

# **APPENDIX B**

## **CHECKING YOUR UNDERSTANDING**

### **ANSWERS TO EXERCISES**



# Chapter 1

1. List three examples of how you may use a map on an incident.

**Possible answers:**

- **To assist with navigation.**
- **To determine the location of a specific point or area (water sources, threatened resources).**
- **To calculate distance.**
- **To determine size of an area.**
- **To determine terrain and vegetative cover.**
- **To determine routes of travel.**
- **To determine names of streets, rivers, mountains, and other features.**
- **To visualize a specific area.**

2. Describe two key points to remember when using a map with a compass or GPS receiver.

**When using a compass with a map, an adjustment often has to be made for magnetic declination.**

**When using a GPS receiver with a map, the datum for the map must be entered into the GPS receiver.**

3. Indicate the type of map that would be most appropriate for these activities:
  - A. Locate hot spots on an incident – **Infrared map**
  - B. Determine slope of a specific area – **Topographic map**
  - C. Identify travel route – **Transportation map**
  - D. Determine current perimeter location – **Situation Unit map**
  - E. Identify perimeter location when the incident started – **Progression map**

4. What publication can you use to learn the ICS symbols?

**Fireline Handbook**

5. List three sources of where you can obtain maps.

**Possible sources:**

- **Federal agencies - local, regional, and national**
- **Local/State agency offices**
- **Local business offices**
- **Internet**
- **Mapping software**

## Chapter 2

1. What is the fractional scale and declination of this map? If you are using a GPS receiver, what datum would you use?

**Fraction scale:** 1:24,000

**Declination:** 16.5 degrees East

**Datum:** 1927 North American Datum

2. List the reference coordinates for latitude/longitude and UTM.

**Latitude:** 43° 52' 30"

**Longitude:** 115° 52' 30"

**UTM:** 591<sup>000m</sup>.E. and 4858<sup>000m</sup>.N.

3. Calculate the contour interval for this map.

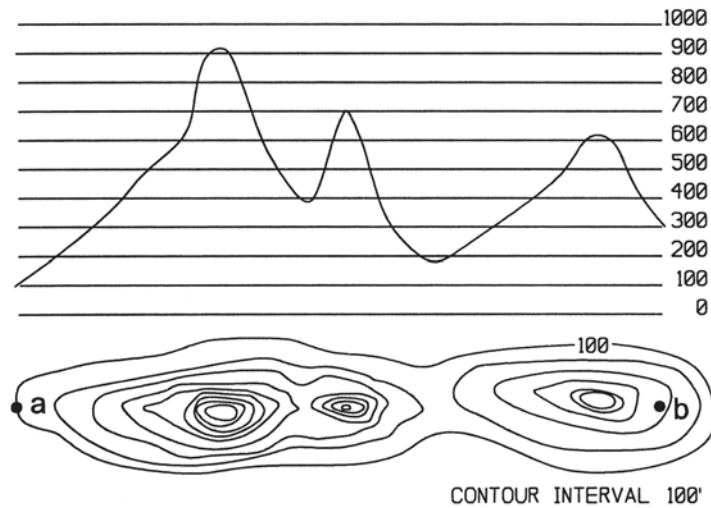
**Step 1:** Two index contours are 9000 feet and 9100 feet.

**Step 2:** The difference between the two index contours:  
9100 feet – 9000 feet = 100 feet.

**Step 3:** There are 5 lines.

**Step 4:** Contour interval is 20 (100 divided by 5).

4. Draw a profile (similar to a line graph) of the land from point “a” to point “b.” Elevation lines are marked in 100-foot increments. Hint: The elevation rises from the 100-foot contour line.



5. Identify the topographic feature inside the rectangles lettered A- F with one of these characteristics: stream, hilltop, steep terrain, ridge, depression, and flat terrain.

- A. **Hilltop**
- B. **Flat terrain**
- C. **Steep terrain**
- D. **Ridge**
- E. **Depression**
- F. **Stream or drainage**

6. Estimate the percent slope between A and B. What is the aspect of the slope between A and B? The scale is 1:24,000 (1 inch = 2000 feet).

Slope: 12%                      Aspect: SW

- Step 1: The elevation of point A is 9400 and point B is 9160**
- Step 2: Vertical (rise) distance is 240 feet**
- Step 3: Horizontal (run) distance is approximately 2000 feet**
- Step 4: Slope is 12% (240 ft / 2000 ft = .12)**

7. Determine the equivalent unit of measurement for the following:

- A. **2.5 miles = 200 chains**
- B. **1.5 chains = 33 yards**
- C. **29,040 feet = 5.5 miles**
- D. **3 chains x 20 chains = 6 acres**
- E. **1/8 of a section = 80 acres**

8. Estimate the acreage (in acres) within 10% accuracy (+ or -) of fires A - D.

- A. **80**
- B. **165**
- C. **25**
- D. **27**





## Chapter 3

1. What are two common global coordinate systems used in the United States?
  - **Latitude/Longitude**
  - **Universal Transverse Mercator**
2. Latitude is a measure of how far **north** or **south** a point is from the **equator**.  
  
Longitude is a measure of how far **east** or **west** a point is from the **prime meridian Greenwich England**.
3. On USGS topographic maps, UTM grid lines are marked every **1000** meters.
4. This is an abbreviated UTM coordinate: <sup>5</sup>66E and <sup>51</sup>96N. How else could it be written?  
  
**566000mE and 5196000mN**  
  
**or**  
  
**566000E and 5196000N**
5. Given this UTM position in Montana – 12 683456E 5346782N – the easting is located **183,456** meters east of the 12th zone central meridian and the northing is located **5,346,782** meters north of the 12th zone equator.

6. Write the acreage and location description (section, township and range) for each of the lettered areas.

- A. 160 NW 1/4 , Sec. 3, T.2S., R.4E.
- B. 80 E1/2 NE 1/4, Sec.3, T.2S., R.4E.
- C. 40 NW1/4 SW1/4, Sec.3, T.2S., R.4E.
- D. 20 W1/2 NW1/4 SE1/4, Sec.3, T.2S., R.4E.
- E. 20 S1/2 NE1/4 SE1/4, Sec.3, T.2S., R.4E.
- F. 30 N1/2 and SW1/4 SE1/4 SW1/4, Sec.3, T.2S., R.4E.

**OR**

W1/2 and NE1/4 SE1/4 SW1/4, Sec.3, T.2S., R.4E.

- G. 10 SW1/4 SE1/4 SE1/4, Sec.3,T.2S., R.4E.
- H. 5 E1/2 NE1/4 SW1/4 SE1/4, Sec.3, T.2S., R.4E.
- I. 5 N1/2 NW1/4 SW1/4 SE1/4, Sec.3, T.2S., R.4E.
- J. 2½ NE1/4 SW1/4 SW1/4 SE1/4, Sec.3, T.2S., R.4E.

7. Name two other Geographic Location Systems besides latitude/longitude, UTM, and U.S. Public Land Survey.

**Possible answers:**

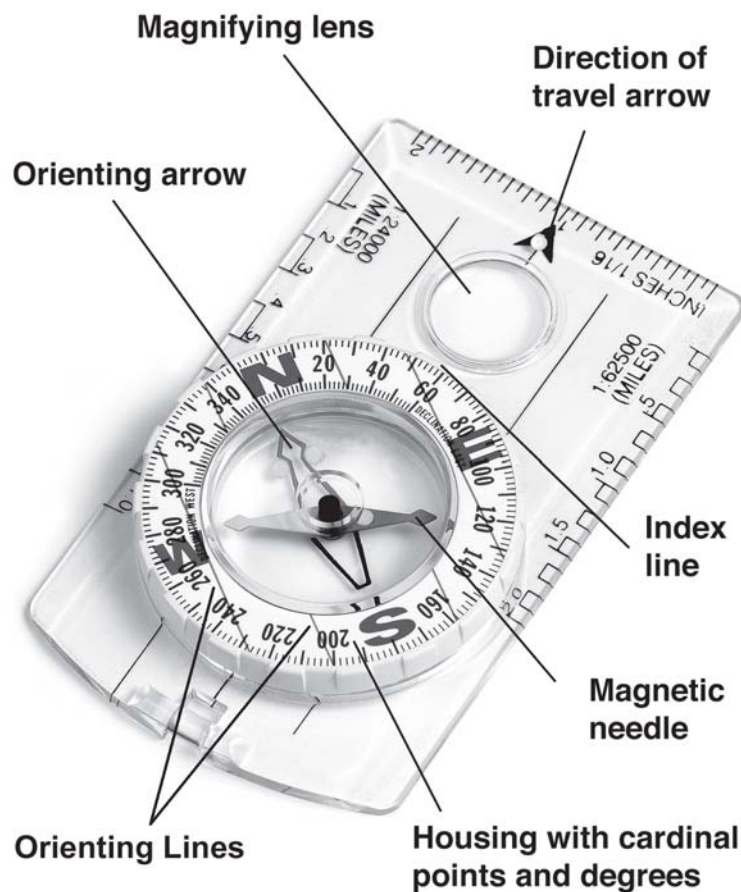
- **Military Grid Reference System**
- **Spanish Land Grants**
- **Metes and Bounds**
- **State Land Coordinate System**

## Chapter 4

1. List three examples of how you may use a compass on an incident.

**Possible answers:**

- **Determine direction to a destination or landmark.**
  - **Stay on a straight course to a destination or landmark, even if you lose sight of the destination or landmark.**
  - **Avoid obstacles in the path to the destination or landmark.**
  - **Return to your starting point.**
  - **Pinpoint locations on a map and in the field.**
  - **Identify what you are looking at in the field or on a map.**
  - **Orient a map.**
  - **Plot points on a map.**
  - **Plot route of travel on a map.**
2. Label the seven parts of a compass.



3. List five tips on how to obtain accurate compass readings.

**Possible answers:**

- **Hold the compass level and steady so the needle swings freely.**
- **Hold the compass about waist high in front of the body, except when using a compass with a sighting mirror or a sighting type compass.**
- **Raise and lower eyes when taking a bearing, do not move your head. Always use the same eye when taking bearings.**
- **Directly face object that is being measured.**
- **Magnetic fields will give incorrect compass readings. Avoid taking readings near magnetic fields such as steel, iron (ferrous metals), vehicles, rebar, and clipboards. Even belt buckles and rings can interfere with the compass reading.**
- **Take bearing twice.**
- **Adjust for magnetic declination as appropriate.**
- **Follow the direction of travel arrow, not the compass needle, when walking a bearing. Always follow the line indicated by the compass rather than relying on judgment as to the direction.**
- **Use back bearings to ensure you are on track when navigating.**

4. How do you adjust your compass for declination? How do you know what the declination is for the area where you are working?

**Refer to the owner's manual for instructions on adjusting a compass for declination.**

**Look at the bottom left hand corner of a USGS topographic map for the magnetic declination information.**

5. What are the two different ways to orient a compass?

**Orient to magnetic north or geographic north.**

6. The following exercises will improve your performance.

- Practice taking direct and back bearings of various objects.

**No answer – just practice.**

- Take a compass bearing of a distant object. Mark your starting location, walk to your object. Now take a back bearing and follow that bearing. How far off were you from your starting point?

**You should be close to or at your starting point.**

- Practice estimating slope using a clinometer.

**No answer – just practice.**



## Chapter 5

1. Practice storing and naming waypoints and tracks using a GPS receiver.

**No answer – just practice.**

2. Determine how many waypoints your GPS receiver can store in the memory.

**Answer will vary depending upon type of GPS receiver.**

3. List three ways you can prevent making user mistakes when using a GPS receiver.

- **Be extremely careful when entering information into the receiver.**
- **Verify that the receiver has locked on to four satellites.**
- **Don't hold the GPS receiver close to the body and use the antenna as appropriate. Sometimes facing the south can alleviate signal problems caused by the body.**

4. List three things that are important to do when you are taking a GPS receiver with you on an incident.

- **Always bring a compass and map.**
- **Have a GPS download cable.**
- **Have extra batteries.**
- **Know memory capacity of the GPS receiver to prevent loss of data, decrease in accuracy of data or other problems.**
- **Bring the GPS external antennae for use while driving or flying.**
- **Take notes that describe what you are saving in the receiver.**

5. How should you name waypoints?

**Use short descriptive names, such as D1, HL1, DP1, H1, A1.**





## Chapter 6

1. Practice orienting a map with topographic features and with a compass.

**Keep practicing until you feel comfortable. It is much easier to practice in terrain that you are familiar with before trying to do it in unfamiliar terrain.**

2. Using a protractor or compass, what is the bearing between point A and B?

**299 degrees**

3. What is the latitude/longitude coordinate of point C?

**Latitude 46° 53' 45" Longitude 114° 45' 31"**

4. What is the UTM coordinate of point C? UTM zone is 11.

**Zone 11 Easting 668780 Northing 5195780**

5. Plot the following latitude/longitude coordinate on the map:

Latitude 46° - 53' - 47" Longitude 114° - 46' - 33"

**See map on page B-20 for answer.**

6. Plot the following UTM coordinate on the map:

Zone 11 Easting 668780 Northing 5195530

**See map on page B-20 for answer.**

7. When estimating your own position using triangulation, can you take bearings of a tree and large rock for drawing lines of position?

**No, you need to use landmarks that can be found on a map.**

8. You are a field observer on an incident. You see a potential hot spot several miles away and you need to radio in the location but you do not know the hot spot's location. How can you find out the location of the hot spot using a compass?

**One option is to find out if anyone else is nearby who can also see the hot spot. If so, then both of you can take a bearing and you can draw lines of intersection to determine location of the hot spot.**

9. Follow the directions in this chapter and determine your pace on level and sloping ground.
10. If your average pace is  $5\frac{1}{2}$  feet and you walk 1700 paces on level ground, how many feet did you travel?

**9,350 feet**

11. In general, list three situations that could lengthen or shorten your pace.

- **Steepness of slope**
- **Strong winds**
- **Soft surfaces such as sand and gravel.**
- **Wet, rainy, or icy conditions.**

12. What are the four standards that you should incorporate when preparing field maps?

- **S. T. A. N. D. D.**
- **Symbology Standard**
- **Accuracy Standard**
- **Utility Standard**

13. Why is determining the memory capacity of your GPS receiver important?

**If you run out of memory while you are collecting data it can result in a loss of data.**

14. What information should be in your field notes?
- **Designations/names used on map and in GPS receiver (Access #1, A1, DP#1, DP1)**
  - **Description of items mapped (capabilities and limitations of water sources)**
  - **General observations**
    - **Fuel types**
    - **Spread rates**
    - **Safety/hazards**
    - **Fire weather**
    - **Distances**
    - **Other information, as appropriate**
  - **Name of person who collected data and when it was collected (date and hours). Writing down the start and stop time when recording track data can help GIS personnel identify track data once it is downloaded.**
  - **Digital photos can also accompany notes.**



