Overview for Families

Mathematics in Context unit: ***Made to Measure***

Mathematical strand: **Geometry and Measurement**

The following pages will help you to understand the mathematics that your child is currently studying as well as the type of problems (s)he will solve in this unit.

Each page is divided into three parts:

- *Section Focus*
  Identifies the mathematical content of each section.

- *Learning Lines*
  Describes the mathematical flow of each section.

- *Learning Outcomes*
  Outlines what students should know and be able to do at the end of each section.

"From the very beginning of his education, the child should experience the joy of discovery."

Alfred North Whitehead

Made to Measure

Section A Lengths

Section Focus

In this section, the use of the metric and customary systems to measure length, which students have studied in previous grades, is reviewed. Students relate the length of different parts of the body to familiar objects and choose appropriate measurement units for a variety of situations. Historic units to measure length are compared to standardized ones so students understand the importance of standard measurement units.

Learning Lines

Number Sense

Students are encouraged to use and develop their measurement sense by finding personal points of reference having to do with length. Here are some examples:

- The distance from my house to our school is about 3 miles.
- When walking at a comfortable speed, I move about 2 miles per hour.
- An inch is about the same as the width of my thumb.

Students learn to decide when to use an exact measure and when an estimate is more appropriate.

Measurement

Students use inch rulers or centimeter tape measures to measure the length of an object. They read rulers to the nearest tenth and understand the meaning of metric measurements for length. For example, the length 2.7 cm is 2 cm and 7 mm. Students investigate the use of historic measurements for length, such as a hand span, a thumb, or a fathom, and how they are related.

Problem Solving

A variety of problem-solving situations are provided in this section. Students investigate the relationship between foot length and shoe size and between fathom and height of a person.

Learning Outcomes

By the end of this section, students are able to

- measure length using metric, customary, and non-standard units of measure;
- understand the importance of using standard measurement units;
- convert units of length within systems and between systems;
- choose an appropriate unit of measurement for a given situation; and
- decide whether to use an exact measure or an estimate.

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Section B Areas

Section Focus

In Section B, the focus is on area and related units of measurement. Metric units for length in the metric system are, for example, kilometer, decimeter, meter, and centimeter. The units for area are square kilometers, square decimeters, square meters, and square centimeters. In the customary system, units for length are inch (in.), mile (mi), or feet (ft), and the units for area are square inches, square miles, and square feet. The concept of surface area is reviewed.

Learning Lines

Number Sense

Students are encouraged to use and develop their measurement sense with area by finding personal points of reference. Here are some examples:

- An acre is about the same area as that of a football field.
- On average, the body surface area of an adult is about two square meters (m^2).
- The surface area of my math book is about 600 cm^2.

Measurement

Students learn how, initially, area was measured using units that originated from the human body, like square thumbs and square fathoms. They select and use appropriate measurement units for area using both metric and customary units of measurement.

Other Representations

Students use a special chart named a *nomogram* to relate a person's body area to his or her weight and height.

Learning Outcomes

By the end of this section, students are able to

- calculate the area of a rectangle or a square using appropriate units of measurement;
- calculate the area of a cylinder used as a model to represent the human body;
- compare and critique different methods of calculating the surface area of an irregularly shaped object;
- model real objects using regular geometric shapes;
- recognize historical units of measurement for area such as the acre; and
- use a nomogram to investigate the relationship between a person's height, weight, and body's surface area.

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Section C Volumes

Section Focus

Students investigate different methods for estimating, calculating, and determining the volume of different objects, containers, or spaces using metric and customary units of measurement. Students make a cubic centimeter (cm^3) from a net and investigate how many are needed to fill a cubic decimeter (dm^3). They decide which unit of measurement is appropriate when measuring the volume of different objects.

Learning Lines

Number Sense

Students are encouraged to enhance their sense of volume by finding personal points of reference. Here are some examples:

- About 1,200 centimeter cubes fill a tissue box.
- The volume of my hand is about 200 cm^3.
- One gallon of milk is about 4 liters.
- A can of water is about 1/3 liter.

Measurement

Students estimate and compare the volume of a variety of objects using their own points of reference. They investigate the formula *volume* = *area of base* × *height* and explain why it works for some objects, like a box or a cylinder, but not for others, like a pyramid or a cone. The need for consistent measuring units is emphasized. Students also learn about historic units of measurement related to body sizes, such as the *cubic cubit* and a *full cord*.

Learning Outcomes

By the end of this section, students can

- measure volume in two ways, using liquid units of measure such as liters, and solid units of measure such as cubic centimeters (cm^3);
- calculate the volume of a box using the formula, *volume* = *area of base* × *height*, and are able to explain in which situations this formula will not work; and
- estimate and compare the volume of a variety of objects using appropriate units of measurement.

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Section D Angles

Section Focus

In this section, students explore the angles that they can make with their wrists and ankles and investigate how furniture and computers are designed to fit the angles of the body. The use of a compass card or protractor is reviewed. Students who have used the unit *Figuring All the Angles* will be familiar with the use of a compass card.

Learning Lines

Measurement

Students measure and draw angles using appropriate units. The compass card is a tool used throughout *Mathematics in Context* to measure angles and navigate. In this section, students use these 360° protractors to measure angles. Students should be given the opportunity to investigate the use of this measurement tool so that they can learn to use it appropriately and can distinguish the differences between this tool and the protractor.

Problem Solving

Students discuss the layout of a traditional keyboard and why the design does not fit the natural angles of the wrist. Students then make diagrams of furniture to fit certain ergonomic requirements.

Learning Outcomes

By the end of this section, students

- measure and draw angles using a compass card or protractor and
- use geometric models to solve problems.