BLUEBIRD MATH CIRCLE
Alliance of Indigenous Math Circles

Issue 19: Geometry is Earth Measurement

Share your problems, solutions, models, stories, and art:
https://aimathcircles.org/Bluebird

Northern Arizona is a high-desert region with many colorful, beautiful, and strange land-forms. It looks just like Mars. I spent my childhood playing and exploring all of that land by day, and by night was greeted with an expansive and clear night sky. As Navajo children, we are told stories of how all those land forms and constellations in the sky came to be, because we are taught it is important to know your origins: both your own existence and the land you inhabit. When I started working at NASA Jet Propulsion Laboratory, I realized the space exploration we do is all an expansion of my childhood lesson: to better understand our own existence in this world, and the universe that created us.

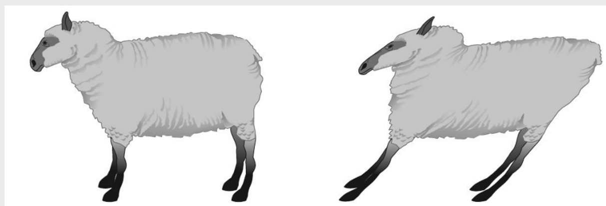
–Aaron Yazzie, Mechanical Engineer, NASA Jet Propulsion Laboratory

NEWSFLASH
Join LIVE Bluebird Math Circle to work on these activities together with friends and family.

Monday January 10, 5-6 PM MDT online.

Sign up at **https://aimathcircles.org/Bluebird**

MATH JOKE



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Measuring Distance

For this Bluebird Session, we will measure distance 'as the bluebird flies'; that is, as if we could fly in a straight line from one place to another.

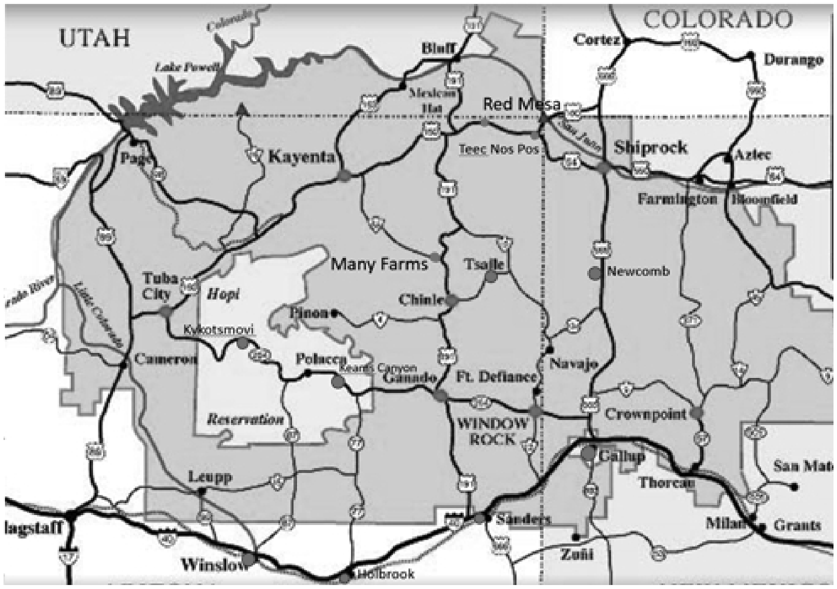
To the right is a chart of Bluebird distances between communities. Distances are given to the nearest mile.

Note that there are zeroes along the diagonal of the diagram (here colored blue), because the distance between a town and itself is zero. Sometimes we don't actually enter these zeroes.

Also, some of the distances are left out, because they would repeat distances already given. For example, the distance between Newcomb and Gallup is 51 miles, and it is the same as the distance between Gallup and Newcomb. So we don't enter the same distance twice.

We want to look at the situation geometrically. On the next page is a map showing the towns in the chart.

(nearest mile)	Chinle	Farmington	Gallup	Ganado	Holbrook	Kayenta	Keams Canyon	Kykotsmovi	Many Farms	Newcomb	Red Mesa	Sanders	Shiprock	Teec Nos Pos	Tsaile	Tuba City	Window Rock	Winslow
Chinle	0																	
Farmington	84	0																
Gallup	53	50	0							51								
Ganado	31	100	46	0														
Holbrook	93	167	91	66	0													
Kayenta	55	111	115	78	126	0												
Keams Canyon	42	127	83	39	62	64	0											
Kykotsmovi	62	146	108	61	72	62	25	0										
Many Farms	13	80	73	45	106	43	49	66	0									
Newcomb	48	40	51	59	126	90	90	110	52	0								
Red Mesa	57	74	105	87	148	47	91	101	41	61	0							
Sanders	66	121	39	36	52	115	65	86	80	81	121	0						
Shiprock	65	25	50	87	154	86	108	124	60	34	41	113	0					
Teec Nos Pos	58	51	98	86	151	65	96	111	50	49	17	118	25	0				
Tsaile	21	86	59	44	111	64	64	83	23	46	48	75	80	43	0			
Tuba City	90	169	143	97	102	68	61	36	90	137	130	122	146	129	109	0		
Window Rock	44	86	20	26	83	99	55	89	56	46	92	36	80	85	45	124	0	
Winslow	100	181	115	80	31	120	60	59	108	141	152	77	166	158	121	82	103	0



1) Suppose we had to decide whether to travel to a certain store which has a branch in Tuba City and another in Gallup. Which towns are closer to the store in Tuba City? Which are closer to Gallup?

2) What is the 'border' between points closer to Tuba City and points closer to Gallup?

3) Which points are the same distance ('equidistant') from Tuba City and Gallup? There may not be a town at such a point, but is there a town that is almost equidistant?

4) Suppose we are thinking about the distance from each town to Tuba City. Which towns are closer toTuba City than Chinle is to Tuba City? What is the shape that separates these towns from those that are further than Chinle is from Tuba City?

Ask Bluebird

QUESTION—*What is the reason behind 3.14, or π (pi)?*—from Rivas T.

BLUEBIRD SAYS—All circles are *similar*. They look the same, only some are bigger and some are smaller.

This is not true of rectangles. A dollar bill is a rectangle that's longer than it is wide. But a typical ID card is a rectangle that is more like a square. You can tell the difference in shape without knowing how far away you are from the object.

Mathematicians describe this property of circles by noting that the ratios of corresponding parts of a circle are always the same. Pi (π)i, which is approximately 3.14, is the ratio of the circumference to the diameter in any circle. There are a bit more than three diameters which will fit around the circumference of any circle.

There is no π, no constant, for rectangles. The ratio of the width to the length, or the width to the diagonal, or any other two corresponding line segments, will be different for different 'kinds' of rectangles. But there is only one 'kind' of circle. So π is a constant for all circles.

FUN FACT OF THE FORTNIGHT	The radius of the moon is approximately **1,079.6 miles**. Think of the moon as a sphere. If we could slice it through its center, the cross section would be a *great circle* of the moon. How would you use π to calculate the circumference of such a great circle?

