Holyoke Public Schools

Grade 6

How Likely Is It?

Table of Contents

CURRICULUM MAPS OUTLINE

Map Goals:

1. To ensure that students are exposed to a rigorous curriculum in every school and every grade.
2. To have consistent instruction and assessment district wide.
3. To prepare students for the MCAS test.
4. To explain what is expected to be covered in each CMP or Investigations Unit.

Expectations:

The district's expectation is for students to successfully meet the Massachusetts Mathematics Standards. In order to help facilitate this, teachers are required to follow the curriculum maps. The successful implementation of these maps requires teachers to thoroughly read each lesson in the TE and work through the project and problems in the map and the text prior to planning their lessons. Work should be kept in the binder with the curriculum map. Working through the math is an essential part of lesson planning, as it helps the teacher to better understand the concept being taught and the students' possible misunderstandings.

Feedback To Students:

Feedback needs to happen daily in the classroom. There are many ways to give feedback. Conferencing, observations, questions asked during your opening, work time and closing are all forms of feedback.

Map Components:

1. GENERAL PROBING QUESTIONS
2. UNIT SPECIFIC PROBING QUESTIONS
3. GOALS OF UNIT, CONTENT STANDARDS, & PERFORMANCE STANDARDS
4. PROJECT- to be done at end of unit and kept in the portfolio.
5. STUDENT MASTER – for project
6. IVESTIGATIONS
7. NOTEBOOK - includes: 3 Ring Binder, Bound Notebook, Portfolio
8. ACCOUNTABLE TALK – using probing questions
9. ON DEMAND ASSESSMENTS - to be done during teaching of unit.
10. STUDENT MASTERS- for on-demand assessments.

Mathematics Evidence of Learning Artifacts

Artifact	K - 1	2 – 5	6 - 8
3 Ring Binder ***(3R)****	o Student Work[1]	o Vocabulary o Student sheets[1] ***All work should be dated and listed by investigation***	o Math books o Vocabulary o Core Problems[1] o Lab sheets ***All work should be dated and listed by investigation***
Marble Notebook ***(MNB)***	o Journal entries[2]	o Table of Contents o Problem of the day o Journal entries o Class work ***All work should be dated and listed by investigation in the Table of Contents***	o Table of Contents o Work time o Journal entries ***All work should be dated and listed by investigation in the Table of Contents***
Portfolio[3] ***(P)***	o On-demand tasks o Projects o Teacher anecdotal notes	o On-demand tasks o Reflections o Projects ***All work should be dated and listed by investigation***	o On-demand tasks o Reflections o Projects ***All work should be dated and listed by investigation***

[*] *Folders may be used in place of binders for these grade levels*
[1] *Send home at the end of each unit*
[2] *Use grade level math journals*
[3] *All documents should be kept for the entire year*

Accountable Talk

Probing Assessment Questions

As students progress through this unit, they should be asked the following questions to assess their specific knowledge of the unit.

- *What are the possible outcomes that occur in the events for this situation?*
- *How could I determine the experimental probability of each of the outcomes?*
- *Is it possible to determine the theoretical probability of each of the outcomes?*
- *If so what are these probabilities?*
- *How can I use the probabilities I have found to answer questions or make decisions about this situation?*

Probing Questions – Teacher's Role

The teacher's role in probing for understanding is to ask questions that will:

- *Clarify student understanding*
- *Get at the objective of the lesson*
- *Go deeper into the mathematics*
- *Uncover misconceptions and misunderstandings*
- *Compare and contrast*

Probing Questions – Student's Role

The students' role is to be an active participant by:

- *Explaining their strategies*
- *Asking clarifying questions to teacher and other students*
- *Being active listeners*
- *Using the language of mathematics*

Probing Questions - Suggestions

When probing for understanding the teacher and students can use one or more of these suggested questions:

- *Why are you using < >?*
- *What are the ways you could < >?*
- *What else do you know?*
- *How do you know that?*
- *Can you show that?*
- *What convention did you use here?*
- *What can you do if you do not know?*
- *What standard does this work apply to?*
- *Is this always true?*
- *How does this connect to other mathematics we have learned?*
- *What is the same and what are the differences between < >?*
- *Can you back that up?*
- *Where is the math in your sketch?*
- *What does the answer mean?*
- *Does the answer make sense?*
- *Could you have used another operation to solve this task?*
- *Can you give examples?*
- *Can you say it another way?*
- *What's the math?*
- *Tell me about the task in your own words?*
- *What are you trying to find?*
- *How did you make your estimate?*
- *Will your answer be an over-estimate or an under-estimate? Why?*
- *I noticed that you used <….> to help you understand the task. Can you show us what you did and tell us how it helped you?*

- *Where do you see < > in your <model, diagram, number line, chart, etc.>?*
- *How can we see < > in your <model, diagram, number line, chart, etc.>?*
- *You have used a representation that is different from others that I've seen. Can you show us your <model, diagram, number line, chart, etc.>, and tell us how it helped you?*
- *How did you decide to solve the task? Why did you choose that method?*
- *Did you try any method that didn't work?*
- *Tell us what you tried.*
- *Why didn't it work?*
- *Would it ever work?*

Goals, Content Standards, & Performance Standards

Unit Goals:

- *Understand that probabilities are useful for predicting what is useful over the long run.*
- *Understand the concepts of equally likely, and not equally likely.*
- *Understand that a game of chance is fair only if each player has the same chance of winning not just a possible chance of winning.*
- *Understand that there are two ways to build probability models; gathering data from experiments and by analyzing the possible equal likely outcomes.*
- *Understand that experimental probabilities are better estimates than theoretical probabilities and they are based on larger numbers of trial.*
- *Develop strategies for finding both experimental and theoretical probabilities.*
- *Interpret statements of probability to make decisions or answer questions.*

Math Content Standards:

- *Understand that probabilities are useful for predicting what is useful over the long run.*
- *Understand the concepts of equally likely, and not equally likely.*
- *Understand that a game of chance is fair only if each player has the same chance of winning not just a possible chance of winning.*
- *Understand that there are two ways to build probability models; gathering data from experiments and by analyzing the possible equal likely outcomes.*
- *Understand that experimental probabilities are better estimates than theoretical probabilities and they are based on larger numbers of trial.*
- *Develop strategies for finding both experimental and theoretical probabilities.*
- *Interpret statements of probability to make decisions or answer questions.*

Performance Standards:

- *(M4 a) Collects data, organizes data, and displays data with tables, charts, and graphs that are appropriate.*
- *(M4 b) Analyzes data with respect to characteristics of frequency and distribution including mode and range.*
- *(M4 c) Analyzes appropriately central tendencies of data that consider mean and median.*
- *(M4 d) Makes conclusions and recommendations based on data analysis.*
- *(M4 e) Critiques the conclusions and recommendations of others' statistics.*
- *(M4 f) Considers the effects of missing or incorrect information.*
- *(M4 g) Formulates hypotheses to answer a question and to use data to test hypotheses.*
- *(M4 h) Represents and determines probability as a fraction of a set of equally likely, likely outcomes; recognizes equally likely outcomes and constructs*
- *sample spaces.*
- *(M4 i) Makes predictions based on experimental or theoretical probability.*
- *(M4 j) Predicts the result of a series of trials once the probability on one trial is known.*

Investigation 1: A First Look At Chance

<table>
<tr><td colspan="2"><u>Objectives</u>
Investigations 1.1 – 1.4</td><td><u>Pacing:</u>
5 days</td></tr>
<tr><td rowspan="6">Evidence of Learning Artifacts

Journal and Reflection questions should be posted and referred to at the beginning of the appropriate Investigation.

Journal and Reflection entries need to be done in class as part of the closure and assessment</td><td colspan="2"><u>Vocabulary [2]:</u>
Appendix 2, Investigation 1</td></tr>
<tr><td colspan="2"><u>Core Problems [2]:</u>
How Likely Is It?, Investigation 1 ACE Problems# 1-5, 31, 6-8, 21-23, 32, 9, 26, 11-18, 27-30</td></tr>
<tr><td colspan="2"><u>Work Time [1]:</u>
How Likely Is It?, Problems #1.1, 1.2, 1.3, 1.4</td></tr>
<tr><td colspan="2"><u>Journal Entries [1]:</u>
Appendix 3, Inv #1.1 – 1.4</td></tr>
<tr><td colspan="2"><u>On Demand Tasks [3]:</u>
Appendix 5, Investigation 1</td></tr>
<tr><td colspan="2"><u>Mathematical Reflection [3]</u>
Appendix 4, MMR1:</td></tr>
<tr><td>Accountable Talk

To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the mathematics discipline, and to rigorous thinking.</td><td colspan="2">As a result of this Investigation, students should be able to talk and manipulate the vocabulary of the Investigation in response to this type of question:

o How did you know that?
o How can you use …?
o Can you show another way?
o What convention did you use?

These are some recommended questions that you might use. Others can be found be found at the beginning of the map and on the probing question sheet in the district mathematics guide.</td></tr>
</table>

1. Marble Note Book
2.3 Ring Binder
3. Portfolio

Investigation 2: Experimental and Theoretical Probability

<table>
<tr><td colspan="2"><u>Objectives</u>
Investigations 2.1 – 2.4</td><td><u>Pacing:</u>
6 days</td></tr>
<tr><td rowspan="6">Evidence of Learning Artifacts

Journal and Reflection questions should be posted and referred to at the beginning of the appropriate Investigation.

Journal and Reflection entries need to be done in class as part of the closure and assessment</td><td colspan="2"><u>Vocabulary [2]:</u>
Appendix 2, Investigation 2</td></tr>
<tr><td colspan="2"><u>Core Problems [2]:</u>
How Likely Is It? , Investigation 2 ACE Problems: # 1, 13 34, 4-6, 17-24, 9, 25-31, 35, 36, 10, 32, 33, 37</td></tr>
<tr><td colspan="2"><u>Work Time [1]:</u>
How Likely Is It?, Problems #2.1, 2.2, 2.3, 2.4</td></tr>
<tr><td colspan="2"><u>Journal Entries [1]:</u>
Appendix 3, Inv #2.1 – 2.4</td></tr>
<tr><td colspan="2"><u>On Demand Tasks [3]:</u>
Appendix 5, Investigation 2</td></tr>
<tr><td colspan="2"><u>Mathematical Reflection [3]</u>
Appendix 4, MMR2:</td></tr>
<tr><td>Accountable Talk

To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the mathematics discipline, and to rigorous thinking.</td><td colspan="2">As a result of this Investigation, students should be able to talk and manipulate the vocabulary of the Investigation in response to this type of question:

o How did you know…?
o How can you justify…?
o Does your answer make sense?
o Can you draw me a diagram?

These are some recommended questions that you might use. Others can be found be found at the beginning of the map and on the probing question sheet in the district mathematics guide.</td></tr>
</table>

1. Marble Note Book
2.3 Ring Binder
3. Portfolio

Investigation 3: Making Decisions With Probability

<table>
<tr><td colspan="2"><u>Objectives</u>
Investigations 3.1 – 3.3</td><td><u>Pacing:</u>
4 days</td></tr>
<tr><td rowspan="6">Evidence of Learning Artifacts

Journal and Reflection questions should be posted and referred to at the beginning of the appropriate Investigation.

Journal and Reflection entries need to be done in class as part of the closure and assessment</td><td colspan="2"><u>Vocabulary [2]:</u>
Appendix 2, Investigation 3</td></tr>
<tr><td colspan="2"><u>Core Problems [2]:</u>
How Likely Is It?, Investigation 3 ACE Problems: #1-3, 5-6, 18-21, 31, 32, 7,9, 22-26, 10, 28 -30, 33-35</td></tr>
<tr><td colspan="2"><u>Work Time [1]:</u>
How Likely Is It?, Problems 3.1 – 3.3</td></tr>
<tr><td colspan="2"><u>Journal Entries [1]:</u>
Appendix 3, Inv #3.1, 3.2, 3.3</td></tr>
<tr><td colspan="2"><u>On Demand Tasks [3]:</u>
Appendix 5, Investigation 3</td></tr>
<tr><td colspan="2"><u>Mathematical Reflection [3]</u>
Appendix 4, MMR3:</td></tr>
<tr><td>Accountable Talk

To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the mathematics discipline, and to rigorous thinking.</td><td colspan="2">As a result of this Investigation, students should be able to talk and manipulate the vocabulary of the Investigation in response to this type of question:

o What is your strategy?
o How could you check that ….. is correct?
o Could you begin with a different step?
o Does …. make sense given the information in the problem?

These are some recommended questions that you might use. Others can be found be found at the beginning of the map and on the probing question sheet in the district mathematics guide.</td></tr>
</table>

1. Marble Note Book
2.3 Ring Binder
3. Portfolio

Investigation 4: Probability, Genetics, and Games

<table>
<tr><td colspan="2"><u>Objectives</u>
Investigation 4.1- 4.3</td><td><u>Pacing:</u>
4 days</td></tr>
<tr><td rowspan="6">Evidence of Learning Artifacts

Journal and Reflection questions should be posted and referred to at the beginning of the appropriate Investigation.

Journal and Reflection entries need to be done in class as part of the closure and assessment</td><td colspan="2"><u>Vocabulary [2]:</u>
Appendix 2, Investigation 4</td></tr>
<tr><td colspan="2"><u>Core Problems [2]:</u>
How Likely Is It?, Investigation 4 ACE Problems: #1, 13-17, 3-7, 19, 27, 20-26</td></tr>
<tr><td colspan="2"><u>Work Time [1]:</u>
How Likely Is It?, Problem replace with specific investigations, eg. 1.1-1.3</td></tr>
<tr><td colspan="2"><u>Journal Entries [1]:</u>
Appendix 3, Inv #4.1- 4.3</td></tr>
<tr><td colspan="2"><u>On Demand Tasks [3]:</u>
Appendix 5, Investigation 4</td></tr>
<tr><td colspan="2"><u>Mathematical Reflection [3]</u>
Appendix 4, MMR4:</td></tr>
<tr><td>Accountable Talk

To promote learning, explore solutions, and justify reasoning, conversations between students and students or students and teacher must be accountable – accountable to the learning community, to the mathematics discipline, and to rigorous thinking.</td><td colspan="2">As a result of this Investigation, students should be able to talk and manipulate the vocabulary of the Investigation in response to this type of question:
o Is there a way to write ….?
o Does …. help you find the answer?
o

These are some recommended questions that you might use. Others can be found be found at the beginning of the map and on the probing question sheet in the district mathematics guide.</td></tr>
</table>

1. Marble Note Book
2.3 Ring Binder
3. Portfolio

Appendix 1 Unit Project

Project [1] Student work should be placed in portfolio	The project is the culminating assessment, which will allow students to apply what they learned about the use of probability. It is written in MCAS form to give students the experience of answering an open-response question. The unit project is called 'The Card Game' and the student handout for the project can be found in Appendix 1

1. portfolio

Unit Project Scoring Guide

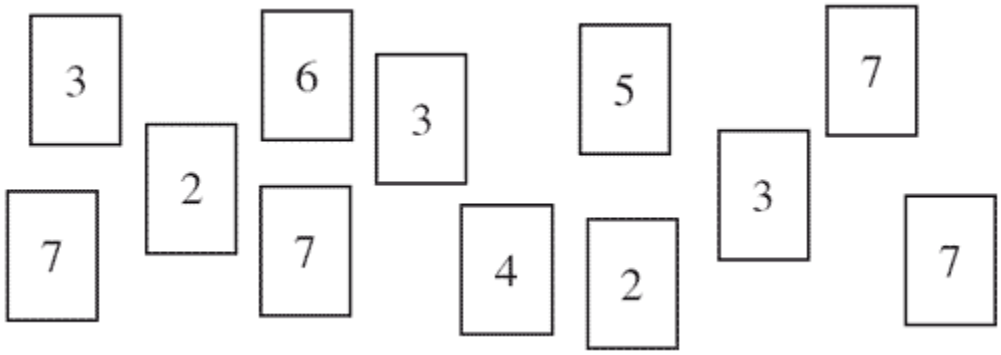
Score	Description
4	The student response demonstrates an exemplary understanding of the Data Analysis, Statistics, and Probability concepts involved in predicting the probability of outcomes in simple experiments.
3	The student response demonstrates a good understanding of the Data Analysis, Statistics, and Probability concepts involved in predicting the probability of outcomes in simple experiments. Although there is significant evidence that the student is able to recognize and apply the concepts involved, some aspect of the response is flawed. As a result, the response merits 3 points.
2	The student response demonstrates a fair understanding of the Data Analysis, Statistics, and Probability concepts involved in predicting the probability of outcomes in simple experiments. While some aspects of the task are completed correctly, others are not. The mixed evidence provided by the student merits 2 points.
1	The student response demonstrates only a minimal understanding of the Data Analysis, Statistics, and Probability concepts involved in predicting the probability of outcomes in simple experiments.
0	The student response contains insufficient evidence of an understanding of the Data Analysis, Statistics, and Probability concepts involved in predicting the probability of outcomes in simple experiments to merit any points.

NAME: _____ **DATE:** _____

UNIT PROJECT: The Card Game

- *BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.*
- *Show all work (diagrams, tables, and computations) on your answer sheet.*
- *If you do the work in your head, explain in writing how you did the work.*

Silas has the cards shown below. All cards are the same size and shape. He put the cards into a bag.



Silas will pull one card out of the bag without looking.

a) Will the number on the card Silas pulls out more likely be an even number or more likely be an odd number? Show or explain how you got your answer.

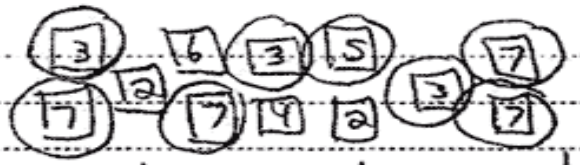
b) What is the probability that the card Silas pulls out will have a 3 on it? Show or explain how you got your answer.

c) Silas will perform this experiment a total of 72 times, replacing the card after each pull. What is the total number of times he should expect to pull out a card with a 7 on it? Show or explain how you got your answer.

2005 MCAS Grade 6 Mathematics

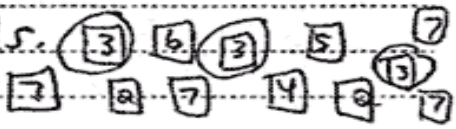
Student Work: Question #31- Score Point 4

A. Silas has 12 cards
If a number is circled it is an odd number.
8/12 of the numbers on the cards are odd.



Silas is more likely to pull out an odd-numbered card because there are more odd-numbered cards.

B. There is a total of 12 cards.
If it is circled, it is a card with a three on it.
3/12 of the cards have a 3 on them.



Silas has a 3/12 (1/4), or 25% chance of pulling out a card with a 3 on it.

C. 1/3 of the cards have a seven on them. He should expect to pull out a card with a 7 on it 1/3 of the number of his pulls.

$$3\overline{)72}\quad 24$$
$$-6$$
$$12$$
$$-12$$
$$0$$

He should expect to pull a card with a seven on it 24 times out of 72 times

2005 MCAS Grade 6 Mathematics

Student Work: Question #31- Score Point 3

a. 8 of Silas's cards are odd and 4 of the cards are even. It is more likely that Silas will pull a odd card out of the bag because there are more of them.

b. Out of all the 12 cards there are 3 cards with 3's on them. That means there is a 3/12 chance he will pull out a 3. I know this because out of 12 cards 3 have 3's on them 3/12 is equivilent to 1/4 because both are divisable by 3, and 3÷3=1 and 12÷3=4. So there's a 1/4 chance of getting a 3.

c. There are 4 sevens in the 12 cards If Silas pulls out the cards randomly 72 times it is likley 7 will be pulled out 4/12 of the time. In order to find out how many times 7 will apear out of 72 I must divide 72 by 4. This is because there is a 1/4 chance 7 will apear, 4 goes into 72 18 times, so it is likley that 7 will apear 18 times out of the 72 times.

$$4\overline{)72}\quad 18,\ -4,\ 32,\ -32,\ 0$$

2005 MCAS Grade 6 Mathematics

Student Work: Question #31- Score Point 2

a. It would most likely be and odd number because there are more odd numbers then even ones.

b. It would be 3 out of 11, because there are 11 cards and three of them have 3's on them.

c. It would be 4 out of 72 times he has experimented this, because there are for card four cards that have 7 on them and he will try this 72 times.

2005 MCAS Grade 6 Mathematics

Student Work: Question #31- Score Point 1

a. A odd number because there are 8 odds and 4 even so 8 is more so she is going to pull out a odd number.

b. Because there are 3 of 2 so if there are 2 of the same number 3 will probability come out.

c. That there are 4 of 7 of which there are more seven so silas will pull out a seven.

Appendix 2 Vocabulary

Investigation 1:

- *probability, experimental probability, equally likely*

Investigation 2:

- *outcomes, theoretical probability, tree diagram, fair game*

Investigation 3:

- *simulation*

Investigation 4:

- *none new*

Appendix 3 Journal Entries

Investigation 1:

Investigation 1.1:

As the number of trials increases what is happening to the percent of heads?

Investigation 1.2:

Were your results and other groups the same and if not what could you do with the given class data to compare the variation?

Investigation 1.3:

In an experiment, are 30 trials as good as 500 trials to predict the chances of a result? Explain

Investigation 1.4:

What does it mean for results to be equally likely?

Investigation 2:

Investigation 2.1

Describe how you can find the theoretical probability of an outcome. Why is it called theoretical probability?

Investigation 2.2

What does it mean to find the probability of something that is not happening?

How can you compute that?

Investigation 2.3

Explain the pros and cons of a tree diagram and an organized list.

Investigation 2.4

What does it mean to have a fair game?

Investigation 3

Investigation 3.1

Describe a situation in which it is difficult or impossible to find the theoretical probabilities of the outcomes.

Investigation 3.2

Explain what it means for a probability situation to be fair.

Investigation 3.3

How would you find the theoretical probabilities of this problem? Is the pointer likely to fall at each time section equally? Why or why not?

Investigation 4

Investigation 4.1

Is our class data representative of the nation as a whole? Explain.

Investigation 4.2

Neither Greg not Megan can curl their tongues. What is the probability that their daughter and curl her tongue? Explain.

Investigation 4.3

When you roll two number cubes how many different number pairs are possible and are these pairs equally likely?

Appendix 4 Reflections

MMR1

How do you find the experimental probability that a particular result will occur? Why is it called the experimental probability?

MMR2

a. Suppose two people do an experiment to estimate the probability that an outcome occurs. Will they get the same probabilities? Explain

b. Suppose two people analyze a situation to find that an outcome occurs. Will they get the same probabilities? Explain.

c. One person uses an experiment to estimate the probability that an outcome occurs. Another person analyzes the situation to find the theoretical probability that the outcome can occur. Will they get the same probabilities? Explain. [pg. 38 #2

MMR3

Describe a situation in which you and a friend can use probability to make a decision. Can the probabilities of the outcomes be determined both experimentally and theoretically? Why or why not? [pg. 54 # 1]

MMR4

– Describe some of the strategies for determining the theoretical probabilities for situations in this unit. Give an example of a situation for each of the strategies. [pg. 69 #3]

Appendix 5 On Demand Tasks

CMP2: How Likely Is It?

On-Demand Tasks ***Student Book: ACE Questions*** In class individualized On-Demand tasks assess knowledge of mathematical facts, operations, concepts, and skills, and their efficient application to problem solving. The results of these different forms of assessment provide rich profiles of students' achievements in mathematics and serve as the basis for identifying curricula and instructional approaches to best develop their talents.	*After Inv. 1* ACE Problems 19, 20, 25 *After Inv. 2* Additional Practice and Skills #4 p.103; ACE Problems 3 pg. 29 *After Inv. 3* ACE Problems 8,11 – 16, *After Inv. 4* ACE Problems 8 – 11,12

HPS Mathematics Scoring Rubric

Score	Description
4	The response shows a **comprehensive** understanding of the mathematical concept(s) and/or procedures embodied in the task(s). It indicates that the student has **completed the task(s)** correctly, using mathematically sound procedures. It contains **clear, complete explanations** and/or **adequate work required**.
3	The response shows a **general** understanding of the mathematical concept(s) and/or procedures embodied in the task(s). It indicates that the student has **completed the task(s)**, using mathematically sound procedures. It contains **complete explanations** and/or **adequate work required**.
2	The response shows a **basic** understanding of the mathematical concept(s) and/or procedures embodied in the task(s). It addresses **most aspects of the task(s)**, using mathematically sound procedures. It may contain a correct solution but provides **incomplete procedures, reasoning and/or explanations**. It may reflect **some misunderstandings** of the underlying mathematical concepts and/or procedures.
1	The response shows a **minimal** understanding of the mathematical concepts and/or procedures embodied in the task(s). It addresses some elements of the task(s) correctly but reaches an **inadequate solution and/or provides reasoning that is faulty or incomplete**. It exhibits **multiple flaws related to a misunderstanding of important aspects** of the task(s), misuse of mathematical procedures, or faulty mathematical reasoning. It reflects a **lack of essential understanding** of the underlying mathematical concepts. It may contain a correct numerical answer but **the required work is not provided**. .
0	The response is **completely incorrect, irrelevant, or incoherent**, or contains a correct response arrived at using an **obviously incorrect procedure**.

NAME: _____ **DATE:** _____

Investigation 1

- *BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.*
- *Show all work (diagrams, tables, and computations) on your answer sheet.*
- *If you do the work in your head, explain in writing how you did the work*
-

19. Colby rolls a number cube several times. She records the result of each roll and organizes her data in the table below.

Number Cube Results

Number	Times the Number is Rolled
1	𝍸 |
2	𝍸 ||||
3	𝍸 |
4	𝍸 |||
5	𝍸 𝍸 |
6	𝍸 𝍸

a. What fraction of the rolls are 2's? What percent is this?

b. What fraction of the rolls are odd numbers? What percent is this?

c. What percent of the rolls is greater than 3?

d. Suppose Colby rolls the number cube 100 times. About how many times can she expect to roll a 2? Explain.

e. If Colby rolls the number cube 1,000 times, about how many times can she expect to roll an odd number? Explain.

20. For each pair of fractions, find a fraction between the two fractions.

a. $\frac{1}{10}$ and $\frac{8}{25}$ **b.** $\frac{3}{8}$ and $\frac{11}{40}$

-

.

NAME: _____ **DATE:** _____

Investigation 1 (con't)

25. Weather forecasters often use percents to give probabilities in their forecasts. For example, a forecaster might say that there is a 50% chance of rain tomorrow. For the forecasts below, change the fractional probabilities to percents.

a. The probability that it will rain tomorrow is $\frac{2}{5}$.

b. The probability that it will snow Monday is $\frac{3}{10}$.

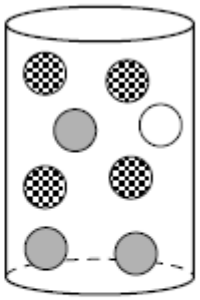
c. The probability that it will be cloudy this weekend is $\frac{3}{5}$.

NAME: _____ **DATE:** _____

Investigation 2

- *BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.*
- *Show all work (diagrams, tables, and computations) on your answer sheet.*
- *If you do the work in your head, explain in writing how you did the work*

4. A can contains eight chips. Three chips are gray, four are checkered, and one is white.



a. What is the probability of drawing a white chip?

b. What is the probability of drawing a checkered chip?

c. What is the probability of drawing a gray chip?

d. What is the probability of *not* drawing a white chip?

e. What is the probability of *not* drawing a gray chip?

NAME: _____ **DATE:** _____

Investigation 2 (con't)

3. A bag contains two white blocks, one red block, and three purple blocks. You choose one block from the bag.

a. Find each probability.

$P(\text{white}) =$ ■ $P(\text{red}) =$ ■ $P(\text{purple}) =$ ■

b. What is the probability of *not* choosing a white block? Explain how you found your answer.

c. Suppose the number of blocks of each color is doubled. What happens to the probability of choosing each color?

d. Suppose you add two more blocks of each color. What happens to the probability of choosing each color?

e. How many blocks of which colors should you add to the original bag to make the probability of choosing a red block equal to $\frac{1}{2}$?

NAME: _____ **DATE:** _____

Investigation 3

- *BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.*
- ***Show all work*** *(diagrams, tables, and computations) on your answer sheet.*
- *If you do the work in your head, explain in writing how you did the wor*
-
-

8. Multiple Choice Jake, Carl, and John try to decide what to do after school. Jake thinks they should play video games. Carl wants to see a movie. John thinks they should ride their bikes. Which choice is a fair way to decide?

A. Let's toss three coins. If they all match, we play video games. If there are exactly two heads, we see a movie. If there are exactly two tails, we ride our bikes.

B. Let's roll a number cube. If we roll a 1 or 2, we play video games. If we roll a 3 or 4, we go to the movies. Otherwise, we ride bikes.

C. Let's use this spinner.

D. None of these is fair.

-

NAME: _____ **DATE:** _____

Investigation 3 (con't)

For Exercises 11–16, complete the following table. Write each probability as a fraction, decimal, or percent.

Probabilities

	Fraction	Decimal	Percent
11.	$\frac{1}{4}$	■	25%
12.	$\frac{1}{8}$	■	■
13.	■	■	$33\frac{1}{3}\%$
14.	■	■	10%
15.	■	0.1666...	■
16.	■	0.05	■

NAME: _____ **DATE:** _____

Investigation 4

- *BE SURE TO ANSWER AND LABEL ALL PARTS OF EACH QUESTION.*
- ***Show all work*** *(diagrams, tables, and computations) on your answer sheet.*
- *If you do the work in your head, explain in writing how you did the work*

Multiple Choice **For Exercises 8 and 9, use your list of possible outcomes when you roll two number cubes from Problem 4.3.**

8. What is the probability of getting a sum of 5 when you roll two number cubes?

A. $\frac{1}{9}$ **B.** $\frac{1}{6}$ **C.** $\frac{1}{4}$ **D.** $\frac{1}{3}$

9. What is the probability of getting a sum greater than 9 when you roll two number cubes?

F. $\frac{1}{9}$ **G.** $\frac{1}{6}$ **H.** $\frac{1}{4}$ **J.** $\frac{1}{3}$

Multiple Choice **For Exercises 10 and 11, Ella is playing Roller Derby with Carlos. Ella places all her markers in column 1 and Carlos places all of his markers in column 12.**

10. What is the probability that Ella will win?

A. 0 **B.** $\frac{1}{3}$ **C.** $\frac{1}{2}$ **D.** 1

11. What is the probability that Carlos will win?

F. 0 **G.** $\frac{1}{3}$ **H.** $\frac{1}{2}$ **J.** 1

NAME: _____ *DATE:* _____

Investigation 4 (con't)

12. In some board games, you can end up in "jail." One way to get out of jail is to roll doubles (two number cubes that match). What is the probability of getting out of jail on your turn by rolling doubles? Use your list of possible outcomes of rolling two number cubes. Explain your reasoning.

NOTES