Lesson Template

CA Content Standard(s):	***Content Objective:***	***Language Objective:***
7AF 2.1 Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents Alg 2.0 Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.	Students will be able to relate the abstract notion of exponential growth to a tangible form. They will use a regular piece of paper to generate and model $2^x \ni x \geq 0$. In this activity students will be able to articulate why $2^0 = 1$.	Students will use sentence frames to discuss and write out their strategy and observations in regards to the "Power of Two" activity.

Preparing the Learner	**I**nteracting with Text/ information source	**E**xtend Learning/ Understanding
• Activate prior knowledge • Focus on key concepts • Introduce new terms in meaningful contexts	• Students deconstruct, analyze, understand • reconstruct and connect to larger objectives in meaningful ways • Students take a critical stance towards ideas emerging from reading	• Create/recreate based on understanding • Application of newly-gained knowledge • Connections to larger body of knowledge, taking a critical stance in relationship to other ideas

Lesson Sequence	**Strategy and Scaffolds Uses**	**Gradual Release of Responsibility**	**Strategies/Plan**
Task 1: ***Prediction*** Time: 5 min	***Three step interview***	□ Teacher does (I Do) □ Teacher-students do (We Do) □ ***Students do collaboratively (You do)*** □ ***Student does individually (You do)***	*Note: Prior to starting have students make at least four appointments with other students using the appointment book strategy. It will be used later in the lesson.* Students grab a piece of paper Without folding the paper students predict how many times they feel they will be able to fold the paper. (Students are predicting the maximum number of folds they think they can make.) Teacher records all predictions on board or chart paper. Potential Misconceptions: Students folding in two but not necessarily in half each time.

Guiding Question(s):	Sentence Frame(s):	Checking for Understanding:
How many times do you think you can fold a piece of paper in half?	I predict I can fold this paper a maximum of _____ times because….	□ Physical_____ □ ***Verbal:_Three step interview***_____ □ ***Written: Sentence frame- Quick -write***_____

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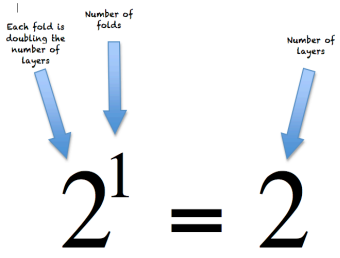
Task 2: ***Power of Two Activity*** Time: 10 min	***ThINK- Pair- Share*** ***Appointment Book***	□ Teacher does (I Do) □ Teacher-students do (We Do) □ ***Students do collaboratively (You do)*** □ ***Student does individually (You do)***	Students grab your piece of paper and actually try to fold it in half as many times as possible. Note: Please no footprints or teeth marks on the paper (those are stomps and chomps but not folds). ***Ask them to discuss with their appointment book partner(3 appointments here):*** • How many times where you actually able to fold your paper in half? • How did the actual result fare with your prediction? • If there was a discrepancy, why do you feel you were not able to fulfill your predicted number of folds? Potential Misconceptions: Students folding in two but not necessarily in half each time.
Guiding Question(s): What stopped you from folding the paper any further?	Sentence Frame(s): _____ prevented me from folding the paper any further. I think this is because_____.		Checking for Understanding: □ **Physical**:Tchr can physically see if student completed task___ □ **Verbal:** Student discuss w/ prtnr the questions. □ Written_____
Task 3: ***Vocabulary lesson Power of Two- Record Table*** Time: 25 minutes	***Graphic Organizer*** ***Appointment Book***	□ Teacher does (I Do) □ **Teacher-students do (We Do)** □ **Students do collaboratively (You do)** □ Student does individually (You do)	 Teacher explains this graphic that explains that he exponent is the # of folds and the result is the number of layers of rectangles after that # of folds. Tchr discusses all the key vocabulary: Exponent, Base, Power, Result, Exponential Growth, Repeated Multiplication Student go back to their paper and fills out the table provided with partner (appointment 4)

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			Teacher guides students in writing the result in expanded notation after students have documented their results in table (i.e. $2^4 = 2 \bullet 2 \bullet 2 \bullet 2$) ***Students answer:*** How many folds layers would there have been in the initial predictions? How many layers would there be if the paper was folded 10 times? 20 times? If we now place 2^0 in the blank space of your table; what does that mean and what is your answer? ***Pick one of the following to answer in writing:*** How could you increase the number of folds you could achieve? Why is $2^0 = 1$? How does 2^5 **compare** to 5^2 ? Be prepared to share what you have written. <u>Potential Misconceptions:</u> Students mistake the exponent basic multiplication and see 2^3 as $2 \bullet 3$.
Guiding Question(s): What is another way of thinking of exponents?	Sentence Frame(s): In 2^5 means_____ by _____, which is_____. 5^2 means_____ _____,which is_____. Another way to think of exponents is _____ _____ so it is a shortcut for writing _____.		Checking for Understanding: □ Physical_____ □ **Verbal:** Students use sentence frames and questions when discussing □ **Written**__Students write out sentences.