

1.3 Models & Applications

GOALS:

1. Translate word problems to algebra.
2. Solve word problems using a systematic approach.
3. For equations with more than one variable, solve for one of the variables in terms of the other.

Study 1.3 CVC 1-7 # 1- 11;
15, 19, 23, ... 43; 49, 53, 57..., 69

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1.3 Models & Applications

Problem:

Statistics indicate that, in your life:

You will devote 32 years to
sleeping and eating.

The number of years sleeping will exceed
the number of years eating by 24.

How many years will you spend sleeping?

How many years eating?

How do we solve such problems?

Need to translate
words ----> algebra
use algebra ----> solution

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Start small:

When two times a number is decreased by 3,
the result is 11. Find the number.

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Start small:

When two times a number is decreased by 3,
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translate
words ---->
algebra

let $x =$ the number

then

$$2x - 3 = 11$$

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1.3 Models & Applications

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When two times a number is decreased by 3,
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translate
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let $x =$ the number

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$$2x - 3 = 11$$

use algebra
----> solution

$$2x = 14$$

$$x = 7$$

Check: $2(7) = 14,$
 $14 - 3 = 11$ ✓

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One number exceeds another by 24. The sum
of the two numbers is 58. Find the numbers.

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One number exceeds another by 24. The sum of the two numbers is 58. Find the numbers.

let $x =$ the 2nd number

then $x + 24 =$ 1st number

$$x + (x + 24) = 58$$

solve:

$$2x + 24 = 58$$

$$2x = 34$$

$$x = 17 \text{ 2nd \#}$$

$$x + 24 = 41 \text{ 1st \#}$$

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Problem:

Statistics indicate that, in your life:

You will devote 32 years to sleeping and eating.

The number of years sleeping will exceed the number of years eating by 24. ✓

How many years will you spend sleeping? ✓

How many years eating? ✓

How to Do Word Problems:

1. **Read the problem** to determine problem type
2. Read the problem again, identifying what's **given** and what you need to
3. **Organize the information:** draw a **diagram**, construct a **table**, etc.
4. **Identify the unknown variables,** and add to the diagram or table.
5. **Write equations** that relate the **given** and the
6. **Solve the system** of equations to find the unk
7. **Check the solution:** Have you found all of "✓"
Does solution **make sense?** **Do numbers fit?**

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G: ABL Statistics; 32yrs sleeping & eating
 #yrs sleeping exceeds #yrs eating by 24
 F: How many years sleeping?
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 F: How many years sleeping?
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sleeping	eating
$x + 24$	x

$$x + 24 + x = 32$$

$$2x + 24 = 32$$

$$2x = 8$$

$$x = 4 \text{ hr. eating}$$

$$x + 24 = 28 \text{ hr. sleeping}$$

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1.3 Models & Applications

G: ABL Statistics; 32 yrs sleeping & eating
 #yrs sleeping exceeds #yrs eating by 24

F: How many years sleeping?
 " " " eating?

let $x = \# \text{yrs. eating}$
 $x + 24 = \# \text{yrs. sleeping}$
 $x + (x + 24) = 32$
 $x + x + 24 = 32$

$2x + 24 = 32$ CLT

$2x = 8$ APE

$x = 4 \text{ yrs. eating}$ MPE

$x + 24 = 28 \text{ yr. sleeping}$

Ch: $28 + 4 = 32 \checkmark$

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G: Discount pass for bridge \$30/mo.
 Bridge toll \$5, reduced to \$3.50 w. pass.
 F: # times bridge crossed/mo so that
 cost w. pass = cost w/o pass

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cross bridge more than 20 times/mo.

G: Discount pass for bridge \$30/mo.
 Bridge toll \$5, reduced to \$3.50 w. pass.

F: # times bridge crossed/mo so that
 cost w. pass = cost w/o pass

let $x = \#$ bridge crossings

	w/o pass	with pass
# of crossings	x	x
monthly charge	0	30
cost of crossing	$5x$	$3.50x$
total monthly cost	$5x$	$30 + 3.50x$

$5x = 30 + 3.50x$
 $-3.50x = -3.50x$
 $1.50x = 30$
 $x = \frac{30}{1.5} = \frac{300}{15} = 20$ bridge crossings

\therefore purchase of pass results in savings if
 cross bridge more than 20 times/mo.

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7. Check the solution: Have you found all of "them"? Does solution make sense? Do numbers fit?

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G: Repairs to sailboat \$1603, including \$532 for parts plus labor costs @ \$63/hr.

F: # hrs. of labor to repair the boat?

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G: Repairs to sailboat \$1603, including \$532 for parts plus labor costs @ \$63/hr.

F: # hrs. of labor to repair the boat?

↓

$x = \# \text{ hrs. of labor}$

$63x = \text{labor costs.}$

$532 + 63x = 1603$

$\begin{array}{r} 532 + 63x = 1603 \\ -532 \qquad \qquad = -532 \\ \hline 63x = 1071 \quad \text{APE} \end{array}$

$x = \frac{1071}{63} = \frac{119}{7} = \boxed{17 \text{ hrs. of labor}}$

Ch: $532 + 17(63) = 532 + 1071$

$\begin{array}{r} 532 \\ 17 \\ \hline 1071 \\ \hline 1603 \end{array}$

$= \$1603 \checkmark$

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G: $C = 2\pi r$ F: r

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$$G: \boxed{C = 2\pi r} \quad F: r$$
$$2\pi r = C$$

$$\frac{2\pi r}{2\pi} = \frac{C}{2\pi}$$
$$\rightarrow r = \frac{C}{2\pi}$$

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$$V = \pi r^2 h \quad F: h$$



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$$V = \pi r^2 h \quad F : h$$



$$\frac{\pi r^2 h}{\pi r^2} = \frac{V}{\pi r^2}$$

$$h = \frac{V}{\pi r^2}$$

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