Solving Equations

1 $x + 9 = 3$

2 $f - 2 = 11$

3 $-4z = 48$

4 $\dfrac{m}{-3} = 9$

5 $\dfrac{5}{6}m = 10$

6 $9 = \dfrac{-3}{4}y$

3 Solve the equation. $-4(x + 10) - 6 = -3(x - 2)$

☐☐☐☐☐☐☐☐

4 Shades R Us charges $20 per day to rent a lounge chair and $15 per day to rent an umbrella. Dan and Lisa paid a total of $245 to rent a lounge chair and an umbrella each during their vacation. Lisa rented the chair and umbrella for 1 day less than Dan. The following equation represents this situation, where x represents the number of days Dan rented the lounge chair and umbrella.

$20x + 15x + 20(x - 1) + 15(x - 1) = 245$

What is the total amount Dan paid to rent the lounge chair and umbrella during his vacation?

A. $80

B. $105

C. $140

D. $17

5 Bill is planning to drive from his house to a baseball stadium and arrive in time for the beginning of the championship game. His arrival time depends on the traffic. If traffic is light, he will travel at an average speed of 50 miles per hour and arrive 1 hour early. If traffic is heavy, he will travel at an average speed of 30 miles per hour and arrive on time. The equation below can be used to model this situation, where t represents Bill's driving time, in hours.

$$50(t - 1) = 30t$$

What is the distance, **in miles**, from Bill's house to the baseball stadium?

☐☐☐☐☐☐☐☐

PROBLEM SOLVING

① A bookstore sold 18,000 paperbacks one month. This was 10% less than the number of paperbacks the store sold the previous month. The following equation represents this situation, where x represents the number of paperbacks sold the previous month.

$x - 0.1x = 18,000$

How many paperbacks did the store sell in both the months combined?

    A. 20,000

    B. 35,990

    C. 38,000

    D. 180,000

② Mario needs to cut three book shelves from a board that is 1.8 meters long. The second shelf is 15 centimeters longer than twice the length of the first shelf. The remaining shelf is 5 centimeters longer than the first shelf. The equation below represents this situation, where x is the length of the first shelf in meters.

$$x + (2x + 0.15) + (x + 0.05) = 1.8$$

Which of the following is the length, in meters, of the first shelf?

    A. 0.40
    B. 0.45
    C. 0.53
    D. 0.96

independent practice:

⑦ $-11 = b - 9$ **⑧** $-108 = 9j$

⑨ $-9 = \dfrac{h}{-7}$ **①⓪** $\dfrac{8}{5}x = \dfrac{4}{15}$

one-Step Equations

① $4y - 4 = 16$

② $-1 = \dfrac{z}{3} - 7$

③ $7d - 1 = 13$

④ $\dfrac{a}{3} + 4 = 6$

Special Cases:

① Identity

$3(4x + 2) = 6(2x + 1)$

② No Solution

$2 - 15n = 5(-3n + 2)$

Equations w/ Variables on both sides

Solve equations with variables on both sides

① 8m + 5 = 6m + 1   **②** 8c + 5 = 4c − 11

③ 10b + 18 = 8b + 4   **④** 19 − 13p = -17p − 5

⑤ 9a = 6(a + 4)   **⑥** 5h − 7 = 2(h + 1)

⑤ $\frac{y-13}{8} = 14$ **⑥** $\frac{m+6}{-3} = 4$

⑦ 8y + 3y = 44   **⑧** -32 = -5k + 13k

Two-Step Equations

Solve multi-step equations by first _____.

① 12x + 14 + 10x = 80   **②** 6c – 8 – 2c = -6

③ -3x + 25 + x + 21 = 2   **④** 5x – 11 – 4x + 24 = 5

Solve multi-step equations involving the _____.

① 5m + 2(m + 1) = 23   **②** 14 + 2(4g – 3) = 40

③ 27 = 3c – 3(6 – 2c)   **④** $\frac{3}{2}(x – 5) = -6$

Multi-Step Equations

Answer Key!

Solving Equations

GUIDED PRACTICE:

① $x + 9 = 3$

$\underline{\quad -9 \quad\quad -9 \quad}$

$\quad x = -6$

② $f - 2 = 11$

$\underline{\quad +2 \quad\quad +2 \quad}$

$\quad f = \quad 13$

③ $-4z = 48$

$\underline{\dfrac{-4 \quad\quad -4}{z = -12}}$

④ $-3 \cdot \dfrac{m}{-3} = 9 \cdot -3$

$\underline{\qquad\qquad\qquad\qquad}$

$\quad m = -27$

⑤ $\dfrac{6}{5} \cdot \dfrac{5}{6}m = 10 \cdot \dfrac{6}{5}$

$\underline{\qquad\qquad\qquad\qquad}$

$\quad m = 12$

⑥ $\dfrac{4}{-3} \cdot 9 = \dfrac{-3}{4}y \cdot \dfrac{4}{-3}$

$\underline{\qquad\qquad\qquad\qquad}$

$\quad -12 = y$

---

③ Solve the equation. $-4(x + 10) - 6 = -3(x - 2)$

$-4x - 40 - 6 = -3x + 6$

$-4x - 46 = -3x + 6$

$-46 = x + 6$

$-52 = x$

–	5	2				

④ Shades R Us charges \$20 per day to rent a lounge chair and \$15 per day to rent an umbrella. Dan and Lisa paid a total of \$245 to rent a lounge chair and an umbrella each during their vacation. Lisa rented the chair and umbrella for 1 day less than Dan. The following equation represents this situation, where x represents the number of days Dan rented the lounge chair and umbrella.

$20x + 15x + 20(x - 1) + 15(x - 1) = 245$

What is the total amount Dan paid to rent the lounge chair and umbrella during his vacation?

A. \$80

B. \$105

C. \$140 ⭕

D. \$17

$20x + 15x + 20x - 20 + 15x - 15 = 245$

$70x - 35 = 245$

$70x = 280$

$x = 4 \quad \leftarrow 4 \text{ days}$

$4(\$20 + \$15) =$
$\$140$

⑤ Bill is planning to drive from his house to a baseball stadium and arrive in time for the beginning of the championship game. His arrival time depends on the traffic. If traffic is light, he will travel at an average speed of 50 miles per hour and arrive 1 hour early. If traffic is heavy, he will travel at an average speed of 30 miles per hour and arrive on time. The equation below can be used to model this situation, where t represents Bill's driving time, in hours.

$$50(t - 1) = 30t$$

What is the distance, **in miles**, from Bill's house to the baseball stadium?

7	5					

$50t - 50 = 30t$

$-50 = -20t$

$2.5 = t \quad \leftarrow 2.5 \text{ hours}$

$30t =$
$30(2.5) =$
75 miles

PROBLEM SOLVING

① A bookstore sold 18,000 paperbacks one month. This was 10% less than the number of paperbacks the store sold the previous month. The following equation represents this situation, where x represents the number of paperbacks sold the previous month.

$x - 0.1x = 18,000$

How many paperbacks did the store sell in both the months combined?

A. 20,000

B. 35,990

C. 38,000

D. 180,000

$1x - 0.1x = 18,000$
$0.9x = 18,000$
$x = 20,000$

$18,000 + 20,000 = 38,000$

② Mario needs to cut three book shelves from a board that is 1.8 meters long. The second shelf is 15 centimeters longer than twice the length of the first shelf. The remaining shelf is 5 centimeters longer than the first shelf. The equation below represents this situation, where x is the length of the first shelf in meters.

$$x + (2x + 0.15) + (x + 0.05) = 1.8$$

Which of the following is the length, in meters, of the first shelf?

A. 0.40
B. 0.45
C. 0.53
D. 0.96

$4x + 0.2 = 1.8$
$4x = 1.6$
$x = 0.4$

independent practice:

⑦ $-11 = b - 9$

$\underline{+9 \qquad\qquad +9}$

$-2 = b$

⑧ $\dfrac{-108}{9} = \dfrac{9j}{9}$

$-12 = j$

⑨ $-7 \cdot -9 = \dfrac{h}{-7} \cdot -7$

$63 = h$

⑩ $\dfrac{5}{8} \cdot \dfrac{8}{5}x = \dfrac{4}{15} \cdot \dfrac{5}{8}$

$x = \dfrac{1}{6}$

one-Step Equations

1 $4y - 4 = 16$

$$\underline{+4 \qquad +4}$$
$$\frac{4y}{4} = \frac{20}{4}$$
$$\boxed{y = 5}$$

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

$$\underline{+7 \qquad\qquad +7}$$
$$6 = \frac{z}{3}$$
$$\boxed{18 = z}$$

3 $7d - 1 = 13$

$$\underline{+1 \qquad +1}$$
$$\frac{7d}{7} = \frac{14}{7}$$
$$\boxed{d = 2}$$

4 $\frac{a}{3} + 4 = 6$

$$\underline{-4 \qquad -4}$$
$$\frac{a}{3} = 2$$
$$\boxed{a = 6}$$

Special Cases:

1 Identity

$$3(4x + 2) = 6(2x + 1)$$

$$12x + 6 = 12x + 6$$
$$\underline{-12x \qquad\quad -12x}$$

$$6 = 6$$

Since 6 = 6 is a true statement, any number can be substituted for x. This equation is ALWAYS TRUE, also known as the identity.

2 No Solution

$$2 - 15n = 5(-3n + 2)$$

$$2 - 15n = -15n + 10$$
$$\underline{+15n \qquad +15n}$$

$$2 \neq 10$$

Since 2 = 10 is a false statement. There are no numbers that can be substituted for x. This equation is NEVER TRUE, therefore has no solutions.

Equations w/ Variables on both sides

Solve equations with Variables on both sides

① 8m + 5 = 6m + 1

$$\underline{-6m \qquad\qquad -6m}$$
$$2m + 5 = 1$$
$$\underline{\qquad -5 \quad -5}$$
$$\frac{2m}{2} = \frac{-4}{2}$$
$$\boxed{m = -2}$$

② 8c + 5 = 4c − 11

$$\underline{-4c \qquad\qquad -4c}$$
$$4c + 5 = -11$$
$$\underline{\qquad -5 \qquad -5}$$
$$\frac{4c}{4} = \frac{-16}{4}$$
$$\boxed{c = -4}$$

③ 10b + 18 = 8b + 4

$$\underline{-8b \qquad\qquad -8b}$$
$$2b + 18 = 4$$
$$\underline{\qquad -18 \qquad -18}$$
$$\frac{2b}{2} = \frac{-14}{2}$$
$$\boxed{b = -7}$$

④ 19 − 13p = -17p − 5

$$\underline{\qquad +17p \qquad +17p}$$
$$19 + 4p = -5$$
$$\underline{-19 \qquad\qquad -19}$$
$$\frac{4p}{4} = \frac{-24}{4}$$
$$\boxed{p = -6}$$

⑤ 9a = 6(a + 4)

$$9a = 6a + 24$$
$$\underline{-6a \quad -6a}$$
$$\frac{3a}{3} = \frac{24}{3}$$
$$\boxed{a = 8}$$

⑥ 5h − 7 = 2(h + 1)

$$5h - 7 = 2h + 2$$
$$\underline{-2h \qquad\qquad -2h}$$
$$3h - 7 = 2$$
$$\underline{\qquad +7 \qquad +7}$$
$$\frac{3h}{3} = \frac{9}{3}$$
$$\boxed{h = 3}$$

⑤ $8 \cdot \dfrac{y-13}{8} = 14 \cdot 8$

$$y - 13 = 112$$
$$\underline{+13 \quad +13}$$
$$\boxed{y = 125}$$

⑥ $-3 \cdot \dfrac{m+6}{-3} = 4 \cdot -3$

$$m + 6 = -12$$
$$\underline{-6 \quad -6}$$
$$\boxed{m = -18}$$

⑦ 8y + 3y = 44

$$\frac{11y}{11} = \frac{44}{11}$$
$$\boxed{y = 4}$$

⑧ -32 = -5k + 13k

$$\frac{-32}{8} = \frac{8k}{8}$$
$$\boxed{-4 = k}$$

Two-Step Equations

Solve multi-step equations by First combining like terms.

① $12x + 14 + 10x = 80$

$$22x + 14 = 80$$
$$-14 \quad -14$$
$$\frac{22x}{22} = \frac{66}{22}$$
$$\boxed{x = 3}$$

② $6c - 8 - 2c = -6$

$$4c - 8 = -6$$
$$+8 \quad +8$$
$$\frac{4c}{4} = \frac{2}{4}$$
$$\boxed{c = 0.5}$$

③ $-3x + 25 + x + 21 = 2$

$$-2x + 46 = 2$$
$$- 46 \quad - 46$$
$$\frac{-2x}{-2} = \frac{-44}{-2}$$
$$\boxed{x = 22}$$

④ $5x - 11 - 4x + 24 = 5$

$$x + 13 = 5$$
$$-13 \quad -13$$
$$\boxed{x = -8}$$

Solve multi-step equations involving the distributive property.

① $5m + 2(m + 1) = 23$

$$5m + 2m + 2 = 23$$
$$7m + 2 = 23$$
$$-2 \quad -2$$
$$\frac{7m}{7} = \frac{21}{7}$$
$$\boxed{m = 3}$$

② $14 + 2(4g - 3) = 40$

$$14 + 8g - 6 = 40$$
$$8g + 8 = 40$$
$$-8 \quad -8$$
$$\frac{8g}{8} = \frac{32}{8}$$
$$\boxed{g = 4}$$

③ $27 = 3c - 3(6 - 2c)$

$$27 = 3c - 18 + 6c$$
$$27 = 9c - 18$$
$$+18 +18$$
$$\frac{45}{9} = \frac{9c}{9}$$
$$\boxed{5 = c}$$

④ $\frac{2}{3} \cdot \frac{3}{2}(x - 5) = -6 \cdot \frac{2}{3}$

$$(x - 5) = -4$$
$$+5 \quad +5$$
$$x = 1$$

Multi-Step Equations

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**The 5 questions under the "Problem Solving" tab, were taken from the FLVS Algebra 1 EOC Practice Test and the Florida Algebra 1 Test Item Specs.
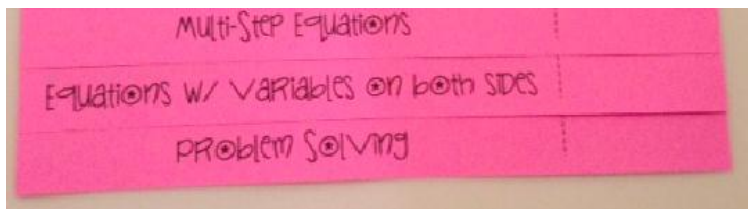
http://www.flvs.net/areas/studentservices/EOC/Documents/Practice%20Test%20for%20flvs_net_Final.pdf

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Directions:

Step 1: Print pages 1&2, 3&4, 5&6 front to back (flip along the short edge so that the information is facing in opposite directions).

Step 2: Line up the three pages as shown, below:

Step 3: Fold over the top sections and secure with a few staples at the top.

Step 4: Cut along the dotted lines to cut off the extra piece on the right.

The final product should look like this: