Conceptual Planning Framework

**Big Idea:**

* Number represents, describes, and compares the quantities of ratios, rates, and percents.

**Key Concepts:**

* Pattern, Relationships

**Content:**

* Perfect squares and cubes
* Square and cube roots

**Essential Questions:**

* How can we communicate our understanding in math and reflect on our learning as mathematicians?
* What is unique about perfect squares and roots?
* How are roots and squares related?

**Curricular Competencies:**

**Reasoning and analyzing**

• Use tools or technology to explore and create patterns and relationships, and test conjectures

**Understanding and solving**

• Communicate mathematical thinking in many ways

**Connecting and reflecting**

• Reflect on mathematical thinking

**Ideas to promote Inquiry through E-learning:**

|  |  |  |
| --- | --- | --- |
| Face to Face | Remote | Independent |
| * Synchronous
* Small group
* 50 minutes/ session
* 2 interactions/ week (40%)
* 1 interaction/ week (20%) Interactions may occur before or after remote sessions
 | * Synchronous
* full group
* 60 minutes/session
* 1 interaction/week (40/20%)
* 2 sessions/cycle (40/20%)
* Interactions may occur before or after face to face sessions

Design Considerations* Embed opportunities to promote social interactions and build community (Connection)
* Chunk time/activities by using different technology tools/tasks to maintain engagement

Padlet <https://padlet.com/>Mentimeter <https://www.mentimeter.com/>* Incorporate small groups opportunities for discussion and problem solving (Collaboration)

Break Out Rooms<https://www.youtube.com/watch?v=48J7ADQqPco#action=share><https://www.youtube.com/watch?v=qo6yqh7erEY> | * Asynchronous / At home
* Students need to be able to start on this independently / prior to face to face or remote sessions
* 3 sessions/week (40%)
* 4 sessions/week (20%)
* 50 minutes/session

Design Considerations* Post weekly schedule before Monday at 8:30am
* Provide articles to read, videos to view and any questions to be discussed prior to remote meetings
* Incorporate on-line discussion boards to answer questions and address misconceptions (Clarification)
* Incorporate inquiry questions and visible thinking routines (Critical and Conceptual Thinking at Project Zero <http://www.pz.harvard.edu>

 Possible FormatsFlipped classroom<https://www.schoology.com/blog/flipped-classroom><https://flippedlearning.org/>Hyperdocs<https://www.cultofpedagogy.com/hyperdocs/><https://hyperdocs.co/>Choice Boards<https://catlintucker.com/2016/04/design-your-own-digital-choice-board/> |

**Summative Performance Assessment:**

Squareable numbers Rich Math [Task](https://mathforlove.com/lesson/squarable-numbers/). Students can complete in Onenote notebook or on paper and upload photos of completed work.

**Timeline:** One 2-week cycle, or approximately 1 month based on an eight-block rotation

**Learning Plan:**

|  |  |  |
| --- | --- | --- |
| **Face to Face (F2F)** | **Remote** | **Independent** |
| F2F Session 1 (50 min)* Intro/Review of perfect squares.
* Have students build square root towers using graph paper and construction paper see this [link](http://www.mathactivities.net/lessons/square-numbers-activity.htm) for the lesson.
* Introduce and review square root as the inverse function
* Check for understanding by doing a few questions together or as an exit slip.
 | Remote 1* Community building and expectations, course outline
* MS Teams/ 365 walk through/ scavenger hunt
* Breakout/small group work activity from [youcubed](https://www.youcubed.org/). Students can use the collaboration space to work together.
 | Independent Session 1* [Padlet:](https://padlet.com/) [See, Think, Wonder](http://www.pz.harvard.edu/resources/see-think-wonder) to activate prior knowledge and assess what students already know about roots and squares
* Khan Academy videos: [introduction to square roots](https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86%3Arational-exponents-radicals/x2f8bb11595b61c86%3Aradicals/v/introduction-to-square-roots) and [understanding square roots](https://www.khanacademy.org/math/algebra/x2f8bb11595b61c86%3Arational-exponents-radicals/x2f8bb11595b61c86%3Aradicals/v/understanding-square-roots) or similar introductory videos
* Practice questions either in Onenote Notebook or an online platform (Khan Academy, IXL or similar) OR Background reading from [CK12.org](https://flexbooks.ck12.org/cbook/ck-12-interactive-middle-school-math-8-for-ccss/section/10.1/primary/lesson/understanding-perfect-squares-and-perfect-cubes-msm8-ccss) and practice questions
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| Session 2 (50 min)* Intro/Review of cube roots.
* Hands on practice building cube root towers -[link](https://www.brighthubeducation.com/middle-school-math-lessons/127844-building-cube-towers-and-their-roots/#lesson-procedure)
* Introduce cubed roots as the inverse function
* Check for understanding by doing a few questions together or as an exit slip
 | Remote 2 * Small group warm up from [Math Before Bed](https://mathbeforebed.com/start-here/)
* [Number talk](https://howweteach.com/todays-number-simplifying-numeric-square-roots-math-talk/) on square roots
* Square and cube roots [Kahoot](https://create.kahoot.it/share/8ed37283-e3fc-4389-a8ed-ff7200993731)
 | Session 2* Cube root introductory videos Khan Academy [intro to cube roots](https://www.khanacademy.org/math/pre-algebra/pre-algebra-exponents-radicals/pre-algebra-cube-root/v/introduction-to-cube-roots)
* Practice questions either in OneNote Notebook or an online platform (Khan Academy, IXL or similar)
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|  |  | Session 3* Square and cube root choice board. See this [link](https://catlintucker.com/2016/04/design-your-own-digital-choice-board/)
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|  |  | Session 4* Squareable numbers Rich Math [Task](https://mathforlove.com/lesson/squarable-numbers/). Students can complete in Onenote notebook or on paper and upload photos of completed work.
 |
| Extension Activities:* Make a radical clock or calendar & use explain it or similar app to describe your project
* Play [Squbed](http://www.empoweringparentstoteach.com/math/squbed/) game (great for extra in class time or warm up)
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Questions to Consider:

* *What are the essential questions students need to answer?*
* *How are the essential questions connected to the performance/summative task?*
* *How can the summative task reflect authentic work connected to the areas of study/discipline?*
* *What problem will the students solve?*
* *Will the inquiry allow students to self-direct and have agency in their learning?*
* *How can you augment or redefine the use of technology to enhance student learning ?*
* *What will the students be able to transfer to their next inquiry?*

Online Instructional Models:

Flipped classroom

<https://www.schoology.com/blog/flipped-classroom>

<https://flippedlearning.org/>

Hyperdocs

<https://www.cultofpedagogy.com/hyperdocs/>

<https://hyperdocs.co/>

Choice Boards

<https://catlintucker.com/2016/04/design-your-own-digital-choice-board/>

Teaching Online Tips :

* Embed opportunities to promote social interactions and build community (Connection)
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	+ Padlet <https://padlet.com/>
	+ Mentimeter <https://www.mentimeter.com/>
* Incorporate small group opportunities for discussion and problem solving (Collaboration)
	+ Break Out Rooms in MS Teams
		- <https://www.youtube.com/watch?v=48J7ADQqPco#action=share>
		- <https://www.youtube.com/watch?v=qo6yqh7erEY>