

NUMERACY:

The Basics Workbook



Set D: Adding & Subtracting Fractions 2

Companion Workbook to Numeracy: The Basics Video Series

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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



ADDING & SUBTRACTING FRACTIONS 2

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

Practice Section A

Calculate the following. Express your answer in lowest terms.

1. $\frac{3}{4} - \frac{1}{2}$ = _____

2. $\frac{7}{8} - \frac{1}{4}$ = _____

3. $\frac{5}{8} + \frac{1}{4}$ = _____

4. $\frac{1}{2} - \frac{1}{4}$ = _____

5. $\frac{3}{8} + \frac{1}{2}$ = _____

6. $\frac{9}{16} - \frac{1}{4}$ = _____

7. $\frac{5}{8} + \frac{5}{16}$ = _____

8. $\frac{3}{4} + \frac{5}{16}$ = _____

9. $\frac{7}{8} - \frac{21}{32}$ = _____

10. $\frac{5}{8} - \frac{1}{2}$ = _____

11. $\frac{1}{2} - \frac{7}{16}$ = _____



12. $\frac{5}{8} - \frac{3}{16} = \underline{\hspace{2cm}}$

13. $\frac{15}{32} - \frac{7}{16} = \underline{\hspace{2cm}}$

14. $\frac{5}{32} + \frac{5}{8} = \underline{\hspace{2cm}}$

15. $\frac{3}{4} + \frac{1}{32} = \underline{\hspace{2cm}}$

16. $\frac{7}{8} - \frac{5}{16} = \underline{\hspace{2cm}}$

17. $\frac{15}{16} - \frac{3}{8} = \underline{\hspace{2cm}}$

18. $\frac{1}{4} + \frac{3}{8} = \underline{\hspace{2cm}}$

19. $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = \underline{\hspace{2cm}}$

20. $\frac{1}{4} + \frac{3}{8} - \frac{1}{2} = \underline{\hspace{2cm}}$

Practice Section B

Calculate the following. Express your answer in lowest terms.

1. $\frac{1}{8} + \frac{7}{16} + \frac{1}{4} = \underline{\hspace{2cm}}$

2. $\frac{5}{16} - \frac{3}{8} + \frac{1}{4} = \underline{\hspace{2cm}}$

3. $\frac{3}{4} - \frac{1}{16} - \frac{1}{2} = \underline{\hspace{2cm}}$



4. $\frac{1}{2} - \frac{1}{32} - \frac{7}{16}$ = _____

5. $\frac{7}{16} + \frac{1}{2} - \frac{3}{8}$ = _____

6. $\frac{3}{8} + \frac{1}{2} - \frac{7}{16}$ = _____

7. $\frac{3}{4} - \frac{1}{2} + \frac{3}{8}$ = _____

8. $\frac{1}{2} + \frac{5}{16} + \frac{1}{8}$ = _____

9. $\frac{3}{4} - \frac{1}{8} + \frac{1}{2}$ = _____

10. $\frac{15}{16} - \frac{3}{4} + \frac{1}{8}$ = _____

11. $\frac{3}{4} + \frac{1}{32} - \frac{5}{16}$ = _____

12. $\frac{3}{8} - \frac{3}{4} + \frac{1}{2}$ = _____

13. $\frac{3}{4} - \frac{3}{16} - \frac{1}{2}$ = _____

14. $\frac{3}{8} - \frac{1}{2} + \frac{3}{16}$ = _____

15. $\frac{3}{8} + \frac{1}{2} + \frac{1}{4}$ = _____

16. $\frac{3}{8} - \frac{1}{4} - \frac{7}{16} + \frac{1}{2}$ = _____

17. $\frac{3}{4} - \frac{1}{2} + \frac{5}{32} - \frac{5}{16}$ = _____



$$18. \quad \frac{3}{4} - \left(\frac{1}{8} - \frac{1}{2} \right) = \underline{\hspace{2cm}}$$

$$19. \quad \frac{3}{8} + \frac{3}{4} - \frac{1}{2} + \frac{1}{16} = \underline{\hspace{2cm}}$$

$$20. \quad \frac{5}{32} - \left(\frac{1}{4} - \frac{1}{2} \right) = \underline{\hspace{2cm}}$$

$$21. \quad \frac{5}{32} + \frac{7}{16} + \frac{1}{4} - \frac{3}{8} = \underline{\hspace{2cm}}$$

$$22. \quad \frac{5}{8} - \left(\frac{7}{16} - \frac{22}{32} \right) + \frac{3}{4} = \underline{\hspace{2cm}}$$

$$23. \quad \frac{3}{8} - \left(\frac{3}{4} - \frac{1}{2} \right) + \frac{1}{16} = \underline{\hspace{2cm}}$$

$$24. \quad \frac{1}{2} - \left(\frac{1}{4} - \frac{7}{16} \right) - \left(\frac{5}{32} - \frac{7}{8} \right) = \underline{\hspace{2cm}}$$

$$25. \quad \frac{3}{4} + \frac{1}{2} - \left(\frac{1}{2} + \frac{3}{8} \right) - \left(\frac{3}{4} - \frac{9}{16} \right) = \underline{\hspace{2cm}}$$

Practice Section C

Calculate the following. Express your answer in lowest terms.

$$1. \quad \frac{3}{8} - \frac{1}{16} + \frac{1}{4} + \frac{5}{8} - \frac{7}{16} - \frac{1}{4} + \frac{3}{4} + \frac{1}{8} - \frac{3}{4} + \frac{1}{32} - \frac{5}{16} + \frac{1}{4} + \frac{3}{8} - \frac{1}{2} = \underline{\hspace{2cm}}$$

$$2. \quad \frac{3}{8} - \frac{1}{16} + \frac{1}{4} - \left(\frac{5}{8} - \frac{7}{16} \right) - \left(\frac{1}{4} - \frac{3}{4} \right) + \frac{1}{8} = \underline{\hspace{2cm}}$$

$$3. \quad \frac{3}{8} - \left(\frac{3}{4} - \frac{1}{2} \right) + \frac{1}{16} - \left(\frac{5}{32} - \frac{7}{16} + \frac{1}{4} - \frac{3}{8} \right) = \underline{\hspace{2cm}}$$



$$4. \left(\frac{15}{16} - \frac{3}{4} + \frac{1}{8} \right) + \left[\frac{3}{4} - \left(\frac{3}{16} - \frac{1}{2} \right) + \frac{3}{4} - \left(\frac{1}{8} - \frac{1}{2} \right) \right] = \underline{\hspace{2cm}}$$

$$5. \frac{3}{4} + \left[\frac{1}{2} - \left(\frac{1}{2} + \frac{3}{8} \right) - \left(\frac{3}{4} - \frac{9}{16} \right) \right] - \left(\frac{3}{8} + \frac{3}{4} - \frac{1}{2} \right) + \frac{1}{16} + \frac{3}{4} - \left(-\frac{3}{16} - \frac{1}{2} \right) = \underline{\hspace{2cm}}$$

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.

$$\begin{aligned} & \frac{5}{8} - \left(\frac{7}{16} - \frac{22}{32} \right) - \frac{3}{4} \\ &= \frac{5}{8} \left(\frac{4}{4} \right) - \left(\frac{7}{16} \left(\frac{2}{2} \right) - \frac{22}{32} \right) - \frac{3}{4} \left(\frac{8}{8} \right) \\ &= \frac{20}{32} - \left(\frac{14}{32} - \frac{22}{32} \right) - \frac{21}{32} \\ &= \frac{20}{32} - \left(\frac{8}{32} \right) - \frac{21}{32} \\ &= \frac{20}{32} - \frac{8}{32} - \frac{21}{32} \\ &= -\frac{9}{32} \end{aligned}$$

= _____

**Practice Section E**

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

Calculate the answer to each of the questions below by following the 'rules' of fractions. Give your answer in lowest terms.

$$\left\{ \left(\frac{3}{4} - \frac{15}{16} - \frac{1}{8} \right) + \left[\frac{3}{4} - \left(\frac{3}{16} - \frac{1}{2} \right) + \frac{3}{4} - \left(\frac{1}{8} - \frac{1}{2} \right) \right] \right\} - \left[\frac{1}{2} - \left(\frac{1}{4} - \frac{7}{16} \right) - \left(\frac{5}{32} - \frac{7}{8} \right) \right] + \left[\frac{5}{32} - \left(\frac{1}{4} - \frac{1}{2} \right) \right]$$

= _____



SOLUTIONS

Set D

Adding & Subtracting Fractions 2

**ADDING & SUBTRACTING FRACTIONS 2****Practice Section A**

1. Solution:

$$\begin{aligned}\frac{3}{4} - \frac{1}{2} \\ &= \frac{3}{4} - \frac{1}{2} \left(\frac{2}{2} \right) \\ &= \frac{3}{4} - \frac{2}{4} \\ &= \frac{1}{4}\end{aligned}$$

2. Solution:

$$\begin{aligned}\frac{7}{8} - \frac{1}{4} \\ &= \frac{7}{8} - \frac{1}{4} \left(\frac{2}{2} \right) \\ &= \frac{7}{8} - \frac{2}{8} \\ &= \frac{5}{8}\end{aligned}$$

3. Solution:

$$\begin{aligned}\frac{5}{8} + \frac{1}{4} \\ &= \frac{5}{8} + \frac{1}{4} \left(\frac{2}{2} \right) \\ &= \frac{5}{8} + \frac{2}{8} \\ &= \frac{7}{8}\end{aligned}$$

4. Solution:

$$\begin{aligned}\frac{1}{2} - \frac{1}{4} \\ &= \frac{1}{2} \left(\frac{2}{2} \right) - \frac{1}{4} \\ &= \frac{2}{4} - \frac{1}{4} \\ &= \frac{1}{4}\end{aligned}$$

5. Solution:

$$\begin{aligned}\frac{3}{8} + \frac{1}{2} \\ &= \frac{3}{8} + \frac{1}{2} \left(\frac{4}{4} \right) \\ &= \frac{3}{8} + \frac{4}{8} \\ &= \frac{7}{8}\end{aligned}$$

6. Solution:

$$\begin{aligned}\frac{9}{16} - \frac{1}{4} \\ &= \frac{9}{16} - \frac{1}{4} \left(\frac{4}{4} \right) \\ &= \frac{9}{16} - \frac{4}{16} \\ &= \frac{5}{16}\end{aligned}$$



7. Solution:

$$\frac{5}{8} + \frac{5}{16}$$
$$= \frac{5\left(\frac{2}{2}\right) + \frac{5}{16}}$$
$$= \frac{10}{16} + \frac{5}{16}$$
$$= \frac{15}{16}$$

8. Solution:

$$\frac{3}{4} + \frac{5}{16}$$
$$= \frac{3\left(\frac{4}{4}\right) + \frac{5}{16}}$$
$$= \frac{12}{16} + \frac{5}{16}$$
$$= \frac{17}{16}$$

9. Solution:

$$\frac{7}{8} - \frac{21}{32}$$
$$= \frac{7\left(\frac{4}{4}\right) - \frac{21}{32}}$$
$$= \frac{28}{32} - \frac{21}{32}$$
$$= \frac{7}{32}$$

10. Solution:

$$\frac{5}{8} - \frac{1}{2}$$
$$= \frac{5}{8} - \frac{1\left(\frac{4}{4}\right)}{2\left(\frac{4}{4}\right)}$$
$$= \frac{5}{8} - \frac{4}{8}$$
$$= \frac{1}{8}$$

11. Solution:

$$\frac{1}{2} - \frac{7}{16}$$
$$= \frac{1\left(\frac{8}{8}\right) - \frac{7}{16}}$$
$$= \frac{8}{16} - \frac{7}{16}$$
$$= \frac{1}{16}$$

12. Solution:

$$\frac{5}{8} - \frac{3}{16}$$
$$= \frac{5\left(\frac{2}{2}\right) - \frac{3}{16}}$$
$$= \frac{10}{16} - \frac{3}{16}$$
$$= \frac{7}{16}$$

13. Solution:

$$\frac{15}{32} - \frac{7}{16}$$
$$= \frac{15}{32} - \frac{7\left(\frac{2}{2}\right)}{16\left(\frac{2}{2}\right)}$$
$$= \frac{15}{32} - \frac{14}{32}$$
$$= \frac{1}{32}$$

14. Solution:

$$\frac{5}{32} + \frac{5}{8}$$
$$= \frac{5}{32} + \frac{5\left(\frac{4}{4}\right)}{8\left(\frac{4}{4}\right)}$$
$$= \frac{5}{32} + \frac{20}{32}$$
$$= \frac{25}{32}$$



15. Solution:

$$\frac{3}{4} + \frac{1}{32}$$
$$= \frac{3\left(\frac{8}{8}\right) + \frac{1}{32}}$$
$$= \frac{24}{32} + \frac{1}{32}$$
$$= \frac{25}{32}$$

16. Solution:

$$\frac{7}{8} - \frac{5}{16}$$
$$= \frac{7\left(\frac{2}{2}\right) - \frac{5}{16}}$$
$$= \frac{14}{16} - \frac{5}{16}$$
$$= \frac{9}{16}$$

17. Solution:

$$\frac{15}{16} - \frac{3}{8}$$
$$= \frac{15}{16} - \frac{3\left(\frac{2}{2}\right)}{8}$$
$$= \frac{15}{16} - \frac{6}{16}$$
$$= \frac{9}{16}$$

18. Solution:

$$\frac{1}{4} + \frac{3}{8}$$
$$= \frac{1\left(\frac{2}{2}\right) + \frac{3}{8}}$$
$$= \frac{2}{8} + \frac{3}{8}$$
$$= \frac{5}{8}$$

19. Solution:

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8}$$
$$= \frac{1\left(\frac{4}{4}\right) + \frac{1}{4}\left(\frac{2}{2}\right) + \frac{1}{8}}$$
$$= \frac{4}{8} + \frac{2}{8} + \frac{1}{8}$$
$$= \frac{7}{8}$$

20. Solution:

$$\frac{1}{4} + \frac{3}{8} - \frac{1}{2}$$
$$= \frac{1\left(\frac{2}{2}\right) + \frac{3}{8} - \frac{1}{2}\left(\frac{4}{4}\right)}$$
$$= \frac{2}{8} + \frac{3}{8} - \frac{4}{8}$$
$$= \frac{1}{8}$$

**Practice Section B**

1. Solution:

$$\begin{aligned} & \frac{1}{8} + \frac{7}{16} + \frac{1}{4} \\ &= \frac{1}{8} \left(\frac{2}{2} \right) + \frac{7}{16} + \frac{1}{4} \left(\frac{4}{4} \right) \\ &= \frac{2}{16} + \frac{7}{16} + \frac{4}{16} \\ &= \frac{13}{16} \end{aligned}$$

2. Solution:

$$\begin{aligned} & \frac{5}{16} - \frac{3}{8} + \frac{1}{4} \\ &= \frac{5}{16} - \frac{3}{8} \left(\frac{2}{2} \right) + \frac{1}{4} \left(\frac{4}{4} \right) \\ &= \frac{5}{16} - \frac{6}{16} + \frac{4}{16} \\ &= \frac{3}{16} \end{aligned}$$

3. Solution:

$$\begin{aligned} & \frac{3}{4} - \frac{1}{16} - \frac{1}{2} \\ &= \frac{3}{4} \left(\frac{4}{4} \right) - \frac{1}{16} - \frac{1}{2} \left(\frac{8}{8} \right) \\ &= \frac{12}{16} - \frac{1}{16} - \frac{8}{16} \\ &= \frac{3}{16} \end{aligned}$$

4. Solution:

$$\begin{aligned} & \frac{1}{2} - \frac{1}{32} - \frac{7}{16} \\ &= \frac{1}{2} \left(\frac{16}{16} \right) - \frac{1}{32} - \frac{7}{16} \left(\frac{2}{2} \right) \\ &= \frac{16}{32} - \frac{1}{32} - \frac{14}{32} \\ &= \frac{1}{32} \end{aligned}$$

5. Solution:

$$\begin{aligned} & \frac{7}{16} + \frac{1}{2} - \frac{3}{8} \\ &= \frac{7}{16} + \frac{1}{2} \left(\frac{8}{8} \right) - \frac{3}{8} \left(\frac{2}{2} \right) \\ &= \frac{7}{16} + \frac{8}{16} - \frac{6}{16} \\ &= \frac{9}{16} \end{aligned}$$

6. Solution:

$$\begin{aligned} & \frac{3}{8} + \frac{1}{2} - \frac{7}{16} \\ &= \frac{3}{8} \left(\frac{2}{2} \right) + \frac{1}{2} \left(\frac{8}{8} \right) - \frac{7}{16} \\ &= \frac{6}{16} + \frac{8}{16} - \frac{7}{16} \\ &= \frac{7}{16} \end{aligned}$$



7. Solution:

$$\begin{aligned}\frac{3}{4} - \frac{1}{2} + \frac{3}{8} \\ &= \frac{3\left(\frac{2}{2}\right) - \frac{1\left(\frac{4}{4}\right) + \frac{3}{8}}{4\left(\frac{2}{2}\right) - \frac{1\left(\frac{4}{4}\right) + \frac{3}{8}} \\ &= \frac{6}{8} - \frac{4}{8} + \frac{3}{8} \\ &= \frac{5}{8}\end{aligned}$$

8. Solution:

$$\begin{aligned}\frac{1}{2} + \frac{5}{16} + \frac{1}{8} \\ &= \frac{1\left(\frac{8}{8}\right) + \frac{5}{16} + \frac{1\left(\frac{2}{2}\right)}{2\left(\frac{8}{8}\right) + \frac{5}{16} + \frac{1\left(\frac{2}{2}\right)} \\ &= \frac{8}{16} + \frac{5}{16} + \frac{2}{16} \\ &= \frac{15}{16}\end{aligned}$$

9. Solution:

$$\begin{aligned}\frac{3}{4} - \frac{1}{8} + \frac{1}{2} \\ &= \frac{3\left(\frac{2}{2}\right) - \frac{1}{8} + \frac{1\left(\frac{4}{4}\right)}{4\left(\frac{2}{2}\right) - \frac{1}{8} + \frac{1\left(\frac{4}{4}\right)} \\ &= \frac{6}{8} - \frac{1}{8} + \frac{4}{8} \\ &= \frac{9}{8}\end{aligned}$$

10. Solution:

$$\begin{aligned}\frac{15}{16} - \frac{3}{4} + \frac{1}{8} \\ &= \frac{15}{16} - \frac{3\left(\frac{4}{4}\right) + \frac{1\left(\frac{2}{2}\right)}{16 - \frac{3\left(\frac{4}{4}\right) + \frac{1\left(\frac{2}{2}\right)} \\ &= \frac{15}{16} - \frac{12}{16} + \frac{2}{16} \\ &= \frac{5}{16}\end{aligned}$$

11. Solution:

$$\begin{aligned}\frac{3}{4} + \frac{1}{32} - \frac{5}{16} \\ &= \frac{3\left(\frac{8}{8}\right) + \frac{1}{32} - \frac{5\left(\frac{2}{2}\right)}{4\left(\frac{8}{8}\right) + \frac{1}{32} - \frac{5\left(\frac{2}{2}\right)} \\ &= \frac{24}{32} + \frac{1}{32} - \frac{10}{32} \\ &= \frac{15}{32}\end{aligned}$$

12. Solution:

$$\begin{aligned}\frac{3}{8} - \frac{3}{4} + \frac{1}{2} \\ &= \frac{3}{8} - \frac{3\left(\frac{2}{2}\right) + \frac{1\left(\frac{4}{4}\right)}{8 - \frac{3\left(\frac{2}{2}\right) + \frac{1\left(\frac{4}{4}\right)} \\ &= \frac{3}{8} - \frac{6}{8} + \frac{4}{8} \\ &= \frac{1}{8}\end{aligned}$$



13. Solution:

$$\begin{aligned} & \frac{3}{4} - \frac{3}{16} - \frac{1}{2} \\ &= \frac{3\left(\frac{4}{4}\right) - \frac{3}{16} - \frac{1\left(\frac{8}{8}\right)}{2} \\ &= \frac{12}{16} - \frac{3}{16} - \frac{8}{16} \\ &= \frac{1}{16} \end{aligned}$$

14. Solution:

$$\begin{aligned} & \frac{3}{8} - \frac{1}{2} + \frac{3}{16} \\ &= \frac{3\left(\frac{2}{2}\right) - \frac{1\left(\frac{8}{8}\right)}{2} + \frac{3}{16} \\ &= \frac{6}{16} - \frac{8}{16} + \frac{3}{16} \\ &= \frac{1}{16} \end{aligned}$$

15. Solution:

$$\begin{aligned} & \frac{3}{8} + \frac{1}{2} + \frac{1}{4} \\ &= \frac{3}{8} + \frac{1\left(\frac{4}{4}\right)}{2} + \frac{1\left(\frac{2}{2}\right)}{4} \\ &= \frac{3}{8} + \frac{4}{8} + \frac{2}{8} \\ &= \frac{9}{8} \end{aligned}$$

16. Solution:

$$\begin{aligned} & \frac{3}{8} - \frac{1}{4} - \frac{7}{16} + \frac{1}{2} \\ &= \frac{3\left(\frac{2}{2}\right) - \frac{1\left(\frac{4}{4}\right)}{4} - \frac{7}{16} + \frac{1\left(\frac{8}{8}\right)}{2} \\ &= \frac{6}{16} - \frac{4}{16} - \frac{7}{16} + \frac{8}{16} \\ &= \frac{3}{16} \end{aligned}$$

17. Solution:

$$\begin{aligned} & \frac{3}{4} - \frac{1}{2} + \frac{5}{32} - \frac{5}{16} \\ &= \frac{3\left(\frac{8}{8}\right) - \frac{1\left(\frac{16}{16}\right)}{2} + \frac{5}{32} - \frac{5\left(\frac{2}{2}\right)}{16} \\ &= \frac{24}{32} - \frac{16}{32} + \frac{5}{32} - \frac{10}{32} \\ &= \frac{3}{32} \end{aligned}$$

18. Solution:

$$\begin{aligned} & \frac{3}{4} - \left(\frac{1}{8} - \frac{1}{2}\right) \\ &= \frac{3\left(\frac{2}{2}\right) - \left(\frac{1}{8} - \frac{1\left(\frac{4}{4}\right)}{2}\right) \\ &= \frac{6}{8} - \left(\frac{1}{8} - \frac{4}{8}\right) \\ &= \frac{6}{8} - \left(-\frac{3}{8}\right) \\ &= \frac{6}{8} + \frac{3}{8} \\ &= \frac{9}{8} \end{aligned}$$

**19.** Solution:

$$\begin{aligned} & \frac{3}{8} + \frac{3}{4} - \frac{1}{2} + \frac{1}{16} \\ &= \frac{3}{8} \left(\frac{2}{2} \right) + \frac{3}{4} \left(\frac{4}{4} \right) - \frac{1}{2} \left(\frac{8}{8} \right) + \frac{1}{16} \\ &= \frac{6}{16} + \frac{12}{16} - \frac{8}{16} + \frac{1}{16} \\ &= \frac{11}{16} \end{aligned}$$

20. Solution:

$$\begin{aligned} & \frac{5}{32} - \left(\frac{1}{4} - \frac{1}{2} \right) \\ &= \frac{5}{32} - \left(\frac{1}{4} \left(\frac{8}{8} \right) - \frac{1}{2} \left(\frac{16}{16} \right) \right) \\ &= \frac{5}{32} - \left(\frac{8}{32} - \frac{16}{32} \right) \\ &= \frac{5}{32} - \left(-\frac{8}{32} \right) \\ &= \frac{5}{32} + \frac{8}{32} \\ &= \frac{13}{32} \end{aligned}$$

21. Solution:

$$\begin{aligned} & \frac{5}{32} + \frac{7}{16} + \frac{1}{4} - \frac{3}{8} \\ &= \frac{5}{32} + \frac{7}{16} \left(\frac{2}{2} \right) + \frac{1}{4} \left(\frac{8}{8} \right) - \frac{3}{8} \left(\frac{4}{4} \right) \\ &= \frac{5}{32} + \frac{14}{32} + \frac{8}{32} - \frac{12}{32} \\ &= \frac{15}{32} \end{aligned}$$

22. Solution:

$$\begin{aligned} & \frac{5}{8} - \left(\frac{7}{16} - \frac{22}{32} \right) + \frac{3}{4} \\ &= \frac{5}{8} \left(\frac{4}{4} \right) - \left(\frac{7}{16} \left(\frac{2}{2} \right) - \frac{22}{32} \right) + \frac{3}{4} \left(\frac{8}{8} \right) \\ &= \frac{20}{32} - \left(\frac{14}{32} - \frac{22}{32} \right) + \frac{24}{32} \\ &= \frac{20}{32} - \left(-\frac{8}{32} \right) + \frac{24}{32} \\ &= \frac{20}{32} + \frac{8}{32} + \frac{24}{32} \\ &= \frac{52}{32} \\ &= \frac{26}{16} \\ &= \frac{13}{8} \end{aligned}$$

23. Solution:

$$\begin{aligned} & \frac{3}{8} - \left(\frac{3}{4} - \frac{1}{2} \right) + \frac{1}{16} \\ &= \frac{3}{8} \left(\frac{2}{2} \right) - \left(\frac{3}{4} \left(\frac{4}{4} \right) - \frac{1}{2} \left(\frac{8}{8} \right) \right) + \frac{1}{16} \\ &= \frac{6}{16} - \left(\frac{12}{16} - \frac{8}{16} \right) + \frac{1}{16} \\ &= \frac{6}{16} - \frac{4}{16} + \frac{1}{16} \\ &= \frac{3}{16} \end{aligned}$$



24. Solution:

$$\begin{aligned} & \frac{1}{2} - \left(\frac{1}{4} - \frac{7}{16} \right) - \left(\frac{5}{32} - \frac{7}{8} \right) \\ &= \frac{1}{2} \left(\frac{16}{16} \right) - \left(\frac{1}{4} \left(\frac{8}{8} \right) - \frac{7}{16} \left(\frac{2}{2} \right) \right) - \left(\frac{5}{32} - \frac{7}{8} \left(\frac{4}{4} \right) \right) \\ &= \frac{16}{32} - \left(\frac{8}{32} - \frac{14}{32} \right) - \left(\frac{5}{32} - \frac{28}{32} \right) \\ &= \frac{16}{32} - \left(-\frac{6}{32} \right) - \left(-\frac{23}{32} \right) \\ &= \frac{16}{32} + \frac{6}{32} + \frac{23}{32} \\ &= \frac{45}{32} \end{aligned}$$

25. Solution:

$$\begin{aligned} & \frac{3}{4} + \frac{1}{2} - \left(\frac{1}{2} + \frac{3}{8} \right) - \left(\frac{3}{4} - \frac{9}{16} \right) \\ &= \frac{3}{4} \left(\frac{4}{4} \right) + \frac{1}{2} \left(\frac{8}{8} \right) - \left(\frac{1}{2} \left(\frac{8}{8} \right) + \frac{3}{8} \left(\frac{2}{2} \right) \right) - \left(\frac{3}{4} \left(\frac{4}{4} \right) - \frac{9}{16} \right) \\ &= \frac{12}{16} + \frac{8}{16} - \left(\frac{8}{16} + \frac{6}{16} \right) - \left(\frac{12}{16} - \frac{9}{16} \right) \\ &= \frac{12}{16} + \frac{8}{16} - \left(\frac{14}{16} \right) - \left(\frac{3}{16} \right) \\ &= \frac{12}{16} + \frac{8}{16} - \frac{14}{16} - \frac{3}{16} \\ &= \frac{3}{16} \end{aligned}$$

**Practice Section C**

1. Solution:

$$\begin{aligned} & \frac{3}{8} - \frac{1}{16} + \frac{1}{4} + \frac{5}{8} - \frac{7}{16} - \frac{1}{4} + \frac{3}{4} + \frac{1}{8} - \frac{3}{4} + \frac{1}{32} - \frac{5}{16} + \frac{1}{4} + \frac{3}{8} - \frac{1}{2} \\ &= \frac{3}{8} \left(\frac{4}{4} \right) - \frac{1}{16} \left(\frac{2}{2} \right) + \frac{1}{4} \left(\frac{8}{8} \right) + \frac{5}{8} \left(\frac{4}{4} \right) - \frac{7}{16} \left(\frac{2}{2} \right) - \frac{1}{4} \left(\frac{8}{8} \right) + \frac{3}{4} \left(\frac{8}{8} \right) + \frac{1}{8} \left(\frac{4}{4} \right) - \frac{3}{4} \left(\frac{8}{8} \right) + \frac{1}{32} - \frac{5}{16} \left(\frac{2}{2} \right) + \frac{1}{4} \left(\frac{8}{8} \right) + \frac{3}{8} \left(\frac{4}{4} \right) - \frac{1}{2} \left(\frac{16}{16} \right) \\ &= \frac{12}{32} - \frac{2}{32} + \frac{8}{32} + \frac{20}{32} - \frac{14}{32} - \frac{8}{32} + \frac{24}{32} + \frac{4}{32} - \frac{24}{32} + \frac{1}{32} - \frac{10}{32} + \frac{8}{32} + \frac{12}{32} - \frac{16}{32} \\ &= \frac{15}{32} \end{aligned}$$

2. Solution:

$$\begin{aligned} & \frac{3}{8} - \frac{1}{16} + \frac{1}{4} - \left(\frac{5}{8} - \frac{7}{16} \right) - \left(\frac{1}{4} - \frac{3}{4} \right) + \frac{1}{8} \\ &= \frac{3}{8} \left(\frac{2}{2} \right) - \frac{1}{16} + \frac{1}{4} \left(\frac{4}{4} \right) - \left(\frac{5}{8} \left(\frac{2}{2} \right) - \frac{7}{16} \right) - \left(\frac{1}{4} \left(\frac{4}{4} \right) - \frac{3}{4} \left(\frac{4}{4} \right) \right) + \frac{1}{8} \left(\frac{2}{2} \right) \\ &= \frac{6}{16} - \frac{1}{16} + \frac{4}{16} - \left(\frac{10}{16} - \frac{7}{16} \right) - \left(\frac{4}{16} - \frac{12}{16} \right) + \frac{2}{16} \\ &= \frac{6}{16} - \frac{1}{16} + \frac{4}{16} - \left(\frac{3}{16} \right) - \left(-\frac{8}{16} \right) + \frac{2}{16} \\ &= \frac{6}{16} - \frac{1}{16} + \frac{4}{16} - \frac{3}{16} + \frac{8}{16} + \frac{2}{16} \\ &= \frac{16}{16} \\ &= 1 \end{aligned}$$



3. Solution:

$$\begin{aligned} & \frac{3}{8} - \left(\frac{3}{4} - \frac{1}{2} \right) + \frac{1}{16} - \left(\frac{5}{32} - \frac{7}{16} + \frac{1}{4} - \frac{3}{8} \right) \\ &= \frac{3}{8} \left(\frac{4}{4} \right) - \left(\frac{3}{4} \left(\frac{8}{8} \right) - \frac{1}{2} \left(\frac{16}{16} \right) \right) + \frac{1}{16} \left(\frac{2}{2} \right) - \left(\frac{5}{32} - \frac{7}{16} \left(\frac{2}{2} \right) + \frac{1}{4} \left(\frac{8}{8} \right) - \frac{3}{8} \left(\frac{4}{4} \right) \right) \\ &= \frac{12}{32} - \left(\frac{24}{32} - \frac{16}{32} \right) + \frac{2}{32} - \left(\frac{5}{32} - \frac{14}{32} + \frac{8}{32} - \frac{12}{32} \right) \\ &= \frac{12}{32} - \left(\frac{8}{32} \right) + \frac{2}{32} - \left(-\frac{13}{32} \right) \\ &= \frac{12}{32} - \frac{8}{32} + \frac{2}{32} + \frac{13}{32} \\ &= \frac{19}{32} \end{aligned}$$

4. Solution:

$$\begin{aligned} & \left(\frac{15}{16} - \frac{3}{4} + \frac{1}{8} \right) + \left[\frac{3}{4} - \left(\frac{3}{16} - \frac{1}{2} \right) + \frac{3}{4} - \left(\frac{1}{8} - \frac{1}{2} \right) \right] \\ &= \left(\frac{15}{16} - \frac{3}{4} \left(\frac{4}{4} \right) + \frac{1}{8} \left(\frac{2}{2} \right) \right) + \left[\frac{3}{4} \left(\frac{4}{4} \right) - \left(\frac{3}{16} - \frac{1}{2} \left(\frac{8}{8} \right) \right) + \frac{3}{4} \left(\frac{4}{4} \right) - \left(\frac{1}{8} \left(\frac{2}{2} \right) - \frac{1}{2} \left(\frac{8}{8} \right) \right) \right] \\ &= \left(\frac{15}{16} - \frac{12}{16} + \frac{2}{16} \right) + \left[\frac{12}{16} - \left(\frac{3}{16} - \frac{8}{16} \right) + \frac{12}{16} - \left(\frac{2}{16} - \frac{8}{16} \right) \right] \\ &= \left(\frac{5}{16} \right) + \left[\frac{12}{16} - \left(-\frac{5}{16} \right) + \frac{12}{16} - \left(-\frac{6}{16} \right) \right] \\ &= \frac{5}{16} + \left[\frac{12}{16} + \frac{5}{16} + \frac{12}{16} + \frac{6}{16} \right] \\ &= \frac{5}{16} + \frac{35}{16} \\ &= \frac{40}{16} \\ &= \frac{20}{8} \\ &= \frac{10}{4} \\ &= \frac{5}{2} \end{aligned}$$



5. Solution:

$$\begin{aligned} & \frac{3}{4} + \left[\frac{1}{2} - \left(\frac{1}{2} + \frac{3}{8} \right) - \left(\frac{3}{4} - \frac{9}{16} \right) \right] - \left(\frac{3}{8} + \frac{3}{4} - \frac{1}{2} \right) + \frac{1}{16} + \frac{3}{4} - \left(-\frac{3}{16} - \frac{1}{2} \right) \\ &= \frac{3}{4} \left(\frac{4}{4} \right) + \left[\frac{1}{2} \left(\frac{8}{8} \right) - \left(\frac{1}{2} \left(\frac{8}{8} \right) + \frac{3}{8} \left(\frac{2}{2} \right) \right) - \left(\frac{3}{4} \left(\frac{4}{4} \right) - \frac{9}{16} \right) \right] - \left(\frac{3}{8} \left(\frac{2}{2} \right) + \frac{3}{4} \left(\frac{4}{4} \right) - \frac{1}{2} \left(\frac{8}{8} \right) \right) + \frac{1}{16} + \frac{3}{4} \left(\frac{4}{4} \right) - \left(-\frac{3}{16} - \frac{1}{2} \left(\frac{8}{8} \right) \right) \\ &= \frac{12}{16} + \left[\frac{8}{16} - \left(\frac{8}{16} + \frac{6}{16} \right) - \left(\frac{12}{16} - \frac{9}{16} \right) \right] - \left(\frac{6}{16} + \frac{12}{16} - \frac{8}{16} \right) + \frac{1}{16} + \frac{12}{16} - \left(-\frac{3}{16} - \frac{8}{16} \right) \\ &= \frac{12}{16} + \left[\frac{8}{16} - \left(\frac{14}{16} \right) - \left(\frac{3}{16} \right) \right] - \left(\frac{10}{16} \right) + \frac{1}{16} + \frac{12}{16} - \left(-\frac{11}{16} \right) \\ &= \frac{12}{16} + \left[\frac{8}{16} - \frac{14}{16} - \frac{3}{16} \right] - \frac{10}{16} + \frac{1}{16} + \frac{12}{16} + \frac{11}{16} \\ &= \frac{12}{16} - \frac{9}{16} - \frac{10}{16} + \frac{1}{16} + \frac{12}{16} + \frac{11}{16} \\ &= \frac{17}{16} \end{aligned}$$



Practice Section D

1. Solution:

There are two errors. In line 3, there is a multiplication error: $3 \times 8 = 24$, not 21.
In line 4, a double negative is missing.

The correct solution is:

$$\begin{aligned} & \frac{5}{8} - \left(\frac{7}{16} - \frac{22}{32} \right) - \frac{3}{4} \\ &= \frac{5}{8} \left(\frac{4}{4} \right) - \left(\frac{7}{16} \left(\frac{2}{2} \right) - \frac{22}{32} \right) - \frac{3}{4} \left(\frac{8}{8} \right) \\ &= \frac{20}{32} - \left(\frac{14}{32} - \frac{22}{32} \right) - \frac{24}{32} \\ &= \frac{20}{32} - \left(-\frac{8}{32} \right) - \frac{24}{32} \\ &= \frac{20}{32} + \frac{8}{32} - \frac{24}{32} \\ &= \frac{4}{32} \\ &= \frac{1}{8} \end{aligned}$$

**Practice Section E**

Solution:

$$\begin{aligned}
& \left\{ \left(\frac{3}{4} - \frac{15}{16} - \frac{1}{8} \right) + \left[\frac{3}{4} - \left(\frac{3}{16} - \frac{1}{2} \right) + \frac{3}{4} - \left(\frac{1}{8} - \frac{1}{2} \right) \right] \right\} - \left[\frac{1}{2} - \left(\frac{1}{4} - \frac{7}{16} \right) - \left(\frac{5}{32} - \frac{7}{8} \right) \right] + \left[\frac{5}{32} - \left(\frac{1}{4} - \frac{1}{2} \right) \right] \\
&= \left\{ \left(\frac{3}{4} \left(\frac{8}{8} \right) - \frac{15}{16} \left(\frac{2}{2} \right) - \frac{1}{8} \left(\frac{4}{4} \right) \right) + \left[\frac{3}{4} \left(\frac{8}{8} \right) - \left(\frac{3}{16} \left(\frac{2}{2} \right) - \frac{1}{2} \left(\frac{16}{16} \right) \right) + \frac{3}{4} \left(\frac{8}{8} \right) - \left(\frac{1}{8} \left(\frac{4}{4} \right) - \frac{1}{2} \left(\frac{16}{16} \right) \right) \right] \right\} - \left[\frac{1}{2} \left(\frac{16}{16} \right) - \left(\frac{1}{4} \left(\frac{8}{8} \right) - \frac{7}{16} \left(\frac{2}{2} \right) \right) - \left(\frac{5}{32} - \frac{7}{8} \left(\frac{4}{4} \right) \right) \right] + \left[\frac{5}{32} - \left(\frac{1}{4} \left(\frac{8}{8} \right) - \frac{1}{2} \left(\frac{16}{16} \right) \right) \right] \\
&= \left\{ \left(\frac{24}{32} - \frac{30}{32} - \frac{4}{32} \right) + \left[\frac{24}{32} - \left(\frac{6}{32} - \frac{16}{32} \right) + \frac{24}{32} - \left(\frac{4}{32} - \frac{16}{32} \right) \right] \right\} - \left[\frac{16}{32} - \left(\frac{8}{32} - \frac{14}{32} \right) - \left(\frac{5}{32} - \frac{28}{32} \right) \right] + \left[\frac{5}{32} - \left(\frac{8}{32} - \frac{16}{32} \right) \right] \\
&= \left\{ \left(-\frac{10}{32} \right) + \left[\frac{24}{32} - \left(-\frac{10}{32} \right) + \frac{24}{32} - \left(-\frac{12}{32} \right) \right] \right\} - \left[\frac{16}{32} - \left(-\frac{6}{32} \right) - \left(-\frac{23}{32} \right) \right] + \left[\frac{5}{32} - \left(-\frac{8}{32} \right) \right] \\
&= \left\{ -\frac{10}{32} + \left[\frac{24}{32} + \frac{10}{32} + \frac{24}{32} + \frac{12}{32} \right] \right\} - \left[\frac{16}{32} + \frac{6}{32} + \frac{23}{32} \right] + \left[\frac{5}{32} + \frac{8}{32} \right] \\
&= \left\{ -\frac{10}{32} + \frac{70}{32} \right\} - \left[\frac{45}{32} \right] + \left[\frac{13}{32} \right] \\
&= \frac{60}{32} - \frac{45}{32} + \frac{13}{32} \\
&= \frac{28}{32} \\
&= \frac{14}{16} \\
&= \frac{7}{8}
\end{aligned}$$