

TEACHER GUIDE: STUDENTS CALCULATE SCALE DIMENSIONS ON MAP

CALCULATING SCALE DISTANCES:

This provides an excellent opportunity to use some fairly basic algebra to show how a “scale factor” is derived from a simple scale equation. In the formula below, SD = Scale Distance desired; T = Actual Time back to event of interest. The **0.6 mi. / 10 mya** fraction is the **Reference** equivalent determined from building the scale used in this lesson.

$\frac{\text{EVENT}}{\text{T}} = \frac{\text{REFERENCE}}{10 \text{ mya}}$	Dividing 0.6 mi. by 10 mya = 0.06 mi/mya (Scale Factor) Multiplying both sides of the equation by T cancels T on the left, and results in: SD = T x 0.06 mi/mya (Scale Distance Calculation)
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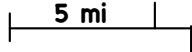
Therefore, to find the map-scale Distance backwards in time to a desired event, just multiply that Actual Time (T) in mya by 0.06 mi/mya
 The product will be the map-scale Distance (SD) in miles (mya units cancel out).

If your students can handle the “scale factor” derivation, ask them to see if they can figure it out, and compare results with each other. Show them how the **Event** SD/T ratio is proportional to the **Reference** ratio, then let them do the derivation.

If they have no algebra experience, just show them the proportion equivalence equation, and explain that the “scale factor” (0.06 mi/mya) was calculated from that. Then have them use the **Scale Distance Calculation (SD)** for each T (Actual Time) desired, then enter that into the table.

CALCULATING MAP DISTANCES:

Once the **scale distance** (SD) is determined, this distance (miles) needs to be translated into the **map distance** (MD in cm) that corresponds to the scale distance (SD). This will require a second calculation, using the *map’s* scale. Different maps will have different scales; a convenient source of maps to use would be Google Maps or similar online map source. A Google map has its map scale in the lower left hand corner (see sample below). Carefully measure (in cm, to nearest tenth of a cm) the actual length of the map scale dimension (the 5 mile dimension in the sample measures 1.9 cm); then divide that measurement (1.9 cm in sample) by the miles (5 miles in sample). Now multiply that result (0.38) by the desired scale distance (SD). Set your compass for that map distance. Placing the compass center point at your school location, scribe a light circle for that distance. Look for familiar places of interest that lie on or close to that scribed arc, and pick one to remember as being associated with the special event in time that happened millions of years ago. Record that special place on your **Scale Events Worksheet** table on the line for that event. Answer Discussion questions.

Sample Map Scale (Google Map):  MSD = 5 miles (between upper marks)
 MSM = 1.9 cm (between upper marks)

Map Distance = Scale Distance x (Map Scale Measurement / Map Scale Dimension)
MD = SD (MSM/MSD)