Workplace Education Manitoba

NUMERACY:
The Basics Workbook

Set Q: Metric Conversions

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

METRIC CONVERSIONS

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

Practice Section A

Convert each of the following metric measures into the units indicated.

1. $12\,cm = \_\_\_\_\,m$
2. $4\,cm = \_\_\_\_\,mm$
3. $4\,km = \_\_\_\_\,mm$
4. $8\ km = \_\_\_\_\,cm$
5. $7\,m = \_\_\_\_\,cm$
6. $13cm = \_\_\_\_\,mm$
7. $36\ mm = \_\_\_\_\,cm$
8. $29\ m = \_\_\_\_\,km$
9. $5.5\,cm = \_\_\_\_\,mm$
10. $0.6\,cm = \_\_\_\_\,m$
11. $9\,km = \_\_\_\_\,cm$
12. $27\,mm = \_\_\_\_\,cm$
13. $8.1\,m = \_\_\_\,mm$
14. $7.5\,m = \_\_\_\,km$
15. $67000mm = \_\_\_\,km$

Practice Section B

Convert each of the following metric measures into the units indicated.

1. $107\,mm = \_\_\_\,cm$

2. $142\,mm = \_\_\_\,km$

3. $17.5\,km = \_\_\_\,cm$

4. $11.25\,km = \_\_\_\,mm$

5. $322\,cm = \_\_\_\,m$

6. $5.5\,km - 2400\,cm = \_\_\_\_\_\,mm$

7. $1.5\,km + 5000m = \_\_\_\_\_\,cm$

8. $36\,cm + 3\,km = \_\_\_\_\_\,mm$

9. $5.3\,km + 7500\,m = \_\_\_\_\_\,cm$

10. $5m + 3.7\ cm = \_\_\_\_\_\,mm$

11. $4\,km + 2300\,cm - 610\,m = \_\_\_\_\_\,cm$

12. $5\,m + 21cm - 1700mm = \_\_\_\_\_\,km$

13. $5680m + 279cm - 1.7km = \_\_\_\_\_\,mm$

14. $1.5km - 3390\,cm + 670mm = \_\_\_\_\_\,m$

15. $7000m - 5.4\,km + 27500mm = \_\_\_\_\_\,cm$

Practice Section C

Convert each of the following metric measures into the units indicated.

1. Convert 4750 mm into ___ m + ___ cm + ___ mm

2. Convert 6894220 mm into ___ km + ___ m + ___ cm + ___ mm

3. $5\,m + 21cm - 1700mm + 5.5\,km - 2400\,cm = \_\_\_\_\_\,mm$

4. $(0.75km + 548m - 27500mm) - (1.5m - 1500mm + 1.75cm) = \_\_\_\_\_\,m$

5. $(1.5km - 1519cm) + \dfrac{300m}{1.25} - \left(1.125m \div \dfrac{1}{4} + 125cm\right) = \_\_\_\_\_\,km$

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.

$$5\,m + 21\,mm - 1.5\,cm = \_\_\_\_\_\,cm$$
$$5\,\cancel{m} \times \frac{100\,cm}{1\,\cancel{m}} + 21\,\cancel{mm} \times \frac{1\,cm}{10\,\cancel{mm}} - 1.5\,cm = \_\_\_\_\_\,cm$$
$$500\,cm + 210\,cm - 1.5\,cm = \_\_\_\_\_\,cm$$
$$= 708.5\,cm$$

2.

$$4\,m - 21\,cm = \_\_\_\_\_\,mm$$
$$4\,\cancel{m} \times \frac{100\,\cancel{cm}}{1\,\cancel{m}} \times \frac{10mm}{1\,\cancel{cm}} = 400\,mm$$
$$21\,\cancel{cm} \times \frac{10mm}{1\,\cancel{cm}} = 210\,mm$$
$$400 - 210 = 190\,cm$$

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

A rope that is 24000 mm long must be cut into 20 individual pieces such that each piece is 5 cm longer that the previous piece. How long, in meters, is the 10^{th} piece of rope? Support your answer with suitable calculations.

SOLUTIONS

Set Q

Metric Conversions

METRIC CONVERSIONS

Practice Section A

1. Solution:

$12\,cm = \_\_\_\_\,m$

$$12\,\cancel{cm} \times \frac{1m}{100\,\cancel{cm}} = \frac{12}{100}\,m = 0.12\,m$$

2. Solution:

$4\,cm = \_\_\_\_\,mm$

$$4\,\cancel{cm} \times \frac{10\,mm}{1\,\cancel{cm}} = 40\,mm$$

3. Solution:

$4\,km = \_\_\_\_\,mm$

$$4\,\cancel{km} \times \frac{1000\,\cancel{m}}{1\,\cancel{km}} \times \frac{100\,\cancel{cm}}{1\,\cancel{m}} \times \frac{10mm}{1\,\cancel{cm}} = 4000000\,mm$$

4. Solution:

$8\ km = \_\_\_\_\,cm$

$$8\,\cancel{km} \times \frac{1000\,\cancel{m}}{1\,\cancel{km}} \times \frac{100cm}{1\,\cancel{m}} = 800000\,cm$$

5. Solution:

$7\,m = \_\_\_\_\,cm$

$$7\,\cancel{m} \times \frac{100cm}{1\,\cancel{m}} = 700\,cm$$

6. Solution:

$13cm = \_\_\_\_\,mm$

$$13\,\cancel{cm} \times \frac{10mm}{1\,\cancel{cm}} = 130\,mm$$

7. Solution:

$36\ mm = \_\_\_\_\,cm$

$$36\,\cancel{mm} \times \frac{1cm}{10\,\cancel{mm}} = \frac{36}{10}\,cm = 3.6\,cm$$

8. Solution:

$29\ m = \_\_\_\_\ km$

$$29\ \cancel{m} \times \frac{1km}{1000\ \cancel{m}} = \frac{29}{1000} km = 0.029\ km$$

9. Solution:

$5.5\ cm = \_\_\_\_\ mm$

$$5.5\ \cancel{cm} \times \frac{10mm}{1\ \cancel{cm}} = 55\ mm$$

10. Solution:

$0.6\ cm = \_\_\_\_\ m$

$$0.6\ \cancel{cm} \times \frac{1m}{100\ \cancel{cm}} = \frac{0.6}{100} m = 0.006\ m$$

11. Solution:

$9\ km = \_\_\_\_\ cm$

$$9\ \cancel{km} \times \frac{1000\ \cancel{m}}{1\ \cancel{km}} \times \frac{100cm}{1\ \cancel{m}} = 900000\ cm$$

12. Solution:

$27\ mm = \_\_\_\_\ cm$

$$27\ \cancel{mm} \times \frac{1cm}{10\ \cancel{mm}} = \frac{27}{10} cm = 2.7\ cm$$

13. Solution:

$8.1\ m = \_\_\_\ mm$

$$8.1\ \cancel{m} \times \frac{100\ \cancel{cm}}{1\ \cancel{m}} \times \frac{10mm}{1\ \cancel{cm}} = 8100\ mm$$

14. Solution:

$7.5\ m = \_\_\_\ km$

$$7.5\ \cancel{m} \times \frac{1\ km}{1000\ \cancel{m}} = \frac{7.5}{1000} km = 0.0075\ km$$

15. Solution:

$67000 mm = \_\_\_\ km$

$$67000\ \cancel{mm} \times \frac{1\ \cancel{cm}}{10\ \cancel{mm}} \times \frac{1\ \cancel{m}}{100\ \cancel{cm}} \times \frac{1km}{1000\ \cancel{m}} = \frac{67000}{10 \times 100 \times 1000} km = 0.067\ km$$

Practice Section B

1. Solution:

$107\,mm = \_\_\_\,cm$

$$107\,\cancel{mm} \times \frac{1cm}{10\,\cancel{mm}} = \frac{107}{10}\,cm = 10.7\,cm$$

2. Solution:

$142\,mm = \_\_\_\,km$

$$142\,\cancel{mm} \times \frac{1\,\cancel{cm}}{10\,\cancel{mm}} \times \frac{1\,\cancel{m}}{100\,\cancel{cm}} \times \frac{1km}{1000\,\cancel{m}} = \frac{142}{10 \times 100 \times 1000}\,km = 0.000142\,km$$

3. Solution:

$17.5\,km = \_\_\_\,cm$

$$17.5\,\cancel{km} \times \frac{1000\,\cancel{m}}{1\,\cancel{km}} \times \frac{100cm}{1\,\cancel{m}} = 1750000\,cm$$

4. Solution:

$11.25\,km = \_\_\_\,mm$

$$11.25\,\cancel{km} \times \frac{1000\,\cancel{m}}{1\,\cancel{km}} \times \frac{100\,\cancel{cm}}{1\,\cancel{m}} \times \frac{10mm}{1\,\cancel{cm}} = 11250000\,mm$$

5. Solution:

$322\,cm = \_\_\_\,m$

$$322\,\cancel{cm} \times \frac{1m}{100\,\cancel{cm}} = \frac{322}{100}\,m = 3.22\,m$$

6. Solution:

$5.5\,km - 2400\,cm = \_\_\_\_\_\,mm$

$$5.5\,\cancel{km} \times \frac{1000\,\cancel{m}}{1\,\cancel{km}} \times \frac{100\,\cancel{cm}}{1\,\cancel{m}} \times \frac{10mm}{1\,\cancel{cm}} = 5500000\,mm$$

$$2400\,\cancel{cm} \times \frac{10mm}{1\,\cancel{cm}} = 24000\,mm$$

$$5500000 - 24000 = 5476000\,mm$$

7. Solution:

$1.5\,km + 5000m = \_\_\_\_\_\ cm$

$$1.5\,\cancel{km} \times \frac{1000\,\cancel{m}}{1\,\cancel{km}} \times \frac{100cm}{1\,\cancel{m}} = 150000\,cm$$

$$5000\,\cancel{m} \times \frac{100cm}{1\,\cancel{m}} = 500000\,cm$$

$$150000 + 500000 = 650000\,cm$$

8. Solution:

$36\,cm + 3\,km = \_\_\_\_\_\ mm$

$$36\,\cancel{cm} \times \frac{10mm}{1\,\cancel{cm}} = 360\,mm$$

$$3\,\cancel{km} \times \frac{1000\,\cancel{m}}{1\,\cancel{km}} \times \frac{100\,\cancel{cm}}{1\,\cancel{m}} \times \frac{10mm}{1\,\cancel{cm}} = 3000000\,mm$$

$$360 + 3000000 = 3000360\,mm$$

9. Solution:

$5.3\,km + 7500m = \_\_\_\_\_\ cm$

$$5.3\,\cancel{km} \times \frac{1000\,\cancel{m}}{1\,\cancel{km}} \times \frac{100cm}{1\,\cancel{m}} = 530000\,cm$$

$$7500\,\cancel{m} \times \frac{100cm}{1\,\cancel{m}} = 750000\,cm$$

$$530000 + 750000 = 1280000\,cm$$

10. Solution:

$5m + 3.7\ cm = \_\_\_\_\_\ mm$

$$5\,\cancel{m} \times \frac{100\,\cancel{cm}}{1\,\cancel{m}} \times \frac{10mm}{1\,\cancel{cm}} = 5000\,mm$$

$$3.7\,\cancel{cm} \times \frac{10mm}{1\,\cancel{cm}} = 37\,mm$$

$$5000 + 37 = 5037\,mm$$

11. Solution:

$4\,km + 2300\,cm - 610\,m = \_\_\_\_\_\ cm$

$4\,\cancel{km} \times \frac{1000\,\cancel{m}}{1\,\cancel{km}} \times \frac{100\,\cancel{cm}}{1\,\cancel{m}} cm = 400000\,cm$

$610\,\cancel{m} \times \frac{100cm}{1\,\cancel{m}} = 61000\,cm$

$400000 + 2300 - 61000 = 341300\,cm$

12. Solution:

$5\,m + 21cm - 1700mm = \_\_\_\_\_\ km$

$5\,\cancel{m} \times \frac{1km}{1000\,\cancel{m}} = \frac{5}{1000} km = 0.005\,km$

$21\,\cancel{cm} \times \frac{1km}{100000\,\cancel{cm}} = \frac{21}{100000} km = 0.00021\,km$

$1700\,\cancel{mm} \times \frac{1\,\cancel{cm}}{10\,\cancel{mm}} \times \frac{1km}{100000\,\cancel{cm}} = \frac{1700}{10 \times 100000} km = 0.0017\,km$

$0.005 + 0.00021 - 0.0017 = 0.00351\,km$

13. Solution:

$5680m + 279cm - 1.7km = \_\_\_\_\_\ mm$

$5680\,\cancel{m} \times \frac{1000mm}{1\,\cancel{m}} = 5680000\,mm$

$279\,\cancel{cm} \times \frac{10mm}{1\,\cancel{cm}} = 2790\,mm$

$1.7\,\cancel{km} \times \frac{100000\,\cancel{cm}}{1\,\cancel{km}} \times \frac{10mm}{1\,\cancel{cm}} = 1700000\,mm$

$5680000 + 2790 - 1700000 = 3982790\,mm$

14. Solution:

$1.5km - 3390\,cm + 670mm = \_\_\_\_\_\ m$

$1.5\,\cancel{km} \times \frac{1000m}{1\,\cancel{km}} = 1500\,m$

$3390\,\cancel{cm} \times \frac{1m}{100\,\cancel{cm}} = \frac{3390}{100} m = 33.9\,m$

$670\,\cancel{mm} \times \frac{1m}{1000\,\cancel{mm}} = \frac{670}{1000} m = 0.67\,m$

$1500 - 33.9 + 0.67 = 1466.77\,m$

15. Solution:

$7000\,m - 5.4\,km + 27500\,mm = \_\_\_\_\_\,cm$

$$7000\,\cancel{m} \times \frac{100cm}{1\,\cancel{m}} = 700000\,cm$$

$$5.4\,\cancel{km} \times \frac{100000cm}{1\,\cancel{km}} = 540000\,cm$$

$$27500\,\cancel{mm} \times \frac{1cm}{10\,\cancel{mm}} = \frac{27500}{10}cm = 2750\,cm$$

$700000 - 540000 + 2750 = 162750\,cm$

Practice Section C

1. Solution:

4750 mm = ___ m + ___ cm + ___ mm

$$4750\,\cancel{mm} \times \frac{1m}{1000\,\cancel{mm}} = 4.750\,m = 4\,m + 0.75\,m$$

$$0.75\,\cancel{m} \times \frac{100cm}{1\,\cancel{m}} = 75\,cm$$

$4750\,mm = 4\,m + 75\,cm + 0\,mm$

2. Solution:

6894220 mm = ___ km + ___ m + ___ cm + ___ mm

$$6894220\,\cancel{mm} \times \frac{1km}{1000000\,\cancel{mm}} = 6.89422\,km = 6\,km + 0.89422\,km$$

$$0.89422\,\cancel{km} \times \frac{1000m}{1\,\cancel{km}} = 894.22\,m = 894\,m + 0.22\,m$$

$$0.22\,\cancel{m} \times \frac{100cm}{1\,\cancel{m}} = 22\,cm$$

$6894220\,mm = 6\,km + 894\,m + 22\,cm + 0\,mm$

3. Solution:

$5\,m + 21cm - 1700mm + 5.5\,km - 2400\,cm = \_\_\_\_\_\; mm$

$5\,\cancel{m} \times \frac{1000mm}{1\,\cancel{m}} = 5000\,mm$

$21\,\cancel{cm} \times \frac{10m}{1\,\cancel{cm}} = 210\,mm$

$5.5\,\cancel{km} \times \frac{1000000mm}{1\,\cancel{km}} = 5500000\,mm$

$2400\,\cancel{cm} \times \frac{10m}{1\,\cancel{cm}} = 24000\,mm$

$5000 + 210 - 1700 + 5500000 - 24000 = 5479510\,mm$

4. Solution:

$(0.75km + 548m - 27500mm) - (1.5m - 1500mm + 1.75cm) = \_\_\_\_\_\; m$

$0.75\,\cancel{km} \times \frac{1000m}{1\,\cancel{km}} = 750\,m$

$27500\,\cancel{mm} \times \frac{1m}{1000\,\cancel{mm}} = 27.5\,m$

$1500\,\cancel{mm} \times \frac{1m}{1000\,\cancel{mm}} = 1.5\,m$

$1.75\,\cancel{cm} \times \frac{1m}{100\,\cancel{cm}} = 0.0175\,m$

$(750 + 548 - 27.5) - (1.5 - 1.5 + 0.0175) = 1270.5 - 0.0175 = 1270.4825\,m$

5. Solution:

$(1.5km - 1519cm) + \frac{300m}{1.25} - \left(1.125m \div \frac{1}{4} + 125cm\right) = \_\_\_\_\_\; km$

$1519\,\cancel{cm} \times \frac{1km}{100000\,\cancel{cm}} = 0.01519\,km$

$300\,\cancel{m} \times \frac{1km}{1000\,\cancel{m}} \div 1.25 = 0.24\,km$

$1.125m \div \frac{1}{4} \times \frac{1km}{1000\,\cancel{m}} = 0.0045\,km$

$125\,\cancel{cm} \times \frac{1km}{100000\,\cancel{cm}} = 0.00125\,km$

$(1.5 - 0.01519) + 0.24 - (0.0045 + 0.00125) = 1.48481 + 0.24 - 0.00575 = 1.71906\,km$

Practice Section D

1. Solution:
The conversions are all done correctly. The error is in line 3 of the solution when 21 mm is multiplied by 10 rather than being divided by 10. (21mm = 2.1 cm) Therefore, 500 + 2.1 – 1.5 = 500.6 cm.

2. Solution:
There is an error in line 2 when 4 x 100x 10 = 400 mm. It should equal 4000 mm. A second error occurs in the final line when the units are expresses as centimeters instead of millimeters.

Practice Section E

Solution:

There will be 20 'base lengths' that are equal in length to the first piece cut. If each piece is 5 cm longer than the previous, there would be 5+10+15+20….+95 which totals 950 cm = 9500 mm. That would leave 24000 – 9500 = 14500 mm to be divided into 20 equal 'base lengths'. The base length, and therefore the first length, would need to be 14500/20 mm which is 725 mm = 0.725 m.