

Solving Equations using Algebra

When we solve equations using algebra, the first thing we want to do is to "isolate" the variable. That is we want to get the variable by itself on one side of the equal sign.

To isolate the variable and solve the equation, we use opposite operations:

Addition	opposite	→	Subtraction
Subtraction	opposite	→	Addition
Multiplication	opposite	→	Division
Division	opposite	→	Multiplication

Remember whatever you do to one side of the equation you **MUST** do the the other side.

Examples:

$$2x + 4 = 20$$

$$2x + 4 - 4 = 20 - 4$$

$$2x = 16$$

$$\frac{2x}{2} = \frac{16}{2}$$

$$x = 8$$

Mar 22-10:48 AM

Master 6.29 Activating Prior Knowledge continued

Preserving Equality

When we solve an equation using algebra, we must preserve the equality. Whatever we do to one side of an equation, we must do to the other side too.

We can:

- Add the same number to both sides
- Subtract the same number from both sides
- Multiply both sides by the same number
- Divide both sides by the same number

Example 2

a) Describe the operation you would perform to isolate the variable in each equation.

b) Solve the equation. Verify the solution.

i) $x + 7 = 9$ ii) $3x = 36$

Solution

i) a) To isolate x , subtract 7 from both sides of the equation.

b) $x + 7 - 7 = 9 - 7$
 $x = 2$
 Check: Substitute $x = 2$ back into the original equation.
 Left side = $x + 7$ Right side = 9
 $= 2 + 7$
 $= 9$
 Since the left side equals the right side, the solution is correct.

ii) a) To isolate x , divide both sides of the equation by 3.

b) $\frac{3x}{3} = \frac{36}{3}$
 $x = 12$
 Check: Substitute $x = 12$ back into the original equation.
 Left side = $3x$ Right side = 36
 $= 3(12)$
 $= 36$
 Since the left side equals the right side, the solution is correct.

Quick Review

Mar 22-11:15 AM

[Solving Equations using Algebra](#)

To solve an equation, we need to isolate the variable on one side of the equation.

To do this, we get rid of the numbers on that side of the equation.

When we solve an equation using algebra, we must also preserve the equality.

Whatever we do to one side of the equation, we must do to the other side, too.

Apr 30-2:51 PM

Whatever we do to one side of the equation, we must do to the other side, too.

Solve using algebra tiles then solve by using algebra

a) $2y - 1 = 7$
model

algebra

with algebra whatever you want to get rid of you do the opposite operation to it

b) $2 + 3a = -4$

Mar 21-12:02 PM

[Getting a Fraction or a Decimal as an Answer is OK](#)

Use algebra to solve the equation. Then verify the solution.

$16t - 69 = -13$

Mar 21-12:07 PM

Brad charges \$4 for each bag of garbage, and \$7 cleaning gutters. On Friday, Brad cleaned 1 gutter and took out the garbage. He earned \$19. How many bags of garbage did he take out?

a) Write an equation to represent this problem?
 b) Solve the equation using algebra.
 c) Verify the solution.

Mar 21-12:08 PM

Class/Homework

pg. 330

5, #6, #7, #8, #9, #10
Use algebra only

Mar 25-9:26 AM

5a) $2x-1=7$
 $2x-1+1=7+1$
 $2x=8$
 $\frac{2x}{2}=\frac{8}{2}$
 $x=4$ LS RS
 $2x-1$ 7
 $8-1$
 7

b) $11=4a-1$
 $11+1=4a-1+1$
 $12=4a$
 $\frac{12}{4}=\frac{4a}{4}$
 $3=a$ LS RS
 11 $4a-1$
 $4 \times 3-1$
 $12-1$
 11

c) $5+2m=9$
 $5+2m-5=9-5$
 $2m=4$
 $\frac{2m}{2}=\frac{4}{2}$
 $m=2$ LS RS
 $5+2m$ 9
 $5+2 \times 2$
 $5+4$
 9

Mar 26-10:54 AM

a) $1=10-3x$
 $1-10=10-3x-10$
 $-9=-3x$ $\frac{-9}{-3}=\frac{-3x}{-3}$
 $\frac{-9}{-3}=\frac{-3x}{-3}$ $-3=-x$
 $3=x$ LS RS
 $10-3x$
 $10-3 \times 3$
 $10-9$
 1

b) $13-2x=5$
 $13-2x-13=5-13$
 $-2x=-8$ $\frac{-2x}{-2}=\frac{-8}{-2}$
 $\frac{-2x}{-2}=\frac{-8}{-2}$ $13-2x$ 5
 $13-8$
 5
 $x=4$

f) $3x-6=12$
 $3x-6+6=12+6$
 $3x=18$ $\frac{3x}{3}=\frac{18}{3}$ LS RS
 $\frac{3x}{3}=\frac{18}{3}$ $3x-6$ 12
 $18-6$
 12
 $x=6$

Mar 26-10:59 AM

b) $4x=-16$
 $\frac{4x}{4}=\frac{-16}{4}$
 $x=-4$ LS RS
 $4x$ -16
 4×-4
 -16

b) $12=-3x$
 $\frac{12}{-3}=\frac{-3x}{-3}$
 $-4=x$ LS RS
 12 $-3x$
 $4=-x$ -3×-4
 $-4=x$ 12
 12

c) $-21=7x$
 $\frac{-21}{7}=\frac{7x}{7}$
 $-3=x$ LS RS
 -21 $7x=3$
 -21

d) $6x=-30$
 $\frac{6x}{6}=\frac{-30}{6}$
 $x=-5$ LS RS
 $6x$ -30
 6×-5
 -30

Mar 26-11:16 AM

7. a) mistake
 In 2nd step, the student added and subtracted 15 from the right side.
 $-3x+15=30$
 $-3x+15-15=30-15$
 $-3x=15$
 $\frac{-3x}{-3}=\frac{15}{-3}$
 $-x=5$
 $x=-5$

b) mistake, student said $7-1=8$ instead of 6
 $7=1+2n$
 $7-1=1+2n-1$
 $6=2n$
 $\frac{6}{2}=\frac{2n}{2}$
 $3=n$

c) mistake - in 3rd step, the student should have divided by 2, and he mult. by 2
 $3+2t=4$
 $3+2t-3=4-3$
 $2t=1$
 $\frac{2t}{2}=\frac{1}{2}$
 $t=\frac{1}{2}$

d) No mistake

Mar 26-11:23 AM

8a) $2x+5=-7$
 $2x+5-5=-7-5$
 $2x=-12$
 $\frac{2x}{2}=\frac{-12}{2}$
 $x=-6$ LS RS
 $2x+5$ -7
 $2 \times -6+5$
 $-12+5$
 -7

b) $-3x+11=2$
 $-3x+11-11=2-11$
 $-3x=-9$
 $\frac{-3x}{-3}=\frac{-9}{-3}$
 $-x=-3$
 $x=3$ LS RS
 $-3x+11$ 2
 $-3 \times 3+11$
 $-9+11$
 2

Mar 26-12:06 PM

$$\begin{aligned}
 c) -9 &= 5 + 7x \\
 -9 - 5 &= 5 + 7x - 5 \\
 -14 &= 7x \\
 \frac{-14}{7} &= \frac{7x}{7} \\
 -2 &= x
 \end{aligned}$$

LS
 -9
 RS
 $5 + 7x$
 $5 + 7x - 2$
 $5 + -14$
 -9

Mar 26-12:10 PM

Pa331

9. a) n = number of week

$$\begin{aligned}
 24n + 72 &= 288 \\
 24n + 72 - 72 &= 288 - 72 \\
 24n &= 216 \\
 \frac{24n}{24} &= \frac{216}{24} \\
 n &= 9
 \end{aligned}$$

LS
 $24n + 72$
 $24n + 72$
 288
 RS
 288

In 9 weeks, Navid will have the money in her account.

10. a) n = number of students

$$\begin{aligned}
 2n + 85 &= 197 \\
 2n + 85 - 85 &= 197 - 85 \\
 2n &= 112 \\
 \frac{2n}{2} &= \frac{112}{2} \\
 n &= 56
 \end{aligned}$$

LS
 $2n + 85$
 $2n + 85$
 $112 + 85$
 197
 RS
 197

56 students attended the dance.

Mar 29-11:08 AM

Class/Homework

Page 332 #11 (use algebra) and always check (verify means sub back in)

Worksheet 2 : Solve using algebra and always check (verify, means sub back in)

Mar 24-3:32 PM

Extra Practice 2

Lesson 6.2: Solving Equations Using Algebra

- Solve each equation. Verify the solution.
 - $4x = 23$
 - $-25 = -5x$
 - $-45 = 8x$
 - $3x = 54$
- Solve each equation. Verify the solution.
 - $-5x + 11 = 27$
 - $12x - 21 = 45$
 - $-43 = 5x - 27$
 - $6x - 15 = -45$
- Solve each equation. Verify the solution.
 - $3x - 7 = 5$
 - $-4x - 6 = -14$
 - $4x - 7 = 10$
 - $-7x - 8 = 13$
- Solve each equation. Verify the solution.
 - $2x = 2 + 4$
 - $15 = 10 + 3x$
 - $3 = 5 - 6$
 - $9x = 1$
- Write an equation you can use to answer each question. Solve the equation. Verify the solution.
 - Five more than two times a number is 17. What is the number?
 - Six less than three times a number is 29. What is the number?
- The Grade 8 students had a graduation dinner. They paid a flat rate of \$125 for the use of the hall, plus \$12 for each student who attended. The total cost of the dinner was \$644. How many students attended the dinner?
 - Write an equation you could use to solve the problem.
 - Solve the equation. Verify the solution.
- Use the information:

Ice cream: \$150	Skate rental: \$3
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 - Write a problem that can be solved using an equation.
 - Write the equation, then solve the problem.

11) a) $-8x + 11 = 59$

$$\begin{aligned}
 -8x + 11 - 11 &= 59 - 11 \\
 -8x &= 48 \\
 \frac{-8x}{-8} &= \frac{48}{-8} \\
 x &= -6
 \end{aligned}$$

LS
 $-8x + 11$
 $-8x + 11$
 $48 + 11$
 59
 RS
 59

b) $11c + 21 = -34$

$$\begin{aligned}
 11c + 21 - 21 &= -34 - 21 \quad [-34 + (-21)] \\
 11c &= -55 \\
 \frac{11c}{11} &= \frac{-55}{11} \\
 c &= -5
 \end{aligned}$$

LS
 $11c + 21$
 $11c + 21$
 $-55 + 21$
 -34
 RS
 -34

c) $23 = -5b + 3$

$$\begin{aligned}
 23 - 3 &= -5b + 3 - 3 \\
 20 &= -5b \\
 \frac{20}{-5} &= \frac{-5b}{-5} \\
 -4 &= -b \\
 -4 &= b
 \end{aligned}$$

LS
 23
 RS
 $-5b + 3$
 $-5x + 3$
 $20 + 3$
 23

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d) $-45 = 6a - 15$

$$\begin{aligned}
 6a - 15 &= -45 \\
 6a - 15 + 15 &= -45 + 15 \\
 6a &= -30 \\
 \frac{6a}{6} &= \frac{-30}{6} \\
 a &= -5
 \end{aligned}$$

LS
 -45
 RS
 $6a - 15$
 $6x(-5) - 15$
 $-30 - 15$
 -45

e) $52 = 25 - 9f$

$$\begin{aligned}
 52 - 25 &= 25 - 9f - 25 \\
 27 &= -9f \\
 \frac{27}{-9} &= \frac{-9f}{-9} \\
 -3 &= f
 \end{aligned}$$

LS
 52
 RS
 $25 - 9f$
 $25 - 9(-3)$
 $25 - (-27)$
 $25 + 27$
 52

f) $-13 + 4d = 31$

$$\begin{aligned}
 -13 + 4d &= 31 + 13 \\
 4d &= 44 \\
 \frac{4d}{4} &= \frac{44}{4} \\
 d &= 11
 \end{aligned}$$

LS
 $-13 + 4d$
 $-13 + 4(11)$
 $-13 + 44$
 31
 RS
 31

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page 332 #12

a) $3n + 7 = 8$
 $3n + 7 - 7 = 8 - 7$
 $3n = 1$
 $\frac{3n}{3} = \frac{1}{3}$
 $n = \frac{1}{3}$ or $0.\bar{3}$

b) $6x + 6 = 15$
 $6x + 6 - 6 = 15 - 6$
 $6x = 9$
 $\frac{6x}{6} = \frac{9}{6}$
 $x = 1.5$

c) $-23 = 5p - 27$
 $-23 + 27 = 5p - 27 + 27$
 $4 = 5p$
 $\frac{4}{5} = \frac{5p}{5}$
 $0.8 = p$

LS RS
 $3n+7$ 8
 $1+7$ 8

LS RS
 $6x+6$ 15
 $6x+6$ 15
 $9+6$ 15

LS RS
 -23 $5p-27$
 4 -27
 4 -27
 -23

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page 332 #12

d) $5p + 6 = 7$
 $5p + 6 - 6 = 7 - 6$
 $5p = 1$
 $\frac{5p}{5} = \frac{1}{5}$
 $p = 0.2$

e) $8e - 9 = -3$
 $8e - 9 + 9 = -3 + 9$
 $8e = 6$
 $\frac{8e}{8} = \frac{6}{8}$
 $e = \frac{3}{4}$ or 0.75

f) $-17 + 10g = -9$
 $-17 + 10g + 17 = -9 + 17$
 $10g = 8$
 $\frac{10g}{10} = \frac{8}{10}$
 $g = \frac{4}{5}$ or 0.8

LS RS
 $5p+6$ 7
 $5p+6$ 7
 $1+6$ 7

LS RS
 $8e-9$ -3
 $8e-9$ -3
 $6-9$ -3

LS RS
 $-17+10g$ -9
 $-17+10g$ -9
 $-17+8$ -9

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13. $n = \text{yesterday's temp.}$
 $2n + 7 = -3$
 $2n + 7 - 7 = -3 - 7$ $[-3 + (-7)]$
 $2n = -10$
 $\frac{2n}{2} = \frac{-10}{2}$
 $n = -5$

LS RS
 $2n+7$ -3
 $2x-5+7$ -3
 $-10+7$ -3

Yesterday's temperature was -5°C .

Mar 29-12:03 PM

Homework: Sheet Extra Prac 2 # 1-7

Ex Prac

1a) $4x = 32$
 $\frac{4x}{4} = \frac{32}{4}$
 $x = 8$

b) $-35 = -5x$
 $\frac{-35}{-5} = \frac{-5x}{-5}$
 $7 = x$

c) $-48 = 8x$
 $\frac{-48}{8} = \frac{8x}{8}$
 $-6 = x$

d) $9x = 54$
 $\frac{9x}{9} = \frac{54}{9}$
 $x = 6$

LS RS
 $4x$ 32
 $4x$ 32

LS RS
 -35 $-5x$
 -35 -35

LS RS
 -48 $8x$
 -48 -48

LS RS
 $9x$ 54
 $9x$ 54

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2a) $-8a + 11 = 27$
 $-8a + 11 - 11 = 27 - 11$
 $-8a = 16$
 $\frac{-8a}{-8} = \frac{16}{-8}$
 $a = -2$

b) $12b + 21 = 93$
 $12b + 21 - 21 = 93 - 21$
 $12b = 72$
 $\frac{12b}{12} = \frac{72}{12}$
 $b = 6$

c) $-42 = 5c - 27$
 $-42 + 27 = 5c - 27 + 27$
 $-15 = 5c$
 $\frac{-15}{5} = \frac{5c}{5}$
 $-3 = c$

d) $6f - 15 = -45$
 $6f - 15 + 15 = -45 + 15$
 $6f = -30$
 $\frac{6f}{6} = \frac{-30}{6}$
 $f = -5$

LS RS
 $-8a+11$ 27
 $-8a+11$ 27
 $16+11$ 27

LS RS
 $12b+21$ 93
 $12b+21$ 93
 $72+21$ 93

LS RS
 -42 $5c-27$
 -15 -27
 -15 -27
 -42

LS RS
 $6f-15$ -45
 $6f-15$ -45
 $-30-15$ -45

Mar 29-12:39 PM

3a) $2x - 7 = 9$
 $2x - 7 + 7 = 9 + 7$
 $2x = 16$
 $\frac{2x}{2} = \frac{16}{2}$
 $x = 8$

b) $-4x + 6 = -14$
 $-4x + 6 - 6 = -14 - 6$
 $-4x = -20$
 $\frac{-4x}{-4} = \frac{-20}{-4}$
 $x = 5$

c) $6x - 7 = -19$
 $6x - 7 + 7 = -19 + 7$
 $6x = -12$
 $\frac{6x}{6} = \frac{-12}{6}$
 $x = -2$

d) $-7x - 8 = 13$
 $-7x - 8 + 8 = 13 + 8$
 $-7x = 21$
 $\frac{-7x}{-7} = \frac{21}{-7}$
 $x = -3$

LS RS
 $2x-7$ 9
 $2x-7$ 9
 $16-7$ 9

LS RS
 $-4x+6$ -14
 $-4x+6$ -14
 $-20+6$ -14

LS RS
 $6x-7$ -19
 $6x-7$ -19
 $-12-7$ -19

LS RS
 $-7x-8$ 13
 $-7x-8$ 13
 $21-8$ 13

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4 a) $2a+3 = 4$
 $2a+3-3 = 4-3$
 $2a = 1$
 $\frac{2a}{2} = \frac{1}{2}$
 $a = \frac{1}{2}$

LS $2a+3$ RS 4
 $2 \times \frac{1}{2} + 3$
 $1+3$
 4

b) $15 = 10+2b$
 $15-10 = 10+2b-10$
 $5 = 2b$
 $\frac{5}{2} = \frac{2b}{2}$
 $2.5 = b$

LS 15 RS $10+2b$
 $10+2 \times 2.5$
 $10+5$
 15

c) $3 = 5c-6$
 $3+6 = 5c-6+6$
 $9 = 5c$
 $\frac{9}{5} = \frac{5c}{5}$
 $1.8 = c$

LS 3 RS $5c-6$
 $5 \times 1.8 - 6$
 $9-6$
 3

d) $9f-7 = 1$
 $9f-7+7 = 1+7$
 $9f = 8$
 $\frac{9f}{9} = \frac{8}{9}$
 $f = 0.\bar{8}$

LS $9f-7$ RS 1
 $9 \times \frac{8}{9} - 7$
 $8-7$
 1

$9 \times \frac{8}{9} = \frac{72}{9} = 8$

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5 a) $n = \text{the number}$
 $2n+5 = 17$
 $2n+5-5 = 17-5$
 $2n = 12$
 $\frac{2n}{2} = \frac{12}{2}$
 $n = 6$

LS $2n+5$ RS 17
 $2 \times 6 + 5$
 $12+5$
 17

The number is 6.

b) $n = \text{the number}$
 $5n-6 = 29$
 $5n-6+6 = 29+6$
 $5n = 35$
 $\frac{5n}{5} = \frac{35}{5}$
 $n = 7$

LS $5n-6$ RS 29
 $5 \times 7 - 6$
 $35-6$
 29

The number is 7.

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6. $a = \text{number of students who attended}$

$13a+125 = 944$
 $13a+125-125 = 944-125$
 $13a = 819$
 $\frac{13a}{13} = \frac{819}{13}$
 $a = 63$


LS $13a+125$ RS 944
 $13 \times 63 + 125$
 $819 + 125$
 944

63 students attended


7. If it cost \$225 for the class to go skating and they have to pay \$150 for ice rental and \$3 for skate rental, how many students skated?

$s = \# \text{ who skated}$
 $3s+150 = 225$
 $3s+150-150 = 225-150$
 $3s = 75$
 $\frac{3s}{3} = \frac{75}{3}$
 $s = 25$
 25 students skated.

Mar 29-12:59 PM



Warm Up Grade 8
April 3, 2014



Solve each equation. Verify the solution.

a) $-2x + 4 = 26$ b) $\frac{a}{3} = 6$ c) $-3 = 2x + 15$

Mar 25-2:32 PM

Extra Practice??

IXL math

Grade 8 Skills

- x.6 Solve one-step equations
- x.7 Solve two-step equations

Questions??

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Attachments

Extra Practice 2 Solve using algebra.pdf