Important Concepts . . .

Preview Review

Mathematics   Grade 7   TEACHER KEY
W2 - Lesson 3:   Algebra and Verifying
Linear Equations

Important Concepts of Grade 7 Mathematics

Materials Required

Math Set
Calculator

No Textbook Required

This is a stand-alone course.

Alberta Distance Learning Centre has an Internet site that you may find useful. The address is as follows: **http://www.adlc.ca**

The use of the Internet is optional. Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

Preview/Review Concepts
for
Grade Seven Mathematics

Teacher Key

Introductory Information for Teachers

Preview/Review courses are aimed mainly at students who have completed the regular course but who need to review some of the material before beginning the next grade. Other students may find Preview/Review courses useful in preparing for the new concepts they will study in their next grade.

No Preview/Review course is intended to replace the regular course because each covers only what the writers have decided are the top 15 concepts from the Program of Studies for that course.

Preview/Review materials are intended for use by teachers and students in one-subject and one-grade classrooms. This Preview/Review course contains fifteen lessons in three sections. Each section has five lessons. A short quiz is provided at the end of each section to test student knowledge of the material studied. In a classroom the course will likely be completed in three weeks.

This Preview/Review course is written to be stand-alone. There is no textbook required.

W2 – Lesson 3: Algebra and Verifying Linear Equations

Objective:

- *I can solve and verify the solution to a linear equation.*

Solving equations using algebra

To solve an equation, isolate the variable by "undoing" the operations surrounding the variable

Do	Un-do
+	-
-	+
×	÷
÷	×

Example: $2x + 9 = 13$

Undo addition: subtract 9 *from both sides of the equal sign*.

$2x+9-9=13-9$

$2x=4$

Undo multiplication: divide *both sides* by 2.

$$\frac{2x}{2} = \frac{4}{2}$$

$x=2$

Example 2: $\dfrac{x}{3} - 4 = 2$

Undo subtraction: add 4 to *both sides*.

$$\frac{x}{3} - 4 + 4 = 2 + 4$$

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

Undo division: multiply *both sides* by 3.

$$\frac{x}{3} \times 3 = 6 \times 3$$

$x=18$

Remember: whatever you do to one side, you do to the other side too.

Practice:

Solve each equation, showing each algebra step.

a. $4x - 2 = 14$

4x – 2 + 2 = 14 + 2
4x = 16
x = 4

b. $3n + 5 = 11$

3n + 5 – 5 = 11 – 5
3n = 6
n = 2

c. $w + 45 = 50$

w + 45 – 45 = 50 – 45
w = 5

d. $2d - 6 = 2$

2d – 6 + 6 = 2 + 6
2d = 8
d = 4

Verifying a solution

Verify a solution by substituting the answer back into the original equation.

Example: $2x + 9 = 13$
Our solution was x = 2.

Verify: Left side: $2(2) + 9$ Right side: 13
                    $4 + 9$
                    13

Since the left side of the equal sign ends up being the same as the right side, we know the solution is correct.

Example 2: $x/3 - 4 = 2$
Our solution was x = 18.

Verify: Left side: $(18)/3 - 4$ Right side: 2
                    $6 - 4$
                    2

Practice:

Verify if the given solution is correct. Show all steps. **Note: Some will be incorrect**

a. $2x - 7 = 11$, $x = 9$

Left side:

$2(9) - 7$
$18 - 7$
11

Right side: 11

Correct

b. $\frac{y}{3} - 5 = 1$, $y = 18$

Left side:
$\frac{(18)}{3} - 5$
$6 - 5$
1

Right side: 1

Correct

c. $\frac{n}{2} + 3 = 8$, $n = 6$

Left side:
$\frac{(6)}{2} + 3$
$3 + 3$
6

Right side: 8

Incorrect

d. $2d + 7 = 17$, $d = 7$

Left side:

$2(7) + 7$
$14 + 7$
21

Right side: 17

Incorrect

e. $\frac{g}{4} + 6 = 11$, $g = 20$

Left side:
$\frac{(20)}{4} + 6$
$5 + 6$
11

Right side: 11

Correct

f. $6d - 11 = 13$, $d = 2$

Left side:

$6(2) - 11$
$12 - 11$
1

Right side: 13

Incorrect

Objective:

- *I can verify the solution to a linear equation using manipulatives.*

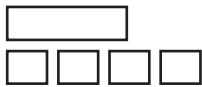**Unit tile:** represented by a single tile. Each one tile represents +1.

Variable tile: represented by a long rectangular tile. Each tile represents one unit of a variable.

Verifying equations with algebra tiles

Solve: $x + 4 = 9$

Left side: **Right side**

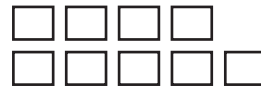*Remove 4 unit tiles from each side to isolate the x-tile*
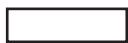
Each x-tile equals 5 unit tiles (x = 5)

Verify: $x + 4 = 9$, $x = 5$

Left side

→
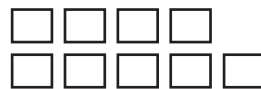
Right side

(9 tiles)

Since the left side has the same number of tiles as the right side, we know the solution is correct.

Practice:

Verify each given solution using Algebra tiles.

Verify: x – 2 = 3, x = 5

Left side

□□□□☒☒

Right side

□□□

Correct

Verify: 2x + 1 = 3, x = 1

Left side

□□□

Right side

□□□

Verify: 3x – 3 = 6, x = 3

Left side

□□☒
□□☒
□□☒
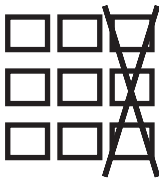
Right side

□□□
□□□

Objective:

- *I can use equations to solve word problems.*

Writing and solving equations from word problems

Example:

At the bakery loaves of bread cost $2.00 per loaf. How many loaves can be bought with $10.00?

    a.   Write the equation representing the solution.

       2b = 10

    b.   Solve the equation, verify the equation.

       2b = 10

$$\frac{2b}{2} = \frac{10}{2}$$

       b = 5

       Left side: $2b \rightarrow 2(5) \rightarrow 10$

       Right side: 10

LS = RS, therefore the solution is correct

Practice:

1. In Greg's class, 13 people play hockey. The class has 21 students.

    a. Write an equation to find the number of students who don't play hockey.

    $13 + h = 21$

    b. Solve the equation, verify the solution.

    $13 - 13 + h = 21 - 13$
    $h = 8$

    Verify:
    Left side:
    $13 + (8)$
    21

    Right side: 21

1. Jake is thinking of a number. He multiplies it by two and then subtracts five. The result is seven.

    a. Write an equation to represent the solution.

    $2n - 5 = 7$

    b. Solve the equation to find the mystery number.

    $2n - 5 + 5 = 7 + 5$
    $2n = 12$
    $n = 6$

    The mystery number is 6

Summary and Practice:

- *I can use equations to solve word problems.*

1. Fill in the blanks.

   → A variable, x, has 4 added to it, we need to ___**subtract**___ __**4**___ from both sides
     to isolate x.

   → A variable, n, has 6 subtracted from it; we need to ___**add**___ __**6**___ to both
     sides to isolate n.

   → A variable, g, is multiplied by 3, to isolate g we need to ___**divide**___ by __**3**___
     on both sides.

   → A variable, w, is divided by 2; to isolate w we need to ___**multiply**___ by __**2**___ on
     both sides.

2. Solve and verify, showing all steps.

   a. 5x – 7 = 18

5x-7=18	**Verify:**	
5x-7+7=18+7	**Left side:**	**Right side:**
5x=25	**5(5)-7**	**18**
x=5	**25-7**	
	18	

   b. 4n + 8 = 20

4n+8=20	**Verify:**	
4n+8-8=20-8	**Left side:**	**Right side:**
4n=12	**4(3)+8**	**20**
n=3	**12+8**	
	20	

3. Solve. Verify your solution using Algebra tiles.

a. w + 4 = 11

w + 4 − 4 = 11 − 4
w = 7

Left side

⬜⬜⬜⬜⬜⬜⬜
⬜⬜⬜⬜

Right side

⬜⬜⬜⬜⬜⬜⬜
⬜⬜⬜⬜

b. 2y + 6 = 16

2y + 6 − 6 = 16 − 6
2y = 10
y = 5

Left side

⬜⬜⬜⬜⬜ ⬜⬜⬜
⬜⬜⬜⬜⬜ ⬜⬜⬜

Right side

⬜⬜⬜⬜⬜ ⬜⬜⬜
⬜⬜⬜⬜⬜ ⬜⬜⬜

c. $\dfrac{h}{2} + 3 = 6$

$\dfrac{h}{2} + 3 - 3 = 6 - 3$

$\dfrac{h}{2} = 3$

$\dfrac{h}{2} \times 2 = 3 \times 2$

$h = 6$

Left side

(⬜⬜⬜)

(⬜⬜⬜)⬜⬜⬜

Right side

⬜⬜⬜⬜⬜⬜

4. Sarah invited some friends over to play video games. Three friends left after one game, but seven friends stayed to play more. How many friends did Sarah have over?

    a. Write an equation

    $f - 3 = 7$

    b. Solve the equation, verify the solution.

    $f - 3 + 3 = 7 + 3$
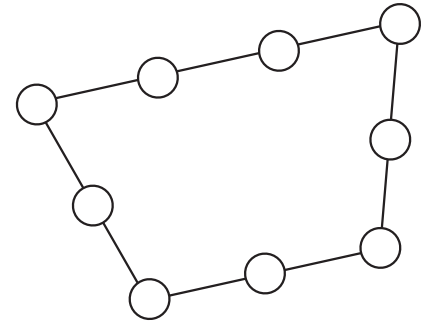 $f = 10$

    Verify:
    Left side:
    (10) – 3
    7

    Right side: 7

5. Peter wants to build a fence around his garden. He needs 3 cross pieces between each fence post, except the gate which needs 5 pieces. Before going to the lumber store, Peter determines he will need 3p + 5 pieces of wood, where p is the number of posts.

    a. If Peter's garden has 9 fence posts, he decides he'll need 32 pieces of wood. Is Peter correct? Why or why not?

    No, Peter is incorrect because p needs to stand for the number of spaces between the posts not including the gate space.

    b. How many pieces of wood does Peter actually need?

    3 (8) + 5   He actually needs 29
    24 + 5   pieces.
    29

6. Beth is setting up a restaurant with large and small tables. She decides that each small table will have 4 chairs, and each large table will have 6 chairs.

a. Write an expression for the number of chairs (c) using s for small tables, and l for large tables.

c = 4S + 6L

b. How many tables of the other size can Beth set up if she has:

i. 2 large tables and 44 chairs?

44 = 4S + 6(2)
44 = 4S + 12
44 – 12 = 4S +12 – 12
32 = 4S
8 = S   **She can have 8 small tables**

ii. 3 large tables and 38 chairs?

38 = 4S + 6(3)
38 = 4S + 18
38 – 18 = 4S +18 – 18
20 = 4S
5 = S   **She can have 5 small tables**

iii. 6 small tables and 48 chairs?

48 = 4(6) + 6L
48 = 24 + 6L
48 – 24 = 24 – 24 + 6L
24 = 6L
4 = L   **She can have 4 large tables**

7.   Warren has 15 songs downloaded to his MP3 player. He downloads 8 new songs
     each month. After how many months will Warren have 71 songs?

     8m +15 = 71
     8m + 15 – 15 = 71 – 15
     8m = 56
     m = 7   **It will take 7 months to get 71 songs.**