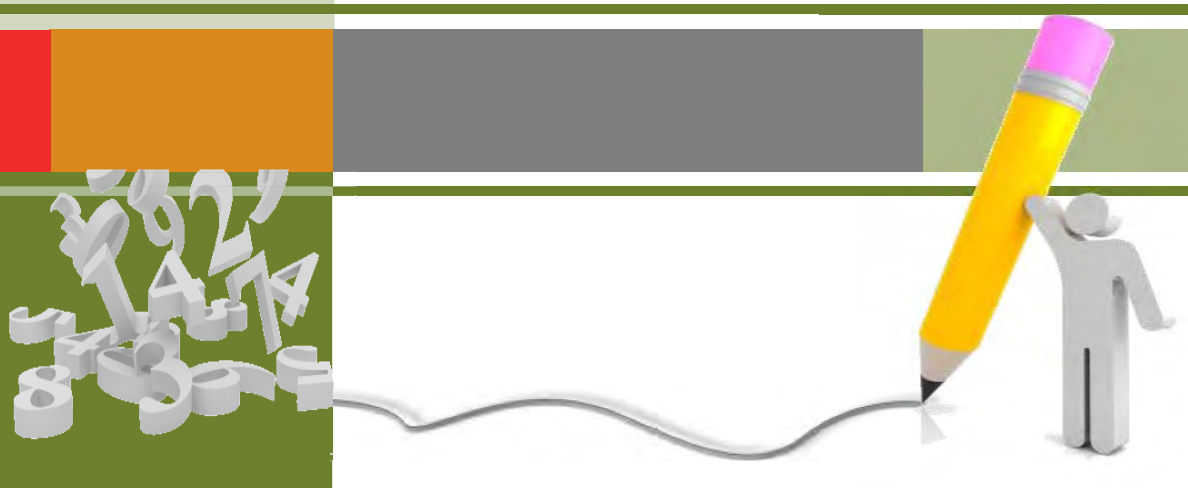
Workplace Education Manitoba

NUMERACY:
The Basics Workbook



Set X: Ratio and Proportion

Companion Workbook to Numeracy: The Basics Video Series

Watch the video for this workbook at
www.wem.mb.ca/learning_on_demand.aspx

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INTRODUCTION

What is Numeracy: The Basics Workbook?

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

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

RATIO AND PROPORTION

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

Practice Section A

Find the missing value in each question. Express your answer as a decimal.

1. $1:2=?:10$ = _____
2. $2:1=?:10$ = _____
3. $2:5=?:10$ = _____
4. $5:2=?:10$ = _____
5. $3:2=?:8$ = _____
6. $5:2=?:8$ = _____
7. $2:3=?:9$ = _____
8. $3:1=?:9$ = _____
9. $5:4=10:?$ = _____
10. $5:3=?:9$ = _____
11. $2:3=6:?$ = _____
12. $2:5=8:?$ = _____
13. $1.5:1=6:?$ = _____
14. $1.5:3=4.5:?$ = _____
15. $8:3=4:?$ = _____

Practice Section B

Find the missing value in each question. Express your answer as a decimal if decimals are given in the question. Express your answer as a fraction if fractions are given in the question.

1. $1.5 : 4.5 = 4.5 : ?$ = _____

2. $4 : 2.5 = ? : 7.5$ = _____

3. $4.25 : 2 = ? : 4$ = _____

4. $5 : 3.5 = 15 : ?$ = _____

5. $2.5 : 3.5 = 15 : ?$ = _____

6. $2\frac{1}{2} : 5 = ? : 15$ = _____

7. $4\frac{1}{2} : 5 = 9 : ?$ = _____

8. $3 : 2\frac{1}{4} = 6 : ?$ = _____

9. $4\frac{1}{2} : ? = 9 : 14$ = _____

10. $7 : 5 = 3\frac{1}{2} : ?$ = _____

11. $3 : 8 = 4\frac{1}{2} : ?$ = _____

12. $1\frac{1}{2} : \frac{1}{2} = ? : 4$ = _____

13. $3\frac{1}{2} : 8 = ? : 4$ = _____

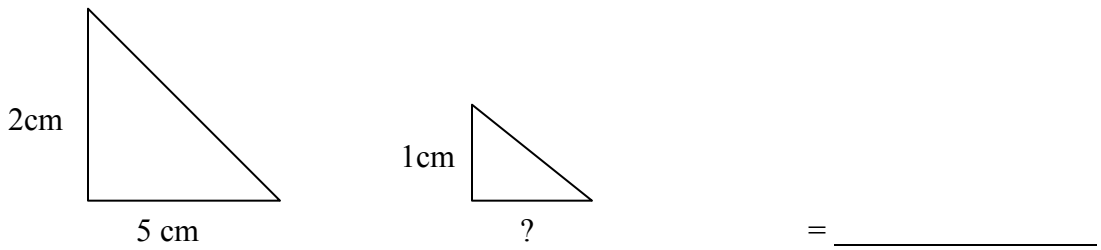
14. $4\frac{1}{2} : 2 = 12\frac{3}{4} : ?$ = _____

15. $8.375 : 67 = 2 : ?$ = _____

Practice Section C

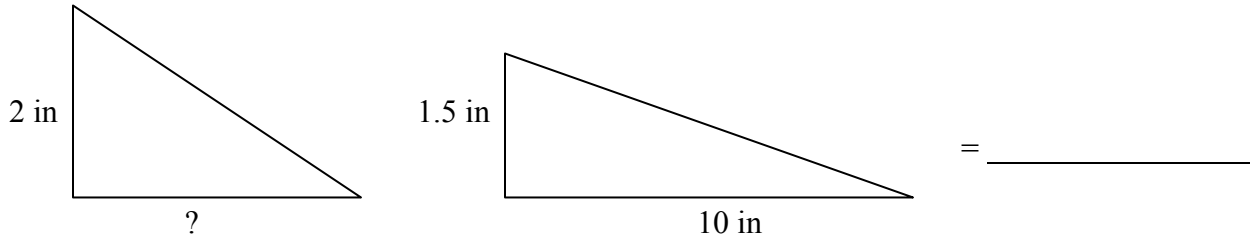
Find the missing value in each question. Express your answer as a fraction if fractions are given in the question.

1.



= _____

2.



= _____

3. $7\frac{3}{4} : 2\frac{1}{2} = 2 : ?$ = _____

4. $3\frac{1}{4} : ? = 5 : 6\frac{1}{8}$ = _____

5. $5\frac{1}{4} : 2 = ? : 7\frac{1}{3}$ = _____

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. Below is a possible solution to a question that contains some error(s). Circle the error(s) and present a correct solution.

   Find the missing value in the question below.

$$4\frac{1}{8} : 3 = ? : 8\frac{3}{8}$$
$$\frac{33}{8} : 3 = ? : 8\frac{3}{8}$$
$$\frac{33}{8} : 3 = ? : \frac{11}{8}$$
$$\frac{33}{8} : \frac{3}{1} = 1 : \frac{11}{8}$$
$$? = 1$$

   = _____

2. Susan writes the following solution when asked to find the value of x:

$$x : 3 = y : 6$$
$$\rightarrow 3 \times number = 6$$
$$\rightarrow number = 2$$
$$x \times 2 = y$$
$$x = 3$$

   Is Susan's solution correct?

Practice Section E

Challenge Question. If you can do this one, then you get an A^{+}. ☺

If the following statement is true $x : y : z = x : 3 : 5 = 2 : y : 15 = 5 : 1 : z$, find the values of x, y, and z.

SOLUTIONS

Set X

Ratio and Proportion

RATIO AND PROPORTION

Practice Section A

1. Solution:

$1:2=?:10$

$\rightarrow 2\times 5=10$

$\rightarrow 1\times 5=5$

$?=5$

← notice the format – it is used to solve all Part A problems.

2. Solution:

$2:1=?:10$

$?=20$

3. Solution:

$2:5=?:10$

$?=4$

4. Solution:

$5:2=?:10$

$?=25$

5. Solution:

$3:2=?:8$

$?=12$

6. Solution:

$5:2=?:8$

$?=20$

7. Solution:

$2:3=?:9$

$?=6$

8. Solution:

$3:1=?:9$

$?=27$

9. Solution:

$5:4=10:?$

$?=8$

10. Solution:

$5:3=?:9$

$?=15$

11. Solution:

$2:3=6:?$

$?=9$

12. Solution:

$2:5=8:?$

$?=20$

13. Solution:

$1.5:1=6:?$

$?=4$

14. Solution:

$1.5:3=4.5:?$

$?=9$

15. Solution:

$8:3=4:?$

$?=\frac{3}{2}=1.5$

Practice Section B

1. Solution:

$1.5 : 4.5 = 4.5 : ?$

$\rightarrow 1.5 \times 3 = 4.5$

$\rightarrow 4.5 \times 3 = 13.5$

$? = 13.5$

← notice the format – it is used to solve all Part B problems.

2. Solution:

$4 : 2.5 = ? : 7.5$

$\rightarrow 2.5 \times 3 = 7.5$

$\rightarrow 4 \times 3 = 12$

$? = 12$

3. Solution:

$4.25 : 2 = ? : 4$

$\rightarrow 2 \times 2 = 4$

$\rightarrow 4.25 \times 2 = 8.5$

$? = 8.5$

4. Solution:

$5 : 3.5 = 15 : ?$

$\rightarrow 5 \times 3 = 15$

$\rightarrow 3.5 \times 3 = 10.5$

$? = 10.5$

5. Solution:

$2.5 : 3.5 = 15 : ?$

$\rightarrow 2.5 \times 6 = 15$

$\rightarrow 3.5 \times 6 = 21$

$? = 21$

6. Solution:

$2\frac{1}{2} : 5 = ? : 15$

$\rightarrow 5 \times 3 = 15$

$\rightarrow 2\frac{1}{2} \times 3 = 7\frac{1}{2}$

$? = 7\frac{1}{2}$

7. Solution:

$4\frac{1}{2} : 5 = 9 : ?$

$\rightarrow 4\frac{1}{2} \times 2 = 9$

$\rightarrow 5 \times 2 = 10$

$? = 10$

8. Solution:

$3 : 2\frac{1}{4} = 6 : ?$

$\rightarrow 3 \times 2 = 6$

$\rightarrow 2\frac{1}{4} \times 2 = 4\frac{1}{2}$

$? = 4\frac{1}{2}$

9. Solution:

$$4\frac{1}{2} : ? = 9 : 14$$
$$\rightarrow 4\frac{1}{2} \times number = 9$$
$$\rightarrow number = 2$$
$$\rightarrow ? \times 2 = 14$$
$$\rightarrow ? = \frac{14}{2} = 7$$
$$? = 7$$

10. Solution:

$$7 : 5 = 3\frac{1}{2} : ?$$
$$\rightarrow 7 \times number = 3\frac{1}{2}$$
$$\rightarrow number = \frac{1}{2}$$
$$\rightarrow 5 \times \frac{1}{2} = \frac{5}{2} = 2\frac{1}{2}$$
$$? = 2\frac{1}{2}$$

11. Solution:

$$3 : 8 = 4\frac{1}{2} : ?$$
$$\rightarrow 3 \times number = 4.5$$
$$\rightarrow number = \frac{4.5}{3} = 1.5$$
$$\rightarrow 8 \times 1.5 = ?$$
$$? = 12$$

12. Solution:

$$1\frac{1}{2} : \frac{1}{2} = ? : 4$$
$$\rightarrow \frac{1}{2} \times number = 4$$
$$\rightarrow number = 8$$
$$\rightarrow 1\frac{1}{2} \times 8 = ?$$
$$? = \frac{3}{2} \times 8 = \frac{24}{2} = 12$$

13. Solution:

$$3\frac{1}{2} : 8 = ? : 4$$
$$\rightarrow 8 \times number = 4$$
$$\rightarrow number = \frac{1}{2}$$
$$\rightarrow 3\frac{1}{2} \times \frac{1}{2} = ?$$
$$? = \frac{7}{2} \times \frac{1}{2} = \frac{7}{4} = 1\frac{3}{4}$$

14. Solution:

$$4\frac{1}{2} : 2 = 12\frac{3}{4} : ?$$
$$\rightarrow 4\frac{1}{2} \times number = 12\frac{3}{4}$$
$$\rightarrow number = 12\frac{3}{4} \div 4\frac{1}{2} = \frac{51}{4} \div \frac{9}{2} = \frac{51}{4} \times \frac{2}{9} = \frac{102}{36} = \frac{51}{18}$$
$$\rightarrow 2 \times \frac{51}{18} = ?$$
$$? = \frac{102}{18} = \frac{17}{3} = 5\frac{2}{3}$$

15. Solution:

$8.375 : 67 = 2 : ?$

$\rightarrow 8.375 \times number = 2$

$\rightarrow number = \frac{2}{8.375} = 0.2388059...$

$\rightarrow ? = 67 \times 0.2388059...$

$? = 16$

Practice Section C

1. Solution:

$2 : 5 = 1 : ?$

$? = \frac{5}{2}\ cm$

2. Solution:

$2 : ? = 1.5 : 10$

$\rightarrow 2 \times number = 1.5$

$\rightarrow number = \frac{1.5}{2} = 0.75$

$\rightarrow ? \times 0.75 = 10$

$? = \frac{10}{0.75} = 13.\bar{3}\ in$

3. Solution:

$7\frac{3}{4} : 2\frac{1}{2} = 2 : ?$

$\rightarrow 7\frac{3}{4} \times number = 2$

$\rightarrow number = 2 \div 7\frac{3}{4} = 2 \div \frac{31}{4} = 2 \times \frac{4}{31} = \frac{8}{31}$

$\rightarrow 2\frac{1}{2} \times \frac{8}{31} = ?$

$? = \frac{5}{2} \times \frac{8}{31} = \frac{40}{62} = \frac{20}{31}$

4. Solution:

$3\frac{1}{4} : ? = 5 : 6\frac{1}{8}$

$\rightarrow 3\frac{1}{4} \times number = 5$

$\rightarrow number = 5 \div 3\frac{1}{4} = 5 \div \frac{13}{4} = 5 \times \frac{4}{13} = \frac{20}{13}$

$\rightarrow ? \times \frac{20}{13} = 6\frac{1}{8}$

$? = 6\frac{1}{8} \div \frac{20}{13} = \frac{49}{8} \div \frac{20}{13} = \frac{49}{8} \times \frac{13}{20} = \frac{637}{160} = 3\frac{157}{160}$

5. Solution:

$5\frac{1}{4} : 2 = ? : 7\frac{1}{3}$

$\rightarrow 2 \times number = 7\frac{1}{3}$

$\rightarrow number = 7\frac{1}{3} \div 2 = \frac{22}{3} \div 2 = \frac{22}{3} \times \frac{1}{2} = \frac{22}{6} = \frac{11}{3}$

$\rightarrow ? = 5\frac{1}{4} \times \frac{11}{3}$

$? = \frac{21}{4} \times \frac{11}{3} = \frac{231}{12} = \frac{77}{4} = 19\frac{1}{4}$

Practice Section D

1. Solution:

There is only one error in the solution and it occurs in line 3. The mixed fraction $8\frac{3}{8}$ was incorrectly converted to an improper fraction. Instead of $\frac{11}{8}$, the correct equivalent improper fraction is $8\frac{3}{8}=\frac{8\times 8+3}{8}=\frac{67}{8}$.

The correct solution is:

$$4\frac{1}{8}:3=?:8\frac{3}{8}$$

$$\frac{33}{8}:3=?:\frac{67}{8}$$

$$\rightarrow 3\times number=\frac{67}{8}$$

$$\rightarrow number=\frac{67}{8}\div 3=\frac{67}{8}\times\frac{1}{3}=\frac{67}{24}$$

$$?=\frac{33}{8}\times\frac{67}{24}$$

$$?=\frac{2211}{192}=\frac{737}{64}$$

2. Solution:

Yes and No! The solution $x=3$ is true if and only if $y=6$. The real answer here is that there are infinitely many solutions to this problem. Simply choose any value for *x* and then find the corresponding *y* value (or choose any value for *y* and then find the corresponding *x* value).

Practice Section E

Solution:
$x:3:5=2:y:15=5:1:z$

Using the first two ratios, we can find the value of y.
$x:3:5=2:y:15$

$3:5=y:15$

$\rightarrow 5\times number=15$

$\rightarrow number=\frac{15}{5}=3$

$\therefore y=3\times 3=9$

Filling in the y value, we get $x:3:5=2:9:15=5:1:z$.

Using the first two ratios again, we can find the value of x.
$x:3:5=2:9:15$

$x:3=2:9$

$\rightarrow 3\times number=9$

$\rightarrow number=\frac{9}{3}=3$

$x=2\div number=2\div 3=\frac{2}{3}$

Using the last two ratios, we can now find the value of z.
$2:9:15=5:1:z$

$9:15=1:z$

$\rightarrow 9\times number=1$

$\rightarrow number=1\div 9=\frac{1}{9}$

$z=15\times number=15\times\frac{1}{9}=\frac{15}{9}$

Therefore, the value of x is $\frac{2}{3}$, the value of y is 9, and the value of z is $\frac{15}{9}$.