

UNIT OF STUDY

Title: Counting Techniques	Subject/Course: Algebraic Connections	Length: 10 days
Topic: CS 1 unit 1	Grade: 12th	Designer: Prado
UNIT GOALS AND EXPECTATIONS		
<p>IMPORTANT CONCEPTS/UNDERSTANDINGS:</p> <ul style="list-style-type: none"> ◆ There is more than one way to count events ◆ Counting Techniques can save a lot of time ◆ Tree diagramming can make choice clearer ◆ Solve permutations and combinations and relate them to real-life situations 	<p>ESSENTIAL QUESTIONS:</p> <ul style="list-style-type: none"> ◆ How do I draw a tree diagram? ◆ What is the fundamental Counting Principle? ◆ When is an event independent or dependent? ◆ When is a problem a permutation? ◆ When is a permutation with repetition and without repetition? ◆ When is a problem a combination? 	
<p>STUDENT LEARNING EXPECTATIONS:</p> <p>PS.1AC.1 Apply counting techniques to determine the number of outcomes, tree diagram, fundamental Counting Principle, permutations (with and without repetition), and combinations</p>		
<p>SPECIFIC DECLARATIVE KNOWLEDGE – What I know</p> <ul style="list-style-type: none"> ◆ Explain vocabulary words: tree diagram, fundamental Counting Principle, independent events, dependent events, factorial, permutation, combination ◆ Identify a tree diagram ◆ Apply fundamental Counting Principle to problems ◆ Identify an independent event ◆ Identify a dependent event ◆ Identify a factorial ◆ Identify a permutation ◆ Identify a combination 	<p>SPECIFIC PROCEDURAL KNOWLEDGE – What I need to do</p> <ul style="list-style-type: none"> ◆ Draw a tree diagram ◆ Solve a problem using the fundamental Counting Principle ◆ Solve a factorial ◆ Add, subtract, multiply and divide factorials ◆ Find the value of a permutation ◆ Find the value of a combination ◆ Reduce a fractional factorial expression ◆ Rewrite a product of consecutive integer factors as a fractional factorial expression 	
UNIT ASSESSMENTS		

(Include tasks related to Dimensions 3 and 4 and Bloom's Taxonomy)

Traditional Assessments: <ul style="list-style-type: none">◆ Unit 1 Assessment◆ Vocabulary Quiz◆ Unit 1 Quizzes	Other Evidence of Learning: <ul style="list-style-type: none">◆ Homework◆ Class work◆ Getting Started Problems
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ACTIVITIES AND LEARNING EXPERIENCES	Resources
Solving Problems using a Tree diagram <ul style="list-style-type: none">◆ S will learn vocabulary using the 4-step vocabulary process (tree diagram)◆ S will do Getting Started activity sheet◆ S will do hands-on activity creating sandwiches◆ T will model tree diagramming and relate to sandwich activity◆ S will do in-class worksheet on tree diagramming◆ T will go over worksheet	<ul style="list-style-type: none">◆ 4-step vocabulary sheets◆ Getting Started problems◆ Sandwich bags with pieces of sandwich to create different sandwiches with one type of bread◆ Tree diagramming worksheet
Solving Problems using the Fundamental Counting Principle <ul style="list-style-type: none">◆ S will learn vocabulary: fundamental Counting Principle, independent events, and dependent events◆ S will do hands-on activity creating outfits◆ S will watch a short video on permutations done by the Boston Red Sox on Smartboard◆ T will model fundamental Counting Principle (independent and dependent events), relate to outfits activity and how to use calculators to solve◆ S will do in-class worksheet on fundamental Counting Principle◆ T will go over worksheet and assign homework	<ul style="list-style-type: none">◆ Sandwich bags with pieces of clothing to create different outfits with different number of pants and shirts◆ Fundamental Counting Principle worksheet◆ Short video on permutations from www.teachertube.com◆ Smartboard◆ Calculators
How to write and Solve Factorials <ul style="list-style-type: none">◆ S will learn vocabulary: factorial◆ S will do Getting Started activity sheet◆ T will model how a factorial is written, its notation, and how to use calculators to solve◆ S will do worksheet on only writing out factorials and notation, not solving◆ T will go over how to write worksheet◆ T will model how a factorial is solved◆ S will do worksheet on notation, writing, and solving factorials◆ T will go over worksheet and assign homework	<ul style="list-style-type: none">◆ Getting Started problems◆ Writing Factorial worksheet◆ Solving Factorial worksheet◆ Calculators
Adding, Subtracting and Multiplying Factorials <ul style="list-style-type: none">◆ S will do Getting Started activity sheet◆ T will model how to add and subtract factorials (with proper notation) and how to use calculators to solve◆ S will do worksheet on notation, writing out, adding and subtracting factorials◆ T will go over adding and subtracting factorials worksheet	<ul style="list-style-type: none">◆ Getting Started problems◆ Adding and Subtracting factorials worksheet◆ Multiplying factorials worksheet◆ Calculators

- ◆ T will model how to multiply factorials (with proper notation) and how to use calculators to solve
- ◆ S will do worksheet on notation, writing out, and multiplying factorials
- ◆ T will go over multiplying factorials worksheet and assign homework

Dividing Factorials and Permutation Basics

- ◆ S will do Getting Started activity sheet
- ◆ T will model how to simplify fractional factorial expressions and create fractional factorial expressions (with and without calculator)
- ◆ S will do worksheet on notation, creating, writing out, and simplifying factorial expressions
- ◆ T will go over simplifying factorials worksheet
- ◆ T will introduce the definition of permutations, model the different formulas of a permutation, model how to use and write out a permutation
- ◆ S will do worksheet on the basics of permutations
- ◆ T will go over permutations worksheet and assign homework

Permutations with repetition

- ◆ S will do Getting Started activity sheet
- ◆ S will watch short video created by the Boston Red Sox over permutations
- ◆ T will model how to solve permutations with repetition (using proper notation), in reading problem form, and using calculators to solve
- ◆ S will do worksheets on notation, writing out, and solving permutations with repetition
- ◆ T will go over permutation worksheets and assign homework

Permutation without repetition

- ◆ S will do Getting Started activity sheet
- ◆ T will model how to solve permutations without repetition (using proper notation), in reading problem form, and using calculators to solve
- ◆ S will do worksheets on notation, writing out, and solving permutations without repetition
- ◆ T will go over permutation worksheets and assign homework

Permutation (arranging problems)

- ◆ S will do Getting Started activity sheet
- ◆ T will refresh students on permutation definition and formulas
- ◆ S will use personal dry erase boards to compete in a game of permutations (to refresh on rules and how to solve)
- ◆ S will do worksheets on notation, writing out, and solving arranging problems (with and without repetition)
- ◆ T will go over arranging worksheets and assign homework

Combination Basics and Listing Combinations

- ◆ S will do Getting Started activity sheet
- ◆ T will introduce the definition of combinations, model the different formulas of a combination, and model how to use and write out a combination problem
- ◆ S will do worksheet on notation and writing out combinations
- ◆ T will go over combination worksheet
- ◆ T will model how to solve listing combinations (with and without calculators)
- ◆ S will do worksheet on listing combinations

- ◆ Getting Started problems
- ◆ Dividing factorials worksheet
- ◆ Basics of permutations worksheet
- ◆ Vocabulary sheet
- ◆ Calculators

- ◆ Getting Started problems
- ◆ Short video by Boston Red Sox on www.teachertube.com
- ◆ Permutations with repetition worksheets (numerical and word)
- ◆ Calculators

- ◆ Getting Started problems
- ◆ Permutations with repetition worksheets (numerical and word)
- ◆ Calculators

- ◆ Getting Started problems
- ◆ Personal dry erase boards
- ◆ Arranging (with and without repetition) worksheets
- ◆ Calculators

- ◆ Getting Started problems
- ◆ Basics of combinations worksheet
- ◆ Listing combinations worksheet
- ◆ Smartboard
- ◆ Vocabulary sheet
- ◆ Calculators

- ◆ T will go over listing combinations worksheet and assign homework

Combinations

- ◆ S will do Getting Started activity sheet
- ◆ T will model how to solve combination problems as repetitive permutations (numerical and word) with and without calculators
- ◆ S will do worksheet on combinations (numerical and word) using proper notation and with or without calculators
- ◆ T will go over combination worksheets and assign homework

Permutations/Combinations Which One?

- ◆ S will do Getting Started activity sheet
- ◆ S will use personal dry erase boards to compete over which problem is a combination or a permutation and then solve
- ◆ T will refresh over definitions, notation, and formulas used in permutations and combinations
- ◆ S will do worksheets on permutation/combination problems (finding out which one is which and writing the formulas used to solve)
- ◆ T will go over worksheets and assign homework

- ◆ Getting Started problems
- ◆ Combination worksheets
- ◆ Smartboard
- ◆ Calculators

- ◆ Getting Started problems
- ◆ Permutation/Combination worksheets
- ◆ Personal dry erase boards
- ◆ Smartboard
- ◆ Vocabulary sheets
- ◆ Calculators

Career Connections

Computer Programmer, Password designer, Restaurant owner, Clothing designer