1.6 Roots and Radicals

1.6 Exercise Set, page 163 (145): 1, 3, 12, 14, 15, 17,19

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2. Solving Linear Equations and Inequalities

2.1 Linear Equations

2.1 Exercise Set, page 204 (186): 1, 3, 6, 13, 15, 19, 20, 21, 33, 37, 50

2.2 Use a General Strategy to Solve Linear Equations

2.2 Exercise Set, page 221 (203): 1, 8, 15, 27, 30, 32, 34, 40

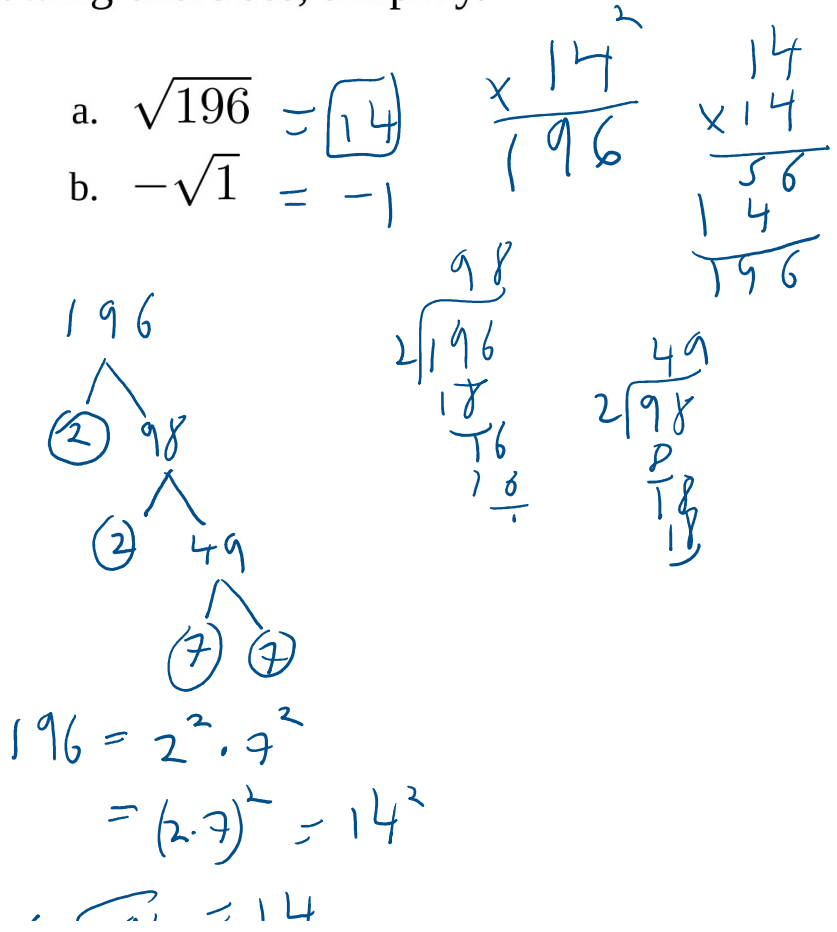
Exam 1		stem & leaf		
73.1875	mean			A-0
75	median	8	3334589	B-7
12.91423	st. dev	7	337	C-3
45	min	6	89	D-2
89	max	5	489	F- 4
16	count	4	5	

1.6

In the following exercises, simplify.

2. a. $\sqrt{196} = 14$

b. $-\sqrt{1} = -1$



$(2 \cdot 7) = 14$

$\therefore \sqrt{196} = 14$

c. $\sqrt[5]{-32} = -2$

In the following exercises, estimate each root between two consecutive whole numbers.

b. $\sqrt[3]{71}$

$3^3 = 27 < 71$

$10^3 = 1000 > 71$

$4^3 = 64 < 71$

$5^3 = 125 > 71$

$4 < \sqrt[3]{71} < 5$

71^(1/3)=4.1408

In the following exercises, approximate each root and round to two decimal places.

12. a. $\sqrt{19}$
    b. $\sqrt[3]{89}$
    c. $\sqrt[4]{97}$

13. a. $\sqrt{53}$
    b. $\sqrt[3]{147}$
    c. $\sqrt[4]{452}$

97 ^ 4

97^(1/4)=3.1383

97 ^ (1 ÷ 4) =

3.138288992714996080455772127287

97 (x^y) $(1 \div 4) =$

$\sqrt[n]{x}$

2.1

Learning Objectives

By the end of this section it is expected that you will be able to:

- Verify a solution of an equation
- Solve equations using the Subtraction and Addition Properties of Equality
- Solve equations using the Division and Multiplication Properties of Equality
- Solve an equation with variables and constants on both sides

Is $x=2$ a solution of $x^3-4x^2+3x=0$?

$2^3-(4)(2^2)+(3)(2) \stackrel{?}{=} 0$

$8-16+6 \stackrel{?}{=} 0$

$14-16 \stackrel{?}{=} 0$

$-2 \neq 0$

$\therefore x=2$ is not a solution

Is $(x,y)=(5,6)$ a solution of $8x-y=10$?

$(8)(5)-6 \stackrel{?}{=} 10$

$40-6 \stackrel{?}{=} 10$

$34 \neq 10$

$\therefore (x,y)=(5,6)$ is not a solution

Memorize

Solution of an equation

A **solution of an equation** is a value of a variable that makes a true statement when substituted into the equation.

Memorize

Linear Equation

A **linear equation** is a first degree equation in one variable that can be written as: $ax + b = 0$, where a and b are real numbers and $a \neq 0$,

Memorize

Properties of Equality

Subtraction Property of Equality
For any real numbers a, b, and c,
if $a = b$,
then $a - c = b - c$.

Addition Property of Equality
For any real numbers a, b, and c,
if $a = b$,
then $a + c = b + c$.

Division Property of Equality
For any numbers a, b, and c, and $c \neq 0$,
if $a = b$,
then $\frac{a}{c} = \frac{b}{c}$.

Multiplication Property of Equality
For any numbers a, b, and c,
if $a = b$,
then $ac = bc$.

When you add, subtract, multiply, or divide the same quantity from both sides of an equation, you still have equality.

2.1

In the following exercises, solve each equation using the Subtraction and Addition Properties of Equality. Also, check answer

9. $x - \frac{1}{3} = 2$

$x - \frac{1}{3} + \frac{1}{3} = 2 + \frac{1}{3}$

$x + \left(-\frac{1}{3} + \frac{1}{3}\right) = (2)\left(\frac{3}{3}\right) + \frac{1}{3}$

$x + 0 = \frac{6+1}{3}$

$\boxed{x = \frac{7}{3}}$

$x - \frac{1}{3} = 2$

$x = 2 + \frac{1}{3}$

$x = \frac{6}{3} + \frac{1}{3}$

$\boxed{x = \frac{7}{3}}$

check $\frac{7}{3} - \frac{1}{3} \stackrel{?}{=} 2$

$\frac{7-1}{3} \stackrel{?}{=} 2$

$\frac{7-1}{3} = 2$

$\frac{6}{3} \stackrel{?}{=} 2$

$2 = 2$ ✓

In the following exercises, solve each equation using the Division and Multiplication Properties of Equality and check the solution.

30. $-\frac{7}{10}x = -\frac{14}{3}$

$(-1)\left(-\frac{7x}{10}\right) = (-1)\left(-\frac{14}{3}\right)$

$\frac{7x}{10} = \frac{14}{3}$

$\left(\frac{10}{7}\right)\left(\frac{7}{10}\right)x = \left(\frac{10}{7}\right)\left(\frac{14}{3}\right)$ (2)

$1x = \frac{20}{3}$

$x = \frac{20}{3}$

$-\frac{7}{10}x$ bad notation

$\frac{-7x}{10} = \left(\frac{7}{10}\right)x$ good notation

$\frac{7x}{10} = \frac{14}{3}$

$\frac{\frac{7x}{10}}{\frac{7}{10}} = \frac{\frac{14}{3}}{\frac{7}{10}}$

invert denominator and multiply

$= \left(\frac{14}{3}\right)\left(\frac{10}{7}\right)$

In the following exercises, solve the following equations with constants on both sides.

38. $6x - 17 = 5x + 2$

$6x - 5x - 17 = 5x - 5x + 2$

$x - 17 = 2$

$x = 19$

50. $6.6x - 18.9 = 3.4x + 54.7$

round answer to nearest tenth

round answer to nearest tenth

$(6.6-3.4)x = 54.7 + 18.9$

$3.2x = 73.6$

$x = \frac{73.6}{3.2}$

$\boxed{x = 23.0}$

$3.2\overline{)73.6}$ $\quad 23.0$

64

96

96

0

2.2

Textbook typo

EXAMPLE 2

Solve: $(y + 9) = 8.$

EXAMPLE 3

Solve: $5(a - 3) + 5 = -10.$

$5a - 15 + 5 = -10$

$5a - 10 = -10$

$5a = 0$

$\boxed{a = 0}$

check $5(0-3) + 5 \stackrel{?}{=} -10$

$5(-3) + 5 \stackrel{?}{=} -10$

$-15 + 5 \stackrel{?}{=} -10$

$-10 = -10$ ✓

$\frac{5}{5}(a-3) + \frac{5}{5} = \frac{-10}{5}$

$a - 3 + 1 = -2$

$a - 2 = -2$

$\boxed{a = 0}$

Memorize

Conditional equation

An equation that is true for one or more values of the variable and false for all other values of the variable is a conditional equation.

$2x = 10$

$\boxed{x = 5}$

$x = 4$ is not a solution

$2(4) \stackrel{?}{=} 16$

$8 \neq 10$

Identity

An equation that is true for any value of the variable is called an **identity**.

$x + x = 2x$

$2x = 2y$

$x = x$

Contradiction

An equation that is false for all values of the variable is called a contradiction.

A contradiction has no solution.

$x + 1 = x$

$1 = 0$ False

No solution

Your Name MTH 111 quiz 2

Write each problem.

1. Simplify and write in scientific notation, rounded to a single digit.

$$\frac{(346)(0.7)}{40}$$

answer $a \times 10^n$ not required

$$\frac{(346)(0.7)}{40}$$

$$\approx \frac{(3\times10^{2})(7\times10^{-1})}{4\times10^{1}}$$

$$= \left(\frac{21}{4}\right)\times10^{2-1-1}$$

$$\approx \left(\frac{20}{4}\right)\times10^{0} = \boxed{5\times10^{0}}$$

not required

Calculator check: 346*0.7/40=6.055

$$\approx \boxed{6\times10^{0}}$$

same order of magnitude

2. Solve and check.

$$7x-\frac{1}{3}=2$$

$$7x=2+\frac{1}{3}$$

$$7x=2\left(\frac{3}{3}\right)+\frac{1}{3}$$

$$7x=\frac{6+1}{3}$$

$$7x=\frac{7}{3}$$

$$\boxed{x=\frac{1}{3}}$$

check

$$7\left(\frac{1}{3}\right)-\frac{1}{3}\stackrel{?}{=}2$$

$$\frac{7-1}{3}\stackrel{?}{=}2$$

$$\frac{6}{3}\stackrel{?}{=}2$$

$$2=2\ \surd$$

3. Estimate $\sqrt{200}$ by finding two consecutive integers Such that $n<\sqrt{200}<n+1$.

$$10^{2}=100<200$$

$$11^{2}=121<200$$

$$13^{2}=169<200$$

$$\boxed{14^{2}=196<200}$$

$$\boxed{15^{2}=225>200}$$

15

$14^2 = 196 < 200$

$15^2 = 225 > 200$

$14 < \sqrt{200} < 15$

calculator check: Sqrt(200)=14.14213562373095