

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 1: Basic Trigonometry, Unit 1 The Pythagorean Theorem**

<b>Stage 1 - Desired Results</b>	
<p><b>Established Goal(s):</b></p> <p>Most students will already be somewhat familiar with the Pythagorean Theorem so this unit should focus on ensuring that students understand the theorem in relationship to solving problems involving right triangles.</p>	
<p><b>Understanding(s):</b> <i>Students will understand ...</i></p> <ul style="list-style-type: none"> <li>• Discuss the six primary trigonometric functions using proper English terminology and notation.</li> <li>• Understand and discuss the domain and range for each of the six primary trigonometric functions.</li> <li>• Identify the graphs of the six primary trigonometric functions.</li> <li>• Graph the six primary trigonometric functions.</li> </ul>	<p><b>Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• How do we know the Pythagorean Theorem is true?</li> <li>• How can we generate whole number solutions to the Pythagorean theorem?</li> </ul>
<p><b>Knowledge:</b> <i>Students will know ...</i></p> <ul style="list-style-type: none"> <li>• How to state and prove the Pythagorean Theorem</li> <li>• Identify Pythagorean Triples</li> <li>• How to solve any quadratic equation that has real roots</li> <li>• How to identify a quadratic equation that doesn't have real roots</li> </ul>	<p><b>Skills:</b> <i>Student will be able to:</i></p> <ul style="list-style-type: none"> <li>• State and prove the Pythagorean Theorem</li> <li>• Discuss right triangles and in particular special right triangles <ul style="list-style-type: none"> <li>○ <math>30^\circ, 60^\circ, 90^\circ</math></li> <li>○ <math>45^\circ, 45^\circ, 90^\circ</math></li> <li>○ 3, 4, 5</li> <li>○ Etc.</li> </ul> </li> <li>• A proper understanding of the quadratic formula <ul style="list-style-type: none"> <li>○ <math display="block">x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \text{ for}</math> <math display="block">ax^2 + bx + c = 0</math></li> </ul> </li> </ul>
<b>Stage 2 - Assessment Evidence</b>	

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

**Performance Task(s):**

To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.

- Comprehension (true/false, definitions, identifying topics and themes, etc.)
- Solving pure mathematical problems as well as word problems.
- Discussions and presentations
- Group project that involves research and report writing
- Homework assignments

**Other Evidence:**

The following will also be observed, recorded, and considered for the final grade of students in each lesson activity

- Motivation
- Engagement
- Collaboration
- Communication pattern among peers and with the teacher
- Reactions
- Respect to others and different opinions

**Stage 3 – Learning Plan**

**Learning Activities:**

In this course, students are involved in a variety of class activities to understand mathematics at a deeper level, to transfer their knowledge to other contexts, and to improve their skills of working with mathematics in the form of discussion, presentation, and interaction. In so doing, students demonstrate their ability to use English mathematical language and notation appropriate to their grade level. The following is a summary of lesson activities for the course.

**1. Individual/pair/small group activity**

Students practice and improve solving pure mathematical problems for the general topic, looking for connections with previous topics, using notation and terminology, identifying a sequence to solve a problem, inferring mathematics from written English, and solving real-world problems.

**2. Discussion and presentation:**

Students in pair or in small groups will discuss a topic or an issue given. After a certain time, they will share their ideas with the class. This activity will boost student imagination and creativity, help them understand that mathematics is more than calculating, and improve cooperation and collaboration with peers.

**3. Critical Thinking Activities**

Students are involved in more challenging discussions and activities at grade level that are related to higher-order thinking skills according to the revised Bloom's Taxonomy as below:

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

***Applying***

Students can apply their knowledge on mathematical concepts to other contexts in their lives after reading. Student application of their knowledge will be demonstrated during the class activities, such as discussion, presentation, peer-review, and problem-solving.

***Analyzing***

Students can compare and contrast different methods for solving problems. Students also analyze different types of problems without a clearcut solution laid out for them. Finally, students will also analyze their peers board work and presentations. Students will gain an appreciation for peer-review, which is a fundamental element of both mathematics and science.

***Evaluating***

Students can evaluate possible solutions to a problem and settle on the one that will best solve the problem at hand. Students will also evaluate the work of their peers and suggest alternative methods for solving problems. In doing so, students will gain a deeper understanding and appreciation for mathematics and mathematical thinking.

***Creating***

Students can demonstrate their creativity and imagination by working challenging problems based on their lesson. Some activities will involve solving real-world problems from a variety of disciplines. These problems will be different from the standard word problem as they will draw on the student's ability to link various aspects of mathematics together in order to solve the problem.

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 1, Unit 1 Trigonometric Functions and Ratios**

<b>Stage 1 - Desired Results</b>	
<p><b>Established Goal(s):</b></p> <p>At the end of the unit, students will be able to:</p> <ul style="list-style-type: none"> <li>• Identify and define the six primary trig functions.</li> <li>• Identify the domain for each of the six primary trig functions.</li> <li>• Graph the six primary trig functions.</li> </ul>	
<p><b>Understanding(s):</b>  <i>Students will understand ...</i></p> <ul style="list-style-type: none"> <li>• Discuss the six primary trigonometric functions using proper English terminology and notation.</li> <li>• Understand and discuss the domain and range for each of the six primary trigonometric functions.</li> <li>• Identify the graphs of the six primary trigonometric functions.</li> <li>• Graph the six primary trigonometric functions.</li> </ul>	<p><b>Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• How do we find the domain and range for the trigonometric functions?</li> <li>• Can we graph the trigonometric functions the same way we can graph other functions?</li> </ul>
<p><b>Knowledge:</b>  <i>Students will know ...</i></p> <ul style="list-style-type: none"> <li>• The six primary trigonometric functions using proper English terminology and notation.</li> <li>• The graphs of the six primary trigonometric functions.</li> </ul>	<p><b>Skills:</b>  <i>Student will be able to:</i></p> <ul style="list-style-type: none"> <li>• Identify and define the six primary trig functions.</li> <li>• Identify the domain for each of the six primary trig functions.</li> <li>• Graph the six primary trig functions.</li> </ul>
<b>Stage 2 - Assessment Evidence</b>	
<p><b>Performance Task(s):</b></p> <p>To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.</p>	<p><b>Other Evidence:</b></p> <p>The following will also be observed, recorded, and considered for the final grade of students in each lesson activity</p> <ul style="list-style-type: none"> <li>• Motivation</li> <li>• Engagement</li> <li>• Collaboration</li> </ul>

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

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| <ul style="list-style-type: none"><li>• Comprehension (true/false, definitions, identifying topics and themes, etc.)</li><li>• Solving pure mathematical problems as well as word problems.</li><li>• Discussions and presentations</li><li>• Group project that involves research and report writing</li><li>• Homework assignments</li></ul> | <ul style="list-style-type: none"><li>• Communication pattern among peers and with the teacher</li><li>• Reactions</li><li>• Respect to others and different opinions</li></ul> |
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**Stage 3 – Learning Plan**

**Learning Activities:**

In this course, students are involved in a variety of class activities to understand mathematics at a deeper level, to transfer their knowledge to other contexts, and to improve their skills of working with mathematics in the form of discussion, presentation, and interaction. In so doing, students demonstrate their ability to use English mathematical language and notation appropriate to their grade level. The following is a summary of lesson activities for the course.

**1. Individual/pair/small group activity**

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**2. Discussion and presentation:**

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**3. Critical Thinking Activities**

Students are involved in more challenging discussions and activities at grade level that are related to higher-order thinking skills according to the revised Bloom's Taxonomy as below:

***Applying***

Students can apply their knowledge on mathematical concepts to other contexts in their lives after reading. Student application of their knowledge will be demonstrated during the class activities, such as discussion, presentation, peer-review, and problem-solving.

***Analyzing***

Students can compare and contrast different methods for solving problems. Students also analyze different types of problems without a clearcut solution laid out for them. Finally, students will also analyze their peers board

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

work and presentations. Students will gain an appreciation for peer-review, which is a fundamental element of both mathematics and science.

***Evaluating***

Students can evaluate possible solutions to a problem and settle on the one that will best solve the problem at hand. Students will also evaluate the work of their peers and suggest alternative methods for solving problems. In doing so, students will gain a deeper understanding and appreciation for mathematics and mathematical thinking.

***Creating***

Students can demonstrate their creativity and imagination by working challenging problems based on their lesson. Some activities will involve solving real-world problems from a variety of disciplines. These problems will be different from the standard word problem as they will draw on the student's ability to link various aspects of mathematics together in order to solve the problem.

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 1, Unit 3 Trigonometric Identities**

<b>Stage 1 - Desired Results</b>	
<p><b>Established Goal(s):</b></p> <p>This unit will introduce students to some fundamental trig identities.</p>	
<p><b>Understanding(s):</b> <i>Students will understand ...</i></p> <ul style="list-style-type: none"> <li>• Pythagorean identities</li> <li>• Angle Sum and Difference Identities</li> <li>• Double-Angle Identities</li> <li>• Half-Angle Identities</li> <li>• Sum Identities</li> <li>• Product Identities</li> </ul>	<p><b>Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• How can we apply the trigonometry ratios to prove results about the trigonometric functions?</li> </ul>
<p><b>Knowledge:</b> <i>Students will know ...</i></p> <ul style="list-style-type: none"> <li>• The most common trigonometric identities</li> <li>• How to prove some Pythagorean identities</li> </ul>	<p><b>Skills:</b> <i>Student will be able to:</i></p> <ul style="list-style-type: none"> <li>• Prove some Pythagorean identities</li> <li>• Discuss and use the most common trig identities</li> </ul>
<b>Stage 2 - Assessment Evidence</b>	
<p><b>Performance Task(s):</b></p> <p>To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.</p> <ul style="list-style-type: none"> <li>• Comprehension (true/false, definitions, identifying topics and themes, etc.)</li> <li>• Solving pure mathematical problems as well as</li> </ul>	<p><b>Other Evidence:</b></p> <p>The following will also be observed, recorded, and considered for the final grade of students in each lesson activity</p> <ul style="list-style-type: none"> <li>• Motivation</li> <li>• Engagement</li> <li>• Collaboration</li> <li>• Communication pattern among peers and with the teacher</li> <li>• Reactions</li> </ul>

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

word problems.

- Discussions and presentations
- Group project that involves research and report writing
- Homework assignments

- Respect to others and different opinions

### Stage 3 – Learning Plan

#### **Learning Activities:**

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#### **1. Individual/pair/small group activity**

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#### **2. Discussion and presentation:**

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#### **3. Critical Thinking Activities**

Students are involved in more challenging discussions and activities at grade level that are related to higher-order thinking skills according to the revised Bloom's Taxonomy as below:

#### ***Applying***

Students can apply their knowledge on mathematical concepts to other contexts in their lives after reading. Student application of their knowledge will be demonstrated during the class activities, such as discussion, presentation, peer-review, and problem-solving.

#### ***Analyzing***

Students can compare and contrast different methods for solving problems. Students also analyze different types of problems without a clearcut solution laid out for them. Finally, students will also analyze their peers board work and presentations. Students will gain an appreciation for peer-review, which is a fundamental element of both mathematics and science.

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

***Evaluating***

Students can evaluate possible solutions to a problem and settle on the one that will best solve the problem at hand. Students will also evaluate the work of their peers and suggest alternative methods for solving problems. In doing so, students will gain a deeper understanding and appreciation for mathematics and mathematical thinking.

***Creating***

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The Asian International School  
 Unit Backward Design  
 Mathematics, Upper-Intermediate, 2018-2019  
 Chapter 1, Unit 4 Inverse Trigonometric Functions

**Stage 1 - Desired Results**

**Established Goal(s):**

At the end of the unit, students will be able to:

- Solve basic trig equations using sin, cos, tan, cot.
- Use proper notation for inverses of the trig functions  $\sin^{-1}(\theta)$ .
- Solve basic trig equations using sec and csc.

**Understanding(s):**  
*Students will understand ...*

- Solving trigonometric equations.
- How to set up trigonometric equations from word problems.

**Essential Question(s):**

- How do we solve trigonometric equations?
- Is there an operation for the trigonometric functions that is analogous to division or subtraction for the real numbers?

**Knowledge:**  
*Students will know ...*

- How to discuss basic trigonometric equations and their solutions using proper English terminology and notation.
- How to solve word problems involving basic trigonometric equations.

**Skills:**  
*Student will be able to:*

- Solve basic trig equations using sin, cos, tan, cot.
- Use proper notation for inverses of the trig functions  $\sin^{-1}(\theta)$ .
- Solve basic trig equations using sec and csc.

**Stage 2 - Assessment Evidence**

**Performance Task(s):**

To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.

- Comprehension (true/false, definitions,

**Other Evidence:**

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- Motivation
- Engagement
- Collaboration
- Communication pattern among peers and with

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

identifying topics and themes, etc.) <ul style="list-style-type: none"> <li>• Solving pure mathematical problems as well as word problems.</li> <li>• Discussions and presentations</li> <li>• Group project that involves research and report writing</li> <li>• Homework assignments</li> </ul>	the teacher <ul style="list-style-type: none"> <li>• Reactions</li> <li>• Respect to others and different opinions</li> </ul>
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**Stage 3 – Learning Plan**

**Learning Activities:**

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 2: Trigonometry in the Circle, Unit 1 Arc and Angles**

<b>Stage 1 - Desired Results</b>	
<b>Established Goal(s):</b>  This unit will introduce students to the unit circle, radians, and arcs.	
<b>Understanding(s):</b> <i>Students will understand ...</i> <ul style="list-style-type: none"> <li>• The Unit Circle</li> <li>• Radians and Angles in the Circle</li> <li>• Arcs</li> <li>• Measuring Arcs and Representing Arcs in the Circle</li> </ul>	<b>Essential Question(s):</b> <ul style="list-style-type: none"> <li>• How do write an equation for a circle?</li> <li>• Is there anything special about a circle of radius 1?</li> </ul>
<b>Knowledge:</b> <i>Students will know ...</i> <ul style="list-style-type: none"> <li>• What the unit circle is</li> <li>• The equation of the unit circle</li> <li>• What radians are</li> <li>• What arcs are and how to measure arc length</li> </ul>	<b>Skills:</b> <i>Student will be able to:</i> <ul style="list-style-type: none"> <li>• Discuss the unit circle</li> <li>• Measure arc length</li> <li>• Represent arcs in a circle</li> </ul>
<b>Stage 2 - Assessment Evidence</b>	
<b>Performance Task(s):</b>  To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades. <ul style="list-style-type: none"> <li>• Comprehension (true/false, definitions, identifying topics and themes, etc.)</li> <li>• Solving pure mathematical problems as well as word problems.</li> </ul>	<b>Other Evidence:</b>  The following will also be observed, recorded, and considered for the final grade of students in each lesson activity <ul style="list-style-type: none"> <li>• Motivation</li> <li>• Engagement</li> <li>• Collaboration</li> <li>• Communication pattern among peers and with the teacher</li> <li>• Reactions</li> <li>• Respect to others and different opinions</li> </ul>

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

- Discussions and presentations
- Group project that involves research and report writing
- Homework assignments

**Stage 3 – Learning Plan**

**Learning Activities:**

In this course, students are involved in a variety of class activities to understand mathematics at a deeper level, to transfer their knowledge to other contexts, and to improve their skills of working with mathematics in the form of discussion, presentation, and interaction. In so doing, students demonstrate their ability to use English mathematical language and notation appropriate to their grade level. The following is a summary of lesson activities for the course.

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***Evaluating***

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

Students can evaluate possible solutions to a problem and settle on the one that will best solve the problem at hand. Students will also evaluate the work of their peers and suggest alternative methods for solving problems. In doing so, students will gain a deeper understanding and appreciation for mathematics and mathematical thinking.

***Creating***

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 2, Unit 2 Trigonometric Functions in the Unit Circle**

<b>Stage 1 - Desired Results</b>	
<p><b>Established Goal(s):</b></p> <p>In this unit students will be introduced to the trig functions in the context of the unit circle.</p>	
<p><b>Understanding(s):</b> <i>Students will understand ...</i></p> <ul style="list-style-type: none"> <li>The trigonometric functions in the unit circle</li> </ul>	<p><b>Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>How can we define the trigonometric functions in the unit circle?</li> </ul>
<p><b>Knowledge:</b> <i>Students will know ...</i></p> <ul style="list-style-type: none"> <li>Sine and Cosine in the Unit Circle</li> <li>The Other Trig Functions in the Unit Circle</li> </ul>	<p><b>Skills:</b> <i>Student will be able to:</i></p> <ul style="list-style-type: none"> <li>Define the trigonometric functions in terms of the unit circle</li> </ul>
<b>Stage 2 - Assessment Evidence</b>	
<p><b>Performance Task(s):</b></p> <p>To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.</p> <ul style="list-style-type: none"> <li>Comprehension (true/false, definitions, identifying topics and themes, etc.)</li> <li>Solving pure mathematical problems as well as word problems.</li> <li>Discussions and presentations</li> <li>Group project that involves research and report writing</li> <li>Homework assignments</li> </ul>	<p><b>Other Evidence:</b></p> <p>The following will also be observed, recorded, and considered for the final grade of students in each lesson activity</p> <ul style="list-style-type: none"> <li>Motivation</li> <li>Engagement</li> <li>Collaboration</li> <li>Communication pattern among peers and with the teacher</li> <li>Reactions</li> <li>Respect to others and different opinions</li> </ul>

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

**Stage 3 – Learning Plan**

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***Creating***

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 2, Unit 3 Trigonometric Identities**

<b>Stage 1 - Desired Results</b>	
<p><b>Established Goal(s):</b></p> <p>This unit will introduce students to some fundamental trig identities in the unit circle.</p>	
<p><b>Understanding(s):</b> <i>Students will understand ...</i></p> <ul style="list-style-type: none"> <li>• Pythagorean identities in the unit circle</li> <li>• Angle Sum and Difference Identities in the unit circle</li> <li>• Double-Angle Identities in the unit circle</li> <li>• Half-Angle Identities in the unit circle</li> <li>• Sum Identities in the unit circle</li> <li>• Product Identities in the unit circle</li> </ul>	<p><b>Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• How do the trigonometric identities work in the unit circle?</li> </ul>
<p><b>Knowledge:</b> <i>Students will know ...</i></p> <ul style="list-style-type: none"> <li>• The most common trigonometric identities in the unit circle</li> <li>• How to prove some Pythagorean identities in the unit circle</li> </ul>	<p><b>Skills:</b> <i>Student will be able to:</i></p> <ul style="list-style-type: none"> <li>• Prove some Pythagorean identities in the unit circle</li> <li>• Discuss and use the most common trig identities in the unit circle</li> </ul>
<b>Stage 2 - Assessment Evidence</b>	
<p><b>Performance Task(s):</b></p> <p>To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.</p> <ul style="list-style-type: none"> <li>• Comprehension (true/false, definitions, identifying topics and themes, etc.)</li> </ul>	<p><b>Other Evidence:</b></p> <p>The following will also be observed, recorded, and considered for the final grade of students in each lesson activity</p> <ul style="list-style-type: none"> <li>• Motivation</li> <li>• Engagement</li> <li>• Collaboration</li> <li>• Communication pattern among peers and with the teacher</li> </ul>

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

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| <ul style="list-style-type: none"><li>• Solving pure mathematical problems as well as word problems.</li><li>• Discussions and presentations</li><li>• Group project that involves research and report writing</li><li>• Homework assignments</li></ul> | <ul style="list-style-type: none"><li>• Reactions</li><li>• Respect to others and different opinions</li></ul> |
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**Stage 3 – Learning Plan**

**Learning Activities:**

In this course, students are involved in a variety of class activities to understand mathematics at a deeper level, to transfer their knowledge to other contexts, and to improve their skills of working with mathematics in the form of discussion, presentation, and interaction. In so doing, students demonstrate their ability to use English mathematical language and notation appropriate to their grade level. The following is a summary of lesson activities for the course.

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**3. Critical Thinking Activities**

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***Applying***

Students can apply their knowledge on mathematical concepts to other contexts in their lives after reading. Student application of their knowledge will be demonstrated during the class activities, such as discussion, presentation, peer-review, and problem-solving.

***Analyzing***

Students can compare and contrast different methods for solving problems. Students also analyze different types of problems without a clearcut solution laid out for them. Finally, students will also analyze their peers board work and presentations. Students will gain an appreciation for peer-review, which is a fundamental element of both mathematics and science.

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

***Evaluating***

Students can evaluate possible solutions to a problem and settle on the one that will best solve the problem at hand. Students will also evaluate the work of their peers and suggest alternative methods for solving problems. In doing so, students will gain a deeper understanding and appreciation for mathematics and mathematical thinking.

***Creating***

Students can demonstrate their creativity and imagination by working challenging problems based on their lesson. Some activities will involve solving real-world problems from a variety of disciplines. These problems will be different from the standard word problem as they will draw on the student's ability to link various aspects of mathematics together in order to solve the problem.

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 3: Vectors, Unit 1 Introduction to Vectors**

<b>Stage 1 - Desired Results</b>	
<p><b>Established Goal(s):</b></p> <p>This unit will introduce students to the concept of vectors and some basic properties of vectors. At the end of this unit students should be able to discuss vectors and the basic properties of vectors. Teachers should pay close attention to ensure that students use correct notation and terminology.</p>	
<p><b>Understanding(s):</b> <i>Students will understand ...</i></p> <ul style="list-style-type: none"> <li>• Vectors</li> <li>• Unit Vectors</li> <li>• Zero Vector</li> </ul>	<p><b>Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• What are Vectors?</li> <li>• What operations can we perform on vectors?</li> </ul>
<p><b>Knowledge:</b> <i>Students will know ...</i></p> <ul style="list-style-type: none"> <li>• What vectors are</li> <li>• What unit vectors are</li> <li>• What the zero vector is</li> </ul>	<p><b>Skills:</b> <i>Student will be able to:</i></p> <ul style="list-style-type: none"> <li>• Discuss vectors, unit vectors, and the zero vector in 2 and 3 space</li> </ul>
<b>Stage 2 - Assessment Evidence</b>	
<p><b>Performance Task(s):</b></p> <p>To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.</p> <ul style="list-style-type: none"> <li>• Comprehension (true/false, definitions, identifying topics and themes, etc.)</li> <li>• Solving pure mathematical problems as well as word problems.</li> <li>• Discussions and presentations</li> <li>• Group project that involves research and report writing</li> </ul>	<p><b>Other Evidence:</b></p> <p>The following will also be observed, recorded, and considered for the final grade of students in each lesson activity</p> <ul style="list-style-type: none"> <li>• Motivation</li> <li>• Engagement</li> <li>• Collaboration</li> <li>• Communication pattern among peers and with the teacher</li> <li>• Reactions</li> <li>• Respect to others and different opinions</li> </ul>

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

- Homework assignments

**Stage 3 – Learning Plan**

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 3, Unit 2 Addition and Subtraction of Vectors**

<b>Stage 1 - Desired Results</b>	
<p><b>Established Goal(s):</b></p> <p>Students will learn how to add and subtract vectors in <math>2</math>-space and <math>3</math>-space but should be able to extend this knowledge to adding and subtracting vectors in <math>n</math>-space. Students will also be introduced to the first type of multiplication with vectors; multiplication of a vector by a scalar.</p>	
<p><b>Understanding(s):</b> <i>Students will understand ...</i></p> <ul style="list-style-type: none"> <li>• Operations               <ul style="list-style-type: none"> <li>○ Addition</li> <li>○ Subtraction</li> <li>○ Scalar multiplication</li> </ul> </li> <li>•</li> </ul>	<p><b>Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• What basic operations can we perform on vectors?</li> </ul>
<p><b>Knowledge:</b> <i>Students will know ...</i></p> <ul style="list-style-type: none"> <li>• How to add and subtract vectors</li> <li>• How to multiply a vector by a scalar value</li> </ul>	<p><b>Skills:</b> <i>Student will be able to:</i></p> <ul style="list-style-type: none"> <li>• Add vectors in <math>2</math> and <math>3</math>-space</li> <li>• Subtract vectors in <math>2</math> and <math>3</math>-space</li> <li>• Multiply vectors in <math>2</math> and <math>3</math>-space by a scalar value</li> </ul>
<b>Stage 2 - Assessment Evidence</b>	
<p><b>Performance Task(s):</b></p> <p>To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.</p> <ul style="list-style-type: none"> <li>• Comprehension (true/false, definitions, identifying topics and themes, etc.)</li> <li>• Solving pure mathematical problems as well as word problems.</li> <li>• Discussions and presentations</li> <li>• Group project that involves research and</li> </ul>	<p><b>Other Evidence:</b></p> <p>The following will also be observed, recorded, and considered for the final grade of students in each lesson activity</p> <ul style="list-style-type: none"> <li>• Motivation</li> <li>• Engagement</li> <li>• Collaboration</li> <li>• Communication pattern among peers and with the teacher</li> <li>• Reactions</li> <li>• Respect to others and different opinions</li> </ul>

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

report writing

- Homework assignments

### Stage 3 – Learning Plan

#### **Learning Activities:**

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

In doing so, students will gain a deeper understanding and appreciation for mathematics and mathematical thinking.

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 3, Unit 3: Dot Product and Cross Product of Vectors**

<b>Stage 1 - Desired Results</b>	
<p><b>Established Goal(s):</b></p> <p>This unit will introduce students to the dot product and cross product of vectors</p>	
<p><b>Understanding(s):</b> <i>Students will understand ...</i></p> <ul style="list-style-type: none"> <li>• Dot product</li> <li>• Cross Product</li> <li>• Basic Theorems</li> </ul>	<p><b>Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• Can we multiply vectors like we do real numbers?</li> </ul>
<p><b>Knowledge:</b> <i>Students will know how to ...</i></p> <ul style="list-style-type: none"> <li>• Calculate the dot product of vectors</li> <li>• Calculate the cross product of vectors</li> </ul>	<p><b>Skills:</b> <i>Student will be able to:</i></p> <ul style="list-style-type: none"> <li>• Define both dot product and cross product</li> <li>• Calculate both dot products and cross products</li> </ul> <p>Explain how dot products relate to parallel vectors</p>
<b>Stage 2 - Assessment Evidence</b>	
<p><b>Performance Task(s):</b></p> <p>To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.</p> <ul style="list-style-type: none"> <li>• Comprehension (true/false, definitions, identifying topics and themes, etc.)</li> <li>• Solving pure mathematical problems as well as word problems.</li> <li>• Discussions and presentations</li> <li>• Group project that involves research and report writing</li> </ul>	<p><b>Other Evidence:</b></p> <p>The following will also be observed, recorded, and considered for the final grade of students in each lesson activity</p> <ul style="list-style-type: none"> <li>• Motivation</li> <li>• Engagement</li> <li>• Collaboration</li> <li>• Communication pattern among peers and with the teacher</li> <li>• Reactions</li> <li>• Respect to others and different opinions</li> </ul>

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

- Homework assignments

### Stage 3 – Learning Plan

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 4: Statistics, Unit 1: Frequency and Relative Frequency Tables**

<b>Stage 1 - Desired Results</b>	
<p><b>Established Goal(s):</b></p> <p>Students will be introduced to methods for obtaining real-world data. Students will learn how to create frequency tables and relative frequency tables.</p>	
<p><b>Understanding(s):</b> <i>Students will understand ...</i></p> <ul style="list-style-type: none"> <li>• Collecting Real-World Data</li> <li>• Frequency Tables and Relative Frequency Tables</li> <li>• Charts and Graphs</li> </ul>	<p><b>Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• How can we apply mathematics to real world situations?</li> </ul>
<p><b>Knowledge:</b> <i>Students will know how to ...</i></p> <ul style="list-style-type: none"> <li>• Collect real-world data</li> <li>• Generate frequency tables and relative frequency tables</li> <li>• Generate Charts and Graphs</li> </ul>	<p><b>Skills:</b> <i>Student will be able to:</i></p> <ul style="list-style-type: none"> <li>• Collect real-world data</li> <li>• Create frequency tables</li> <li>• Create relative frequency tables</li> <li>• Create and interpret histograms</li> <li>• Create and interpret broken-line graphs</li> <li>• Create and interpret pie-charts</li> </ul>
<b>Stage 2 - Assessment Evidence</b>	
<p><b>Performance Task(s):</b></p> <p>To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher's discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.</p> <ul style="list-style-type: none"> <li>• Comprehension (true/false, definitions, identifying topics and themes, etc.)</li> </ul>	<p><b>Other Evidence:</b></p> <p>The following will also be observed, recorded, and considered for the final grade of students in each lesson activity</p> <ul style="list-style-type: none"> <li>• Motivation</li> <li>• Engagement</li> <li>• Collaboration</li> <li>• Communication pattern among peers and with the teacher</li> </ul>

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

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| <ul style="list-style-type: none"><li>• Solving pure mathematical problems as well as word problems.</li><li>• Discussions and presentations</li><li>• Group project that involves research and report writing</li><li>• Homework assignments</li></ul> | <ul style="list-style-type: none"><li>• Reactions</li><li>• Respect to others and different opinions</li></ul> |
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**Stage 3 – Learning Plan**

**Learning Activities:**

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

***Evaluating***

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**  
**Chapter 4, Unit 1: Frequency and Relative Frequency Tables**

<b>Stage 1 - Desired Results</b>	
<p><b>Established Goal(s):</b></p> <p>Students will be introduced to the common central tendencies and dispersions including mean, median, mode, variance, and standard deviation.</p>	
<p><b>Understanding(s):</b>  <i>Students will understand ...</i></p> <ul style="list-style-type: none"> <li>• Mean</li> <li>• Median</li> <li>• Mode</li> <li>• Variance</li> <li>• Standard deviation</li> </ul>	<p><b>Essential Question(s):</b></p> <ul style="list-style-type: none"> <li>• What information can we find from a set of real-world data points?</li> </ul>
<p><b>Knowledge:</b>  <i>Students will know how to ...</i></p> <ul style="list-style-type: none"> <li>• Calculate various statistics on real-world data</li> </ul>	<p><b>Skills:</b>  <i>Student will be able to calculate:</i></p> <ul style="list-style-type: none"> <li>• Mean</li> <li>• Median</li> <li>• Mode</li> <li>• Variance</li> <li>• Standard deviation</li> </ul>
<b>Stage 2 - Assessment Evidence</b>	
<p><b>Performance Task(s):</b></p> <p>To assess student progress made in this course, student work in the following activities will be clearly recorded and evaluated according to criteria, rubrics, and the teacher’s discretion. Homework assignments will be given 10% and all the others will be given 30% of student grades.</p> <ul style="list-style-type: none"> <li>• Comprehension (true/false, definitions, identifying topics and themes, etc.)</li> <li>• Solving pure mathematical problems as well as word problems.</li> <li>• Discussions and presentations</li> <li>• Group project that involves research and</li> </ul>	<p><b>Other Evidence:</b></p> <p>The following will also be observed, recorded, and considered for the final grade of students in each lesson activity</p> <ul style="list-style-type: none"> <li>• Motivation</li> <li>• Engagement</li> <li>• Collaboration</li> <li>• Communication pattern among peers and with the teacher</li> <li>• Reactions</li> <li>• Respect to others and different opinions</li> </ul>

**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

report writing

- Homework assignments

### Stage 3 – Learning Plan

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**The Asian International School**  
**Unit Backward Design**  
**Mathematics, Upper-Intermediate, 2018-2019**

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