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Code:
RED0038

Measure Up

Using metric measurement concepts to solve open-ended tasks.
For students working at Intermediate/ Challenging Level.

Ages 10+

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Published by Ready-Ed Publications (2004) P.O. Box 276 Greenwood W.A. Australia 6024
Email: info@readyed.com.au Website: www.readyed.com.au

ISBN 1 86397 461 X

Links to Standards

Theme: Measurement

Page	Related Standard
6-11	Identifies some of the commonly used units and basic units; calculates some simple conversions; and uses prefixes appropriately.
12	Uses a scale to determine distances and compares distances.
13	Investigates and appreciates systems of measurement other than the metric system.
14-18	Uses straightforward arithmetic to calculate perimeters.
19	Sketches mathematical shapes from a description; uses straightforward arithmetic to calculate perimeters; and calculates and compares costs based on price per quantity.
20	Appreciates that many different shapes may have the same perimeters.
21	Uses a fixed scale to construct a perimeter; differentiates between two and three-dimensional shapes.
22-25	Uses straightforward arithmetic to calculate areas of simple and complex shapes.
26	Uses a variety of methods to determine the area of a shape.
27	Calculates the area of a complex shape; performs multi-level calculations; compares two situations.
28	Calculates the area of a complex shape; performs multi-level calculations; sources and compares two situations.
29	Compares the area of several shapes; uses the concepts of area and distance to solve a problem.
30-32	Uses straightforward arithmetic to calculate surface areas of rectangular prisms.
33-34	Uses formula or alternative means to solve a problem.
35-37	Uses straightforward arithmetic to calculate the capacity of rectangular prisms and cylinders.
38	Uses formula to solve a problem; demonstrates an understanding of capacity as a three-dimensional measurement.
39	Uses formula or alternative means to solve a problem; demonstrates an understanding of capacity as a three-dimensional measurement.
40	Appreciates and justifies that different shaped objects can have the same capacity; determines dimensions of a shape given specific criteria.
41-42	Distinguishes between different measurement concepts; namely for one, two and three dimensional shapes.

Contents

Teachers' Notes

This book is directed towards developing process skills using a sound content base and so is directly in tune with outcomes-based courses. The aim of this book is to provide teachers with a plan for presenting open-ended tasks to mathematics students of Years 5 - 7. This book focuses on the concept of measurement.

Each measurement idea (basic units, conversions, perimeter, area, surface area and capacity) is presented as a series of four types of questions:

1. Knowledge and understanding of mathematical concepts can be achieved by rigour-based exercises.
2. Adaptation of such concepts to more difficult situations, seemingly non-mathematical, can be learnt through tackling word problems.
3. Mini tasks are long word problems that often require multiple steps. They usually have a definite answer though it may be achieved through a variety of methods.
4. The open-ended tasks in this book can be achieved on a variety of levels and cover a range of student outcomes. The final answer is generally not important. The purpose of such questions is to test not only mathematical skill, but also for students to achieve the outcomes related to problem solving, logic, lateral thinking, working in groups, creativity, testing options amongst others.

More on open-ended tasks:

- The tasks can be presented as classroom/homework activities or assessments. It is recommended that initial tasks be non-assessed until students become more confident with them. If done as an assessment, an appropriate rubric should accompany the task sheet.
- Tasks are designed to be carried out in groups or individually. If the task is to be assessed as a group activity, it should be accompanied by a rubric that clearly states the role of each member of the group.
- The very nature of open-ended tasks implies they have no one correct answer. Some of the tasks presented may have a 'best' answer, but if students can give logical and valid details as to how they arrived at their solution, the aim has been achieved.
- The tasks have been chosen such that nearly all students should achieve, at some level. Teachers can expect to see a wide range of problem solving abilities revealed in their classroom.

NB: The initial 'measurement open-ended task' is more traditional (a research assignment) although it is multi-levelled.

As each measurement topic will be presented using the above progression, students will become familiar with the procedure. Thus, the teacher should be able to incorporate more student-directed lessons.

Some extra pointers:

- All answers involving the use of pi (π) were calculated using 3.14.
- There are miscellaneous exercises and word problems at the end of the book.
- Answers have been included for all the exercises and word problems. Some of the mini tasks have answers. There are not specific answers to the open-ended tasks.
- It is important that students set out their work in a clear manner. This not only helps them to follow a method logically, it makes it easier for teachers to follow students' thought patterns. To this end, it may be necessary for some of the word problems to be done on lined paper. Most of the mini tasks and open-ended tasks should also be done on lined paper.

Teachers should encourage discussion before beginning preliminary open-ended tasks so students are given some direction and inspiration. If progression during the task is stilted, gentle guidance, brainstorming and group-work are useful tools to help re-ignite interest and confidence. Post-completion feedback is also vital to ensure continued improvement and success.

Teachers and students sometimes find that the idea of tackling an open-ended task is somewhat daunting. Hopefully, this book, with its definite structure, will guide them to an achievable end.

Name: _____

Basic Measurement

Exercises

❑ Try these exercises without any help.

1. a) Name some units that we use to measure length. _____

_____

_____

b) Name some units that we use to measure mass. _____

_____

_____

c) Name some units that we use to measure volume. _____

_____

_____

d) How many centimeters in 2.3 meters? _____

e) Which is smaller, 2 liters or 200 milliliters? (*circle correct answer*)

f) How many kiloliters in 534 liters? _____

g) Which is bigger, 45 millimeters or 45 centimeters? (*circle correct answer*)

h) How many milligrams in one gram? _____

How did you go?

❑ If you answered some or all of questions a) to c) correctly then you know something about what **type of units** we can use make various measurements.

❑ If you answered some or all of questions d) to h) correctly then you know something about the **size of units**.