



**U.S. Army Research Institute  
for the Behavioral and Social Sciences**

**Research Report 1941**

**Training Aids for Basic Combat Skills: Developing  
Map-Reading Skills**

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# TRAINING AIDS FOR BASIC COMBAT SKILLS: DEVELOPING MAP-READING SKILLS

## EXECUTIVE SUMMARY

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### Research Requirement:

The overarching goal was to develop a training aid that could be used by Initial Entry Training (IET) companies to assist Soldiers in improving map-reading skill proficiency. Map-reading skills were identified as a significant basic combat training gap in recent skill-retention research. The training aid should be compact and portable enough to be used in field environments but also could be used in the barracks or a classroom. The training aid should address the need to tailor training to the background and proficiencies of Soldiers.

### Procedure:

Training-aid development followed a five-phase process: Design, Development, Utilization, Assessment, and Revision. Initial design and development included two training aids, one for background information on grid coordinates and one that provided hands-on practice. Two separate IET companies, 294 Soldiers, completed the training-aid assessment process. Soldiers completed a 20-question grid-coordinate test immediately following their map-reading training class. Training aids were distributed and Soldiers had access to them for about three weeks. At the end of the 3-week use period, a second 20-question grid-coordinate test was administered that was equivalent to the initial test. Soldiers also completed a questionnaire to provide feedback on their use of the training aids.

### Findings:

Scores on the initial grid-coordinate test were used to divide the Soldiers into groups of high-performing and low-performing map readers. Soldiers in the low-performing group scored higher when they used the hands-on practice training aid but there was no difference in retention-test scores for the Soldiers in the high-performance group. All Soldiers benefitted from the background-information training aid regardless of having the hands-on practice training aid available. The two separate training aids were integrated into a single training packet that included both the background information and hands-on practice.

### Utilization and Dissemination of Findings:

Designing an adjunct training aid to be compatible with various levels of Soldier skill can be effective in improving training. Soldiers can use the training aid without assistance. Because material in the training aid has varying degrees of difficulty, Soldiers at multiple skill levels should benefit. Results of this research were presented to the units who supported the project. The final version of the map-reading training aid was provided to selected IET units at Fort Benning, GA. The final version of the map-reading training aid is provided as a CD with this publication or can be obtained by contacting the ARI – Fort Benning Research Unit.

# TRAINING AIDS FOR BASIC COMBAT SKILLS: DEVELOPING MAP-READING SKILLS

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# **Training Aids for Basic Combat Skills: Developing Map-Reading Skills**

## **Introduction**

This research report supplements the description of the development of training aids for basic combat skills given in Bink, Wampler, Dlubac, and Cage (2010). The overarching goal of the training aids described in Bink et al. was to develop a set of aids that could be used by Initial Entry Training (IET) companies to assist Soldiers in improving skill proficiency. To this end, training-aid suggestions were solicited from approximately 150 Drill Sergeants (DSs) and training company Leaders representing more than 25 IET companies. There were several criteria for selecting the specific types of training aids to develop from these suggestions. First, the training aids should address important basic-combat skills. Second, the training aids should address tasks with which IET Soldiers have difficulty. Third, the training aids should be compact and portable enough to be used in field environments but also could be used in the barracks or a classroom. Finally, the training aids should address the need to tailor training to the background and proficiencies of Soldiers.

As outlined in Bink et al. (2010), training-aid development should follow a five-phase process: Design, Development, Utilization, Assessment, and Revision. Accordingly, a training aid is not fully developed until all phases have been sequentially completed. The Design phase refers to the preliminary plans regarding the purpose and function of the aid, whereas the Development phase refers to the application of Design principles to the practicality of the training environment and resources available for the training aid (Bink et al.). Stated differently, Design involves preparing the aspects of the aid that will drive its use, whereas Development involves participating in the construction of the aid and planning the practical aspects that might influence that construction. Following Design and Development, Utilization involves the use (physical or mental) of the training aid. Next, Assessment involves the empirical and practical review of the stages that precede it. Principles in the Assessment phase call for the evaluation of whether the aid was effectively utilized in its current design to meet the goals for which it was developed. Finally, Revision involves using the evaluation results to create a more effective and efficient training aid. The present research product details the development, assessment, and revision of a graphical training aid for map-reading skills.

Map-reading skills were identified as a significant basic combat training need in recent skill-retention research (Cobb, James, Graves & Wampler, 2009). In the assessment of 10 IET skills, determining the grid coordinate for a point on a military map showed the lowest level of proficiency with less than 10% of Soldiers attaining the required skill level at either the initial test or retest (Cobb et al., 2009). Determining grid coordinates is an important skill because it incorporates other map-reading skills (e.g., identifying topographic symbols) and it directly translates to land-navigation skills (e.g., Simutus & Barsam, 1982). Map-reading skill and grid-coordinate skill also support the use of Army digital systems such as Force XXI Battle Command Brigade and Below (see Bink, Wampler, Goodwin, & Dyer, 2009) and Command Post of the Future (see Catrambone, Wampler, & Bink, 2009).

Determining grid coordinates and land navigation have historically been challenging tasks for Soldiers. Not only has previous research shown a lack of readiness for land navigation

skills in the training base (see Pleban & Grainer, 1985; Nelsen & Chirico, 2003), but also difficulties with land navigation skills have been shown to contribute to battlefield mortality (e.g., Department of the Army [DA], 2003) and to fratricide (DA, 2006a). While the insertion of technologies and digital systems has introduced many new land-navigation capabilities to Soldiers on the battlefield, the ability to navigate on the ground remains a daunting task for many. For example, as the Army was developing the Land Warrior system, it was determined that Soldiers needed some fundamental map-reading training prior to using the Land Warrior system's navigation capability (Dyer et al., 2000).

The difficulty with navigating from maps is that doing so requires both technical skills to interact with the map and abstraction skills to translate map information to navigation information (or vice versa). The process of orienting to and extracting information from a map involves spatial knowledge, verbal ability, perceptual skill, mathematical skill, and problem-solving skill (e.g., Presson, 1982; Denis & Loomis, 2007; Simutus & Barsam, 1982). This complex map-reading skill set requires significant experience and background knowledge to master (Gilhooly, Wood, Kinnear & Green, 1988; Ormrod, Ormrod, Wagner & McCallin, 1988; Presson, 1982). Likewise, the ability to abstract two-dimensional information from a map and translate that information into action in the physical world requires multiple skills such as the manipulation of multiple types of information (e.g., route and survey information) and the re-orientation of mental perspective (see Denis & Loomis, 2007; Thorndyke & Hayes-Roth, 1982; Tkacz, 1987).

In sum, because map-reading skills are complex and because map-reading skills contribute to land-navigation skill, it was not surprising that suggestions for new training aids for basic combat skills included a recommendation for an aid to assist with map reading (Bink et al., 2010). According to the Soldier's Manual of Common Tasks (DA, 2006b)<sup>1</sup>, there are 18 different tasks for land navigation and map reading, such as identifying topographic symbols, converting azimuths, and determining direction without a compass. Most of these tasks are trained in IET. However, the present map-reading training aid directly focused on a fundamental map skill that is the basis for navigation – determining the grid coordinates for a point on a military map. Because determining grid coordinates has two measurable standards (i.e., Soldiers must correctly use the 100,000 m grid-square identifier and determine the 6-digit grid coordinate to within 100 m accuracy), the compelling factor for designing the training-aid content was to ensure the Soldier would receive necessary information to attain the task standards. The information contained in the training aid was intended to supplement classroom training.

### **Training Aid Design and Development**

Effective training materials must be designed to meet the needs of the intended target audience and the training outcome (Wampler et al., 2006). Moreover, effective training materials should have clear, measurable, and attainable objectives for the skills to be learned, should use a delivery modality that is appropriate to the skill to be learned, and should accommodate heterogeneous experience in the training audience (Wampler et al., 2006). These three characteristics of effective training materials served as the basis for designing the map-

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<sup>1</sup> The 2006 version of the Soldier's Manual of Common Tasks was current at the time the training aids were developed. A version of the Manual dated 18 June 2009 has since been distributed.



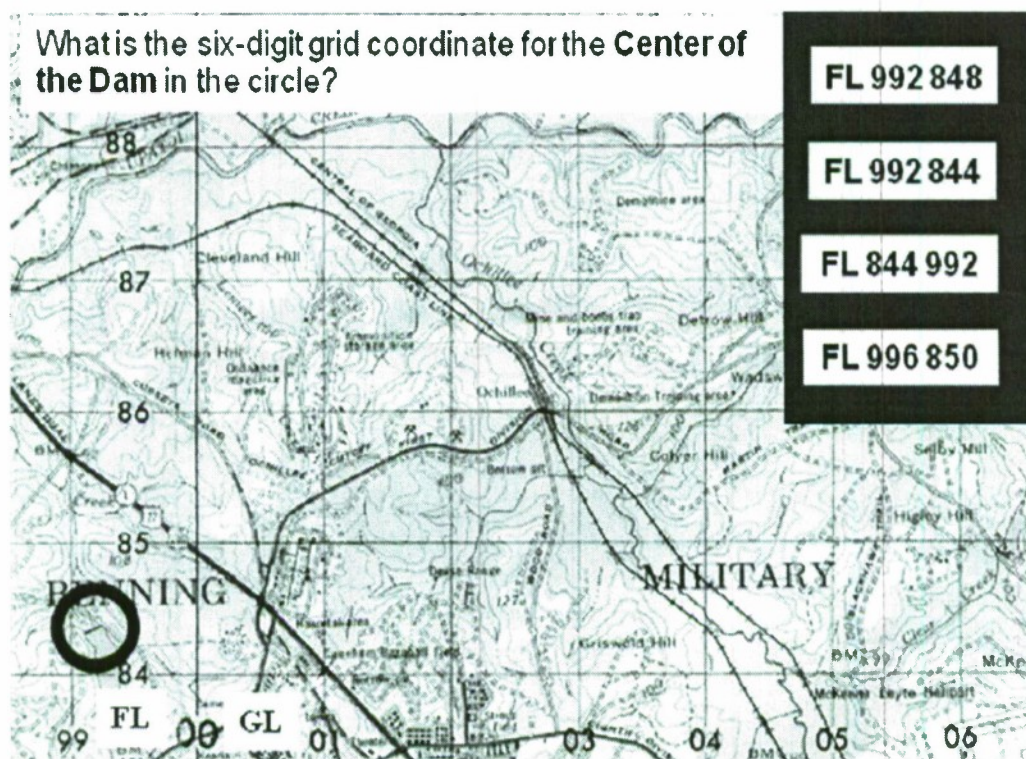
reading training aid. While measurable objectives and delivery modality were important considerations in the design of the current training aid, particular attention was paid to designing a training aid that would have benefit across multiple levels of military and educational backgrounds as well as across heterogeneous levels of map-reading skills and knowledge.

The goal of developing a training aid that was effective across the ranges of Soldiers' abilities may seem like a trivial or an obvious outcome. However, most military training is developed to assure the "average" individual can meet a given standard. Likewise, most training aids are developed with a focus on the task rather than on the characteristics of the trainee (Sticha, Gibbons & Singer, 1993). Using a "one size fits all" approach to training-aid design reduces the likelihood that trainees will equally benefit from using training aids (see Duffy & Hoffman, 1999; Snow, 1992). In fact, providing training material that some trainees do not understand while at the same time does not challenge other trainees is likely to inhibit learning (Kalyuga, 2007; Kalyuga, Ayres, Chandler & Sweller, 2003; Tomlinson & Kalbfleisch, 1998). Thus, being able to construct training aids that can benefit performance across skill levels represents a significant advancement for training-aid design.

The difficulty in developing training aids that are appropriate across individuals with varying skill levels is that different types of information have different effects across the skill range. That is, the types of information in a training aid that would benefit low-performing individuals are quite different from information that would benefit high-performing individuals (Hammond & Gibbons, 2001; Hess & Holloway, 1984). More specifically, research suggests that low-performing individuals benefit from training material that focuses on surface features of a task that guide the execution of the task, i.e., procedural information (Applebee & Langer, 1983; Ericsson, Krampe & Tesch-Romer, 1993; Palincsar, 1986). Likewise, research suggests that high-performing individuals benefit from training material that focuses on integrative features of the task that provide a deeper understanding, i.e., conceptual information (e.g., Ericsson et al., 1993; Hmelo-Silver, Duncan & Chinn, 2007; Puntambekar & Hübscher, 2005). It is important to note that low-performing individuals can benefit from conceptual information if the information provides organizing principles for task execution. However, high-performing individuals will not benefit from procedural information because they have already "mastered" that phase of the task (Corno, 2008).

Accordingly, two types of training aids were developed for determining grid coordinates. Each training aid consisted of a set of self-study flashcards. One set of flashcards contained scaled sections of topological maps and asked the Soldiers to find map features based on grid coordinates or to provide the grid coordinates for a given map feature. The reverse of each flashcard provided feedback (i.e., correct answers and rationale to help the Soldier understand possible errors). This set was called "hands-on practice" because it involved practicing the procedural steps of determining a grid coordinate (see Figure 1). Accordingly, the hands-on-practice flashcards were designed to benefit Soldiers who had low level of grid-coordinate performance. The other set of flashcards provided additional information about the construction of maps (e.g., map of the world information) and the logic of the grid-coordinate system. This set was called "background information" because it provided Soldiers with background concepts underlying the grid coordinate system (see Figure 2). The information was presented with both verbal descriptions and graphical illustrations to reinforce the given concepts (e.g., Bower, 1972;

Paivio, 1986). The background-information flashcards were designed to benefit Soldiers with initial proficiency in determining grid-coordinates.



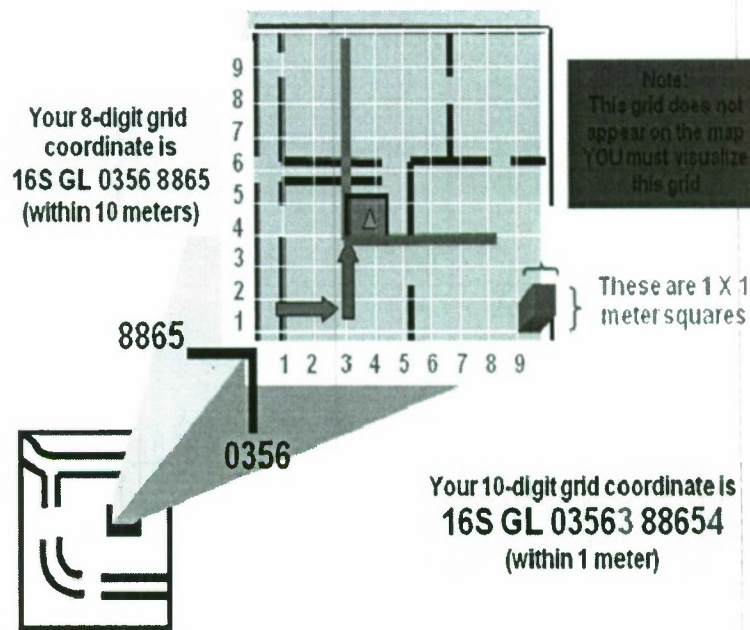
Reverse Side of Card

- FL 992 848 Incorrect - You're off by 400 meters on the last digit.
- FL 992 844 Correct
- FL 844 992 Incorrect - You must read a grid coordinate right then up.
- FL 996 850 Incorrect - You're off by 400 meters on the first digit and off by 600 meters on the last digit.

*Figure 1.* Sample card from "hands-on practice" training aid.

To maximize their potential use, the training aids were designed to be provided to Soldiers following basic map-reading training and to be frequently available. For example, the format for the training aids needed to be such that Soldiers could use it without DS assistance, and the training aid needed to be durable to withstand environmental elements such as rain and exposure to dirt. Lastly, the training aids needed to be compact enough and with minimal weight so Soldiers could carry aids with them.





These 1 meter squares are also read to the right and then up.  
 Remember to stop on the line before reaching your location  
 inside the range building. The ten digit grid coordinate for  
 your location inside the range building would be  
**16S GL 03563 88654.**

*Figure 2.* Sample card from “background information” training aid.

Training content for both map-reading training aids was largely drawn from previously developed map-reading training materials. The content developed for the Land Warrior prerequisite-skill training (Dyer et al., 2000) had already been assessed for use by an IET audience and served as the basis for the current training aid content<sup>2</sup>. The map displays on the hands-on practice flashcards were reproduced to scale to allow the use of the Army’s standard protractor. Both sets of flashcards were constructed on paper approximately 5.5” x 8.5” and covered in heavy laminate. Each set of flashcards was spiral bound and contained a cover in order to be distributed as a packet. The size was small enough so the packets could be carried in a Soldier’s uniform pocket. The small size, light weight, and durable covering allowed training aids to be carried to most training events for use during down time or for concurrent training and to withstand rough handling in a field environment by multiple users.

<sup>2</sup> As part of the Land Warrior pre-requisite skills training, ARI developed an interactive multimedia instruction CD to train Soldiers in selected skills including navigation skills such as plotting grid coordinates. Further information on the interactive multimedia instruction can be obtained from ARI - Fort Benning Research Unit.

## Training Aid Assessment and Revision

Because the two training aids were specifically developed to benefit different types of learners, predictions about the outcomes of training-aid use could be made. On the one hand, the training aid that guided Soldiers through the process of determining grid coordinates (“hands-on practice”) was predicted to benefit individuals who had initial difficulty with understanding grid coordinates (i.e., “low-performing” Soldiers). On the other hand, the training aid that provided conceptual information about the grid coordinate system and map construction (“background information”) was predicted to benefit individuals who were initially able to determine grid coordinates (i.e., “high-performing” Soldiers).

### Method

**Participants.** Two separate Infantry One Station Unit Training companies participated in the assessment of the map-reading training aid packets. The companies’ cycles were staggered such that one company completed the assessment before the other company began participation. In total, 294 Soldiers completed the training-aids assessment process.

**Materials and procedure.** On the day that each company received classroom map-reading training, which included training on determining grid coordinates, researchers administered a 20-question map-reading test after training. On the test, three questions assessed general knowledge of the grid coordinates, two questions provided a grid coordinate and asked what was at that location, and the remaining 15 questions required the participant to determine the grid coordinate for a designated map feature to within 100 m accuracy (i.e., a 6-digit coordinate). All questions were based on the Tenino, WA map sheet (Sheet 1477 IV, Series V791, Edition 7-DMA, 1:50,000 scale), which was used during classroom training. A copy of the grid-coordinate test is provided in Appendix A.

After the initial map-reading test, training aids were distributed with instructions on how to use the aids and with encouragement to use them as often as possible. One platoon in each company only received the hands-on practice training aid, one platoon in each company only received the background information training aid, one platoon in each company received both training aids, and one platoon in each company did not receive any training aids. Each squad in a given platoon received two copies of the appropriate training aid to use and share among Soldiers.

Soldiers had access to the training aids for about three weeks. According to feedback from the units, Soldiers used training aids during the evenings while on barracks watch duty, during concurrent training periods for other training events, and during land navigation field exercises. At the end of the 3-week use period, a second 20-question map-reading test was administered that was similar in format and equivalent in content to the initial map-reading test (i.e., a retention test). A copy of the retention test is provided in Appendix B. Each Soldier also completed a questionnaire to provide feedback on the amount of time the training aids were used and on how the training aids were used (e.g., alone, with others). The questionnaires also allowed Soldiers to offer suggested changes for improving the training aids. Soldiers completed a questionnaire for each training aid used. A copy of the questionnaire is given in Appendix C.



## Results

All comparisons were tested at the 5% error rate. Post-hoc differences in means were determined by pair-wise comparisons of 95% confidence intervals. Where appropriate group means and standard errors of the means are given in the text. Error bars on all data figures represent 95% confidence intervals.

**Grid-coordinate test performance.** The responses on both the initial map-reading test and retention map-reading test were scored for correctness. Responses were considered incorrect for a number of reasons. First, some Soldiers indicated that they “didn’t know” the answer. Second, some Soldiers provided the wrong alpha-numeric grid-zone identifier. Third, some Soldiers provided the incorrect two-letter grid-square identifier. Finally, some Soldiers provided the wrong six-digit grid coordinate or juxtaposed the numerals in the grid coordinates. However, failing to provide the grid coordinate to within 100-meter accuracy (i.e., wrong six-digit coordinates) and omitting the grid-zone identifier were the most frequent errors.

Scores on the initial map-reading test were used to divide the Soldiers into groups of high-performing map readers and low-performing map readers. The groups were defined by computing quintiles on the initial map-reading test and assigning Soldiers in the lower two quintiles to the “low-performing” group ( $n = 95$ ; test mean = .24,  $SEM = .02$ ) and assigning Soldiers in the upper two quintiles to the “high-performing” group ( $n = 121$ ; test mean = .86,  $SEM = .01$ ). Data from Soldiers in the middle quintile ( $n = 78$ ) were excluded from the primary analyses, but were included for subsequent analyses. Thus, the sample size for the primary set of analyses was 216. In these primary analyses, comparisons among scores on the retention map-reading test were made in an omnibus 2 (low-performing group vs. high-performing group)  $\times$  2 (background-information training aid vs. no background-information training aid)  $\times$  2 (hands-on practice training aid vs. no hands-on practice training aid) between-groups design.

The three-way interaction failed to reach the level of statistical significance ( $F < 1$ ). However, the interaction between the performance groups and the hands-on practice training aid was statistically significant ( $F(1, 209) = 7.83$ ,  $MSE = .05$ ). As can be seen in Figure 3, the statistically significant interaction was driven by the fact that the Soldiers in the low-performing group scored higher when they used the hands-on practice training aid than when they did not use the training aid ( $t(93) = 2.87$ ,  $SEM = .05$ ), but there was no difference in retention-test scores for the Soldiers in the high-performing group ( $t < 1.00$ ).

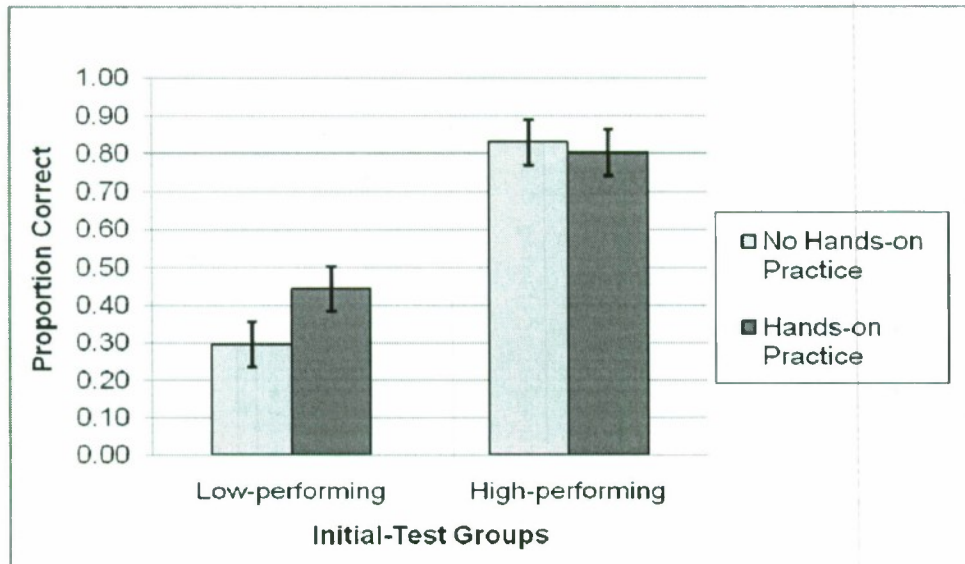
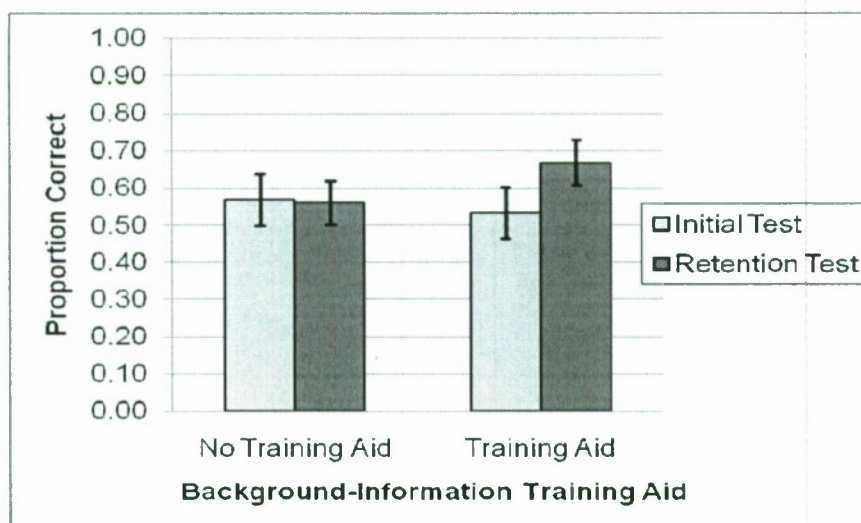


Figure 3. Retention test scores for hands-on practice training aid across low-performing map readers and high-performing map readers.

The interaction between performance groups and the background-information training aid was not statistically significant ( $F < 1$ ). However, there was a main effect for the background-information training aid ( $F(1, 209) = 125.06, MSE = .05$ ). That is, the Soldiers who used the background-information training aid scored higher on the retention grid-coordinate test ( $mean = 0.62, SEM = .02$ ) than did Soldiers who did not use the background-information training aid ( $mean = 0.56, SEM = .02$ ) regardless of initial map-reading test performance. Thus, the low-performing group benefitted from the hands-on practice training aid, but there was no additive effect (i.e., interaction) of using both training aids.

A secondary comparison of map-reading test retention rates was conducted for the entire sample ( $n = 294$ ) with an omnibus 2 (within: initial test vs. retention test) x 2 (between: background-information training aid vs. no background-information training aid) x 2 (between: hands-on practice training aid vs. no hands-on practice training aid) mixed design. Again, the analysis indicated that all Soldiers benefitted from the background-information training aid regardless of having the hands-on practice training aid available ( $F(1, 291) = 24.45, MSE = .03$ ). No other interaction was statistically significant (all  $F$ 's  $< 1.00$ ). Figure 4 presents the nature of background-information effect.





*Figure 4.* Proportion correct on map-reading tests as a function of background-information training aid.

Taken together, the results of the analyses of map-reading test retention indicated that all Soldiers benefited from the background-information training aid, but only Soldiers who scored low on the initial map-reading test benefitted from the hands-on practice. Moreover, Soldiers who scored low on the initial map-reading test only benefitted from the background-information training aid when hands-on practice was not available.

**Questionnaire responses.** According to questionnaire responses, about 5% of Soldiers who were provided the training aids indicated they “never had a chance to use” the materials. For those who used the training aids, 70% used the training aids for one hour or less, and 55% of those who used the training aids generally did so by themselves as opposed using the aid in a small group (45%). In addition, 65% of those using the training aids indicated that the materials were helpful, and those using the training aids found them to be moderately effective (i.e., median = 5 on 10-point effectiveness scale). Finally, 90% of Soldiers who used the training aids recommended these materials for all IET Soldiers. It is important to note that these response rates did not differ between the two types of training aids.

Interestingly, ratings did not differ between the low-performing group and the high-performing group for time using the training aids (Hands-on Practice  $\chi^2(4) = 2.59$ ; Background Information  $\chi^2(3) = 4.48$ ), perceived effectiveness of the training aids (Hands-on Practice  $\chi^2(8) = 4.18$ ; Background Information  $\chi^2(8) = 4.48$ ), and perceptions of training-aid usability (Hands-on Practice  $\chi^2(1) = 2.24$ ; Background Information  $\chi^2(1) = 1.87$ ). Taken together, the self-report results indicated that Soldiers did not differentially use the training aids based on their abilities and that the Soldiers were mostly unaware of the actual benefits of using the training aids. However, free-response comments were helpful in defining how Soldiers were affected by each training aid. Table 1 provides a summary of free-response comments.

Table 1

*Summary of Free-response Comments for the Questionnaire Item “Do you think the training aid helped you?”*

<b>Background Information</b>	<b>Hands-on Practice</b>
Told me everything I needed to know	Easy, quick practice
Well laid-out and descriptive	Reinforcement; extra help
Breaks information down, step-by-step	Clear and easy to understand
Brief overview of some new material	Tips if you had the wrong answer
Could study on my own	Easier to use than full map
Simple and easy to understand	Immediate feedback on right/wrong answer

### **Revisions to the Training Aid**

The assessment results indicated that the background-information training aid was beneficial to all Soldiers who used it, and, as predicted, the hands-on practice training aid provided a benefit to individuals who had initial difficulty with understanding grid coordinates. Because there was benefit for both types of training-aid material, the two separate packets were integrated into a single training aid that included both the background information and hands-on practice. In the final version of the integrated training aid, the background information is presented followed by simple instructions on plotting grid coordinates and by instructions and hands-on practice questions for plotting both 6-digit grid coordinates and 8-digit grid coordinates. A short summary recaps the instruction and is followed by more complex practice questions. The more complex questions were added to the final version and were *not* included in the version of the training aid assessed with Soldiers. The complex questions were added as a way to expand the scope of possible use for the training aid and to further challenge advanced learners. The final version of the map-reading training aid is provided as a CD with this publication or can be obtained by contacting the ARI – Fort Benning Research Unit.

### **Discussion and Conclusions**

The goals for developing the training aids reported here were to address the difficult-to-obtain skill of determining grid coordinates and to develop an aid that was effective across a range of Soldiers’ abilities. To that end, two different grid-coordinate training aids were designed to match the general pedagogical needs of novices and more advanced trainees. On the one hand, the grid-coordinate training aid that allowed Soldiers to practice the process of determining grid coordinates (“hands-on practice”) with immediate performance feedback was predicted to benefit individuals who had initial difficulty with understanding grid coordinates. On the other hand, the grid-coordinate training aid that provided conceptual information about the grid coordinate system and map construction (“background information”) was predicted to benefit individuals who were initially not able to determine grid coordinates. While these predictions were mostly confirmed in the assessment results, it was clear that a single training aid that leveraged both hands-on practice and background information could be constructed to benefit the training of map-reading skills across individuals with varying levels of initial ability.



The main implication of the results was to suggest that adjunct training aids can be effective in assisting the training of Soldiers with varied ability levels. The fact that IET trains Soldiers from across the spectrum of military occupational specialties, that the vast majority of IET Soldiers have no military background, and that IET Soldiers have different educational experience suggests that there should be large variability in the backgrounds, skills, and knowledge among IET Soldiers. Likewise, learning skills and rates of learning will vary among IET Soldiers. Finally, basic combat skills represent a heterogeneous skill set. As a result, training aids used in conjunction with existing training may have a significant impact when used in IET.

Because of factors such as Soldier throughput and time constraints, there may be little opportunity for alternative training techniques based on a Soldier's level of proficiency or experience. In fact, training techniques are seldom altered to better suit the task or training audience (for examples see, Dyer et al., 2000; Leibrecht, Wampler, Goodwin & Dyer, 2007; Wampler et al., 2006; Wampler, James, Leibrecht & Beal, 2007). Training programs, even for IET, might be improved if trainers accommodate requirement-specific training goals, student populations with varying characteristics, and diverse training environments. Using training aids to augment training in these situations or to tailor some aspects of training to individual needs may help Soldiers retain skills (Arthur, Bennett, Stanush & McNelly, 1998) and improve overall Soldier readiness. As the present results suggested, designing an adjunct training aid to be compatible with various levels of skill proficiency can be effective in improving training. What is more, this approach to training-aid development may be leveraged to other tasks, especially within Army basic combat training.

With regard to the technical characteristics of the current map-reading training aid, combining the separate training-aid packets provided a single training aid that will allow Soldiers to learn how to determine grid coordinates, practice new map-reading skill, and receive immediate feedback on their performance. The single packet will allow Soldiers to use the training aid without assistance from others and, because the hands-on practice questions are of varying degrees of difficulty, will allow more Soldiers at all skill levels to be challenged.

Results of this research were presented to the units who supported the project. The final version of the map-reading training aid was provided to selected IET units at Fort Benning, GA. These units will continue to use the training aid and could form the foundation for future research concerning the benefit of this training aid or other related training aids for use in basic combat skills. The final version of the map-reading training aid is provided as a CD with this publication or can be obtained by contacting the ARI – Fort Benning Research Unit.

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**APPENDIX A**  
**INITIAL GRID-COORDINATE TEST**

## Grid Coordinate Test 1

This test is to assess your knowledge of map grid coordinates. Your results **WILL NOT** be released to anyone. You will be using the Washington 1:50,000 TENINO Map Sheet.

Do the best you can!

1. When determining a grid coordinate to an accuracy of **1** meter, how many digits are required? \_\_\_\_\_ digits
2. When determining a grid coordinate to an accuracy of **10** meters, how many digits are required? \_\_\_\_\_ digits
3. When determining a grid coordinate to an accuracy of **100** meters, how many digits are required? \_\_\_\_\_ digits
4. To the nearest **10 meters** what is the grid coordinate for the **ZION CHAPEL** in the circle labeled **Z**? \_\_\_\_\_
5. What is the **6 digit** grid coordinate for the **SPOT ELEVATION 147** in the circle labeled **4**?  
\_\_\_\_\_
6. What is the **6 digit** grid coordinate for the center of the "**O**" in **FORT LEWIS** in the Northeast corner of the map? \_\_\_\_\_
7. What is the name of the **CREEK** that runs through **EG 14 92**? \_\_\_\_\_
8. What is the **6 digit** grid coordinate for the **ROAD JUNCTION** in the circle labeled **F**?  
\_\_\_\_\_
9. What is located at **EG 1063 9577**? \_\_\_\_\_
10. To the nearest **100 meters** what is the grid coordinate for the **CRAWFORD MOUNTAIN LOOKOUT TOWER** in **EG 18 87**? \_\_\_\_\_
11. What is the **8 digit** grid coordinate for the center of the "**O**" in **40** in **BLACK LAKE** in the Northwest corner of the map? \_\_\_\_\_
12. What is located at **EH 1130 0005**? \_\_\_\_\_
13. To the nearest **100 meters** what is the grid coordinate for the center of the **BRIDGE** over **PATTISON LAKE** in the Northeast corner of the map? \_\_\_\_\_
14. What is the **6 digit** grid coordinate to the **SCHOOL** in the circle labeled **M**? \_\_\_\_\_

15. What is the **6 digit** grid coordinate for the center of the **LEFT HILLTOP** in the circle labeled **J**? \_\_\_\_\_
16. To the nearest **100 meters** what is the grid coordinate for the **JUNCTION** of the **INTERMITTENT STREAM** and **ROAD** in the circle labeled **6**? \_\_\_\_\_
17. What is the **6 digit** grid coordinate to the **STREAM JUNCTION** in the **SOUTHERN PORTION** of the circle labeled **1**? \_\_\_\_\_
18. To the nearest **100 meters** what is the grid coordinate for the center of the **"5" on the HIGHWAY INDICATOR** in the circle labeled **N**? \_\_\_\_\_
19. To the nearest **100 meters** what is the grid coordinate for the **BEGINING** of the **STREAM** in the circle labeled **P**? \_\_\_\_\_
20. What is the **6 digit** grid coordinate for the center of the **"0" in 60** in the circle labeled **Q**?  
\_\_\_\_\_



**APPENDIX B**  
**RETENTION GRID-COORDINATE TEST**

## Grid Coordinate Test 2

This test is to assess the effectiveness of the prototype grid coordinate training aids some of you received. You will be using the Washington 1:50,000 TENINO Map Sheet. Use the lines for each question to write your answers. Do **NOT** write in the boxes in the left margin.

Do the best you can!

- ☐ 1. When determining a grid coordinate to an accuracy of **100** meters, how many digits are required? \_\_\_\_\_ digits
- ☐ 2. When determining a grid coordinate to an accuracy of **10** meters, how many digits are required? \_\_\_\_\_ digits
- ☐ 3. When determining a grid coordinate to an accuracy of **1** meter, how many digits are required? \_\_\_\_\_ digits
- ☐☐☐☐ 4. To the nearest **100 meters** what is the grid coordinate for the center of the letter "A" in the word "BLACK" in the name BLACK LAKE in the top left corner of the map? \_\_\_\_\_
- ☐☐☐☐ 5. What is the **8 digit** grid coordinate for the **Active Open Pit Mine** near the circle labeled **E**? \_\_\_\_\_
- ☐☐☐☐ 6. What is the **6 digit** grid coordinate for the center of the "O" in the word "RESERVATION" in the northeast corner of the map, above the 96-grid line?  
\_\_\_\_\_
- ☐ 7. What is the name of the **CREEK** that runs through **EG 06 92**?  
\_\_\_\_\_
- ☐☐☐☐ 8. What is the **6 digit** grid coordinate for the intersection of the railroad and the hard surface road **near BM79** just to the east of the oval labeled **I**? \_\_\_\_\_
- ☐ 9. What is located at **EG 0583 8960**? \_\_\_\_\_
- ☐☐☐☐ 10. To the nearest **100 meters** what is the grid coordinate for the **Church of God** in **EG 03 85**? \_\_\_\_\_
- ☐☐☐☐ 11. What is the **8 digit** grid coordinate for the center of the "O" in the word "Olympia" in the title **Olympia Substation** in the top left corner of the map?  
\_\_\_\_\_
- ☐ 12. What is located at **EH 0935 0068**? \_\_\_\_\_

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13. To the nearest **100 meters** what is the grid coordinate for the center of the **RAILROAD BRIDGE** over **Deschutes River** about 1,000 meters north of the label **P**? \_\_\_\_\_

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14. What is the **6 digit** grid coordinate to the **SCHOOL** in the town **Bucoda** which is in the lower portion of the center of the map? \_\_\_\_\_

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15. What is the **6 digit** grid coordinate for the center of **HILLTOP 106** just west of the circle labeled **I**? \_\_\_\_\_

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16. To the nearest **100 meters** what is the grid coordinate for the **JUNCTION** of **Scatter Creek** and the **4-lane ROAD** about 1,000 meters west of the circles labeled **Q** and **F**? \_\_\_\_\_

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17. What is the **6 digit** grid coordinate for the center of the letter "**O**" in the name "**MacIntosh Lake**" which is located just north of the **90-grid line** on the eastern side of the map? \_\_\_\_\_

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18. To the nearest **100 meters** what is the grid coordinate for the center of the "**507**" **HIGHWAY INDICATOR** about midway between the towns of **Tenino** and **Bucola**? \_\_\_\_\_

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19. To the nearest **100 meters** what is the grid coordinate for **horizontal control station Skook** very near the circle labeled **E**? \_\_\_\_\_

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20. What is the **6 digit** grid coordinate for the center of **Spot Elevation 147** in the circle labeled **4**? \_\_\_\_\_



**APPENDIX C**  
**TRAINING AID ASSESSMENT QUESTIONNAIRE**

Roster Number \_\_\_\_\_

**Map-Reading Training Aid  
Assessment**

1. Approximately how many hours did you use the training aid?

- a. Less than 1 hour \_\_\_\_\_
- b. About 1 hour \_\_\_\_\_
- c. About 2 hours \_\_\_\_\_
- d. About 3 hours \_\_\_\_\_
- e. About 4 hours \_\_\_\_\_
- f. About 5 hours \_\_\_\_\_
- g. More than 5 hours \_\_\_\_\_

2. Do you think the training aid helped you? Yes \_\_\_\_\_ No \_\_\_\_\_

Why?

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3. How did you use the training aid?

\_\_\_\_\_ Singularly \_\_\_\_\_ Buddy Team \_\_\_\_\_ Group

4. On the below scale, how effective was the training aid in helping you learn to determine grid coordinates?

1 \_\_\_\_\_ 2 \_\_\_\_\_ 3 \_\_\_\_\_ 4 \_\_\_\_\_ 5 \_\_\_\_\_ 6 \_\_\_\_\_ 7 \_\_\_\_\_ 8 \_\_\_\_\_ 9 \_\_\_\_\_ 10  
Not effective

Very effective

5. How would you improve the training aid to make it more effective?

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6. Would you recommend the training aid for all BCT Soldiers?

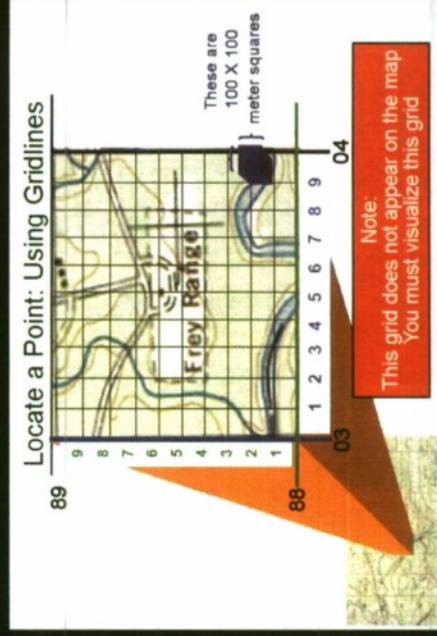
Yes \_\_\_\_\_ No \_\_\_\_\_

Why?

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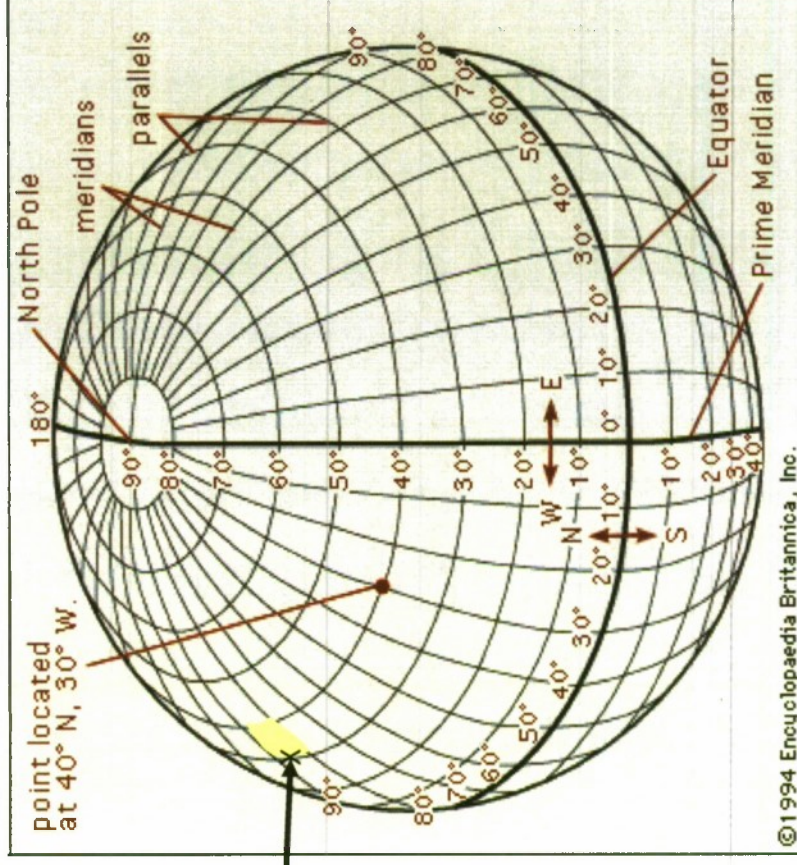
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# Plotting Grid Coordinates





## Grid Coordinates



Where is Ft. Benning, GA?

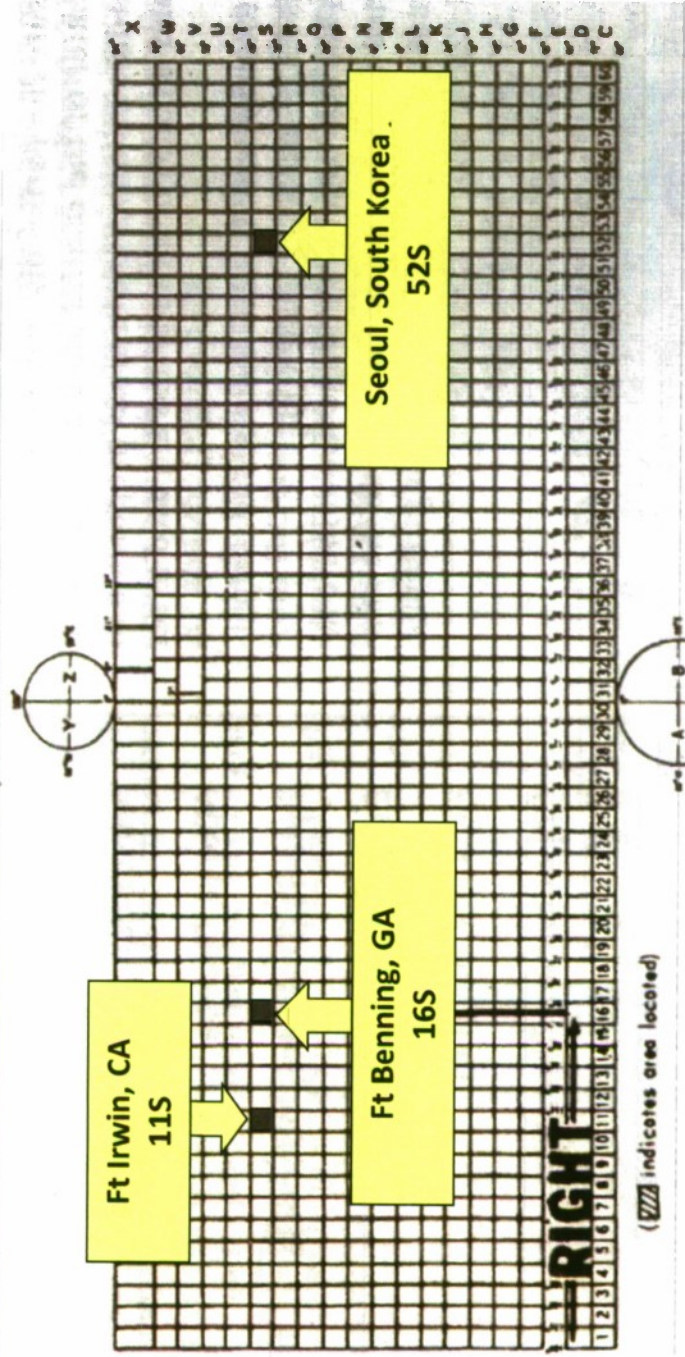
Approximate location  
of the  
COLUMBUS MAP  
(Ft. Benning is part of the  
Columbus map)

A map of the earth is great for  
the Space Shuttle.

An Infantryman needs a map  
with sufficient details of his  
area of operations.

A globe shows the entire earth. Chances are the town you lived in will not be depicted on the globe. However, to support dismounted military operations, you need a map that depicts the terrain in which you are operating, in sufficient detail, like your home town map.

## The UTM Grid System : The Earth Depicted Flat





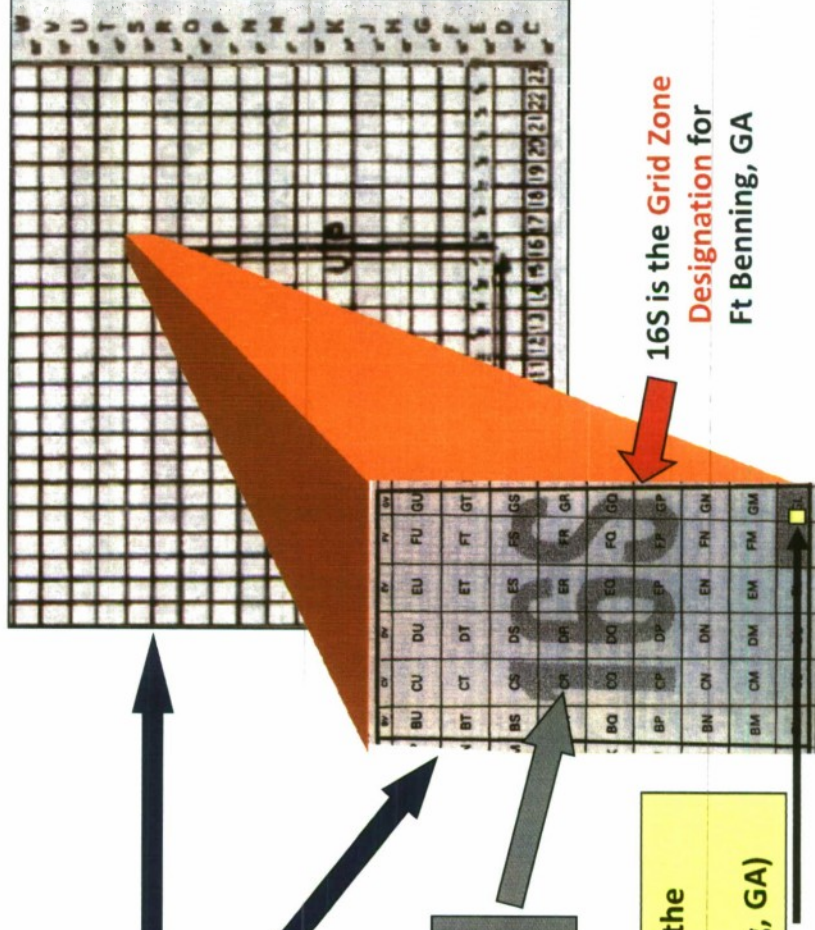
The universal transverse mercator grid system, also known as the UTM grid, displays the earth as a flat surface, then dissects it into large rectangular grid zones. Each grid zone is designated by a number letter combination. For example, Fort Irwin, CA is located in the 11S grid zone. Fort Benning, GA is located in the 16S grid zone and Seoul, South Korea is located in the 52S grid zone. As you can tell from the display, the number part of each grid zone designation represents a location from west to east. The letter part represents a location from south to north.

## The UTM Grid System

Each UTM grid zone is divided into 100,000 meter squares.

Each 100,000 meter square is designated by two letters. (See BU, CU, DU... BT, CT...)

Approximate location of the Columbus, GA map (which contains Ft. Benning, GA)



A UTM grid zone is then divided into 100,000 meter squares. Each 100,000 meter square is given a two letter designation for identification (see BU, CU, DU... BT, CT...). The first letter represents a column in the grid zone and the second letter represents a row. Notice that squares around the margin of the grid zone are smaller than 100,000 meters.

## UTM Grid Zones

Each UTM grid zone represents a very large section of earth.

BV	BW	BX	BY	BZ	CV	CW	CX	CY	CZ	DV	DW	DX	DY	DZ	EV	EW	EX	EY	EZ	FV	FW	FX	FY	FZ	GV	GW	GX	GY	GZ
BU	BV	BW	BX	BY	CU	CV	CW	CX	CY	DU	DV	DW	DX	DY	EU	EV	EW	EX	EY	FU	FW	FX	FY	FZ	GU	GW	GX	GY	GZ
BT	BV	BW	BX	BY	CT	CV	CW	CX	CY	DT	DV	DW	DX	DY	ET	EV	EW	EX	EY	FT	FW	FX	FY	FZ	GT	GW	GX	GY	GZ
BS	BV	BW	BX	BY	CS	CV	CW	CX	CY	DS	DV	DW	DX	DY	ES	EV	EW	EX	EY	FS	FW	FX	FY	FZ	GS	GW	GX	GY	GZ
BR	BV	BW	BX	BY	CR	CV	CW	CX	CY	DR	DV	DW	DX	DY	ER	EV	EW	EX	EY	FR	FW	FX	FY	FZ	GR	GW	GX	GY	GZ
BQ	BV	BW	BX	BY	CQ	CV	CW	CX	CY	DQ	DV	DW	DX	DY	EQ	EV	EW	EX	EY	FQ	FW	FX	FY	FZ	GQ	GW	GX	GY	GZ
BP	BV	BW	BX	BY	CP	CV	CW	CX	CY	DP	DV	DW	DX	DY	EP	EV	EW	EX	EY	FP	FW	FX	FY	FZ	GP	GW	GX	GY	GZ
BN	BV	BW	BX	BY	CN	CV	CW	CX	CY	DN	DV	DW	DX	DY	EN	EV	EW	EX	EY	FN	FW	FX	FY	FZ	GN	GW	GX	GY	GZ
	BV	BW	BX	BY	CM	CV	CW	CX	CY	DM	DV	DW	DX	DY	EM	EV	EW	EX	EY	FM	FW	FX	FY	FZ	GM	GW	GX	GY	GZ
	BV	BW	BX	BY	CL	CV	CW	CX	CY	DL	DV	DW	DX	DY	EL	EV	EW	EX	EY	FL	FW	FX	FY	FZ	GL	GW	GX	GY	GZ

Ft. Knox,  
Kentucky

Ft. Benning,  
Georgia

Approximate location of the  
Vine Grove, KY map  
(which contains Ft. Knox, KY)

Approximate location of the  
Columbus, GA map  
(which contains Ft. Benning, GA)

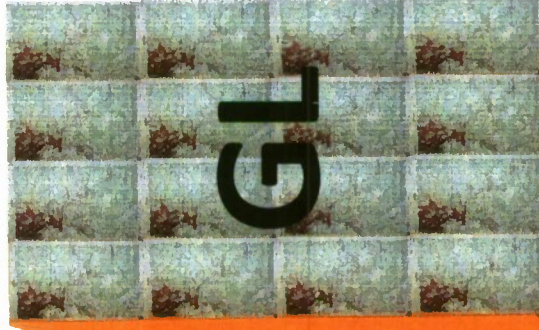


A UTM grid zone represents a very large section of the earth. For example, within the 16S grid zone, you find both Fort Knox, Kentucky and Fort Benning, Georgia with plenty of room to spare. Maps depict geographic areas of interest and may contain portions of more than one UTM grid zone and portions of one or more 100,000 meter squares. The Columbus map sheet, which contains Fort Benning, for example, is in UTM grid zone 16S and contains parts of the FL and GL 100,000 meter squares. The Vine Grove map sheet, which contains Fort Knox has parts of the ET, FT, ES and FS 100,000 meter squares.

## 100,000 meter square

Each 100,000 meter square is represented by a 2-letter combination.

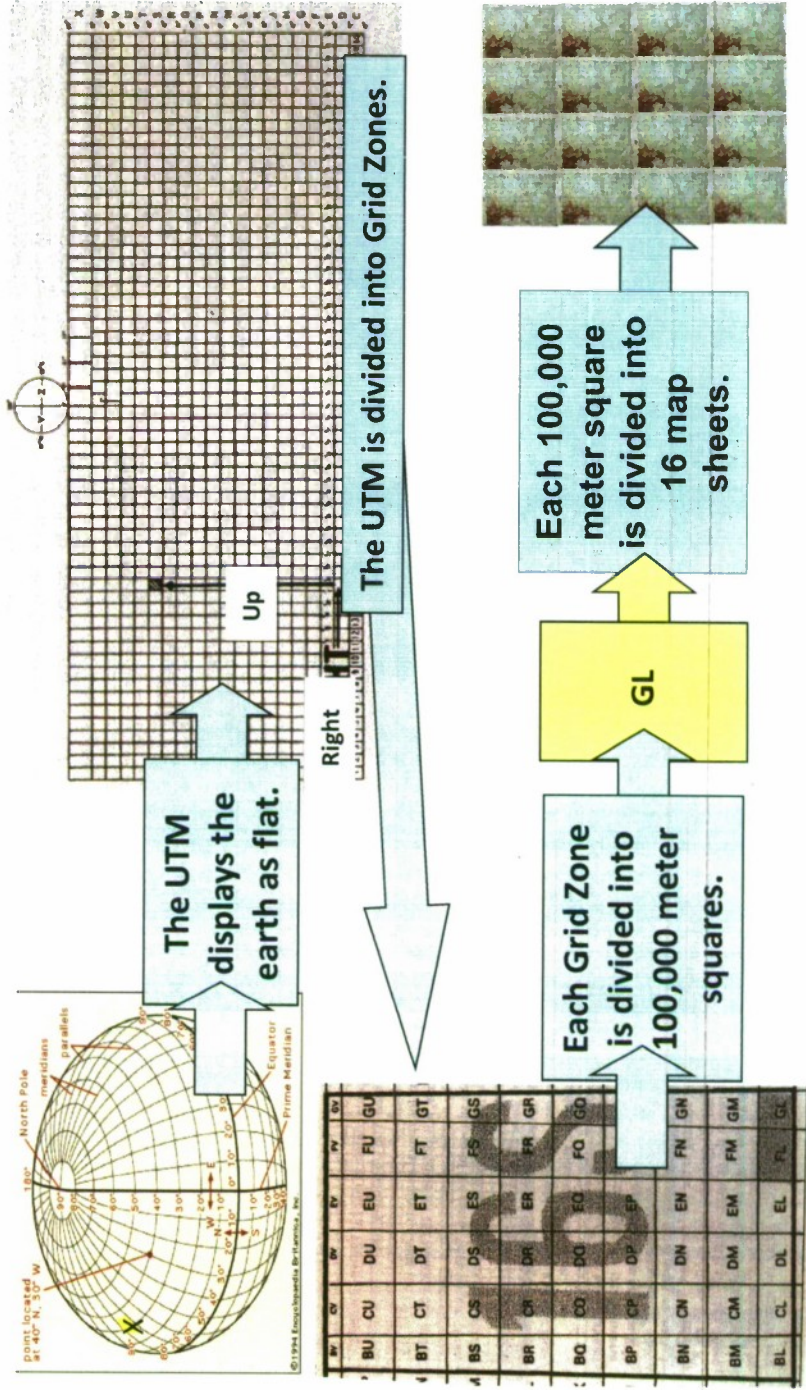
BV	BW	BX	BY
BU	CU	DU	EU
BT	CT	DT	ET
BS	CS	DS	ES
BR	CR	DR	ER
BQ	CQ	DQ	EQ
BP	CP	DP	EP
BN	CN	DN	EN
BM	CM	DM	EM
BL	CL	DL	EL



Each 100,000 meter square contains about **16** map sheets.

Each 100,000 meter square is identified by a 2- letter combination. A further subdivision is into map sheets which represent a portion of the earth drawn to scale. It would take about 16 map sheets to represent a single 100,000 meter grid square.

# Review

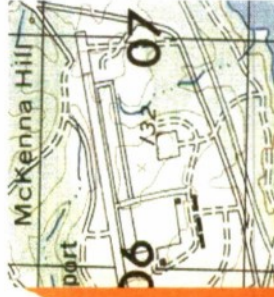




Before we move ahead, let's do a short review. The UTM grid displays the earth as flat and divides the earth into grid zones. These grid zones are divided into 100,000 meter squares. Geographic areas are then depicted on map sheets which can display portions of more than one grid zone and more than one 100,000 meter square. You will need to know this information because these number-letter combinations are critical in identifying a grid coordinate.

## Map Sheets

Map Sheets consist of  
1,000 meter grid squares.



A 1:50,000 map sheet  
has  
more than 600  
1,000 meter grid  
squares.



1,000 meters

1,000 meters

4  
3  
2  
1  
0

0 1 2 3 4 ....

On 1 to 50,000 and 1 to 25,000 map scales, the 100,000 meter squares are divided by 1,000 meter gridlines. These gridlines are numbered from left to right and from bottom to top. They divide the map into grid squares that measure 1,000 meters on each side.



**Where could you be?**

- You know that you are facing North.
- You have water to your front, left, and right.

**Where could you be?**

- You know that you are facing North.
- You have water to your front, left, and right.

**You need to report your location.**

- You know that you are facing North.
- You have water to your front, left, and right.

## Where could you be?



Now that we know how map scales relate to each other, let's discuss how you can locate a point on a map. The grid system displayed on maps permit you to identify the precise location of a point. Correctly communicating this grid information allows others to know the location of the point. For example, you need to report your location. You know you are facing North and that you have water on three sides. But where are you located?

## Locating a Point: The Grid Zone

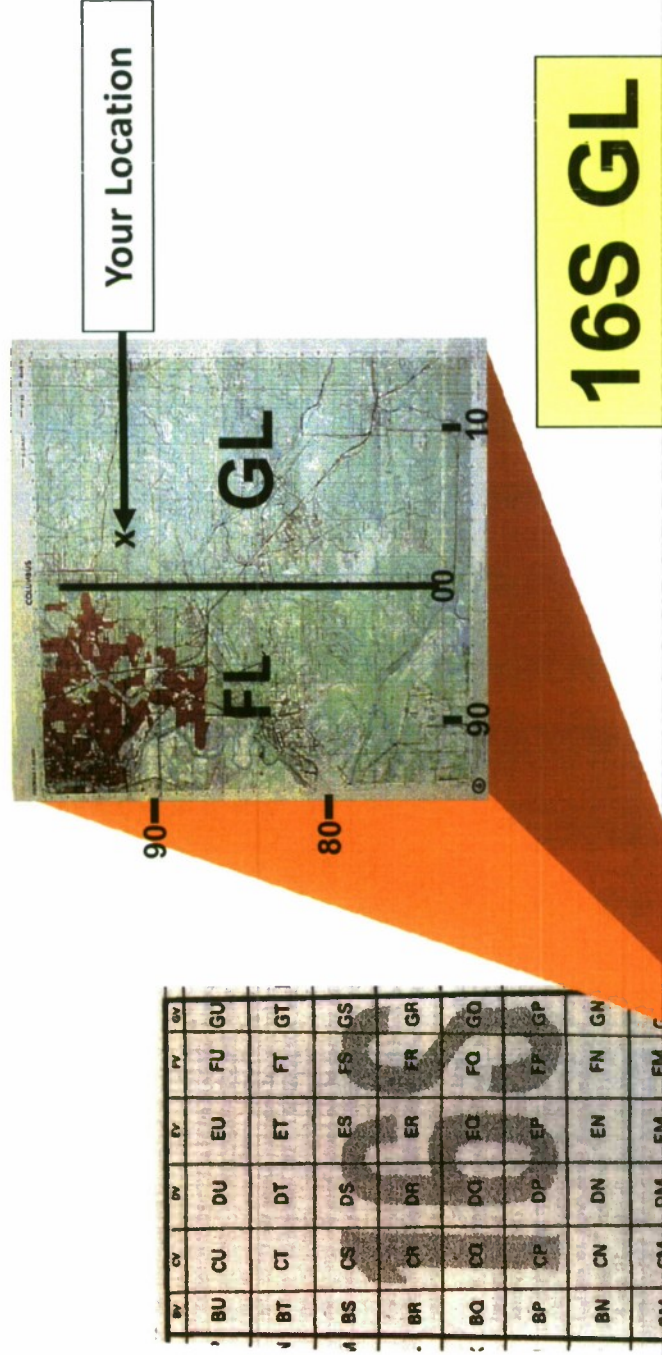
16	17	18	19	20
BU	CU	DU	EU	FU
BT	CT	DT	ET	FT
BS	CS	DS	ES	FS
BR	CR	DR	ER	FR
BQ	CQ	DQ	EQ	FQ
BP	CP	DP	EP	FP
BN	CN	DN	EN	FN
BM	CM	DM	EM	FM
BL	CL	DL	EL	FL

Ft Benning, GA is  
Located in the 16S grid zone.

Ft Benning, GA

Let's say that you are located in the range building on FREY Range at Ft. Benning, GA. The first element of identification you will need is the grid zone, 16S. The first element of your grid coordinate will be 16S.

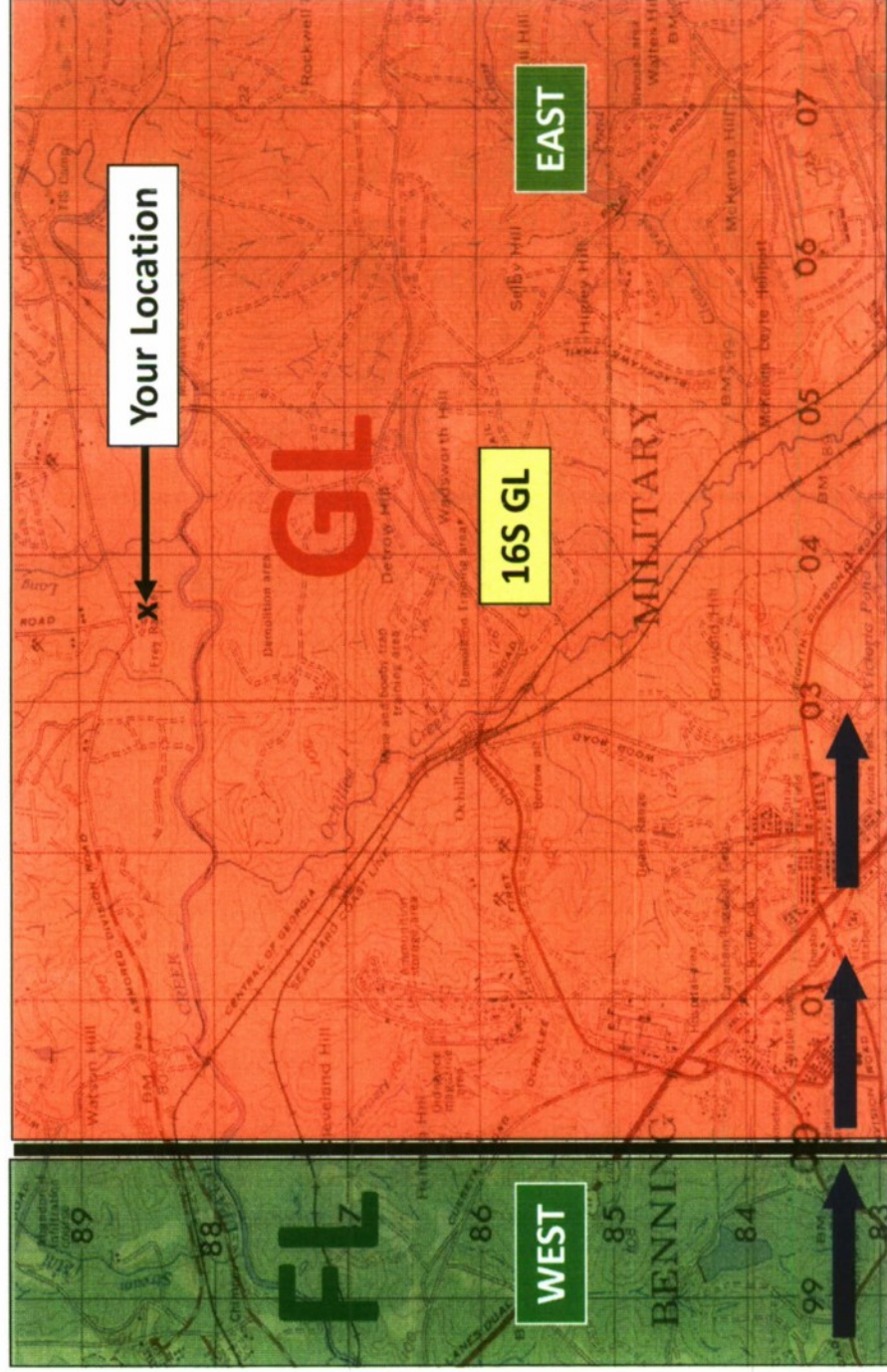
# Grid Coordinates





Remember, the 16S grid zone is divided into 100,000 meter squares. The second element of the grid coordinate is a 2-letter designation for the 100,000 meter square in which you are located. In our case, Frey Range is in the "GL" 100,000 meter square.

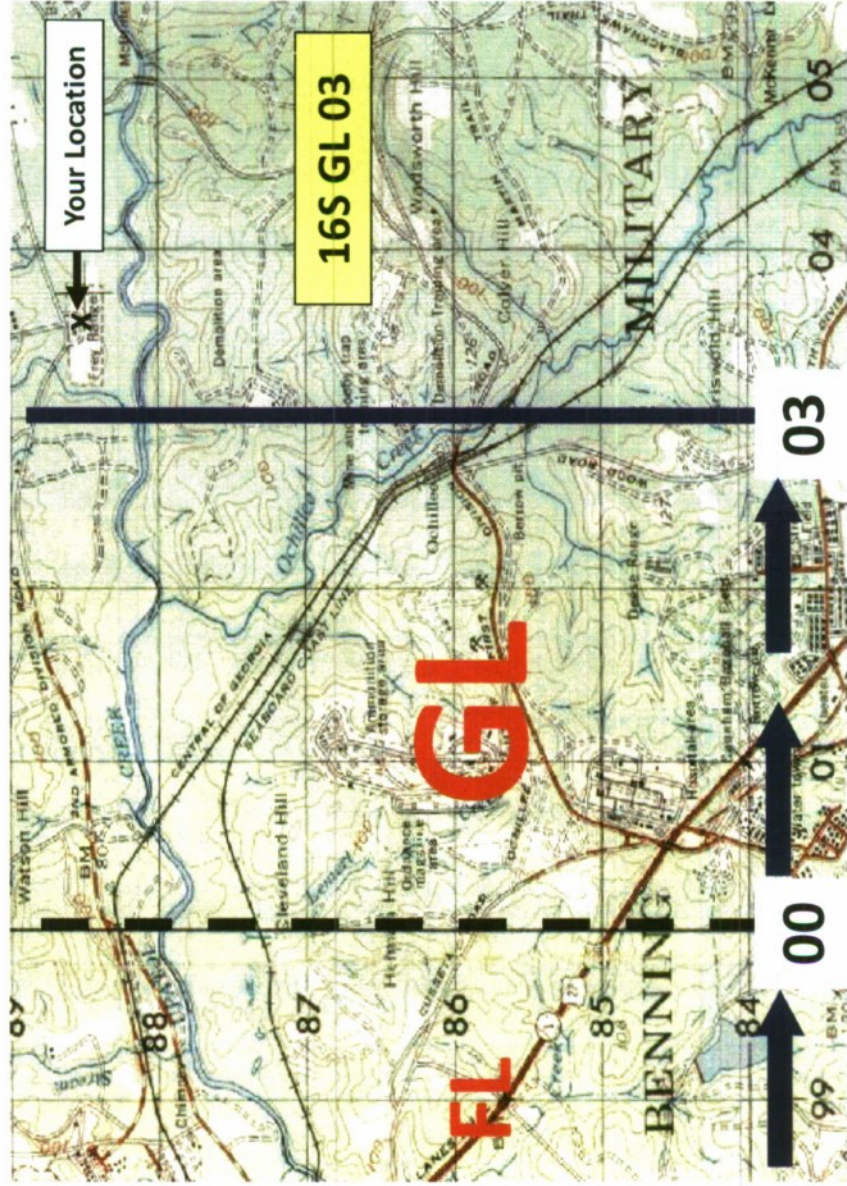
## Locating a Point



Now let's determine the numbers or digits in the grid coordinate. The first set of numbers refers to west to east locations. On a map you always read gridlines to the right first. On the section of the map shown, as you read right, going from west to east, you cross the 00 south to north line that divides FL from GL. The next grid line is numbered 01, and so on until we get to 07 on the far right or the east side of the map display.



## Locating a Point: Using Gridlines





**When reading to the right, you stop on the gridline before the selected location. For example, you are located in the range building on FREY Range. In determining the grid location, you would stop on the "03" south to north gridline.**

**Your Location**

**Your 4-digit grid coordinate**  
**16S GL 03 88**  
 (and locates the point within 1,000 meters).

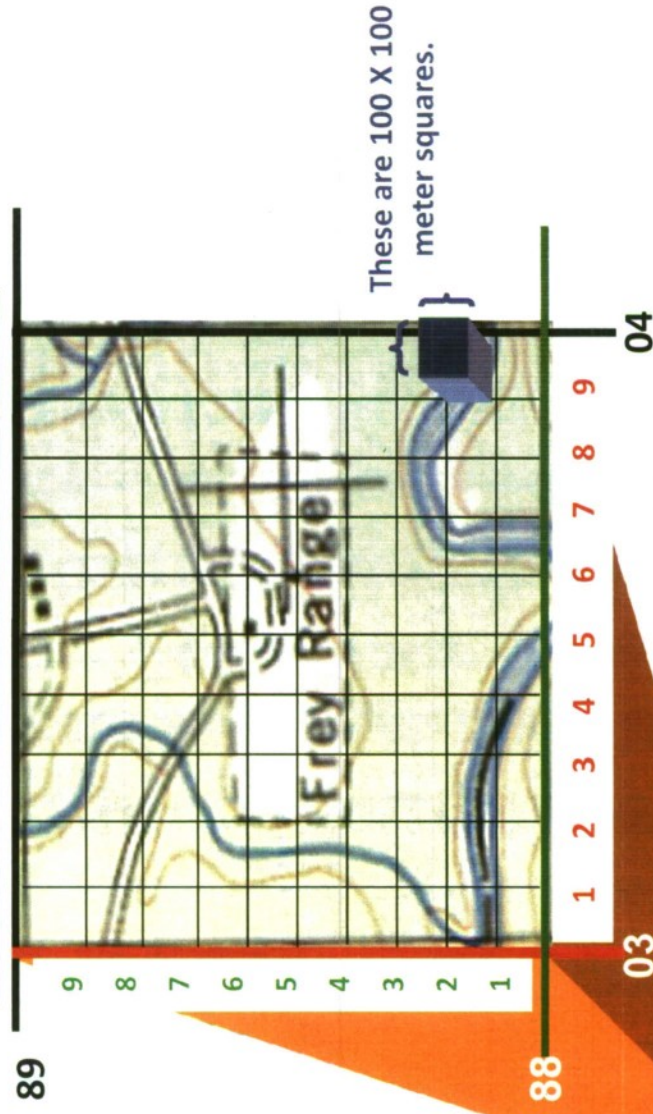
**03**

**88**

Your 4-digit grid coordinate is  
**16S GL 03 88**  
(and locates the point  
within 1,000 meters).

Now we need to determine the south to north location for Frey Range. After reading to the right, you read up, until the grid line before your location. In this case it would be the "88" gridline. This makes the four digit grid coordinate "16S GL 03 88".

## Locating a Point: Using Gridlines

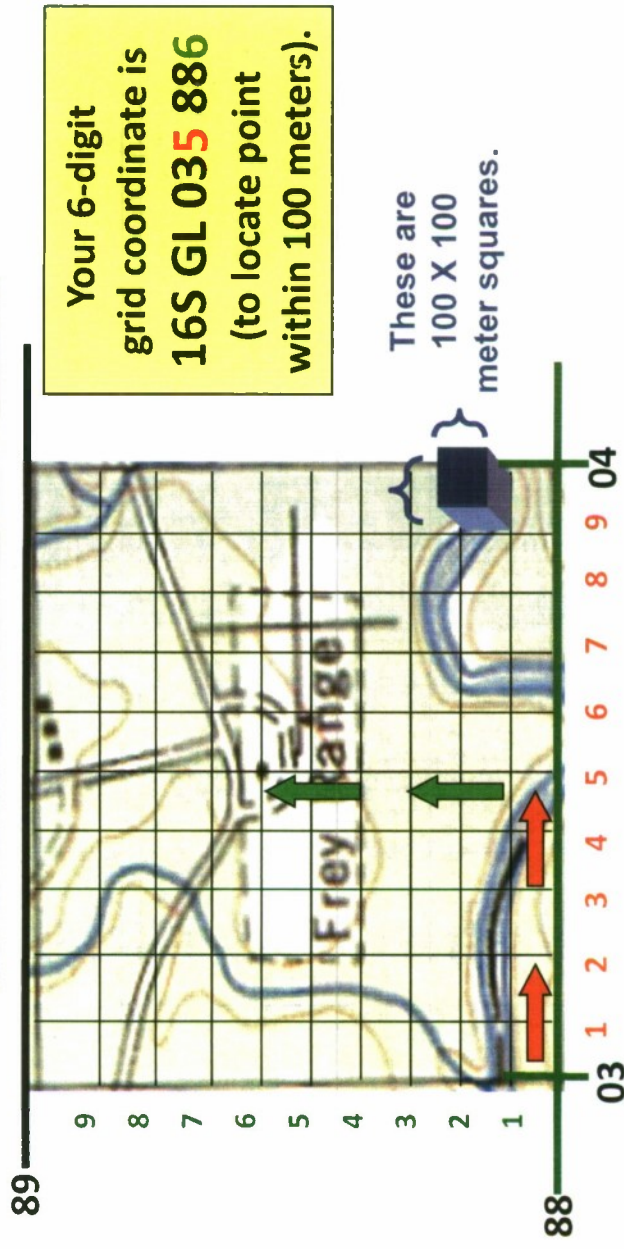


Note:  
This grid does not appear on the map.  
YOU must visualize this grid.



Knowing that a location is somewhere within 1,000 meters is not very precise. We can be more precise than a 4-digit grid if we use 6-digit, 8-digit, and even 10- digit coordinates. We will start with 6 digit coordinates. The first step is to visually divide a 1,000 meter grid square with lines to create a checkerboard with 100 by 100 meter squares. These lines do not appear on the map.

## Locating a Point: Using Gridlines



As with the 4-digit grid you must read right then up. Beginning at the 03 north/south grid line count the imaginary lines to the right until just before your location 03**5**. Then begin at the 88 east /west grid line and count the imaginary lines up until just before your location 88**6**. The 6-digit grid is "16S GL 035 886".

**OK. You should now understand how to plot a 6-digit grid coordinate which locates a point within 100 meters.**

**Try a few questions to practice what you have learned.**

**The answer to the question is provided on the back of the question.**



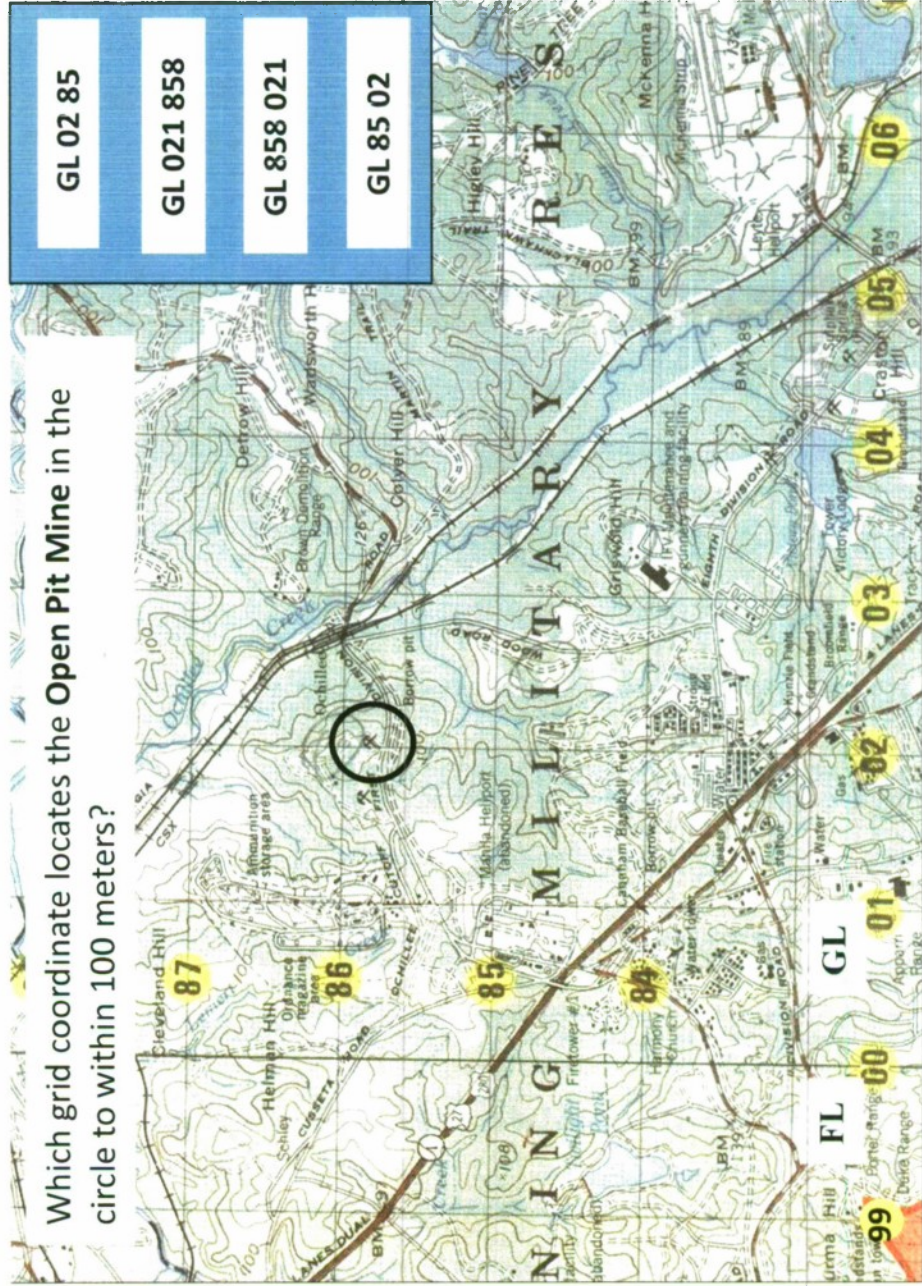
Which grid coordinate locates the Open Pit Mine in the circle to within 100 meters?

GL 02 85

GL 021 858

GL 858 021

GL 85 02



**GL 02 85 Incorrect**

A 4-digit grid locates a point to within 1,000 meters.

**GL 021 858 Correct**

**GL 858 021 Incorrect**

You must read a grid coordinate right then up.

**GL 85 02 Incorrect**

You must read a grid coordinate right then up and a 4-digit grid locates a point to within 1,000 meters.



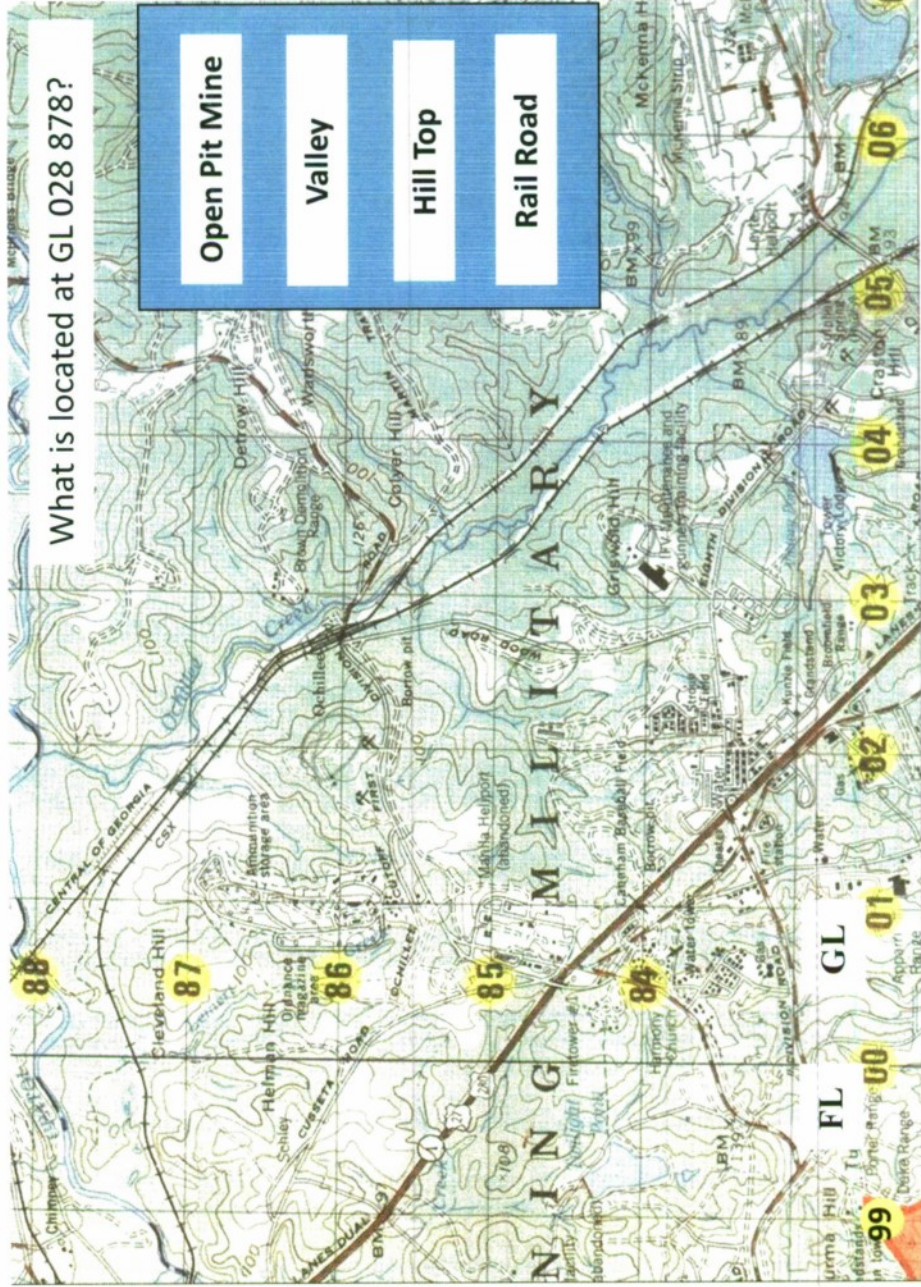
What is located at GL 028 878?

Open Pit Mine

Valley

Hill Top

Rail Road





What is located at GL 028 878?

Open Pit Mine **Incorrect**  
Read right then up.

Valley **Incorrect**  
Read right then up.

Hill Top **Correct**

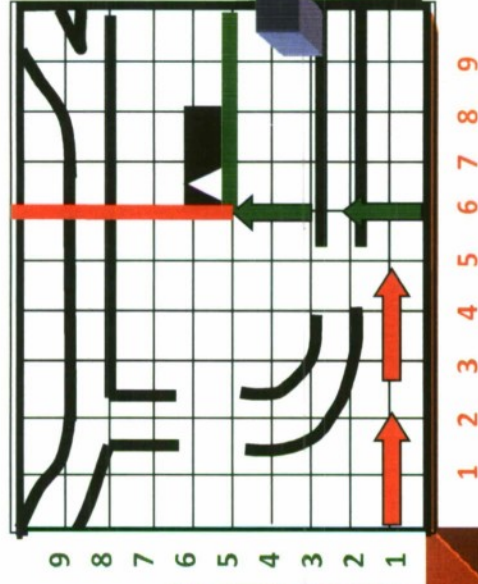
Rail Road **Incorrect**  
Read right then up.



**If you had trouble determining 6-digit grid coordinates, review this section before continuing. Next we'll learn how to determine an 8-digit grid coordinate, which locates a point to within 10 meters.**

## Locating a Point: Using Gridlines

Your 6-digit  
grid coordinate is  
**16S GL 035 886**  
(to locate a point  
within 100 meters).

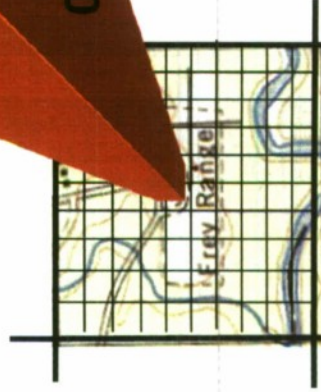


**Note:**  
This grid does not  
appear on the map.  
YOU must visualize this  
grid.

These are 10 X 10  
meter squares.

**Right** →  
then  
→ **Up**

Your 8-digit grid coordinate is  
**16S GL 035 8865**  
(to locate a point within 10 meters).

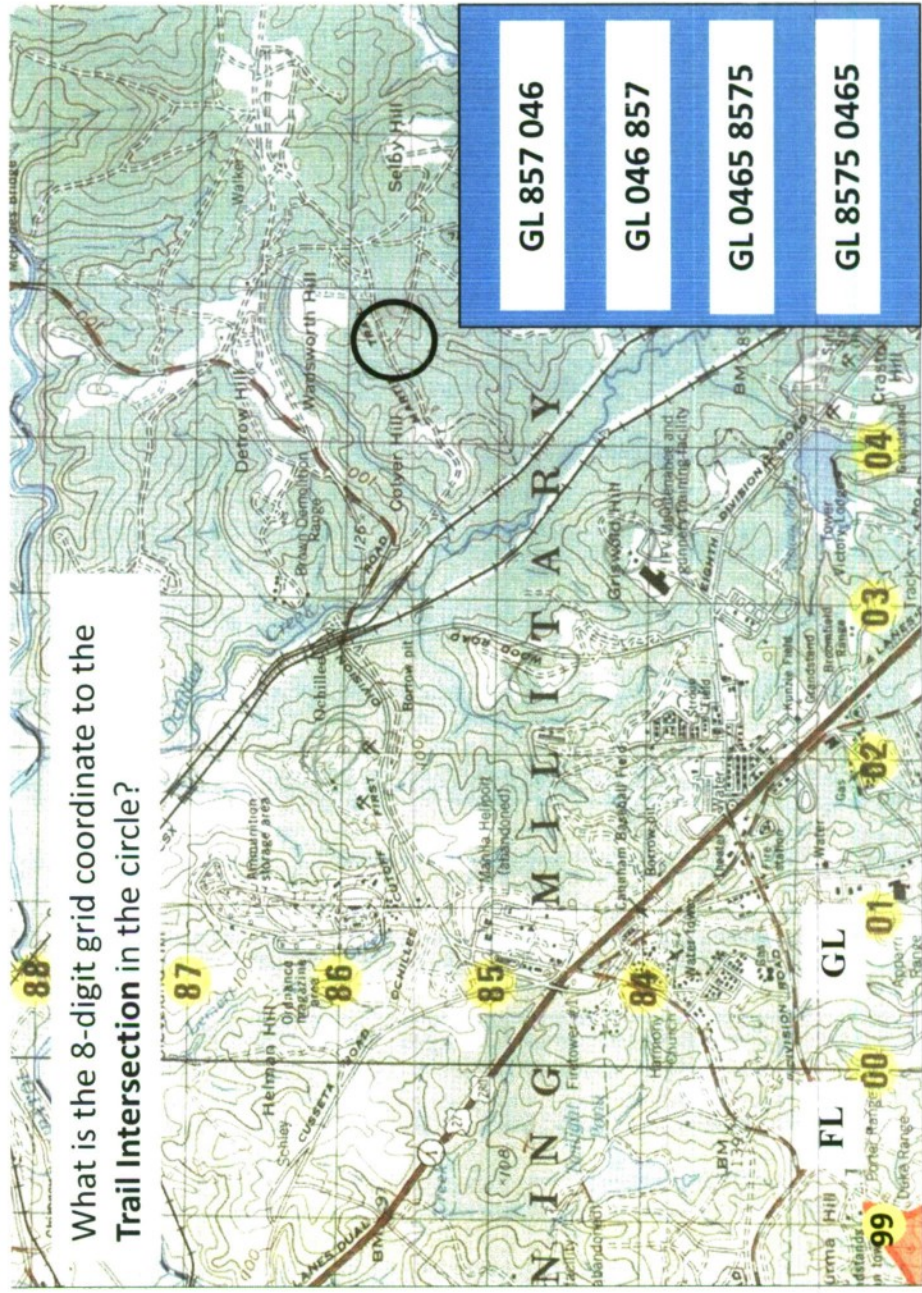


You visually can further divide the 100 meter squares into 10 meter by 10 meter squares. These lines will not appear on the map. This means that the next grid coordinate with 8-digits will locate you to within 10 meters. 10 meters is approximately 30 feet. You can see that the FREY Range building is 2 squares, or 20 meters long, by 1 square, or 10 meters wide. You can now locate yourself within the building.

**OK. Now it's time to practice with 8-digit grid coordinates.  
Remember, always read right then up.**

**Try a few questions to see what you have learned.**





What is the 8-digit grid coordinate to the Trail Intersection in the circle?

GL 857 046

GL 046 857

GL 0465 8575

GL 8575 0465

GL 857 046 **Incorrect**

This is only a 6-digit grid. Also you must read right then up.

GL 046 857 **Incorrect**

This is only a 6-digit grid.

GL 0465 8575 **Correct**

GL 8575 0465 **Incorrect**

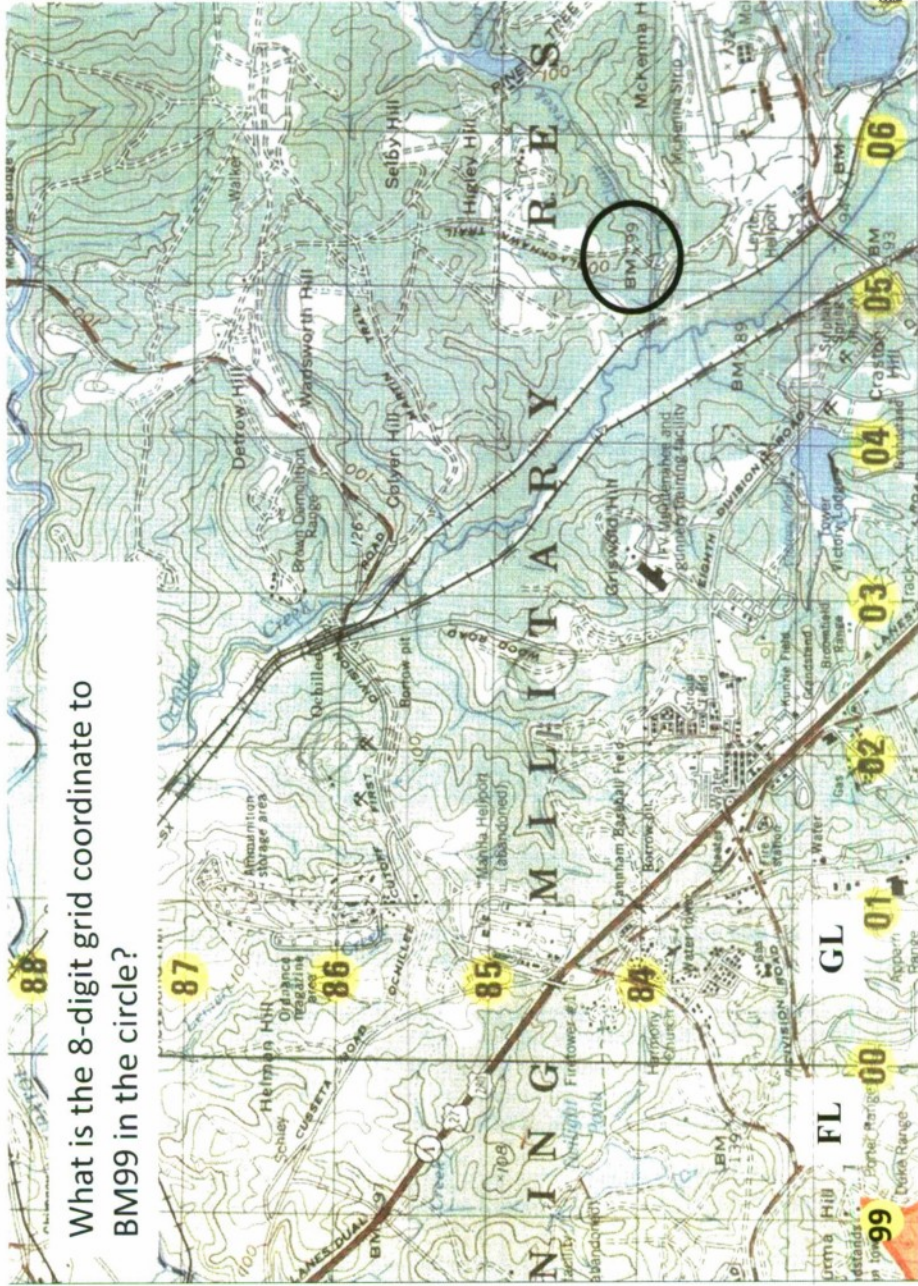
You must read right then up.

Did you have any numbers in the wrong place?

Remember, all numbers reading to the right go in the initial group of numbers, followed by all numbers reading up.



What is the 8-digit grid coordinate to BM99 in the circle?



The exact location for the Bench Mark (BM) is the "X"  
Between "BM" and "99".

GL 0525 8410 **Correct**

Did you have the correct 100,000 meter square identifier?

Did you have an 8-digit grid?

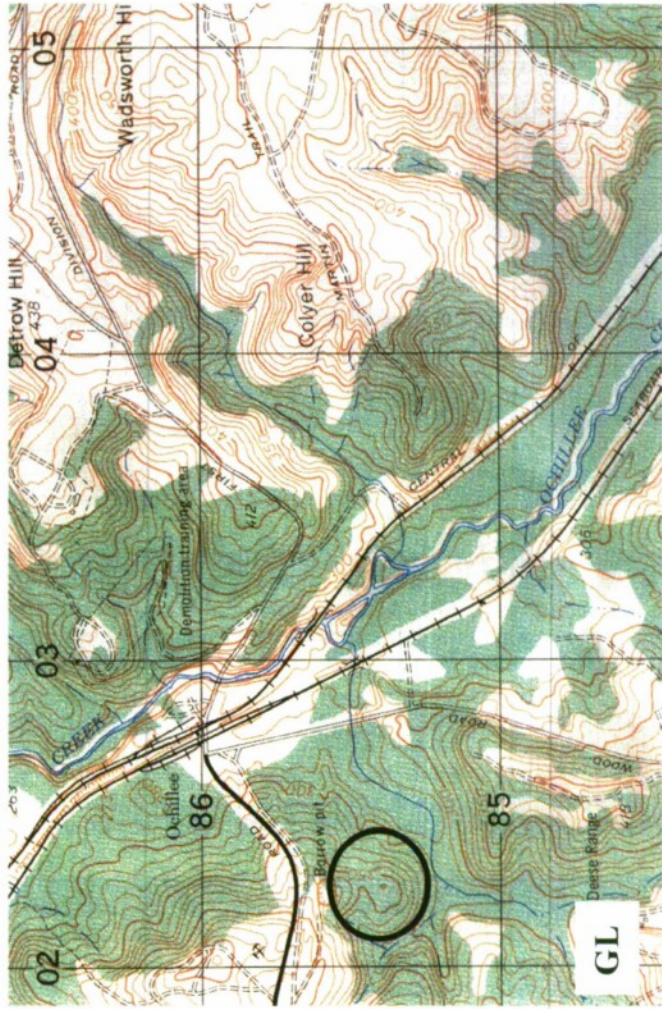
Did you read right then up?

Did you have all numbers in the correct sequence?

If you missed this one, try it again before moving ahead.



A topographic map of the Ochiltree area in South Australia. The map features contour lines indicating elevation, with labels such as 400, 500, and 600. Key locations include Wadsworth Hill, Colyer Hill, and Ochiltree. A road labeled 'D86' runs through the area, and a creek labeled 'Ochiltree Creek' is visible. A circled area is marked on the map, likely indicating a specific point of interest or a location mentioned in the text. The map also shows a 'Demolition training area' and a 'Dune Range'.



**GL 0226 8538** Correct

**Did you have the correct 100,000 meter square identifier?**

**Did you have an 8-digit grid?**

**Did you read right then up?**

**Did you have any numbers in the wrong sequence?**

**Did you read the grid to the hill top, the smallest closed circle?**

**Try again if you missed this one.**

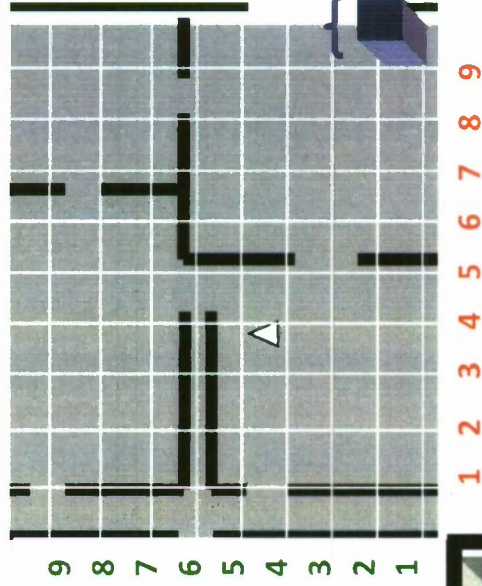
**If you had trouble determining 8-digit grid coordinates review this section before continuing on to 10-digit grid coordinates.**

**10-digit grid coordinates are only used when working with digital systems such as Global Positioning Systems (GPS), Blue Force Tracker (BFT), and Force XXI Battle Command Brigade and Below (FBCB2).**

## Locating a Point: Using Gridlines

Your 8-digit grid coordinate is  
**16S GL 0356 8865**  
(to locate a point within 10 meters).

Note:  
This grid does not appear on the map.  
YOU must visualize this grid.

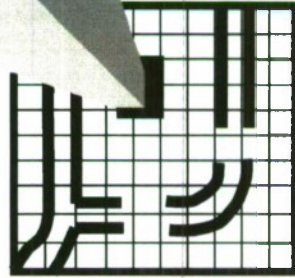


These are 1 X 1  
meter square.

8865

1 2 3 4 5 6 7 8 9

0356

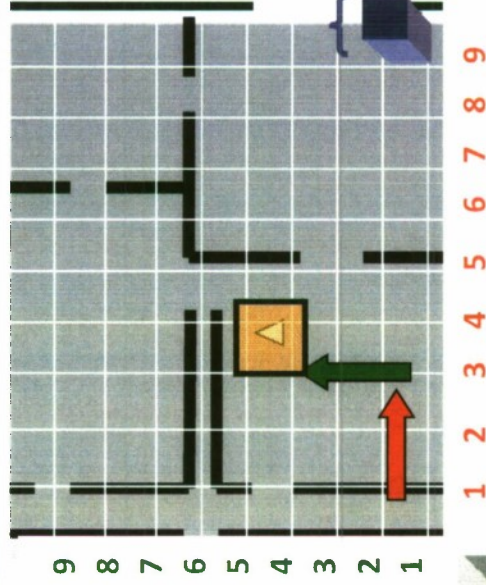




You visually can further divide the 10 meter squares into 1 meter by 1 meter squares. These lines will not appear on the map. This means that the next grid coordinate will locate you to within 1 meter. We know that 1 meter is approximately 3 feet. Locating our position to this level of accuracy permits us to determine which room we are in, in the building.

## Locating a Point: Using Gridlines

Your 8-digit grid coordinate is  
**16S GL 0356 8865**  
(to locate a point within 10 meters).



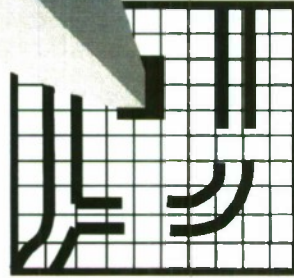
Note:  
This grid does not appear on the map.  
YOU must visualize this grid.

These are 1 X 1 meter square.

1 2 3 4 5 6 7 8 9

Right then Up

Your 10-digit grid coordinate is  
**16S GL 03563 88654**  
(to locate a point within 1 meter).

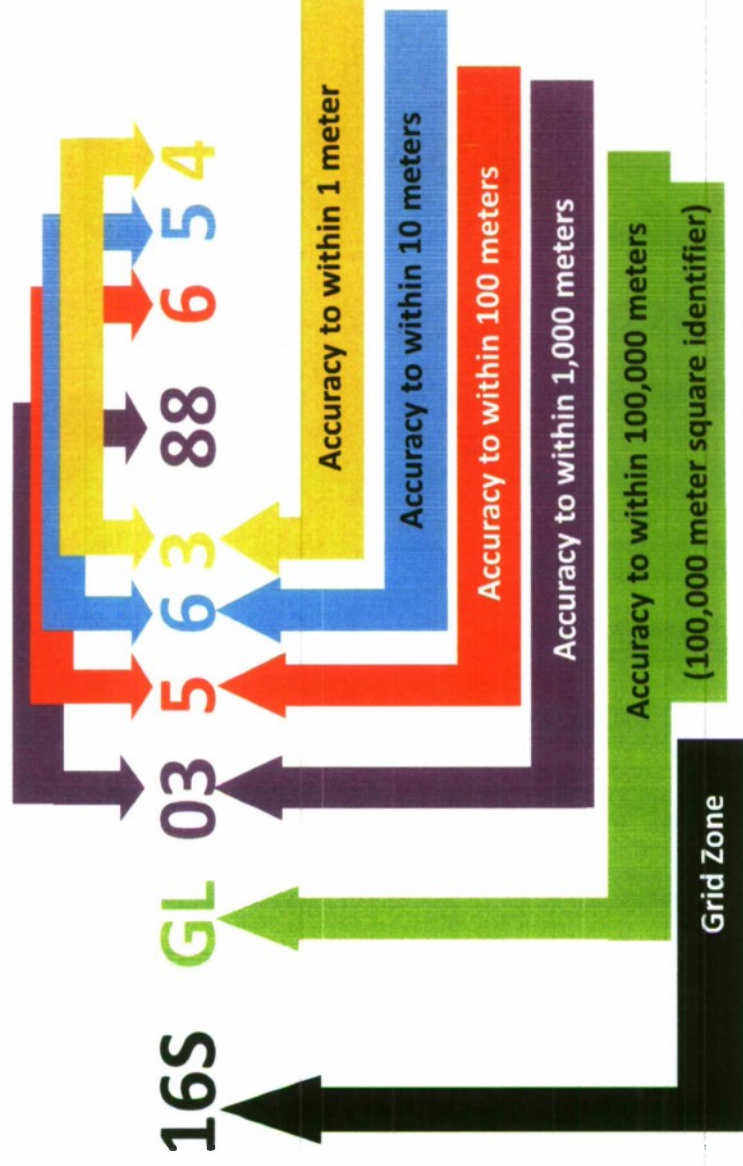


8865

0356

These 1 meter squares are also read to the right and then up. Remember to stop on the line before reaching your location inside the range building. The 10-digit grid coordinate for your location inside the range building would be "16S GL 03563 88654".

## Review





Let's do a quick review. The first set of alpha numerics indicates the grid zone. The next set of 2-letters is the 100,000 meter square. The first pair of two numbers provides the grid square. The next pair of numbers (6-digits) locates a point within 100 meters. The next pair of numbers (8-digits) refines the accuracy to within 10 meters. The final pair of numbers (10-digits) refines the accuracy to within 1 meter.

**Let's try some more questions for practice.**

What is the 8-digit grid coordinate to the "o" in the words Wadsworth Hill in the circle?

**GL 0465 8625 Correct**

**Did you have the correct 100,000 meter square identifier?**

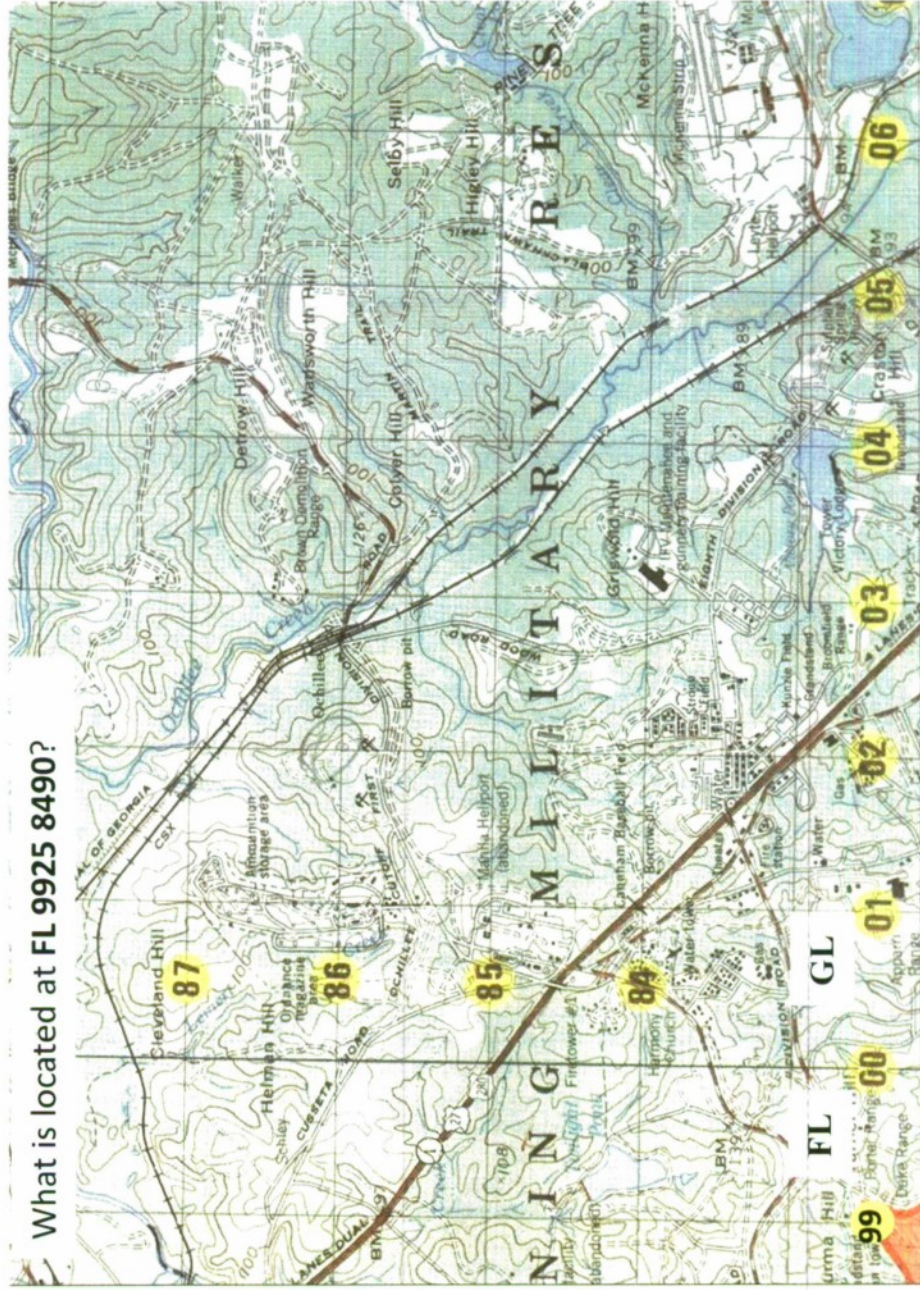
**Did you have an 8-digit grid?**

**Did you read right then up?**

**Did you have any numbers in the wrong sequence?**

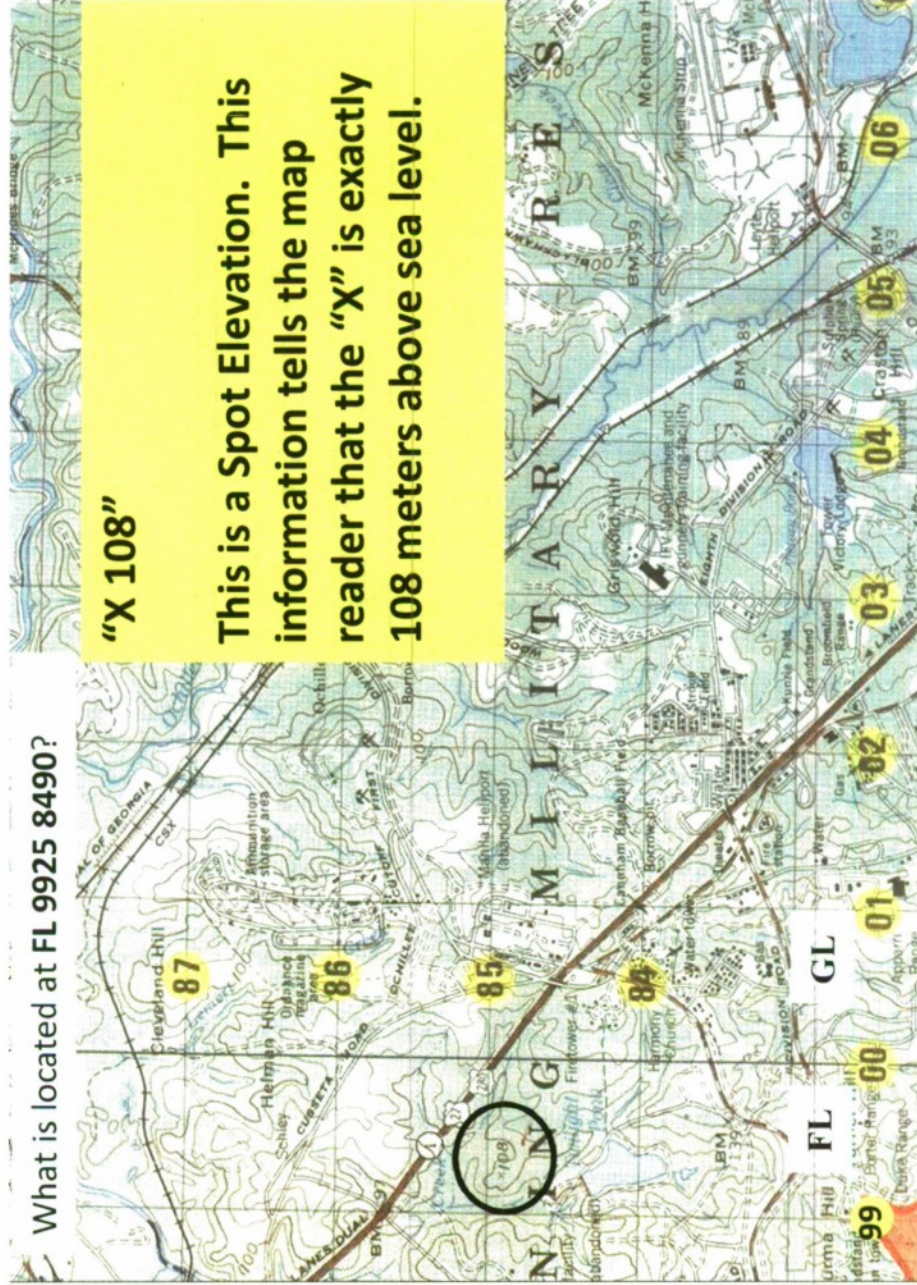


What is located at FL 9925 8490?

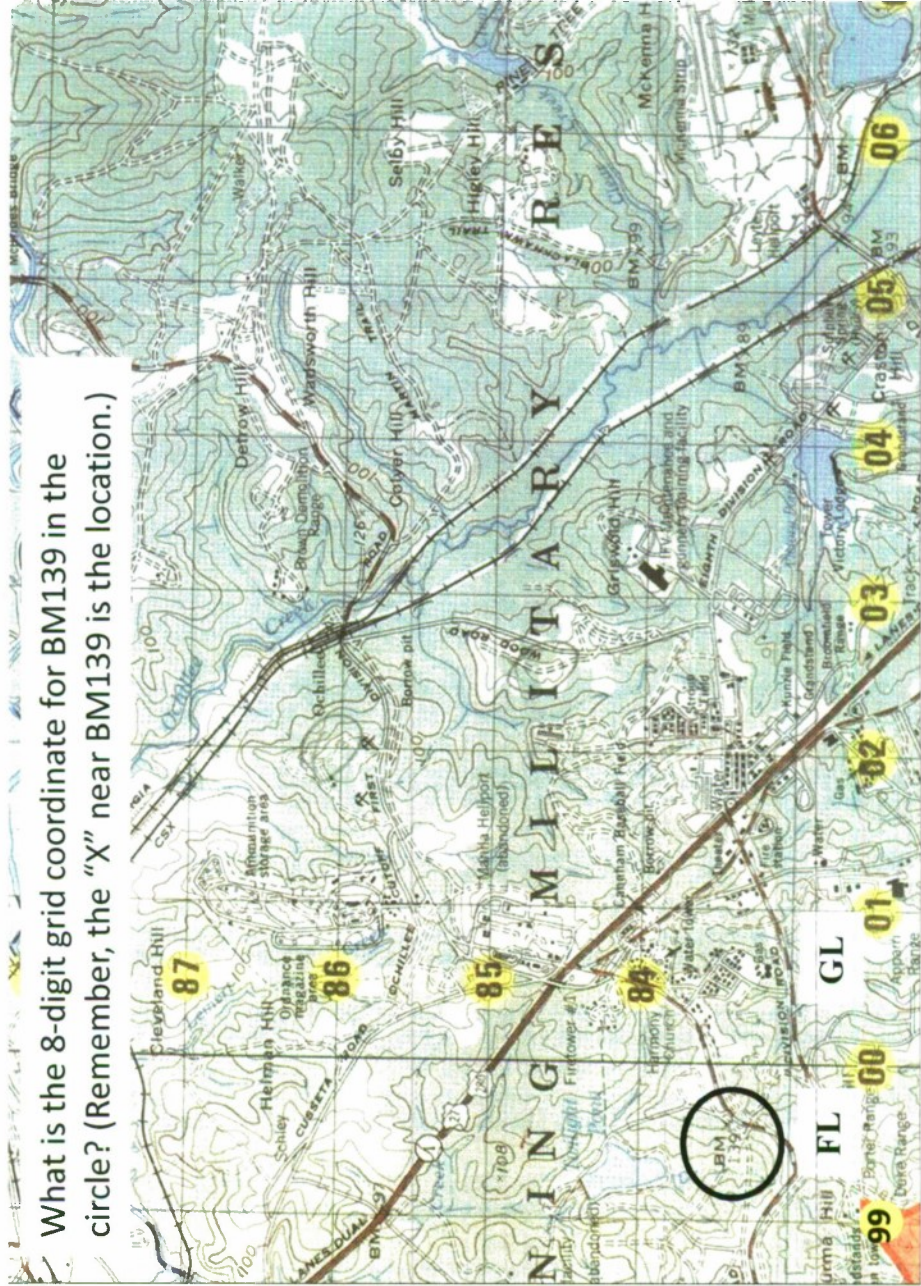




What is located at FL 9925 8490?







**FL 9962 8340**

**BM139 is a Bench Mark. This information tells the map reader that the "X" is exactly 139 meters above sea level.**



[illegible][illegible]

What is located at GL 0132 8280?

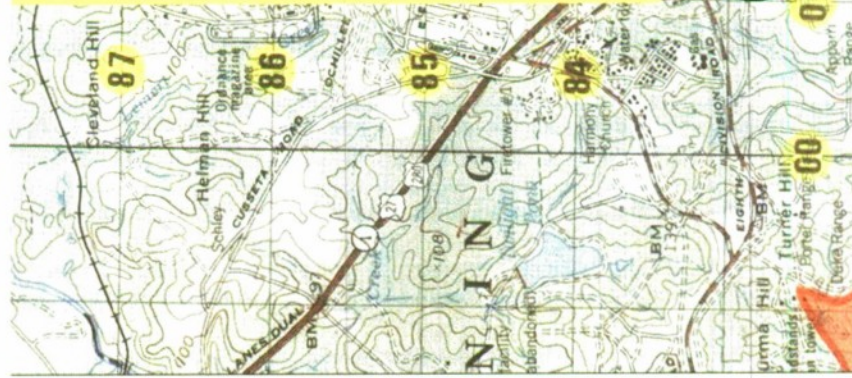


### Water Tower

As you noticed the 83 and 82 gridline are not labeled on the map. Also the water tower is located in a grid square that is only partially displayed on the map.

To obtain the grid coordinate, first, align the protractor to read the east/west coordinates.


Second align the protractor with the 83 gridline and read down to get the north/south coordinate. REMEMBER that this number MUST be added to the 82 gridline (which is not displayed on the map) to get the correct grid coordinates.





[illegible][illegible]

GL 0522 8245

The  symbol means that the bench mark is "monumented". There is a 6" x 6" cement monument with a brass disk on the ground at that exact location stating the location and the elevation is 93 meters above sea level.

Did you remember to:

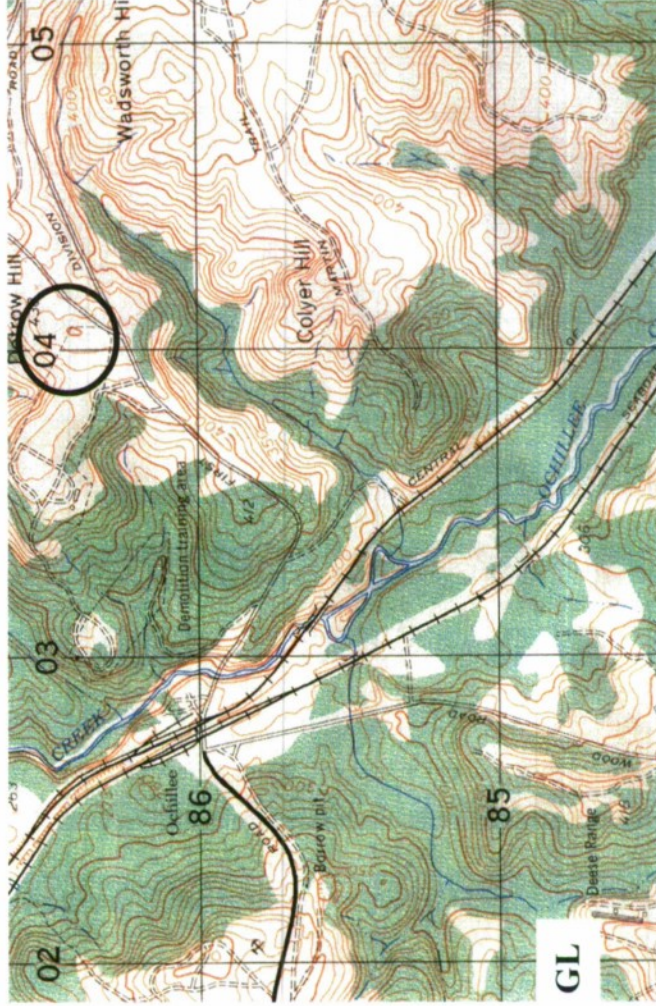
First, align the protractor to get the east/west coordinates.

Second, align the protractor with the 83 gridline and read down.

**REMEMBER** that this number **MUST** be added to the 82 gridline (which is not displayed on the map) to get the correct north/south grid coordinate.



To within 10 meters, what is the grid coordinate to the hill top in the circle?



**GL 0406 8642** Correct

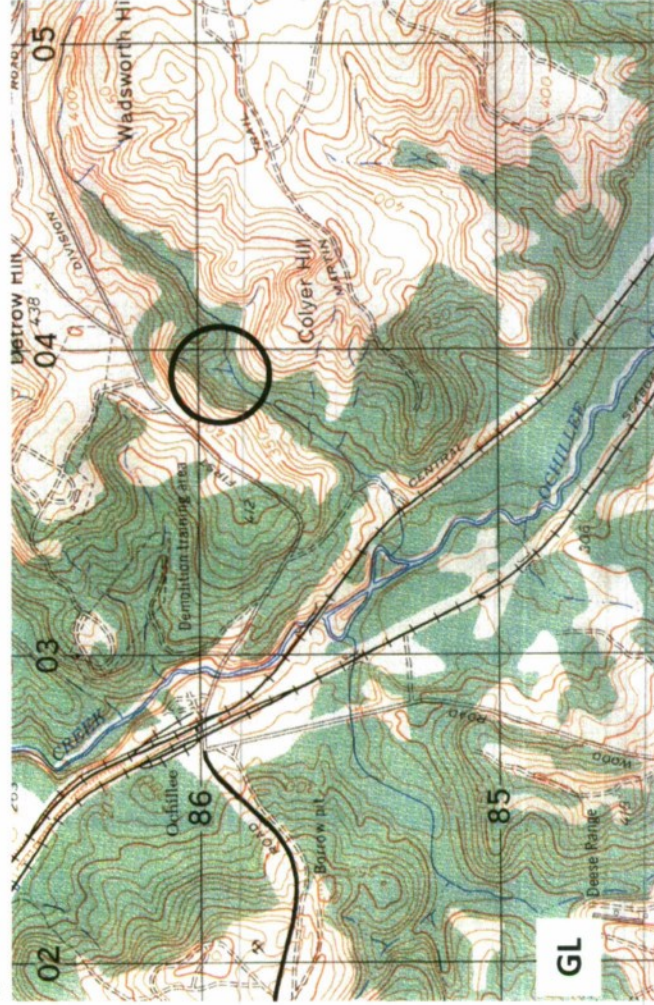
**Did you have the correct 100,000 meter square identifier?**

**Did you have an 8-digit grid?**

**Did you read right then up?**

**Did you have all numbers in the correct sequence?**

What is the 8-digit grid coordinate to the intermittent stream junction in the circle?



GL 0393 8588 **Correct**

Did you have the correct 100,000 meter square identifier?

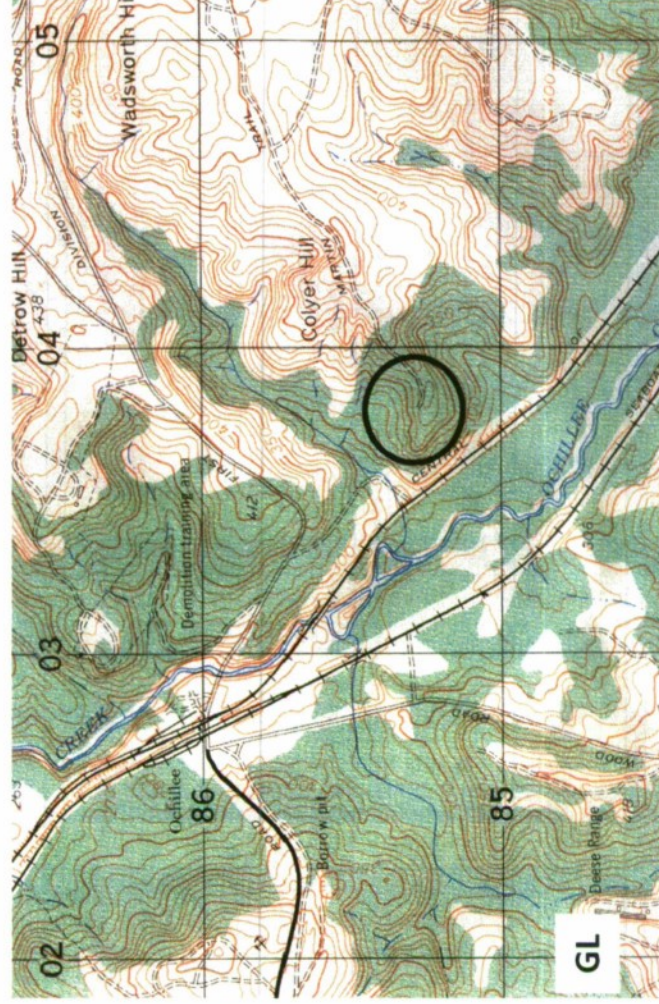
Did you have an 8-digit grid?

Did you read right then up?

Did you have all numbers in the correct sequence?



To the nearest 100 meters, what is the grid coordinate to the end of the trail in the circle?



**GL 038 852** Correct

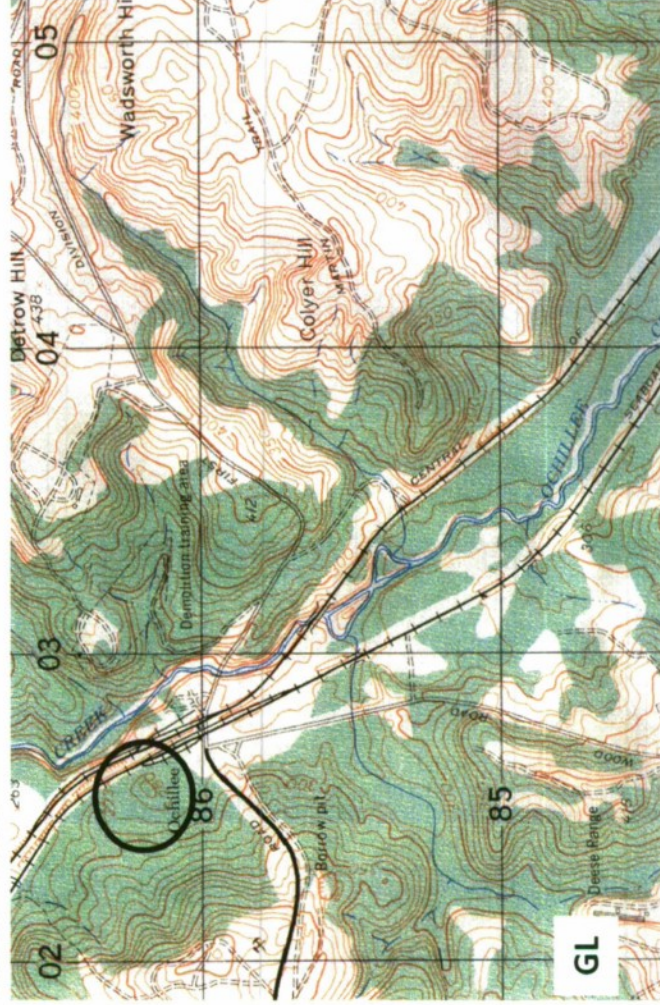
**Did you have the correct 100,000 meter square identifier?**

**Did you have a 6-digit grid? Remember, you only need 6 digits to locate a point within 100 meters.**

**Did you read right then up?**

**Did you have all numbers in the correct sequence?**

To the nearest 10 meters, what is the grid coordinate to the hill top in the circle?



**GL 0257 8617 Correct**

**Did you have the correct 100,000 meter square identifier?**

**Did you have an 8-digit grid?**

**Did you read right then up?**

**Did you have all numbers in the correct sequence?**

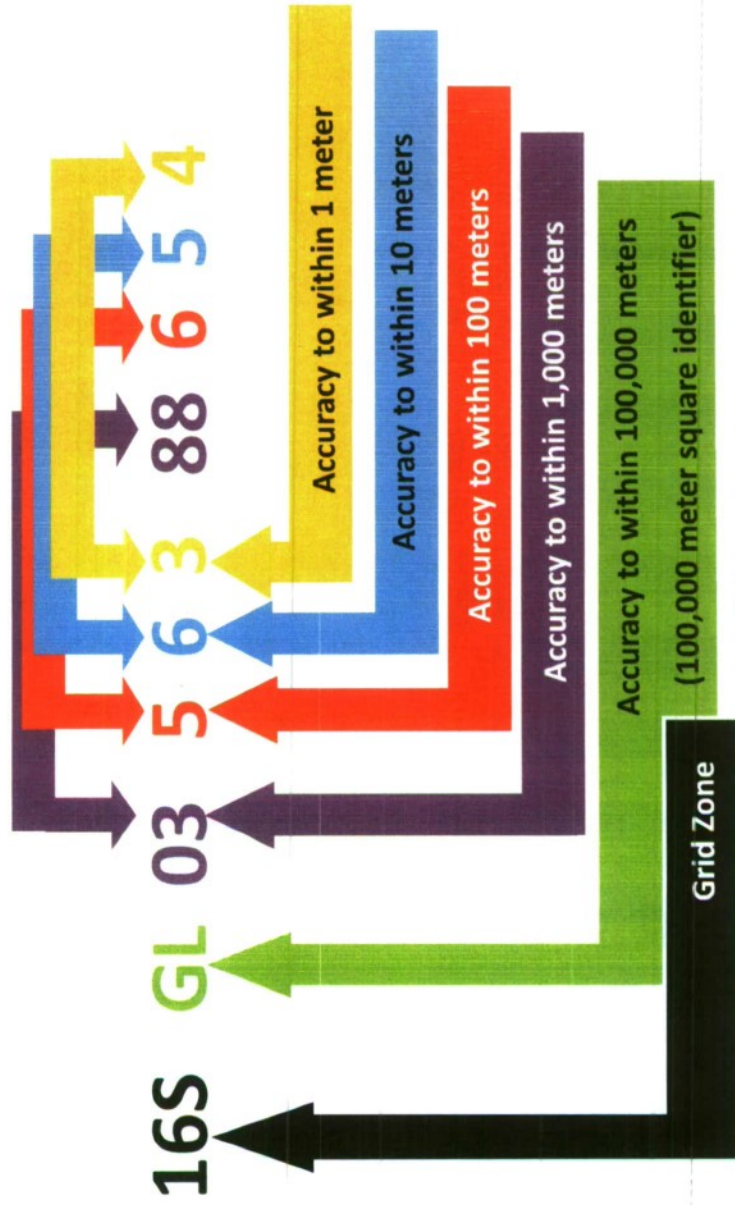


**Well how did you do?**

**If you had trouble, review the material again and ask your battle buddy for help.**

**Let's move ahead to the review.**

Review



**Always include the 100,000 meter square identifier.**

**Always read coordinates right, then up.**

**Be sure to include the correct number of digits.**

**6-digits = within 100 meters**

**8-digits = within 10 meters**

**10-digits = within 1 meter**

**Ensure digits are provided in the correct sequence  
(all digits reading “right”, then all digits reading “up”).**

**For further information on map reading or land  
navigation refer to FM 3-25.26.**



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