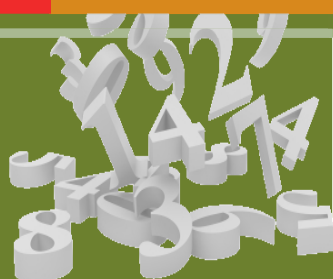


# NUMERACY:

## The Basics Workbook



### Set V: Solving Equations 1

Companion Workbook to Numeracy: The Basics Video Series

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## INTRODUCTION

### What is Numeracy: The Basics Workbook?

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This workbook is intended to accompany Workplace Education Manitoba's (WEM) Numeracy: The Basics Video Series, a set of 50 videos that explain essential numeracy concepts.

The refresher videos cover 25 critical numeracy topics, each broken into concept and practice.

The video series and accompanying downloadable workbooks can be found on the WEM website at [http://www.wem.mb.ca/learning\\_on\\_demand.aspx](http://www.wem.mb.ca/learning_on_demand.aspx)

These Numeracy: The Basics workbooks provide an opportunity for additional skill-building practice.

### Numeracy: The Basics topics are:

- Order of Operations 1
- Order of Operations 2
- Adding & Subtracting Fractions 1
- Adding & Subtracting Fractions 2
- Multiplying & Dividing Fractions
- Mixed & Improper Fractions
- Operations with Mixed Fractions 1
- Operations with Mixed Fractions 2
- Operations with Mixed Fractions 3
- Adding & Subtracting Decimals
- Multiplying Decimals
- Dividing Decimals
- Order of Operations & Decimals
- Decimals, Fractions & Percent 1
- Decimals, Fractions & Percent 2
- Imperial Conversions
- Metric Conversions
- Metric and Imperial Conversions
- Geometry 1 – Perimeter
- Geometry 2 – Area
- Geometry 3- Volume
- Solving Equations 1
- Solving Equations 2
- Ratio & Proportion
- Averages



## SOLVING EQUATIONS 1

This workbook contains five skill-building practice sections. Solutions can be found at the end of the workbook.

### Practice Section A

Solve each of the following equations for the variable 'x'.

1.  $2x = 4$        $x =$  \_\_\_\_\_

2.  $3x = 12$        $x =$  \_\_\_\_\_

3.  $2x = 14$        $x =$  \_\_\_\_\_

4.  $5x = 30$        $x =$  \_\_\_\_\_

5.  $4x = 20$        $x =$  \_\_\_\_\_

6.  $6x = 24$        $x =$  \_\_\_\_\_

7.  $2x + 1 = 9$        $x =$  \_\_\_\_\_

8.  $1 + 3x = 7$        $x =$  \_\_\_\_\_

9.  $7x + 2 = 30$        $x =$  \_\_\_\_\_

10.  $2x - 5 = 17$        $x =$  \_\_\_\_\_

11.  $5 - x = 3$        $x =$  \_\_\_\_\_

12.  $13 = 7 + 2x$        $x =$  \_\_\_\_\_

13.  $3 + 3x = 12$        $x =$  \_\_\_\_\_

14.  $2x + 4 = 16$        $x =$  \_\_\_\_\_

15.  $4x + 7 = 11$        $x =$  \_\_\_\_\_

**Practice Section B**

Solve each of the following equations for the variable 'x'.

1.  $10 + 3x = 8x$   $x =$  \_\_\_\_\_

2.  $7 - 3x = 11x$   $x =$  \_\_\_\_\_

3.  $5x + 16 = 7x$   $x =$  \_\_\_\_\_

4.  $2x - 5 = x - 1$   $x =$  \_\_\_\_\_

5.  $6x + 2x - 1 = 3$   $x =$  \_\_\_\_\_

6.  $2 + 5x = 3x + 8$   $x =$  \_\_\_\_\_

7.  $7x + 1 = 3x + 9$   $x =$  \_\_\_\_\_

8.  $9 - 2x = 5x - 5$   $x =$  \_\_\_\_\_

9.  $3(x + 2) = 18$   $x =$  \_\_\_\_\_

10.  $2(x - 5) + 2 = 10$   $x =$  \_\_\_\_\_

11.  $7x = 3(x + 6) - 2x$   $x =$  \_\_\_\_\_

12.  $27 = 10 - 2(x - 1) + 7x$   $x =$  \_\_\_\_\_

13.  $2x + 17 + 4x = 9 - 2x + 3(x + 6)$   $x =$  \_\_\_\_\_

14.  $7x + 2(x - 1) = 2x + 3(2x + 4)$   $x =$  \_\_\_\_\_

15.  $30 - 2(x - 5) = 3(2x - 1) + 6(x + 2) + 3$   $x =$  \_\_\_\_\_

**Practice Section C**

Solve each of the following equations for the variable 'x'.

1.  $7(3-x) = 5 - 4(x-1)$   $x =$  \_\_\_\_\_

2.  $3(x+2) + 2(3-2x) + 7x = 2(8x+1)$   $x =$  \_\_\_\_\_

3.  $6(x+2) - 8 + 2x = 8x$   $x =$  \_\_\_\_\_

4.  $31 - 3x = 5 + 8(x+2) + \frac{1}{2}(2x-4)$   $x =$  \_\_\_\_\_

5.  $15 - [2(x-2) - 18x + 6(x+2)] - 10 + 2(x-1) + 3 = 8x - 3(-5-x)$   $x =$  \_\_\_\_\_

**Practice Section D**

In this section, solutions for the practice questions contain commonly-made errors. For each question, circle the error(s) and give a correct solution.

1. Solve the following equation for the variable 'x'.

$$2(3-x) = 13 - 4(x-1)$$

Solution:

$$2(3-x) = 13 - 4(x-1)$$

$$6 - x = 13 - 4x - 4$$

$$6 - x = 9 - 4x$$

$$6 + 3x = 9$$

$$\cancel{2}x = \frac{3}{\cancel{2}}$$

$$x = 1$$

**Practice Section E**

Challenge Question. If you can do this one, then you get an A<sup>+</sup>. 😊

If the length of a rectangle is 3 more than one less twice the width and the perimeter of the rectangle is 52 cm, find the dimensions of the rectangle.



# SOLUTIONS

## Set V

### Solving Equations 1



**SOLVING EQUATIONS 1****Practice Section A**

1. Solution:

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

$$x = 2$$

2. Solution:

$$3x = 12$$

$$\frac{\cancel{3}x}{\cancel{3}} = \frac{12}{3}$$

$$x = 4$$

3. Solution:

$$2x = 14$$

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{14}{2}$$

$$x = 7$$

4. Solution:

$$5x = 30$$

$$\frac{\cancel{5}x}{\cancel{5}} = \frac{30}{5}$$

$$x = 6$$

5. Solution:

$$4x = 20$$

$$\frac{\cancel{4}x}{\cancel{4}} = \frac{20}{4}$$

$$x = 5$$

6. Solution:

$$6x = 24$$

$$\frac{\cancel{6}x}{\cancel{6}} = \frac{24}{6}$$

$$x = 4$$

7. Solution:

$$2x + 1 = 9$$

$$2x = 8$$

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{8}{2}$$

$$x = 4$$

8. Solution:

$$1 + 3x = 7$$

$$3x = 6$$

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

$$x = 2$$

9. Solution:

$$7x + 2 = 30$$

$$7x = 28$$

$$\frac{\cancel{7}x}{\cancel{7}} = \frac{28}{7}$$

$$x = 4$$

10. Solution:

$$2x - 5 = 17$$

$$2x = 22$$

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{22}{2}$$

$$x = 11$$

11. Solution:

$$5 - x = 3$$

$$5 = 3 + x$$

$$x = 2$$



12. Solution:  
 $13 = 7 + 2x$   
 $6 = \frac{\cancel{2}x}{\cancel{2}}$   
 $3 = x$

13. Solution:  
 $3 + 3x = 12$   
 $3x = 9$   
 $\frac{\cancel{3}x}{\cancel{3}} = \frac{9}{3}$   
 $x = 3$

14. Solution:  
 $2x + 4 = 16$   
 $2x = 12$   
 $\frac{\cancel{2}x}{\cancel{2}} = \frac{12}{2}$   
 $x = 6$

15. Solution:  
 $4x + 7 = 11$   
 $4x = 4$   
 $\frac{\cancel{4}x}{\cancel{4}} = \frac{4}{4}$   
 $x = 1$

### Practice Section B

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1. Solution:  
 $10 + 3x = 8x$   
 $10 = 5x$   
 $\frac{10}{5} = \frac{\cancel{5}x}{\cancel{5}}$   
 $2 = x$

2. Solution:  
 $7 - 3x = 11x$   
 $7 = 14x$   
 $\frac{7}{14} = \frac{\cancel{14}x}{\cancel{14}}$   
 $\frac{1}{2} = x$

3. Solution:  
 $5x + 16 = 7x$   
 $16 = 2x$   
 $\frac{16}{2} = \frac{\cancel{2}x}{\cancel{2}}$   
 $8 = x$

4. Solution:  
 $2x - 5 = x - 1$   
 $2x = x - 1 + 5$   
 $2x = x + 4$   
 $x = 4$

5. Solution:  
 $6x + 2x - 1 = 3$   
 $8x - 1 = 3$   
 $\frac{\cancel{8}x}{\cancel{8}} = \frac{4}{8}$   
 $x = \frac{1}{2}$



6. Solution:  
 $2 + 5x = 3x + 8$   
 $5x = 3x + 8 - 2$   
 $5x - 3x = 6$   
 $2x = 6$   
 $\frac{\cancel{2}x}{\cancel{2}} = \frac{6}{2}$   
 $x = 3$

7. Solution:  
 $7x + 1 = 3x + 9$   
 $7x = 3x + 9 - 1$   
 $7x - 3x = 8$   
 $4x = 8$   
 $\frac{\cancel{4}x}{\cancel{4}} = \frac{8}{4}$   
 $x = 2$

8. Solution:  
 $9 - 2x = 5x - 5$   
 $9 = 7x - 5$   
 $9 + 5 = 7x$   
 $\frac{14}{7} = \frac{\cancel{7}x}{\cancel{7}}$   
 $2 = x$

9. Solution:  
 $3(x + 2) = 18$   
 $3x + 6 = 18$   
 $3x = 12$   
 $\frac{\cancel{3}x}{\cancel{3}} = \frac{12}{3}$   
 $x = 4$

10. Solution:  
 $2(x - 5) + 2 = 10$   
 $2x - 10 + 2 = 10$   
 $2x - 8 = 10$   
 $2x = 18$   
 $\frac{\cancel{2}x}{\cancel{2}} = \frac{18}{2}$   
 $x = 9$

11. Solution:  
 $7x = 3(x + 6) - 2x$   
 $7x = 3x + 18 - 2x$   
 $7x = x + 18$   
 $6x = 18$   
 $\frac{\cancel{6}x}{\cancel{6}} = \frac{18}{6}$   
 $x = 3$

12. Solution:  
 $27 = 10 - 2(x - 1) + 7x$   
 $27 = 10 - 2x + 2 + 7x$   
 $27 = 12 + 5x$   
 $15 = 5x$   
 $\frac{15}{5} = \frac{\cancel{5}x}{\cancel{5}}$   
 $3 = x$



13. Solution:

$$2x + 17 + 4x = 9 - 2x + 3(x + 6)$$

$$6x + 17 = 9 - 2x + 3x + 18$$

$$6x + 17 = 27 + x$$

$$5x = 10$$

$$\cancel{5}x = \frac{10}{\cancel{5}}$$

$$x = 2$$

14. Solution:

$$7x + 2(x - 1) = 2x + 3(2x + 4)$$

$$7x + 2x - 2 = 2x + 6x + 12$$

$$9x - 2 = 8x + 12$$

$$9x = 8x + 14$$

$$x = 14$$

15. Solution:

$$30 - 2(x - 5) = 3(2x - 1) + 6(x + 2) + 3$$

$$30 - 2x + 10 = 6x - 3 + 6x + 12 + 3$$

$$40 - 2x = 12x + 12$$

$$40 = 14x + 12$$

$$\frac{28}{14} = \frac{\cancel{14}x}{\cancel{14}}$$

$$x = 2$$



### Practice Section C

---

1. Solution:

$$7(3-x) = 5 - 4(x-1)$$

$$21 - 7x = 5 - 4x + 4$$

$$21 - 7x = 9 - 4x$$

$$12 - 7x = -4x$$

$$12 = 3x$$

$$\frac{12}{3} = \frac{\cancel{3}x}{\cancel{3}}$$

$$4 = x$$

2. Solution:

$$3(x+2) + 2(3-2x) + 7x = 2(8x+1)$$

$$3x + 6 + 6 - 4x + 7x = 16x + 2$$

$$6x + 12 = 16x + 2$$

$$6x + 10 = 16x$$

$$\frac{10}{10} = \frac{\cancel{10}x}{\cancel{10}}$$

$$1 = x$$

3. Solution:

$$6(x+2) - 8 + 2x = 8x$$

$$6x + 12 - 8 + 2x = 8x$$

$$8x + 4 = 8x$$

$$4 = 8x - 8x$$

$$4 = 0$$

Since  $4 \neq 0$  there is no solution.



4. Solution:

$$31 - 3x = 5 + 8(x + 2) + \frac{1}{2}(2x - 4)$$

$$31 - 3x = 5 + 8x + 16 + x - 2$$

$$31 - 3x = 19 + 9x$$

$$31 = 19 + 12x$$

$$12 = 12x$$

$$\frac{12}{12} = \frac{\cancel{12}x}{\cancel{12}}$$

$$1 = x$$

5. Solution:

$$15 - [2(x - 2) - 18x + 6(x + 2)] - 10 + 2(x - 1) + 3 = 8x - 3(-5 - x)$$

$$15 - [2x - 4 - 18x + 6x + 12] - 10 + 2x - 2 + 3 = 8x + 15 + 3x$$

$$15 - [-10x + 8] - 9 + 2x = 11x + 15$$

$$15 + 10x - 8 - 9 + 2x = 11x + 15$$

$$-2 + 12x = 11x + 15$$

$$12x = 11x + 17$$

$$x = 17$$

## Practice Section D

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1. Solution:

The first error is made when multiplying on the left-hand side. The person forgot to multiply the '-x' by 2 as well. The second error is in line 2 when the person falls into the double negative trap (- - = +) using -4 instead of +4.

The correct solution is:

$$2(3 - x) = 13 - 4(x - 1)$$

$$6 - 2x = 13 - 4x + 4$$

$$6 - 2x = 17 - 4x$$

$$6 + 2x = 17$$

$$2x = 11$$

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{11}{2}$$

$$x = \frac{11}{2}$$

**Practice Section E**

---

Solution:

Let the width of the rectangle be '  $x$ '.

The length is  $3 + (2x - 1) = 3 + 2x - 1 = 2x + 2$ .



If the perimeter of the rectangle is 52 cm, then :

$$\begin{aligned} P &= (2x + 2) + (2x + 2) + x + x \\ &= 2x + 2 + 2x + 2 + x + x \\ &= 6x + 4 \end{aligned}$$

$$52 = 6x + 4$$

$$48 = 6x$$

$$\frac{48}{6} = \frac{\cancel{6}x}{\cancel{6}}$$

$$8 = x$$

Therefore, the width is 8 cm and the length is  $2x + 2 = 2(8) + 2 = 16 + 2 = 18$  cm.