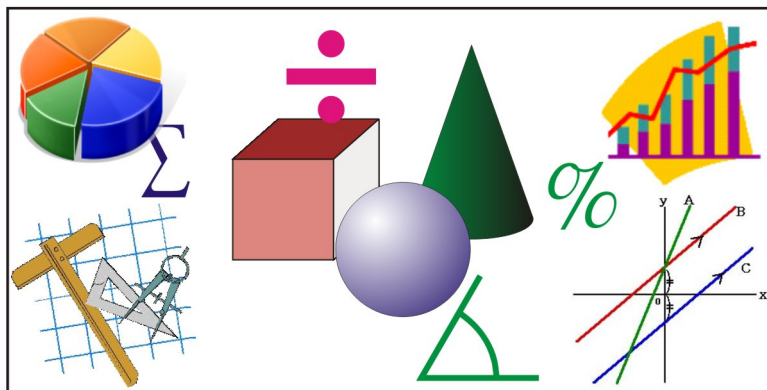


**RAVEN'S CORE GRADE 9**  
**(LITERACY FOUNDATIONS LEVEL 6)**

**MATHEMATICS PROGRAM**

**STUDENT GUIDE AND  
RESOURCE BOOK**



**The Key to Student Success**

One of a series of publications by Raven Research Associates  
for Secondary and Elementary Mathematics

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## Introduction

This book is intended to assist students with the core content for Mathematics Grade 9 and/or Mathematics Literacy Level 6. It is linked to the provincial mathematics curriculum and designed by experienced teachers of mathematics to provide students with greater success in these courses. It includes the following features:

- Clear Descriptions of the Key Concepts
- Numerous Examples with Step-by-Step Solutions
- Many Practice Exercises to Reinforce Understanding and Application
- Review Exercises with a Range of Difficulty Levels
- All Answers which are listed at the Back of the Book
- Produced by Experienced Teachers of Mathematics
- Attractively Bound and Formatted for Clarity and Ease of Access

The program is designed for the following:

- (i) Students in the regular program taking a MATH 9 COURSE and preparing to take a MATH 10 COURSE of studies in the regular school program OR
- (ii) Adult students enrolled in LITERACY FOUNDATIONS OF MATH AT LEVEL 6 and preparing to take LEVEL 7.

The core content areas listed in the Table of Contents, shown in the next page, are linked to prescribed learning outcomes for Mathematics Literacy Level 6. The following list of prescribed outcomes and corresponding codes from A1 to C3 are listed next.

### NUMBER

<p>A1 demonstrate an understanding of perfect square and square root concretely, pictorially, and symbolically</p> <p>A2 determine the square root of positive whole and rational numbers that are perfect squares</p> <p>A3 determine, using technology, the approximate square root of positive rational numbers that are non-perfect squares and justify their reasonableness</p> <p>A4 demonstrate an understanding of powers with integral bases (excluding base 0) and whole number exponents by:</p>	<ul style="list-style-type: none"> <li>- representing repeated multiplication using powers</li> <li>- using patterns to show that a power with an exponent of zero is equal to one</li> <li>- solving problems involving powers</li> </ul> <p>A5 demonstrate an understanding of rational numbers by</p> <ul style="list-style-type: none"> <li>- comparing and ordering rational numbers</li> <li>- solving problems that involve arithmetic operations on rational numbers, with or without technology</li> </ul> <p>A6 explain and apply the order of operations, including exponents, with or without technology</p>
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### PATTERNS AND RELATIONS

<p><b>Patterns</b></p> <p>B1 determine if the relationship between two variables is linear and justify the reasoning</p> <p>B2 generate a pattern from a problem using linear equations and verify by substitution</p> <p>B3 graph linear relations, analyse the graph, and interpolate or extrapolate from the graph to solve problems</p> <p><b>Variables and Equations</b></p> <p><i>It is expected that students will:</i></p> <p>B4 model and solve problems using linear equations of the form</p> <ul style="list-style-type: none"> <li>- <math>a\chi = b</math>, <math>\chi/a = b</math>, <math>a \neq 0</math>, <math>a\chi + b = c</math></li> <li>- <math>\chi/a + b = d</math>, <math>a \neq 0</math>, <math>a(\chi + b) = c</math>, <math>a\chi + b = c\chi + d</math></li> <li>- <math>a(b\chi + c) = d(e\chi + f)</math>, <math>- a/\chi = b</math>, <math>\chi \neq 0</math></li> </ul> <p>where <math>a, b, c, d, e</math>, and <math>f</math> are rational numbers</p>	<p>B5 solve single variable linear inequalities with rational coefficients</p> <p>B6 demonstrate an understanding of polynomials (of degree less than or equal to 2) by</p> <ul style="list-style-type: none"> <li>- identifying the variables, degree, number of terms and coefficients, including the constant term of a given simplified polynomial expression</li> <li>- describing a situation for a given first-degree polynomial expression</li> <li>- matching equivalent polynomial expressions given in simplified form (e.g., <math>4x - 3x^2 + 2</math> is equivalent to <math>-3x^2 + 4x + 2</math>)</li> </ul> <p>B7 add and subtract polynomial expressions (of degree less than or equal to 2)</p> <p>B8 multiply and divide polynomial expressions by monomials (of degree less than or equal to 2)</p>
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### SHAPE AND SPACE

<p><b>Measurement</b></p> <p>C1 develop and apply the Pythagorean theorem to solve problems</p> <p><b>3-D Objects and 2-D Shapes</b></p> <p>C2 explain and describe polygons and polyhedra in terms of their edges, faces, and vertices</p>	<p>C3 determine the surface area of:</p> <ul style="list-style-type: none"> <li>- right rectangular prisms</li> <li>- right triangular prisms</li> <li>- right cylinders</li> <li>- composite 3-D objects to solve problems</li> </ul>
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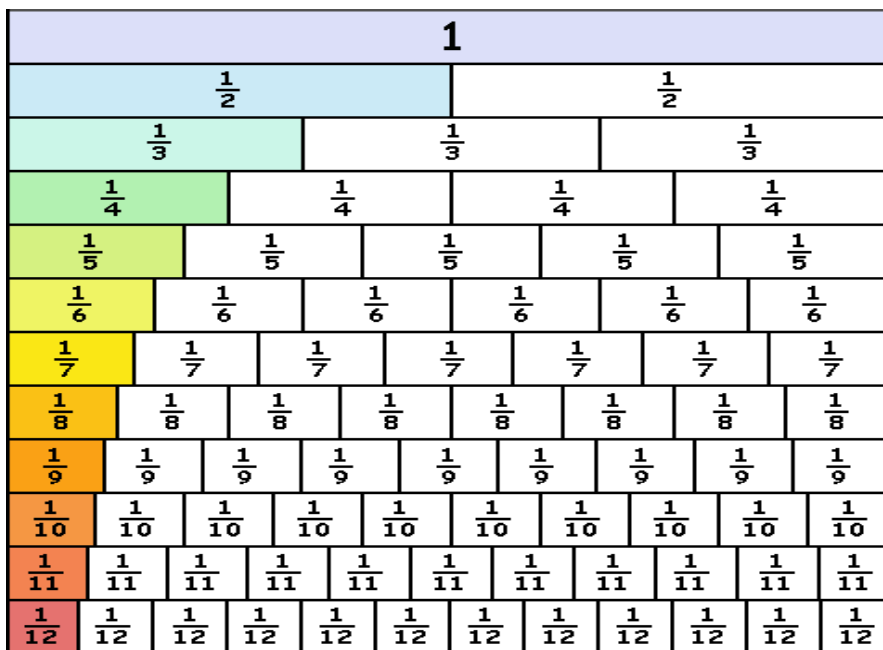
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***SAMPLE FROM RAVEN'S CORE MATH 9  
(LITERACY FOUNDATIONS LEVEL 6)***

### Comparing and Ordering Fractions and Decimals

- Sometimes we need to compare two fractions to discover which is larger or smaller. One way of doing this is to use a fraction wall.



- The **fraction wall** above shows a value of 1 divided several times into sets of equal parts. By looking at the amount of space taken up by each part, we can tell which fractions are larger and which ones are smaller.
- We will use the following symbols to show the relationship between numbers:

“>” *greater than* e.g.  $3 > 2$ ; “<” *less than* e.g.  $5 < 8$ ;  
and “=” e.g.  $2 = 6/3$

Looking at the fraction wall shown above we can see the following relations by the size of each of the corresponding parts.

$$\frac{1}{2} > \frac{1}{3}, \quad \frac{1}{8} < \frac{1}{7}, \quad \frac{3}{6} = \frac{4}{8}, \quad \frac{3}{7} > \frac{2}{5}$$

### Ways to Compare Fractions

- There are two easy ways to compare fractions: using decimals or using the same denominator. We will convert to decimals in the example below

e.g. 1. Which is bigger  $\frac{3}{8}$  or  $\frac{5}{12}$ ? (you may want to use a calculator)

(i) Write each as a decimal  $8 \overline{)3} = 0.375$  and  $12 \overline{)5} = 0.416\bar{6}$

(ii) Using place value we can see that  $\frac{5}{12} = 0.416\bar{6}$  is larger.

### Location on the Number Line

- We could also look at location on the number line to compare fractions in order of size. If one fraction is located to the left of another, it is smaller or if one fraction is located to the right of another it is larger.



- Looking at the number line above we can see that  $\frac{1}{4} < \frac{1}{2}$  or that  $\frac{9}{10} > \frac{3}{4}$

### To Order Fractions from Smallest to Largest or Vice Versa

- rewrite each fraction as a decimal fraction first
- use place value to order them
- re-write the fractions in their original forms

### Examples with Solutions

- Compare each pair of fractions. Which is largest or smallest?

a.  $\frac{1}{2}$  and  $\frac{3}{5}$

b.  $\frac{2}{9}$  and  $\frac{1}{4}$

c.  $\frac{3}{4}$  and  $\frac{7}{10}$

Answer

a.  $\frac{1}{2} = 0.5$  and  $\frac{3}{5} = 0.6$ :  $\frac{1}{2} < \frac{3}{5}$

b.  $\frac{2}{9} = 0.2\bar{2}$  and  $\frac{1}{4} = 0.25$ :  $\frac{2}{9} < \frac{1}{4}$

c.  $\frac{3}{4} = 0.75$  and  $\frac{7}{10} = 0.7$ :  $\frac{3}{4} > \frac{7}{10}$

2. Arrange each set of fractions from **smallest to largest**.

*Write as decimals first to order by place value, then in original form*

a.  $\frac{2}{3}, \frac{1}{4}, \frac{9}{10}, \frac{1}{2}$

a.  $\frac{1}{4}, \frac{1}{2}, \frac{2}{3}, \frac{9}{10}$

b.  $\frac{1}{4}, \frac{2}{11}, \frac{2}{10}, \frac{1}{2}$

b.  $\frac{2}{11}, \frac{2}{10}, \frac{1}{4}, \frac{1}{2}$

3. Arrange each set of numbers from **largest to smallest**.

*Write as decimals first to order by place value, then in original form*

a.  $1\frac{1}{4}, 1.3, \frac{9}{5}, \frac{3}{2}, 0.8$

a.  $\frac{9}{5}, \frac{3}{2}, 1.3, 1\frac{1}{4}, 0.8$

b.  $\frac{4}{3}, 1.2, \frac{5}{4}, 1\frac{2}{9}$

b.  $\frac{4}{3}, \frac{5}{4}, 1\frac{2}{9}, 1.2$

4. The following numbers are supposed to be in order from **smallest to largest**. Which number is out of place?

$0.2, \frac{1}{4}, \frac{3}{5}, 0.5$

$\frac{3}{5} = 0.6$ , it is larger than 0.5

### Exercises 1.6.2

1. Write each decimal as a fraction or mixed number in simplest form.

a. 0.35

b. 0.101

c. 1.03

d. 5.005

e.  $4.7\overline{77}$

f.  $6.09\overline{09}$

2. Write each fraction as a decimal or a mixed number decimal.

a.  $\frac{7}{1000}$

b.  $2\frac{1}{3}$

c.  $\frac{7}{20}$

d.  $\frac{9}{25}$

e.  $4\frac{8}{11}$

f.  $\frac{9}{16}$

3. Write each improper fraction as a mixed number.

a.  $\frac{11}{7}$

b.  $\frac{9}{5}$

c.  $\frac{7}{3}$

d.  $\frac{25}{7}$

e.  $\frac{21}{10}$

f.  $\frac{50}{3}$

4. Write each mixed number as an improper fraction.

a.  $2\frac{1}{7}$

b.  $5\frac{3}{5}$

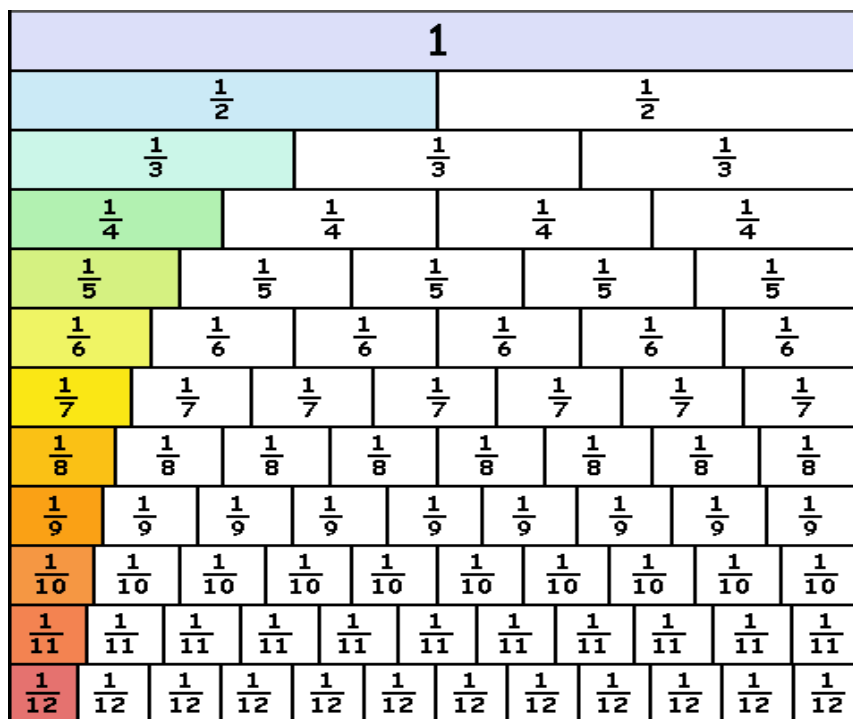
c.  $10\frac{3}{11}$

d.  $21\frac{3}{10}$

e.  $11\frac{10}{11}$

f.  $1000\frac{1}{10}$

Refer to the fraction wall shown below to determine the relationship between each pair of fractions in Question #5. The first one (#5a) is done for you.



Refer to the fraction wall above to determine the relationship between each pair of fractions. Use the following symbols to show it.

“>” *greater than* ; “<” *less than* ; and “=” *equal*

5. Compare each pair of fractions. Which fraction is largest or smallest, or are they equal?

a.  $\frac{1}{2} > \frac{1}{3}$

b.  $\frac{1}{8} \frac{1}{7}$

c.  $\frac{2}{3} \frac{4}{6}$

d.  $\frac{4}{9} \frac{3}{7}$

e.  $\frac{1}{2} \frac{4}{8}$

f.  $\frac{3}{7} \frac{2}{5}$

g.  $\frac{3}{5} \frac{4}{7}$

h.  $\frac{7}{11} \frac{6}{10}$

6. Arrange each set of fractions from **smallest to largest**.

a.  $\frac{1}{2}, \frac{1}{3}, \frac{3}{4}, \frac{2}{3}$

b.  $\frac{4}{5}, \frac{1}{10}, \frac{1}{11}, \frac{2}{5}$

c.  $\frac{3}{25}, \frac{1}{4}, \frac{3}{10}, \frac{1}{5}$

d.  $\frac{5}{6}, \frac{2}{3}, \frac{3}{4}, \frac{3}{10}$

e.  $\frac{5}{4}, \frac{9}{10}, \frac{6}{5}, \frac{19}{20}$

f.  $\frac{2}{3}, \frac{5}{6}, \frac{3}{12}, \frac{6}{5}$

7. Arrange each set of fractions, decimals, and mixed numbers from **largest to smallest**.

a.  $\frac{4}{5}, 1\frac{1}{4}, 0.5, 1.3$

b.  $0.4, \frac{3}{10}, \frac{4}{5}, \frac{10}{3}, 1.2$

c.  $2.1, \frac{11}{10}, 0.9, \frac{49}{50}$

d.  $\frac{3}{4}, 0.7, \frac{3}{8}, 1.1$

e.  $\frac{3}{25}, 0.1, \frac{3}{2}, 1.1$

f.  $\frac{4}{5}, \frac{5}{4}, 1\frac{3}{4}, 1.2$

8. The following numbers are supposed to be in order from **smallest to largest**. Which number is out of place?

a.  $1.2, \frac{5}{4}, 1.09, \frac{8}{3}$

b.  $\frac{6}{5}, 1\frac{1}{2}, 1.3, \frac{5}{3}$

c.  $\frac{4}{5}, 1\frac{1}{5}, 1.5, 1\frac{1}{4}$

d.  $2.25, \frac{10}{4}, 2\frac{1}{5}, 2.75$

e.  $\frac{3}{10}, 0.25, \frac{3}{5}, 0.75$

f.  $\frac{1}{5}, 0.25, \frac{3}{10}, 0.19$