

Lesson Plan Title: Math With Dog Team Hitches

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**Discipline / Subject:** math

**Topic:** number sense: factors, prime/composite numbers

**Grade Level:** 2<sup>nd</sup> – 6<sup>th</sup> grades

**Resources / References / Materials Teacher Needs:**

Photos of dog teams harnessed in fan position and pairs

(Optional) Clip from video *Eight Below*

3/4 inch squares of paper representing dogs; one long rectangle representing the sled

Baggies

Article on harnessing teams to read to students on why mushers harness dogs differently:

<http://www.athropolis.com/arctic-facts/fact-dogs-hitch.htm>

Prepare multiple baggies with these numbers of squares: 5, 10, 3, 9, 11, 16

**Lesson Summary:** Students will experiment with differing hitching methods for sled dogs to determine if the number of “dogs” in a baggie can be paired, made into an array, or if a fan hitch will be needed. This leads to a discussion on prime and composite numbers.

**Standards Addressed: (Local, State, or National)**

**1. Local 21<sup>st</sup> century skill:** critical thinking, collaboration

**2. VA 5.3** The student will

- a) identify and describe the characteristics of prime and composite numbers; and
- b) identify and describe the characteristics of even and odd numbers.

**3. CCSS.Math.Content.4.OA.B.4**

Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.

**4. CCSS.Math.Content.2.OA.C.3, 4**

**5. CCSS.Math.Content.3.OA.A.1**

**Learning objectives:**

1. The student will formulate understandings of factors
2. The student will formulate understandings of prime and composite numbers
3. The student will understand odd and even amounts of numbers

**Assessment:**

Method of assessment for learning: recording sheet each student fills in during his/her exploration

**Procedural Activities**

1. Discuss factors of numbers, numbers that multiply together to reach a certain product
2. Show students a video (*Eight Below* movie clip) or photos of a dog team pulling a sled hitched onto a gangline. Discuss what they see about the dog team. Write on the board or on an anchor chart. Vocabulary to pull out: harnesses, ganglines, lead dogs, wheel dogs. Note: if it doesn't come up naturally, work it so the fact that the dogs are in pairs comes up.
3. Tell the students you will now contrast that method of hitching together sled dogs. Sometimes over unstable ice or snow cover, a method of hitching dogs is in a fan position so that the dogs' weight is spread out over a wider area.
4. Show photo or another clip on the fan formation from *Eight Below*. Ask students to comment on what is different about this lineup of dogs.
5. Hand out recording sheets
6. Give directions on finding factors. "Each square in the baggie I am handing out represents a dog on your dog team, pulling your sled. When you get your baggie, put your dogs into rows so that there is the same number of dogs in each row. Record the formation on your recording sheet by drawing an X for each dog and a rectangle for the sled they are pulling." [Note: students should find that certain numbers can be made into multiple arrays]
7. Demonstrate with a baggie of 12. Show students how to record their findings and to write the arrays and factors of 12.
8. "Let's try another baggie. [Get baggie of 5 squares.] Let's see if you can show how the hitch should be set up for this dog team. Remember, each row has to have the same number of dogs." As you have a student try to make and show it on the document camera, pose a question: "Can we use the gangline, paired hitch for this group of dogs? What kind of hitching should we do here?" Draw in "dogs" and the sled on recording sheet along with its factors.
9. Discuss the factors of 5. [This should lead into a talk on prime/composite numbers as you contrast the factors of 12 and 5 and the types of hitches that those numbers allow]
10. Allow students to work in pairs with bags containing some composite and prime amounts of squares. They should each record on their own sheets.
11. When students finish with a baggie, they may come up and get another one with a differing amount of "dogs."
12. When time is up, ask the following questions:
  - When did you get to use gangline hitches?
  - When did you have to use the fan hitches? For which numbers of dogs?
  - Teach them about a prime number having only two factors, 1 and itself.
  - Teach about composite numbers having more than two factors.

- Which of your dog teams are prime numbers? Which are composite? [Have students discuss with their partners]

13. Write on your form, which dog teams were a prime number and which were composite numbers.

14. "From what you drew and figured out by building the dog teams, write the definition of a prime number and a composite number on the back of your recording sheet."

**Materials Students Need:** Recording sheets to show mathematical thinking

**Technology Utilized to Enhance Learning:**

- Video of dogs running in various hitches (gangline or fan)
- Create a flip chart on an Active Board for students to manipulate the "dogs" into arrays for hitching.

**Other Information**

**Modifications for special learners/ Enrichment Opportunities:**

This activity could be used for lower age groups exploring the concept of odd and even number. To remediate, work with a small group using varied numbers of squares. Practice arrays, discussing factors, and labeling drawings with factors.

Enrichment activity: adapt the lesson for divisibility rules exploration.