Earth Systems Name: Date: Per:
Mr. Varner
Topographic and geologic maps
Lab experiment

Reading Topographic Maps

Purpose: to learn the most important parts of a topographic map, how to read the map, and how to interpret and calculate data using the map.

Note: Maps used will also be available in digital format online.

A. Identify the map

• To identify the map, look in the top right hand corner.

1. What is the **quadrangle** name?

2. What is the **state** name?

3. What is the **county** name?

4. What **series** does this map belong to?

5. What kind of map is it? (In parentheses)

B. Government heading

• To identify the government agency, look in the top left corner of the map.

6. What **department** of the U.S. government made this map?

7. What is the section of this department that produced this map? (They make most official U.S. maps.)

C. Credit legend

• To find out the details about who made this map, and how it was made, look in the bottom left corner.

Mapping Agencies and Control Data Agencies
Current agencies:
USGS — United States Geological Survey
NGA — National Geospatial-Intelligence Agency
NGS — National Geodetic Survey, formerly USC&GS — U.S. Coast and Geodetic Survey
NOAA — National Oceanic and Atmospheric Administration,
which includes NOS — National Ocean Service
USACE (formerly USCE) — U.S. Army Corps of Engineers
Past agencies:
NIMA — National Imagery and Mapping Agency; DMA — Defense Mapping Agency;
USATC — U.S. Army Topographic Command; AMS — Army Map Service

8. What is the name of the mapping agency who produced this map?

9. Geodetic control is the scientific data information needed to make a topographic map. What agency or agencies provided the **control** data?

10. Fill in the important dates given below. If any are *not* present on your map, draw a line — .

a) Topography (compiled):

b) Planimetry (derived from imagery taken):

c) Aerial photographs taken:

d) Revised from aerial photographs taken:

e) Field check *:

f) Field check (after revised photos):

g) Public Land System:

h) Boundaries (current):

* A field check is when a government worker actually goes to the places to check out the information from the aerial photos.

11. A projection tells you how the round Earth was projected onto a flat map. Topographic maps use a few different projections. What type of **projection** was used for this map?

12. Geodetic datum is the main longitude-latitude coordinate system used for the map. In the U.S., this is always one of the following: North American Datum 1927 (NAD27), North American Datum 1983 (NAD83), or World Geodetic System (WGS 84). What geodetic **datum** is used for this map?

13. All topographic maps include a 1000 meter reference grid (or grid tick marks) based on the global Universal Transverse Mercator (UTM) projection. The world is divided into numbered zones. What UTM **zone** is this map located in? [Don't worry about the California Coordinate System.]

D. Date

• Find the main dates for this map on the bottom right corner.

14. What is the **date** (year) of this map? This is the last field check and is shown in **black** print.

15. Maps are sometimes revised (updated). If so, you will see a **purple (magenta)** date. What is the year of the revision (if any)?

E. Quadrangle location

16. Draw a small **×** at the location of this map in California.

F. Scale, and horizontal and vertical distances
• These are usually in the bottom center of the map.

17. The scale shows how much bigger the real land is than the map. For example, 1:63,000 means that 1 centimeter on the map equals 63,000 cm (0.63 km) in the real world. What is the **scale** of this map?

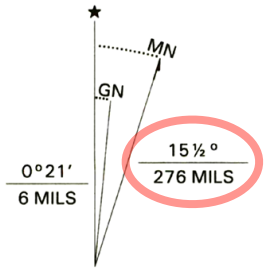
18. What **horizontal distance scales** are shown on this map (usually 3 or 4 are shown)?

19. The contour interval gives the vertical distance between the brown contour lines that show elevation above sea level. What is the **contour interval** for this map?

G. Declination
Declination shows the difference between the direction to the north pole (true north: ★) and the direction of magnetic north (**MN**) shown on a compass. It is measured in degrees (°) and milliradians (MILS) (which are thousandths of a radian).

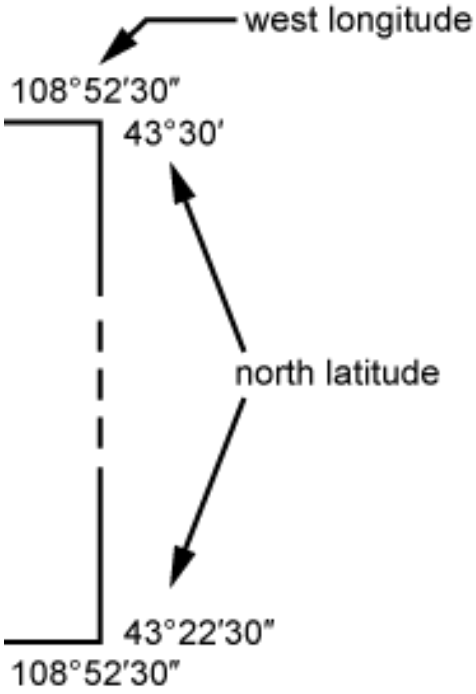
20. What is the **declination** on your map?

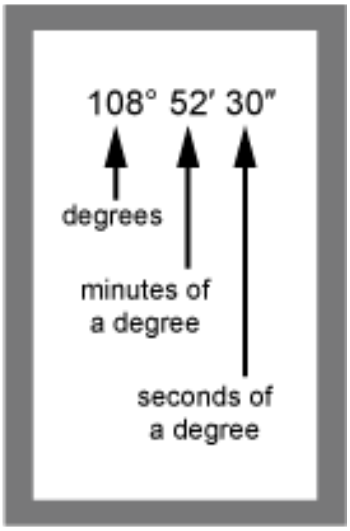
Example:



UTM GRID AND 1997 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

H. Geographic coordinates
Coordinates show where this map is on the Earth. In the U.S.A., the numbers on the right and left show the **latitude** in degrees, arc-minutes, and arc-seconds **north** of the equator. The numbers of the top and bottom show the **longitude west** of 0° (in London, England).





21. What are the coordinates on the top left?

_____ N _____ W

22. What are the coordinates on the top right?

_____ N _____ W

23. What are the coordinates on the bottom left?

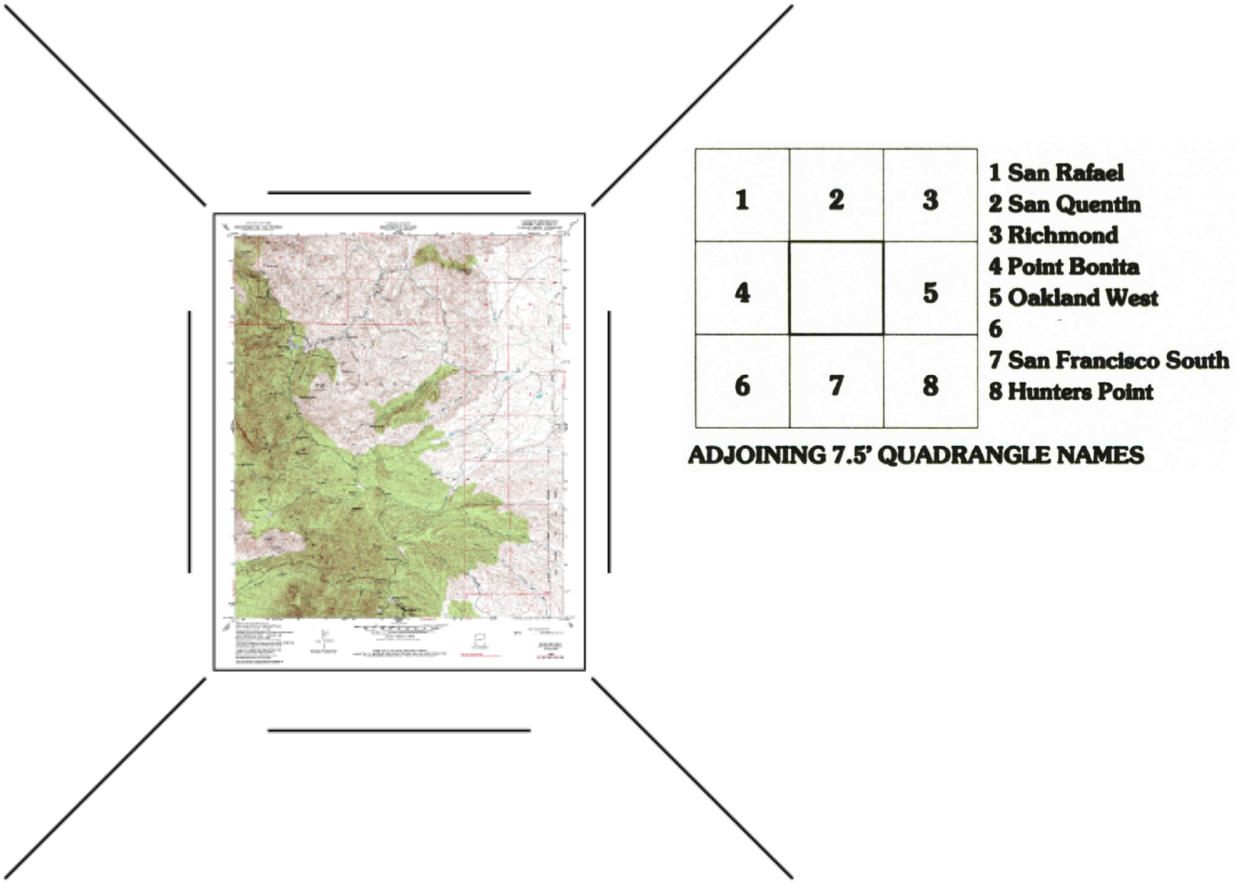
_____ N _____ W

24. What are the coordinates on the bottom right?

_____ N _____ W

I. Adjoining quadrangles

25. A single topographic map is called a **quadrangle**. The names of the eight quadrangles around this map are shown. Older maps put the names on the edges of the map (called the neat line). Very recent maps include a graphic on the lower right of the map as show below (right). Find the names of all eight adjoining quadrangles on your map, and write them on the diagram.



J. Elevations on the map

26. Use the brown contour lines and spot elevations to find the elevation (in feet above sea level) of four places on different parts of the map. The places you choose may be lakes, schools, cemeteries †, churches, wells ●, springs ⚬, mountain peaks △, etc. Use locations with names.

Name and type of place	Elevation
_____	_____
_____	_____
_____	_____
_____	_____

K. Calculating a stream gradient using a topographic map

27. Find a stream channel on your map that is at least a mile long. (For the Valley Center quadrangle, Escondido Creek up on the grade to Valley Center works well.). Identify two points on the stream over a mile apart (do not mark the maps!). Use the scale at the bottom to measure the distance in **feet**.

a) Distance = _____ feet

Next use the contour lines to find the elevation of the higher point on the stream.

b) Elevation of high point = _____ feet

Lastly, use the contour lines to find the elevation of the lower point on the stream.

c) Elevation of low point = _____ feet

Find the difference between the high point and the low point (subtract).

d) Elevation change from high to low (difference) = _____ feet

Divide the difference by the distance between the points (d ÷ a). This will give your **gradient**. It is a ratio of the drop in vertical elevation in feet to the horizontal distance in feet.

e) Stream gradient (elevation change ÷ distance) = _____ .