnostic/Introductory Activity:
Unit 1 Lesson 4

Which of the following statements are equations?

a. $2 \times 12 = 18 + 6$

b. $3 \times 2 + 6 = 3 \times 3 + 4$

c. $4 \times 4 = 1 + 3 + 5 + 7$

d. $18 + 8 = 52 \div 2$

e. $10 + 6 + 2 = 3 \times 7$

4.1 Solving Equations

One-step equations
A solution to an equation is a value that makes the two sides of the equation _____ when the value is substituted for the variable.

When we solve equations, our goal is to get the variable by itself (x = ?). We can isolate x by "undoing" the operations that occur with x. To undo an operation, we apply the operation's opposite. Ie. Addition is the opposite to subtraction; multiplication is the opposite to division.

(a) $x - 2 = 7$ $x - 2 + 2 = 7 + 2$ $x = 9$	Here, "we have x subtract 2." To ***UNDO*** the ***"subtract 2"***, we can ***add 2***. An equation is like a balance, we must add 2 to both sides to maintain balance. Simplify. State the solution.	Check x = 9 in original equation L.S. R.S. x – 2 | 7 (9) – 2 7 →LS = RS and x = 9
(b) $x + 5 = 12$ $x + 5 - 5 = 12 - 5$ $x = 7$	In this example, we have "x add 5." To ***UNDO*** the ***"add 5"***, we will ***subtract 5*** from both sides. Simplify and state the solution.	Check x = 7 in original equation L.S. R. S. x + 5 | 12 (7) + 5 12 →LS = RS and x = 7
(c) $2x = 24$ $\frac{2x}{2} = \frac{24}{2}$ $x = 12$	In this example, we have "x multiplied by 2." To ***UNDO*** the ***"multiply 2"***, we will ***divide by 2*** on both sides. Simplify and state the solution.	Check x = 12 in original equation L.S. R.S. 2x | 24 2(12) 24 →LS = RS and x = 12

(d) $\frac{x}{3} = 17$ $\left(\frac{x}{3}\right) \times 3 = (17) \times 3$ $x = 51$	In this example, we have "x divided by 3." To ***UNDO*** the ***"divide by 3"***, we will ***multiply by 3*** on both sides. Simplify and state the solution.	Check x = 51 in original equation L.S. R.S. $\frac{x}{3}$ $\frac{51}{3}$ 17 17 →LS = RS And x = 51

Exercise 4.1

Solve. Complete a check for questions (a) and (f).

(a) x + 4 = -8

(b) x + 7 = 31

(c) y – 1 = -10

(d) y – 10 = 93

(e) -3x = 15

(f) 7x = 21

(g) $\frac{x}{6} = -2$

(h) $\frac{y}{5} = 10$

(i) 5 + x = 12

(j) 7 – y = 8

(k) x÷ 6 = -3

(l) -6x=36

4.2 Multi-step equations

Goal: Isolate the variable "x". We can do this by "undo"ing BEDMAS.
Undo addition/subtraction first and then undo multiplication/division. Each time we undo an operation, both sides are affected.
Solve.

(a)

$5x + 4 = -16$ — Undo +4 with -4

$5x + 4 - 4 = -16 - 4$

$5x = -20$ — Undo multiplication by 5 with division

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

$x = -4$

(b)

$\frac{9x}{2} - 6 = 21$ — Undo –6 with +6

$\frac{9x}{2} - 6 + 6 = 21 + 6$

$\frac{9x}{2} = 27$ — Undo ÷2 by using ×2

$\left(\frac{9x}{2}\right) \times 2 = (27) \times 2$

$9x = 54$ — Undo ×9 by using ÷9

$\frac{9x}{9} = \frac{54}{9}$

(c)

2x + 4 = 3x – 6 — Undo the +4 with -4

2x + 4 –4 = 3x – 6 -4

2x = 3x -10 — Collect the "x's" on the same side by subtracting 3x from both sides.

2x – 3x = 3x –3x -10

-1x = -10 — Simplify

X = 10

Exercise 4.2

Solve.

(a) 3x + 7 = 19

(b) 4 = -6x + 14

(c) 2x + 7 = 6x -1

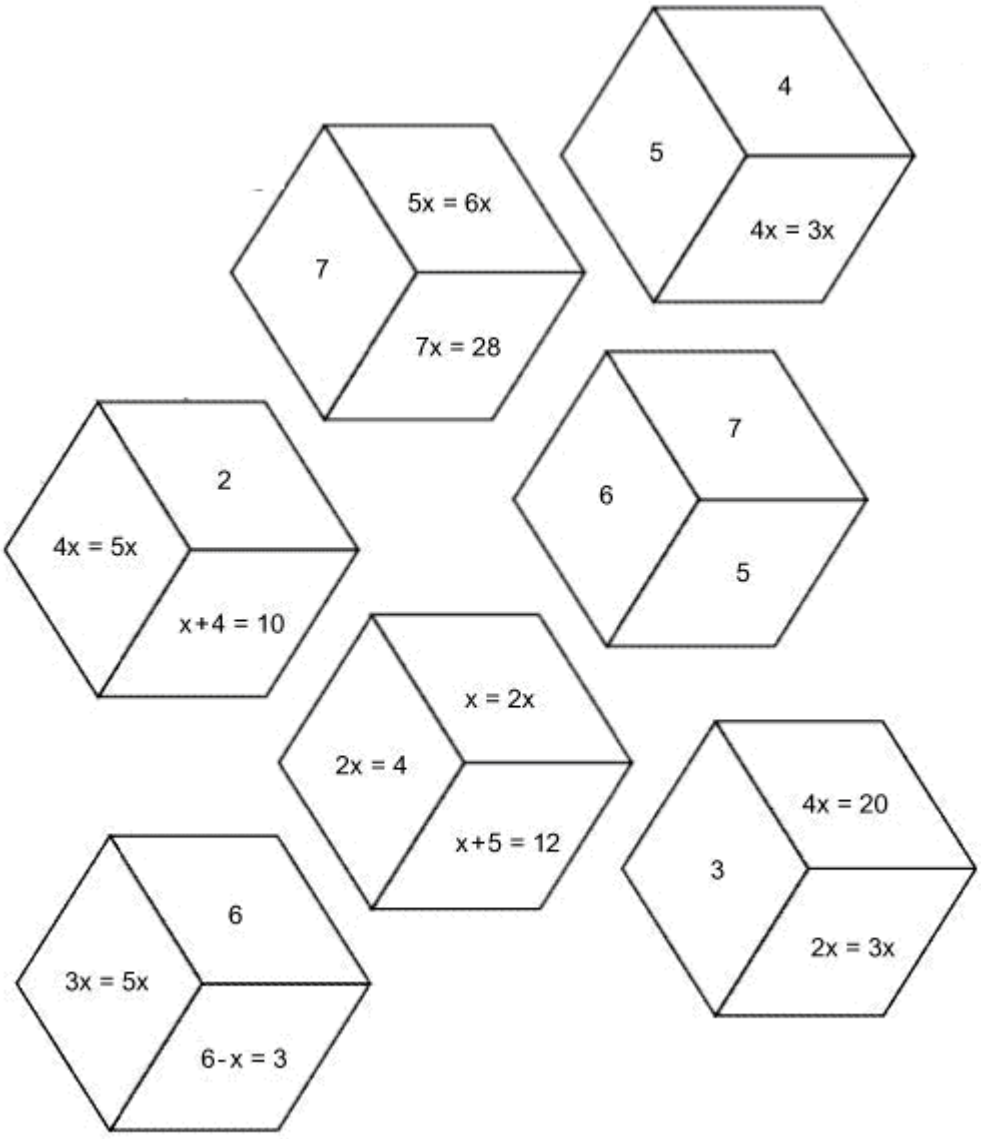
(d) 3 – 5x = 11 – 9x

(e) -8x = -3(2 + 4x)

(f) 4(x+2) = 16

Additional Exercise

Cut out the following equation tiles. Use the tile with 3 numbers at the centre. Solve each equation and complete your design by matching the edges with the same number.



This is the shape you are trying to achieve.

Solving Equations Assignment

1. Solve.

(a) $8x = -24$

(b) $n - 1 = 5$

(c) $7 + a = -2$

(d) $\frac{y}{2} = 7$

2. Solve and Check.

(a) $1 - 4y = 13$

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

LS	RS

LS	RS

3. Solve for the unknown. Show your work.

(a) $2x+3=11$

(b) $60=2y+30$

(c) $9+6x= -3+4x$

(d) $6y+3+4y-8y = -7$

(e) $4(x+2) = 6x-15$

(f) $5x – (4x+3) =7$

4. The total earning, e dollars, a bike courier earns is made up of a daily flat rate of $25, plus $8 per delivery, where d represents the number of deliveries. Which equation represents this relationship? Explain your choice.

(a) $E = 25 d + 8$
(b) $E = 25 + 8 d$
(c) $E = d(25 + 8)$
(d) $E = 25 + 8$