GRADE 8 MATHEMATICS at a glance

Grade 8 Mathematics at a Glance can be used in designing, planning, and assessing student learning for the year. It can be used as a planning tool to preview the content of the Grade 8 Mathematics curriculum.

It is organized by **strands** and sorts learning outcomes into categories or **learning targets**. The learning targets can be used to connect learning by integrating strands, learning outcomes, and other subject areas.

This document can be used with the ***Glance Across the Grades*** document to plan clear and concise expectations for student learning by using big ideas (the why behind what we are learning).

Mathematical PROCESSES

The seven interrelated **mathematical processes** are intended to permeate teaching and describe the critical aspects of learning, doing, and understanding mathematics. These processes allow students to engage in thinking about mathematics, and support the acquisition and the use of mathematical knowledge and foundational skills that develop conceptual understanding.

These processes are outlined in detail in *Kindergarten to Grade 8 Mathematics: Manitoba Curriculum Framework of Outcomes (2013)*.

- **[C] COMMUNICATION**
- **[CN] CONNECTIONS**
- **[ME] MENTAL MATHEMATICS AND ESTIMATION**
- **[PS] PROBLEM SOLVING**
- **[R] REASONING**
- **[T] TECHNOLOGY**
- **[V] VISUALIZATION**

NUMBER Strand

- **Representation of Whole Numbers and Operations with Whole Numbers**
  Perfect squares and square roots N.1
  Multiplication and division of integers N.7
- **Representation of Rational Numbers**
  Ratio and rate N.4
- **Operations with Rational Numbers**
  Approximate square roots N.2
  Percents N.3
  Problems involving rates, ratio, and proportional reasoning N.5
  Multiplication and division of fractions N.6
  Problems involving positive rational numbers N.8

PATTERNS AND RELATIONS Strand

Patterns
- **Patterning and Algebraic Thinking**
  Graphs and analysis PR.1

Variables and Equations
- **Algebraic Representations with Equations**
  Problems involving linear equations PR.2

SHAPE AND SPACE Strand

Measurement
- **Length**
  Problems involving Pythagorean theorem SS.1
- **Area**
  Problems involving surface area SS.3
- **Volume (Capacity)**
  Formulas SS.4

3-D Objects and 2-D Shapes
- **Identifying, Sorting, Comparing, and Constructing**
  Nets SS.2
  Different views SS.5

Transformations
- **Position and Motion**
  Tessellations SS.6

STATISTICS AND PROBABILITY Strand

Data Analysis
- **Collection, Organization, and Analysis of Data**
  Critique representations SP.1

Chance and Uncertainty
- **Probability**
  Problems involving probability SP.2

Substrands
- **Learning Targets**

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GRADE 8 MATHEMATICS

Curriculum Overview

NUMBER Strand

- **Representation of Whole Numbers and Operations with Whole Numbers**
  Demonstrate an understanding of perfect squares and square roots (limited to whole numbers). ➡ N.1

  Demonstrate an understanding of multiplication and division of integers. ■ N.7

- **Representation of Rational Numbers**
  Demonstrate an understanding of ratio and rate. ⬌ N.4

- **Operations with Rational Numbers**
  Determine the approximate square root of numbers that are not perfect squares (limited to whole numbers). ➡ N.2

  Demonstrate an understanding of percents greater or equal to 0%. ⬅ N.3

  Solve problems involving rates, ratios, and proportional reasoning. ➡ N.5

  Demonstrate an understanding of multiplying and dividing positive fractions and mixed numbers. ➡ N.6

  Solve problems involving positive rational numbers. ⬌ N.8

PATTERNS AND RELATIONS Strand

Patterns

- **Patterning and Algebraic Thinking**
  Graph and analyze two-variable linear relations. ➡ PR.1

Variables and Equations

- **Algebraic Representations with Equations**
  Model and solve problems involving linear equations in the form
  - $ax = b$
  - $\frac{x}{a} = b, a \neq 0$
  - $ax + b = c$

  ⬌

  - $\frac{x}{a} + b = c, a \neq 0$
  - $a(x + b) = c$

  ➡

  where a, b, and c are integers. PR.2

SHAPE AND SPACE Strand

Measurement

- **Length**
  Develop and apply the Pythagorean theorem to solve problems. ■ SS.1

- **Area**
  Determine the surface area of right rectangluar prisms, triangluar prisms, and cylinders to solve problems. ➡ SS.3

- **Volume (Capacity)**
  Develop and apply formulas for determining the volume of right prisms and cylinders. ➡ SS.4

3-D Objects and 2-D Shapes

- **Identifying, Sorting, Comparing, and Constructing**
  Draw and construct nets for 3-D objects. ➡ SS.2

  Draw and interpret top, front, and side views of 3-D objects composed of right rectangular prisms. ➡ SS.5

Transformations

- **Position and Motion**
  Demonstrate an understanding of tessellation by explaining the properties of tessellating shapes, and by creating and identifying tessellations. ■ SS.6

STATISTICS AND PROBABILITY Strand

Data Analysis

- **Collection, Organization, and Analysis of Data**
  Critique ways in which data are presented. ■ SP.1

Chance and Uncertainty

- **Probability**
  Solve problems involving the probability of independent events. ⬌ SP.2

- ■ Concept/learning outcomes are taught in this grade only and will be applied in future grades.
- ⬅ Concept/learning outcomes introduced in previous grade(s) are further taught in this grade and will be applied in future grades.
- ➡ Concept/learning outcomes are taught for the first time in this grade and will be taught in future grade(s).
- ⬌ Concept/learning outcomes introduced in previous grades are taught in this grade and will continue to be taught in future grades.

REPORT CARD CATEGORIES

KNOWLEDGE AND UNDERSTANDING OF MATHEMATICAL CONCEPTS

The student demonstrates knowledge and understanding of grade-specific mathematical concepts and skills in each strand (number, patterns and relations, shape and space, statistics and probability).

MENTAL MATH AND ESTIMATION

The student uses math knowledge and number facts to calculate mentally or estimate within each strand (number, patterns and relations, shape and space, statistics and probability). Students apply mental math strategies with efficiency, accuracy, and flexibility. They are able to make reasonable estimates of values or quantities using benchmarks and referents.

PROBLEM SOLVING

The student applies knowledge, skill, or understanding to solve problems in each strand (number, patterns and relations, shape and space, statistics and probability). By learning to solve problems and by learning through problem solving, students connect mathematical ideas in new contexts. Students think logically, visualize, model, reason, and communicate and justify their solutions.

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GRADE 8 MATHEMATICS

Mathematical Processes

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COMMUNICATION (C)

Reading about, representing, viewing, writing about, listening to, and discussing mathematical ideas allows students to create links among their own language and ideas, the language and ideas of others, and the formal language and symbols of mathematics. Communication enables students to reflect upon, to validate, and to clarify their thinking. Expression of mathematical meaning and ideas can be accomplished orally or in written representations such as journals and learning logs.

CONNECTIONS (CN)

Mathematics becomes more meaningful when it is contextualized and linked to students' experiences across disciplines. Furthermore, mathematics should be viewed as an integrated whole, rather than as the study of separate strands or units. Within a particular topic, students should see the connections between concrete, pictorial, and symbolic modes of representation. When mathematical ideas are connected to each other or to real-world phenomena, students begin to view mathematics as useful, relevant, and integrated.

MENTAL MATH AND ESTIMATION (ME)

Mental mathematics is a combination of strategies that enhances flexible thinking and number sense. Estimation is a strategy for determining approximate values or quantities, usually by referring to benchmarks or using referents, or for determining the reasonableness of calculated values. Estimation is often used to make mathematical judgments and to develop useful, efficient strategies for dealing with situations in daily life. Strategies in mental mathematics and estimation enable students to calculate mentally without the use of external aids. In the process, they improve their computational fluency—developing efficiency, accuracy, and flexibility.

PROBLEM SOLVING (PS)

Students develop understanding of mathematical concepts and procedures when they apply their mathematical knowledge to solve problems in new ways and meaningful contexts. When students encounter new situations and respond to questions of the type *How would you . . . ?* or *How could you . . . ?*, the problem-solving approach is being modelled. Problems are often open-ended, so students may arrive at multiple solutions in different and creative ways. Rich problems allow students in the class to demonstrate their knowledge, skill, or understanding at a level appropriate to them. Learning through problem solving should be the focus of mathematics at all grade levels and should be embedded throughout all topics.

REASONING (R)

Mathematical reasoning involves generalizing from patterns, conjecturing, validating, and proving. Students need to develop confidence in their abilities to reason and to justify their mathematical thinking. Good reasoning is as important as finding correct answers. The thinking skills developed by a focus on reasoning can be used in life in a wide variety of contexts and disciplines.

TECHNOLOGY (T)

Technology contributes to and supports the learning of a wide range of mathematical concepts and can increase the focus on conceptual understanding by decreasing the time spent on repetitive procedures. It enables students to explore and create patterns, organize and display data, examine relationships, model situations, generate and test conjectures, solve problems, and reinforce the learning of basic facts. Technology can help to satisfy the curiosity of students and lead to rich mathematical discoveries at all grade levels. The use of technology can enhance, although it should not replace, conceptual understanding, procedural thinking, and problem solving.

VISUALIZATION (V)

Visual images and visual reasoning are important to a sense of number, space, and measurement. Visualization is fostered through the use of concrete materials, technology, and a variety of visual representations. Visualization can help students gain a concrete understanding of abstract concepts.