

Lesson Plan Title

Average Speed & Projected Finish Time

Developed by: Jim Schmitt – Science Department – Eau Claire North High School

Discipline: Science (Physical)

Topic: Average Speed

Grade Level: Middle School & High School

Resources / References / Materials Teacher Needs:

Trail map: <http://www.iditarod.com/trailinfo/index/php>

Checkpoint Summary: <http://www.iditarod.com/raceupdates/racecheckpointselect.php> or
<http://www.cabelasiditarod.com>

Lesson Summary:

During the Iditarod, students will follow a sled team and determine the average speed between each checkpoint and the average speed for the entire race. Students will also be able to project the finish time of the team they follow.

Standard's Addressed: Wisconsin's Model Academic Standards for Science

D.8.6 – While conducting investigations, explain the motion of objects using concepts of speed, velocity, acceleration, friction, momentum, and changes over time, among other, and apply these concepts and explanations to real life situations outside the classroom.

D.12.7 – Qualitatively and quantitatively analyze changes in the motion of objects and the forces that act on them and represent analytical data both algebraically and graphically.

Learning objectives:

- 1) Students will be able to calculate the average speed for one team for a segment of the Iditarod Trail.
- 2) Students will be able to calculate the average speed for one team for the whole race.
- 3) Students will also be able to project the finishing time of the team they're following.

Assessment:

- 1) Calculation of the average speed and comparison to the Iditarod web site current standings.
- 2) Comparison of the predicted time to the actual finish time.

Procedural Activities:

Students should use this formula to determine the average speed in miles for each hour traveled (commonly called miles per hour or mph). *Average speed = Distance traveled / Elapsed time.*

To calculate elapsed time in hours, take the hours, minutes and seconds and convert all to hours in a decimal form. If it takes 2 hours, 51 minutes and 37 seconds to travel a segment of the trail, students will do the following:

$$51 \text{ minutes} * 1 \text{ hour} / 60 \text{ minutes} = .85 \text{ hours}$$

$$37 \text{ seconds} * 1 \text{ minutes} / 60 \text{ seconds} * 1 \text{ hour} / 60 \text{ minutes} = 0.01 \text{ hours}$$

$$\text{Elapsed time} = 2 \text{ hours} + 0.85 \text{ hours} + 0.01 \text{ hours} = 2.86 \text{ hours}$$

Projecting time needed to finish can be done by Algebraically re-arranging the speed equation. Students can use the average speed of the team up until that point and the distance needed to travel to calculate the anticipated elapsed time. *Elapsed time = Distance traveled / Average speed.* Once the elapsed time has been calculated, the decimal time will need to be put back into minutes and seconds. For example if an elapsed time of 15.38 hours is calculated, students will do the following:

$$0.38 * 60 \text{ minutes} / 1 \text{ hour} = 22.8 \text{ minutes}$$

$$0.8 \text{ minutes} * 60 \text{ seconds} / 1 \text{ minutes} = 48 \text{ seconds}$$

$$\text{Elapsed time} = 15 \text{ hours}, 22 \text{ minutes}, 48 \text{ seconds.}$$

Materials Students Need:

Worksheet created by teacher, Iditarod web site (results and maps), calculator.

Technology Utilized to Enhance Learning:

Internet – Iditarod or Cabelas' web site

Other Information:

Consider converting to kilometers for each hour traveled (kilometers per hour kpm which is used in Canada...the Iditarod's neighbor and in Europe where mushers have entered the Iditarod from Norway, Italy, Holland and the United Kingdom. There are 1.609 kilometers in each mile.

Modifications for special learners/ Enrichment Opportunities:

Set up a spreadsheet that converts the minutes and seconds to and from decimal for those with limited math skills. Those with very limited math skills can utilize a teacher prepared spreadsheet for all calculation.

Notes: To give meaning to the speed traveled by the dog teams, compare the speeds to those of the fastest animals on the planet and the fastest humans. For the fastest human time, research the best marathon time for male or female to see how that compares to the pace of the sled dog teams. Try moving (biking or running) at the pace of the dog team you followed. Try this on dry land and in the snow or sand.