

IMPORTANT: Please refer to the Preface for Topographic Map Activities for preliminary instructions and information common to all Topographic Map Activities in the series.

Topographic Map Activity 6 - Mileage equivalent for a degree of longitude (Revised 07-28-20)

Objective: To calculate the number of miles that each degree of longitude represents at any given latitude.

Background: At the equator, each degree of longitude is equivalent to about 69.17 miles. However, as we move away from the equator towards either of the poles this mileage equivalent gets smaller. This is because the lines marking degrees of longitude all merge to a single point at each pole. The equation for calculating the number of miles that each degree of longitude represents at any given latitude is:

$$\text{miles} = \text{cosine}(\text{degrees of latitude}) \cdot 69.17.$$

All we need to do is find the cosine of the degrees of latitude, then multiply that by 69.17 miles.

Activity: We will use a latitude of 36° N (Red Rock Canyon NCA is near this latitude) and figure out the number of miles there are for each degree of longitude.

Step 1. Find the cosine of 36° (three different methods are illustrated below).

Method 1: It's easy if you have a handheld calculator with a cosine key (ensure you are set in the degree mode and not the radian mode, then press cosine, followed by 36). The answer is .809016994 (depending on how many digits are displayed on your calculator).

Method 2: Use an [online cosine calculator](#). (set the calculator in degree mode and not radian mode). Here we get .80901699437

Method 3: Use a [cosine table](#) (may have to interpolate between whole degrees if your latitude has a decimal extension, like 36.5°). For 36° we get .809017

Step 2. Multiply any one of the above answers by 69.17 miles. You get 55.959706 (rounded to 6 digits after the decimal point)

Each degree of longitude at a 36° latitude is equal to 55.959706 miles.

[Feedback](#)

TABLE OF COSINE FOR 0° TO 90°

Degrees	Cosine	Degrees	Cosine	Degrees	Cosine	Degrees	Cosine	Degrees	Cosine	Degrees	Cosine
0	1	16	.961262	32	.848048	48	.669131	64	.438371	80	.173648
1	.999848	17	.956305	33	.838671	49	.656059	65	.422618	81	.156434
2	.999391	18	.951057	34	.829038	50	.642788	66	.406737	82	.139173
3	.998630	19	.945519	35	.819152	51	.629320	67	.390371	83	.121869
4	.997564	20	.939693	36	.809017	52	.615661	68	.374607	84	.104528
5	.996195	21	.933580	37	.798636	53	.601815	69	.358368	85	.087156
6	.994522	22	.927184	38	.788011	54	.587785	70	.342020	86	.069756
7	.992546	23	.920505	39	.777146	55	.573576	71	.325568	87	.052336
8	.990268	24	.913545	40	.766044	56	.559193	72	.309017	88	.034900
9	.987688	25	.906308	41	.754710	57	.544639	73	.292372	89	.017452
10	.984808	26	.898794	42	.743145	58	.529919	74	.275637	90	0
11	.981627	27	.891007	43	.731354	59	.515038	75	.258819		
12	.978148	28	.882948	44	.719340	60	.000005	76	.241922		
13	.974370	29	.874620	45	.707107	61	.484810	77	.224951		
14	.970296	30	.866025	46	.694658	62	.469472	78	.207912		
15	.965926	31	.857167	47	.681998	63	.453990	79	.190809		