02-13-26 MTH 111

1.5 Exponents and Scientific Notation
1.5 Exercise Set, page 142 (124): 1, 3, 6, 8, 11, 18, 20, 22, 26, 28, 30, 32, 34, 36, 38, 41
1.6 Roots and Radicals
1.6 Exercise Set, page 163 (145): 1, 3, 12, 14, 15, 17,19

I will provide supplementary material about identifying significant digits.

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
2.3 Use a Problem Solving Strategy
2.3 Exercise Set, page 243 (225): 1, 6, 11, 15, 16, 19, 23, 25, 27, 32, 37

2.4 Solve a Formula for a Specific Variable
2.4 Exercise Set, page 263 (245): 1, 3, 4, 6, 21, 24, 30, 32

Exam 1, Friday, 02/20/26, 1.1 - 1.6, 2.1 -2.4

Google Gemini

What are the rules for identifying significant digits in a number?

Identifying significant digits (or "sig figs") is basically the art of determining which numbers in a measurement actually carry meaning and which ones are just there to hold a decimal place.

Think of it this way: if you use a cheap ruler to measure something, claiming it's 1.2000045 cm long is a bit of a stretch. The rules of significant digits keep us honest about the precision of our tools.

Here is the breakdown of the "Golden Rules":

1. The Non-Zero Rule

All non-zero digits are always significant.
If you see a number between 1 and 9, it counts.

- **Example:** `438` has three significant digits.

2. The Sandwich Rule (Zeros Between Digits)

Any zeros between two non-zero digits are significant.
They are "trapped" by the measurement, so they count as part of the precision.

- **Example:** `507` has three significant digits.
- **Example:** `10.002` has five significant digits.

3. The Leading Zero Rule

Zeros at the beginning of a number are never significant.
These are just placeholders to show how small a number is. Even if there is a decimal point, they don't count.

- **Example:** `0.008` has only one significant digit (the 8).
- **Example:** `0.023` has two significant digits.

4. The Trailing Zero Rule

Zeros at the end of a number are only significant if there is a decimal point.
This is where people usually get tripped up. The decimal point acts like a "stamp of approval" that those zeros were intentionally measured.

- **Significant:** `45.00` (4 sig figs) — The zeros show we measured exactly to the hundredths place.
- **Not Significant:** `4500` (2 sig figs) — Without a decimal, these are assumed to be vague placeholders.

supplied

Summary Table

Number	Significant Digits	Why?
652	3	All non-zeros.
602	3	Trapped zero counts.
0.006	1	Leading zeros never count.
65.00	4	Trailing zeros with a decimal count.
6500	2	Trailing zeros without a decimal don't count.

A Quick Pro-Tip: Scientific Notation

If a number is written in scientific notation, like 4.50×10^3, you only look at the coefficient (4.50). In this case, there are 3 significant digits. This is often the easiest way to avoid confusion with those pesky trailing zeros!

1.5: 22

In the following exercises, find a) the volume and b) the surface area of the sphere with the given radius. Round answers to the nearest hundredth.

22. 3 centimetres

V = Vol of sphere with radius r

$$\boxed{V = \frac{4\pi r^3}{3}}$$ supplied

$$V = \frac{4\pi(3\text{ cm})^3}{3}$$

$$V = \frac{4\pi(3^3)(\text{cm}^3)}{3}$$

$$V = 4\pi 9 \text{ cm}^3$$

$$V = 36\pi \text{ cm}^3 \approx \boxed{113.10 \text{ cm}^3}$$

36*Pi=113.0973355292326 ≈ 113.10

36*3.14=113.04 ≈ 113.04

22. a. 113.04 cu. cm

Textbook answer

1.6: 3

In the following exercises, simplify.

3. a. $\sqrt{\frac{4}{9}}$

$$\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$$

$$= \frac{\sqrt{4}}{\sqrt{9}}$$

$$= \boxed{\frac{2}{3}}$$

2.1

$$3x - 4 = 5$$

Find x

There it is!

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

HOW TO: Determine whether a number is a solution to an equation

1. Substitute the number in for the variable in the equation.
2. Simplify the expressions on both sides of the equation.
3. Determine whether the resulting equation is true (the left side is equal to the right side).
    - If it is true, the number is a solution.
    - If it is not true, the number is not a solution.

Check if x= 4 is a solution to the equation $3x - 5 = 12$

$$3(4) - 5 \stackrel{?}{=} 12$$

$$12 - 5 \stackrel{?}{=} 12$$

$$7 \neq 12$$

$\therefore$ $x = 4$ is <u>not</u> a solution to the equation

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$$3x - 5 = 12$$

$$3x - 5 + 5 = 12 + 5$$

$$(-5+5) = 12$$

$3x-5=12$

$3x+(-5+5)=17$

correct with every detail

$3x+0=17$

$3x=17$

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

$\left(\frac{3}{3}\right)x=\frac{17}{3}$

$(1)x=\frac{17}{3}$

$\boxed{x=\frac{17}{3}}$

more practical presentation

$3x-5=12$

$3x=17$

$\boxed{x=\frac{17}{3}}$

check $3\left(\frac{17}{3}\right)-5\stackrel{?}{=}12$

$17-5\stackrel{?}{=}12$

$12=12$ ✓

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 $a\neq 0$,

a and b are constant real numbers
x is a variable

Memorize

Properties of Equality

Subtraction Property of Equality
For any real numbers $a, b,$ and c,
$$\begin{array}{lrcl} \text{if} & a & = & b, \\ \text{then} & a-c & = & b-c. \end{array}$$

Addition Property of Equality
For any real numbers $a, b,$ and c,
$$\begin{array}{lrcl} \text{if} & a & = & b, \\ \text{then} & a+c & = & b+c. \end{array}$$

Division Property of Equality
For any numbers $a, b,$ and c, and $c \neq 0$,
$$\begin{array}{lrcl} \text{if} & a & = & b, \\ \text{then} & \frac{a}{c} & = & \frac{b}{c}. \end{array}$$

Multiplication Property of Equality
For any numbers $a, b,$ and c,
$$\begin{array}{lrcl} \text{if} & a & = & b, \\ \text{then} & ac & = & bc. \end{array}$$

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

EXAMPLE 1

How to Solve Linear Equations Using the General Strategy

Solve: $-6\,(x+3) = 24.$

Solution

Step 1. Simplify each side of the equation as much as possible.	Use the Distributive Property. Notice that each side of the equation is simplified as much as possible.	$-6(x+3) = 24$ $-6x - 18 = 24$
Step 2. Collect all variable terms on one side of the equation.	Nothing to do – all x's are on the left side.	
Step 3. Collect constant terms on the other side of the equation.	To get constants only on the right, add 18 to each side. Simplify.	$-6x - 18 + 18 = 24 + 18$ $-6x = 42$

Step 4. Make the coefficient of the variable term to equal to 1.	Divide each side by −6. Simplify.	$\frac{-6x}{-6} = \frac{42}{-6}$ $x = -7$
Step 5. Check the solution.	Let $x = -7$ Simplify. Multiply.	**Check:** $-6(x+3) = 24$ $-6(-7+3) \stackrel{?}{=} 24$ $-6(-4) \stackrel{?}{=} 24$ $24 = 24 ✓$

Solve: $-6\,(x+3) = 24.$

$$\frac{-6(x+3)}{-6} = \frac{24}{-6}$$

$$x + 3 = -4$$

$$\boxed{x = -7}$$

Distributive property of multiplication over addition

$$a(b+c) = ab + ac$$

Solve: $\frac{2}{3}\,(6m-3) = 8-m.$

$$\left(\frac{2}{3}\right)(6m) + \left(\frac{2}{3}\right)(-3) = 8 - m$$

$$(2)\left(\frac{6}{3}\right)m + (2)\left(-\frac{3}{3}\right) = 8 - m$$

$$2(2)m + (2)(-1) = 8 - m$$

$$4m - 2 = 8 - m$$

$4m - 2 = 8 - m$

$4m + m - 2 + 2 = 8 + 2 - m + m$

$5m = 10$

$\boxed{m = 2}$

check $\frac{2}{3}(6(2) - 3) \stackrel{?}{=} 8 - 2$

$\frac{2}{3}(12 - 3) \stackrel{?}{=} 6$

$\left(\frac{2}{3}\right)(9) \stackrel{?}{=} 6$

$6 = 6$ ✓

$\frac{2}{3}(6(2) - 3)$

$\left(\frac{2}{\cancel{3}}\right)(\overset{2}{\cancel{6}})(2) + \frac{2}{3}(-3)$

$8 - 2$

6

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.
> **contradiction**
> An equation that is false for all values of the variable is called a contradiction. A contradiction has no solution.
> **identity**
> An equation that is true for any value of the variable is called an identity. The solution of an identity is all real numbers.

Conditional equation $2x + 5 = 14$

Conditional equation $2x + 5 = 14$

Contradiction

$$x = x + 1$$
$$-x \quad -x$$
$$0 = 1 \quad \text{False}$$
$\therefore$ No solution

$\therefore$ contradiction

Identity

$$x = x$$
$$x + x = 2x$$

Solve the linear equation.

23. $-(7m+4) - (2m-5)$

$$-7m - 4 = 2m - 5$$
$$1 = 9m$$
$$\boxed{m = \frac{1}{9}}$$

check $-\left(7\left(\frac{1}{9}\right) + 4\right) \stackrel{?}{=} 2\left(\frac{1}{9}\right) - 5$

$$-\frac{7}{9} - 4 \stackrel{?}{=} \frac{2}{9} - 5$$
$$-\frac{7}{9} - \frac{4(9)}{9} \stackrel{?}{=} \frac{2}{9} - 5\left(\frac{9}{9}\right)$$

$$\frac{-7-36}{9} \stackrel{?}{=} \frac{2-45}{9}$$

$$-\frac{43}{9} = -\frac{43}{9} \checkmark$$

Textbook answer

23. $m = \frac{4}{5}$?

Memorize in your own words

HOW TO: Solve an application

1. **Read** the problem. Make sure all the words and ideas are understood.
2. **Identify** what we are looking for.
3. **Name** what we are looking for. Choose a variable to represent that quantity.
4. **Translate** into an equation. It may be helpful to restate the problem in one sentence with the important information.
5. **Solve** the equation using good algebra techniques.
6. **Check** the answer in the problem and make sure it makes sense.
7. **Answer** the question with a complete sentence.

EXAMPLE 6

Abdullah paid \$28,675 for his new car. This was \$875 less than the sticker price. What was the sticker price of the car?

Let P = sticker price in dollars.

$P - \$875 = \$28,675$

Solve for P

$P = \$28,675 + \$875$

$$+ \quad 875$$
$$\$29{,}550$$
$$\boxed{p = \$29{,}550}$$

The sticker price is \$29,550.

TRY IT 8

One number is six more than another. The sum of the numbers is twenty-four. Find the numbers.

Let x, y be the numbers

$x = y + 6$

$x + y = 24$

$(y+6) + y = 24$

$2y = 24 - 6$

$2y = 18$

$\boxed{y = 9}$

$x = 9 + 6$

$\boxed{x = 15}$

Check $15 \stackrel{?}{=} 9 + 6$

$15 = 15$ ✓

$15 + 9 \stackrel{?}{=} 24$

$24 = 24$ ✓

Alternative

Let y = 1 number

Let $y + 6$ = other number

$y + y + 6 = 24$

$2y = 18$

$\boxed{\begin{array}{c} y = 9 \\ y + 6 = 15 \end{array}}$

The numbers are 15 and 9.

EXAMPLE 9

The length of a rectangle is 32 metres and the width is 20 metres. Find a) the perimeter, and b) the area.

memorize

$$\boxed{\begin{aligned} A &= LW \\ P &= 2(L+W) \end{aligned}}$$

A = area of rectangle
= (length)(width)

P = perimeter of rectangle
= twice (length + width)
L W

$$A = (32\text{ m})(20\text{ m})$$

$$\boxed{A = 640\text{ m}^2}$$

$$P = 2(32\text{ m} + 20\text{ m})$$

$$= 2(52\text{ m})$$

$$\boxed{P = 104\text{ m}}$$

Memorize

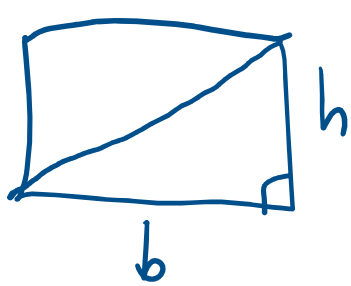
$d = rt$

d = distance, r = rate, t = time

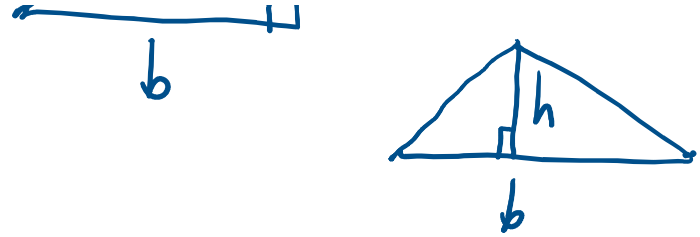
Memorize

A = area of triangle with base b and height h

$A = \left(\frac{1}{2}\right) bh$



Area = bh



2.4

EXAMPLE 1

Solve the formula $d = rt$ for t:

a. when $d = 520$ and $r = 65$

b. in general

$520 = 65t$

(a) $t = \frac{520}{65} = \frac{(5)(104)}{(5)(13)}$

$= \frac{104}{13}$

$\boxed{t = 8}$

$\begin{array}{r} 104 \\ 5\overline{)520} \\ 5 \\ \hline 20 \\ 20 \\ \hline 0 \end{array}$

$\begin{array}{r} 13 \\ 5\overline{)65} \\ 5 \\ \hline 15 \\ 15 \\ \hline 0 \end{array}$

$\begin{array}{r} 8 \\ 13\overline{)104} \\ 104 \\ \hline 0 \end{array}$

(b) $d = rt$

$\boxed{\frac{d}{r} = t}$

$r = \frac{d}{t}$

Exam | scratch

Exam

\# 3

solve

$x+3=5$

$x=5-3$.

$\boxed{x=2}$ ← from calc.

scratch work

$3+5=8$

$3-5=-2$