Minnesota State University, Mankato

Level 2 Lesson Plan

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| Name  | Ms. Liesel Theusch (co-teaching with Mr. Tyler Keller) | Grade level(s) | 10th – 12th  |
| Date(s) taught | April 3rd, 2017 | Course/Subject | Pre-Calculus |
| Lesson Title | 4.3 Review | Observed Lesson, by | Dr. Amy Scheuerman |

**CONTENT FOCUS**

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| * Central Focus of the Learning Segment
 | * Trigonometric Functions
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| Content Standard(s) | **Standard:** (9.3.3) Know and apply properties of geometric figures to solve real-world and mathematical problems and to logically justify results in geometry.(9.3.3.5) Know and apply properties of right triangles, including properties of 45-45-90 triangles and 30-60-90 triangles, to solve problems and logically justify results.**Standard**: (9.3.4) solve real-world and mathematical geometric problems using algebraic methods.* (9.3.4.1) Understand how the properties of similar right triangles allow the trigonometric ratios to be defined, and determine the sine, cosine and tangent of an acute angle in a right triangle.
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| Content Learning Objective(s) | * **Given 5 types of trigonometry review notecard questions, TSSBAT complete a card from each of the 5 types of review questions. APWI students completing a checklist with at least 4 stars marked next to the types of review questions they practiced during the “Speed Dating” review game.**
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| Language Demand Objective(s) |  |

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| Materials/Resources Needed  | Teacher Materials: | Students’ Materials: |
| * SMART Board Presentation (“4.3 Quiz Review”)
* “4.3 Review” Notecards
* Problem type checklist/assessment
* 4.3 Review Worksheet
 | * Personal Whiteboards/markers
* Calculator
* Chapter 4 guided notes (if they need it)
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**LEARNING TASK IMPLEMENTATION**

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| ***LAUNCH*** *- engage learners, set purpose, activate prior knowledge, pre-assess, etc.*  |
| **Pacing** | **Lesson Segments** | **Instructional Strategies – Teacher (says and does)** | **Learning Tasks – Student (says and does)** |
| 4 min  | Bell Ringer/Class Overview | Pledge of Allegiance/AnnouncementsCall back attention after announcements.I will address the class with class specific announcements:* Welcome back from band trip
* Band students~ Did anyone watch the Vodcast Ms. Conway assigned? How did it go?

Some may have found it difficult: reassure them that Ms. Conway will be working with them to catch them up.* Mr. Keller’s and my own last day with the class ~ “Thank you”
* Quiz tomorrow over trig functions and angles ~ today we will be catching up (band students) and reviewing

Ms. Conway will take the ~12 band students to another room to review what the class covered in their absence. As band students leave, Mr. Keller will be asking the students to fill in the pairs of desks to prepare for our review activity later in class. | Students will stand for the Pledge and listen to announcements. Many will walk to friends as announcements are read over the intercom. Once announcements are read students will return to seats, but probably still talk.Band Students: Talk about how well they understood the Vodcast. Some may admit to being confused or finding it difficult.Band students will go with Ms. Conway to an empty classroom across the hall as remaining students will pair up with each other in the desks that were left empty so each student is sitting with a partner at a table. |
| 5-8 min | Introduction – Content Review  | Review SMART presentation: \*For each review slide in "4.3 Review Slides"\*1. State the question from the slide.
2. Ask the students to describe the process to solve.

*(Students do NOT need to solve these problems and write them down, only contribute to class discussion about the process of finding them.)*1. **a.** If the students answer correctly, reveal the answer and corresponding work shown on the slide, agree with and restate the student's answer.

**b.** If students do not answer completely or answer incorrectly, reveal work on the slide and ask a student to describe the process that is shown on the slide.**Slide #2: Converting Angles**“What are the 2 ways we can convert angles?”* substituting 180º for π
* using the appropriate ratio (180º/ π or π/180º)

\*\*First example uses substitution, second uses ratio\*\***Slide #3: Find the 6 trig functions given a triangle with 2 side lengths**“Before we find the functions, what do we need to do first?”* Use Pythagorean Theorem to find missing length

“Now that we have the 3 lengths what do we do?”* Use SOHCAHTOA

\*\*Ask which functions are the reciprocals of sine, cosine, and cotangent\*\***Slide #4: Finding Coterminal Angles**“What is a coterminal angle?”* An angle that has the same terminal side. Lies at the same place in a coordinate plane.

“How do we find coterminal angles?”* (Given angle) ± 1 revolution
* Angle ± 2π or 360º

**Slide #5: Finding trig functions when given a point**(Anticipated Difficulty)Prompt students through the following steps and reveal the written work on the slide after each step.1. Plot the given point in a coordinate plane.
2. Create the reference triangle with the nearest x-axis.
3. Label the legs of the triangle from your given point
4. Label positive and negative legs of triangle
5. Use Pythagorean Theorem to find third side.
6. Use completed triangle to calculate trig functions. (🡨similar to slide #3)

**Slide #6: Finding exact values of trig functions:**“What are the general steps to solve??”* Plot angle in the coordinate plane.
* Create 45-45-90 triangle or 30-60-90 triangle and label sides
* Create the appropriate trig function ratio in reference to θ

When working through Slide #6 draw the 45-45-90 triangle and 30-60-90 triangle on the whiteboard and ask for students to tell me the side lengths and angles.Ask for questions of if there is a problem the students want more review on/do another example. | Students will be answering questions prompted by Mr. Keller or I as we alternately work through the review slides. Some may take out their Chapter 4 guided notes as a refresher on how to solve.Students may use their calculator to find the missing side of the given triangle. Students may use their calculator or mental math the find at least one coterminal angle of either given angle.Students will follow along as the class discusses how to solve the problem step by step. They will contribute to discussion by stating which quadrant the given angle is in, whether a side measurement is positive or negative, and state which measurements of the triangle we will use in the trig function that was asked to be found. Students will tell Mr. Keller or I the measurements and corresponding angles of the 45-45-90 triangle and 30-60-90 triangle. They will then use the created triangle to tell us the side lengths needed for the value we were asked to find (sin(135º)). |
| ***INSTRUCTION/APPLICATION*** *- procedures to acquire new knowledge and/or skills and apply or use them in a meaningful way, instructional strategies, assessment, active engagement, practice, feedback, differentiation, etc.* |
| **Pacing** | **Lesson Segments** | **Instructional Strategies – Teacher (says and does)** | **Learning Tasks – Student (says and does)** |
| 3 min | Game Instruction  | “Today we are playing a speed dating review game.”Mr. Keller will explain how the game works.1. Each student will get a review notecard
2. Each will complete their given problem on their whiteboard and be the "expert" on their problem.

(There will be time for any questions to be answered about any notecard problems.)1. When instructed, one student from each table will get up and move to a new table.
2. The new partners will exchange cards and complete the review problems.
3. If the students have any questions about their new problem they will ask the "expert" for the problem.
4. After completing the review problem, the student will find the card number on their checklist and mark a start if they completed the problem confidently and got it correct on the first try. They will mark a check next to the card number if they did not get the correct answer or if they needed to ask the “expert” or teacher for guidance.
5. Repeat #3-5

As Mr. Keller explains, the rules I will be handing out the review cards and checklists. At the end of giving directions, he will ask for any questions about how the game will work. | Students will each take a review card and checklist and put their name of the checklist that they will hand in at the end of class.Some may have questions about the logistics of how the game works after Mr. Keller explains.* Will we get different “expert” cards throughout the game?
* How does the checklist work?
* Who moves to a new table when asked to switch?
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| 20 min | Activities | After Mr. Keller is finished explaining the game and the materials are passed out, I will ask that the students clear their desks except for their whiteboard/markers, activity materials, and a calculator and give students 1-2 mins to practice and understand their “expert” card. During this time Mr. Keller and I will be walking around the room ensuring the students are using processes we learned in class an answer any questions. Once everyone is finished with their “expert” card one person from each table of pairs will get up and rotate to a new table. Students will exchange cards and begin the review game. This will be done until the last ~10 mins of class As Mr. Keller and I walk around the room observing student work.Predicted Challenges:There will likely be students who do not want to write out the problems given to them and that is where Mr. Keller or I can check in and ask “How are you doing?” “Any Questions?” “How do you get the reference triangle for this problem?” etc.There may also be some students that are faster than others. We can always give the fast students a few of the extra cards to practice. | 1. Each will complete their given problem on their whiteboard and be the "expert" on their problem.

(There will be time for any questions to be answered about any notecard problems.)1. When instructed, one student from each table will get up and move to a new table.
2. The new partners will exchange cards and complete the review problems.
3. If the students have any questions about their new problem they will ask the "expert" for the problem.
4. After completing the review problem, the student will find the card number on their checklist and mark a start if they completed the problem confidently and got it correct on the first try. They will mark a check next to the card number if they did not get the correct answer or if they needed to ask the “expert” or teacher for guidance.

If students struggle with a review problem, the expert of the card will guide their partner through the process by answering any questions. If the expert is not able to answer the question, the students can ask Mr. Keller or myself. Some students will lose interest in writing down and practicing the problems on their white board. They may glance at the problem walk through it in their head then sit waiting for the next rotation.  |
| ***CLOSURE*** *- student reflection on learning, assessment, etc.* |
| **Pacing** | **Lesson Segments** | **Instructional Strategies – Teacher (says and does)** | **Learning Tasks – Student (says and does)** |
| 8-13 min  | Closure – Wrap up | When ~10 minutes, we will ask the students to return to their seats. Once everyone is settled there will be a chance for students to ask any questions they have or for us to address any common mistakes we observed.Students will hand forward their checklists and we will collect them.If there are no further questions the students will be given one last review worksheet as homework with 5-7 minutes left of class so the students can work on it.By this time, the band students should have returned from working with Ms. Conway for the class period and they will have the same review worksheet to work on.Once everyone is back, Mr Keller and I will thank the class one last time for allowing us into their classroom. The remaining time is for the students to work on their worksheet and ask any other questions. | Students will turn in their checklists.When asked about any problems they would like to see done or have any questions on, I anticipate there to be questions about finding trig functions when you are only given a point in the coordinate plane.Another problem students might struggle with is when they are asked to find exact values of angles not in the first quadrant since they must create a reference triangle and correctly place each negative sign in their answers when finding the trig functions.When given the worksheet for homework, students will be expected to start working on it with the extra time given to them, but most will likely be too excited about catching up with friends that had gone to Florida for band.  |
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**MONITORING STUDENT LEARNING**

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| Type of Assessment(Informal or Formal) | Description of Assessment | Modifications  | Evaluation Criteria |
| Informal | As students practice the notecards during the review game, Mr. Keller and I will be walking around the room to observe students work and notice any common misconceptions.The personal checklist the students complete has the list of numbers written on each notecard with a blank next to it. As the students do the review notecards from the 5 categories covered in the class review before the game, they will put a star if they completed a problem on their own without help or guidance. The students will put a check mark next to questions they needed help on. This is turned in at the end of the game. At the end of the hour, there is also a worksheet “Section 4.3 Quiz Review” that will be distributed. This worksheet has problems regarding reference angles, coterminal angles, finding the six trig functions given a point, and stating the exact value of trig functions ( ex. sin(pi/3)). | There are no modifications needed for this assessment. The students will be writing their answers down on whiteboards then their partner checks it.  | Students will be evaluated based on completion of the checklist. The stars and check marks that the students complete it with is more for both of us to know what they may need to review before the quiz. If majority of students have 3 or more check marks on their list, this is an indicator that they may not be prepared for the quiz and need another day for review.The worksheet will be evaluated based on completion with the answer key being available online for students to check their work *before* the quiz.  |
| Formal |  |  |  |

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TPA Commentary Support

(Dependent on class information)

**ACADEMIC LANGUAGE DEMANDS**

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| Prior Academic Language Development |  |
| Language Function |  |
| Content Specific Vocab. |  |
| Syntax or Discourse |  |
| Language Supports |  |

**KNOWLEDGE OF STUDENTS TO INFORM TEACHING**

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|  | Student Information | How will you use this information in this lesson? |
| Prior Learning/Thinking/ Experiences | Students will have already learned and practiced the 5 different types of problems in the review activity. This lesson is meant to give them more practice on these 5 types of problems so they will be well-prepared for the quiz. | This information will be used when going through the review slides. When walking through the problems, I will ask students for key words or phrases we used to describe the process needed to solve each problem. (reciprocal, hypotenuse, ratio, radians, degrees, reference angle/triangles, coterminal angles, etc.) |
| Common Errors or Misunderstandings | When assessed after the 4.2 lesson, students struggled with using the Pythagorean Theorem. Specifically, they struggled with setting the hypotenuse equal to *c* whether they needed to find the hypotenuse or it was given. Another error is students trying to use a reference triangle to find trig functions of quadrantal angles instead of the unit circle. Another error students make is to not include the appropriate negative signs in their answers when angles are not in the first quadrant. | In the review slide SMART presentation there are problems where students would need to explain how to set up the Pythagorean Theorem in order to complete a triangle. There is also an example in the presentation where students must find the trig value of and angle in the second quadrant where they must remember to place the negative signs on their reference triangle. After the short review of the slides in class, Mr. Keller and I will quickly ask when we use the unit circle with trig functions. This will remind students that reference triangles cannot be used with quadrantal angles.Review problems addressing each of these three common mistakes were included in the game that students would have an opportunity to practice.  |
| Students with IEPs | There are 2 students with IEPs. One is for a back fusion and the other is on the Autistic spectrum which affects his sociability.  | Neither of these students will need outright accommodations for this activity, but it is necessary to be aware of the student on the Autistic spectrum since this is a social activity. Students can exchange cards and work out the problems on the whiteboards without talking to one another if they prefer which will help this particular student. If I notice the student not completing the review because of the social interaction,  |
| English Language Learners | There are no ELL students in the class. | This information will not affect the lesson. These students are at the same level of the other students except they are a year younger. |
| Gifted and Talented Learners | There are 12 sophomores in the class and they are considered to be gifted since they are on a faster track in math. |  |
| Students on 504 Plans | There are no students on 504 plans in this class. |  |
| Struggling/Underperforming Students  | There is one student that is considered to be struggling in this class. | In this lesson, I will make sure to check in with questions about how they’re doing a problem periodically during the time students are playing the game. I will regularly check with some of their work on their whiteboard. |
| Family/Community/Cultural Assets | During this lesson, only half of the class will be present because of the school band going on a trip to Florida last week. The half of the class that is gone will be with Ms. Conway in another room. | The smaller class allows more practice with the problems and faster moving when asked to rotate. The reduced class size is why a review game with movement was chosen.  |
| Social /Emotional/Mental Health | The only student in this category is the student who is Autistic with an IEP. | There is no other modification needed for this student. This is only for awareness during the activity. |
| Other | There are no other modifications needed. |  |

**SUPPORTING STUDENT LEARNING**

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| Safety Issues to Consider | With many students moving at once and books on the floor, it is a possibility that students could trip or bump into each other. |
| Human Resources Utilized | * Mentor teacher: Ms. Conway Co-Teacher: Mr. Keller
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| Co-teachingNot Required for TPA  | Strategy: ☐ One Teach, One Assist ☐ One Teach, One Observe **X** ☐ Station Teaching ☐ Parallel Teaching ☐ Alternative Teaching ☐ Team Teaching  |
| Roles and ResponsibilitiesNot Required for TPA | Teacher A:  | Ms. Liesel Theusch | Teacher B: | Mr. Tyler Keller |
| Main Teacher (co-taught) | Assisting Teacher (co-taught) |
| Research-Based Practices or Theories  | Vygotsky’s Theory of Social Interaction: Students will be working with many different peers in the review activity. On student is the expert and the other may need help from the partner when working the problem out on their whiteboard.Reciprocal Learning: Students will teach their peers and be taught by their peers in this review. |