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The Manual for G.P.S With Conventional Non-Electronic Maps



There are two things your other G.P.S Manual did not tell you!

1. How to find a G.P.S coordinate for anything on a paper map.
2. How to use your G.P.S to locate your position on a paper map

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USING THIS BOOK

Click on the "Table of Contents" in the box of the upper left hand corner of any page to take you back to The Table of Contents.

From the Table of Contents you can click on any section that you wish to read. Adobe Reader allows you to change the font size to make reading easier.

Understanding the format of this book.

You will notice that throughout the book that some things are labeled as: 3a, 3b, 3c or 4a, 4b, 4c, etc.

The number is for the chapter.

The letter is for the step within the chapter.

Some more involved chapters include a checklist.

The checklists are there to help you remember the order of each required step to perform the task at hand. You may want a reminder of the order of each required step without having to read again how to do each required.

The checklists are also labeled 3a, 3b, 3c or 4a, 4b, 4c, etc. These labels directly correspond to the explanation of how to do each required step for that particular task.

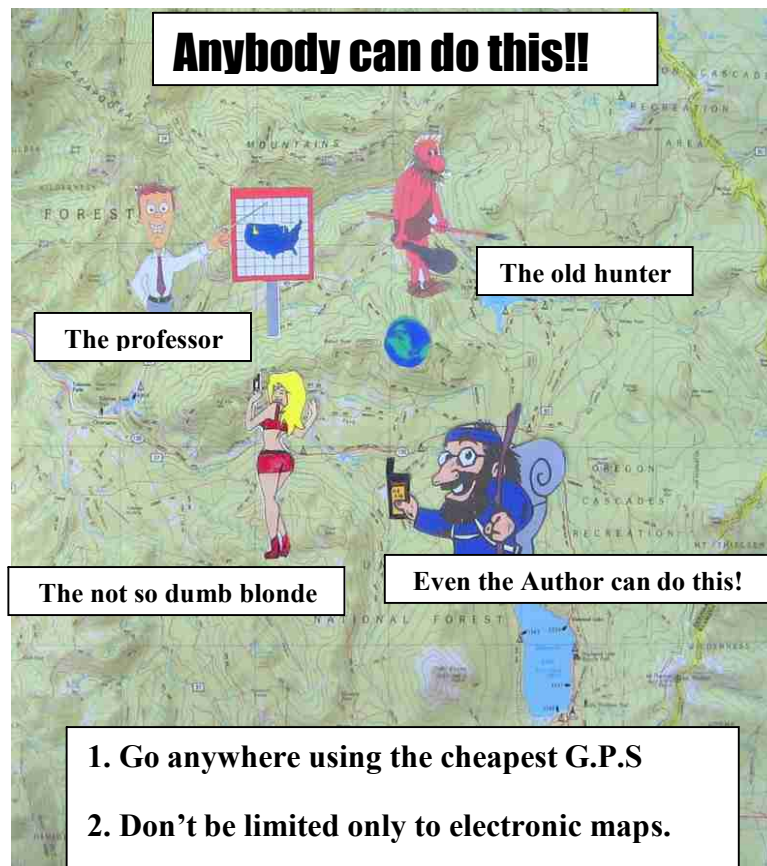


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The Manual for G.P.S with Conventional Non-Electronic Maps

by Robert Kiser

Warning!

The author and the publisher assume no liability for accidents or injuries of persons or property of readers who engage in the activities described in this book. For your personal safety please read the section on [page 59](#)

This book is available in paperback without the added sections of Christianity at Amazon.com

The Manual For G.P.S With Conventional Non-Electronic Maps

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The Manual For G.P.S With Conventional Non-Electronic Maps

I bought my first G.P.S in 1996. I was just starting to plan a hike on the Pacific Crest Trail across Oregon. This is a trail that travels along the West coast from Mexico to Canada. It did not take me too long to realize that the manual that came with my G.P.S lacked the information I needed. The manual was designed to help me back track or find my way back to where I had already been. Hiking this trail I had no interest in finding my way back. I was only interested in finding my way to somewhere I had never been before. I knew that possibly there would be times when I would lose the trail in snow, windfalls, washouts, etc. Looking at the maps that I would be using I also realized that there were some long stretches in-between water sources. Yet there were creeks nearby that did not cross the trail. How would I find them? I also knew that there would be times when I would be on the trail and would like conformation from my G.P.S as to where on the map I actually was at the moment. Unfortunately my manual did not tell me how to use my G.P.S in this manner. So I bought a thirty-dollar book on navigating with a G.P.S. I learned a lot from this book, but the bottom line is it did not teach me how to do what I wanted to accomplish either. I was very frustrated and had to figure it out on my own.

Since, that time manufactures have developed different versions of G.P.S receivers that cost more. There are also electronic maps that you can buy that can be downloaded into your G.P.S receiver. This certainly makes some things more convenient yet I still see the need for my book. You could rely only on the most expensive G.P.S and electronic maps if you want. However, I can still see two problems. First, all maps are not equal. I have found one map may be more reliable for finding water sources another map will show more trails.

Another map may show more roads. In other words some maps will show certain features better than other maps. I don't want to say I can't use my G.P.S receiver to go there just because the location is found on a paper map and not on an electronic map. The second reason is only so much detail can be shown on a little hand held screen on your G.P.S receiver. Therefore, you cannot see all of the surrounding detail at a glance as you can on a conventional map.

By utilizing the information in this book you can use any map that has latitude and longitude degrees marked on the side. With this information and a little math you can enter Waypoints into your G.P.S receiver. In this way you can utilize all your favorite maps that show the detail you want to see. (Not to mention that you can save money by not buying stuff you do not need.) With the information in this book you will also be able to find your current location on your favorite map using your G.P.S receiver. I can go anywhere I want and locate myself on the map using the cheapest G.P.S receiver without paying extra for electronic maps.

A Waypoint is a coordinate or location that you enter into your G.P.S receiver. I am assuming that you have already learned how to use your G.P.S to enter and find Way Points. The manuals that come with a G.P.S do a good job of teaching you that much.

You do not need a G.P.S to learn how to get a G.P.S coordinate from a map. This book will make much more sense, if you treat it like a workbook and follow along with the steps locating Dollar Mountain using the map at the back. You may even want to photo copy that page so you can easily work with the map without having to turn back and forth in the pages in the book.

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CHAPTER 1

There is general information that needs to be understood about the map and your G.P.S.

You will need a map that has the Latitude and Longitude coordinates along the edge of the map. These are the lines that you have seen on a globe. These numbers on a map are expressed in degrees, minutes and seconds. These are not measurements of time. They are measurements of distance. One degree of Latitude is equal to 60 minutes or about 69.17 miles. One minute of Latitude is equal to 60 seconds or about 1.15 miles. One second of Latitude is equal to about 33.82 yards. Longitude does not remain consistent. The reason why is because the circles around the globe become more compressed as you go North or South of the Equator. They become compressed because the world is spherical or ball shaped in design. Having given you all of these measurements I should also tell you that these measurements are a surveyed distance. It will not be that exact on your G.P.S. receiver. I have had my receiver indicate that I changed my location by a second or two when in fact I had not moved at all.

Reading latitude and longitude numbers is rather simple $123^{\circ} 22' 30''$ is read as One hundred twenty-three degrees, twenty-two minutes and thirty seconds. This is a West bearing that runs through Southern Oregon. Everything in North America is read as a North or West bearing. That is because we are North of the Equator and West of the Prime Meridian.

Symbols

$^{\circ}$ = Degree

' = Minute

'' = Seconds

It took me a little while to become used to this next part. Here in North America the following is true.

(1) The horizontal lines that run East and West on your map and around the globe are the North bearing. These horizontal lines encircling the globe grow larger in degree as you go North of the Equator

(2) The vertical lines that run North and South on your map and around the globe are the West bearing. These vertical lines grow larger in degree as you go West of the Prime Meridian.

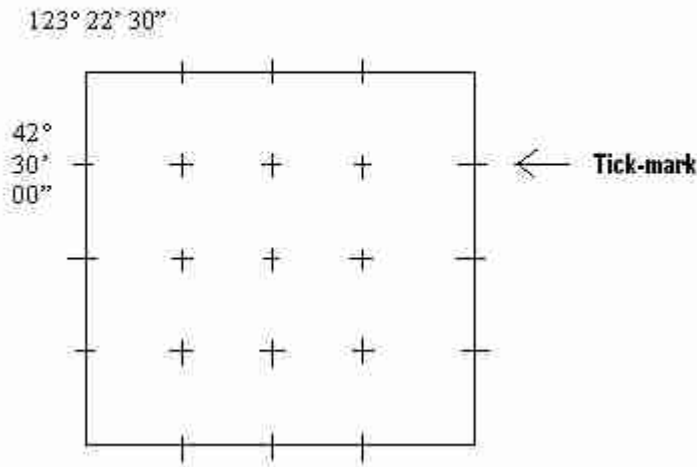
For North America

North bearing lines run horizontally (from side to side) and you read them from the bottom of the map going up. This is the distance North of the Equator. = Latitude

West bearing lines run up and down vertically and you read them from right to left. This is the distance West of the Prime Meridian = Longitude

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Your map may have the degrees, minutes and seconds along the edge of your map and might not have the connecting grid lines drawn across the map. You may only have tick marks on the edge. In this case you can take a straight edge and carefully connect the tick marks from each side of the map. (I use my 4-foot level for this process.) You will also notice that there are cross sections across the map that line up with these opposing tick marks. They just look like a + on the map.



(Illustration 1)

Anywhere that these Latitude and Longitude lines cross can be entered as a “Waypoint” into your G.P.S receiver. Then you can use your Navigate or GOTO mode, etc. (depending upon your receiver) to travel to that point. For example: You could enter the horizontal line $42^{\circ} 22' 30''$ for a North bearing and the vertical line $123^{\circ} 15' 00''$ for a West bearing into your G.P.S receiver and navigate to it. (See map on page 58) Upon arrival you would be close to Grant Pass Peak in Southern Oregon. What if you wanted to go to Dollar Mountain? There are no grid lines that cross Dollar Mountain. To determine the G.P.S coordinate for that location will require two measurements on the map and a little bit of math.

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CHAPTER 2

Why do I need a math formula to find a specific location?

One can enter the coordinate where two grid lines cross by using the degrees for each line and entering it into the G.P.S as a Waypoint. However most likely any location that you wish to travel to will not be where the grid lines on your map cross. The grid lines are measured as degrees, minutes and seconds. Therefore one must determine how many minutes and seconds the desired location is from the known grid line. This conversion of distance on the map to minutes and seconds is a simple math problem. The good news is you only have to figure out the seconds per part on your ruler one time for each different map scale that you normally use in your area as will be explained shortly.

What we are going to figure out is how much distance does one millimeter on your ruler represent?

Once that is figured out we will then make two measurements from existing grid lines on the map. Then add the measured distance with the ruler to the Latitude and Longitude lines on the map that you measured from. Every location on the North America continent has a coordinate where Latitude and Longitude cross and we will be able to determine that coordinate from the map without the G.P.S and without going there first.

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CHAPTER 3

How do I develop this math formula for the maps I use?

First I would like to share how easy it is going to be before you become scared by thinking, but I hate math! First of all you get to use a calculator. It will take about a half hour to determine how many seconds are in each segment of your ruler. This you will only have to do once and then you will never have to do it for that map again. Once that is determined it will only take a couple of minutes to figure out what the G.P.S coordinate is for anything on that map.

This process and the following chapters will probably be easier if you actually follow the steps with both the map and measurements using the map at the back as we locate Dollar Mountain. I really draw out the explanations, but once you grasp what we are doing you will be surprised at how easy it really is.

(3a) First you will select your favorite map that has the degrees of latitude and longitude marked along the edges.

(3b) Look to see if the grid lines connect the degrees of latitude and longitude across the map. The grid lines will need to be drawn in with a straight edge, if they are not there already. In the event the grid lines are not drawn in then connect the opposing tick marks by each line of latitude and longitude. Make sure that you also connect the cross sections that look like a + when you do this as was previously seen in illustration 1. Use extreme care when doing this. A line that is off will also make your coordinate off when you are in the field.

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(3c) Figure out how many minutes and seconds that is between each degree mark.

To do this simply take two numbers from across the top of the map that are next in line to each other. Then subtract the number on the right from the number on the left.

For example on my map (See page 58 or illustration 2)

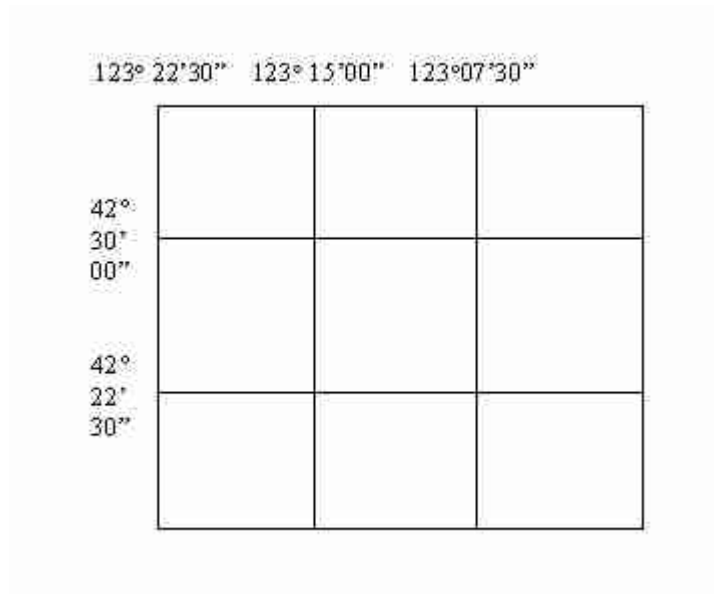
I took $123^{\circ} 22' 30'' - 123^{\circ} 15' 00'' = 7' 30''$.

$\begin{array}{r} 22'30'' \\ - 15'00'' \\ \hline 7'30'' \end{array}$
--

That is 123° degrees, 22' minutes, 30'' seconds minus

123° degrees, 15' minutes and 00'' seconds = 7' minutes and 30'' seconds.

Now write down how many minutes and seconds between vertical grid lines that you found on your map.



(Illustration 2)

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SIDE NOTE: In case your map does not show the degrees, minutes and seconds on every grid line. Then you will have to determine the bearing for the un-named grid lines yourself.

Unlike the map at the back some maps may only show the degree on every other grid line and place a tick mark in the middle between the two grid lines that are marked. For example my Idaho Panhandle National Forest map does not draw in the grid lines and skips the labeling of every other tick mark. I drew in the grid lines by using my 4-foot level as a straight edge and connecting the tick marks.

On the top of the map the first grid line is marked 117° degrees.

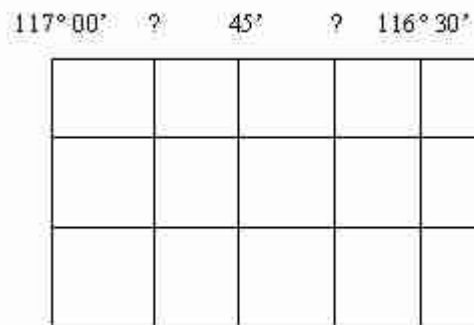
The next grid line to the right was not marked.

The next grid line to the right of that is marked $45'$.

The next grid line to the right of that was unmarked.

The next grid line to the right of that is marked $116^{\circ} 30'$.

(See Illustration 3)



(Illustration 3)

(Notice my Idaho Panhandle National Forest map does not always place the degree.

It also does not always place the seconds when it ends in an even minute.)

So I was looking at ($117^{\circ} 00'$, ?, $45'$, ?, $116^{\circ} 30'$) it was up to me to fill in the blanks. I knew that since the degrees grow larger reading from right to left I should be starting from the right $116^{\circ} 30'$ moving left to the $45'$. ($45 - 30 = 15$) That means that between the grid line with the $30'$ minutes I would move left past the unnamed grid line to the grid line labeled $45'$ minutes.

Between these two points was a span of 15 minutes. Therefore the unlabeled grid line in the middle of 45 minutes and 30 minutes is exactly half of the 15-minute span between the two labeled grid lines. Divide 15 in half and we get 7.5.

That is 7 minutes and half of a minute or 7 minutes 30 seconds.

I add the 7 minutes 30 seconds to the $116^{\circ} 30'$.

The unlabeled grid line between $116^{\circ} 30'$ and $45'$ is $116^{\circ} 37' 30''$

(Written as hundredths of a minute it would read $116^{\circ} 37.50$)

To label the grid line between the 45 minutes and 117° degrees we now know to add 7' minutes, 30'' seconds to the $45'$ minutes.

($45' + 7' 30'' = 52' 30''$) or (45 minutes + 7 minutes, 30 seconds = 52 minutes, 30 seconds)

So the next unlabeled grid line is ($116^{\circ} 52' 30''$) We now can add 7 minutes 30 seconds to this and we will have the next labeled grid line of 117° degrees.

(Remember there is only 60 minutes in 1 degree)

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Before I filled in the blanks I had ($117^{\circ} 00'$, ?, $45'$, ?, $116^{\circ} 30'$) as seen in illustration 3 on previous page. After filling in the unnamed grid lines I had:

($117^{\circ} 00'$, $116^{\circ} 52'30''$, $116^{\circ} 45'$, $116^{\circ} 37'30''$, $116^{\circ} 30'$)

The complete form reads:

($117^{\circ} 00' 00''$, $116^{\circ} 52' 30''$, $116^{\circ} 45' 00''$, $116^{\circ} 37'30''$, $116^{\circ} 30' 00''$)

Written with hundredths of a minute instead of seconds it would read:

($117^{\circ} 00.00$, $116^{\circ} 52.50$, $116^{\circ} 45.00$, $116^{\circ} 37.50$, $116^{\circ} 30.00$)

END OF SIDE NOTE

Now that you have figured out how many minutes and seconds there are between each degree mark we will convert them all to seconds

(3d) Use a calculator to convert all of the minutes and seconds to seconds.

I had 7 minutes and 30 seconds between grid lines. In my case I did the following.

There are 60 seconds in a minute. So 7 minutes X 60 seconds = 420 seconds.

Next I added the remainder of the 30 seconds. (420 seconds + 30 seconds = 450 seconds.)

So there are 450" seconds in 7' minute's 30" seconds.

(3e) Next take a ruler and measure between any two vertical lines next to each other at the top and bottom of the map.

It can be a standard ruler or a metric ruler.

You will get greater accuracy for your G.P.S coordinate by using a ruler that has more lines or parts in it. In this case I used a metric ruler.

My map of the Rouge River National Forest map has two sides.

On the bottom of the South portion of the map I measured 8.2 cm between the vertical lines.

On the other side at the top or North portion of the map I measured 8.0 cm between the vertical lines. The 8.2 cm represents 82 segments on a number line. The 8.0 cm represents 80 segments on a number line. I chose to work with 8.1 cm or 81 segments on a number line. I chose this because that number is in the middle giving me the most reliability for the largest portion of the map.

(See illustration 4 below)

(For those who cannot read a metric ruler you may want to jump ahead and read the first part of chapter 10 on [page 43](#))

(Illustration 4)

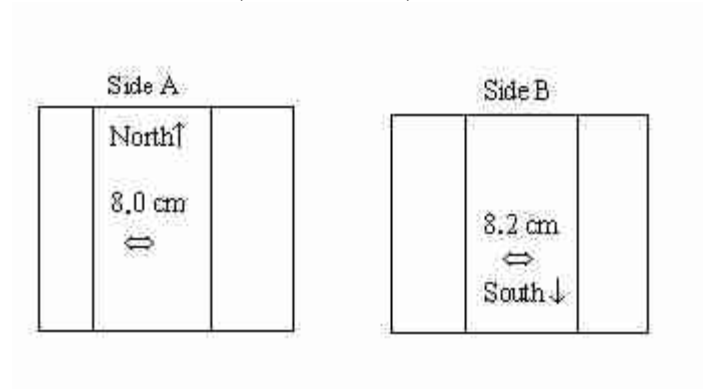


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Using 8.1 will produce some degree of error. A greater distance measured on the map will produce a greater error. However the greatest distance I would measure is half of that distance or 41 mm. This would calculate to a maximum error of 3 seconds at the far North or South part of the map. To me that is not a problem, but if you want to increase accuracy you can figure the seconds per mm for different parts of the map. (This map is about 97 miles in-between points of the North and South section. This is a large area that I only use one math formula.)

Remember the reason why these vertical lines vary in distance is because they are more compressed as one travels North or South of the Equator. This is because the world is round in shape.

(3f) Next use a calculator to divide the number of seconds that you found by the number of segments that you measured.

In my case I had 450 seconds divided by 81 segments on the ruler = 5.5555555.

I rounded this off to the 4th digit past the decimal point and got 5.5556.

(Remember we used the vertical lines here.)

In other words on my map each measured mm segment represents about 5.5556 seconds for the West bearing for my G.P.S receiver.

(3g) You just figured out how many seconds are in each segment of your ruler for the West bearing. Now you will have to do the same thing for the North bearing.

I had 7 minutes 30 seconds between lines on the top of the map.

I also have 7 minutes 30 seconds between lines on the side of the map.

However many minutes and seconds you found between lines on the top of the map should be consistent with how many minutes and seconds you have on the side of the map. The minutes and seconds will be the same, but the distance will not be the same. So next measure the distance between two horizontal lines on the side of the map.

On my map there were 10.9 cm between the horizontal lines. That means there is 109 mm or segments on a number line between the two horizontal lines. Unlike the vertical grid lines the distances between the horizontal grid line is consistent throughout the map.

(3h) Next divide the number of seconds that you found by the number of segments that you measured.

In my case the 7 minutes and 30 seconds equaled 450 seconds and I had 109 segments between the horizontal lines. So I divide 450 seconds by 109 segments that equals 4.1284403. I rounded this off to the 4th digit past the decimal point and got 4.1284. In other words on my map each measured mm segment represents 4.1284 seconds for the North bearing for my G.P.S receiver.

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Conclusion: I used a US Forest map that has a scale of 1:126,720 in Southern Oregon. The map scale is found in the legend on your map. (Map scales are explained more in [chapter 7](#)) My map has 7 minutes 30 seconds between grid lines. I used a metric ruler and found that I had an average of 8.1 cm between the vertical grid lines. I also had 10.9 cm between the horizontal grid lines. I did the math and found that whenever I measure a distance on this map each mm on my ruler represents the following.

North Bearing = 4.1284 seconds per mm.

West Bearing = 5.5556 seconds per mm.

This process will need to be done for each map scale that you use in the same area.

Now that you know how to do this part you can use the following checklist to help you prepare the math formula for all of your favorite maps.

You can write the seconds per mm for the North and West bearing on your map. This way you will not forget it.

(3a) First you will select your favorite map that has the degrees of latitude and longitude marked along the edges.

(3b) Look to see if the grid lines connect the degrees of latitude and longitude across the map. If the grid lines are not drawn in then you will have to draw them in with a straight edge.

(3c) Figure out how many minutes and seconds that is between each degree mark.

(3d) Use a calculator to convert all of the minutes and seconds to seconds.

(3e) Take a ruler and measure between the two vertical lines at the top and bottom of the map. Next take an average between the two measurements.

(3f) Next divide the number of seconds that you found by the number of segments that you measured and round it off to the 4th digit past the decimal point. Write down the number. (West Bearing)

(3g) Next measure the distance between two horizontal lines on the side of the map.

(3h) Now divide the number of seconds that you found by the number of segments that you measured and round it off to the 4th digit past the decimal point. Write down the number. (North Bearing)

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CHAPTER 4

How do I use addition to find a G.P.S coordinate for anything on my map without going there first?

To find a G.P.S coordinate from your map you will require four steps. These steps will involve measuring from two different grid lines, converting the measured distance from the map to minutes and hundredths of a minute. Then you will have to either add or subtract the sum of those minutes and seconds from the degree marked on the map. That is all there is to it and it will only take a couple of minutes.

Here again this is going to be easier than it sounds. I am going to really draw out the explanation to make it clear as I can. However in reality once you understand how it works there is not much to it.

This will not be an exact science. In other words this will get you there so you can find your desired location, but it is not always going to bring you within 100 feet of that location. I will explain why after I explain the process of addition and subtraction. Later in the book are tips to find things even with a coordinate that is not exact. Following is a breakdown of the four steps needed to find your desired location. In the process of this breakdown we will use Dollar Mountain as an example, which is found on the map at the back.

(4a) To find any specific location on the map using addition take your ruler and measure the distance from the nearest vertical grid line East (or to the right) of the desired location.

Remember the degrees grow larger in number going West of the Prime Meridian. By measuring from a grid line to the right of the desired location we will have to add the necessary amount of minutes and seconds. The degrees grow larger going from the right of the map to the left.

Write the measured distance down for the West bearing.

(4b) The next thing you will do is measure the distance from the nearest horizontal grid line South of (or below) the desired location.

By measuring from a grid line below the desired location we will have to add the necessary amount of minutes and seconds. The degrees grow larger going from the bottom of the map up to the top. Write your measured distance down for the North bearing.

Example on my map ([See page 58.](#))

(4a) Dollar Mountain is approximately 6.6 cm West of bearing $123^{\circ} 15'00''$

(4b) Dollar Mountain is also approximately 7 cm North of the bearing $42^{\circ} 22'30''$

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From here on we will be using hundredths of a minute instead of regular seconds.

Your G.P.S receiver in the “initialize” or Setup process will give you a choice of Deg/Min/Sec or Deg/Min/ MMM or Deg/ Min/MM.

We will be working with Deg/ Min/ MM.

So you will want to set your receiver on this mode before entering a Waypoint.

You can verify that you have it set correctly by entering a Waypoint.

There should be two digits after the minutes and you should be able to change both digits to nine to make it read 99.

Deg/Min/Sec can only go to 59 before changing the minutes.

Also when set on Deg/ Min/ MM there will be a decimal point with 2 digits to the right.

In contrast the Deg/Min/Sec will not have a decimal point and the Deg/ Min/ MMM will have 3 digits to the right of the decimal point instead of 2. We want a decimal point with only 2 digits to the right of it.

Note: Also in the “initialize,” or “Setup” process you will find that you can change your North Reference. I travel using my hand held compass. Therefore I also set my G.P.S on Magnetic North instead of True North. For simplicity I do not set the declination on my compass because I follow a Magnetic North bearing to the Waypoint.

Now back to our hundredths of a minute. The reason we are using MM is because the calculator that we are working with will go up the number 9 in every digit. A measurement in regular seconds will turn over after reaching the number 59. In other words we will divide by 60 to determine minutes. The last two digits in the remainder of our calculation will be in measurements of hundredths of a minute.

The process to get seconds instead of hundredths of a minute is slightly different.

For simplicity we will use hundredths of a minute. In the event you cannot change your G.P.S to read hundredths of a minute you can still use Degrees, Minutes and Seconds. A brief explanation of the difference and how it works will be given [at the end of chapter 5](#).

(4c) Now we will convert the measured distance on the map to minutes and hundredths of a minute.

We will do the North bearing first.

Dollar Mountain is approximately 7 cm North of the bearing 42 22'30”.

There are 70 mm in 7 cm. In other words there are 70 segments represented on the number line.

Remember, when I previously did the math for my map ([chapter 3, h](#)) 4.1284 is the number of seconds per mm for the North bearing.

So I multiply 70 mm by 4.1284 seconds per mm = 288.988 seconds.

There are 288.988 seconds in 7 cm.

We divide the 288.988 seconds by 60 to determine the amount of minutes.

We divide by 60 because there are 60 seconds in a minute.

(288.988 divided by 60 = 4.8164666)

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Now we will round this number off to the nearest hundredth after the decimal point. We now have 4.82. That is the 70 mm to Dollar Mountain is equal to 4 minutes and 82 hundredths of a minute. This will be added to the grid line we measured from $42^{\circ} 22' 30''$.

The $30''$ here taken from the map is still regular seconds, so first we will change this to read as hundredths of a minute. Thirty seconds is one half of a minute. One half of a minute written as a decimal is .50 So I write down $42^{\circ} 22' .50 + 4' .82 =$ North bearing. I will save this for the 4th and final step.

Now, we will figure out what the West bearing is. Dollar Mountain is also approximately 6.6 cm West of bearing $123^{\circ} 15' 00''$. The 6.6 cm has 66 mm in it. That is there are 66 parts represented on the number line. Remember when I previously did the math for my map (Chapter 3, f) 5.5556 is the number of seconds per mm for the West bearing.

I multiply 66 mm by 5.5556 seconds that equals 366.6696. There are 366.6696 seconds in the 66 mm on my map from the grid line $123^{\circ} 15' .00$ to Dollar mountain. Next I divide 366.6696 seconds by 60 to find out how many minutes I will have to add. So 366.6696 divided by $60 = 6.11116$. I round this off to the nearest hundredth and I have $6' .11$. That is I have 6 minutes and 11 hundredths of a minute to add to the West Bearing line that I measured from. I write down the $6' .11$ West and proceed to the 4th and final step.

Important Side Note: Suppose your measured mm from the West grid line on the map was actually 6 mm. When you multiplied the 5.5556 seconds by 6mm your answer would be 33.336 seconds, which is less than a minute. This would represent actual seconds so we would still divide that by 60 to convert it to hundredths of a minute. 33.336 divided by $60 = .5556$. We would then round this off to .56 and add it to the grid line we measured from. Remember when adding this to the grid line from the map that you need 100 hundredths to equal one minute. (See also Important side note on page 21)

(4d) The 4th and final step is to add the minutes and hundredths of a minute to the grid lines that we measured from.

We will do the North bearing first. We measured from the grid line of 42 degrees, 22 minutes, 30 seconds. We also changed the 30 seconds to read as hundredths of a minute and came up with $42^{\circ} 22' .50$

We wrote down that we had to add 4 minutes and 82 hundredths of a minute to the North bearing we measured from. So we have $42^{\circ} 22' .50 + 4' .82 = ?$
Using your calculator you do not input the 42 degrees.
We are only adding the minutes and hundredths of a minute.
So, use your calculator to add $22.50 + 4.82 = 27.32$
The number 27.32 is your minutes and hundredths of a minute.
Now place the 42 degrees back in front of it.
The North bearing for Dollar Mountain is $42^{\circ} 27' .32$

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Now we will add the minutes and hundredths of a minute to the West bearing.
We measured from the grid line of 123° degrees, $15'$ minutes and $00''$ seconds.

(The $00''$ seconds did not have to be converted to hundredths of a minute since zero is always zero on any number scale.)

We also wrote down that we had to add 6 minutes and 11 hundredths of a minute to the West bearing line we measured from. So we have $123^{\circ} 15'.00 + 6.11 = ?$

Again using your calculator you do not input the 123 degrees.

We only use the calculator to add $15.00 + 6.11 = 21.11$

We place the 123 degrees back in front and we have a West bearing of $123^{\circ} 21.11$

Dollar Mountain is located at:

$42^{\circ} 27'.32$ N

$123^{\circ} 21.11$ W

Elevation 1862 (The elevation we have seen on the map)

Here is your checklist for chapter 4

(4a) Measure the distance from the nearest vertical grid line East (or to the right) of the desired location.

(4b) Measure the distance from the nearest horizontal grid line South of (or below) the desired location.

(4c) Convert the measured distance on the map to minutes and hundredths of a minute.
(Make sure your G.P.S is set to read hundredths of a minute)

(4d) Add the minutes and hundredths of a minute to the grid lines that you measured from.
You can now enter this coordinate into your G.P.S receiver as a Waypoint and travel directly to it.

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CHAPTER 5

How do I use subtraction to find a G.P.S coordinate for anything on my map without going there first?

Next we will be using subtraction to find Dollar Mountain.

One good reason to be able to do both addition and subtraction to find the desired G.P.S coordinate is to double-check yourself. By using both addition and subtraction and getting the same coordinate you can be confident that you did the measuring and math correctly.

We have rounded off some numbers. For this reason the coordinate for addition and subtraction may not be an exact match. However when there is only a discrepancy of .01 in the coordinate you can still be sure that you did your math and measuring correctly.

When double checking yourself add the cm's that were measured to the Waypoint for both addition and subtraction. Make sure these two measurements equal the actual distance between the grid lines for that location on the map.

Example the vertical lines on my map change between the far North and South end. There are 8.0 cm on the North end and 8.2 cm on the South end of the map.

Dollar Mountain is located where there are actually 8.1 cm between the vertical grid lines of $123^{\circ} 22' 30''$ & $123^{\circ} 15' 00''$. For addition I had measured a distance of 6.6 cm from the grid line $123^{\circ} 15' 00''$. As you will soon see for subtraction I measured a distance of 1.5 cm from grid line $123^{\circ} 22' 30''$ So to make sure that I measured correctly I added the two measured distances together. In this case $1.5 \text{ cm} + 6.6 \text{ cm} = 8.1 \text{ cm}$.

That is the actual distance between the two vertical grid lines near Dollar Mountain.

This verifies that I measured correctly for the West bearing.

I can also double-check my math by adding the seconds I had for both addition and subtraction together.

As you will see later I found with subtraction the West bearing has 83.334 seconds in 15 mm on my map from the grid line $123^{\circ} 22' 30''$ to Dollar Mountain.

For addition I found there were 366.6696 seconds in the 66 mm on my map from the grid line $123^{\circ} 15' .00$ to Dollar Mountain.

$83.334 + 366.6696 = 450.0036$ or rounded of to the nearest hundredth.

$83.33 + 366.67 = 450$.

Remember there is 450 seconds between the grid lines on the map with Dollar Mountain.

Using the seconds for both addition and subtraction add up to the 450 seconds between the grid lines verifying that the math to that point is correct for the West bearing.

The math and measurement for the North bearing can be double checked in the same manner.

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(5a) To find any specific location on the map using subtraction take your ruler and measure the distance from the nearest vertical grid line West (or to the left) of the desired location.

Write the measured distance down for the West bearing.

(5b) Next we will measure the distance from the nearest horizontal grid line North of (or above) the desired location.

Write that measured distance down for the North bearing.

Example on my map (See page 58.)

(5a) Dollar Mountain is approximately 1.5 cm East of bearing $123^{\circ} 22'30''$

(5b) Dollar Mountain is also approximately 3.9 cm South of the bearing $42^{\circ} 30'00''$

(5c) Now we will convert the measured distance on the map to minutes and hundredths of a minute.

We will do the North bearing first.

Dollar Mountain is approximately 3.9 cm South of the bearing $42^{\circ} 30'00''$.

There are 39 mm in 3.9 cm. In other words there are 39 segments represented on the number line.

Remember when I did the math for my map (chapter 3, h) 4.1284 is the number of seconds per mm for the North bearing.

I multiply 39 mm by 4.1284 seconds per mm = 161.0076 seconds.

There are 161.0076 seconds in 3.9 cm.

The 161.0076 seconds is then divided by 60 to determine the amount of minutes.

We divide by 60 because there are 60 seconds in a minute.

(161.0076 divided by 60 = 2.68346)

Now round this number off to the nearest hundredth after the decimal point.

We now have 2.68. The 39 mm from Dollar Mountain is equal to 2 minutes and 68 hundredths of a minute. This will be subtracted from the grid line we measured from $42^{\circ} 30'00''$.

So I write down $42^{\circ} 30'.00 - 2'.68 =$ North bearing.

I will save this for the 4th and final step.

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Now we will figure out what the West bearing is.

Dollar Mountain is also approximately 1.5 cm East of bearing $123^{\circ} 22'30''$.

The 1.5 cm has 15 mm in it. There are 15 parts represented on the number line.

Remember when I did the math for my map ([chapter 3, f](#)) 5.5556 is the number of seconds per mm for the West bearing.

I multiply 15 mm by 5.5556 seconds that equals 83.334.

There are 83.334 seconds in the 15 mm on my map from the grid line $123^{\circ} 22'30''$ to Dollar Mountain.

Next I divide 83.334 seconds by 60 to find out how many minutes I will have to subtract.

So $83.334 \div 60 = 1.3889$.

Next I round this off to the nearest hundredth and I have $1'.39$.

I have 1 minute and 39 hundredths of a minute to subtract from the West Bearing line $123^{\circ} 22'30''$ that I measured from.

The $30''$ here in the West bearing is still regular seconds so first we will change this to read as hundredths of a minute. Thirty seconds is one half of a minute. In the decimal format one half a minute is written as $.50$

So I write down $123^{\circ} 22'.50 - 1'.39 =$ West bearing and proceed to the 4th step.

Important side note. Do not forget that if you had less than 60 seconds after multiplying the parts per mm that you still must divide that by 60 to convert it to hundredths of a minute. This is true for both North and West Bearings whether adding or subtracting.

(See also Important side note on page 24)

(5d) The 4th and final step is to subtract the minutes and hundredths of a minute from the grid lines that we measured from.

We will do the North bearing first.

We already measured from the grid line of 42 degrees, 30 minutes, 00 seconds.

We wrote down $42^{\circ} 30'.00 - 2'.68 =$ North bearing.

Here again we do not enter the degree into the calculator.

We are only subtracting the minutes and seconds.

So in the calculator we input $30.00 - 2.68 = 27.32$

The number 27.32 is our minutes and hundredths of a minute.

We place the 42 degrees back in front of it and we have $42^{\circ} 27'.32$ for the North bearing of Dollar Mountain.

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Next we subtract the minutes and hundredths of a minute for the West bearing.
We wrote down $123^{\circ} 22'.50 - 1'.39 =$ West bearing.
We do not enter the 123 degrees into the calculator.

We input into the calculator $22.50 - 1.39 = 21.11$
The number 21.11 is our minutes and hundredths of a minute.
We place the 123 degrees back in front of it and we have $123^{\circ} 21'.11$ for a West bearing.

Dollar Mountain is located at:

$42^{\circ} 27'.32$ North

$123^{\circ} 21'.11$ West

Elevation 1862

(The elevation we have seen on the map)

Note: Keep in mind the calculator will not show a 0 in the second digit after the decimal point when not needed.

Example .20 would simply appear as .2 they are in fact the same amount.
However, you need two digits to enter into the G.P.S receiver.
So you would simply add "0" to .2 to have .20

Also you may at times have to subtract from an even degree.
Let's say that you needed to subtract 4.23 or 4 minutes and 23 hundredths of a minute from 117 degrees.

That means you have to first borrow one degree from the 117 degrees.
Then we would have 116 degrees and 60 minutes.
You still cannot subtract 23 hundredths of a minute until you borrow one minute from the 60 minutes.

One minute written in the hundredth's form is 100.
We would have the following: 116 degrees 59 minutes & 100 hundredths of a minute minus 4 minutes and 23 hundredths of a minute.

We would do each category separately starting with the hundredths of a minute.
(100 hundredths of a minute - 23 hundredths of a minute = 77 hundredths of a minute)

Then we would subtract the minutes. (59 minutes - 4 minutes = 55 minutes)
So we have 116 degrees minus 4 minutes & 23 hundredths of a minute = 116 degrees, 55 minutes and 77 hundredths of a minute.
(116 degrees - 4.23 = $116^{\circ} 55.77$)

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In regular use, I always measure from the nearest vertical grid line to my desired location. I also measure from the nearest horizontal grid line. This will help to cut down the severity of errors in math or measurement. A minor error in math or measurement becomes a greater error over distance. The reason why is because we are multiplying the seconds per mm by the measured number of segments. The errors in math or measurement are multiplied as well in the process. The errors become increased with a longer measured distance. I have found in practice that I do better even when I measure wrong etc., if I always measure from whichever grid line is closest to my desired Waypoint.

This means that I may add to the North bearing and Subtract from the West bearing or vice versa. It can also mean that I use subtraction for both the North and West bearing or addition for both. It just depends upon where my desired location is in relation to the nearest grid lines.

Remember the following:

North bearing

For addition you will be measuring (up or North) of the nearest horizontal grid to the Waypoint.

For subtraction you will be measuring (down or South) of the nearest horizontal grid line to the Waypoint.

West bearing

For addition you will be measuring (left or West) of the nearest vertical grid line to the Waypoint.

For subtraction you will be measuring (right or East) of the nearest vertical grid line to the Waypoint.

(See Illustration 5 below)

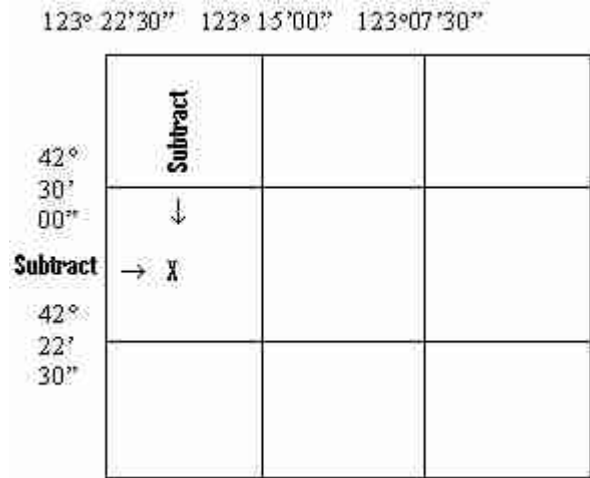
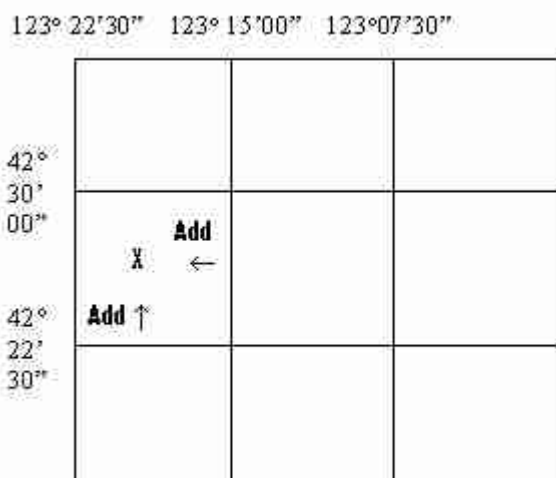


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You can look at the map to see which direction the degrees grow larger for a reminder. When you are measuring in the same direction as the degrees grow larger you will be adding the minutes and seconds. (North or West, up or left)

When you are measuring in the same direction as the degrees grow smaller you will be subtracting the minutes and seconds. (South or East, down or right)
(As seen in Illustration 5 on previous page)

Here is your checklist for chapter 5

(5a) Measure the distance from the nearest vertical grid line West (or to the left) of the desired location.

Write the measured distance down for the West bearing.

(5b) Measure the distance down from the nearest horizontal grid line North of (or above) the desired location.

Write down the measured distance for the North Bearing.

(5c) Convert the measured distance on the map to minutes and hundredths of a minute. (Your G.P.S needs to be set to read hundredths of a minute.)

(5d) Subtract the minutes and hundredths of a minute from the grid lines that you measured from.

You can now enter this coordinate into your G.P.S receiver as a Waypoint and travel directly to it.

REASONS FOR A SMALL DEGREE OF ERROR.

1. The distance between the vertical degree lines may not be consistent. Therefore your seconds per mm calculation may not be exact for the entire map.
2. Rounding any number off means that it is close, but it is no longer exact. This applies in the seconds per mm calculation that you use. It also applies when you round off to the nearest hundredth of a minute.
3. Your ruler needs to be completely vertical or horizontal when you measure or there will be some degree of error. The error would exist because the angle can change the actual distance.
4. When you measure the actual location may fall between the lines on your ruler. This is similar to rounding off a number.
5. The grid lines may not be exact, if you had to draw them in yourself by connecting the opposing tick marks
6. Your measurement to your desired location can also be off slightly when you are working on a less than flat surface like the ground.

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7. Small map scales may have greater room for error than larger map scales ([Chapter 7](#))
8. The US Government imposes some small amount of error through the satellites for civilian use.
9. All map makers must include small distortion errors into the map because they are representing a spherical shape of the world on a flat piece of paper.

The good news is these are all small degrees of error. Small amounts of error will not keep you from finding your desired location. It just means do not expect to navigate to within 10 feet of your location every time you go out. That simply is not going to happen. However you can expect to find your location every time. Let's say that you are looking for a lake. You do your calculations and travel there. Let's say for some unknown reason you were 500 feet off in your calculations. It does not matter at only 500 feet away you can probably see the lake.

In the event that you get an incorrect coordinate in your practice runs you can double-check the following things.

1. Did you measure correctly the distance between the vertical and horizontal lines when you developed your seconds per part on the ruler that you multiply by?
2. Did you determine the correct amount of seconds between each grid line when you developed your seconds per part on the ruler that you multiply by?
3. Do you come up with the same coordinate using both addition and subtraction for both the North and West bearing?
4. Do your measured distance using addition and your measured distance using subtraction add up to the actual distance between the vertical and the horizontal lines for that location on the map?
5. Do the number of seconds that you come up with for both addition and subtraction together equal the actual number of seconds that are in-between grid lines?
6. Is your G.P.S receiver set on Degrees, Minutes and hundredths of a minute?
7. Is your G.P.S receiver set on Magnetic North?
([Read "A word about declination"](#))

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To make this process easier in the field I used to carry copies of something like this with me.

USFS map scale 1:26,720 (7 min. 30 sec. between degree lines)

NORTH BEARING = Horizontal lines connecting the right and left side of the map.

Find where you want to go on the map.

Remember for addition you will be measuring (Up or North) of the nearest degree lines.

For subtraction you will be measuring (down or South) of the nearest degree line.

(1) Write down the degree from the map. Circle the + or - in step (1)

Don't forget if the map's coordinate ends in 30" change that to the decimal .50

(1) Deg. Min. 100ths Min. 100ths
____ . ____ + or - ____ . ____ = North bearing (Elev. _____)

(2) Measure CM to the nearest horizontal grid line.

Write the number of parts. _____

(3) Multiply this number by 4.1284 _____

(4) If the number is above or below 60 divide by 60.

Then round off the remainder to the nearest hundredth and write down the minutes and hundredths that need to be added to or subtracted from the North bearing in step (1).

WEST BEARING = Vertical lines connecting the top and bottom of the map.

Remember for addition you will be measuring (left or West) of the nearest degree lines.

For subtraction you will be measuring (right or East) of the nearest degree line.

(1) Write down the degree from the map. Circle the + or - in step (1)

Don't forget if the map's coordinate ends in 30" change that to the decimal .50

(1) Deg. Min. 100ths Min. 100ths
____ . ____ + or - ____ . ____ = West bearing

(2) Measure CM to the nearest vertical degree line.

Write the number of parts. _____

(3) Multiply this number by 5.5556 _____

(4) If the number is above or below 60 divide by 60.

Then round the remainder off to the nearest hundredth and write down the minutes and hundredths that need to be added to or subtracted from the West bearing in step (1).

Add or Subtract the information for North and West bearings and fill out the blanks below, as it will be in the GPS.

WPT _____ (Name of location)

____ . ____ North bearing

____ . ____ West bearing

Elevation _____ From the map.

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BE SMART PRACTICE FIRST!

You are likely to make some mistakes as you become familiar with figuring out how to determine the coordinate to a location on your map. So do not make your first attempt to locate something a cross-country trip into unfamiliar territory.

Pick a location on your map that you already know where it is. While you are still at home determine the G.P.S coordinate for that location. Now head out pretending that you really do not know where it is and let your G.P.S, map and compass lead you there.

Do this several times picking several locations that you already know how to find. Use both addition and subtraction to find the same coordinate. By doing this in familiar territory first you will become accustomed to what to expect. You will also know what mistakes you are most likely to make. Therefore you will also be able to know how to correct your most common mistakes.

While you are at your known Waypoint you can also practice locating yourself on the map, as you will learn how to do in [chapter 8](#).

Using Degrees, Minutes and Seconds (Deg/Min/Sec) instead of Degrees, Minutes and hundredths of a minute (Deg/ Min/MM)

Using the hundredths of a minute instead of seconds as the last part of the coordinate is really just a matter of preference. It saves me steps with the calculator so I chose to work with hundredths rather than seconds.

For the most part the process is identical. Locating Dollar Mountain I had 288.98 seconds to add to the North bearing. (See 4c) There I simply divided that number by 60 to get the minutes and hundredths of a minute. To have minutes and seconds one must first subtract the largest multiple of 60 and the remainder will be seconds.

I Multiply 60 in my head so I don't erase the 288.98 in the calculator or have to write it down.

I know that $60 \times 4 = 240$. Therefore I take the 288.98 and subtract 240 in the calculator.

The 4 that I multiplied by is the number of minutes.

The remainder after subtracting 240 is the number of seconds. $288.98 - 240 = 48.98$

So I have 4 minutes and 48.98 seconds to add to the North bearing.

I will round this off and add 4 minutes 49 seconds to the North bearing.

So instead of the $42^\circ 27'.32$ that I had in (4d) I add 4 minutes 49 seconds to $42^\circ 22' 30''$.

The seconds here will be added separately before the minutes. $49 \text{ seconds} + 30 \text{ seconds} = 79 \text{ seconds}$ which is equal to 1 minute and 19 seconds including the previous 4 minutes that is 5 minutes 19 seconds added to the North Bearing.

That gives us **$42^\circ 27' 19''$ for the North bearing.**

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(Note if you tried to simply divide the 288.98 by 60 you would not get the proper number of seconds.) Using this same process for the West bearing as in (4c) & (4d) I would take the 366.6696 seconds that I had to add to the West bearing and first subtract 360 which is a multiple of 60 to get the 6 minutes and the remainder is seconds instead of hundredths of a minute.

$366.6696 - 360 = 6.6696$ seconds or 6 minutes and the rounded remainder of 7 seconds to add to the West bearing of $123^{\circ} 15' 00''$. ($123^{\circ} 15' 00'' + 6' 7'' = \mathbf{123^{\circ} 21' 07'' \text{ West}}$)

Using seconds instead of hundredths of a minute the coordinate for Dollar Mountain would be
 $42^{\circ} 27' 19''$ North

$123^{\circ} 21' 07''$ West

By entering the coordinate for Dollar Mountain and then changing the G.P.S back and forth from degrees, minutes and seconds to degrees, minutes and hundredths of a minute you can see that both coordinates below are in fact the same location.

$42^{\circ} 27' 19''$ North (Using seconds and not hundredths of a minute)

$123^{\circ} 21' 07''$ West

AND

$42^{\circ} 27.32$ North (Using hundredths of a minute)

$123^{\circ} 21.11$ West

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CHAPTER 6

A word about declination.

Webster's Collegiate Dictionary 10th edition says that declination is "*the angle formed between a magnetic needle and the geographical meridian.*"

To you that means that declination is the difference between True North and Magnetic North. The declination or the difference between True North and Magnetic North varies depending upon where you are.

The earth's magnetic pull that your compass needle points to is either East of True North or West of True North. Here in the U.S.A Magnetic North and True North are only the same along a line that runs to the West of Florida and up through Lake Michigan. Depending upon where you are in the US the difference between True North and Magnetic North can vary from just a couple of degrees up to about thirty degrees.

True North is higher up on the globe than Magnetic North. At first it seemed backwards to me that on the West Coast here in the U.S.A the compass points East of True North. This means I have to add the declination to turn West to True North.

On the East Coast here in the U.S.A the compass points West of True North. This means I have to subtract the declination to turn East to True North. Viewing a chart that includes the US and the Arctic Circle showing all of the angles as compared to the magnetic needle in the compass helps a person understand.

The good news is you only need to know two things and I will explain them both to you.

(a) Does your G.P.S add or subtract from Magnetic North to get True North?

(b) How many degrees does your G.P.S add or subtract from Magnetic North?

Both of these questions will be answered for you in the following process.

Your G.P.S can tell you the declination.

Your G.P.S can tell you what the declination is where you are.

(6a) First you will want to make sure your G.P.S receiver is set on Magnetic North.

My G.P.S places a small "M" next to a bearing pointing toward a Waypoint when the receiver is set on Magnetic North. My G.P.S also places a small "T" next to a bearing pointing toward a Waypoint when the receiver is set on True North. I can change the North Reference by looking under my "initialize" or "setup" menu in my G.P.S.

(6b) Next you will want to enter several Waypoints into your G.P.S receiver. These Waypoints can be taken from your map where two grid lines cross. A Waypoint can also be from your current position on your G.P.S. Of course, if you set the Waypoint from your current position on your G.P.S you will want to walk away about 1/4 mile before entering another one. Which direction you walk does not matter. You will need to walk away about 1/4 mile for your G.P.S to measure an accurate difference in declination between True North and Magnetic North.

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(6c) Next check your G.P.S to see what the Magnetic North bearing is to those Waypoints and write down those bearings.

(6d) Now change your G.P.S to read True North. Then check to see what the True North bearing is to those same Waypoints and write down those bearings.

We will be checking to see what the difference is in those bearings using Magnetic North & True North.

In some areas your G.P.S may vary by 1 degree in this difference between True and Magnetic North That is OK you are just in an area that is close to in-between the two degrees of declination. Check the difference between True North and Magnetic North on several Waypoints and choose the most prominent one.

Your G.P.S will either add to or subtract from Magnetic North.

(6e) Find out if your G.P.S adds or subtracts from the Magnetic North bearing.

The True north bearings will have a larger number for the degree than the Magnetic North bearings if your G.P.S added the declination.

The True North bearings will have a smaller number for the degree than the Magnetic North bearings if your G.P.S subtracted the declination.

(6f) Find out how many degrees were added to or subtracted from the Magnetic North bearings. For Example while I was in Post Falls Idaho I entered a Waypoint from a map located in Coeur D' Alene Lake. The Magnetic North bearing to that location 24 miles away was 140 degrees. I then changed the North Reference in the G.P.S to read True North.

The True North bearing to that same Waypoint was 159 degrees.

The True North degree 159 is higher than the Magnetic North degree of 140 so the G.P.S added to the Magnetic North bearing. I can subtract to find out how much the G.P.S added to the Magnetic North bearing. ($159 - 140 = 19$) So the G.P.S added 19 degrees to the Magnetic North bearing to give me the True North bearing. ($140 + 19 = 159$)

By the way these are not two different directions to the same location.

The True North bearing of 159 degrees from where I was to my Waypoint in Coeur D Alene lake is correct. The Magnetic North bearing of 140 degrees from where I was to my Waypoint in Coeur D Alene lake was also correct. The two degrees are equal to each other. They are just on different scales. It is like saying that 30 seconds and .50 of a minute are equal or the same amount of time.

There are two things I need to remember when establishing where I am on the map in that area.

(a) The G.P.S **added** to the Magnetic North bearing to give me the True North bearing.

(b) The G.P.S added **19 degrees** to the Magnetic North bearing.

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So for where ever you are in the world you need to answer the same two questions.

(a) Did your G.P.S add or subtract from Magnetic North to get True North?

(b) How many degrees did your G.P.S add or subtract from Magnetic North?

In your area you will always want to do what your G.P.S did.

You must add to the magnetic North bearing to get a True North bearing, if your G.P.S added to the Magnetic North bearing.

You must subtract from the Magnetic North bearing to get a True North bearing, if your G.P.S subtracted from the Magnetic North bearing.

You must (add to) or (subtract from) the Magnetic North bearing the same amount of degrees that your G.P.S did.

(6g) Write down whether you are to add or subtract and the number of degrees for the declination in your area.

(6h) Do not forget to change your G.P.S back to Magnetic North.

I do not need to set the declination on my compass to travel to a Waypoint.

This is why I always leave my G.P.S set to read Magnetic North.

The only time that I change it to read True North is to figure out the declination for a particular area.

Confusing True North and Magnetic North can put you way off course real fast. Let's say that you were 15 degrees off in your direction of travel by using a True North bearing from your G.P.S and using that same bearing with your compass that reads Magnetic North.

The course of travel would be off by not including the declination on your compass.

By the time you walked one mile you would be one-quarter mile off course.

When you take a Waypoint from the map and use your compass to follow a Magnetic North bearing given by your G.P.S to that Waypoint you do not set the declination on your compass.

When you take a Waypoint from the map and use your compass to follow a True North bearing given by your G.P.S to that Waypoint you must set the declination on your compass.

Keep your G.P.S set to read Magnetic North. By doing so you do not need to ever be concerned about declination to travel to any Waypoint taken from your map.

However you will be concerned about declination when using your G.P.S to pinpoint your location on the map.

When pinpointing your location on the map you are not traveling so you can leave your G.P.S set to read Magnetic North. You will however include the declination in your math when pinpointing your location on the map. I will explain this later.

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Use the following check list to find the declination for your area.

- (6a) Make sure your G.P.S receiver is set on Magnetic North.
- (6b) Enter several Waypoints into your G.P.S receiver.
- (6c) Check your G.P.S to see what the Magnetic North Bearing is to those Waypoints and write down the bearings.
- (6d) Change your G.P.S to read True North. Then check to see what the True North bearing is to those same Waypoints and write down those bearings.
- (6e) Find out if your G.P.S adds or subtracts from the Magnetic North bearing.
- (6f) Find out how many degrees were added to or subtracted from the Magnetic North bearing.
- (6g) Write down whether you are to add or subtract and the number of degrees for the declination in your area.
- (6h) Change your G.P.S back to Magnetic North.

DECLINATION CHART

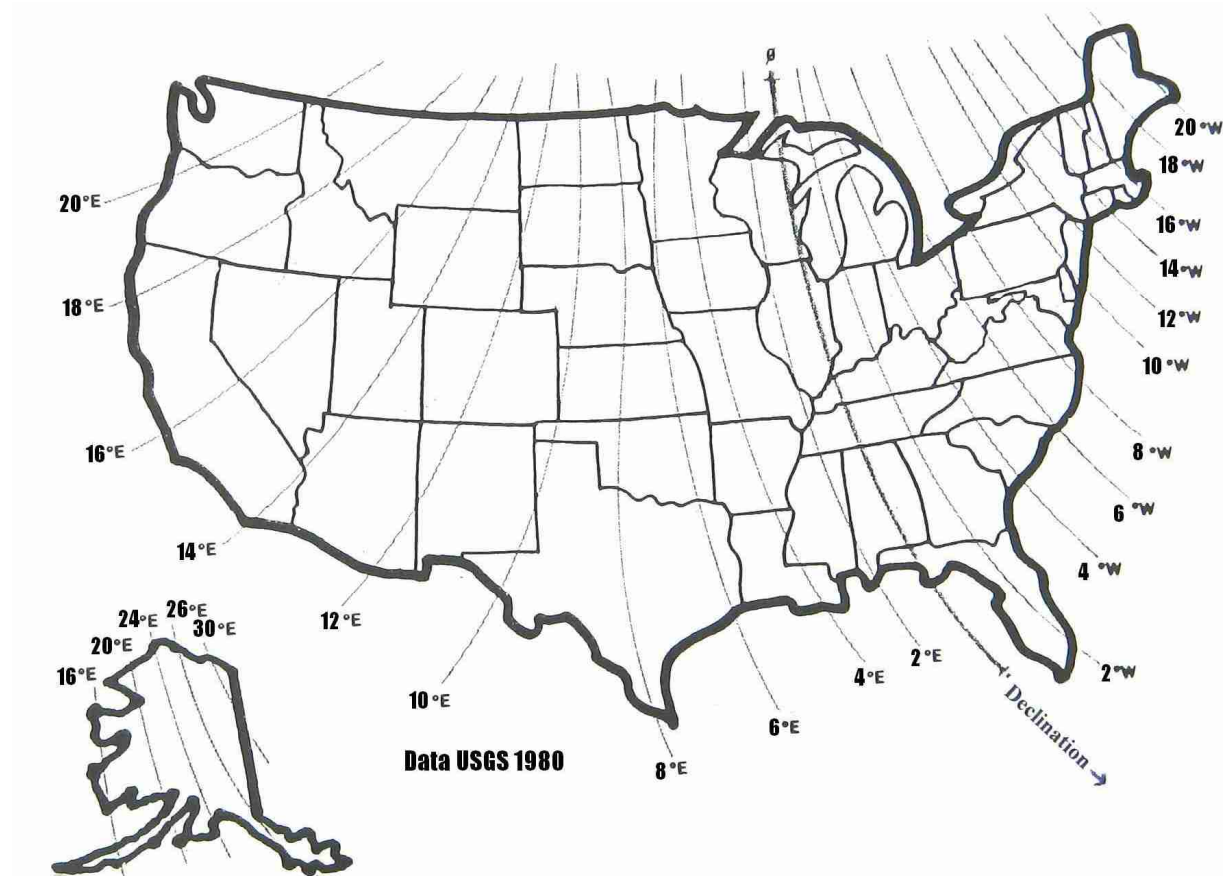


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CHAPTER 7

Why doesn't a single math formula work for all maps?

There are two reasons that the seconds per mm will vary between maps.

Remember the seconds per mm are the numbers you multiply your measured distance by to find a coordinate on the map. This was covered in [chapter three](#).

(a) Your location can change the distance between the vertical lines.

As I pointed out earlier my Rouge River National Forest map has 8.2 cm between the vertical lines at the far South end. It was also 8.0 cm between the vertical lines at the far North end.

Remember the circles around the globe become more compressed as you go North or South of the Equator. For my map the difference of 2 mm occurred in only 97 miles. Therefore traveling 800 miles off my map would change the cm between the vertical lines even more. At this great of a distance it would change the seconds per mm enough to throw off all of my calculations.

(b) Not all maps are the same scale. Your map has a legend. Here you will find a scale that tells you how far a mile is on your map. You will also have symbols with a short explanation of what each symbol represents. In this same area you will find your map scale.

On my Rouge River National Forest map it simply says:

(Scale 1: 126,720) Map scales are like a fraction. The number 1 here would be the numerator.

The 126,720 is the bottom part of the fraction or the denominator.

Fractions vary in size. Map scales also vary in size.

A photo on your drivers' license would be smaller in proportion than another picture of yourself hanging on the living room wall. It is still a picture of you, but the scale of your driver's license photo is smaller. Map scales are similar. It could be showing detail of the same area, but in larger or smaller proportions.

This means that 7 minutes and 30 seconds on maps of the same area can have a different measured distance between grid lines, if the map scale is different.

This of course would mean that the number of seconds per mm of a measured distance would vary with different map scales of the same area.

It is not unusual to come up with a slightly different G.P.S coordinate when figuring the same Waypoint on different maps with different map scales. It will however be close and you will find your desired destination. Generally speaking the larger the map scale the greater your accuracy will be in determining the coordinate. Likewise it is easy to pinpoint the pupil in your eye in a large picture of yourself hanging on the living room wall. It is not so easy to pinpoint the pupil in your eye on your driver's license picture.

For example I used several different maps with different scales to locate Dollar Mountain. On all of the conventional paper maps I used the methods and principles as outlined in this book. I came up with a slightly different coordinate with each one. All of which placed me near the top of Dollar Mountain.

Following are examples of the difference.

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COORDINATE FROM PAPER MAPS

Delorme Atlas & Gazetteer.
(Topo maps in book form.)
Scale 1:150,000
1 inch = 2.4 miles

Dollar Mountain
North 42° 27' .46
West 123° 21' .14

Rogue River National Forest Map
Scale 1:126,720
1 inch = 2 miles

Dollar Mountain
North 42° 27' .32
West 123° 21' .11

USGS-Forest Service
7.5 minute series
Scale 1:24,000
2 5/8 inch = 1 mile

Dollar Mountain
North 42° 27' .45
West 123° 21' .21

USGS National Geographic
Scale 1:34,252
1 9/8 inch = 1 mile

Dollar Mountain
North 42° 27' .42
West 123° 21' .17

COORDINATE FROM ELECTRONIC MAPS & G.P.S RECEIVER

G.P.S receiver reading
While actually there.

Dollar Mountain
North 42° 27' .42
West 123° 21' .27

Delorme Topographical Maps
Electronic version

Dollar Mountain
North 42° 27' .413
West 123° 21' .313

Map Source by Garmin

Dollar Mountain
North 42° 27.410
West 123° 21.410

As you can see none of the figured locations from the paper or the electronic maps were exact. Saving a Waypoint in your G.P.S and then finding your way back to it will always be more exact than figuring a location that you have never been to before.

However ALL of the coordinates figured from paper and electronic maps are close enough to find Dollar Mountain. [Chapter 11](#) gives other tips on finding your location that can make this small error irrelevant.

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CHAPTER 8

How does a G.P.S coordinate help me to know where I am on the map?

You can use your G.P.S to tell you where you are on the map. We will be doing the following steps, which will be explained as we go along.

Later you can use this as a checklist when locating yourself on the map.

- (8a)** Enter a Waypoint where two grid lines cross on the map that you think is near you.
- (8b)** Check your G.P.S receiver to find the bearing and the distance to that Waypoint.
- (8c)** Figure out what 180 degrees is from the bearing given by the G.P.S to the Waypoint.
- (8d)** Take the amount of declination for your area. Add (or subtract) this to the reversed 180-degree bearing given by the G.P.S to the Waypoint.
- (8e)** Use your protractor with your ruler to find your location on the map.

Each step (a) through (e) will correlate with the checklist above.

(8a) Take two grid lines that cross each other near where you think you might be on the map. Take note of the bearing assigned to each grid line. Take the degree, minute and seconds of the North and West bearing and enter it as a Waypoint into your G.P.S receiver.

(Do not forget to convert any seconds on the map to hundredths of a minute.)
In other words 30" seconds on the map will read .50 for your G.P.S receiver.

(8b) Now check your G.P.S receiver to find the bearing and the distance to that Waypoint.

(8c) Then we will figure out what 180 degrees is from the bearing given by the G.P.S to the Waypoint.

For example let's say that the G.P.S says that Waypoint is 360 degrees (Due North) and 3.5 miles away. Now if you have to travel 360 degrees due North 3.5 miles to reach that Waypoint then where are you in relation to it on the map? You are 3.5 miles 180 degrees due South of the Waypoint.

Whenever you want to know where you are on the map pick two grid lines that cross each other on the map. Then enter them into the G.P.S receiver as a Waypoint. Then check your G.P.S to find out where the Waypoint is.

You are always 180 degrees and the same distance that is given away from that Waypoint. One hundred and eighty degrees is a half circle. So 180 degrees will always be exactly the opposite direction.

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There is a couple of ways to know what 180 degrees is from any given bearing. The easiest way for me is to look at my compass. My Silva type 20 compass has an index line that I set on the bearing for the direction I want to travel. Directly across from this index line is another index line that shows me 180 degrees or the opposite of the direction of travel.

Let's say that the G.P.S said that the Waypoint I entered where the two grid lines crossed was 36 degrees 1.5 miles. I would simply set my compass for 36 degrees as if I was going to travel to that Waypoint. I would then look at the index line directly across from 36 degrees that would be set on 216 degrees. I would then know that I was 216 degrees 1.5 miles away from the Waypoint I entered where the two grid lines crossed.

Your compass may not have an index line telling you the opposite of any given bearing. In that case figure it out with your solar powered calculator.

Take whatever bearing your G.P.S says is the direction to the Waypoint where the two grid lines cross and do the following:

Take any bearing that is between 1 degree and 180 degrees and add 180 to it.

For example if the G.P.S gives me a bearing of 36 degrees to that Waypoint I would add one hundred and eighty to it. $180 + 36 = 216$ degrees.

That is 216 degrees is the opposite direction of 36 degrees.

Take any number that is between 181 degrees and 360 degrees and subtract 180.

For example if the G.P.S gives me a bearing of 216 degrees to that Waypoint I would subtract one hundred and eighty from it. $216 - 180 = 36$ degrees.

That is 36 degrees is the opposite direction of 216 degrees.

Since we keep our G.P.S set to read Magnetic North the 216 degrees is a Magnetic North bearing. Maps however are lined up with True North. Therefore the declination for your area must be included to pinpoint your location on the map.

(8d) Take the amount of declination for your area. Add or subtract this to the reversed 180-degree bearing given by the G.P.S to the Waypoint. In other words we first figured out what 180 degrees is from the bearing given by the G.P.S then we add or subtract the declination from that bearing. (Read "A word about declination" [Chapter 6](#))

For example let's say I am back in Idaho in the woods outside Post Falls. The G.P.S said that the bearing to the Waypoint I entered was 1.5 miles 36 degrees. I do not want to go to the Waypoint rather I want to know where I am on the map.

I want to know the opposite of 36 degrees.

Therefore I add 180 degrees to the 36 degrees that gives me a bearing of 216 degrees.

$(36 + 180 = 216)$ The amount of declination must still be added to the 216 degrees.

In Post Falls Idaho there is a 19-degree declination that must be added to the Magnetic North bearing. $(216 + 19 = 235)$

So I am 235 degrees 1.5 miles from the Waypoint.

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It is not enough for me to know that I am 235 degrees from the Waypoint. I also need to know the exact angle of 235 degrees from that Waypoint to my location on the map. This is where a protractor becomes handy.

As explained in the next step I would take my military protractor center it over the Waypoints' two grid lines. I would measure the 1.5 miles from my map scale and line up the 235 degrees on the protractor and locate myself on the map.

(8e) Use a Military protractor or Declitractor with your ruler to find your location on the map. There are pictures of these and “other protractors” at the end of this chapter.

Unlike the regular protractor that we have all used in school these devices have a complete circle or square measuring 360 degrees. The 360 degrees rotate clockwise. There are cross-hairs in the center that you can line up directly over the Waypoints' two grid lines on your map. The angle we want runs from the center of the cross-hairs to the degree marked on the edge of the protractor.

I also have a plastic ruler that has both standard and metric measurements. I use the metric side for measuring the cm when figuring a G.P.S coordinate. I use the standard side for measuring distance. I would place my ruler on the mile scale in the map legend to know how many sixteenths of an inch are in the distance to the Waypoint.

(Measuring distance is explained more in [chapter 10](#))

Then I would lay my ruler across my military protractor. I then have a straight edge that is lined up with the cross-hairs and the degree line. The ruler is also my measuring device to measure the distance from the Waypoint to my location. In this way I can pinpoint my location on the map in relation to the Waypoint.

In my example in (8d) the cross hairs of the Military Protractor would be lined up with the two grid lines on the map where the Waypoint was established.

The 235 degree line and the cross-hairs on the protractor are then lined up using the ruler.

With the ruler I measure the 1.5 miles from the cross-hairs on the protractor to my location along the 235 degree bearing. The point where the 1.5 miles ends is my location on the map.

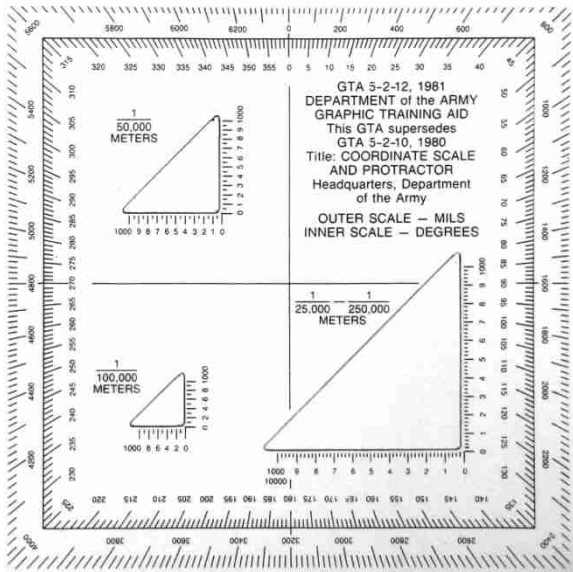
I prefer to use the Military protractor than just the map and compass alone. I can consistently do a better job locating my exact position on the map using the military protractor and the map. I am not able to be as precise using the map and compass alone.

Once your location is determined using this method you should do the following. Check to see if there is another place where the grid lines cross that is closer to your current location than the one you originally used to establish your position on the map. In the event there is a closer waypoint you can enter to determine your position then repeat the process.

I sometimes find better accuracy by utilizing the gridlines that cross that are closest to my actual location when pinpointing myself on the map.

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MILITARY PROTRACTOR



360 Degree Protractor (Numbers run counter-clockwise)

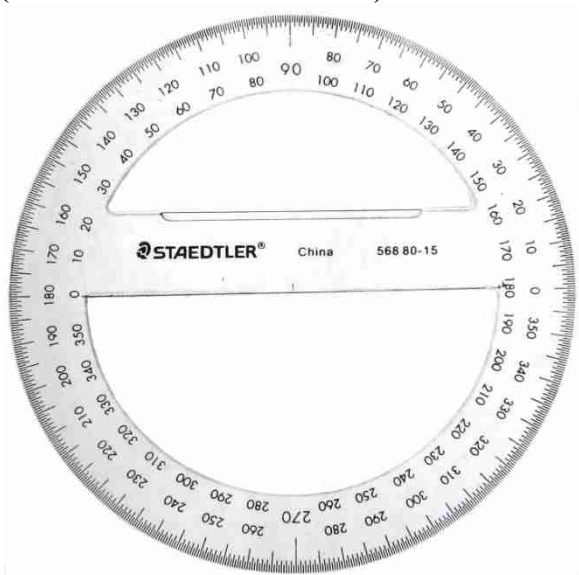


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CHAPTER 9 OTHER PROTRACTORS (See previous illustrations)

You can get by with any protractor. However there may be a few more complications. First of all you will want clear plastic not a colored plastic. You need to line the protractor up on the map's grid lines. Lining up the protractor on the map may cover your Waypoint. You need to be able to see through the protractor to line your ruler up correctly and measure the distance.

I bought a clear 360 degree protractor at an office supply store. It was in with the drafting supplies. It cost less than three dollars. It works OK, but there are a couple of things I do not like about it. The numbers on the outside edge go counterclockwise.

The numbers on the compass are arranged clockwise in a circle.

Therefore I need the numbers on the protractor to run clockwise.

I can place the protractor face down on the map. Then I can look through the plastic to see the numbers. The numbers would then rotate clockwise as I want, but then the numbers appear backwards. They are still recognizable however. There is a second set of numbers on the inner circle that do run clockwise. However they only go in increments of 10 degrees. One can use the inner circle to get the 10 degrees increments and the outer circles lines for the segments' in-between. One must ignore the numbers on the outside edge in this case and only use the lines to count the degrees past the increment of ten.

Another thing I do not like is the outside edge of this protractor has increments of half degrees my compass and G.P.S do not use half degrees. One needs to remember to ignore the smaller lines for this reason.

This protractor also does not have good cross hairs to line up on the map's grid lines.

However there is a small tick mark in the center for the horizontal grid line.

The vertical grid line can be lined up with the 180 and (360) or 0 on the protractor.

My last complaint is this protractor does not fit in my back pocket. It also has thicker plastic than my Military protractor and most of the center is hallow. This does not allow my ruler to lay flat without leaving a gap between the protractor and the map.

Those are my dislikes. However the bottom line is it works. I can use it to locate myself on the map. So if you cannot find a Military protractor at your Army Surplus store as I did then this will work just fine. Just place the protractor face down to make the numbers 1-360 run clockwise. Do not forget (360) or 0 faces the North end of your map when lining up the protractor.

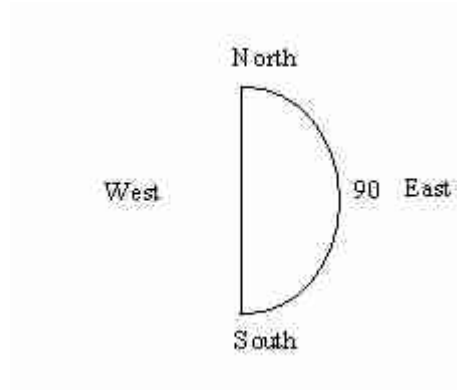
The protractors (360) or 0 and 180 are also to be placed directly over the vertical grid line on the map. The tick mark in the center of the protractor is to be placed on the horizontal grid line on the map.

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In a pinch you can also use a half circle protractor.

I have a half circle protractor that the degrees read clockwise. The half circle protractor only has 180 degrees and we need 360. To use this protractor place the arch of the circle facing East on the map. (90 degrees is due East) (East is on the right side of the map.)

Line up the 0 and 180 on the vertical grid line. The cross-hairs on the straight ruler part of the protractor should be lined up on the maps horizontal and vertical grid line. One end of your ruler can be placed across the cross-hairs on the straight side of the protractor. The other end of the ruler can be lined up with any degree in-between 1 and 180 degrees.



To measure angles 181-360 degrees turn the protractor around with the 90 still facing up so you are not reading the number backwards. Line up the protractor on the grid lines in the same manner as before. The 90 degree is now facing West or the left side of the map. The 180 degree on the outer circle is facing North. The 0 degree on the outer circle is facing South.

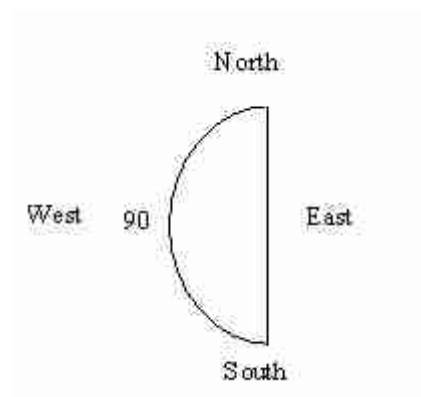


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The angles are correct, but all of the numbers are incorrect. So carry a conversion chart like the one below for measuring anything to the West side of the map. With the protractor placed in this manner the following is true.

(0 = South) (90 = West) (180 = North)

Protractor's Degree	Actual Degree
0	180
5	185
10	190
15	195
20	200
25	205
30	210
35	215
40	220
45	225
50	230
55	235
60	240
65	245
70	250
75	255
80	260
85	265
90	270

Protractor's Degree	Actual Degree
95	275
100	280
105	285
110	290
115	295
120	300
125	305
130	310
135	315
140	320
145	325
150	330
155	335
160	340
165	345
170	350
175	355
180	360

Why I prefer the military protractor.

- (1.) It's cheap.
- (2.) It fits in my back pocket.
- (3.) The numbers 1-360 go clockwise like my compass.
- (4.) It is clear plastic so I can see the map through it.
- (5.) The inside of the protractor is mostly solid so my plastic ruler lies flat making it easier to measure.
- (6.) The cross-hairs are large making it easy to line up on the maps grid lines.

Things to look for in a protractor.

- (1) Clear plastic that is easy to see through.
- (2) The degrees read clockwise.
- (3) There are 360 degrees
- (4) The cross-hairs in the middle are easy to see.

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CHAPTER 10

Reading your ruler & reading miles on your ruler.

I use a plastic ruler that is a metric ruler on one side and a standard ruler on the other. Many people have difficulty reading a ruler. Therefore I have included this section to help you, if you are one of those people.

The Metric Ruler that I use often throughout this book measures centimeters or abbreviated cm. Each large number on the metric ruler is a centimeter while each large number on a standard ruler is an inch.

On the metric ruler the lines in-between are millimeters or abbreviated mm. There is 10 millimeters in 1 centimeter. In the written form numbers to the left of the decimal point are centimeters. Numbers to the right of the decimal point are millimeters. So 1.5 centimeters is 1 centimeter + 5 millimeters. This 1.5 cm is also the same as 15 millimeters. You would locate the number 1 on the ruler and count 5 lines to the right to find 1.5 cm. Starting from the beginning of the ruler there would be 15 lines to find 1.5 centimeters.

I use the metric ruler for finding my G.P.S coordinate because it has more lines or parts in a section than the standard ruler would in the same distance. This gives me greater accuracy for establishing my Waypoint.

The other side of my plastic ruler has standard measurements. I have found that the lines on the standard ruler line up better with the mile scale on the map legend. Therefore I use it when I am measuring miles or distance when locating myself on the map. I will include here the breakdown for distance from different map scales that I own. My Standard ruler has 16 parts per inch. You can count the lines on your own ruler to find out what the smallest fraction is on it. The number of lines in one inch would be the bottom number of the fraction. The top number of the fraction would be 1 for one segment.

If the ruler has 16 lines in one inch then each line represents $1/16$ inch. I will include the proper fraction as well as the unreduced fraction for those that have trouble reading the standard ruler. That way you can just count the number of parts to know how many miles are in a measured distance.

Most Americans have not become used to relating to distance in kilometers therefore I will only do this for regular miles. Keep in mind that the number to the right of a decimal point will be tenths of a mile. Most of us have become accustomed to tenths of a mile when relating to distance because many cars' odometers read tenths of a mile.

The G.P.S receiver also relates distance in tenths and hundredths of a mile. For this is the reason I end in tenths, hundredths and thousandths of a mile instead of changing the number back into a proper fraction.

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The first number to the right of the decimal point is tenths.
The second number to the right of the decimal point is hundredths.
The third number to the right of the decimal point is thousandths.

When doing our calculation of miles to a Waypoint the number 1.875 would represent,
 $1 \text{ mile} + 8 \text{ tenths of a mile} + 7 \text{ hundredths of a mile} + 5 \text{ thousandths of a mile} = 1.875 \text{ miles.}$

Thinking of it like the odometer on a car it would be rounded of to 1.9 miles
(1 mile & 9 tenths of a mile) or almost 2 miles.

My DeLorme Topo map for Oregon has a map scale of 1:150,000.
On this map one inch represents 2.4 miles.
My standard ruler has 16 parts per inch.
So I divided 2.4 by 16 on my calculator and found that each
 $1/16$ of an inch represented .15 miles.
Next I added $.15 + .15$ to find out how much distance was in $2/16$ or $1/8$ inch. I continued this
process until I reached the 2.4 miles that is in one inch on that map.

I always divide the miles by the number of parts in the ruler.
Miles divided by parts = the decimal mileage distance per segment on the ruler.
In other words this decimal mileage distance represents a fraction.
The fraction is the measured distance on the ruler that represents miles and part of a mile.

I have included several charts for map scales that I own. There is a good chance that you can just
use one of the charts for your map.

However if your map scale or ruler is not represented here you can use this process to develop
the chart needed for your map and ruler. You can also use this process to extend the chart for
several inches if you wish.

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1 mile divided by 16 parts in ruler = 0.0625 miles per part

Map Scale 1: 62,500 (1 inch = 1.0 miles)			
Decimal	Sixteenths	Fraction	Miles
	on ruler	on ruler	on map
0.0625	1/16	1/16	0.0625
0.125	2/16	1/8	0.125
0.1875	3/16	3/16	0.1875
0.25	4/16	1/4	0.25
0.3125	5/16	5/16	0.3125
0.375	6/16	3/8	0.375
0.4375	7/16	7/16	0.4375
0.5	8/16	1/2	0.5
0.5265	9/16	9/16	0.5265
0.625	10/16	5/8	0.625
0.6875	11/16	11/16	0.6875
0.75	12/16	3/4	0.75
0.8125	13/16	13/16	0.8125
0.875	14/16	7/8	0.875
0.9375	15/16	15/16	0.9375
1.0	16/16	1 inch	1.0

2 miles divided by 16 parts in ruler = 0.125 miles per part

Map Scale 1:126,720 (1 inch = 2 miles)			
Decimal	Sixteenths	Fraction	Miles
	on ruler	on ruler	on map
0.0625	1/16	1/16	0.125
0.125	2/16	1/8	0.25
0.1875	3/16	3/16	0.375
0.25	4/16	1/4	0.5
0.3125	5/16	5/16	0.625
0.375	6/16	3/8	0.75
0.4375	7/16	7/16	0.875
0.5	8/16	1/2	1.0
0.5265	9/16	9/16	1.125
0.625	10/16	5/8	1.25
0.6875	11/16	11/16	1.375
0.75	12/16	3/4	1.5
0.8125	13/16	13/16	1.625
0.875	14/16	7/8	1.75
0.9375	15/16	15/16	1.875
1.0	16/16	1 inch	2.0

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2.4 miles divided by 16 parts in ruler = 0.15 miles per part

Map Scale 1:150,000 (1 inch = 2.4 miles)			
Decimal	Sixteenths	Fraction	Miles
	on ruler	on ruler	on map
0.0625	1/16	1/16	0.15
0.125	2/16	1/8	0.3
0.1875	3/16	3/16	0.45
0.25	4/16	1/4	0.6
0.3125	5/16	5/16	0.75
0.375	6/16	3/8	0.9
0.4375	7/16	7/16	1.05
0.5	8/16	1/2	1.2
0.5265	9/16	9/16	1.35
0.625	10/16	5/8	1.5
0.6875	11/16	11/16	1.65
0.75	12/16	3/4	1.8
0.8125	13/16	13/16	1.95
0.875	14/16	7/8	2.1
0.9375	15/16	15/16	2.25
1.0	16/16	1 inch	2.4

4 miles divided by 16 parts in ruler = 0.25 miles per part

Map Scale 1:250,000 (1 inch = 4 miles)			
Decimal	Sixteenths	Fraction	Miles
	on ruler	on ruler	on map
0.0625	1/16	1/16	0.25
0.125	2/16	1/8	0.5
0.1875	3/16	3/16	0.75
0.25	4/16	1/4	1.0
0.3125	5/16	5/16	1.25
0.375	6/16	3/8	1.5
0.4375	7/16	7/16	1.75
0.5	8/16	1/2	2.0
0.5265	9/16	9/16	2.25
0.625	10/16	5/8	2.5
0.6875	11/16	11/16	2.75
0.75	12/16	3/4	3.0
0.8125	13/16	13/16	3.25
0.875	14/16	7/8	3.5
0.9375	15/16	15/16	3.75
1.0	16/16	1 inch	4.0

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4.8 miles divided by 16 parts in ruler = 0.3 miles per part

Map Scale 1:300,000 (1 inch = 4.8 miles)			
Decimal	Sixteenths on ruler	Fraction on ruler	Miles on map
0.0625	1/16	1/16	0.3
0.125	2/16	1/8	0.6
0.1875	3/16	3/16	0.9
0.25	4/16	1/4	1.2
0.3125	5/16	5/16	1.5
0.375	6/16	3/8	1.8
0.4375	7/16	7/16	2.1
0.5	8/16	1/2	2.4
0.5265	9/16	9/16	2.7
0.625	10/16	5/8	3.0
0.6875	11/16	11/16	3.3
0.75	12/16	3/4	3.6
0.8125	13/16	13/16	3.9
0.875	14/16	7/8	4.2
0.9375	15/16	15/16	4.5
1.0	16/16	1 inch	4.8

1 mile divided by 42 parts in ruler = 0.0238095 miles per part

Map scale 1:24,000 (2 5/8 in = 1 mile)

Left Column = 16ths on ruler
Center Column = Fractions on ruler
Right Column = Miles on Map

1/16	1/16	0.023
2/16	1/8	0.047
3/16	3/16	0.071
4/16	1/4	0.095
5/16	5/16	0.119
6/16	3/8	0.142
7/16	7/16	0.166
8/16	1/2	0.190
9/16	9/16	0.214
10/16	5/8	0.238
11/16	11/16	0.261
12/16	3/4	0.285
13/16	13/16	0.309
14/16	7/8	0.333
15/16	15/16	0.357
16/16	1 inch	0.380
17/16	1 1/16	0.40
18/16	1 1/8	0.428
19/16	1 3/16	0.452
20/16	1 1/4	0.476
21/16	1 5/16	0.499
22/16	1 3/8	0.523
23/16	1 7/16	0.547
24/16	1 1/2	0.571
25/16	1 9/16	0.595
26/16	1 5/8	0.619
27/16	1 11/16	0.642
28/16	1 3/4	0.666
29/16	1 13/16	0.690
30/16	1 7/8	0.714
31/16	1 15/16	0.738
32/16	2 inches	0.761
33/16	2 1/16	0.785
34/16	2 1/8	0.809
35/16	2 3/16	0.833
36/16	2 1/4	0.857
37/16	2 5/16	0.880
38/16	2 3/8	0.904
39/16	2 7/16	0.928
40/16	2 1/2	0.952
41/16	2 9/16	0.976
42/16	2 5/8	1 mile

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CHAPTER 11

Other navigational tools, things you should bring with you and tips on traveling cross-country.

When I was hiking the Pacific Crest trail I made sure that I had the following items with me. I took some maps a compass, ruler, military protractor, solar powered calculator, pencil, pencil sharpener, paper, rechargeable batteries, small solar panel and of course my G.P.S.

MAPS: There are several different kinds of maps that a person can buy. The good news is now you are no longer limited only to electronic maps. Any map that has the degrees, minutes and seconds along the top and side will work for you. You can even order blown up quadrant maps for your favorite hunting, fishing and hiking areas.

A topographical map is a favorite among many people who love the woods because it adds a 3rd dimension to the map allowing you to see how steep the terrain is. The topographical map can also be used alone to help you determine your location by studying the terrain as compared to the map. You can get a Topographical Atlas and Gazetter for your entire state from DeLorme available in many Sports departments. I got a Coleman Atlas and Gazetter made by DeLorme for Oregon for eleven dollars. It includes grid lines marked with latitude and longitude lines so I can use the paper version for G.P.S coordinates while in the field. DeLorme also has electronic maps for each state.

You can also obtain a variety of topo maps in different map scales. These can be found for each state in the USA by calling:

1-888-ASK-USGS

Or check the following websites.

<http://store.usgs.gov/>

<http://topozone.com/>

Fire maps and Forest Service maps are good for showing many of the logging roads in the vicinity. I have also found Forest Service maps pretty reliable for finding water sources while hiking. On my old Forest Service maps I had to draw the grid lines in myself, but now the Forest Service has updated most of them to include the latitude and longitude grid lines already included. Forest Service maps are only a few dollars and are available at your local Forest Service.

Do not forget to also Check with the Bureau of Land Management (BLM) for maps in the woods also. Sporting good stores and the internet are places you may want to check as well. By looking on the internet I found a map dealer at a local survey supply store. This saved me time from ordering and waiting for my map to come through the mail.

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COMPASS: I will not take my G.P.S without also taking my compass. I find it much easier to follow the hand-held compass rather than the compass in the G.P.S receiver. In heavy tree cover the G.P.S will sometimes lose the satellite signal. Yet heavy tree cover does not affect your hand held compass. The hand-held compass still seems easier to follow even when I am not in heavy tree cover. I find it best to get the Magnetic North bearing from the G.P.S and follow that bearing with my hand held compass. Sometimes I even turn the G.P.S off for a while to preserve battery life. Then turn the G.P.S on again just to get an update on the bearing that I am following with the hand held compass.

Note: By using the Magnetic North Bearing from the (G.P.S) I do not set the declination on my compass. I am following a Magnetic North bearing to the Waypoint.

You will want to remember that metal sources will affect the needle in your compass. The compass is drawn to a magnetic field. Outside sources of metal can cause the floating arrow in the compass to point the wrong way. I once had trouble with mine while working with it on the kitchen table. It took me a while to realize that the metal bar used for extending the table to add a piece was affecting my compass needle. You will always want to consider what metal sources are around the compass while you are working with it. For example I would not recommend laying out our map on the hood of your truck and then trying to also work with your compass there on the hood.

I use a Silva type 20 Compass. Silva has several models of compasses available in many Sports Departments. A good book to buy to teach you how to use your map and compass together is:

(“Be expert with Map & Compass, the complete Orienteering Handbook” by Bjorn Kjellstrom)

Military Protractor, Declitractor & other protractors:

These tools are a necessity for anybody who wants to measure exact angles of degree on a map to pinpoint their location on a map as explained earlier. I ordered my first Military Protractor through an Army Surplus store. Any protractor that has at least 90 degrees and cross-hairs in the middle to line up on the map will work. You might try looking in places that sell office supplies, school supplies, drafting supplies or survey supplies. Read “Other protractors.” ([Chapter 9](#))

A good tip using your protractor is to put a piece of thread or light string through the center hole. If there is no hole in the center you can always drill your own. By placing the thread through the hole in the center you can stretch out the end to read the degree or angle anywhere on the map. Of course a thread or small string is easier to carry around than a yardstick or some other object to make a straight line.

The ruler, and solar powered calculators are tools that are cheap, lightweight and necessary to get the accuracy needed in determining coordinates for the G.P.S receiver on a conventional map. You should be able to get a solar powered calculator, a clear plastic ruler with both cm and standard measurements and a protractor without spending a bundle of money.

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Altimeters

These devices can measure elevation to an accuracy within 30 feet which is much more accurate than many G.P.S receivers. Using an altimeter and a topo map, which shows the elevation throughout the map, can be an added conformation as to where you are. Be advised that these need to be continually reset since they act like a barometer and are directly affected by weather changes.

Extreme weather

One should consider that many electronic devices such as your G.P.S have limits in extreme heat or cold. For those who wish to travel in those conditions they should know what precautions and equipment are needed before departure. This can affect your batteries as well.

I would rather carry a pencil than a pen. You do not have to wonder if the pencil will run out of ink. Also for some reason the pen will not write on certain parts of paper that I have carried in my pocket for a while. With the pencil it does not matter. I also carry a small pencil sharpener with me. Not only will it sharpen your pencil, but also in a pinch the pencil shavings can be used to make fine tinder for starting your fire. Of course I also carry paper to write on, but I need the paper. I do not need the pencil shavings.

Rechargeable batteries and Solar charger. When I was hiking down the Pacific Crest trail I carried several things that used batteries. My G.P.S receiver uses AA batteries. My flashlight uses AA batteries. I carry a Zip stove so that I can cook without caring fuel even during the restricted fire season. The Zip stove uses one AA battery as well. I also carried a cell phone in case of emergency it also runs off a battery. Since I was going to be on the trail for a few months this could be a lot of batteries. So I carried rechargeable batteries and a small 6-inch by 7- inch solar panel to recharge everything. It was made to keep a 12-volt car battery topped off. The solar panel in that respect did not work very well. However it did a great job charging AA batteries and my cell phone. It is just a matter of finding a way to connect the solar panel to the positive end negative points on the batteries. I would charge 4 AA batteries at a time using this solar panel in just a few hours at camp.

Tips when traveling cross-country.

Yellow Street signs in the woods. Those that do not live in the 13 original states or Vermont, Maine, Kentucky, Tennessee, West Virginia or Texas have probably seen the little yellow street signs out in the woods. You may not however have known what these signs were. I am talking about survey signs that help surveyors find established corners. Those outside of these areas have probably also noticed that Forest Service maps are divided into little square sections. On the sides of the map there is a T with a number next to it. Next to this number is an N or S. On the top and bottom of the map there is an R with a number next to it. Next to this number is an E or W. The T stands for Township. The R stands for Range, and of course the N, S, E & W stands for North, South, East and West.

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A Township is a division of territory in surveys of U. S public land containing 36 sections or 36 square miles. The Range is a means of helping to identify parcels within these sections. Today it is possible to identify a 40-acre tract by referring to a few numbers and symbols using this system.

Keep an eye out for these little yellow signs as you are driving out in the woods. They are only about 4 1/2 inches by 5 inches so you will have to pay attention to find them. The signs along the side of the road will give a bearing and distance to the actual corner. It will also inform you which corner that it is by Township, Range and section. The signs that are closest to the corner will say "Bearing Tree" on the top of the sign. The rest of the sign will have information similar to the following outline.

BEARING TREE

Direction _____ Distance _____
T _____ R _____ Section _____
Corner _____ Tract _____
Posted by _____ Date _____

The direction and distance are pointing to the actual corner. Most likely it will be a pipe in the ground with a brass cap. On top of the cap it will show which corner it is and the elevation.

The T, R and Section are the information that you want.

The T = Township. The R = Range. Use this like any other map. Find the Township that is on the sign on the side of your map. Then find the Range that is on the sign on the top or bottom of your map. These points come together at a group of 36 squares each with a number in the center. Each one of these squares is a square mile.

The number in the center of the square is the "Section."

This sign is telling you the direction and distance to a corner post of that section on your map.

Keep in mind when finding where the two points of Township and Range come together is a wide strip. The 36 squares within a Township are six squares by six squares. You will be looking in a strip that contains three squares to both sides of the Township and three squares to each side of the Range. Where these two strips meet is a 36 square section where you are looking for the section number that was on the yellow sign.

We have worked with Dollar Mountain earlier, which is on the map at the back of this book. Dollar Mountain is located in T 36 S, R 6 W, Sec. 12. That is Dollar Mountain is located in Township 36 South, Range 6 West, Section 12.

In this case the Township 35 South and the Range 6 West does not show 3 squares to each side because it is the edge of the map. The 35 South is placed in the correct spot. The Range 6 West is out of place because Range 6 West sections 15 & 16 are not on the map. State boundaries are another example that will also throw the sequence off.

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The following illustration may be of some help.

Each 36 square section is laid out in the following manner.

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Lines' in-between the actual corners are sometimes marked. They are marked by blazing or cutting into a tree and painting that spot with red paint.

Then periodically there will be a larger yellow sign that says "Property Boundary National Forest Land behind this sign."

Sometimes you will see other little yellow signs along side of the road that do not say "Bearing Tree." These signs contain the same information of Township, Range and Section that you need. The difference is that the actual corner is farther away. The "Bearing Trees" are all close to the corner. These other yellow signs are not real close to the corner, but they help the surveyor to know where to park and start walking cross country to the corner.

Other times you will see stakes or post with a BM on it and Elev. and a number. The BM stands for bench mark. The Elev. is the elevation. This can be of some help if you are using a Topographical map.

You may want to find some of these useful little yellow signs to become familiar with them. You can look on your map to see where some section corners are close to a road in which you are familiar. Use the first part of this book to figure out what the coordinate is to those corners. Then you can enter them into your G.P.S receiver and go out and find them. When you find the corner you can pretend you are lost and practice locating yourself on the map using your G.P.S and protractor.

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Do not try to hit a trail head on when looking for it.

Let's say you are hiking down a trail. Suddenly the trail disappears under a blanket of snow. You can look for blazed or cut trees. These would be signs that you are still on the trail even though you can no longer see it. There will however be times when you see no sign of the trail ahead of you at all. You can use the skills you learned in this book to take a coordinate on the trail ahead of you from the map. However a hiking trail is only a couple of feet wide. It is possible to only be a short distance off the trail and not be able to see it because of trees and brush.

The coordinate that you establish ahead of you may not put you on that 2 ft path if you try to hit it head on. To overcome this you can enter a coordinate that you know is actually to the right of the trail and enter that into the G.P.S as a Waypoint. Now when you reach that Waypoint you know that the trail is actually to your left.

Then make a 45 degree turn to the left. This will cause you to actually cross the trail. This is an easier way to find it then trying to hit it head on. This process can of course also be used to hit roads, creeks, rivers or anything long and narrow.

There will be times when you are trying to locate other things. You may arrive at the Waypoint that you entered from the map and not be able to see what you are looking for right away. That does not mean that it is not nearby. Think for a moment what might be obstructing your view?

I remember when I first started to learn how to use my G.P.S receiver. I entered my van as a Waypoint and then walked away. I was so focused on the G.P.S and compass that I did not really pay any attention to where I was going. I tried going back to the van and arrived at my Waypoint, but could not see the van. I remember thinking "great this stupid thing doesn't work! Now where in the heck am I?" I walked about 100 feet and noticed my van parked behind a little hill. The hill was just tall enough to keep me from seeing the van. So stop and think before you assume you are lost.

Do not panic even if you did mess up on your coordinate and become lost you can always use your G.P.S and protractor to find yourself on the map again and start over.

Remember to look for signs of your desired destination. Were you looking for a small pond that you have never been to before? Could it be dried up? Were you looking for a creek? Is there a ravine nearby that you cannot see the bottom? Were you looking for a mineshaft? Do you see any tailings? (Tailings are rocks taken out of the mine) Think and look around before you give up!

This would also be a good time to use your G.P.S and protractor to verify your location on the map. This could give you a clue of how close you are and which way to go from there. In actual practice I have often found that my bearing was correct while the distance may have been slightly off.

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You can estimate your bearing using a stick.

You never know when your G.P.S may malfunction or when you may lose your compass. It is always good to know other ways to determine direction.

You can find the general bearing with a stick and a couple of small rocks. You will also need enough sunlight or moonlight to cast a shadow. Push the stick into the ground as vertical as possible. Place a small rock at the end of the shadow cast by the stick. Now wait 10 to twenty minutes for the shadow to move. Place a second rock at the end of the shadow cast by the stick. A line drawn between the first rock and the second rock will point East and West in the Northern Hemisphere. The first rock is on the West end of the line. The second rock is on the East end of the line. In the middle of the day this line will be pretty close to West. In the morning it will point slightly South of West. In the afternoon it will point slightly North of West.

The sun and moon appear to travel from East to West. The shadows created by both the sun and the moon travel from West to East. The shadow is the opposite.

You now have an idea which direction is East and West. I want you to now picture a map of the USA in your mind.

If you are facing North the East coast is on your right hand side and the West coast is on your left.

Position your body so that you are facing North.

Now imagine in your mind that you are standing in the center of a huge clock with hands. 12 o'clock is due North. The numbers 1 through 12 on this clock are all 30 degrees apart.

12 o'clock = 360 degrees - North

1 o'clock = 30 degrees

2 o'clock = 60 degrees

3 o'clock = 90 degrees - East

4 o'clock = 120 degrees

5 o'clock = 150 degrees

6 o'clock = 180 degrees - South

7 o'clock = 210 degrees

8 o'clock = 240 degrees

9 o'clock = 270 degrees - West

10 o'clock = 300 degrees

11 o'clock = 330 degrees

12 o'clock = 360 degrees - North

Granted this is not near as precise as your compass and G.P.S, but it will give you a general idea which direction any bearing is from where you are standing.

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Hunters check in using a radio and give your coordinate to your partner.

Often hunters carry a two-way radio. It would be a good idea to agree ahead of time to check in with each other once every hour and exchange your coordinate with each other. Then if something does happen they will at least know where to begin looking for you. Even if for some reason you were unconscious your search party could narrow down where to look for you to a relatively small area. Your last coordinate would be a good place for a rescue dog to pick up your scent.

Your partner should at least know how to turn the G.P.S on and read the coordinate to call 911.

Your partner should know how to turn the G.P.S on even if they do not know how to do anything else.

Explain to them that when the G.P.S finds itself it displays the coordinate of your location. This information and a cell phone could save someone's life. It is worth the couple of minutes that it will take to show everybody in the group including children.

How to locate a G.P.S coordinate on a paper map.

Suppose you do get a radio message or phone call and someone is hurt. They give you a G.P.S coordinate of the victim. You can enter that coordinate into the G.P.S receiver and start in a direct bearing to it. However that may not be the best route. Perhaps there is a road near them that would be a better starting point before heading cross-country. You can take the G.P.S coordinate that was given and locate that position on the paper map first to help determine the best route to get there.

1. Enter the coordinate given as a Waypoint into your G.P.S receiver.
2. Get the bearing and distance to that Waypoint from the G.P.S receiver. Since we keep our G.P.S set on Magnetic North add your declination to that bearing.
3. Locate yourself on the map as covered in [chapter 8](#)
4. Place a dot on the map at your actual location.
5. Place the cross hairs of the protractor directly over this dot you just made. Make sure the protractor is as straight as possible as, if the cross hairs were centered over two grid lines.
6. Place your ruler on the cross-hairs of the protractor and the bearing that includes the declination and measure the distance to the victims location. Place an X there and start planning the best route to get to them.

You can use your protractor to get a compass bearing.

From a known location on the map you can obtain a bearing and distance to another point on the map using your protractor and ruler. Place the crosshairs of your protractor over your current position on the map. Place your ruler over the crosshairs and your desired location.

Measure the distance in between the points with your ruler. Here in Oregon I have been adding the declination to change to Magnetic North from my G.P.S to True North on the map. Now I would subtract the declination from True North on the map & protractor for Magnetic North for the compass.

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Let's say that you figured a coordinate from the map for your G.P.S Receiver and entered it as a Waypoint. You could also use this method to verify your accuracy by making sure the bearing and distance are the same using both methods.

When saving a Waypoint of your current position check to see the distance to it before you move on.

Usually the current position will have a distance to it.

In other words you did not actually save the position where you were standing when you saved the Waypoint. Rather you saved a position nearby. This is normal and not a problem. However once in a while the distance to the position is greater than .02 miles. In that case I would delete the Waypoint and save it again before I moved on. Otherwise I would miss it by a greater distance when I tried to return to that Waypoint.

WHAT TO EXPECT IN THE FIELD

I wish I could tell you that you will always find your waypoint within 100 feet. However that isn't going to happen.

Let me tell you about my first time I tried to go to Dollar Mountain. I had first figured out the G.P.S coordinate that is here in this book. I saw on a county map that "B" street in Grants Pass would take me close to the base of the mountain. When I got to the end of "B" street I was looking at a gate across the road and several No Trespassing signs. I turned on my G.P.S and asked it where Dollar Mountain was. It gave me a bearing and a distance. I then used my compass to point myself in the direction of that bearing. It pointed directly at a large antenna on top of a mountain. I reasoned that I could try to circle around the mountain using the antenna for reference point. I wanted to find a way to access the mountain without trespassing.

I drove a short distance up another road off of "B" street and I saw a sign that said "Trail head" I stopped the truck and checked to see if the trail went in the same direction that I wanted to go. When I verified that the trail was going the right way I parked and started heading up the trail. A short way up the trail it took a sharp turn and was no longer heading toward Dollar Mountain. I left the trail at that point and used my G.P.S and compass to head directly toward it. When I was getting close to the top of the mountain I hit the trail again. When I reached my coordinate I was on the South side of the mountain below the antenna, but I was not on top of the mountain.

I then used my G.P.S and protractor to verify where I was on the map. It placed me on the South side of Dollar Mountain near the top. Since I verified that I was indeed on Dollar Mountain I went ahead and walked 400 more steps to reach the top of the mountain. None of my maps showed the tower on top of Dollar Mountain or the trail going up to it. Still I found it just the same.

Some friends thought that my trip was a failure when I first told them I missed the top. That is because they think in terms of the G.P.S always bringing them within mere feet of the destination. However experience shows a person they can save a position with the G.P.S when actually there. Then later traveling back to the same spot they often will not hit the spot right on the money, but they will be close. Figuring the G.P.S coordinate from the map before going there or pinpointing yourself on the map will usually have a greater degree of error than actually being there first and saving the coordinate.

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An electronic map will often give you a coordinate that is closer than using the methods in this book. Yes my electronic version showing Dollar Mountain missed the actual top as well, but it was closer.

My friends' electronic version missed the top as well. The point is that there are many good paper maps out there that show detail that is not on an electronic map.

Without utilizing skills similar to what is in this book a person could not use their G.P.S to go there at all because they would not know a coordinate to enter into their G.P.S receiver.

For example Lets say I wanted to go to Big Bald Spot, Little Bald Spot or the creeks around Bear Pen Gap all which are found to the East of Grants Pass Peak on my forest service map. I would not be able to use my G.P.S to find them without the skill as described in this book.

The Delorme Topo electronic map I have of that area does not show these features seen on my forest service map. By using the skills taught in this book I am not limited to electronic versions of maps. This skill allows a person to use any of their favorite paper maps that provide Latitude and Longitude on the sides of the map.

Most things you will look for will not be like trying to find a stake driven in the ground somewhere. Mountains, lakes and ponds are big enough you can find them once you arrive in the general vicinity. Roads, trails and creeks can always be found by figuring a coordinate to the side of it then making a 45 degree turn to cross it as described earlier. Plan your coordinate well enough and you will also know which way to turn when you do hit the road or trail. Truthfully if I land within a thousand feet of my destination I can usually find whatever it was that I set out to look for. So the bottom line is I can use any map I want and always find what I am looking for or locate myself on the map. Just don't expect to always land within 20 feet of your destination. That simply is not going to happen. Of course larger map scales and more parts on the ruler can help me to increase my accuracy, but that does not mean that I need to run out and buy another map to find something I can already see on the map I have.

One can use other skills to return to an exact location if so desired. For example when I hiked the Pacific Crest Trail across Oregon I first buried food at locations where the trail crossed major roads and highways. I placed my dried food in waterproof containers. I used my G.P.S coordinates and maps to find where the trail crossed these roads and highways. I then looked for something unusual that would make sense in my notes. For example if I seen a Cedar Tree with two different tops on it I would take a G.P.S coordinate there and make a note to look for the Cedar Tree with two tops. Then I would state something like. From the Magnetic North side of the tree set the compass for 216° and measure 16 of my shoe lengths and dig down under the quartz rock. I found all of my drops in this manner.

I also found the trail a few times after losing it in the snow by following the methods in this book. I even used the methods in this book to find creeks to get water that did not actually cross the trail. Use your own power to reason and several different tools like maps, compass, G.P.S etc. and you will soon gain the confidence that you can indeed travel anywhere you want cross-country and not get lost. Make sure you read [page 59](#) as well.

As with most things in life the more you know and understand the more successful you will be when applying your knowledge to the task at hand. Well have fun and remember be safe! Practice first in areas you already know.

Sincerely
Robert Kiser

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Rogue River National Forest

Scale 1:126,720

1 inch = 2 miles

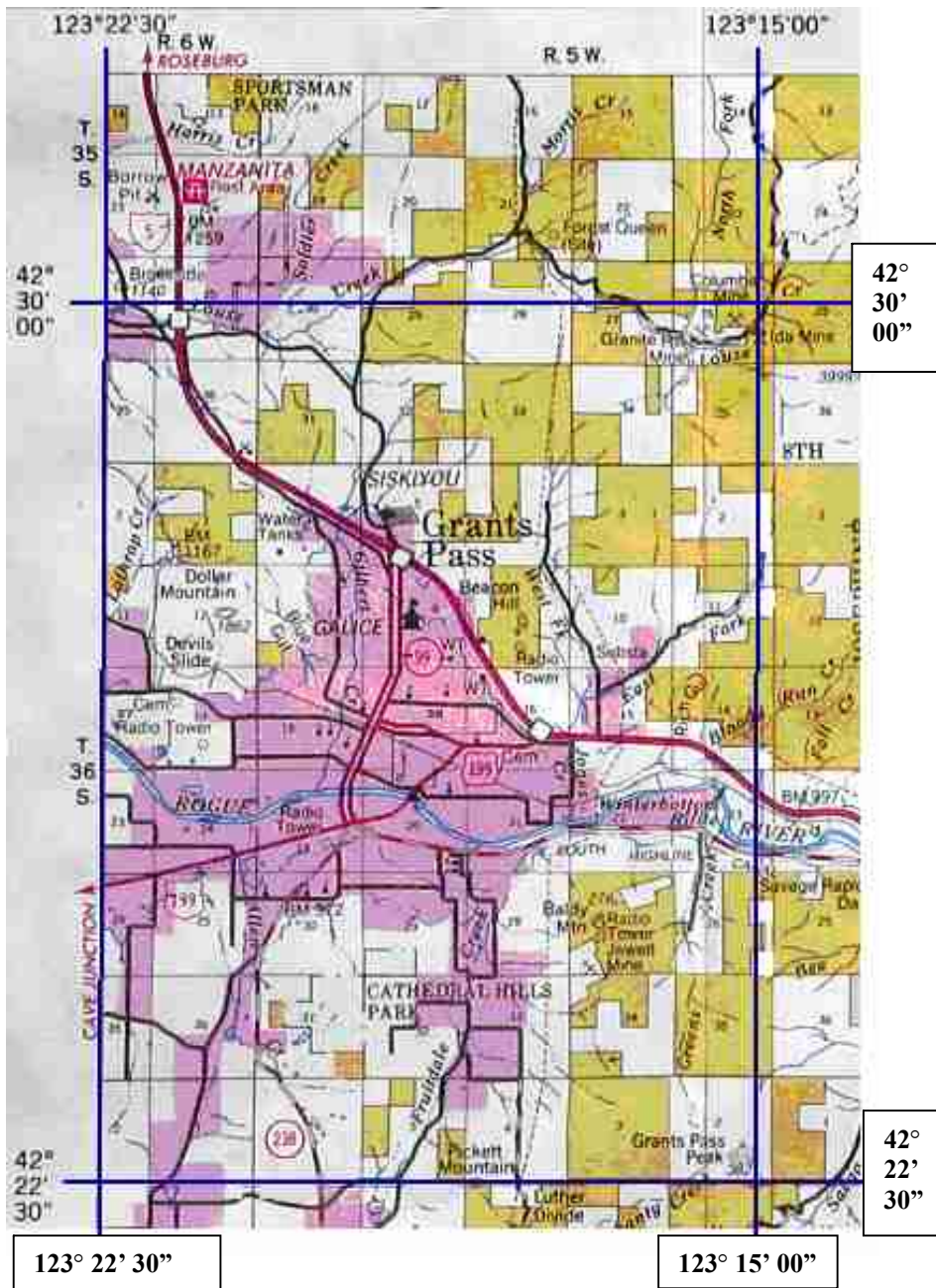


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NOTE FROM THE AUTHOR

I had no book or person to teach me how to do this. I do not consider myself an expert in the field of navigation, map making or math. I cannot guarantee that this book is free from all errors. Even I would not risk my life only on the content of this book. Therefore you should not either!

I can say that I have used the methods that I described in this book for several years and I have encountered some problems and I believe I have the bugs worked out, but I cannot guarantee that to be true.

I believe that using the methods in this book along with other navigational skills such as good map reading and compass skills will prove to be useful to all who are interested in cross-country travel. No single method of navigation by itself should be relied upon as the only means of knowing where you are going or where you are.

I would remind you to practice first in familiar areas. Do this both for finding a coordinate and locating your position on the map. Even when lost redoing this a couple of times while probably solve your problem.

The main key is even, if you do become lost to keep a level head. Do not panic! Stop, if necessary prepare camp. Fumbling around in the dark is a good way to make matters far worse.

Nobody dies because they are lost, but you can die from hypothermia even on a summer night in just a few hours. Here your survival skills and thinking clearly are far more important than being a good navigator!

I recommend everybody becomes familiar with more than one form of navigation, survival skills and emergency first aid before attempting any cross-country travel in the wilderness. Be prepared for the worst so that you can enjoy the best!

NOTE FROM THE AUTHOR

It is hoped that I have been of some help about keeping you from being lost in the woods. I would also like to tell you about other things I have written. Personally I like logic. I like things that I can see on paper that add up and make sense. God gave us a brain and I see no reason to throw it out the window. I have also written about the bible in this fashion. It is reasonable to ask how do you know it is the word of God? Where is the evidence? Is there historical evidence that shows that Jesus rose from the dead outside of the bible? What does it mean to be saved? If you would like to know more about these subjects approached in a no nonsense logical fashion then please contact me for more information.

Robert Kiser
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Gold Hill OR. 97525

Reasonableanswers.org

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Why is this book free?

I assure you I did not write this book with the intention of giving it away. I had high hopes of selling enough copies to get a small piece of land in the country somewhere. I also had hopes of being able to finance my own full time ministry. My hopes declined to wish I could just live like other people in a small place big enough to have a couch on the inside and have electricity and hot running water.

I invested a good sum of money into this going through Xulon Press a self publishing place for Christian Authors. I paid the extra money to have it placed in a book fair and placed on Amazon.com. However three years later I still have no royalties from Xulon Press. They say they only issue checks quarterly after it reaches at least \$25. At the same time I also published a book titled "Jesus" through them with the same results. I tried to sell the books on my own website with no results.

I also sent a copy of this book without this addition to the Boy Scouts of America, Military Book Club, Campmore magazine and other such places with no results.

With the current economy and a loss in my own income from work I have faced the possibility of becoming homeless. I realize that I may not always be able to afford to keep up the ReasonableAnswers.org Website. Who knows things may change in my income where maintaining the website will not be a concern. Just the same when I cannot sell any copies of the book; do I just write it off as a loss and not share the information with anybody? After all of the work that I put into it I would like to think that my writing in this book and Christian material is at least going to help somebody. I did give away a few copies here to the local Search and Rescue.

I guess the bottom line is that I would rather give it away and have it be of some use to somebody! Refusal to give it away and hopes of someday selling it does not do anybody any good and I refuse to be that selfish. Who knows this information may someday save somebody's life. The Christian material may help someone come to know Jesus saving them from eternity in Hell. In either case I would rather give it away than to selfishly cling onto it demanding pay for my efforts and expense. It would cost me further expense to give away paperback copies of my books. It does not cost me any further expense to give away downloadable PDF books. Then even if things do get worse and I have to drop the ReasonableAnswers.org website at least the information will be out there where it can be spread and distributed to others by people just like you. That is why this PDF book is free here and the paperback version without the Christian comments is for sale at Amazon.com Other books besides this one can be downloaded for free as long as I can maintain the website. Do not get me wrong I am not giving up yet I still have plans for a full time self supported ministry that I believe would work, if I get past this financial hurdle. Still either way giving this away makes sense so as to help somebody.

Sincerely

Robert E. Kiser

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Does God exist?

When sharing with the non-believer it does not always start with sharing from the Bible. Some people claim that they do not even believe that God exist. However Romans chapter one would tend to say that they do know of his existence that their denial is because of hardness of heart. Still one should be able to give some reason to the non-believer for their belief in God. The purpose of this writing is to help the Christian give the non-believer some reasonable answers for this belief.

I know that God exist because

1. I know him.
2. I know that God exist because of the fact that the world is here and is full of design in everything from planets to flowers and atoms. The design is evidence there was a designer and a maker.
3. Evidence from the worldwide flood is indication that God not only exist, but he once judged the world already and the evidence of that is everywhere.
4. I know God exist because he has continued to communicate with mankind sharing with him things in detail about the future that no mere man could possibly know. (Prophecy)
5. I know that God exist because he has shared things about science that have proven accurate long before they were quote discovered by mankind.
6. I know that God exist because he was here in human form 2000 years ago. There are historical records of this fact. What makes his testimony credible is that his death and resurrection were told about before he was born. He himself also predicted his resurrection and there were more than 500 eyewitnesses to this event that lasted 40 days. Jesus even appeared to unbelievers. The resurrection of Jesus is an historical fact that can stand in a court of law. The bible says Jesus is God
7. I know that God exist because there are numerous accounts of people who have been clinically dead and have given accounts of God, heaven and Hell.
8. Great scientific minds of both the past and the present have continually believed in the existence of God.

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How do I know God exist?

(1) I know him. Give an example of an answered prayer or your own testimony. This is a point nobody can effectively argue against.

(2) I am here and you are here. In other words mankind came from somewhere. There was a beginning. There are really only two schools of thought of where mankind came from; Creation and Evolution.

Creation says in the beginning God.

Evolution says in the beginning Matter

Sounds funny, but that is indeed what they are saying.

Evolutionists teach single cells eventually evolved into a person. In other words the frog turned into a prince. (Fairy Tale not based upon knowable science.)

There is more than one type of evolution taught. Micro evolution is true and we can see examples of it. A dog can be breed into other types of dogs, but it will always remain within the same kind of animal. It is still a dog it will never become an elephant!

For the dog to become an elephant is Macro evolution which has NEVER been seen or proven.

This takes a giant leap of faith with no direct evidence at all.

The 2nd law of thermodynamics tells us that everything is reaching a state of disorder. In other words things die, rot and decay. We see this everywhere even your house will eventually fall apart without maintenance from an outside source like people.

Evolution teaches the opposite that things over time can reach a state of order and design. This has NEVER been observed or proven. A tadpole may turn into a frog, but for a frog to turn into a prince is a fairy tale not science. Even Charles Darwin knew this was absurd.

Darwin said that:

"To suppose that the eye, (with so many parts all working together)....could have been formed by natural selection, seems, I freely confess, absurd to the highest degree."

"Absurd to the highest degree."

That's Darwin's own opinion of using natural selection to explain the origin of traits that depend on many parts working together."

Christians believe that design shows evidence of a maker. In other words if I found a watch I would probably reach the logical conclusion that somebody made it because it has design and many intricate working parts. The bible tells us that both creation and the flood are knowable to mankind.

2 Pet 3:5-6 For when they maintain this, it escapes their notice that by the word of God the heavens existed long ago and the earth was formed out of water and by water, through which the world at that time was destroyed, being flooded with water. (NAS)

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Rom 1:20-22

20 For since the creation of the world His invisible attributes, His eternal power and divine nature, have been clearly seen, being understood through what has been made, so that they are without excuse.

21 For even though they knew God, they did not honor Him as God, or give thanks; but they became futile in their speculations, and their foolish heart was darkened.

22 Professing to be wise, they became fools,
(NAS)

(3) There was a worldwide flood. God judged the world back in the days of Noah with a worldwide flood. The fact that he did this and there is evidence of the flood verifies that God exist. We know there was a worldwide flood because clams were found on top of Mt Everest and fossilized oysters were found high in the Andes mountain range in Peru. These locations are on different continents high above the ocean. How did they get there? They are there because of a flood produced because of God's judgment on the world.

(Mt Everest) Holt Modern Earth Science, 1983

(Giant Oysters) Dailey American Republic, Friday March 2, 2001

(4) I know God exist because he has continued to communicate with mankind. Much of this communication has been recorded in written form. God has shared with people in the past future events that nobody could accurately predict yet God did it! We call them fulfilled prophecies. Automatically when referring to the bible people say it cannot be trusted yet it has NEVER been proven wrong I would like to start with a quote from Time Magazine.

Time Magazine DEC.30,1974 "After more than two centuries of facing the heaviest scientific guns that could be brought to bear, the bible has survived and perhaps better for the siege even on the critics own terms. Historical fact, the scriptures seem more acceptable now than they did when the rationalist began the attack"

The Bible has never been proven wrong in any of its prophetic messages. I will give one example of a prophetic message which came true.

Isa 44:28-45:1 "It is I who says of Cyrus, 'He is My shepherd! And he will perform all My desire.' And he declares of Jerusalem, 'She will be built,' and of the temple, 'Your foundation will be laid.'" Thus says the LORD to Cyrus His anointed, whom I have taken by the right hand, to subdue nations before him, and to loose the loins of kings; to open doors before him so that gates will not be shut:

Notice Cyrus is mentioned by name although at this point he has not even been born. What's also interesting about this prophetic message is that at the time Isaiah wrote this the city was not yet destroyed and the temple was still standing. Nebuchadnezzar the king of Babylon came along and destroyed it about a hundred years later. Then about 160 years after Isaiah's writing the temple was completed because a Persian king named Cyrus gave the decree to rebuild the city and the temple.

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The American Peoples Encyclopedia vol.11, pg.395 dates the time of Isaiah's death at about 668 B.C. The same volume on pg. 611 states that Nebuchadnezzar destroyed the city and the temple in 586 B.C In volume 6 pg.688-689 of The American Peoples Encyclopedia we find that Cyrus liberated the Jews and allowed them to return to rebuild Jerusalem and even restored sacred vessels taken from the temple. This took place around 539 B.C the new temple was completed in 515 B.C vol.11, pg.611

This is an example of God communicating with mankind proving God exist. No man can make the predictions the bible makes and always be correct. Therefore fulfilled prophecies are evidence of the existence of God because we have recorded communication from him in the Bible.

(5) I know God exist because of knowledge revealed that we did not know.

I would like to mention one area where science and the Bible do meet together.

Job 26:7 "He stretches out the north over empty space, and hangs the earth on nothing."

Keep in mind that Job lived almost 2000 years before Christ. This idea that the earth was suspended on nothing was not even thought of by scientist for thousands of years after Job. Now with our satellites and trips into space we know this to be true. But that was not known in Job's day. The Egyptians declared the earth rested on pillars. The Greeks said it was carried on the back of Atlas. People believed many things but they did not come close to what we know to be true today, and what Job declared a few thousand years ago.

(6) I know God exist because God was here in the form of man. Phil. 2:5-11 Jesus claimed to be God in John 10:30-33 even his enemies understood his claim when he stated "I and the Father are one." Furthermore he acknowledged he was God to Thomas John 20:28-29. Jesus claimed to be from heaven John 6:38. The Bible also tells us Jesus is the creator Col.1:15-16.

Ok so Jesus claimed to be God. Did he leave us any evidence of this fact? Yes he did with the Dead Sea Scrolls we can verify all of the prophecies concerning Jesus were written before Jesus was born through Mary. There are numerous prophecies concerning the Messiah that Jesus fulfilled including his death and resurrection. Without even using the Bible we can show reasonable evidence that Jesus rose from the dead. For more detailed information concerning this see ReasonableAnswers.org from the home page click on "concerning Jesus".

(7) I know God exist because many people have had experiences being clinically dead and have relayed information to us concerning heaven and hell. The Lazarus Phenomenon DVD gives an account of an Africa Pastor named Daniel Ekechukwu who died in a car accident in Nigeria. He later returned to tell of his experience. Secondly, Ian McCormack a young surfer from New Zealand died and returned after being stung by the box jellyfish

The Search for heaven is a documentary DVD which examines the scientific studies, personal testimonies and experiences of those who have had a near-death experience some of these personal testimonies are more evidence that God exist

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8. Great scientific minds of both the past and the present have continually believed in the existence of God. I will mention a couple from the past. Leonardo da Vinci although more famous for his paintings was also a scientist who believed in God.

Isaac Newton famous for discovering gravity he also was a Christian who spent much time studying biblical prophecies. Concerning the prophecies in Daniel Newton once said "to reject Daniel is to reject the Christian religion."

I would like to comment about arguments against the existence of God.

How can one prove anything does not exist? To know that something does not exist anywhere you would have to obtain all knowledge of everyplace at all times.

As far as the existence of God we can offer sound reasons for this belief. In a court of law we can rely on circumstantial evidence. For example in a murder we might have the gun the ballistic report saying that the bullet came the accused persons gun and his fingerprints are on the gun. We could establish motive and other such things that would convict the person of murder even though there were no actual eyewitnesses to the murder.

It is through this circumstantial type evidence that we will offer to show that God does in fact exist.

Many people say evil in the world is an argument against God's existence. I would argue that what they think God should or shouldn't do about evil does not disprove his existence. That is an argument concerning his character which is not what this debate is about. God said that death would come from disobedience. Well we all die!

To totally wipe out sin and the effects of sin by mankind this world as we know it would have to be destroyed; and it will be in God's time. God's character or how he does things is not the question of the debate. Whether he exists is the debate. Pay attention to how they define things be hesitant to agree even if it sounds reasonable. People in debates are often trapped by agreeing to false terms and false definitions.

Written by Robert Kiser, ReasonableAnswers.org

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The Bible has told details of scientific fact long before mankind through science discovered they were true.

The Bible unlike any other writing is unique in the fact that it surpasses mankind's abilities. The prophecies in the Bible that have already been fulfilled are what most point to for the Bible actually being the word of God. No man has ever been able to predict the future with the detail and accuracy that the Bible has shown. However the Bible is in no way limited in providing evidence to the fact that it is indeed the word of God. Another area that can be pointed to for the authenticity of the Bible is science.

Most informed Christians will readily admit the Bible is not a text book on science. You cannot prove the Bible to be the word of God based solely on science. Then again science does not refute the Bible either. Some people think of it as Religion VS Science. Well the fact is the Bible has never been proven scientifically wrong. The same cannot be said about some theories proposed by scientist. Science and the Bible are in harmony in areas where they do meet. However the Bible was written to reveal God to mankind. The Bible was not written to teach anybody about science.

I want to give you a few of the many examples where the Bible mentions scientific facts that today we know are true. Yet what is amazing about these examples is that the Bible declared them as fact long before mankind discovered they were true!

Job 26:7 "He stretches out the north over empty space, and hangs the earth on nothing."

Keep in mind that Job lived almost 2000 years before Christ. This idea that the earth was suspended on nothing was not even thought of by scientist for thousands of years after Job. Now with our satellites and trips into space we know this to be true. But that was not known in Job's day. The Egyptians declared the earth rested on pillars. The Greeks said it was carried on the back of Atlas. People believed many things but they did not come close to what we know to be true today, and what Job declared a few thousand years ago. How did Job know this was true when science had not yet discovered it?

Job 28:25 "When He imparted weight to the wind, and meted out the waters by measure,

Does air have weight? In 1643 a mathematician named Evangelista Torricelli performed an experiment to learn if air has weight. His experiment is what led to the making of our barometer.

The relative weights of air and water are needed for the efficient functioning of the world's hydrologic cycle, which in turn sustains life on the earth.

Nasa.gov tells of an experiment that kids can do to verify this fact in school. Simply make a scale that pivots and balances correctly. Hang two empty balloons on each side and balance it out. Then remove one balloon and blow it up then hang it back in the same place. The side with the blown up balloon will go down because it has the weight of the air inside it.

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Here again we find that air has weight discovered in the 16th century however Job lived almost 2000 years before Christ. The book of Job told us air has weight before science discovered this was true.

Lev 17:11 'For the life of the flesh is in the blood, and I have given it to you on the altar to make atonement for your souls; for it is the blood by reason of the life that makes atonement.'

During George Washington's time, the practice of blood-letting to treat various kinds of illnesses was common. This practice is actually what killed him. The understanding of this verse could have spared his life. In today's world it is common knowledge that blood circulation is vital for our survival. William Harvey is accredited for being the first to introduce the importance of blood circulation in 1616. Yet all critics will agree that the Book of Leviticus was written a few thousand years ago. Any year that falls in B.C is long before 1616 and William Harvey.

William Harvey (1 April 1578 3 June 1657) was an English physician who was the first to describe correctly and in exact detail the systemic circulation and properties of blood being pumped around the body by the heart. (wikipedia.org)

So we learn that the life of the flesh is in the blood in Leviticus long before science discovered the details of this truth.

Job 36:27-30

- 27 "For He draws up the drops of water, they distill rain from the mist,
- 28 Which the clouds pour down, they drip upon man abundantly.
- 29 "Can anyone understand the spreading of the clouds, the thundering of His pavilion?
- 30 "Behold, He spreads His lightning about Him, and He covers the depths of the sea.

This bible reference clearly describes evaporation and its cycle which we now refer to as the hydrological cycle. We also see that the context includes the sea. However the Greeks thought that spring water came from the oceans and was purified in the ground somehow making fresh water.

The understanding that it was through the evaporation process as described in the Book of Job was not discovered and understood until the 17th century. Yet Job was written long before Jesus was even born.

I have personally found the knowledge of this process very comforting when hiking in back country. Using this principle and a clear sheet of plastic a person can obtain purified water from anywhere. Most survival manuals teach this concept in the making of a solar still.

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Here is a short related quote you may find interesting.

Brief historical overview of the hydrologic cycle

" Before the 17th century, many natural philosophers accepted the Greek theory (proposed by people who lived in a semiarid climate on limestone hills) that rainfall was insufficient to feed springs and rivers. It was thought that spring water was purified sea water from deep within the earth (reverse osmosis?).

However, in 1580, Bernard Palissy proposed the theory of the hydrologic cycle. Pierre Perrault (1608-1680) made careful observations of rainfall and streamflow in the Seine River basin, confirming Palissy's hunch and thus began the study of modern scientific hydrology"

Chapter 11 of the 1999 NGWA Press publication, Ground Water Hydrology for Water Well Contractors.
(ngwa.org)

Here in Job we find the Bible describes the hydrological cycle long before science discovers the reality of it.

Job 38:16

"Have you entered into the springs of the sea? Or have you walked in the recesses of the deep?"

Think how this must have sounded to Job. There is no way that anybody in his day that could know there were springs in the ocean. It is not like anybody went deep sea diving or any other type of underwater exploration in his day.

Today we find that hot springs or hydrothermal vents coming from the ocean floor. Scientist first discovered these in the 1970's. How could Job possibly know there were springs of any kind on the ocean floor?

Ecc1 1:6

Blowing toward the south, then turning toward the north, the wind continues swirling along; and on its circular courses the wind returns.

A study of Jet Stream & Trade Winds will show you that the wind does go in the circular course as described in this verse that was written in between 930-970 BC.

Jet Stream was discovered during World War 2.

The Trade Winds were discovered during the time of Christopher Columbus 1451-1506
(earthguide.ucsd.edu & Wikipedia.org)

How did Solomon know about this in 900 BC?

Isa 44:24

Thus says the LORD, your Redeemer, and the one who formed you from the womb, "I, the LORD, am the maker of all things, stretching out the heavens by myself, and spreading out the earth all alone,

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There are a number of Bible references speaking of the stretching out of the heavens. Isaiah is not the oldest reference, but it was written about 746-680 BC.

With the discoveries found with the Hubble Telescope and studies of redshifts most scientists today will agree that the universe has expanded. This is something that has just been discovered in our life time, but the Bible declared the heavens were stretched out in about 17 different passages several thousand years ago.

When we look at the Bible there is no other document rather it be religious or non religious that has this kind of credentials or uniqueness. In prophecies we see the Bible tell world history in advance and much of it has already happened. So the sincere student can check out if the Bible really can foretell the future by looking to see if it was accurate on predictions in the past. Well it does not end there. As you can see here the Bible also had knowledge of scientific details long before they were discovered by mankind. How is that possible? Well perhaps it is because it is what exactly what it claims to be; the written word of God!

Written by Robert Kiser, ReasonableAnswers.org

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Did Jesus rise from the dead?

This is a good question; although some would ask what difference does it make?

Well it is one thing that separates Jesus from all other religious leaders. As a matter of fact the Apostle Paul said that if Jesus did not rise from the dead then Christianity was a fraud and we are still in our sins. No other religious leader in history predicted their own death and bodily resurrection and left numerous eyewitnesses to testify to this fact.

So how do we know this is really true? How many people have you seen rise from the dead? It is certainly reasonable to question such a claim as this. Is the Bible the only evidence that we have? No it is not our only source in fact we can establish the resurrection of Jesus as historical fact without even using the Bible.

Josephus and Tacitus were both 1st century historians and neither one of them were Christians. Just between these two historians we can show that:

Jesus was a person that was alive around 30 A.D. Jesus was sentenced to death on a cross at the hands of Pontius Pilate. His death seemed to put an end to the followers of Jesus for a short time. Then Christianity arose in the same place where Jesus was crucified and buried. There were those that claimed Jesus rose from the dead. This belief spread from the location of the crucifixion to Rome.

We do not have to use the Bible at all to support this much as fact. We can quote from historians and others who lived at that time to establish this much and more of the story that is given to us in the gospels. Even the historical critics that do not believe the Bible can accept this much to be true.

Who were these people that claimed Jesus rose from the dead and is their testimony reliable? It is interesting that not all of these eyewitnesses were believers in Jesus before the resurrection. Paul and James were both unbelievers until after the resurrection. Paul was even out persecuting the followers of Christ until as he said he met the resurrected Jesus. I find it kind of odd that Paul and James became believers only after the resurrection unless they actually believed it to be true.

Paul mentioned that there were more than 500 eyewitnesses most of whom were still alive in 1 Corinthians 15. This would be a rather foolish statement for Paul to make if it were not true. All the people would have to do is question where are these eyewitnesses? He would have been discredited immediately if there really wasn't any.

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Peter preached to a large group of people in Acts chapter 2 telling them that they themselves were aware of all of the miracles that Jesus performed. He goes onto retell the story of the crucifixion and tells them that he and others are eyewitness of the resurrection. About 3,000 people believed what Peter said and accepted Jesus and were baptized after this speech. That is rather hard to explain if the tomb was not empty because they were in walking distance from it at the time. It would also be very hard to explain if the eyewitness's testimonies were not commonly known by the people.

The Bible mentions 20 of these eyewitnesses by name. These eyewitnesses did not just claim to get a glimpse of Jesus in some spirit form or anything like that after Jesus rose from the dead. They claimed they seen the imprints from the nails from his crucifixion and the place where the soldier pierced his side. They claimed to touch him, talk to him and eat with him on more than one occasion over a period of 40 days at which time some watched him bodily ascend into heaven. Now you can choose not to believe that it really happened, but that is what they claimed.

So we have more than 500 eyewitnesses some of who were non-believers before the resurrection claiming this to be true. Should we believe them? What if they were ALL lying? Let me share something that I find interesting. Simon Greenleaf was a professor of Law at Harvard University from 1833 to 1848. He wrote a three volume work "A Treatise on the Laws of Evidence" that is still a classic in the area of law and evidence today. He took his knowledge of law and the rules of evidence and applied it to the testimony of the disciples. Simon Greenleaf said:

"Let (The Gospels) testimony be sifted, as it were an account given in a court of justice on the side of the adverse party, the witness being subjected to a rigorous cross-examination. The result, it is confidently believed, will be an undoubting conviction of their integrity, ability, and truth."

Now the Pharisees had political and personal motive to expose the disciples as liars if at all possible. The same could be said of the Sadducees and the Roman government. Yet the story of the resurrection prevailed in the one area that should have been the most difficult and unlikely, if it were indeed fabricated. The same area and time frame that Jesus was crucified and buried is where the story originated and grew.

Concerning these eyewitnesses what did they have to gain by spreading this story? What was their motive? John was exiled to the island of Patmos all of the rest of the disciples died violent deaths at different times for this belief that Jesus rose from the dead. What would cause someone to willingly die for a lie with no other apparent motive?

Sure today we can see that there are suicide bombers that willingly die for what they believe. What is the difference? The difference is in what they believed. The suicide bombers believe in their cause. The disciples of Jesus willingly died because they believed they seen, talked to, touched and ate with Jesus on several occasions after he rose from the dead.

Simon Greenleaf also said "If then their testimony was not true, there was no possible motive for this fabrication." (The Testimony of the Evangelists, page 32, by Simon Greenleaf)

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We are left with the historical fact that Jesus was crucified and buried. More than 500 eyewitnesses claimed to see him alive after the resurrection. These people claimed to see him, touch him, talk with him and eat with him. After a 40 day period some of them claimed to watch him bodily ascend into heaven. Many of these people died violent deaths for claiming this to be true.

Our evidence of the resurrection does not rest solely upon the Bible. We have documentation from 1st century historians and other writers that lived during that time. We have eyewitness accounts that were willing to die for their testimony of this fact.

Most people reject the resurrection not because of lack of evidence, but rather from a preconceived notion that it is impossible. I suggest to you that it is not wise to let our preconceived ideas determine truth. Rather let us carefully examine the evidence and let the facts of the case determine the truth.

If you are a currently a non-believer I must warn you. There have been other non-believers with great minds who were critical thinkers who have seriously accepted this challenge and became believers in the process.

Written by Robert Kiser, ReasonableAnswers.org

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WHAT DOES IT MEAN TO BE SAVED?

Acts 16:30-31 the jailer said, "Sirs, what must I do to be saved?" And they said, "Believe in the Lord Jesus, and you shall be saved, you and your household."

When the Jailer asked Paul and Silas what he had to do to be saved the answer was short and sweet. All the Jailer and his household had to do was believe in the Lord Jesus Christ. This passage in the book of Acts tells us they did explain more to him and his household. The text also tells us the Jailer and his household did believe. Although I will dig into this a little deeper I want you to recognize the simplicity of the Gospel. You do not have to be a theologian to go to heaven. You only need Jesus Christ. *Acts 4:12 "And there is salvation in no one else; for there is no other name under heaven that has been given among men, by which we must be saved."* I believe a good place to start this discussion is to see what the words saved and salvation actually mean.

Webster's Collegiate Dictionary tenth edition

SAVED 1. a: to deliver from sin **b:** to rescue or deliver from danger or harm **c:** to preserve or guard from injury, destruction or loss

SALVATION 1. a: deliverance from the power and effects of sin.

SALVATION: Deliverance from the power of sin; redemption.

In the Old Testament, the word salvation sometimes refers to deliverance from danger <Jer. 15:20>, deliverance of the weak from an oppressor <Ps. 35:9-10>, the healing of sickness <Is. 38:20>, and deliverance from blood guilt and its consequences <Ps. 51:14>. It may also refer to national deliverance from military threat <Ex. 14:13> or release from captivity <Ps. 14:7>. But salvation finds its deepest meaning in the spiritual realm of life. Man's universal need for salvation is one of the clearest teachings of the Bible. (from Nelson's Illustrated Bible Dictionary)

The term saved and salvation means that we are rescued and delivered. So a logical question would be rescued and delivered from what? When we turn to Christ we are saved from receiving God's wrath.

Rom 5:8-9 "God demonstrates His own love toward us, in that while we were yet sinners, Christ died for us. Much more then, having now been justified by His blood, we shall be saved from the wrath of God through Him.

John 3:36

"He who believes in the Son has eternal life; but he who does not obey the Son shall not see life, but the wrath of God abides on him."

1Thes 1:9-10 For they themselves report about us what kind of a reception we had with you, and how you turned to God from idols to serve a living and true God, and to wait for His Son from heaven, whom He raised from the dead, that is Jesus, who delivers us from the wrath to come.

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You see God is a loving God but he is also a God of justice. Because he is Holy by nature he hates sin. His justice demands that his wrath is poured out on sin. The Bible tells us " the wages of sin is death, but the free gift of God is eternal life in Christ Jesus our Lord" Rom 6:23. We are also told that *"there is no forgiveness of sin without the shedding of blood"*, Hebrews 9:22. The good news is the only man that was good enough to pay the price of our sins was Jesus and he did this for us on the cross Col.2:13-14. **All we have to do is accept Jesus and his payment for our sins**, it is as simple as that. The Lord allows us to have our free will, He will not force himself on us, yet he loves us so much that he suffered terribly and died in our behalf. Considering what he did for us, is it to much to ask for us to just accept him?

It is a common belief in the world today that good people will go to heaven. Certainly they do not deserve to go to Hell, do they? Lets look to see what the Bible really has to say about this. Isa 64:6 *"For all of us have become like one who is unclean, and all our righteous deeds are like a filthy garment; and all of us wither like a leaf, and our iniquities, like the wind, take us away."*(NAS) All of our righteous deeds are like a filthy garment. This means even the good things that we do are like a stained garment or rag before the Lord. This certainly does not sound good, does it? Ps 39:5 *verily every man at his best state is altogether vanity.*(KJV) Now you may be thinking this must be describing mankind as a whole but what about the few that really are good? Luke 18:18-19 *"And a certain ruler questioned Him, saying, "Good Teacher, what shall I do to inherit eternal life?" And Jesus said to him, "Why do you call Me good? No one is good except God alone.*(NAS) You see the problem is that we say that a person is good because we compare them to other people. Compared to other people there are some really good people. However, the Bible does not use man as the standard for good. The Bible uses God as the standard of good, Jesus said, "only God is good" LK.18:19.

Since God is the standard of good in the Bible, compared to him we are all extremely bad. It is a little easier for us to accept that we are not good when we realize man is not the standard. So you might say, "OK, compared to God I am not good, but compared to other people I am a good person. Certainly I do not deserve to be thrown into Hell just because I am not as good as God himself."

Matt 5:20-22 "For I say to you, that unless your righteousness surpasses that of the scribes and Pharisees, you shall not enter the kingdom of heaven.

21 "You have heard that the ancients were told, 'You shall not commit murder' and 'Whoever commits murder shall be liable to the court.'

22 "But I say to you that everyone who is angry with his brother shall be guilty before the court; and whoever shall say to his brother, 'Raca,' shall be guilty before the supreme court; and whoever shall say, 'You fool,' shall be guilty enough to go into the fiery hell. (NAS)

The scribes and Pharisees were very religious, many of these were considered "good people" yet, Jesus said that you had to surpass even that. Even if you called somebody a fool you are guilty enough to be cast into hell. How many people do you know that never even called somebody a fool their entire life? In Mat.5:28, We are told that, if a man even looks at a woman with lust in his heart, he is guilty. So not only would you have to have a perfect life, as far as, your actions, but you also must be pure in all of your thoughts for your entire life. Any person that does not measure up to this standard is in danger of being cast into hell. The Bible tells us that no man is that good.

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Rom 3:23 “for all have sinned and fall short of the glory of God”

I Jn 1:8 “If we say that we have no sin, we are deceiving ourselves, and the truth is not in us.”

Without the rest of the gospel message, this paints a very unpleasant picture for all of mankind. The question every person has to answer is will you accept Jesus and his payment for your sins? Or will you instead, turn your back on him and choose the same destination as the devil and his angels? Whether you believe this or not, these are the only two choices. Jesus said "He who is not with Me is against Me" Matt 12:30

Before a person accepts Jesus as Lord they are spiritually dead. The Apostle Paul writing to the Christians in Ephesus said they were dead in your trespasses and sins and were by nature children of wrath before they accepted Jesus as their Lord Eph 2:1-3. Jesus when talking to Nicodemus said, "unless one is born again, he cannot see the kingdom of God." John 3:3-10. The person that was spiritually dead becomes spiritually born. This is what it means to be born again. You were first born physically and when you receive this spiritual birth you are born again.

By turning to the Lord you are also turning away from sin. Jesus preached and said *"Repent, for the kingdom of heaven is at hand."* Matt 4:17. Peter included repentance in the wiping away of sin. Acts 3:18-20 *"But the things which God announced beforehand by the mouth of all the prophets, that His Christ should suffer, He has thus fulfilled. Repent therefore and return, that your sins may be wiped away, in order that times of refreshing may come from the presence of the Lord; and that He may send Jesus, the Christ appointed for you"*

So let's look at what it means to repent.

REPENT: 1: to turn from sin and dedicate oneself to the amendment of one's life

2: a: to feel regret or contrition b: to change one's mind.

Webster's Collegiate Dictionary tenth edition

REPENTANCE A turning away from sin, disobedience, or rebellion and a turning back to God <Matt. 9:13; Luke 5:32>. In a more general sense, repentance means a change of mind <Gen. 6:6-7> or a feeling of remorse or regret for past conduct <Matt. 27:3>. True repentance is a "godly sorrow" for sin, an act of turning around and going in the opposite direction. This type of repentance leads to a fundamental change in a person's relationship to God.
(from Nelson's Illustrated Bible Dictionary)

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As you can see to repent means more than just feeling bad about something. True repentance involves a change of direction in one's life. To really turn to the Lord you must also turn away from that which he hates, sin. We have seen that we are all sinners and it is the sinners that Jesus came to save Mt.9:11-13. We are all spiritually dead until we are convicted of or sin, repent and turn to the Lord. Once we do this we receive a spiritual birth and are born again. This does not mean all of your troubles will go away, in fact, we are promised we will have troubles, but Jesus will be with us through them. Jn.16:33, Mt.28:20. This also does not mean that you will become sinless, the Apostle Paul himself struggled with this Rom.7:24, But we are to confess our sins.

I Jn 1:7-10 if we walk in the light as He Himself is in the light, we have fellowship with one another, and the blood of Jesus His Son cleanses us from all sin. If we say that we have no sin, we are deceiving ourselves, and the truth is not in us. If we confess our sins, He is faithful and righteous to forgive us our sins and to cleanse us from all unrighteousness. If we say that we have not sinned, we make Him a liar, and His word is not in us.

Once we are born again it does mean we will change. 2 Cor 5:17 "if any man is in Christ, he is a new creature; the old things passed away; behold, new things have come." I Jn 3:9 No one who is born of God practices sin, because His seed abides in him; and he cannot sin, because he is born of God." This change that takes place in a true Christian will continue through their whole life. Phil 1:6 "For I am confident of this very thing, that He who began a good work in you will perfect it until the day of Christ Jesus"

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WHAT MAKES CHRISTIANITY DIFFERENT? IN SEARCH OF THE TRUTH, WITH REASON, LOGIC & EVIDENCE

Whether you are an atheist, agnostic or believer in some form of religion you must first answer the age old question. "Where did man come from?" At this point you are left with two choices.

(1) All life came into being by pure chance. Then through the chain of evolution man evolved from some sort of organism. Those that hold to this position actually exercise more faith than those who hold to the belief of Christianity. I say this because throughout all known history no one has ever seen evolution take place. A tadpole may turn into a frog, but for a frog to turn into a prince is a fairy tale not science.

In the book "what is Creation Science?" by Henry Morris & Gary Parker we find some interesting quotes and comments concerning this. (pg.2, 86 & 88)

"However, as the eminent Harvard biologist, Ernst Mayr, one of the nation's top evolutionist has observed: "Darwin never really did discuss the origin of species in his *On the Origin of Species*" (Niles Eldredge,1985a). Not only could Darwin not cite a single example of a new species originating, but neither has anyone else, in all the subsequent century of evolutionary study" "Darwin himself was acutely aware of this evidence of creation and the problem it posed for his theory. In a chapter of *Origin of the species* called "Difficulties With the Theory," he included traits that depend on separate meaningless parts. Consider the human eye with the different features required to focus at different distances, to accommodate different amounts of light, and to correct for the "rainbow effect." Regarding the origin of the eye, Darwin wrote these words: "To suppose that the eye, (with so many parts all working together)....could have been formed by natural selection, seems, I freely confess, absurd to the highest degree." "

Absurd to the highest degree." That's Darwin's own opinion of using natural selection to explain the origin of traits that depend on many parts working together." One could go into much more detail on evolution , but that is not our purpose here. It is sufficient to say evolution is based upon faith not science.

(2) The second choice is we were created by some sort of God. This of course leads to the question, does this God communicate with mankind? Most people will logically say yes to this. Otherwise they are left with the dilemma of, why would a supreme being bother to create at all only to then ignore his creation? As I stated earlier most people that believe in a God also will believe that he communicates with mankind thus forming what we call religion. Suppose we are created by God and this God communicates with mankind. We should then be able to look back into history and find some sort of record of this communication. Certainly mankind would record something of such great importance and magnitude. Logic should then tell us that if there is a "true religion" this religion should be ancient. In other words, since, God and mankind have been around a very long time the records of communication between them should date back to days of antiquity.

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There are numerous religions today that cannot be traced back to ancient times. This would include such groups as Scientology, Christian Science, Jehovah Witnesses and Mormons to name just a few. Scientology stems from L.Ron Hubbard who was born in 1911. Christian Science is traced back to Mary Baker Eddy in the 1800's. Jehovah Witnesses and the Watchtower Bible and Tract Society are traced back to Charles Taze Russell in the 1800's. Mormonism which is The Church of Jesus Christ of Latter Day Saints is traced back to Joseph Smith in the 1800's. What these religions all have in common is that they are relatively new. Groups such as these may try to claim connection to the New Testament itself. However their doctrines of who God is and his nature, as well as other important major doctrines, such as what salvation is and how it is obtained can only be traced back to their founders of their religion. Certainly truth concerning God should be just as true today as it was 200 years ago or even several thousand years ago. If this same truth was known back then shouldn't we be able to find some record of it? I believe that it is reasonable to expect to find some such record containing their doctrines of God. So if their doctrines concerning God and salvation cannot be found in anybody's writings even 1,000 years ago, why should we believe it?

Some people base their ideas on what they feel is right or because it sounds good. Is something true simply because it sounds good or it is a profound statement? To accept something as true based only on that it sounds good or feels good is not rational. Sure people end up accepting Jesus as their Savior and thus exercising faith. However Christianity is not a blind faith. There is plenty of evidence to show that Jesus is much more than just a great man. There is also ample evidence to show the Bible is not just a collection of books. Rather the evidence of 100% accuracy in Bible prophecy points to divine inspiration.

The doctrines concerning God, in Christianity, do not just sound good. The bible is confirmed to be the word of God by fulfilled prophecy. There is also confirmation in its accuracy found in archeology. The doctrines concerning God in Christianity can also be traced to the reformation period and on through the Catholic Church. From there they can be traced through the writings of the early church fathers and finally connect to the disciples and the New Testament itself. The New Testament connects to the Old Testament or Judaism. In other words, before the New Testament, Judaism was looking forward to the coming of the Messiah. There are numerous prophecies in the Old Testament pertaining to this Messiah. Jesus actually fulfilled these prophecies. This is our evidence that he is the Messiah or the Christ that was to come. In short, in Christianity, we can trace the doctrines concerning God and his nature as well as salvation from the present all the way back to the book of Genesis. Here in the book of Genesis, we go all the way back to where we are told of creation itself.

We are looking for a religion of antiquity because God and man have both been around a long time. Therefore the records of communication between God and man should go back a long time. There are of course, other religions of antiquity such as the Islamic religion (Muslims) or the followers of Buddha. Some people would ask, "why not accept these records as well?" **"Isn't there truth in all religions?"** Different religions make such drastic different claims about God, it is impossible for all religions to be correct. For example, Christianity says God is knowable John 17:3. On the other hand Islam says God is unknowable. To the Muslim it would be blasphemous to say that God is spirit. Jesus however informs us that the Father is spirit John 4:24. There are numerous such contradictions between Christianity and other religions whether ancient or new.

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The next logical question is **what makes Jesus any more credible than other religious leaders of ancient times**, such as Buddha or Muhammad? The answer to this is in the credentials of Jesus himself. Unlike other religious leaders, Jesus was told about in great detail before he was even born. There are numerous prophecies that Jesus fulfilled such as the blood line he would be born through Gen 22:18, Matt 1:1, where he would be born at Micah 5:2, Matt.2:1, how he would be betrayed Ps.41:9, Zech.11:12-13, Jn.13:21- 26, Matt.27:5-7. There are many more prophecies, some of which were in the Introductory issue of this newsletter. The Dead Sea Scrolls confirm the fact that the prophecies were written long before Jesus was born. Jesus also performed many miracles offering them as evidence as to who he was John 10:36-39. The fact that Jesus performed what the people considered miracles is confirmed outside of the bible by the Jewish Historian Josephus who lived AD.37-100. No other religious leader, has performed miracles that are confirmed by other credible historic sources. Jesus predicted his own death and resurrection and then actually rose from the dead. No other religious leader in history has ever done this. Truly no other religious leader in history even comes close to these types of credentials.

Buddha, Muhammad, Confucius and other ancient leaders did not do any miracles verified by credible historical sources. They were not told about in detailed prophecies before they were born. Last of all they did not rise from the dead. When Buddha, Muhammad, Confucius and other ancient leaders died they remained dead!

This makes what Jesus has to say more credible than what Buddha, Muhammad or Confucius may have said. Let us also not forget that Jesus claimed to be the only way in which mankind could come to God the Father John 14:6. All evidence shows that we can either choose Jesus or cling to some other hope that does not have any real substance or credibility in known facts. Which will you choose?

Keep in mind that the "one true church" is not a denomination but rather a body of believers in which Major doctrines are consistent. I am referring to Christianity which includes several denominations and non-denominational churches.

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For more detailed information explaining and defending Christian Beliefs please go to:

<http://ReasonableAnswers.org/>

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