## Chapter 1 Sequences

### Big Ideas:
- Sequences such as arithmetic and geometric sequences are used to model many real-life phenomena.
- Solutions to problems involving arithmetic and geometric sequences make use of performing operations on algebraic expressions and solving equations.

### Objectives
- Define and illustrate an arithmetic sequence and a geometric sequence
- Solve problems involving arithmetic and geometric sequences

### Content Standards
The learner demonstrates understanding of sequences.

### Performance Standards
The learner is able to generate an arithmetic sequence and a geometric sequence, find the sums of the terms in the sequence, and solve problems involving these sequences.

Create a problem book that consists of real-life word problems involving arithmetic and geometric sequences.
| Lesson 1 Definition, Graph, and Sum of Consecutive Terms of Sequences |
|---|---|---|
| **Topics:**  
  - Basic Concepts on Sequences  
  - General Terms of Sequences  
  - Graphs of Sequences  
  - Sums of Consecutive Terms of Sequences  
| **Objectives**  
  - Define sequence and give examples of sequences  
  - Differentiate a finite sequence from an infinite sequence  
  - Find the terms of a sequence given its general term  
  - Determine the \( n \)th term of a sequence given the rule for it  
  - Graph a given sequence  
  - Find the sum of consecutive terms of a sequence using the summation notation  
| **Corresponding K to 12 Curriculum Standards and Learning Competencies Developed**  
  - The learner . . .  
    - observes and generalizes a pattern.  
    - defines and illustrates a sequence and some types of sequences (e.g., harmonic, Fibonacci).  
| **Performance Tasks (for the Lesson)**  
  - How are the notion of a sequence and a function related?  
  - How can you apply the concepts of sequences in solving real-life problems? |

| Lesson 2 Arithmetic Sequences |
|---|---|---|
| **Topics:**  
  - Basic Concepts on Arithmetic Sequences  
  - General Term of an Arithmetic Sequence  
| **Objectives**  
  - Define arithmetic sequence and give examples of arithmetic sequences  
  - Find the first few terms of an arithmetic sequence given its first term and common difference  
| **Corresponding K to 12 Curriculum Standards and Learning Competencies Developed**  
  - The learner . . .  
    - defines, illustrates, and graphs an arithmetic sequence.  
    - gives examples of an arithmetic sequence.  
    - finds the terms of an arithmetic sequence including the general \( n \)th term of the sequence.  
| **Performance Tasks (for the Lesson)**  
  - How important are arithmetic sequences in solving real-life problems? |
<table>
<thead>
<tr>
<th>Objectives</th>
<th>Corresponding K to 12 Curriculum Standards and Learning Competencies Developed</th>
<th>Performance Tasks (for the Chapter)/ Essential Questions (for the Lesson)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sum of the First $n$ Terms of an Arithmetic Sequence</td>
<td>• finds the sum of the terms of a given arithmetic sequence.</td>
<td>• In what ways are geometric sequences useful?</td>
</tr>
<tr>
<td>• Word Problems Involving Arithmetic Sequences</td>
<td>• solves problems involving sequences and their sums.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Find the $n$th term of an arithmetic sequence given its first term and common difference</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Find the common difference, the first term, or a particular term of an arithmetic sequence given two terms of the sequence</td>
<td></td>
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<tr>
<td></td>
<td>• Insert arithmetic means between two given numbers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Find the sum of the first $n$ terms of an arithmetic sequence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Solve word problems involving arithmetic sequences</td>
<td></td>
</tr>
</tbody>
</table>

**Lesson 3 Geometric Sequences**

**Topics:**
- Basic Concepts on Geometric Sequences
- The $n$th Term of a Geometric Sequence

- Define geometric sequence and give examples of it
- Write the first few terms of a geometric sequence given its first term and its common ratio

The learner . . .
- defines, illustrates, and graphs a geometric sequence.
- gives examples of a geometric sequence.
### Chapter 2 Polynomial Functions

**Big Ideas:** One can use polynomial functions to model relationships between two variables encountered in various fields such as natural sciences, social sciences, and businesses.

**Objectives**
- Define a polynomial function
- Solve problems involving the Remainder Theorem and the Factor Theorem
- Determine the zeros of polynomial functions
- Graph polynomial functions

**Content Standards**
The learner demonstrates understanding of polynomial functions.

**Performance Standards**
The learner is able to explore polynomial functions.

**Corresponding K to 12 Curriculum Standards and Learning Competencies Developed**
- differentiates between a finite sequence and an infinite geometric sequence.
- differentiates between an arithmetic sequence and a geometric sequence.
- finds the terms of a geometric sequence including the general $n$th term of the sequence.
- finds the sum of the terms of a given geometric sequence, both finite and infinite.
- solves problems involving sequences and their sums.

**Performance Tasks (for the Chapter)/Essential Questions (for the Lesson)**
Create a PowerPoint presentation of at least five applications of polynomial functions in real-life situations and various fields of study.
<table>
<thead>
<tr>
<th>Chapter Number and Title and Big Ideas/ Lesson Number and Title and Topics</th>
<th>Objectives</th>
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<th>Performance Tasks (for the Chapter)/ Essential Questions (for the Lesson)</th>
</tr>
</thead>
</table>
| **Lesson 1 Polynomial Functions of Degree \(n\)** | • Define a polynomial function of degree \(n\)  
• Identify whether a given function is a polynomial function  
• Determine the degree and the leading coefficient of a given polynomial function | The learner . . .  
• defines and describes polynomial functions.  
• recognizes and gives examples of polynomial functions.  
• recognizes that linear and quadratic functions are also polynomial functions. | Are polynomial functions necessary?  
Why or why not? |
| **Lesson 2 The Remainder and Factor Theorems** | Topics:  
• Addition and Multiplication of Polynomials  
• Division of Polynomials  
• The Remainder Theorem  
• The Factor Theorem | • Determine the quotient of two polynomials using long division  
• Find the quotient and remainder of the polynomial \(f(x)\) divided by \(x - c\) using synthetic division  
• State and illustrate the Remainder Theorem  
• State and illustrate the Factor Theorem | The learner . . .  
• differentiates between polynomial functions and polynomial expressions.  
• recalls how to perform operations on polynomial expressions.  
• describes, illustrates, and performs the synthetic division process for dividing polynomial expressions by a binomial. | In what way or ways are the Remainder Theorem and Factor Theorem useful? |
<table>
<thead>
<tr>
<th>Chapter Number and Title and Big Ideas/ Lesson Number and Title and Topics</th>
<th>Objectives</th>
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<th>Performance Tasks (for the Chapter)/ Essential Questions (for the Lesson)</th>
</tr>
</thead>
</table>
|  |  | • states the Remainder Theorem and provides a proof of the theorem.  
• states the Factor Theorem and provides a proof of the theorem.  
• factors polynomial expressions using synthetic division, the Remainder Theorem, and the Factor Theorem. |  |

### Lesson 3 Zeros of Polynomial Functions

**Topics:**
- The Rational Zero Theorem
- Descartes’s Rule of Signs
- Upper and Lower Bounds of Zeros of Polynomial Functions

**Objectives:**
- State and illustrate the Rational Zero Theorem
- Use the Descartes’s Rule of Signs to find the possible number of positive and negative real zeros of a given polynomial function
- Determine if the given value is an upper or a lower bound of the zeros of a polynomial function

**The learner . . .**
- finds the zeros of polynomial functions.
- solves problems involving factors and zeros of polynomial functions.

**In what way or ways are the Rational Zero Theorem and Descartes’s Rule of Signs useful?**
<table>
<thead>
<tr>
<th>Chapter Number and Title and Big Ideas/Lesson Number and Title and Topics</th>
<th>Objectives</th>
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<th>Performance Tasks (for the Chapter)/Essential Questions (for the Lesson)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Find the zeros of polynomial functions whose degrees are greater than 2 using the Factor Theorem, factoring, synthetic division, and depressed equations</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Lesson 4 Graphs of Polynomial Functions**

*Topics:*
- Characteristics of the Graphs of Polynomial Functions
- Steps in Graphing a Polynomial Function

<table>
<thead>
<tr>
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<th>Performance Tasks (for the Chapter)/Essential Questions (for the Lesson)</th>
</tr>
</thead>
</table>
| • Recognize the characteristics of graphs of polynomial functions  
• Graph polynomial functions whose degrees are greater than 2 | The learner sketches graphs of polynomial functions. | In what way or ways are graphs of polynomial functions useful? |
### Chapter 3  Circles

**Big Ideas:** Circles, along with tangent and secant lines, have interesting properties that make them useful in many real-life situations.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Corresponding K to 12 Curriculum Standards and Learning Competencies Developed</th>
<th>Performance Tasks (for the Chapter)</th>
</tr>
</thead>
</table>
| - Define, identify, and illustrate the parts of a circle | Content Standards  
The learner demonstrates understanding of the concepts of circles. | Create and design at least five geometric constructions involving circles, tangents, secants, inscribed or circumscribed polygons, and other related curves. Compile them in a mini book entitled “Geometric Constructions Mini Book on Circles and Curves.” Include the step-by-step instructions, important properties, and real-life applications of each geometric construction in the mini book. |
| - Derive the relationships among chords, arcs, central angles, and inscribed angles | Performance Standards  
The learner is able to find parts of a circle and solve problems involving the circle and its parts. | |
| - State and prove the theorems relating chords, arcs, central angles, and inscribed angles | | |
| - Define and illustrate lines tangent and secant to a circle | | |
| - State, prove, and apply the properties of tangent and secant lines | | |
| - Determine the degree measures of arcs and angles of a circle, and those formed by tangent and secant lines | | |
| - Solve problems involving circles, secant, and tangent lines | | |
### Lesson 1 Arcs and Angles

**Topics:**
- Basic Concepts on Circles
- Central Angles
- Arcs Formed by Central Angles
- Arc Measures
- Inscribed Angles

**Objectives:**
- Identify and illustrate the key concepts related to circles
- Define, identify, and illustrate minor arcs, major arcs, and semicircles in a circle
- Define, identify, and illustrate central angles and inscribed angles
- Determine the degree measures of arcs and angles of a circle
- Derive the relation among chords, arcs, central angles, and inscribed angles
- State and prove the theorems relating chords, arcs, central angles, and inscribed angles

**Corresponding K to 12 Curriculum Standards and Learning Competencies Developed:**
- The learner . . .
  - defines, identifies, and illustrates the parts of a circle: the center, radius, diameter, interior and exterior, chord, arc, central angle, and inscribed angle.
  - derives the relation among chords, arcs, central angles, and inscribed angles.
  - states and proves the theorems relating chords, arcs, central angles, and inscribed angles.

**Performance Tasks (for the Chapter)/Essential Questions (for the Lesson):**
- What properties of circles make it suitable to use in various real-life situations?

### Lesson 2 Tangent and Secant Lines

**Topics:**
- Tangent Lines
- Angles Formed by Secant and Tangent Lines

**Objectives:**
- Define secant and tangent lines and segments
- Draw and illustrate tangent and secant lines to a circle

**Corresponding K to 12 Curriculum Standards and Learning Competencies Developed:**
- The learner . . .
  - defines secant and tangent lines and segments, and sector of a circle.

**Performance Tasks (for the Chapter)/Essential Questions (for the Lesson):**
- How do you use the properties of arcs and angles formed by tangents and secants to a circle in real-life situations?
### Objectives
- State and apply the properties of tangent and secant lines
- Determine the measures of angles formed by tangent and secant lines
- State and prove theorems on secant and tangent lines
- Solve problems involving secant and tangent lines

### Corresponding K to 12 Curriculum Standards and Learning Competencies Developed
- States and prove theorems on secant and tangent lines and segments.
- Solves problems that involve parts of circles.

### Chapter 4 Plane Coordinate Geometry

**Big Ideas:** Many geometric properties can be justified or proven using coordinate proofs.

- Derive and apply the distance and midpoint formulas
- Use coordinate proofs to verify properties of geometric figures
- Solve problems involving geometric figures on the coordinate plane
- Determine the equation of a circle and express it in different forms
- Find the center and radius of a circle given its equation
- Sketch the graph of a circle on the coordinate plane

**Content Standards**
The learner demonstrates understanding of concepts of circles.

**Performance Standards**
The learner is able to explore geometric figures on the rectangular coordinate plane.

Create a portfolio that consists of at least five coordinate proofs of geometric conjectures or theorems and the extension of the concepts in two-dimensional coordinate system to three-dimensional space.
<table>
<thead>
<tr>
<th>Chapter Number and Title and Big Ideas/ Lesson Number and Title and Topics</th>
<th>Objectives</th>
<th>Corresponding K to 12 Curriculum Standards and Learning Competencies Developed</th>
<th>Performance Tasks (for the Chapter)/ Essential Questions (for the Lesson)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lesson 1 Coordinate Proofs</strong>&lt;br&gt;Topics:&lt;br&gt;- The Distance Formula&lt;br&gt;- The Midpoint Formula&lt;br&gt;- Coordinate Proofs of Geometric Theorems</td>
<td>- Derive and apply the distance formula&lt;br&gt;- Derive and apply the midpoint formula&lt;br&gt;- Use coordinate proofs to verify properties of geometric figures&lt;br&gt;- Solve problems involving geometric figures in the coordinate plane</td>
<td>The learner . . .&lt;br&gt;- derives the distance formula between two points on the plane.&lt;br&gt;- applies the distance formula to derive and prove some geometric properties.&lt;br&gt;- solves problems involving geometric figures in the coordinate plane.</td>
<td>- How do you find the shortest distance between two locations?&lt;br&gt;- How do you prove geometric concepts and properties using the coordinate plane?&lt;br&gt;- How do you apply both geometry and algebra in solving real-life problems?</td>
</tr>
<tr>
<td><strong>Lesson 2 Circles on the Coordinate Plane</strong>&lt;br&gt;Topics:&lt;br&gt;- Forms of Equations of Circles&lt;br&gt;- Equations of Circles Tangent to a Line</td>
<td>- State and derive the center-radius form of the equation of a circle&lt;br&gt;- Determine the equation of a circle given its center and radius</td>
<td>The learner . . .&lt;br&gt;- derives and states the center-radius form of the equation of a circle.&lt;br&gt;- finds the center and radius of a circle given its equation and vice versa.</td>
<td>How do you relate the geometric and algebraic properties of circles using the coordinate plane, and apply them in solving real-life situations?</td>
</tr>
<tr>
<td>Chapter Number and Title and Big Ideas/ Lesson Number and Title and Topics</td>
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</tr>
</tbody>
</table>
|  | • Find the center and radius of a circle given its equation  
• Determine the equation of a circle given its radius and the point of tangency  
• Sketch the graph of a circle on the coordinate plane  
• Solve problems involving circles on the coordinate plane | • sketches the graph of a circle on the coordinate plane.  
• solves problems involving geometric figures in the coordinate plane. |  |

**Chapter 5 Measures of Position and Skewness**

**Big Ideas:** Measures of position and skewness are important numerical measures in describing and analyzing a statistical data set.

|  | Define and describe the measures of position and skewness  
| Describe a statistical data set using the measures of position and skewness | Content Standards  
The learner demonstrates understanding of measures of position.  
**Performance Standards**  
The learner is able to describe a set of data using measures of position. | Gather data on the scores in past examinations of your class. Analyze the distribution of the data by calculating the measures of position and skewness. Draw the boxplot of the data set. Include a report on the computations and descriptions of the obtained data. |
<table>
<thead>
<tr>
<th>Lesson 1 Measures of Position</th>
<th>Objective</th>
<th>Corresponding K to 12 Curriculum Standards and Learning Competencies Developed</th>
<th>Performance Tasks (for the Lesson)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Topics:</strong></td>
<td></td>
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</tr>
<tr>
<td>• Percentiles</td>
<td></td>
<td>• Define and describe the following measures of position: quartiles, deciles, and percentiles</td>
<td>Why is it important to know the measures of position in describing a particular data set?</td>
</tr>
<tr>
<td>• Quartiles</td>
<td></td>
<td>• Explain and interpret quartiles, deciles, and percentiles</td>
<td></td>
</tr>
<tr>
<td>• Deciles</td>
<td></td>
<td>• Calculate percentiles of a set of data</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Use measures of position to describe a data set and infer some information about the data</td>
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<tr>
<td></td>
<td></td>
<td>• Solve problems involving quartiles, deciles, and percentiles</td>
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<tr>
<td>The learner . . .</td>
<td></td>
<td>• defines and describes the following measures of position: quartiles, deciles, and percentiles</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• explains and interprets quartiles, deciles, and percentiles</td>
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<td></td>
<td></td>
<td>• calculates specified percentiles (e.g., 90th percentile) of a set of data</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• uses measures of position to describe a set of data and infers some information about the data</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• solves problems involving quartiles, deciles, and percentiles</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Lesson 2 Measure of Skewness and Boxplot</th>
<th>Objective</th>
<th>Corresponding K to 12 Curriculum Standards and Learning Competencies Developed</th>
<th>Performance Tasks (for the Lesson)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Topics:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Types of Distributions</td>
<td></td>
<td>• Define and describe the measure of skewness</td>
<td>How can the relationship among the measures of central tendency, namely, mean, median, and mode affect the distribution of a set of data?</td>
</tr>
<tr>
<td>• Coefficient of Skewness</td>
<td></td>
<td>• Use the measure of skewness to describe a set of data and infer some information about the data</td>
<td></td>
</tr>
<tr>
<td>• Boxplots</td>
<td></td>
<td>• Construct a boxplot from a set of data</td>
<td></td>
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<tr>
<td>The learner constructs a boxplot from a set of data.</td>
<td></td>
<td></td>
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</tbody>
</table>
**Chapter 6 Counting Techniques and Probability of Events**

**Big Ideas:**
- Counting techniques are used to calculate the number of outcomes in a particular experiment.
- Knowing how to count the possible outcomes in an experiment or a situation is essential in calculating probability of events.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Content Standards</th>
<th>Performance Tasks (for the Lesson)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Count the number of occurrences of an event using different counting techniques&lt;br&gt;- Determine the probabilities of events&lt;br&gt;- Solve problems involving the concepts of probability</td>
<td>The learner demonstrates understanding of basic combinational concepts and probability.</td>
<td>Role-play or simulate real-life situations that involve the applications of the different counting techniques.</td>
</tr>
<tr>
<td><strong>Lesson 1 Counting Techniques</strong></td>
<td><strong>Performance Standards</strong></td>
<td>How can you apply the different counting techniques in real-life situations?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Topics:</th>
<th>The learner . . .</th>
<th>How can you apply the different counting techniques in real-life situations?</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Fundamental Counting Principle&lt;br&gt;- Permutations&lt;br&gt;- Combinations</td>
<td>- counts the number of occurrences of an event using (a) a grid table, (b) a tree diagram, and (c) systematic listing.</td>
<td></td>
</tr>
<tr>
<td>Chapter Number and Title and Big Ideas/ Lesson Number and Title and Topics</td>
<td>Objectives</td>
<td>Corresponding K to 12 Curriculum Standards and Learning Competencies Developed</td>
</tr>
<tr>
<td>---</td>
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</tr>
<tr>
<td>- Use the Fundamental Counting Principle to determine the number of ways a task can be carried out</td>
<td>- uses the Fundamental Counting Principle to count the number of arrangements or ways that a task can be carried out.</td>
<td>- uses the Fundamental Counting Principle to count the number of arrangements or ways that a task can be carried out.</td>
</tr>
<tr>
<td>- Recognize groupings that require order and groupings that do not require order</td>
<td>- recognizes groupings that require order and groupings that do not require order.</td>
<td>- recognizes groupings that require order and groupings that do not require order.</td>
</tr>
<tr>
<td>- Define permutation and combination</td>
<td>- defines a permutation of ( n ) objects taken ( r ) at a time.</td>
<td>- defines a permutation of ( n ) objects taken ( r ) at a time.</td>
</tr>
<tr>
<td>- Derive the formulas for finding the permutation and combination of ( n ) objects taken ( r ) at a time</td>
<td>- derives and uses the formula for finding the permutation of ( n ) objects taken ( r ) at a time.</td>
<td>- derives and uses the formula for finding the permutation of ( n ) objects taken ( r ) at a time.</td>
</tr>
<tr>
<td>- Find the permutation of ( n ) objects taken ( r ) at a time</td>
<td>- defines a combination of ( n ) objects taken ( r ) at a time as a subset.</td>
<td>- defines a combination of ( n ) objects taken ( r ) at a time as a subset.</td>
</tr>
<tr>
<td>- Find the combination of ( n ) objects taken ( r ) at a time</td>
<td>- derives and uses the formula for finding the number of combinations of ( n ) objects taken ( r ) at a time.</td>
<td>- derives and uses the formula for finding the number of combinations of ( n ) objects taken ( r ) at a time.</td>
</tr>
<tr>
<td>- Explain the relationship of a permutation to a combination of ( n ) objects taken ( r ) at a time</td>
<td>- explains the relationship of a permutation to a combination of ( n ) objects taken ( r ) at a time.</td>
<td>- explains the relationship of a permutation to a combination of ( n ) objects taken ( r ) at a time.</td>
</tr>
<tr>
<td>- Solve problems involving permutations and combinations</td>
<td>- solves problems involving permutations and combinations.</td>
<td>- solves problems involving permutations and combinations.</td>
</tr>
<tr>
<td>Chapter Number and Title and Big Ideas/Lesson Number and Title and Topics</td>
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<td>Corresponding K to 12 Curriculum Standards and Learning Competencies Developed</td>
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</tr>
</tbody>
</table>
| Lesson 2 Probability of Events | Topics:  
- Sample Spaces and Events  
- Complement of an Event  
- Operations on Events  
- Theoretical Probability  
- Probability Rules | Recognize events, union of events, and intersection of events  
- Define the probability of the union of two events  
- Find the probability of \( P(A \cup B) \) and \( P(A \cap B) \)  
- Define events that are independent  
- Solve problems on probability involving union and intersection of events | The learner . . .  
- recognizes events, union of events, and intersection of events.  
- finds the cardinality of a union of two sets \( A \) and \( B \).  
- defines the probability of a union of two events using the definition of the probability of an event \( E \).  
- finds the probability \( P(A \cup B) \).  
- defines events that are independent.  
- finds the probability \( P(A \cap B) \).  
- solves problems involving probabilities of union and intersection of events. | How can recognizing the union and intersection of events be used in solving problems involving probability of compound events? |