

Iditarod Sled Dog Weights and Measures

Area (or easily adapted to only use Length) –
Sled Dog Footprint (adapted from Audubon Zoo workshop)

Skills: Number sense, estimation, standard and non-standard area, polygon shapes, problem solving, graphing, and multiplication/division

Literature connection: Measuring Penny by Loreen Leedy (focus on part where dog paw prints widths are being measured) (Optional: If choose to only do length of footprint versus paw print, could use How Big is a Foot? by Rolf Myller.)

Materials:

- Centimeter (or inch) grid paper, one sheet per student (or any blank piece of paper if only doing length)
- Scissors, one per student to cut out student footprints
- Sled dog paw print, one per student
- Optional, paw/hoof/footprints of other animals
- If doing only length, use inch/centimeter ruler

Procedure:

- Hand out grid paper and have students trace foot (with or without shoes) (note: I found it most successful for students to trace foot on chair or to take shoe off and trace on desk)
- Students cut out footprints and put names on back
- Optional, have students estimate how many squares they think they have on their footprints
- Students count square centimeters/inches (I have them label each square 1, 2, 3, etc. to reinforce one-to-one correspondence) (note: I only have students count complete squares, you could have students put half squares together, etc.)
- Students put final number on back of footprint

- Show students one sled dog paw print
- Talk to students about this being a sled dog's paw print. (Sled dogs only walk on tiptoes. It may be helpful to show picture of a dog to show where their "heels" are to help students understand this.)
- At this point you can take it one of two ways, you can have students try to figure out best estimate of the area of the sled dog's paw print (trace the paw print on his/her foot print, count the number of paw prints, and then divide that number by the area of his/her footprint-the areas obtained should be in a fairly close range if you consider the amount of space left on his/her footprint after tracing the sled dog paw prints). The other option is to just trace the sled dog paw prints and get a non-standard area. With that you could also trace other animals, such as hedgehog or rabbit, and compare why there are more/less footprints.
- Make a graph of the non-standard area of the paw prints per footprint depending on the non-standard measurement used (3 paw prints per Tyler's footprint, 10 hedgehog footprints per Tyler's footprint, etc.) or in comparing students (11 students had 3 paw

prints per footprint, 4 students had 2 paw prints per footprint, 5 students had 4 paw prints per footprint, etc.).

Extension 1:

- Show students one elephant footprint and ask them what shape it is closest to, then what do they think it is (the Asian elephant footprint I have is roughly a circle with a diameter of 17 inches on the longer side and diameter of 15.5 inches on the shorter side)
- Talk to students about this being an Asian elephant's footprint. (Asian elephant is smaller than African elephant and this elephant was even on the small side for Asians-only 7,000 lbs! Also, elephants only walk on tiptoes.)
- Again, you can take it one of two ways, you can have students try to figure out best estimate of the area of the elephant's footprint (trace their foot on the elephant, count the number of their footprints, and then multiply that number by the area of their footprint-the areas obtained should be in a fairly close range if you consider the amount of space left on the elephant footprint after tracing the student footprints). The other option is to just trace the student footprints and get a non-standard area. With that you could also trace other animals, such as giraffe or rabbit, and compare why there are more/less footprints.
- Make a graph of the non-standard area of the elephant's footprint depending on the non-standard measurement used (6 of Tyler's footprints, 3 giraffe footprints, etc.).

Extension 2:

- Calculate pounds per square inch (pounds per square centimeter or kilograms per square centimeter) on a sled dog's paw and on the feet of children (a typical Iditarod sled dog weighs 45-60 pounds)

Weight – Weigh a Sled Dog (there is similar enrichment exercise in Everyday Mathematics Grade 4 Lesson 5.1 and 11.1)

Skills: Estimation, addition, subtraction, multiplication, division, comparing whole numbers (<, >, =), algebra, and standard and non-standard weight

Literature connections: How to Weigh an Elephant by Bob Barner (has great examples of animals being compared by a balance) Measuring Penny by Loreen Leedy (focus on part where dogs are being compared on titter-totter) or Biggest, Strongest, Fastest by Steve Jenkins (has information on weight and length of certain animals)

Materials:

- List of various animal weights, you may want to ensure you include your school mascot, choose “nice” numbers to work with, and include some small numbers, such as one pound and two pounds
- Optional, bathroom scale so that students can use their own weight in comparisons
- Calculator, one per student

Procedure:

- List animal names and numbers on board, such as “African elephant = 13,000” and “Bald eagle = 2”
- Ask students to brainstorm what they think these numbers represent (they are the approximate weight of these animals in pounds)
- Optional, read How to Weigh an Elephant. It shows numerous comparisons of animals on a balance, such as an elephant weighs more than two lions and an elephant weighs less than eight gorillas.
- Have students try to find balances between animals, you might start with “Elephant = 2 x Rhinoceros” or “Elephant = Rhinoceros + Rhinoceros” or “Cougar = Wildebeest/2” or “Warthog + Raccoon = Cougar”
- Have students find ten comparisons
- Optional, students may weigh themselves and use the weight in comparisons, such as “Kelsie + Raccoon = Leopard”

List of some animal weights in pounds (lbs):

- Iditarod Sled Dog = 50 (actual weight between 45-60 lbs)
- Bobcat = 70
- Zebra = 550
- African Elephant = 13,000
- Orca (Killer Whale) = 18,000
- Blue Whale = 300,000
- Bald eagle = 2
- Lion = 530
- Giraffe = 2,400
- Squirrel = 1
- Anaconda (snake) = 400
- Cheetah = 150
- Wolf = 50
- Leopard = 100
- Bear = 500
- Skunk = 14
- Raccoon = 25
- Cougar = 225
- Wildebeest = 550
- Warthog = 200
- Rhinoceros = 6,500
- Hippo = 4,400

Length – Sled Dog versus Giraffe Strides and Kangaroo Jumps (adapted from Audubon Zoo and Utah’s Hogle Zoo workshops)

Skills: Standard and non-standard measurement, estimation, and graphing

Literature connection: If You Hopped Like a Frog by David M. Schwartz, Measuring Penny by Loreen Leedy (focus on part where dogs are compared by how high they jump), or Biggest, Strongest, Fastest by Steve Jenkins

Materials:

- Strings (??’ for sled dog stride, 15’ for giraffe stride and 29’ for kangaroo hop)
- Post-It notes (to label students’ first stride and hop)
- Tape measures, yard sticks, and/or foot rulers

Procedures:

- Lay out strings on floor in classroom (if you have room after moving all desks to the side or else do this in the hallway or outside), tape down ends so that it will not move too much
- Have students look at strings and guess how long they are and what they are
- Have students line up and take one step on sled dog string (I had my students do this a couple inches away from string to prevent them from actually walking on string and moving it) and stop, place sticky note with student’s name on that spot, and then have student continue walking down string counting his/her steps. Record the number of steps it took.
- Continue for each student.
- Do similar with giraffe stride and kangaroo jump string, except have students hop on kangaroo jump string. Note: kangaroos jump with both feet at once. The record setting jump made by a grey kangaroo was 44 feet. The typical body length of a male grey kangaroo is 3.4-4.5 feet (head and body) and 3-3.2 feet (for tail). The usual “full speed” jump of a large kangaroo is about 29 feet. Just “ambling along” jumps would be shorter. Sometimes kangaroos shuffle along as well without jumping.
- Graph results on how many strides or hops it took students to make one sled dog stride, one giraffe stride or one kangaroo jump (example, 3 students took 7 steps, 5 students took 6 steps, and 4 students took 5 steps).
- Measure from starting points to sticky note and record measurements for one step and one hop.

Optional: Compare number of sled dog strides to cover one giraffe stride or one kangaroo jump

Other information that would be fun to measure and compare:

- Alaskan husky 23” tall
- Greyhound stride length 16.4’
- 3-inch frog can hop 5’
- 3-millimeter tall flea can spring more than 200 mm into the air
- 1-foot long chameleon has 6” long tongue

- 4-foot tall crane has 16" neck
- Male giraffe is 17' tall (average); 19' record
- Female giraffe 14' tall
- Baby giraffe 6' tall and can grow an inch a day
- Male giraffe's neck is 6 ½' long
- Male giraffe's tail is 6'8" long
- Giraffe tongue is 22" long
- Giraffe male foot is 1' long and 9" wide
- Orangutan arm span is 7 ½'
- Bald eagle wing span is 8'
- Whooping crane wing span is 6.5-7.5'
- Male Orca length is 30', Female Orca is 18'
- Sonoran desert Toad 7 ½"
- Chuckwalla 12"
- Burrowing Owl wingspan 24"
- Black-footed Cat (including tail) 25"
- Dusky Pygmy Rattlesnake 30"
- Crested Porcupine 34"
- Eastern Black and White Colobus Monkey (including tail) 58"
- California King Snake 6'
- Amur Leopard 7'
- American White Pelican wingspan 10'
- African Elephant 11-12' tall
- White Rhinoceros 13'
- Ant 1/32 to ½" long
- Blue Whale 110' long
- Etruscan Shrew 2 ½" long
- Bee Hummingbird 3" long
- Sun Jellyfish – bell 6' across, tentacles 200' long
- Bird Spider 3" body, 11" long with legs
- Cheetah 4 ½' long (without tail)
- Electric Eel 6' long
- Land Snail ¼ to 2"
- Anaconda 27' long
- Flea 1/16" tall
- Galapagos tortoise 5' long

Rate – Speed of a Sled Dog (there is similar enrichment exercise in Everyday Mathematics Grade 4 Lesson 12.2)

Skills: Estimation, addition, subtraction, multiplication, division, comparing whole numbers (<, >, =), and speeds

Literature connections: Measuring Penny by Loreen Leedy (focus on part where Penny is timed) or Biggest, Strongest, Fastest by Steve Jenkins (has information on weight and length of certain animals)

Materials:

- List of various animal speeds, you may want to ensure you include your school mascot and choose “nice” numbers to work with
- Optional, stopwatch and measured length out to at least 30’
- Calculator, one per student

Procedure:

- List animal names and numbers on board, such as “Cheetah = 102” and “Squirrel = 18”
- Ask students to brainstorm what they think these numbers represent (they are the approximate speeds of these animals in feet per second)
- Have students rank animals from fastest to slowest (or vice versa)
- Have students determine who would win a 100-foot race by determining how fast each animal would run it, come in second, third, etc.
- Repeat with different distances
- Optional, have students determine how fast the animals run in miles per hour (mph), example:
 $15 \text{ ft/sec} * 1 \text{ mile}/5280 \text{ ft} * 3600 \text{ sec}/1 \text{ hr} = 10 \text{ mph}$
(take 15 divide by 5280 and then multiply by 3600)

List of some animal speeds in feet/second (ft/sec):

- Iditarod Sled Dog = 15 (approximately 10 mph)
- Sprint Sled Dog = 29 (20 mph)
- Greyhound = 66 (45 mph)
- Camel = 29
- Cheetah = 102 (70 mph for about 3 seconds)
- Squirrel = 18
- Fast human = 30
- Land Snail = 1/90 (8 inches per minute)
- Orca = 36
- House Cat = 44 (of course they cannot maintain this)
- Thoroughbred Race Horse = 63

More mph speeds can be found at <http://www.homeworkspot.com/ask/fastestanimals.htm>

To calculate speeds into ft/sec see example below:

$10 \text{ mph} * 1 \text{ hr}/3600 \text{ sec} * 5280 \text{ ft}/1 \text{ mile} = 14.7 \text{ ft/sec}$
or take 10 divide by 3600 and then multiply by 5280