Teacher Package

Mathematics Exemplar Task
Grade 3 – Measurement, Patterning and Algebra, and Data Management and Probability

Teacher Package

Title: Lots of Coins!

Time Requirements: 200 minutes (total)
- 40 minutes to complete Pre-task 1
- 20 minutes to complete Pre-task 2
- 20 minutes to complete Pre-task 3
- 40 minutes to complete questions 1 and 2
- 40 minutes to complete questions 3 and 4
- 40 minutes to complete questions 5 and 6

Description of the Task

This task will require students to:

- investigate the use of coins in different situations;
- explore concepts of measurement, data management, and probability;
- investigate the relationship of weeks to months.

In conducting investigations, students will use their knowledge of money, probability, patterning, and time relationships. They will solve problems that involve combining given coins; solve probability problems involving coins; and be asked to observe a pattern involving coins and then extend it. Finally, students will make a money estimate based on their knowledge of a time relationship. In the various tasks, students will explain their thinking and show their work.

Expectations Addressed in the Exemplar Task

Note that the codes that follow the expectations are from the Ministry of Education's *Curriculum Unit Planner* (CD-ROM).

Measurement

Students will:

1. demonstrate an understanding of and ability to apply measurement terms: centimetre, metre, kilometre; millilitre, litre; gram, kilogram; degree Celsius; week, month, year (3m34);
2. identify relationships between and among measurement concepts (3m35);
3. solve problems related to their day-to-day environment using measurement and estimation (e.g., in finding the height of the school fence) (3m36);
4. estimate and measure the passage of time in five-minute intervals, and in days, weeks, months, and years (3m44);
5. demonstrate the relationship between all coins and bills up to $100 (3m48);
6. make purchases and change for money amounts up to $10, and estimate, count, and record the value up to $10 of a collection of coins and bills (3m49);
7. read and write money amounts using two forms of notation (89¢ and $0.89) (3m50).

Patterning and Algebra

Students will:

8. identify, extend, and create linear and non-linear geometric patterns, number and measurement patterns, and patterns in their environment (3m78).

Data Management and Probability

Students will:

9. collect and organize data (3m91);
10. demonstrate an understanding of probability and demonstrate the ability to apply probability in familiar day-to-day situations (3m93);
11. organize data in Venn diagrams and charts using several criteria (3m100);
12. conduct simple probability experiments (e.g. rolling a number cube, spinning a spinner) and predict the results (3m103);
13. apply the concept of likelihood to events in solving simple problems (3m104);
14. predict the probability that an event will occur (3m105);
15. use mathematical language (e.g., possible, impossible) in discussion to describe probability (3m106).

Note that, although all of the expectations listed will be addressed through instruction relating to the task, student achievement of expectations 5 and 8 will not be assessed in the final product.

Teacher Instructions

Prior Knowledge and Skills Required

To complete this task, students should have some knowledge or skills related to the following:
- applying the concept of likelihood to events in solving problems
- adding and subtracting money amounts and representing the answer in decimal notation
- the relationship between weeks and months

The Rubric*

The rubric provided with this exemplar task is to be used to assess students' work. The rubric is based on the achievement chart given on page 9 of *The Ontario Curriculum, Grades 1–8: Mathematics, 1997*.

Before asking students to do the task outlined in this package, review with them the concept of a rubric. Rephrase the rubric so that students can understand the different levels of achievement.

Accommodations

Accommodations that are normally provided in the regular classroom for students with special needs should be provided in the administration of the exemplar task.

Classroom Set-up

For the investigation of the assigned tasks, the following classroom organization is recommended:
- a meeting area for the whole class
- individual workspaces

Materials and Resources Required

Before students attempt a particular task, provide them with the appropriate materials from among the following:
- copies of the student package for each student
- picture book about money
- coins (pennies, nickels, dimes, quarters, dollar coins)
- paper or cloth bag
- paper for labels
- writing instruments (pencils, erasers)
- calculators

General Instructions

Setting the Stage

All the student work is to be completed in its entirety at school.

Students are to work in the whole group to complete the pre-tasks. Students are to work individually and independently to complete the exemplar task.

This exemplar task will allow the students to conduct investigations by using their knowledge of money, patterning, probability, and time relationships to make conjectures. Students will be required, for example, to find how many possible sums they can get by combining three of four specified coins. Finding the sums will require students to use a systematic list to make sure that all the possibilities are included.

Students will also be required to use their knowledge of probability to determine all the possible outcomes of a given situation and the probability of obtaining a favourable outcome.

Students will further be asked to observe a pattern that involves money and will be required to predict the value of a certain term. Some students may be unable to extrapolate to find the value of the term. You may suggest that those students construct the pattern before determining the correct answer.

Posting a Word List

It would be useful to post a chart listing mathematical language that is currently being developed or used during the task. Such a chart will provide the students with a resource to use when communicating their mathematical learning. Words that you may include for this task are: *chance, probability, likely, equal, possible, impossible.*

The Pre-tasks

The pre-tasks are designed to review and reinforce the skills and concepts that students will be using in the exemplar task and to model strategies useful in completing the task.

**The rubric is reproduced on pages 14–15 of this document.*

Task Instructions

Introductory Activities

Pre-task 1 (40 minutes)

Introduce the tasks with a picture book about money. Pose questions about topics that arise in the book.

Have the students suggest different ways of giving change for a sum of money (e.g., fifteen cents). Record the responses, and ask how students can be sure that they have listed all the possibilities. Elicit from students the method of using a systematic list for recording possibilities.

Pre-task 2 (20 minutes)

Place a nickel, a dime, and a quarter inside a bag. Ask the students:
- "What are the chances of removing the quarter from the bag?"
- "If two coins are removed, what is the probability that the sum is fifteen cents? thirty-five cents?"

Discuss the students' different approaches to this task.

Pre-task 3 (20 minutes)

Place the following coins in a linear pattern in front of the students, and label the groupings as shown:

dime, nickel, quarter	dime, nickel, quarter
Step 1	Step 2

[This pattern of coins is an example of an a, b, c, a, b, c, . . . pattern.]

Ask:
- "If this pattern continued, what coin would be in the twelfth position? the twentieth position?"
- "How did you arrive at your answer?"

Discuss the strategies that students used in arriving at the answer.

Then ask:
- "What is the total value of the coins at the end of step 1?"
- "What is the combined value of steps 1, 2, and 3? steps 1, 2, 3, 4, and 5?"
- "In how many different ways can you find the answers to these questions?"

Have students discuss their strategies with the rest of the class.

Exemplar Task (three periods of 50 minutes each)

1. Distribute a copy of the student package to each student.

2. The problem that the students will solve independently is provided in the worksheets in Appendix 1.

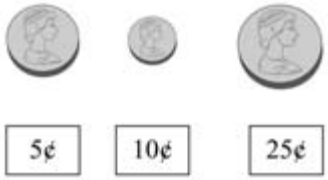
Appendix 1: Student Worksheets

Lots of Coins!

1. Dawson has the following coins.

a. What are all the possible sums you can get by combining three coins? Present your information in such a way that someone looking at your work will see how you solved the problem.

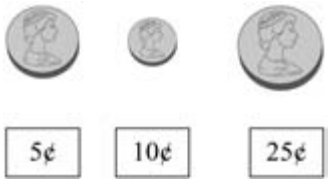
2. Lo said that you can make $9.56 by combining many of the following coins.



Do you agree with Lo? **Yes** ☐ **No** ☐

Explain why you agree or disagree.

3. Imagine that you have these three coins in your pocket:

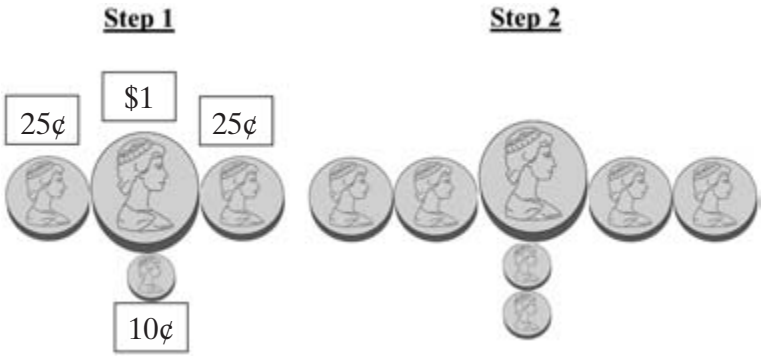


If you take two coins out of your pocket, what is the probability that you removed 30 cents?
Show your work.

4. Make up another probability question using coins.

Show how you would solve the problem.

5. Here is a pattern using loonies, quarters, and dimes.



The value of Step 1 is $1.60. **The value of Step 2 is $2.20.**

If this pattern were to continue, what would be the value of Step 5?

Show how you arrived at your answer. Use the back of the sheet if needed.

6. ESTIMATE how much money you would have if you were given $0.55 each week, and you saved the money for three months.

My estimate is: _____

Show how you estimated your answer.

Organize your work here, and explain your thinking.