TCSS Unit Four Information

Georgia Milestones Domain & Weight: Geometry 15%

Curriculum Map: Applications of Probability

Content Descriptors:

Concept 1: Understand independence and conditional probability and use them to interpret data.

Concept 2: Use the rules of probability to compute probabilities of compound events in a uniform probability model.

Content from Frameworks: Applications of Probability

Unit Length: Approximately 19 days

Georgia Milestones Study Guide for Applications of Probability

TCSS Unit 4 – Accelerated GSE Geometry B/Algebra 2
Curriculum Map

Unit Rational:

Students will understand independence and conditional probability and use them to interpret data. Building on standards from middle school, students will formalize the rules of probability and use the rules to compute probabilities of compound events in a uniform probability model.

Prerequisites: As identified by the GSE Frameworks	***Length of Unit***
✓ Understand the basic nature of probability ✓ Determine probabilities of simple and compound events ✓ Organize and model simple situations involving probability ✓ Read and understand frequency tables	*19 Days*

Concept 1	***Concept 2***
Understand independence & conditional probability and use them to interpret data.	Use the rules of probability to compute probabilities of compound events in a uniform probability model.
Concept 1 GSE Standards	***Concept 2 GSE Standards***
MGSE9-12.S.CP.1 Describe categories of events as subsets of a sample space using unions, intersections, or complements of other events ("or," "and," "not"). **MGSE9-12.S.CP.2** Understand that if two events A and B are independent, the probability of A and B occurring together is the product of their probabilities, and that if the probability of two events A and B occurring together is the product of their probabilities, the two events are independent. **MGSE9-12.S.CP.3** Understand the conditional probability of A given B as P(A and B)/P(B). Interpret independence of A and B in terms of conditional probability; that is conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.	**MGSE9-12.S.CP.6** Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in context. **MGSE9-12.S.CP.7** Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in context.

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MGSE9-12.S.CP.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, use collected data from a random sample of students in our school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare results.*

MGSE9-12.S.CP.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*

Concept 1 Lesson Essential Question	***Concept 2 Lesson Essential Question***
• How can I represent real world objects algebraically? • How can I communicate mathematically using set notation? • In what ways can a Venn Diagram represent complex situations? • How can I use a Venn Diagram to organize various sets of data? • How can two-way frequency tables be useful? • How are everyday decisions affected by an understanding of conditional probability? • What connections does conditional probability have to independence? • What makes two random variables independent? • How do I determine whether or not variables are independent?	• What options are available to me when I need to calculate conditional probabilities? • How do I use and interpret the Addition Rule?

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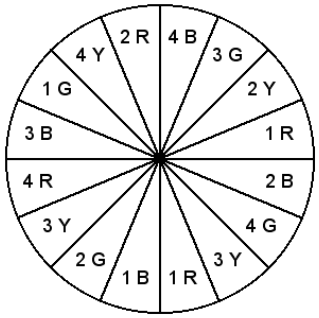
Concept 1 Vocabulary	Concept 2 Vocabulary
Complement Conditional Probability Dependent Events Elements Independent Events Intersection of Sets Mutually Exclusive Events Outcome Overlapping Events Sample Space Set Subset Union of Sets Venn Diagram	Addition Rule Multiplication Rule for Independent Events Conditional probability Uniform probability model
Notation is very important	*Notation is very important*

Concept 1
Sample Assessment Items

MGSE9-12.S.CP.1

Joe and Sarah are playing a board game with the spinner shown below. Each section of the spinner has a number (1, 2, 3, 4) and a color (R = Red, Y = Yellow, G = Green, B = Blue).



a. What subset *A* of the sample space describes the spinner landing on a green section? A = {3G, 1G, 2G, 4G}

b. What subset *B* of the sample space describes the spinner landing on a section with the number 2? B = {2Y, 2R, 2G, 2B}

Concept 2
Sample Assessment Items

MGSE9-12.S.CP.6

Given the table below, find the indicated probability.

	Male	Female	Total
Blue eyes	10	12	22
Brown eyes	38	44	82
Green eyes	12	14	26
Other eyes	20	30	50
Total	80	100	180

$\frac{19}{40}$ The probability that a randomly selected male student has brown eyes.

$\frac{7}{50}$ The probability that a randomly selected female student has green eyes.

$\frac{5}{11}$ The probability that a randomly selected student with blue eyes is male.

$\frac{7}{13}$ The probability that a randomly selected student with green eyes is female.

c. What subset C of the sample space, in terms of A and B, describes the spinner landing on a green section with the number 2?

$C = A \cap B = \{2G\}$

d. Use your results from part c to find the subset that describes the spinner landing on any particular color and number combination.

The subset is the intersection of the subset describing the spinner landing on the chosen color and the subset describing the spinner landing on the chosen number.

e. Which of the sets described in part d are empty? The spinner landing on a red section with the number 3:

$\{1R, 2R, 4R, 1R\} \cap \{3G, 3B, 3Y, 3Y\} = \varnothing$

The spinner landing on a yellow section with the number 1:

$\{2Y, 4Y, 3Y, 3Y\} \cap \{1R, 1G, 1B, 1R\} = \varnothing$

MGSE9-12.S.CP.2

A spinner numbered 1 through 6 has sections that are red, yellow, and blue. Juan spins the spinner 50 times and records the results in the table below. According to the data, which events are independent?

	Even	Odd	Total
Red	6	9	15
Yellow	7	8	15
Blue	7	13	20
Total	20	30	50

A. Landing on a red section and landing on an even number

B. Landing on a yellow section and landing on an even number

C. Landing on a blue section and landing on an even number

D. Landing on a red section and landing on an odd number

MGSE9-12.S.CP.7

Derek randomly chooses a card from a standard deck of 52 playing cards. What is the probability that Derek chooses a club or a queen?

A. $\frac{4}{52}$

B. $\frac{16}{52}$

C. $\frac{13}{52}$

D. $\frac{17}{52}$

MGSE9-12.S.CP.3

A movie theater tracks the ticket and snack sales for one particular showing.

- 84 people who bought a ticket at a discounted rate bought a snack.
- 28 people who bought a ticket at a discounted rate did not buy a snack.
- 126 people who bought a regular price ticket bought a snack.
- 42 people who bought a regular price ticket did not buy a snack.

Is buying a snack independent of buying a regular price ticket? Use conditional probability to justify your answer.

Yes, buying a snack is independent of buying a regular price ticket.

The total number of tickets is
$84 + 28 + 126 + 42 = 280$.

The total number of regular priced tickets is $126 + 42 = 168$.

The total number of people who bought a snack is $84 + 126 = 210$.

$$P(\text{regular price}) = \frac{168}{280} = \frac{3}{5}$$

$$P(\text{snack}) = \frac{210}{280} = \frac{3}{4}$$

$$P(\text{snack and regular price}) = \frac{126}{280} = \frac{9}{20}$$

$$P(\text{snack} \mid \text{regular price}) = \frac{\frac{9}{20}}{\frac{3}{5}} = \frac{3}{4}$$

$$P(\text{regular price} \mid \text{snack}) = \frac{\frac{9}{20}}{\frac{3}{4}} = \frac{3}{5}$$

$P(\text{snack} \mid \text{regular price}) = P(\text{snack})$ and $P(\text{regular price} \mid \text{snack}) = P(\text{regular price})$, so the events are independent.

MGSE9-12.S.CP.4

Sam & Misty are planning a rehearsal dinner party for 100 people. Out of 45 men coming to the party, 36 ordered chicken. Out of the 55 women coming to the party, 24 ordered fish.

a. Create a two-way table to represent the data.

	Chicken	Fish	Total
Man	36	9	45
Woman	31	24	55
Total	67	33	100

b. What is the conditional probability that a guest who ordered fish is a man?

$$P(\text{man} \mid \text{fish}) = \frac{9}{33} = \frac{3}{11} \approx 0.27$$

c. What is the conditional probability that a guest who ordered chicken is a woman?

$$P(\text{woman} \mid \text{chicken}) = \frac{31}{67} \approx 0.46$$

MGSE9-12.S.CP.5

Carlos and Wren are catering a party for 100 people. Out of the 45 men coming, 27 ordered chicken. Out of the 55 women coming, 33 ordered fish. Everyone ordered either chicken or fish. Which of the following statements are true?

A. 40% of the men ordered fish.

B. More than half of the people who ordered chicken are women.

C. The percent of men who ordered chicken is the same as the percent of women who ordered fish.

D. The probability that a person who ordered fish is a man is less than 33%.

E. The probability that a person who ordered chicken is a woman is less than 50%.

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Resources – Concept 1
Factoring

Instructional Strategies & Common Misconceptions

❖ Modeling Conditional Probabilities 1: Lucky Dip – FAL (S.CP.1-5)
*great discussion, critical thinking and error analysis

☐ Venn Diagram Set practice (S.CP.1-3)
Teacher Student

☐ Independent Events practice (S.CP.2)
Teacher Student

These tasks were taken from the GSE Frameworks.

✓ The Conditions are Right - Part 1 - activator (S.CP.2)
Part 2 & 3 - lesson/discussion/practice (S.CP.3 & 6)
Part 4 & 5 – lesson/discussion/practice (S.CP.4&5)
Teacher Student

✓ The Land of Independence - whole group discussion/practice (S.CP.2-5) Teacher Student

✓ Modeling Conditional Probabilities 2 (determining a fair game) (S.CP.1-5) * activator

✓ A Case of Possible Discrimination – extension activity (S.CP.1-5)
Teacher Student

Textbook Resources

- Holt McDougal – Explorations in Core Math Analytic Geometry pages 421-426 (S.CP.1)
- Holt McDougal – Explorations in Core Math Analytic Geometry pages 443, 446-448 (S.CP.2)
- Holt McDougal – Explorations in Core Math Analytic Geometry pages 442, 447-448 (S.CP.3)
- Holt McDougal – Explorations in Core Math Analytic Geometry pages 441, 445-447 (S.CP.4)
- Holt McDougal – Explorations in Core Math Analytic Geometry pages 444-448 (S.CP.5)

Resources – Concept 2
Graphing

Instructional Strategies and Common Misconceptions

These tasks were taken from the GSE Frameworks.

- How Odd? (S.CP.1 & &) – Dice or virtual dice are needed for Part 1
  *great collaborative pairs activity
  (Venn Diagrams, set notation and the addition rule)
  Teacher Student
- Are You Positive? – great culminating activity
  Teacher Student

Textbook Resources

- Holt McDougal – Explorations in Core Math Analytic Geometry pages 449-454 (S.CP.6)
- Holt McDougal – Explorations in Core Math Analytic Geometry pages 455-462 (S.CP.7)

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Concept 1 ***Differentiated Activities***		***Concept 3*** ***Differentiated Activities***
❖ Compound Confusion FAL (S.CP.5) Teacher Student		❖ Medical Testing Culminating Activity – collaborative pairs/groups
Concept 1 ***Resources recommended for Math Support***		***Concept 3*** ***Resources recommended for Math Support***
❖ Interactive Vocabulary Site (differentiate how vocabulary is presented) ❖ Basic Probability notes/practice (S.CP.1) Teacher Student		❖ False Positives (CTAE) Task (S.CP.4&6)

At the end of Unit 4 student's should be able to say "I can…"

- ✓ Use set notation as a way to algebraically represent complex networks of events or real world objects.
- ✓ Represent everyday occurrences mathematically through the use of unions, intersections, complements and their sets and subsets.
- ✓ Use Venn Diagrams to represent the interactions between different sets, events or probabilities.
- ✓ Find conditional probabilities by using a formula or a two-way frequency table.
- ✓ Understand independence as conditional probabilities where the conditions are irrelevant.
- ✓ Analyze games of chance, business decisions, public health issues and a variety of other parts of everyday life can be with probability.
- ✓ Model situations involving conditional probability with two-way frequency tables and/or Venn Diagrams.
- ✓ Confirm independence of variables by comparing the product of their probabilities with the probability of their intersection.