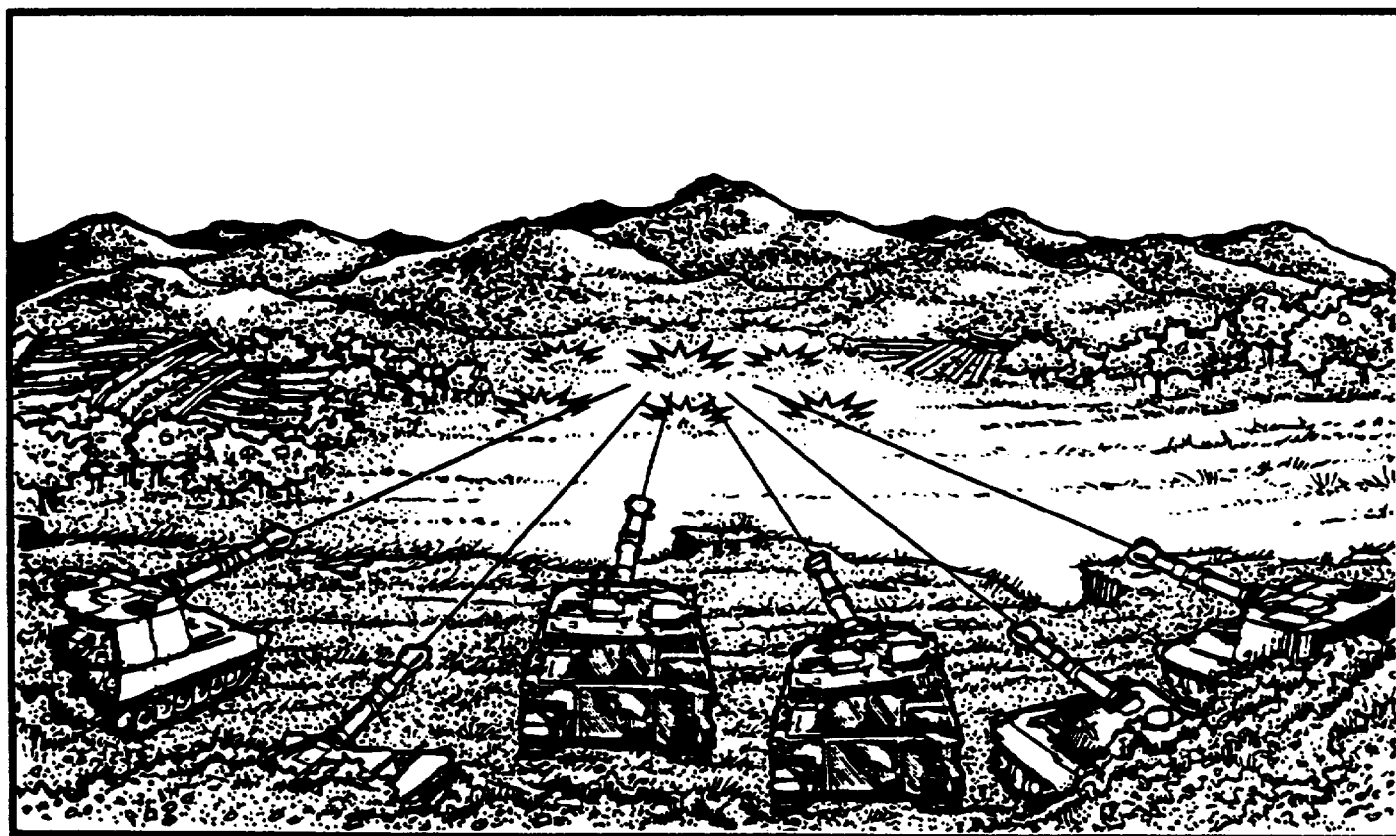


US ARMY FIELD ARTILLERY SCHOOL

SWEEP, ZONE, AND
SWEEP AND ZONE FIRES



THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT
ARMY CORRESPONDENCE COURSE PROGRAM

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READINESS/
PROFESSIONALISM



THRU
GROWTH

CANNON CREW MEMBER

MOS 13B SKILL LEVEL 3

SWEEP, ZONE, AND SWEEP AND ZONE FIRES

SUBCOURSE FA 3310

US Army Field Artillery School

Fort Sill, Oklahoma

Three Credit Hours

GENERAL

This subcourse is designed to train the skills necessary for performing tasks related to computing a sweep and zone fire mission from the originating command. It deals with computing the deflections to be fired and the number of rounds to be fired at each deflection, determining the quadrants to be fired and the number of rounds to be fired at each quadrant, and computing the total number of rounds to be fired for the mission. This subcourse is presented in one lesson consisting of three sections corresponding to elements of the terminal objective supporting the following soldier's manual task:

TASK NO: 061-266-3317

TASK: Compute data for sweep and zone fire mission.

CONDITIONS: You will be given a fire command for sweep and zone fire, a pencil, and paper.

STANDARDS: Determine deflections and/or quadrants to be fired and the number of rounds to be fired IAW FM 6-50.

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GRADING AND CERTIFICATION INSTRUCTIONS

Instructions to the student. This subcourse has an examination that is a performance-based, multiple-choice test covering the lesson. You must score a minimum of 70 percent on this test to meet the objectives of this subcourse.

Credit hours. Three credit hours will be awarded for successful completion of this subcourse.

SWEEP, ZONE, AND SWEEP AND ZONE FIRES

OBJECTIVE

After completing this lesson, you will be able to compute sweep fire missions, zone fire missions, and sweep and zone fire missions. Also, from a given fire command, you will be able to compute the deflection-quadrant combinations to be fired, determine the number of rounds to be fired, and compute the total number of rounds to be fired.

REFERENCES

This subcourse is based on FM 6-50 and other materials approved for US Army field artillery instruction; however, development and progress render the text continually subject to change. Therefore, base your examination answers on material presented in this subcourse rather than on individual or unit experience.

1. INTRODUCTION. Your battery may be in a situation that will require it to fire on a large target area that is excessively wide and/or deep. If the target area cannot be covered accurately by normal battery or platoon sheaf, special methods of fire must be used.

2. SPECIAL METHODS OF FIRE. Among these methods of fire are sweep fire zone fire, and sweep and zone fire. These methods of attack require the use of a combination of quadrant elevations and or deflections. The use of sweep and zone methods of fire may cause the battery or platoon position to become extremely vulnerable to enemy detection by target acquisition devices, and these methods require a high expenditure of ammunition. For a sweep or zone mission to have the desired effect on a target, the chief of section must be able to compute firing data for his howitzer rapidly and accurately. This subcourse teaches you how to compute a sweep and zone fire mission from a given command. You will be able to compute the deflection-quadrant combinations to be fired, determine the number of rounds to be fired, and compute the total number of rounds to be fired for the mission.

Section I. SWEEP FIRE

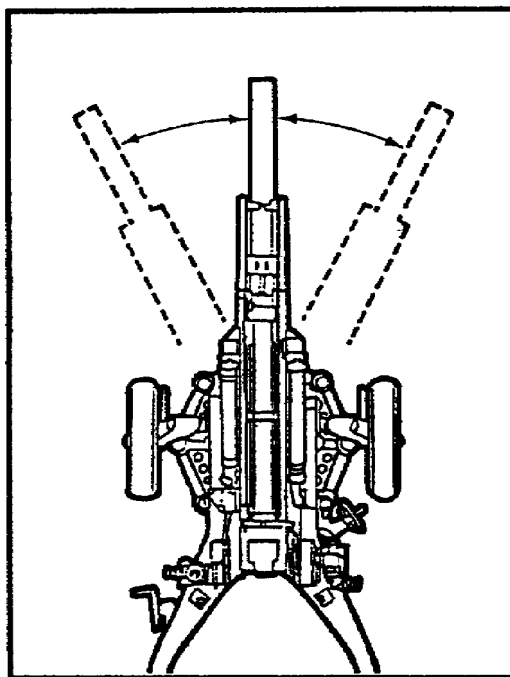


Figure 1. Sweep fire.

3. RECEIVING A SWEEP FIRE MISSION. Sweep fire is a method of fire that allows several deflections and one quadrant to be fired (Figure 1). The number of deflections to be fired will always be an odd number. The chief of section must be able to recognize and acknowledge the special method of fire that his howitzer may receive regarding a sweep fire mission.

EXAMPLE: You are chief of section of a howitzer, and you receive the following fire mission:

FIRE MISSION BATTERY 2 ROUNDS. SWEEP 10 MILS. 3 DEFLECTIONS. SHELL HE. LOT ROMEO TANGO. CHARGE 5. FUZE QUICK. DEFLECTION 3218. QUADRANT 210.

The fire command tells you the size of the sweep (10 mils), the number of deflections to fire (3), and the number of rounds to fire at each deflection (2).

4. COMPUTING THE DEFLECTIONS TO FIRE.

a. To compute the deflections to be fired in the first example, the size of sweep announced (10 mils) is added to the announced deflection (3218 mils), giving you a deflection of 3228 mils. The size of the sweep is also subtracted from the announced deflection (3218), giving you the third deflection of 3208 mils. The three deflections to be fired are 3218, 3228, and 3208 (Figure 2). The announced deflection in the fire command must always be fired first. The remaining two deflections may be fired in any order.

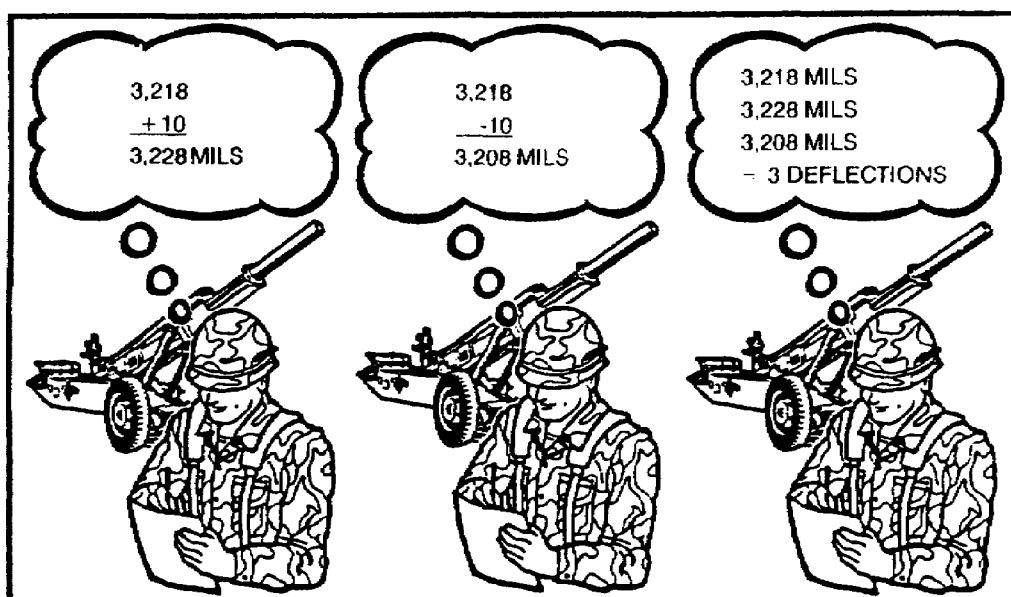


Figure 2. Computing deflections

b. Suppose you receive a fire mission that included the following:

FIRE MISSION. BATTERY 2 ROUNDS. SWEEP 20 MILS. 5 DEFLECTIONS.
DEFLECTION 3220. QUADRANT 387.

(1) The chief of section must immediately identify that there is a special method of fire. SWEEP 20 MILS tells you that the deflections to be fired will differ by 20-mil interval.

(2) The command 5 DEFLECTIONS tells you that five deflections are to be fired. To determine the deflections to be fired, add the announced sweep (20 mils) to and subtract it from the announced deflection and each new deflection. For example, in the above fire mission, the deflections to be fired would be:

3,220 mils = the announced deflection

3,240 mils = the second deflection (3220 + 20)

3,260 mils = the third deflection (3240 + 20)

3,200 mils = the fourth deflection (3220 - 20)

3,180 mils = the fifth deflection (3200 - 20)

c. Now that you have a good concept of how to determine the deflection to be fired, work the following exercise:

FIRE MISSION. BATTERY 2 ROUNDS. SWEEP 8 MILS. 3 DEFLECTIONS.
DEFLECTION 2850. QUADRANT 305.

What are the deflections to be fired?

You should have determined:

2850 = the first deflection

2858 = the second deflection

2842 = the third deflection

Remember that the first deflection fired will always be the announced deflection.

5. DETERMINING THE TOTAL NUMBER OF ROUNDS TO FIRE. The number of rounds to be fired at each deflection is always announced in a fire mission. To determine the total number of rounds to be fired in a sweep fire mission, use the following computation:

$$\begin{array}{rcc} \text{Number of Deflections} & \times & \text{Number of Rounds} & = & \text{Total Number of Rounds} \\ \text{to be Fired} & & \text{to be Fired} & & \text{to be Fired} \end{array}$$

EXAMPLE: You receive a fire mission that includes:

FIRE MISSION, BATTERY 4 ROUNDS. SWEEP 14 MILS. 5 DEFLECTIONS,
DEFLECTION 2997. QUADRANT 308.

Your first reaction should be to multiply the number of deflections to be fired during the mission by the number of rounds to be fired. The fire command includes: 5 DEFLECTIONS and 4 ROUNDS. So you write:

$$\begin{array}{r} 5 \quad \text{Deflections} \\ \times 4 \quad \text{Rounds} \\ \hline = 20 \quad \text{Total Rounds} \end{array}$$

A total of 20 rounds will be fired by your section (each section) in this mission.

6. HOW TO FIRE THE DEFLECTIONS.

a. The command SWEEP 10 MILS (in the example in paragraph 3) tells you that the deflections are to be fired in 10-mil increments between deflections to the left and right of the deflection announced in the fire command.

b. The number of deflections to be fired (in our first example) is included in the fire command 3 DEFLECTIONS.

c. To fire the mission correctly the deflections must be fired so that the announced deflection is fired first. After the announced deflection is fired, the remaining deflections may be fired in any order to finish the mission. For example, if the command 5 DEFLECTIONS is given, the announced deflection is fired first, then two deflections right and two left of the announced deflection will be fired.

PRACTICE EXERCISES

Complete the following exercises by circling T for true or F for false, circling the letter preceding the correct answer, or filling in the blanks as appropriate. Be sure to complete the practice exercises as they appear. They are "building blocks" and will help you complete the rest of the subcourse successfully. The answers follow the last exercise and are separated by a row of slashes (/////). If any of your answers are incorrect, restudy the appropriate part of the subcourse before you continue.

SITUATION: You are a chief section of howitzer number 3, and you receive a fire mission that includes the following:

FIRE MISSION, BATTERY 2 ROUNDS, SWEEP 18 MILS, 5 DEFLECTIONS,
DEFLECTION 2874 QUADRANT 325.

Answer questions 1 through 3 on the basis of the situation above.

1. The deflections you will fire are--
 - a. 2874 ,2911, 2892, 2838, 2855.
 - b. 2874, 2892, 2856, 2838, 2820.
 - c. 2874, 2892, 2910, 2856, 2838.
 - d. 2874, 2892, 2910, 2928, 2856.

2. The number of rounds to be fired at each deflection is--
 - a. 2.
 - b. 5.
 - c. 10.
 - d. 8.

3. The total number of rounds to be fired is--
 - a. 2.
 - b. 5.
 - c. 10.
 - d. 18.

4. When you receive a sweep fire command, it tells you--
- a. the size of the sweep to fire.
 - b. the number of deflections to fire.
 - c. the rounds to fire at each deflection.
 - d. all of the above.

ANSWERS:

- 1. c.
- 2. a.
- 3. c.
- 4. d.

Section II. ZONE FIRE

7. **RECEIVING A ZONE FIRE MISSION.** Zone fire is a method of fire that is used when the standard sheaf does not adequately cover the target and more or less depth is required. Zone fire allows the firing of one deflection with several quadrants (Figure 3). The number of quadrants fired will always be an odd number.

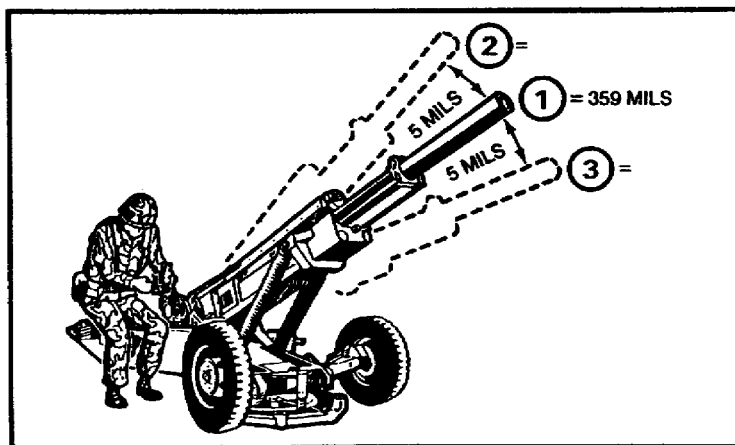


Figure 3. Zone fire.

EXAMPLE: You are chief of section of a howitzer, and you receive the following fire mission:

FIRE MISSION, BATTERY 2 ROUNDS, ZONE 5 MILS. 3 QUADRANTS. LOT X-RAY YANKEE. SHELL HE, CHARGE 5. FUZE QUICK. DEFLECTION 2860. QUADRANT 359.

The fire command tells you the size of the zone (5 mils), the number of quadrants to fire (3), and the number of rounds to fire at each quadrant (2).

8. COMPUTING THE QUADRANTS TO FIRE.

a. To compute the quadrants to be fired in the above example, the size of the zone (5 mils) is added to the announced quadrant (359), giving you a quadrant of 364. The size of the zone is then subtracted from the announced quadrant 359, giving you a quadrant of 354. The three quadrants to be fired are 359, 364, and 354 (Figure 4). The quadrant announced in the fire command is the one you must fire first. The remaining two quadrants may be fired in any order.

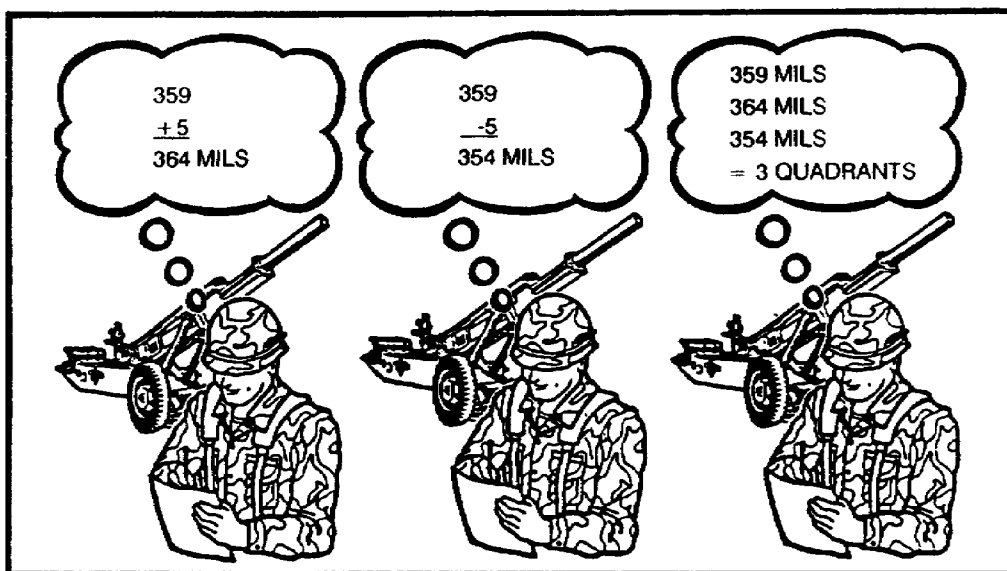


Figure 4. Computing quadrants.

b. Suppose you receive a fire mission that includes the following:

FIRE MISSION. BATTERY 2 ROUNDS. ZONE 3 MILS. 5 QUADRANTS. DEFLECTION 3210. QUADRANT 295.

(1) The chief must immediately identify the special method of fire, ZONE 3 MILS, which tells you that the quadrants to be fired will differ by 3 mils.

(2) The command 5 QUADRANTS tells you that five quadrants are to be fired. To determine the quadrants to be fired above and below the announced quadrant add the announced zone (3 mils) to and

subtract it from the announced quadrant and each new quadrant. For example, in the above fire mission, the quadrants to be fired would be:

295 mils = the announced quadrant

298 mils = the second quadrant (295 + 3)

301 mils = the third quadrant (298 + 3)

292 mils = the fourth quadrant (295 - 3)

289 mils = the fifth quadrant (292 - 3)

Remember that the first quadrant to be fired will always be the announced quadrant.

9. DETERMINING THE TOTAL NUMBER OF ROUNDS TO FIRE. The number of rounds to be fired at each quadrant is always announced in the fire mission. To determine the total number of rounds to be fired in a zone fire mission, use the following computation:

$$\begin{array}{rcl} \text{Number of Quadrants} & \times & \text{Number of Rounds} = \text{Total Number of Rounds} \\ \text{to be Fired} & & \text{to be Fired} \quad \quad \quad \text{to be Fired} \end{array}$$

EXAMPLE: You receive a fire mission that includes the following:

FIRE MISSION, BATTERY 6 ROUNDS, ZONE 8 MILS, 5 QUADRANTS, DEFLECTION 3210.
QUADRANT 380.

The next thing you would do is determine the number of quadrants to be fired during the fire mission. Next, you determine the number of rounds to be fired with each quadrant. In the above fire command, you were given 6 rounds and 5 quadrants. You must compute:

$$\begin{array}{r} 5 \quad \text{Quadrants} \\ \times 6 \quad \text{Rounds} \\ \hline = 30 \quad \text{Total Rounds to be Fired} \end{array}$$

10. HOW TO FIRE THE QUADRANTS.

a. The command ZONE 6 MILS tells you that the quadrants are to be fired in 6-mil increments between quadrants.

b. The number of quadrants to be fired will be announced in the fire command. The command 5 QUADRANTS tells you that five quadrants are to be fired. The quadrants that will be fired are the announced quadrant and two quadrants above and two below the announced quadrant (Figure 5).

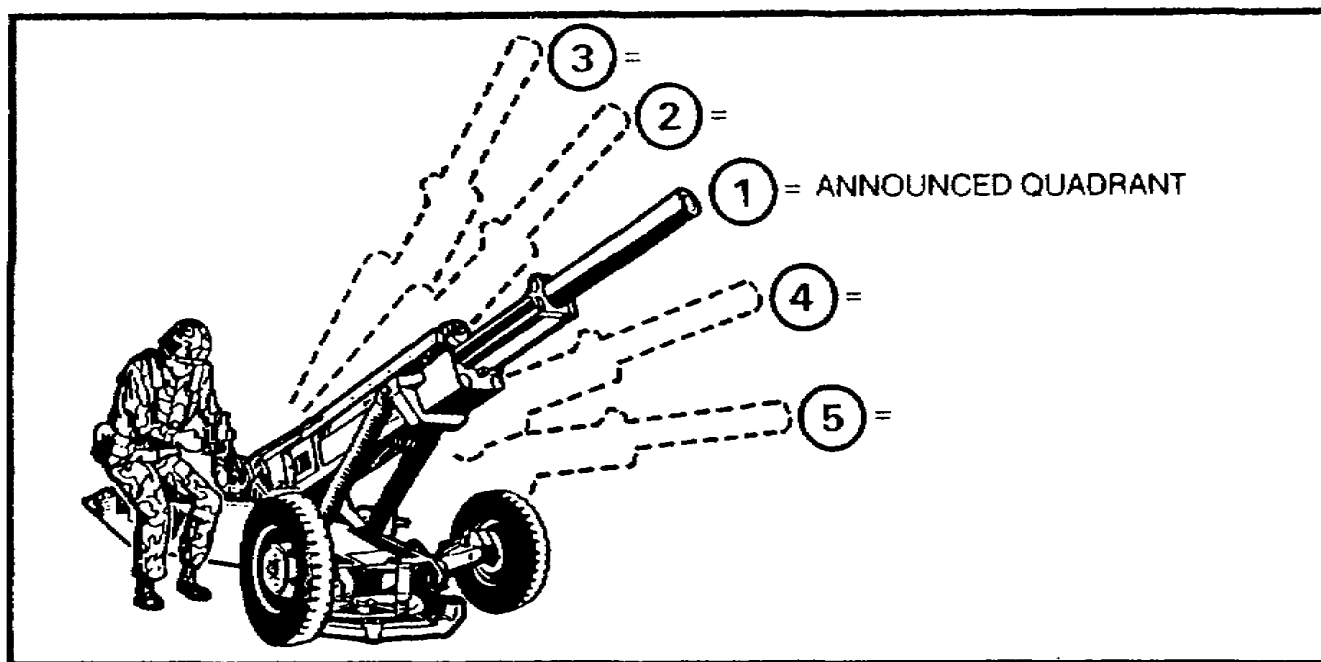


Figure 5. Firing five quadrants.

c. To fire the mission correctly, the quadrants must be fired so that the announced quadrant is fired first. Then the remaining four quadrants can be fired in any order to complete the mission.

PRACTICE EXERCISES:

SITUATION: You are the chief of section for howitzer number 3, and you receive a fire mission that includes the following:

FIRE MISSION. BATTERY 3 ROUNDS. ZONE 7 MILS. 5 QUADRANTS. DEFLECTION 3290. QUADRANT 295.

Answer the following questions on the basis of the situation above.

5. The quadrants you will fire are--
 - a. 295, 302, 309, 281, 288.
 - b. 295, 302, 309, 316, 288.
 - c. 295, 302, 306, 289, 282.
 - d. 295, 288, 306, 302, 281.

6. The first quadrant you will fire is--
- a. 281.
 - b. 288.
 - c. 302.
 - d. 295.
7. The number of rounds to be fired at each quadrant is--
- a. 3.
 - b. 6.
 - c. 9.
 - d. 27.
8. The total number of rounds to be fired is--
- a. 3.
 - b. 6.
 - c. 9.
 - d. 15.

ANSWERS:

- 5. a.
- 6. d.
- 7. a.
- 8. d.

Section III. SWEEP AND ZONE FIRE

11. RECEIVING A SWEEP AND ZONE FIRE MISSION. The fire direction center (FDC) may receive an urgent call for fire on a target that is very wide and deep, and the situation may allow attack of the target with a single firing unit. This calls for a combination of sweep and zone fire. When this technique is used, the battery or platoon position becomes extremely vulnerable to detection and the technique requires a

high expenditure of ammunition. When sweep and zone fire is used, rounds are fired using a variety of deflections and quadrants that you compute from the deflection and quadrant announced by the FDC (Figure 6). The number of combinations of data to be fired will always be an odd number.

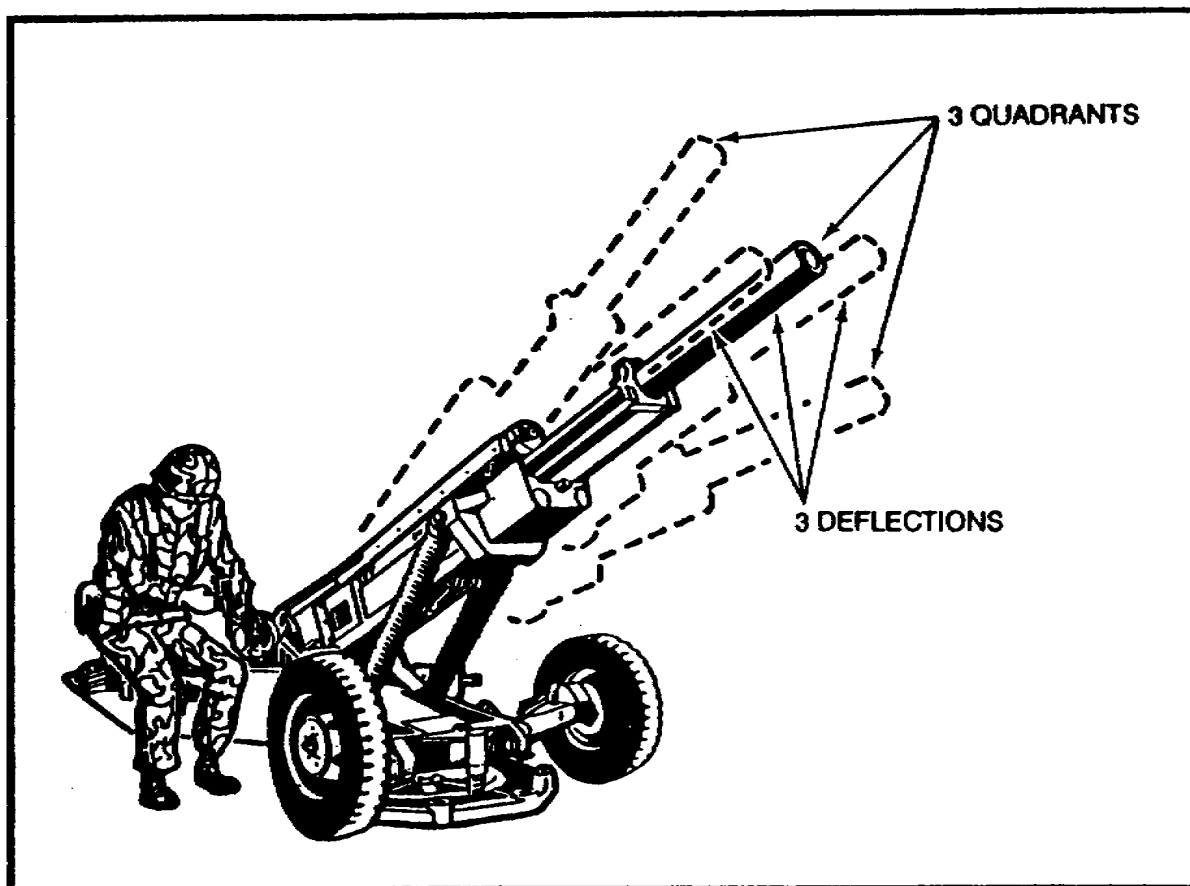


Figure 6. Sweep and zone fire.

EXAMPLE: You are the chief of section of howitzer number 4, and you receive the following mission:

FIRE MISSION. BATTERY 2 ROUNDS. SWEEP 5 MILS. 3 DEFLECTIONS. ZONE 5 MILS. 3 QUADRANTS. LOT X-RAY YANKEE. SHELL HE. CHARGE 5. FUZE QUICK. DEFLECTION 3305. QUADRANT 350.

The fire command tells you the number of rounds to fire at each set of data (2), the size of each sweep (5 mils) and each zone (5 mils), the number of deflections (3), and the number of quadrants to be fired (3).

12. COMPUTING THE DEFLECTION-QUADRANT COMBINATIONS TO FIRE. Use the same method to compute a sweep and zone fire as you did in Sections I and II of this lesson.

a. You have determined that the command orders you to fire three deflections. The deflections to be fired are:

(Sweep 5 mils)
 Deflection 3305 (announced)
 3310
 3300

b. Now you must determine the quadrants to be fired and the quadrant to be fired first. They are:

(Zone 5 mils)
 Quadrant 350 (announced)
 355
 345

c. The last step in computing firing data is to match each deflection with each quadrant. You first match the announced deflection with all three quadrants.

1st deflection: 3305
 350 }
 355 } **3 quadrants**
 345 }

d. The second deflection, 3310, matched with all three quadrants:

2d deflection 3310
 350 }
 355 } **3 quadrants**
 345 }

e. Finally, the last deflection is matched with all three quadrants:

3d deflection: 3300
 350 }
 355 } **3 quadrants**
 345 }

f. Once you have matched each deflection with each quadrant, there should be a total of nine deflection-quadrant combinations:

Deflections	<u>3305</u>	<u>3310</u>	<u>3300</u>
Quadrants:	{ 350	{ 350	{ 350
	{ 355	{ 355	{ 355
	{ 345	{ 345	{ 345

g. Once you have determined all deflection-quadrant combinations to be fired, you must total the number of deflection-quadrant combinations to fire. To compute the number of deflection-quadrant combinations to be fired, multiply the number of deflections by the number of quadrants in the command. Since the fire command calls for three deflections and three quadrants, the computation is:

$$\begin{array}{r} 3 \quad \text{Deflections} \\ \times 3 \quad \text{Quadrants} \\ \hline = 9 \quad \text{Deflection-Quadrant Combinations} \end{array}$$

PRACTICE EXERCISES:

9. The number of combinations of data to be fired will always be a(an) _____.
10. You are the chief of section of howitzer number 3. You receive a fire mission that includes the following:

FIRE MISSION. BATTERY 1 ROUND. SWEEP 23 MILS. 5 DEFLECTIONS. ZONE 9 MILS. 5 QUADRANTS. DEFLECTION 2895. QUADRANT 295.

Determine:

- The total number of deflection-quadrant combinations to be fired.
 - The deflection-quadrant combinations to be fired.
 - The deflection and quadrant to be fired first.
11. The _____ tells you the number of rounds to fire at each set of data.
12. You are the chief of section for howitzer section number 2. You receive a fire mission that includes the following:

FIRE MISSION. BATTERY 2 ROUNDS. SWEEP 20 MILS. 3 DEFLECTIONS. ZONE 8 MILS. 3 QUADRANTS. DEFLECTION 3583. QUADRANT 405

Determine:

- The total number of deflection-quadrant combinations to be fired.
- The deflection-quadrant combinations to be fired.
- The deflection and quadrant to be fired first.



ANSWERS:

9. odd number.

10. a. 25 combinations

b.	<u>2895</u>	<u>2918</u>	<u>2941</u>	<u>2872</u>	<u>2849</u>	Deflections
	295	295	295	295	295	} Quadrants
	304	304	304	304	304	
	313	313	313	313	131	
	286	286	286	286	286	
	277	277	277	277	277	

c. Deflection 2895, Quadrant 295

11. fire command

12. a. 9 combinations

b.	<u>3583</u>	<u>3603</u>	<u>3563</u>	Deflections
	405	405	405	} Quadrants
	413	413	413	
	397	397	397	

c. Deflection 3583, Quadrant 405



13. DETERMINING THE TOTAL NUMBER OF ROUNDS TO FIRE. The number of rounds to be fired at each deflection-quadrant combination is always announced in the fire command.

EXAMPLE: FIRE MISSION. BATTERY 3 ROUNDS. SWEEP 2 MILS. 3 DEFLECTIONS. ZONE 5 MILS. 3 QUADRANTS.

The first action you must take is to determine the number of deflection-quadrant combinations to be fired during the mission. For the above fire mission, a total of 15 combinations will be fired.

$$\begin{array}{r}
 5 \quad \text{Deflections} \\
 \times 3 \quad \text{Quadrants} \\
 \hline
 = 15 \quad \text{Deflection-Quadrant Combinations}
 \end{array}$$

Next you determine the total number of rounds to be fired at each deflection-quadrant combination. Apply the formula above to the fire command, which includes 3 ROUNDS. Since there are 15 combinations to be fired, you complete the computation by multiplying 3 times 15.

$$\begin{array}{r}
 15 \quad \text{Deflection-Quadrant Combinations} \\
 \times 3 \quad \text{Rounds} \\
 \hline
 = 45 \quad \text{Total Rounds}
 \end{array}$$

As chief of section, your mission requires you to fire 45 rounds during the sweep and zone fire mission.

