Section 11
Mathematics

Math can easily be incorporated into the Oregon Trail unit. One form of math was used daily by pioneers to measure distance traveled as well as estimating distances between two points.

1. As the pioneers traveled, they would measure distances by the revolution of their wagon wheels. If you have a wagon wheel available, have students measure distances (by counting revolutions of the wagon wheel) between various points. Students can then compare this distance with that of more standard measurement such as tape measures, meter or yard sticks, rulers, etc. Which form of measuring distance is the easiest to do? Measure the circumference of a wagon wheel. Have students determine how many revolutions of a wheel it would take to cover approximately one mile of ground.

2. The prices of supplies differed from one trading post to another. Have the students figure out these differences, and using shopping advertisements of today, have them compare the prices and dollars spent.

	Fort Hall	Fort Boise	Waiilatpu Mission	The Dalles
Flour	0.20 per lb.	0.20 per lb.	0.05 per lb.	0.18 per lb.
Beef	————	0.20 per lb.	0.07 per lb.	0.25 per lb.
Sugar	0.50 per lb.	0.40 per lb.	0.20 per lb.	0.20 per lb.
Bacon	————-	————-	————-	0.50 per lb.

3. The pioneers would have to estimate the distance across a river in order to ford it safely. Using Jack's Math, have students estimate the distance between two points in the school yard. (Jack's Math-Pacing Method.)

4. Families loaded only things they needed in order to survive the hard trail. Below is a partial list of some items. Have students look up the cost of these items (catalogs or advertisements) and total up the amount.

Ax, rope, shovel, saw, 1 pair of shoes per each person, 2 pairs of boots per each person, 3 iron pots, skillet, 3 knives, tin dishes, spoons, 2 sets of clothing per each person, flour/600 lbs., sugar/75 lbs., salt/25 lbs., rice/30 lbs., meat/300 lbs., small camp stove, tent, and 1 blanket per person.

5. Practice regrouping with subtraction by finding the differences between today's date and important dates in Oregon Trail history.

6. If you are able to visit Whitman Mission National Historic Site, do the following: The perimeter of the locations of the mission buildings are outlined with cinder blocks at the

Waiilatpu Mission. Have the students measure the distance around each building. Various forms of measuring could be used. Students could work in groups. Dimensions of each building could be recorded and compared. An interesting activity would be to compare the sizes of mission buildings with sizes of present-day homes!
7. With measuring tapes or strings, have the students measure the circumference of trees at the site. Are circumferences of one type of tree noticeably different from other types of trees? Why do you think they are different?

8. Determining age of trees. Obtain core samples from the local Forest Service Office. (These are free!) By counting rings, core samples clearly reveal the age of trees. By comparing various core samples with similar trees at your school or town, you can then estimate the age of trees. A second way to determine the age of trees is to examine a cross-section from a log. Students add up the rings to determine the age of the tree.

9. With the tree-ring samples, have students look up specific dates in almanacs and determine what significant events occurred on various dates.

10. The following list is a breakdown of the cost (1849 prices, St Louis Missouri) of certain supplies that pioneers might purchase before leaving on the Oregon Trail. Have students find the difference and compare these prices with to those of today. How much more expensive are they now?

Coffee	0.08 per lb.
Tea	0.55 per lb.
Bacon	0.05 per lb.
Flour	0.02 per lb
Sugar	0.04 per lb.
Rice	0.05 per lb
Dried fruit	0.06 per lb.
Salt	0.06 per lb.
Soap	0.11 per lb.
Candles	0.11 per lb.
Lard	0.05 per lb.
Tent	$5.00 ea.

11. You can also have the students compare these prices to those found along the Oregon Trail. Note how the price usually increases as they get further towards Oregon Country. Some sample questions might be:

Why did the cost of supplies increase as they traveled further West?
Why were the prices at Whitman Mission cheaper than some of the posts and forts?
What was lard used for?
Why did they purchase dried fruit?
What was the importance of dried fruit?

12. The following is a list showing the approximate number of people by year whose destination was either Oregon or Utah/California. (Note the year 1849 as it shows the impact of the California Gold Rush and the years just prior to that show the beginning of the Mormon migrations). Have students utilize and practice place value as they find differences between the years. They can also review basic addition and subtraction skills.

Year	Oregon	Utah/California
1840	13	0
1841	24	34
1842	125	0
1843	875	38
1844	1,475	53
1845	2,500	260
1846	1,200	1,500
1847	4,000	2,650
1848	1,300	2,800
1849	450	26,500
1850	6,000	46,500
1851	3,600	2,600
1852	10,000	60,000
1853	7,500	28,000
1854	6,000	15,167
1855	500	6,184
1856	1,000	10,200
1857	1,500	5,300
1858	1,500	6,150
1859	2,000	18,431

13. Obtain some old currency and have kids feel and observe the difference between today's money and that of yesterday. How do they differ? Have students count out change using the old currency.

Jack's Math

One way of measuring distances is by counting your paces. But you need to know the length of your pace first.

Measuring Your Pace

1) Mark off 50 feet on the ground.

2) Starting with your toes on a starting line, pace the distance 10 times, counting steps.

3) Divide the total paces by ten.
<u>125 paces</u>
10 times = 12.5 paces (average)
125 paces—divided by—10 times—equals—12.5 paces (average)

Divide 50 feet by average paces. This is your length of pace.
<u>50 feet</u>
12.5 paces = 4 foot pace

50 feet—divided by—12.5 paces—equals—4 foot pace

Personal Measurements

Name_____

Date_____

Address_____

Age_____

My height is _____ feet, _____ inches

My eyes are _____ feet, _____ inches above the ground.

My reach across, from tip of one outstretched hand to the tip of the other, is _____ feet, _____ inches.

The length of my forearm, from tip of little finger to elbow, is _____ feet, _____inches.

My hand span, from thumb to little finger, is _____ inches.

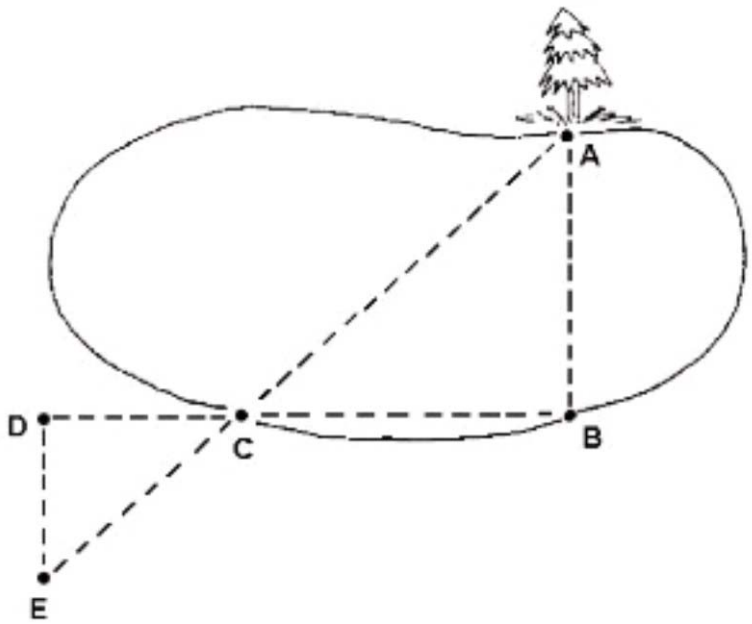
The breadth of my thumb is _____ inches.

The length of my index finger is _____ inches.
The length of my foot is _____ inches.
The length of my pace is _____ feet.

Distance from my _____ to _____ is exactly one inch.**
Distance from my _____ to _____ is exactly one foot.

Distance from my _____ to _____ is exactly one yard.

**Example: End of thumb to first joint. Must be determined for individual.



Measuring Width
Pacing Method

1) Note a landmark (a) on the other side of pond. Place a stick (b) where you are, exactly opposite the landmark.

2) Stand at stick and pace off 100' at a right angle to line (a-b). At this point place another stick (c).

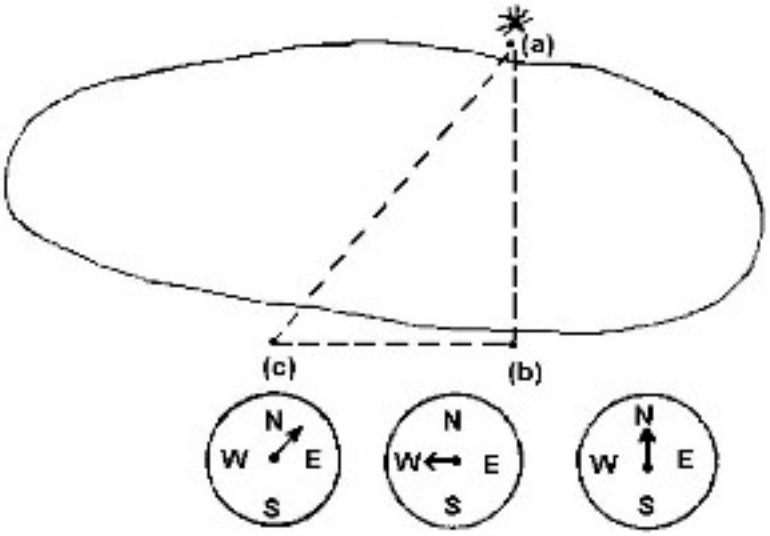
3) Continue pacing along this line for half as much distance as before (in this case 50'). Place another stick (d).

4) Make another right angle and walk until you can sight stick (c) and the landmark (a) in a straight line, then stop. With another stick mark this point (e).

5) Now line (d-e) is half the distance across the pond. Pace line (d-e). Multiply line (d-e) by two. This is the approximate distance across the pond (line a-b).

6) Replace sticks or rocks to where you found them.

Compass Method



1) Walk West until point (a) is exactly Northeast.

2) Sight compass North in line with tree.

3) Point compass North. Take compass reading across pond on landmark (a). (In example above North is across the pond). Place stick at point (b).

4) Turn (90 degrees) on the compass (in example this is a West). Now walk until the compass is halfway between the reading at point (ab) and the reading on the line you are now proceeding (b-c). (In the example this is NE.)

5) At this point (c), line (bc)=line (a-b). So pace distance of line (b-c) and this is the distance across the pond.

Measuring Height

Indian Method

1) Walk away from the tree, bend over and sight its top between your legs. When you can see the top of the tree while in this position, stop.

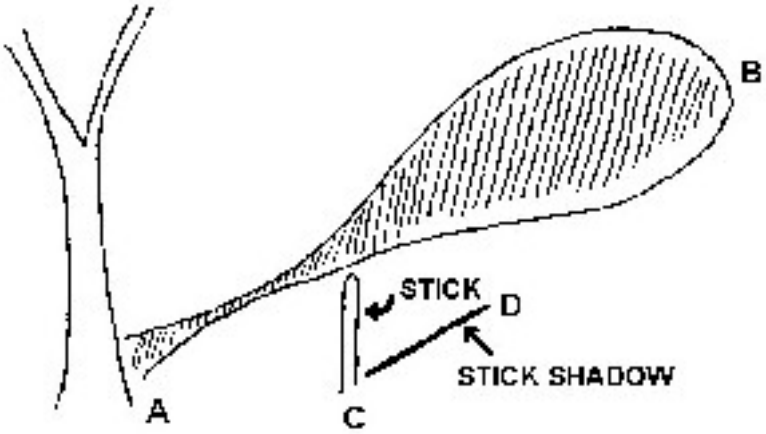
2) The approximate height of the tree will equal your distance from the tree. In bending over, grasp your knees or your ankle.
Stick Methods

3) Mark your height on the tree trunk.

4) Step back several spaces. Hold a stick up before you in an outstretched hand. Sight the height of your mark on the tree and mark this on the stick with your thumbnail.

5) ee how many times this height goes up the tree. Multiply the number of times by your height. This is the approximate height of the tree.

Shadow Method

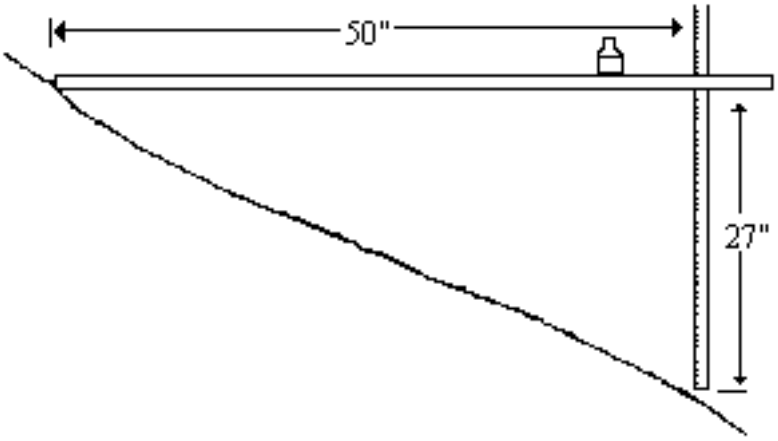


Formula:
<u>Length of tree shadow (ab)</u>
Length of stick shadow (cd)

x Height of stick
= height of tree

(Length of tree shadow [ab]—divided by—Length of stick shadow [cd]—times —Height of stick—equals—Height of tree).

Measuring Slope



Percent of slope is the number of units the land falls or rises in 100 units of horizontal distance.

To measure percent of slope use a stick 50" long and a level, or bottle with water and a yardstick.

1) Hold yardstick in upright position. Place 50" stick on slope and raise free end until it is level. Note its distance above the ground.

2) Read this distance in inches and multiply by two to get percent of slope.
**By knowing slope of land you can discuss what the best use of the land could be (farming, contour farming, pasture, wildlife, etc...) Get land use designations from Soil Conservation office.

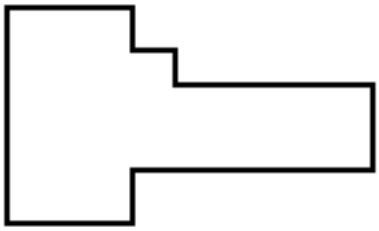
Measuring Water Flow

L (length) = feet
W (average width) = feet
D (average depth) = feet
V (total volume) = L x W x D = cubic feet
T (time for float to travel L) = second
Rate of flow = L/T = ft. per second
Discharge = V/T = cubic feet per second

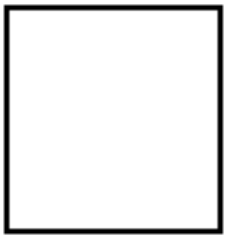
Measuring Area by Pacing

By pacing, find the perimeter of each house.

How do they compare? Which would have the most living space?



Mission House



Emigrant House

Blacksmith Shop

By pacing, find the square footage of the blacksmith shop.

Find square footage of the left hand room.

Eight people lived in this room. How many square feet did each person have to live in?

Measuring Circumference, Diameter, Volume and Board Feet of a Tree

Circumference: Use a tape measure. Measure around the tree at breast height.

Diameter: On the back of your tape measure, mark a line 3.14 inches from end of tape. Put a 1" mark there. From that mark, make another mark 3.14 inches farther down and place a 2" mark there. Continue doing this to the end of the tape. Each 3.14 mark represents one inch in tree diameter.

Volume: Volume of a cone equals 1.047—times—radius squared—times—height
or
pi—divided by—three—times—radius squared—times—height

Board feet: One board is a piece of lumber 1 inch thick, 12 inches wide and 12 inches long. This equals to 144 cubic inches. To find the total board feet in a tree, you divide volume in inches by 144 cubic inches.

Volume in inches = Board feet in inches
144 cubic inches (Volume in inches—divided by—144 cubic inches—equals —Board feet in inches).

This is the approximate total board feet in the tree. Usable or merchantable board feet are considerably less. You can get a volume table from the Forest Service. The Forest Service table gives you the volume according to the number of usable logs. Usable logs are 16 foot sections. So you would need to divide the tree height into the number of 16 ft. sections in your tree in order to use the table.