PART 4

EXPERT LAND NAVIGATION

Supplement

USING THE MILITARY LENSATIC COMPASS

WARNING

This presentation is intended as a quick summary, and not a comprehensive resource. If you want to learn Land Navigation in detail, either buy a book; or get someone, who has the knowledge and skills, to teach you in person.

NOTE

To get the ideas across presented on these slides, many figures, pictures, and calculations may not be to scale and may be exaggerated for clarity.

Note:

Prior to being issued any training *equipment, you will be required to sign a "statement of liability" agreeing to pay for anything you damage or lose.

All items will be inspected and inventoried prior to your signature and at the end of the training day too.

If you do not intend to sign this statement, then you may be denied training.

* **You may use your own equipment.**

Any Questions?

BREAK TIME

. . . and now on with the . . .

LAND NAVIGATION WITH MAP AND LENSATIC COMPASS

LAND NAVIGATION

Why Learn **Land Navigation**? *Training and practicing land navigation on foot provides the following everyday navigation (how not to get lost) benefits;*

- *Tracking present location (Where am **I** ?)*
- *Determining Distance (How far is it and am **I** there yet ?)*
- *Sense of direction (Where do **I** want to go and where am **I** actually going ?)*
- *How to read a topographic map (Do **I** understand the map ?)*
- *Terrain and map association (What hill or river am **I** looking at ?)*
- *Spatial skills (Can **I** mentally visualize the landscape in 3D ?)*
- *Planning safe, practical routes (Take a long safe route or a short risky route ?)*
- *And more Navigational skills*

The best way to learn **LAND NAVIGATION** is to get "dirt time", that is, get out there with a map and compass!

Navigation is not about finding yourself after you are lost (although that's what happens sometimes); it's about keeping track of your position as you move away from a known point. As you move you have to remain cognizant of the terrain you are leaving, of the terrain you are passing, and of the terrain that is ahead.

Navigation in the wilderness means knowing your starting point, your destination, and your route to get there.

These skills will allow you to venture farther off the beaten path than you ever thought before.

THIS PRESENTATION IS DIVIDED INTO FOUR PARTS

PART 1 Basic Land Navigation

- The Lensatic Compass
- The Topographic Map
- The Land and Map Association

PART 2 Intermediate Land Navigation

- Making Sense of Direction
- Tracking Present Location
- Determining Travel Distance

PART 3 Advance Land Navigation

- Planning to Navigate
- Navigation Methods to Stay On Course
- Additional Skills of Land Navigation

PART 4 Expert Land Navigation

- Navigation in different types of Terrain
- Night Navigation
- Sustainment

Any Questions?

PART 4

EXPERT LAND NAVIGATION

supplement

- **Navigating WITHOUT a MAP**
  - Description
  - Skills

NAVIGATING WITHOUT A MAP

DESCRIPTION

The LAND NAVIGATION information, concepts, and skills already presented in the other lessons will help you to navigate anywhere in the world.

However, there will be a time when you DO NOT have a map, and all you have is a Lensatic Compass.

With this technique you can navigate, plan your route, stay on course, and keep track of your location from start to finish, at all times.

- There are dozens of situations when you may have to navigate without a map.
- This can make you uneasy. Unless you know what you are doing, and have very high confidence in your navigation skills, without a map.
- Once these skills are mastered, you can even navigate without a compass !!!

NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

This process means using Mathematics and Measurements for navigation; a process for plotting lines or angles on a chart. The technique is based on the CARTESIAN COORDINATE SYSTEM.

With this technique, one can be more precise on their location and never be lost.

This technique is very useful when one does not have a map available.

When going from Point A to Point B, you can travel in any direction/multiple directions, and still reach Point B.
You do not have to travel in a straight line to reach Point B. And you do not need a map.

When someone else communicates a location, you can meet them there. Even if both parties do not have a map.

One can establish their position in featured or featureless terrain, foul weather, or even in complete darkness.

Required equipment …

- **Lensatic Compass** (use as a protractor for headings, measurements, and drawing lines on paper)
- **Paper** (water proofed for durability – able to write on and erase)
- **Pencil** (preferably one that can write in rain or wet paper)
- Calculator (optional – for adding positive and negative numbers)
- Protractor (optional – used to determine direction and draw/plot lines on paper)
- Plotter Ruler (optional – similar to a protractor)
- Mechanical Compass (optional – for drawing circles)

This technique can also ...

- Be used for making an accurate one dimensional map of the area.
- Be used on a topographical map instead of a plotter graph.
- Be used with a number system that two or more people (at different locations) will understand, when communicating via radio or other means of communication, of their location.
- Be used for many other purposes, that you can think of.

NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

This is all you need.

LENSATIC COMPASS

Pencil

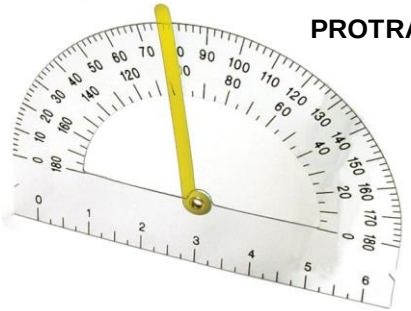
Paper

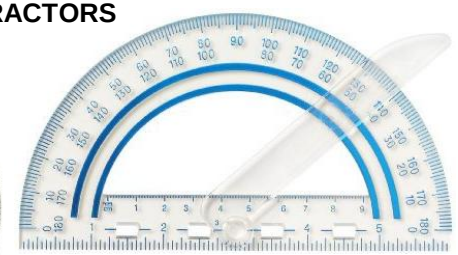
NAVIGATING WITHOUT A MAP

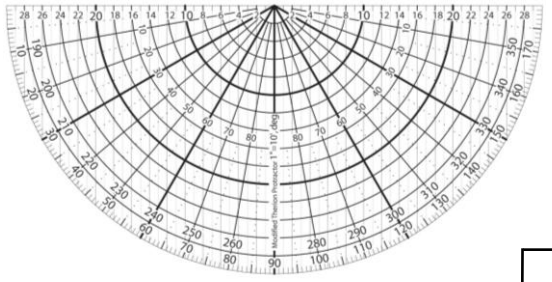
Using a Lensatic Compass

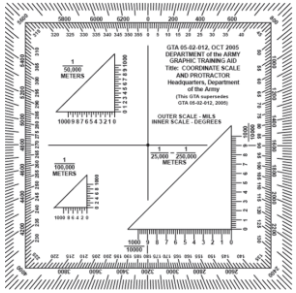
OPTIONAL - Here are some examples of PROTRACTORS and PLOTTER RULERS.

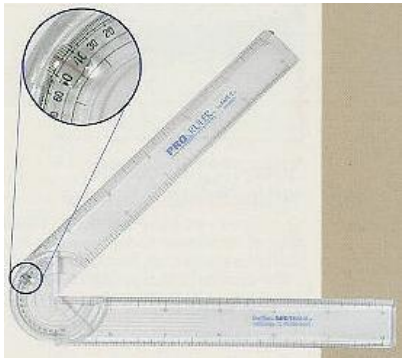
PROTRACTORS

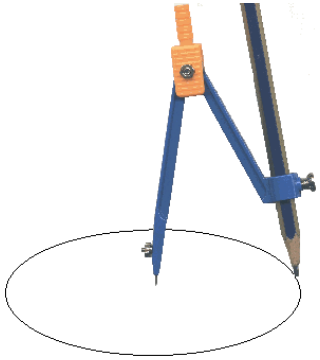




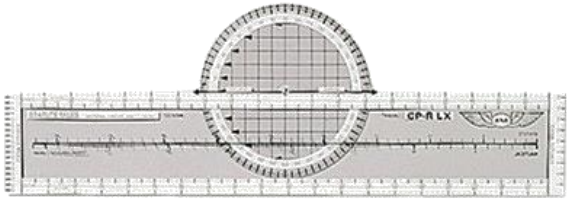




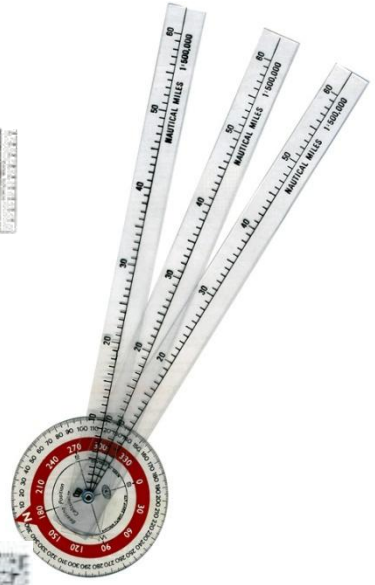


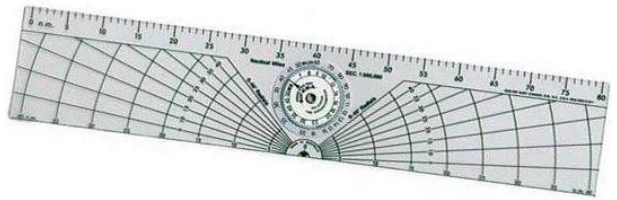


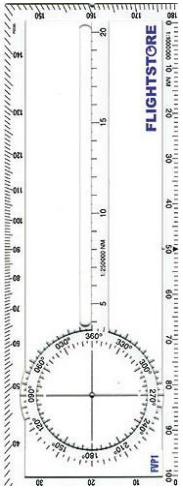
Mechanical Compass



PLOTTER RULERS vary in size and format, but this is a fair representation of one. Notice that there is a protractor on the top. This protractor is marked off in 360 degree segments. The horizontal lines are for orientation with your course, and also have various scales so that the device can be used on a variety of charts that may utilize different measurement scales.





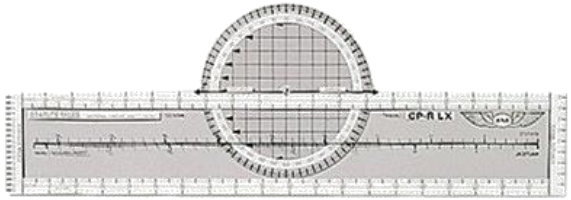


NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

OPTIONAL - Here are some examples of PLOTTERS and GRAPH PAPER.

SEA PLOTTER for ship navigation on water. With an integrated adjustable parallel arm fitted with a moveable compass rose. This permits the direct plotting of magnetic compass courses.



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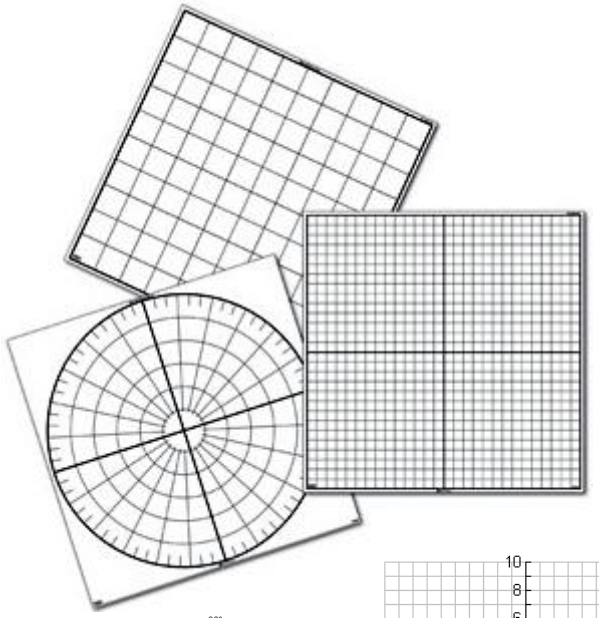
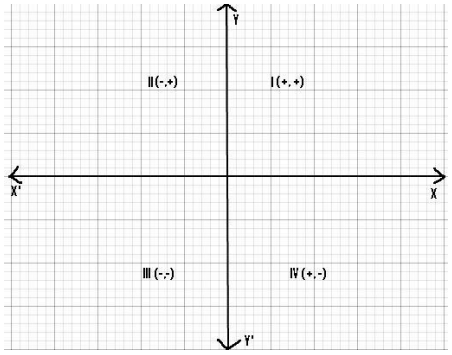
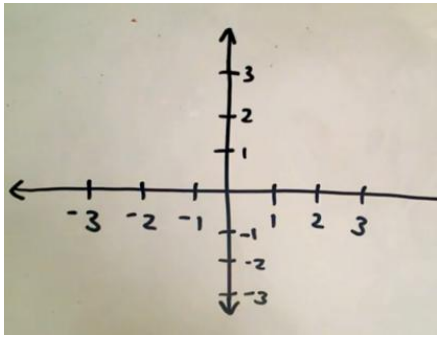
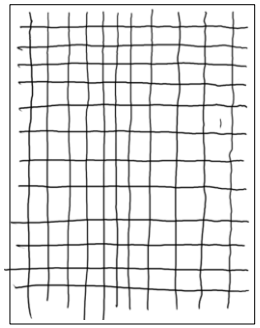
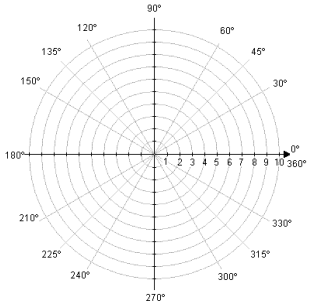
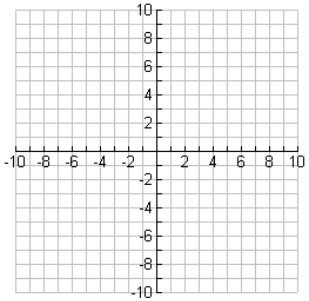












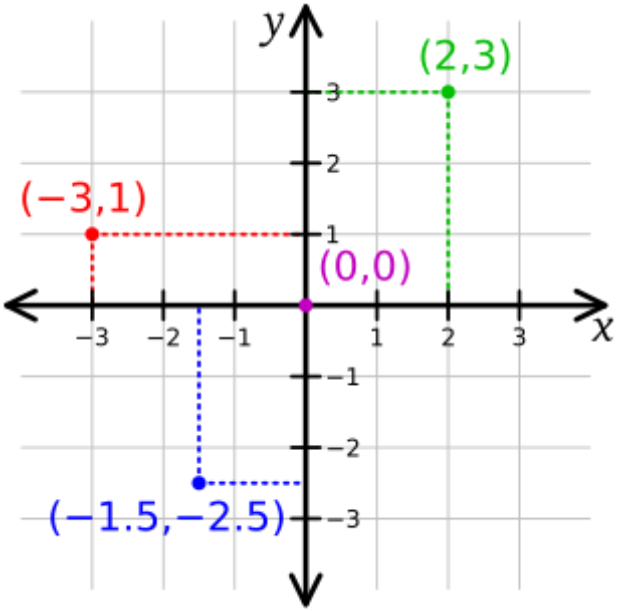
Graph Papers and Coordinate Graphs.

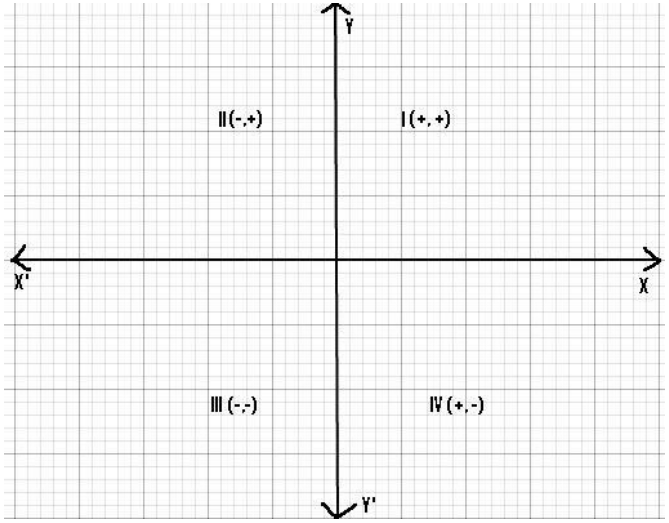
Draw your own Cartesian Coordinate System on blank paper or Graph Paper.

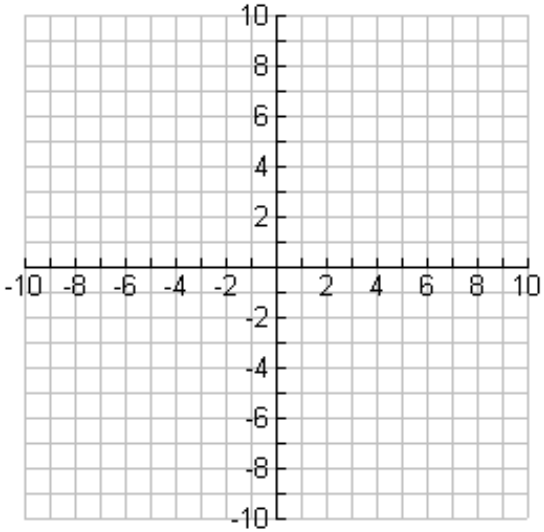
NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

The technique is based on the CARTESIAN COORDINATE SYSTEM.







The following pages will explain how to use this system for land navigation.

NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

Here is the basics of using the System.

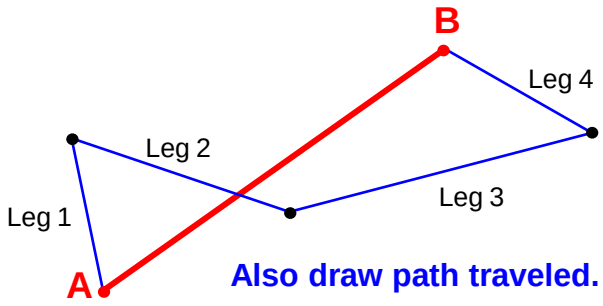
Step One

1. On a blank sheet of paper draw a Cartesian Coordinate system.
2. Use the Lensatic Compass to draw straight lines and equal tick marks.
3. Number the tick marks as shown.

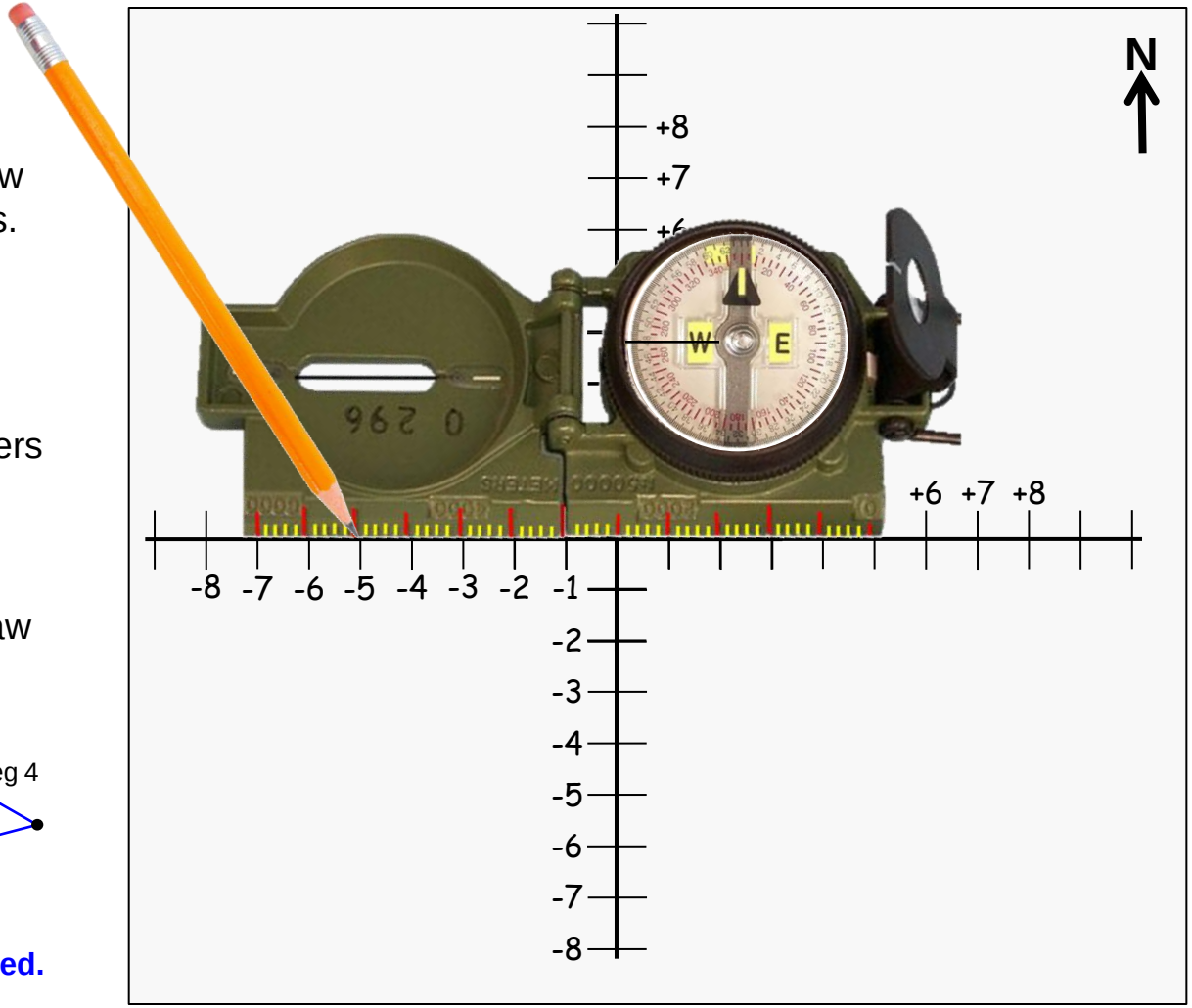
NOTE

Remember that . . .
LEFT & BOTTOM is negative numbers
RIGHT & TOP is positive numbers

4. Use any number system desired.
5. Also leave space to be able to draw your path traveled.



Also draw path traveled.



NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

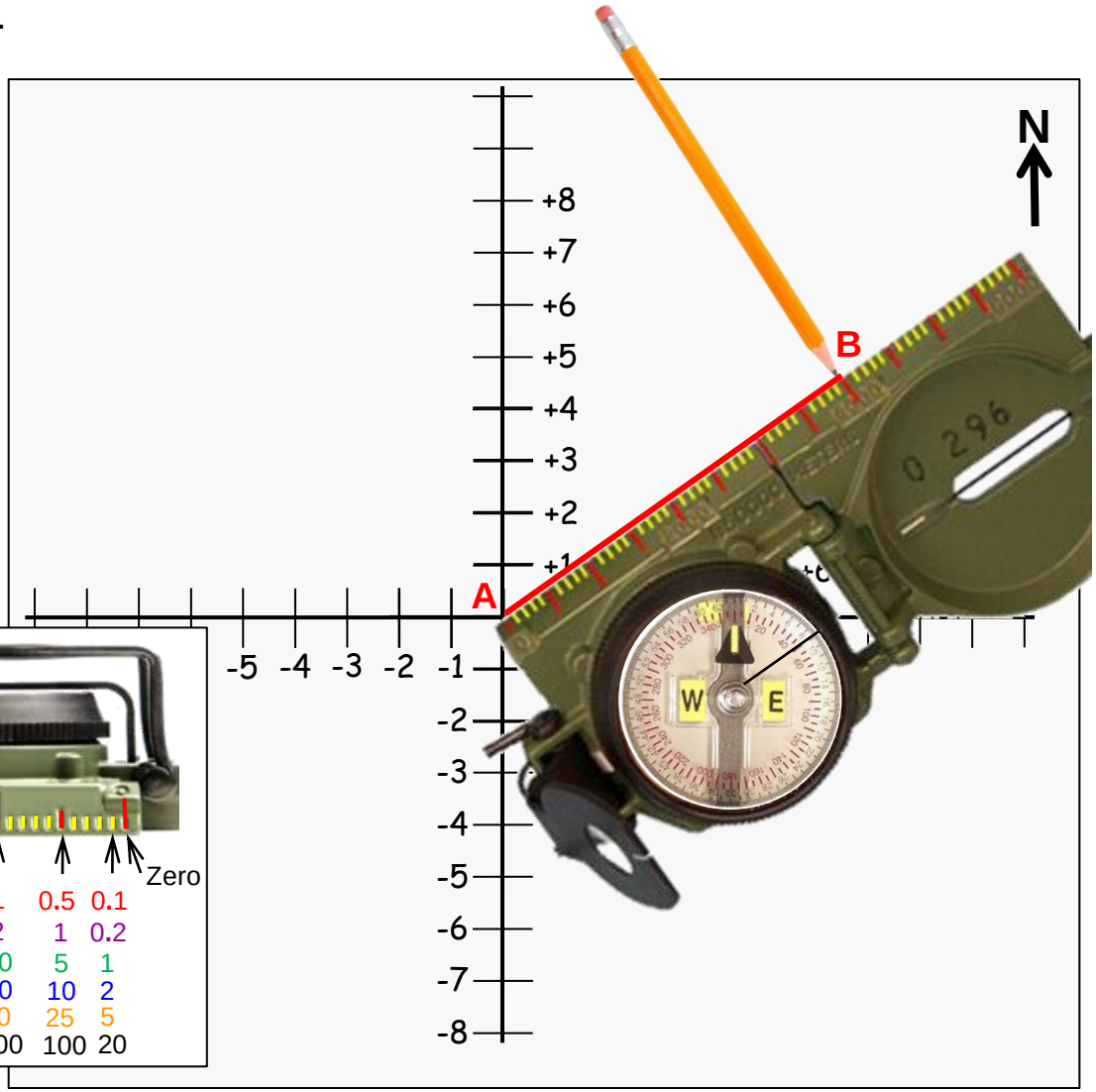
Here is the basics of using the System.

Step Two

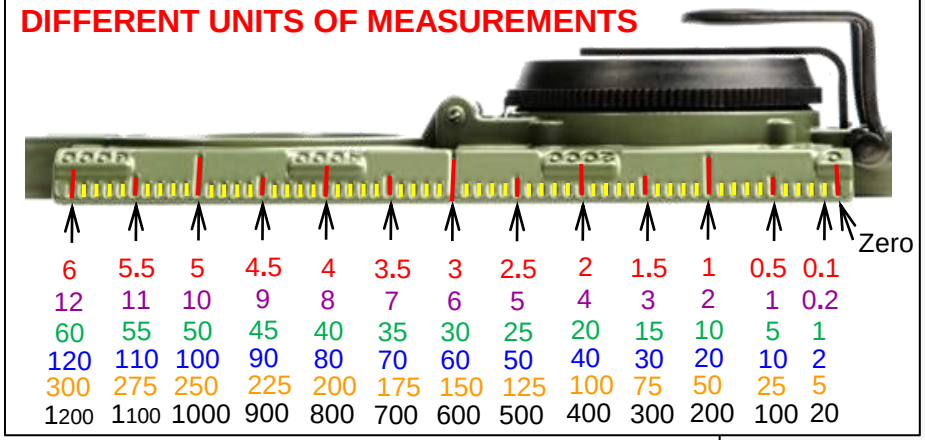
1. From your current location (A), you decide on a heading of 50° and a distance of 8 units of measurement to (B).

2. Units of measurement can be **any desired** distance, count, or number system.

   Feet
   Meter
   Time
   Pace Count
   Mile
   Kilometer
   Number System



DIFFERENT UNITS OF MEASUREMENTS



NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

Here is the basics of using the System.

Step Three

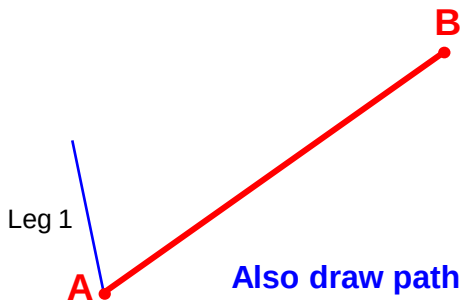
1. From your current location (A), you decide on a heading of 50° and a distance of 8 units of measurement to (B).

2. Units of measurement can be any desired distance, count, or number system.

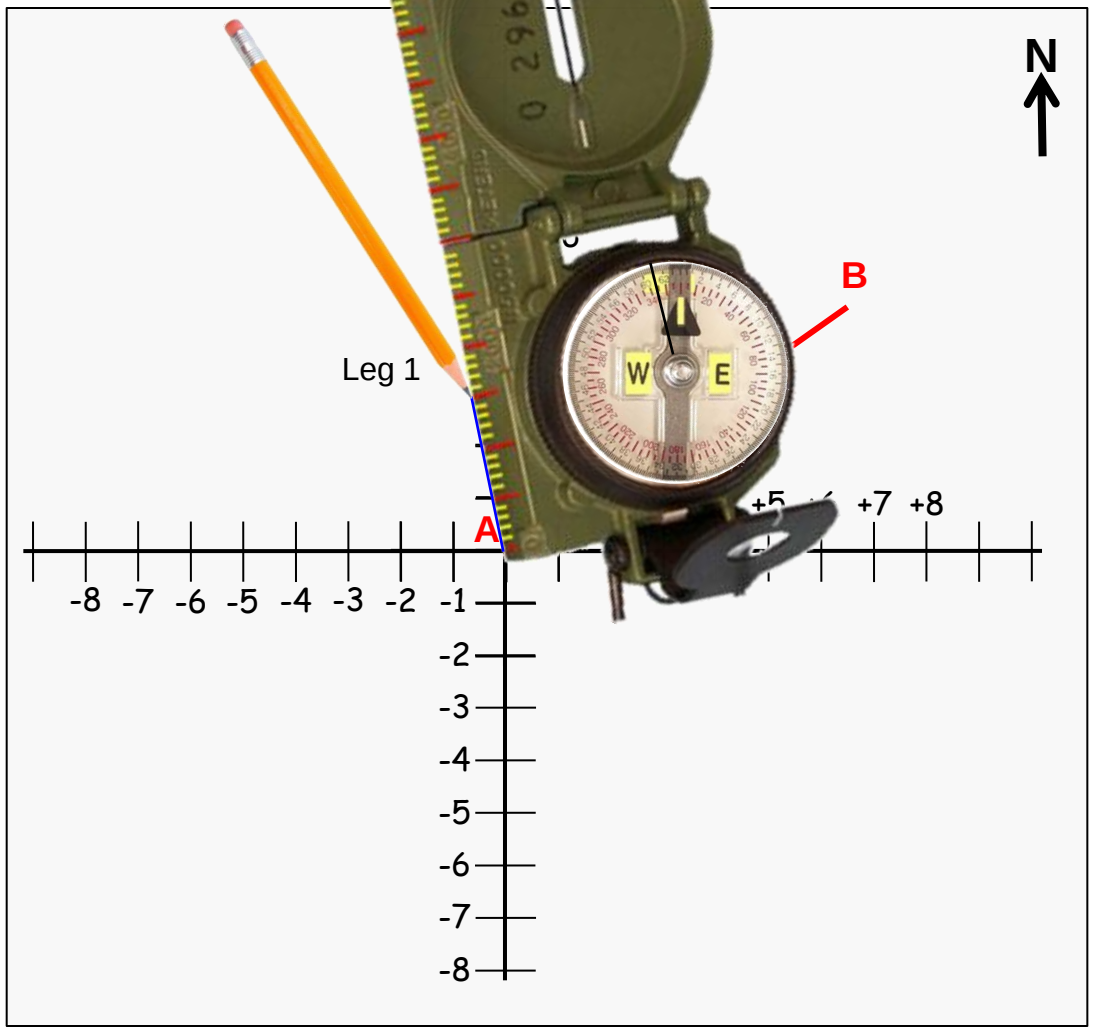
   Feet
   Meter
   Time
   Pace Count
   Mile
   Kilometer
   Number System

3. However, you decide that you DO NOT want to go in a straight line from (A) to (B). But instead, in **multiple directions**.

   Leg 1 = 345° and 3 units



Also draw path traveled.



NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

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Step Three

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   Feet
   Meter
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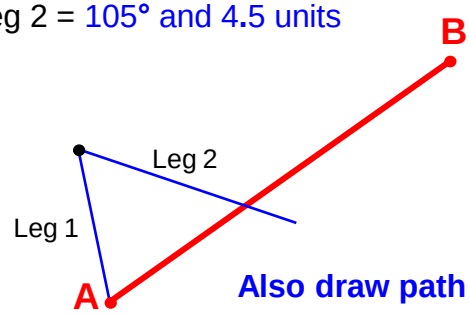
   Mile
   Kilometer
   Number System

3. However, you decide that you DO NOT want to go in a straight line from (A) to (B). But instead, in **multiple directions**.

   Leg 1 = 345° and 3 units
   Leg 2 = 105° and 4.5 units



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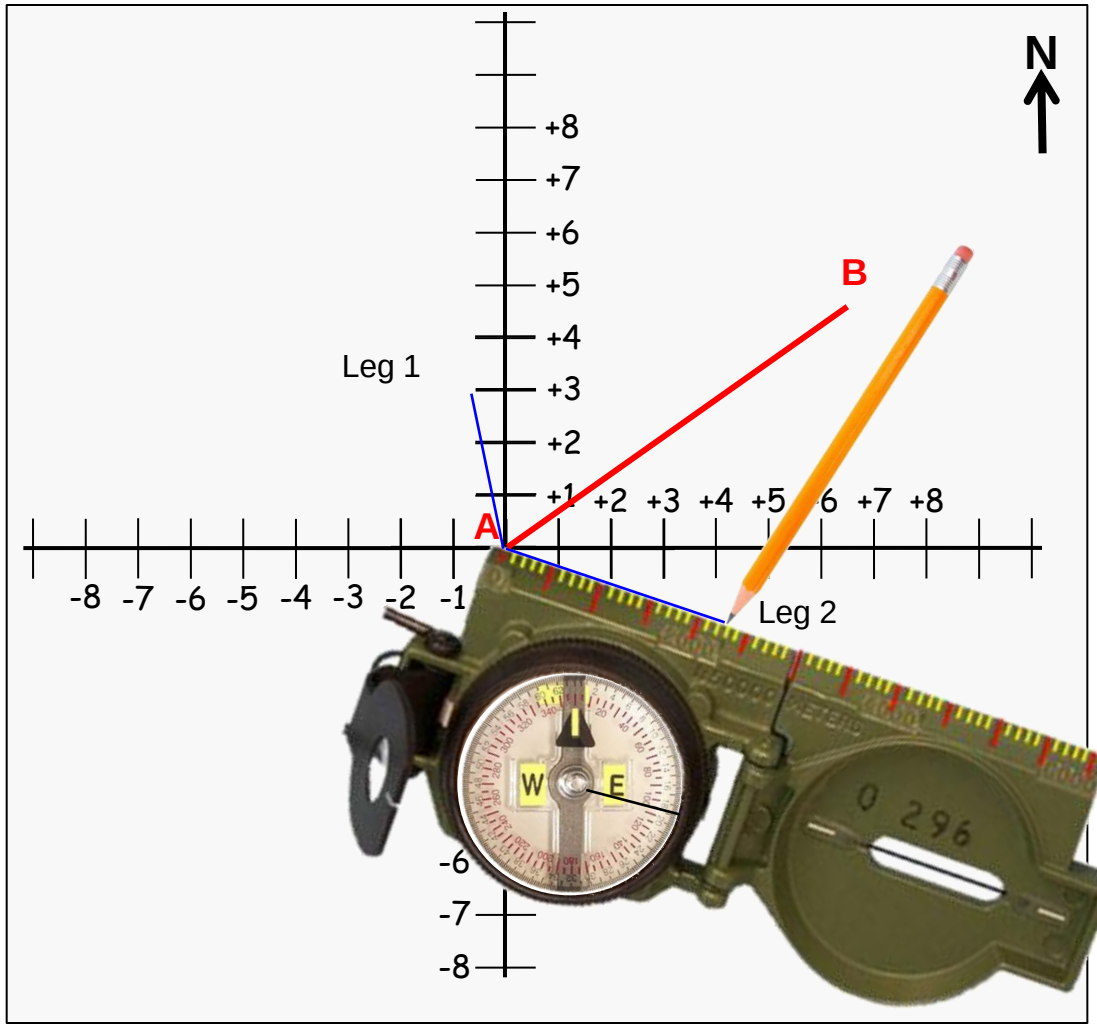

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Step Three

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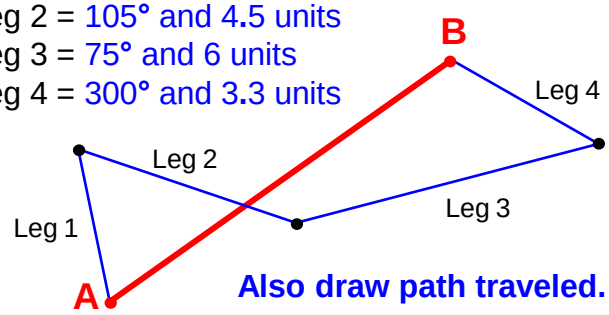
   Feet
   Meter
   Time
   Pace Count
   Mile
   Kilometer
   Number System

3. However, you decide that you DO NOT want to go in a straight line from (A) to (B). But instead, in **multiple directions**.

   Leg 1 = 345° and 3 units
   Leg 2 = 105° and 4.5 units
   Leg 3 = 75° and 6 units
   Leg 4 = 300° and 3.3 units



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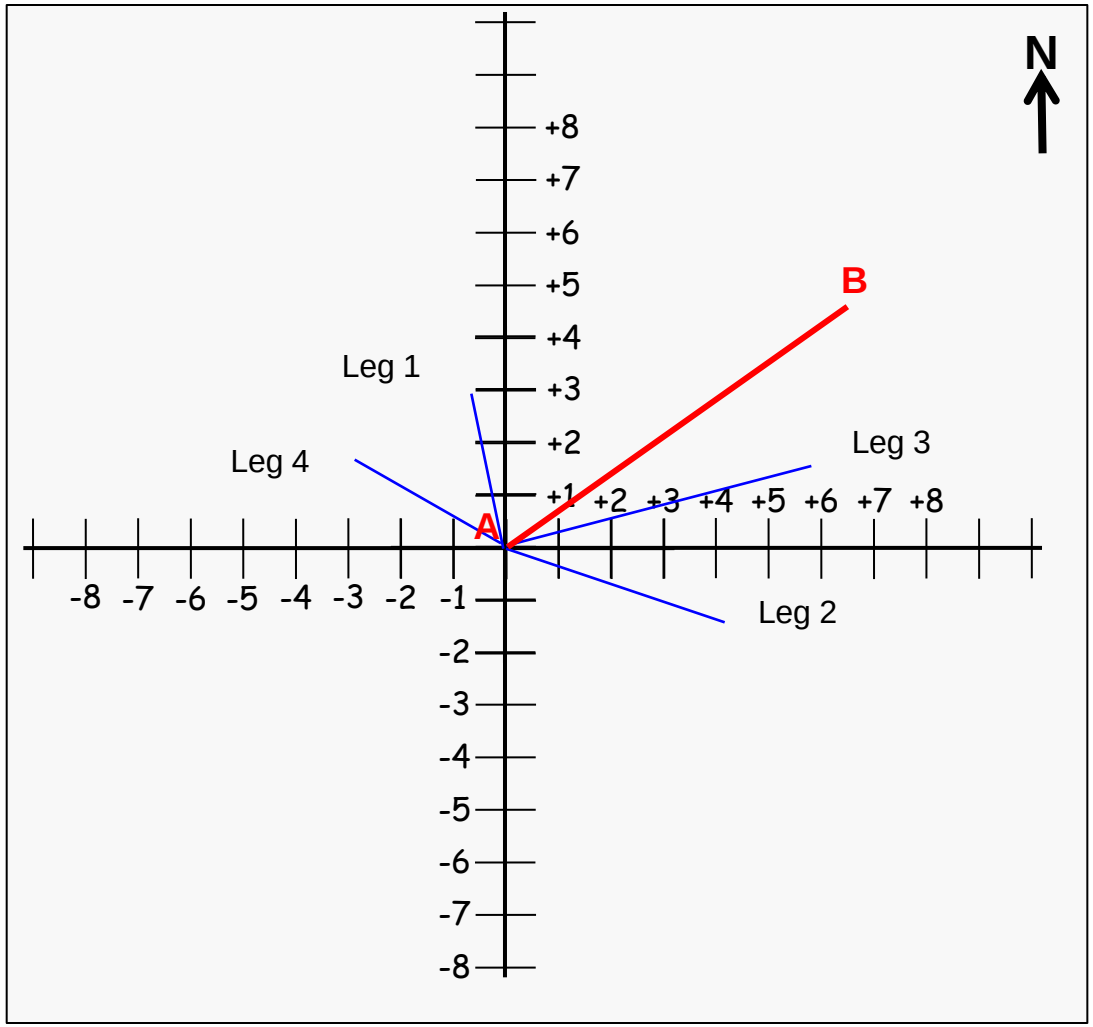

NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

Here is the basics of using the System.

Step Three

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   Feet
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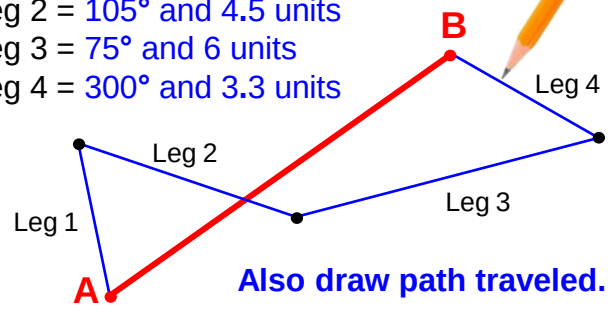

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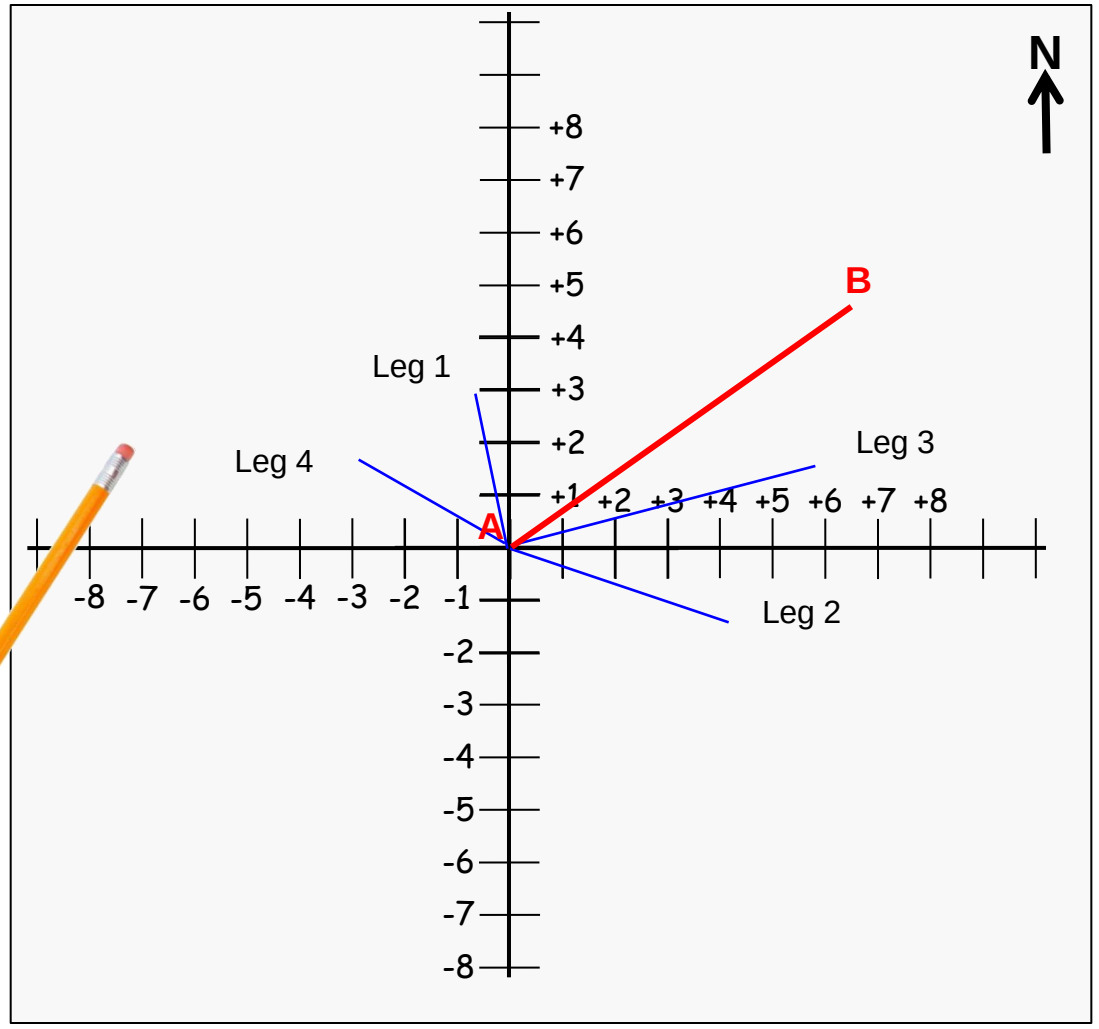


NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

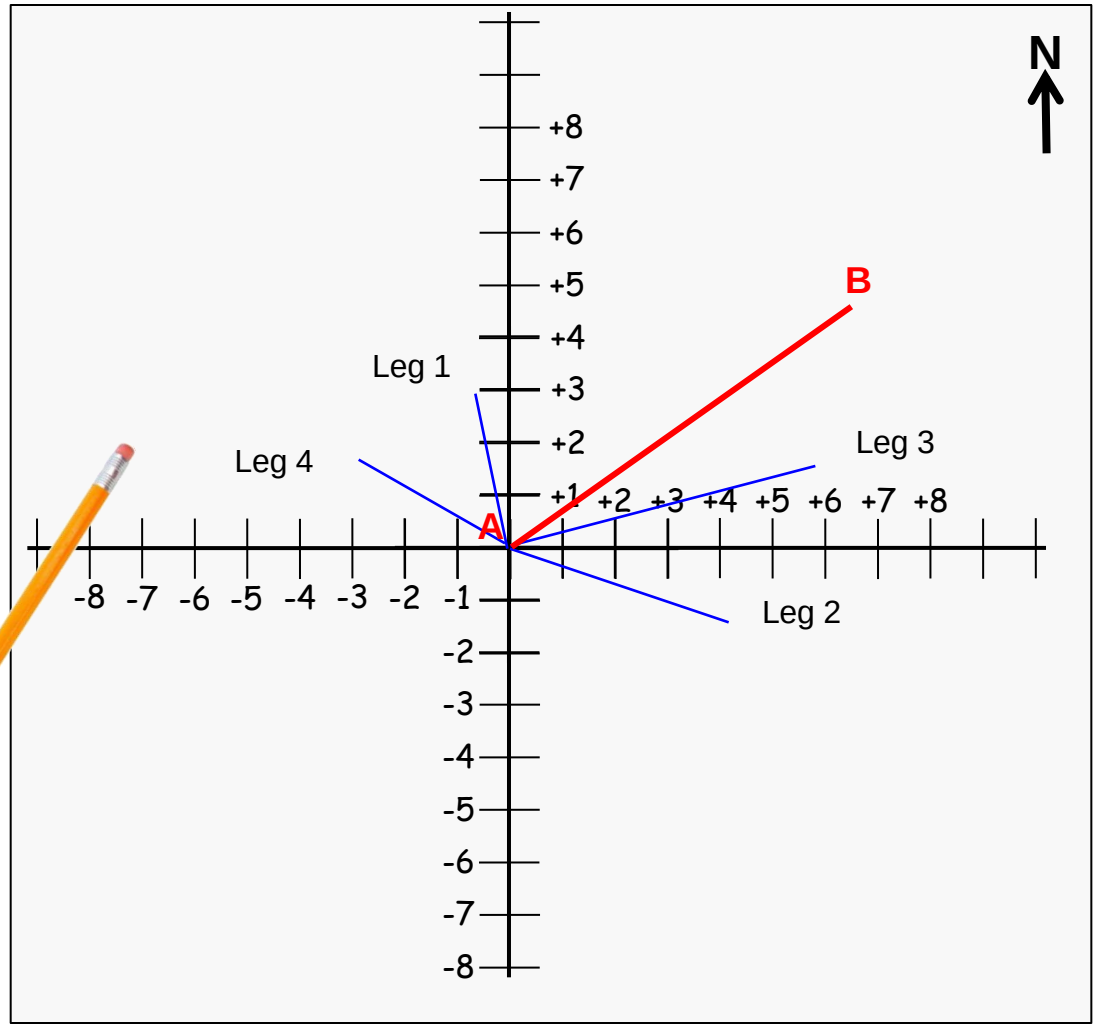
Here is the basics of using the System.

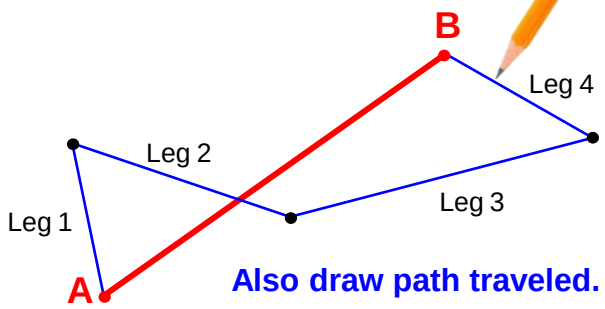
Step Three

4. Every Time you change directions, draw and write down the …

   - LEG # or Route
   - Heading
   - Units of Measurements

5. Always use Intermediate Landmarks or some reference point, to stay on course.





Also draw path traveled.

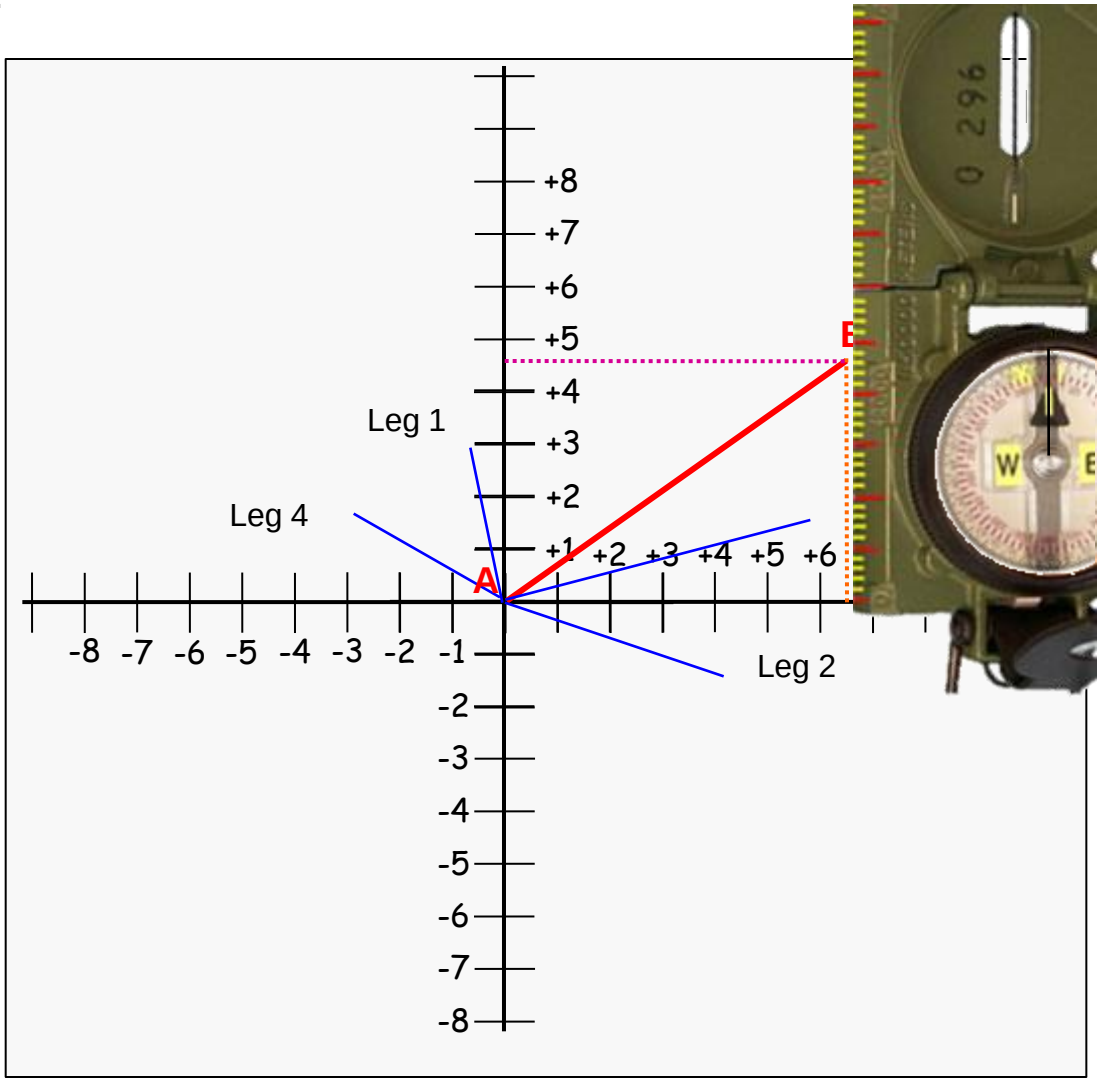
NAVIGATING WITHOUT A MAP

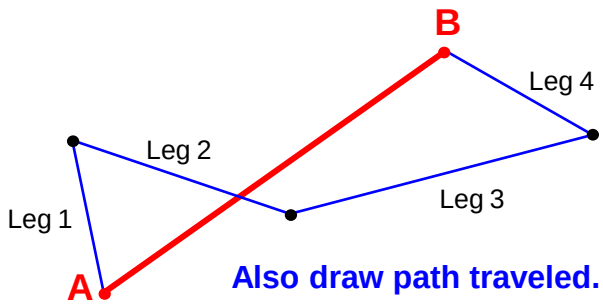
Using a Lensatic Compass

Here is the basics of using the System.

Step Four

1. Measure Vertical and Horizontal Distance of **MAIN Route** (**A**) to (**B**) .
   Vertical = +4.6





Also draw path traveled.

NAVIGATING WITHOUT A MAP

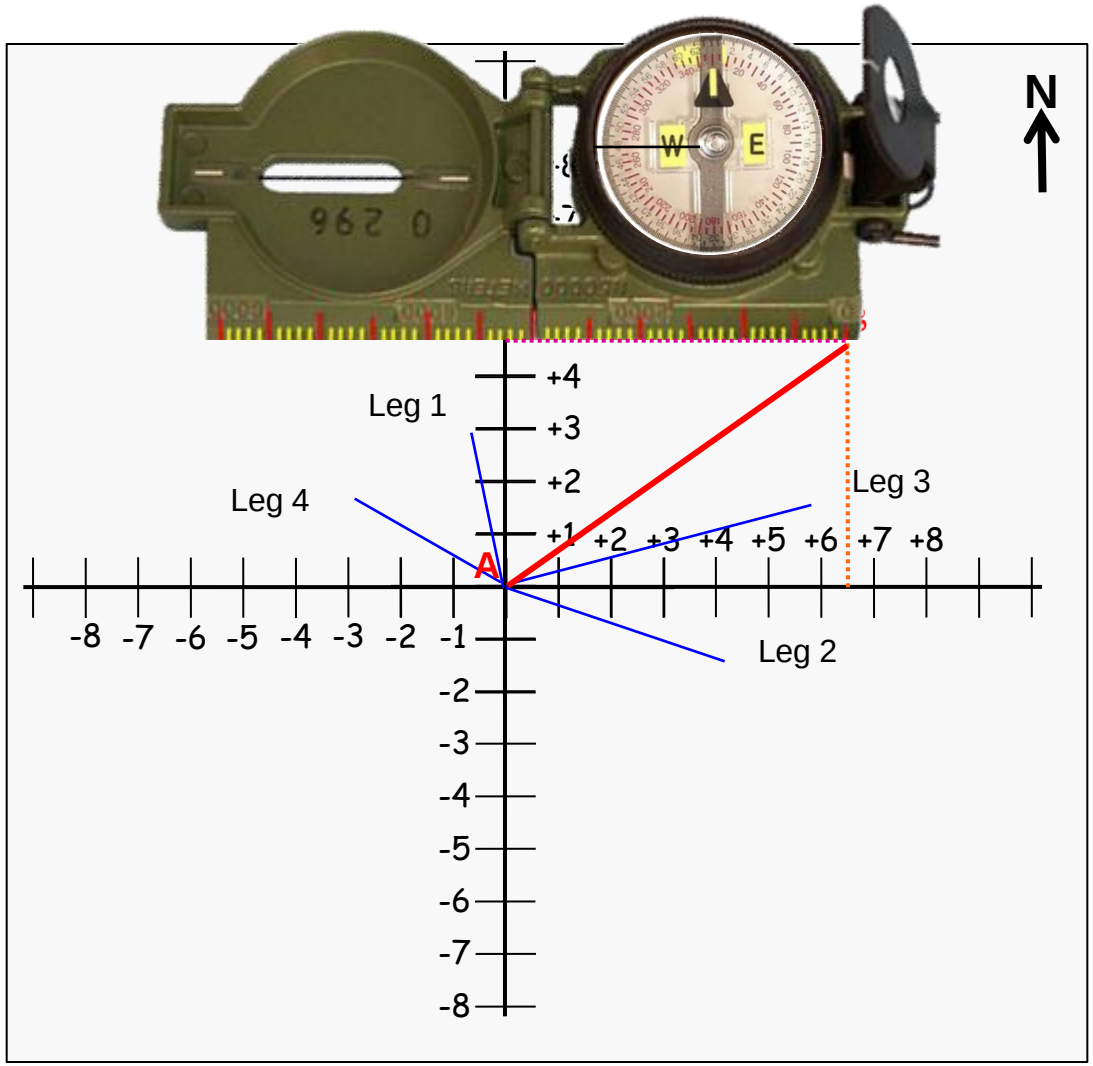
Using a Lensatic Compass

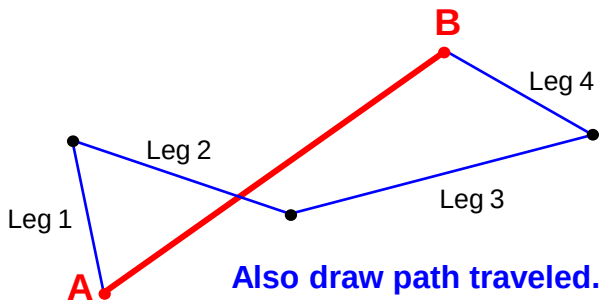
Here is the basics of using the System.

Step Four

1. Measure Vertical and Horizontal Distance of **MAIN Route** (**A**) to (**B**) .
   Vertical = +4.6
   Horizontal = +6.5

This is the **MAIN V +4.6** , **H +6.5** numbers





Also draw path traveled.

NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

Here is the basics of using the System.

Step Four

1. Measure Vertical and Horizontal Distance of **MAIN Route** (**A**) to (**B**) .
   Vertical = +4.6
   Horizontal = +6.5

   This is the **MAIN V +4.6** , **H +6.5** numbers

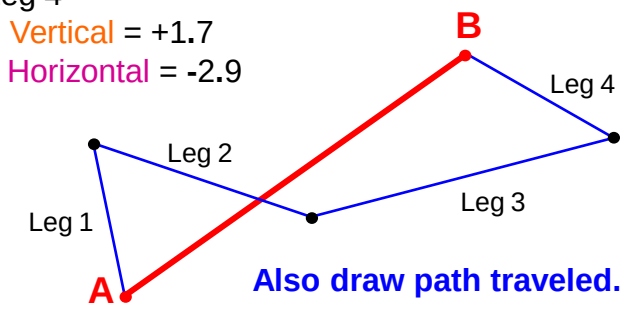
2. Next measure LEGS Vertical and Horizontal

Leg 1
Vertical = +2.9
Horizontal = -0.7

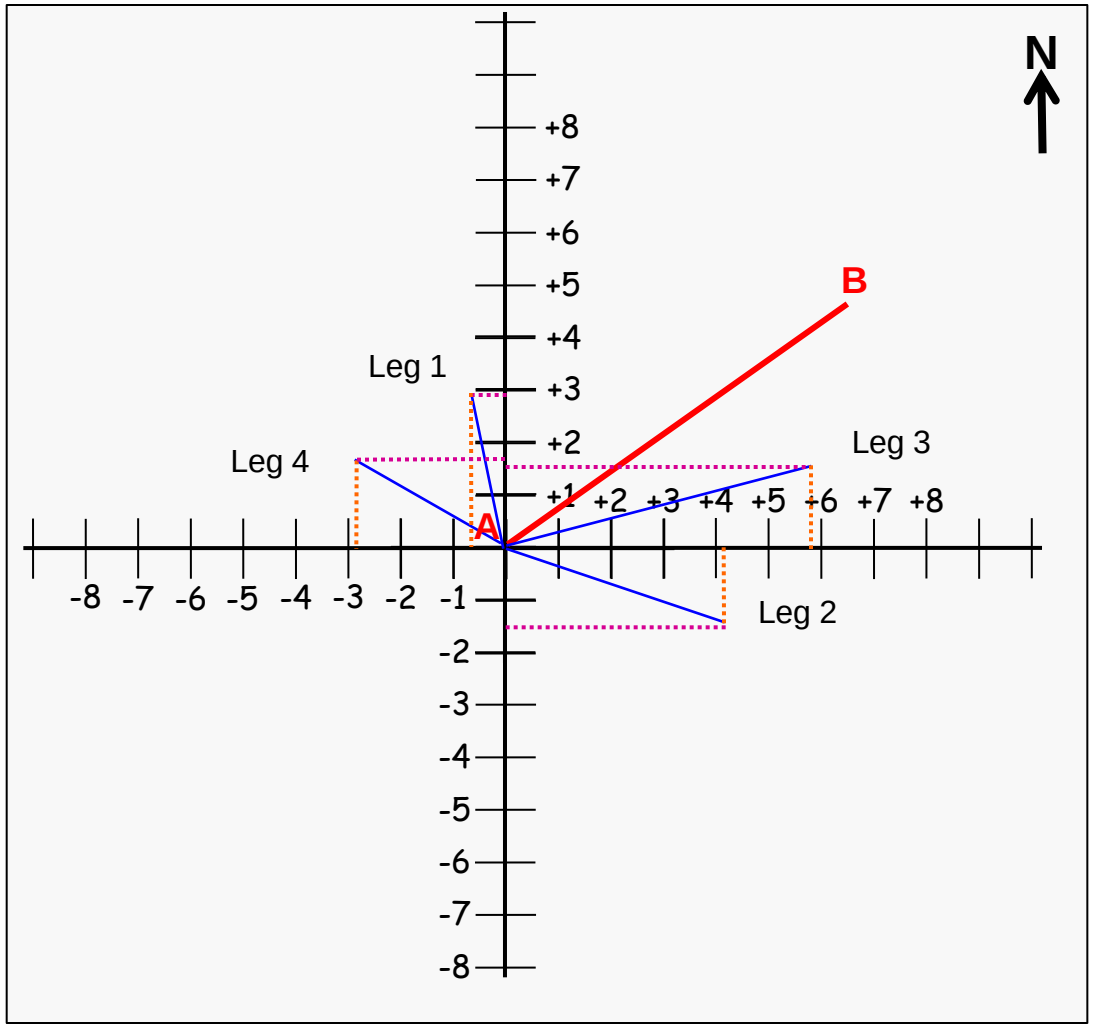
Leg 2
Vertical = -1.5
Horizontal = +4.1

Leg 3
Vertical = +1.5
Horizontal = +5.8

Leg 4
Vertical = +1.7
Horizontal = -2.9



Also draw path traveled.



NAVIGATING WITHOUT A MAP

Using a Lensatic Compass

Here is the basics of using the System.

Step Five

1. SUM all the **LEG** Verticals
   SUM all the **LEG** Horizontals

   Leg 1
   Vertical = +2.9
   Horizontal = -0.7

   Leg 2
   Vertical = -1.5
   Horizontal = +4.1

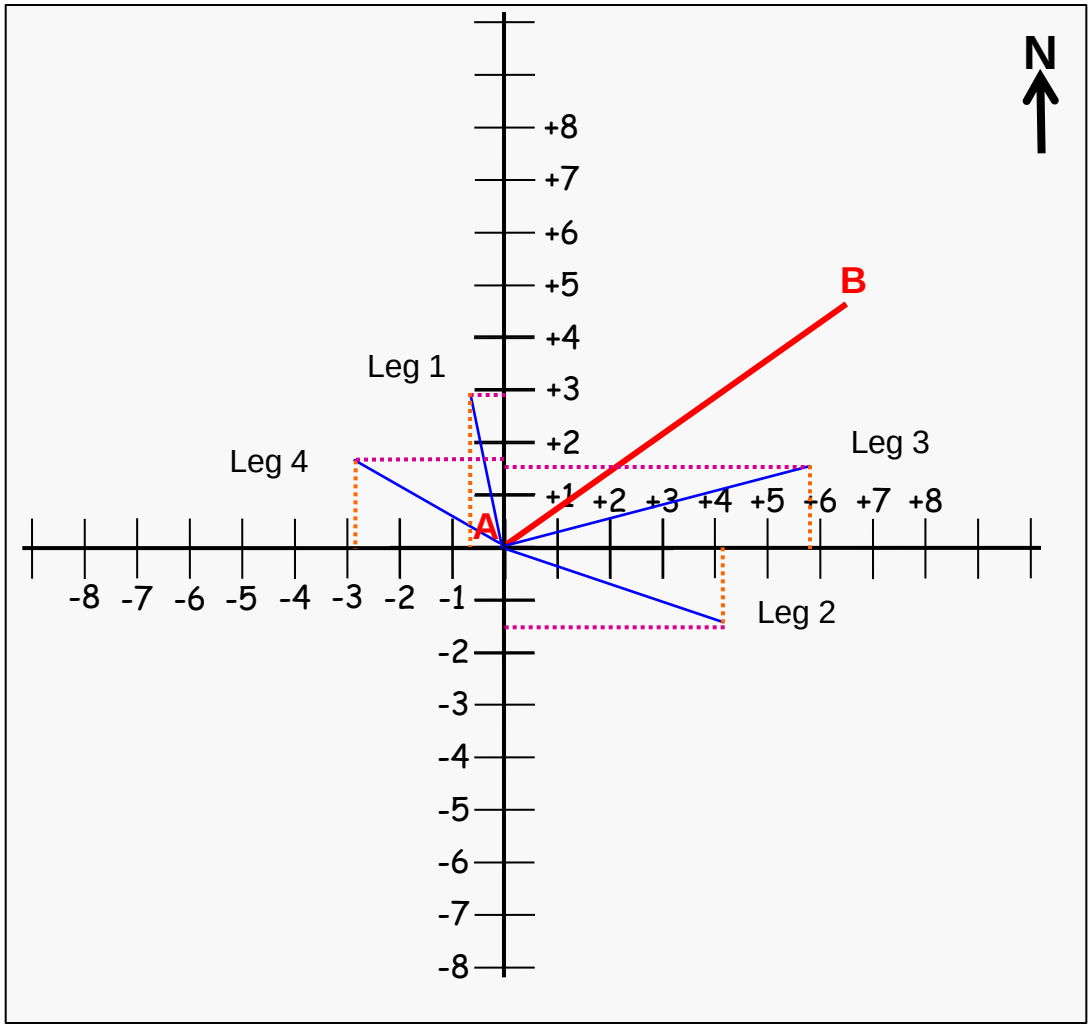
   Leg 3
   Vertical = +1.5
   Horizontal = +5.8

   Leg 4
   Vertical = +1.7
   Horizontal = -2.9

Verticals = (**+2.9**)+(**-1.5**)+(**+1.5**)+(**+1.7**) = **+4.6**
Horizontals = (**-0.7**)+(**+4.1**)+(**+5.8**)+(**-2.9**) = **+6.5**

2. The LEG Vertical and Horizontal totals will equal the **MAIN Route** (**A**) to (**B**) .
   Vertical = +4.6
   Horizontal = +6.5

   This is the **MAIN V +4.6** , **H +6.5** numbers



NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)

Here is the basics of using the System.

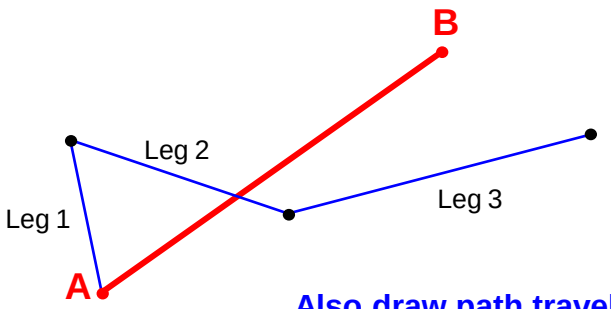
1. Why are these numbers important?

Verticals = (**+2.9**)+(**-1.5**)+(**+1.5**)+(**+1.7**) = **+4.6**
Horizontals = (**-0.7**)+(**+4.1**)+(**+5.8**)+(**-2.9**) = **+6.5**

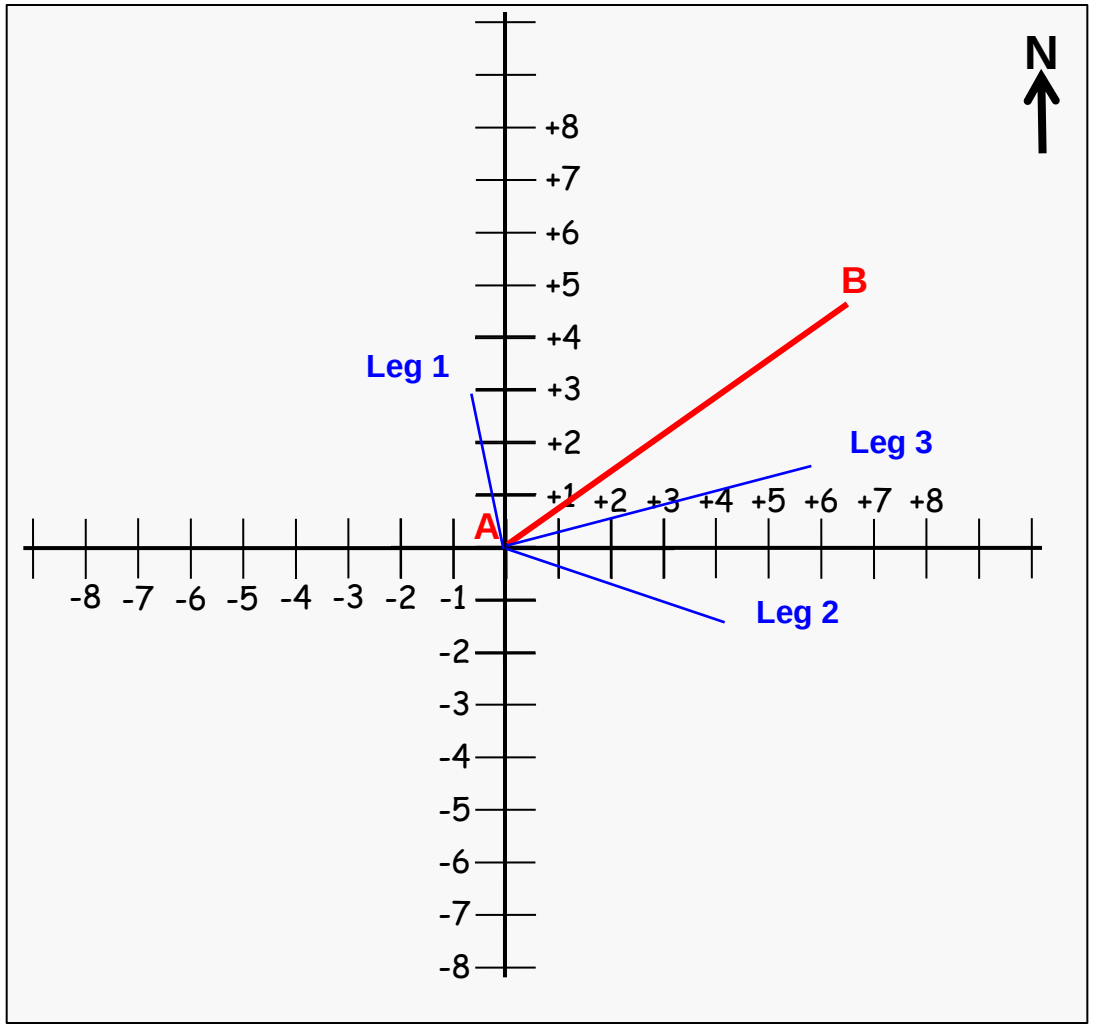
The LEG Vertical and Horizontal totals equaled the **MAIN Route** (**A**) to (**B**) .

Vertical = +4.6
Horizontal = +6.5

2. Suppose you only traveled LEGS 1 thru 3. . .
   - Stopped to radio in your position
   - Decided to head to a new location other than (**B**)
   - Wanted to know what heading and distance to (**B**) is, from current location at end of LEG 3.
   - Decided to head back to **Point** (**A**).



Also draw path traveled.



NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)

Here is the basics of using the System.

1. With only **LEGS 1** thru **3** traveled. Add the Verticals and Horizontals.

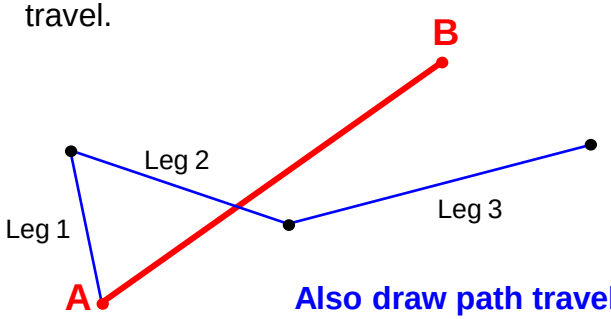
Verticals = (**+2.9**)+(**-1.5**)+(**+1.5**) = **+2.9**
Horizontals = (**-0.7**)+(**+4.1**)+(**+5.8**) = **+9.2**

The **LEG** Vertical and Horizontal totals **DO NOT EQUAL** the **MAIN Route** (**A**) to (**B**) .
Vertical = +4.6
Horizontal = +6.5

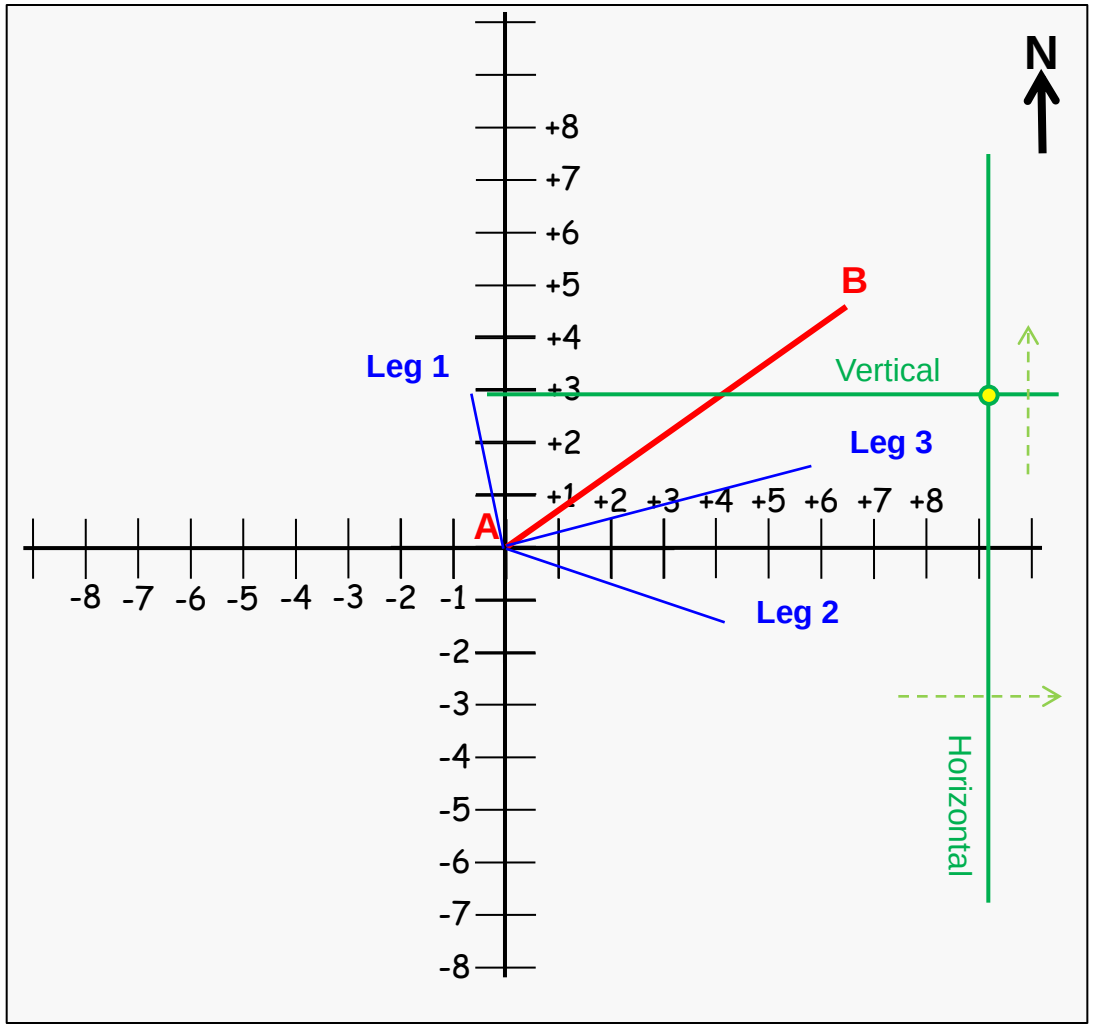
2. Draw a **Vertical Plotter Line** that equals **+2.9** and a **Horizontal Plotter Line** that equals **+9.2**.

3. Where the **Plotter Lines** cross, this is your **current location** (), in relation to **Points** (**A**) and (**B**) .

4. Now you can plan your next LEG or Route to travel.



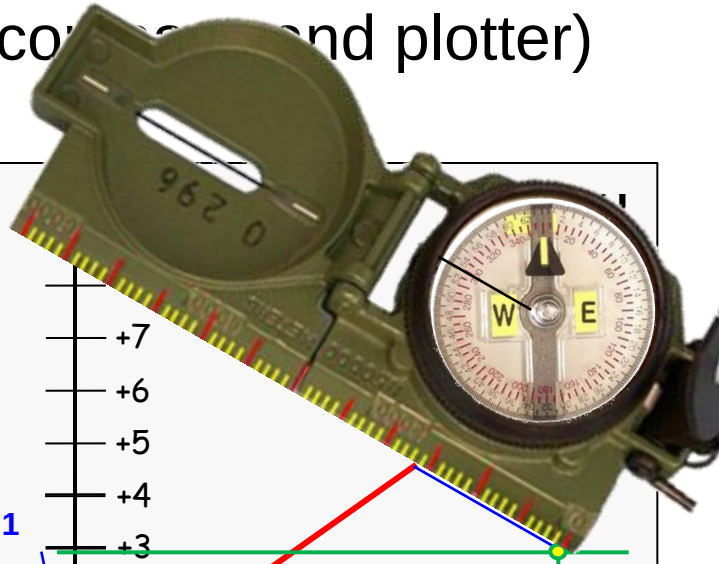
Also draw path traveled.



NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – co[illegible]nd plotter)

Here is the basics of using the System.



SCENARIO one

*You wanted to know what heading and distance to (**B**) is, from current location at end of LEG 3. This would be LEG 4 calculation.*

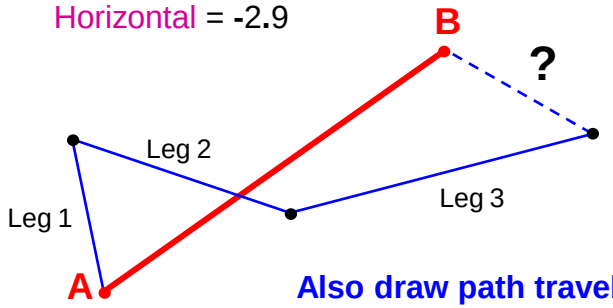
1. With the Lensatic Compass laid out from **current location** (◎) to Point (**B**), you can get the Heading and Units of Measurement.

   Leg 4 = 300° and 3.3 units

2. This would be LEG 4 calculations. Now you have the directions to get to Point (**B**).

3. And to measure LEG 4 Vertical and Horizontal numbers, just draw LEG 4 from **zero**.

Leg 4
Vertical = +1.7
Horizontal = -2.9



Also draw path traveled.

NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)

Here is the basics of using the System.

SCENARIO two

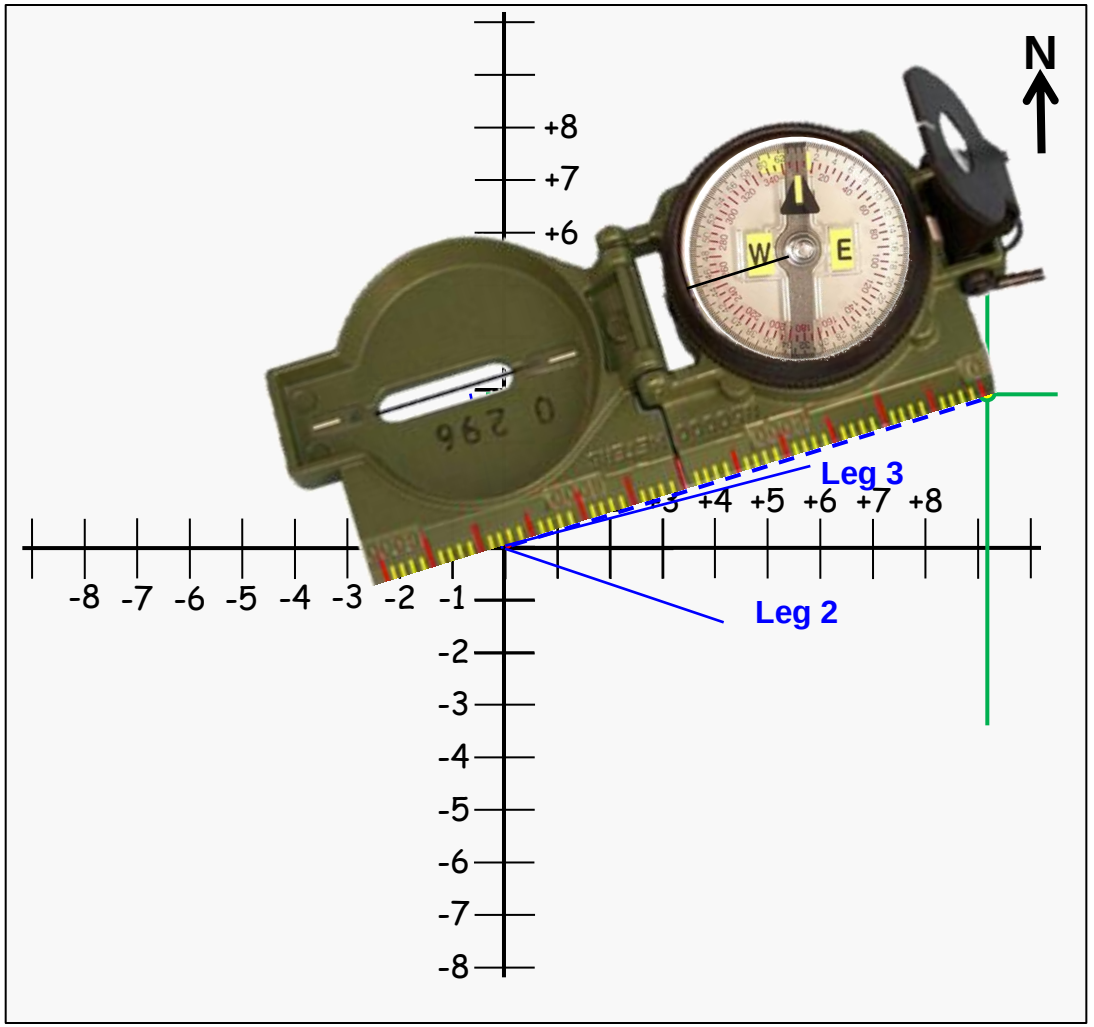
*You decided to head back to Point (**A**). This would be a NEW LEG 4 calculation.*

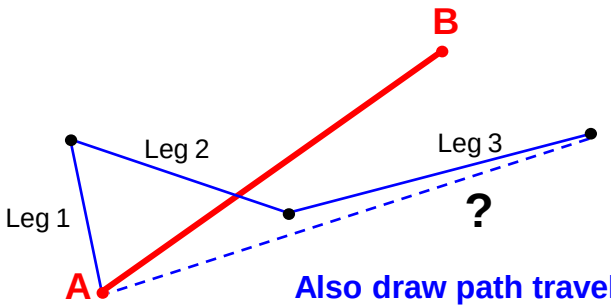
1. With the Lensatic Compass laid out from **current location** (◎) to Point (**A**), you can get the Heading and Units of Measurement.

   NEW LEG 4 = 255° and 9.6 units

2. This would be LEG 4 calculations. Now you have the directions to get back to Point (**A**).

3. But you want to verify your calculations. . . (see next page)





Also draw path traveled.

NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)

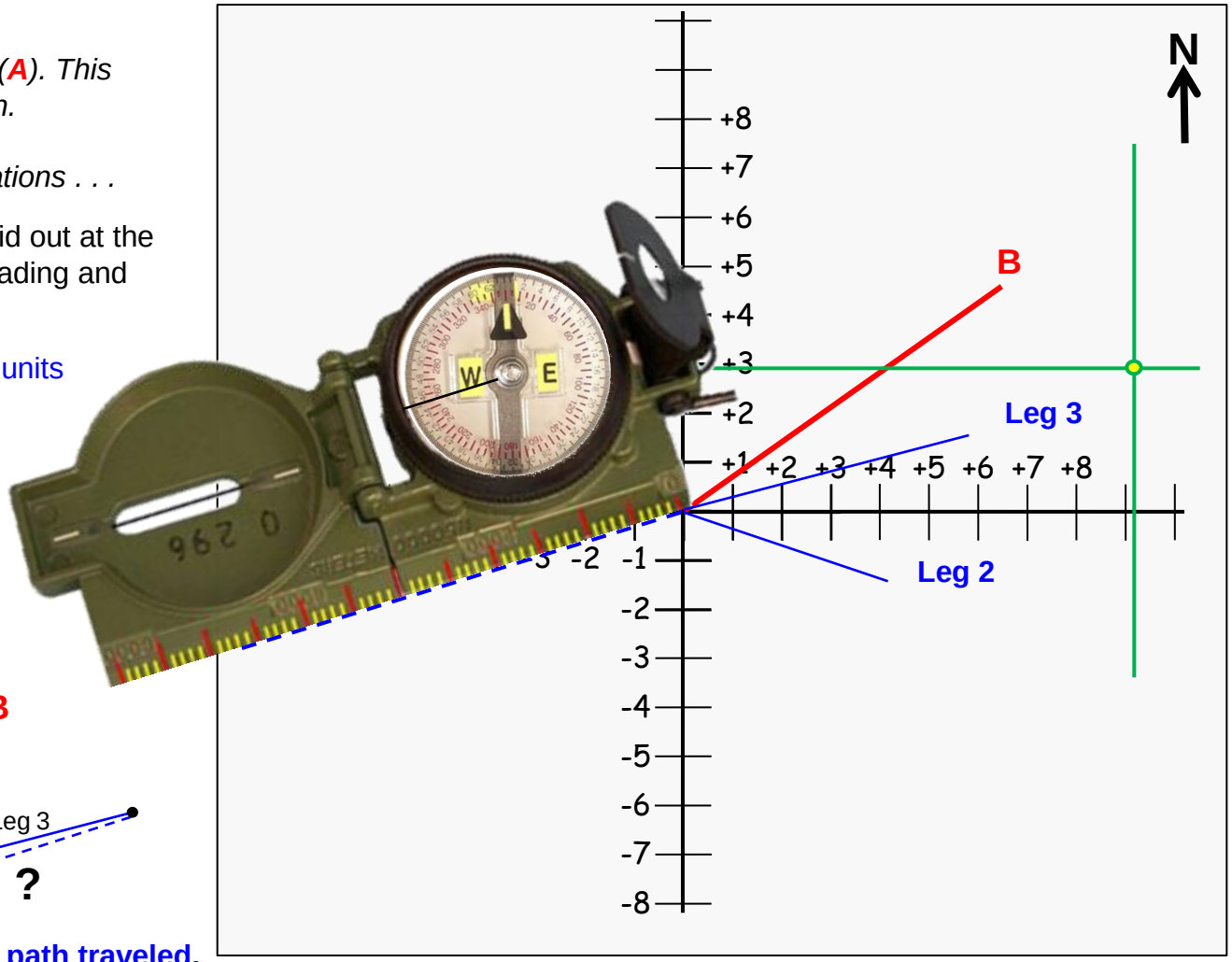
Here is the basics of using the System.

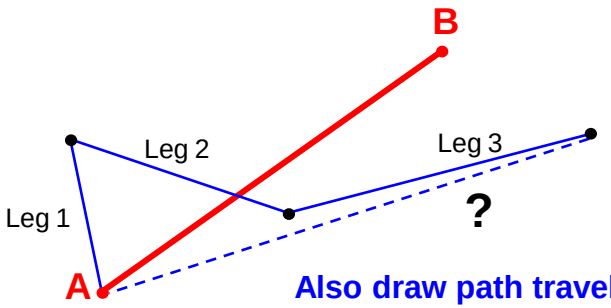
<u>SCENARIO two</u> (continued)
*You decided to head back to Point (**A**). This would be a NEW LEG 4 calculation.*

BUT you want to verify your calculations . . .

4. With the Lensatic Compass laid out at the center (**zero**), draw LEG 4 Heading and Units of Measure.

NEW LEG 4 = 255° and 9.6 units





Also draw path traveled.

NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)

Here is the basics of using the System.

SCENARIO two (continued)
*You decided to head back to Point (**A**). This would be a NEW LEG 4 calculation.*

BUT you want to verify your calculations . . .

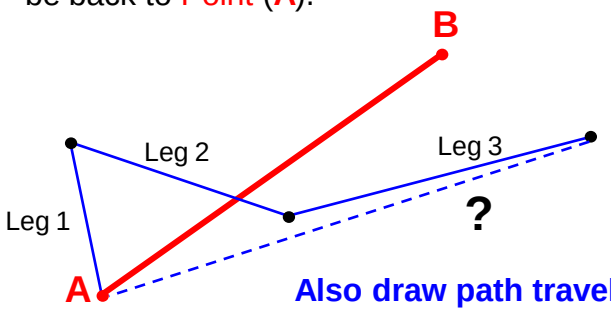
4. With the Lensatic Compass laid out at the center (**zero**), draw LEG 4 Heading and Units of Measure.

   NEW LEG 4 = 255° and 9.6 units

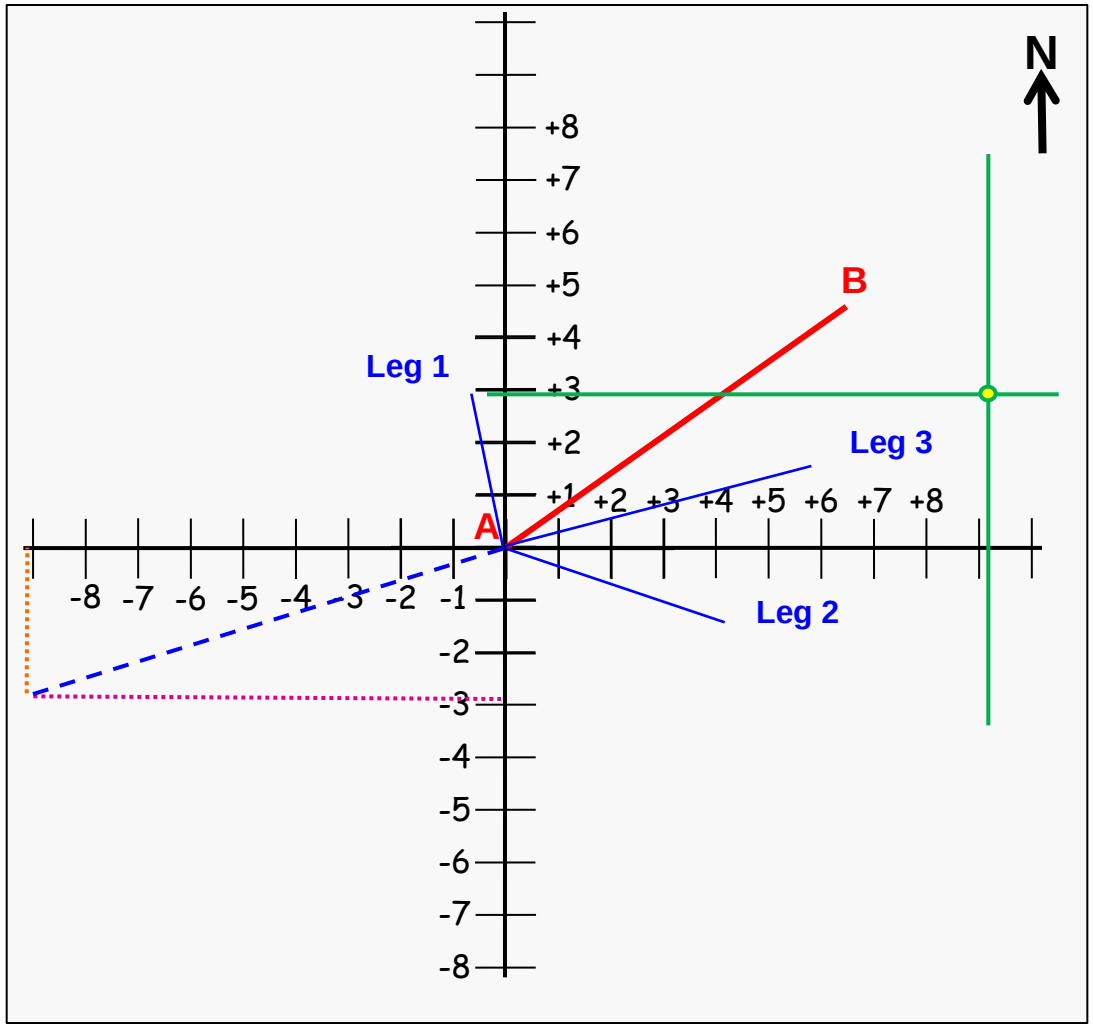
5. Next, measure the Vertical and Horizontal numbers. LEG 4 = **V -2.9** , **H -9.2**

6. Add LEG 4 numbers to LEGS 1 thru 3 (LEG 1 thru 3 = **V +2.9** , **H +9.2**)

7. The total is **zero**, which equals Point (**A**) **zero**. Calculations are correct and you will be back to Point (**A**).



Also draw path traveled.



NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)

Here is the basics of using the System.

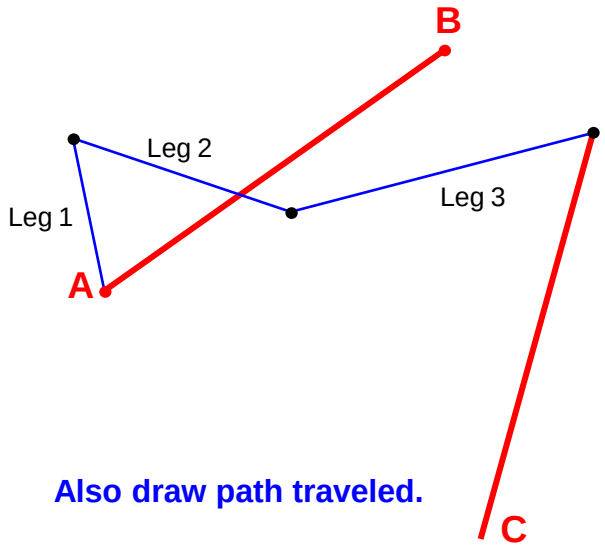
SCENARIO three

*You decided to head to a new location other than Point (**B**). You want to go to Point (**C**) from **current location** (◎). This would be a NEW ROUTE or LEG, it is your choice.*

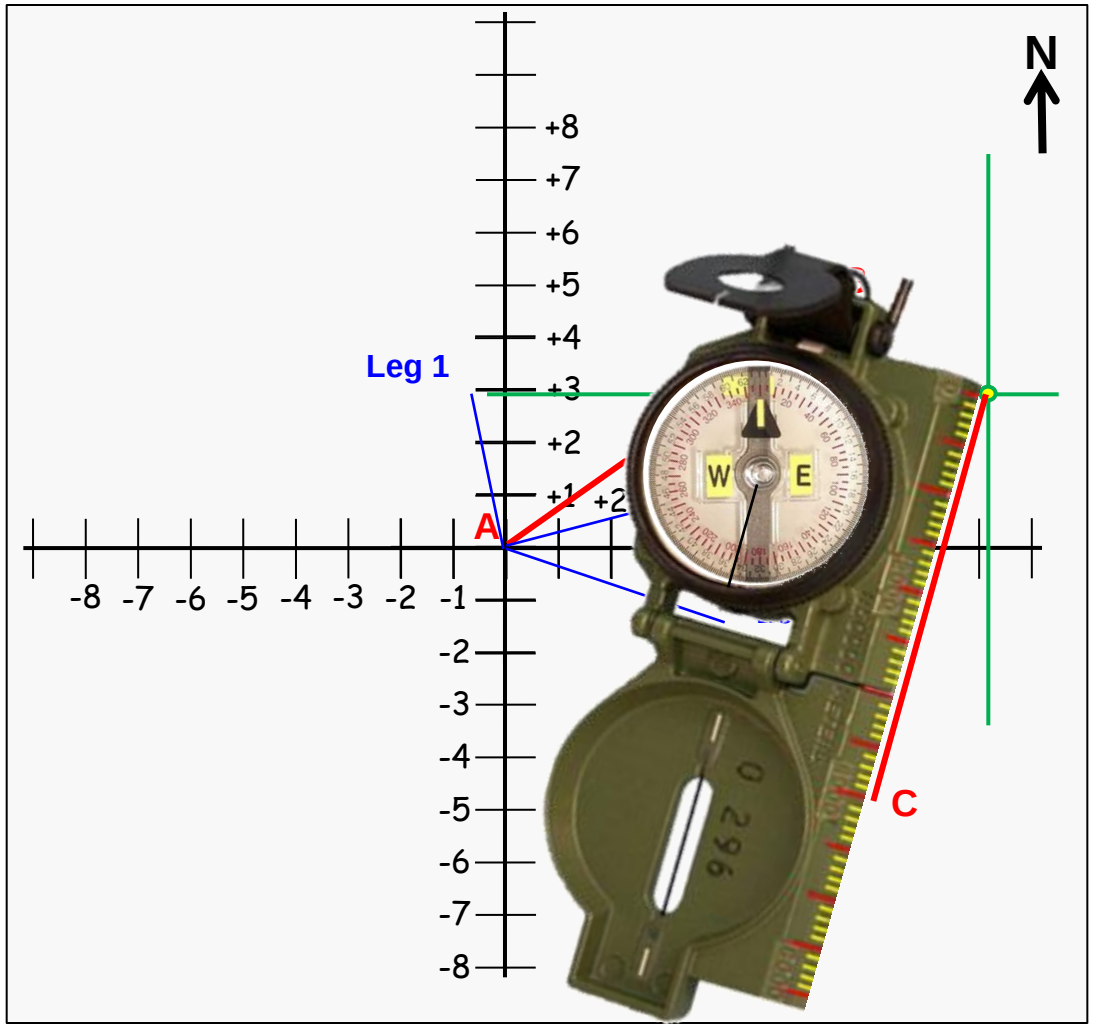
1. With the Lensatic Compass laid out from **current location** (◎) to Point (**C**), you can get the Heading and Units of Measurement.

   NEW ROUTE = 195° and 8 units

2. Now you have directions to get to Point (**C**).



Also draw path traveled.



NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)

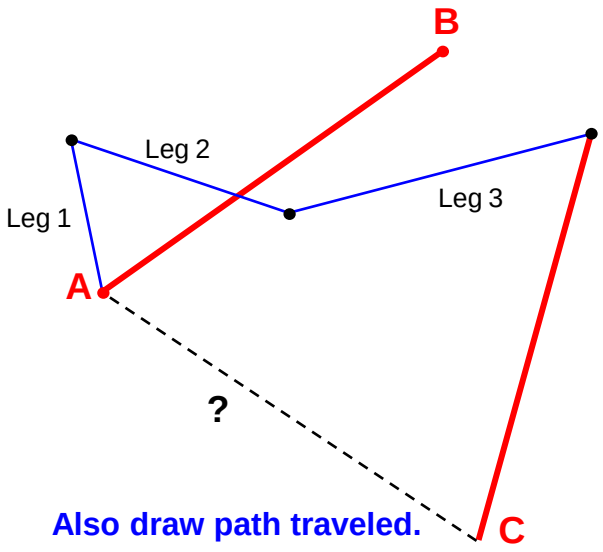
Here is the basics of using the System.

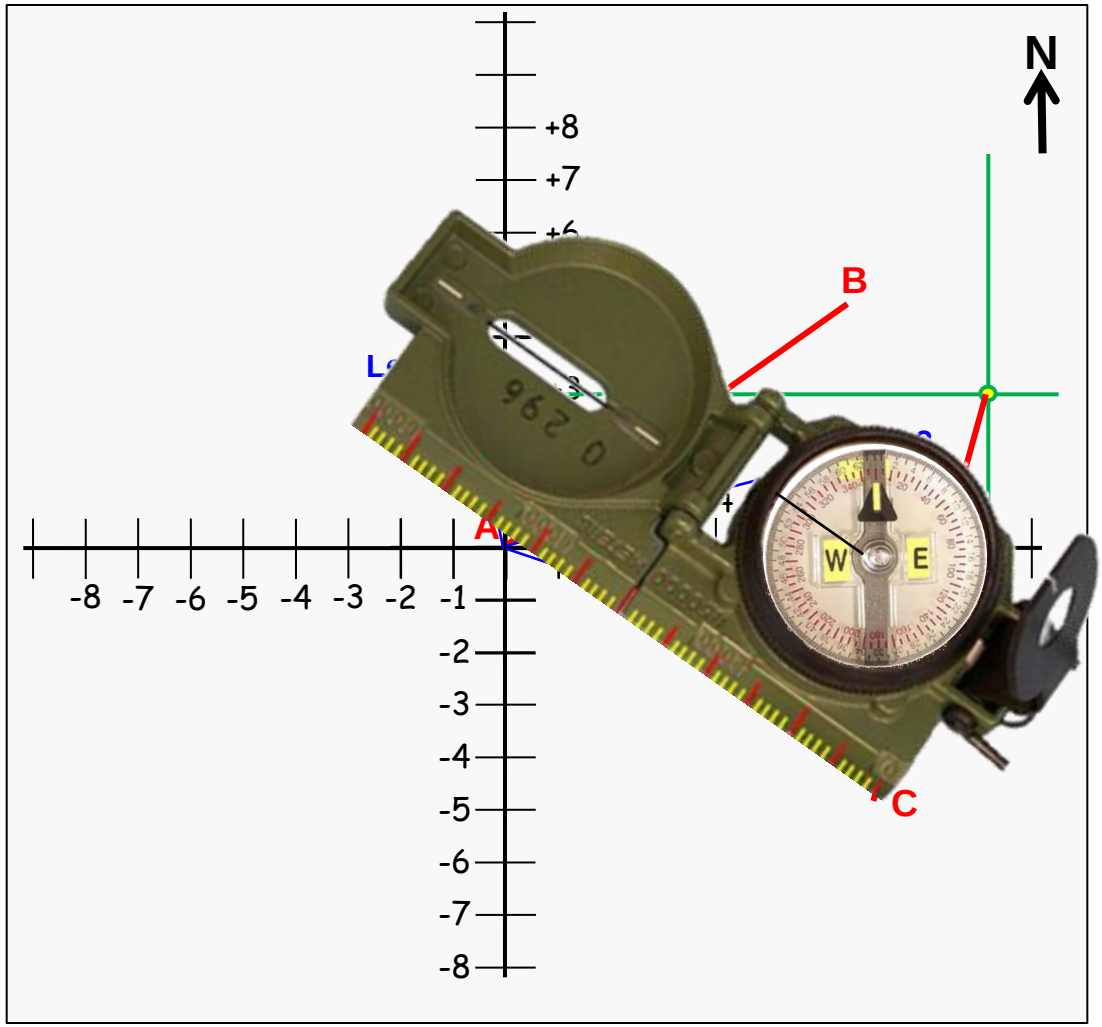
<u>SCENARIO three</u> (continued)
*Now you want to know the Heading and Units of Measurements from Point (**C**) to Point (**A**).*

3. With the Lensatic Compass laid out from end of Point (**C**) to Point (**A**), you can get the Heading and Units of Measurement.

DIRECTION to Point (**A**) = **305°** and **8.4 units**

4. Now you have directions to get to Point (**A**).





NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)

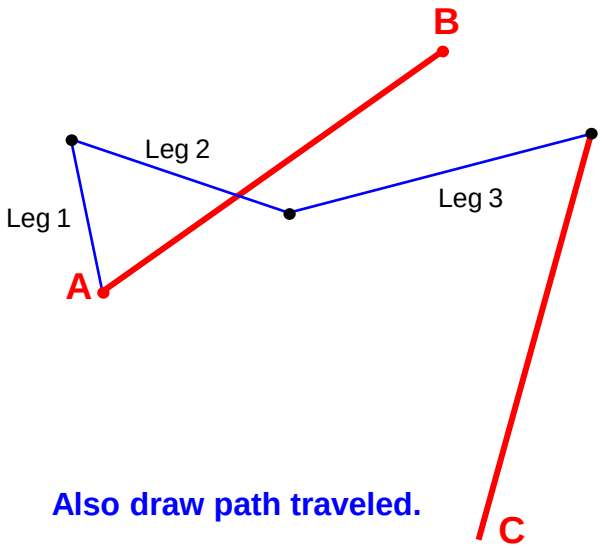
Here is the basics of using the System.

SCENARIO three (continued)
*Now you want to know the Vertical and Horizontal numbers of Point (**C**).*

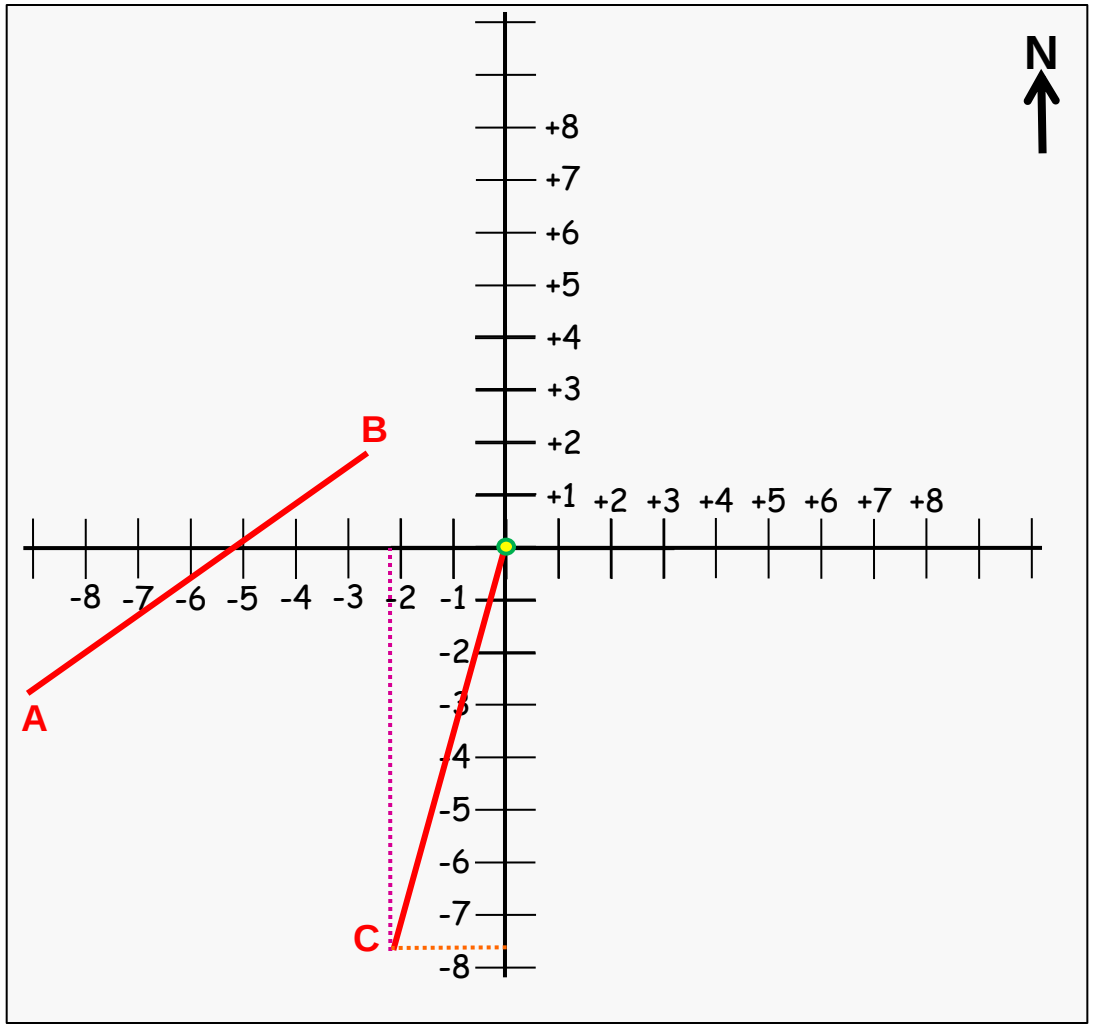
5. Next, draw the Cartesian Coordinate system at your current location (◎) for **zero**.

6. Measure Vertical and Horizontal numbers.
   V = **- 7.6** H = **- 2.2**

7. Start the process again for new travel path.



Also draw path traveled.



NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)

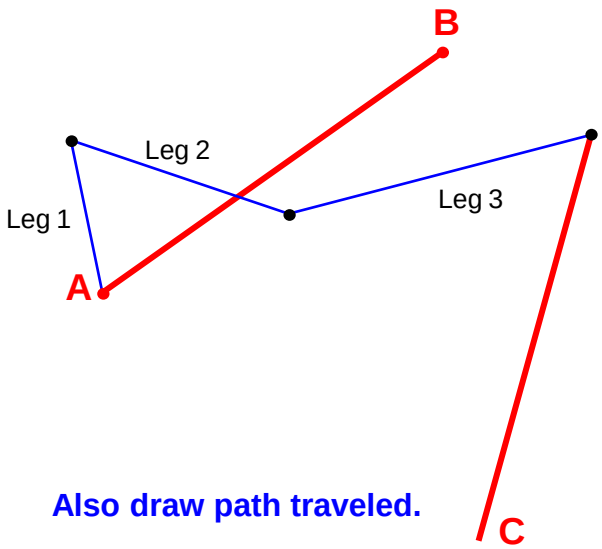
Here is the basics of using the System.

NOTE

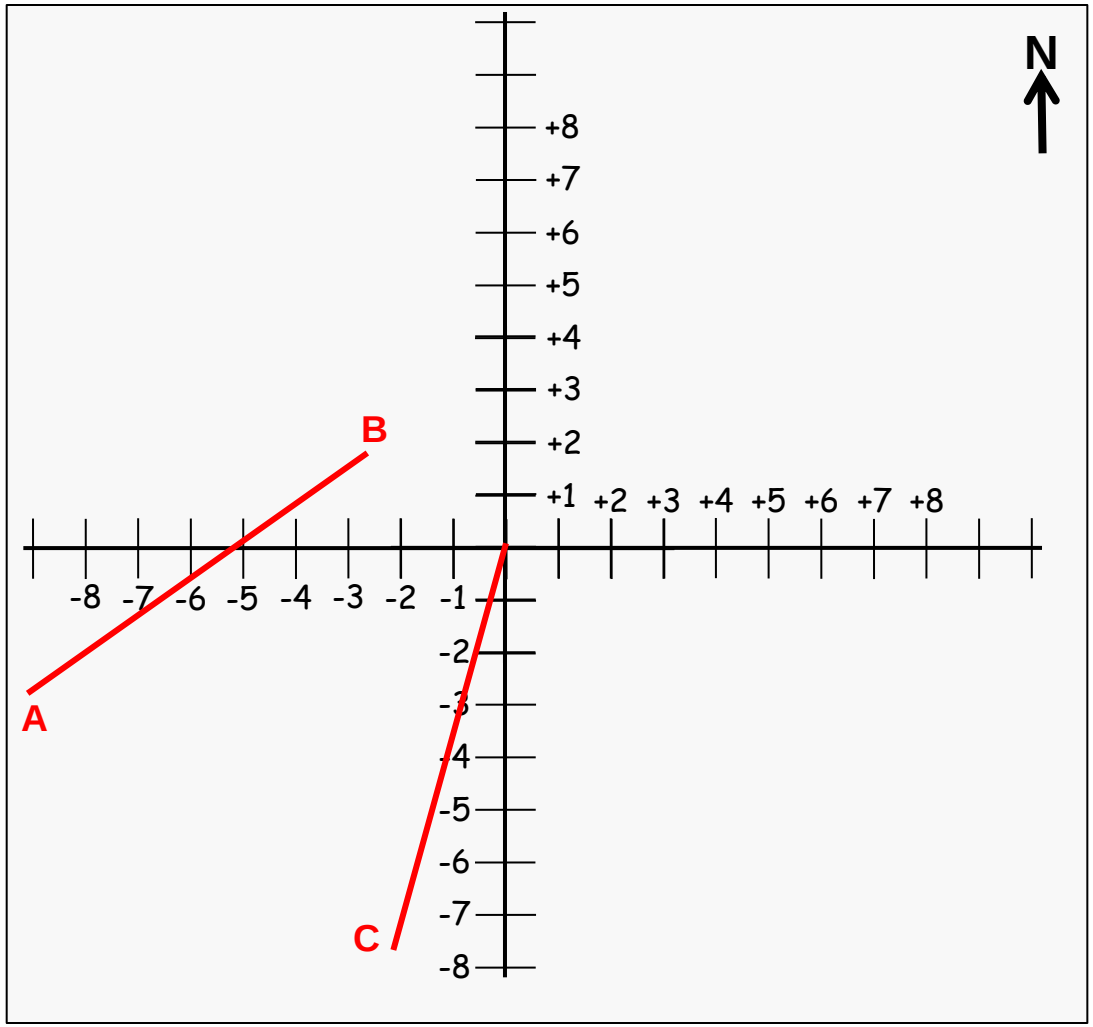
If you have noticed, I drew the paths taken, as I traveled.

exact HEADINGS
exact UNITS OF MEADUREMENT

If you give yourself room on the sheet of paper, you can draw your path to exact scale that matches the Cartesian Coordinate graph, as you plot and calculate numbers.



Also draw path traveled.



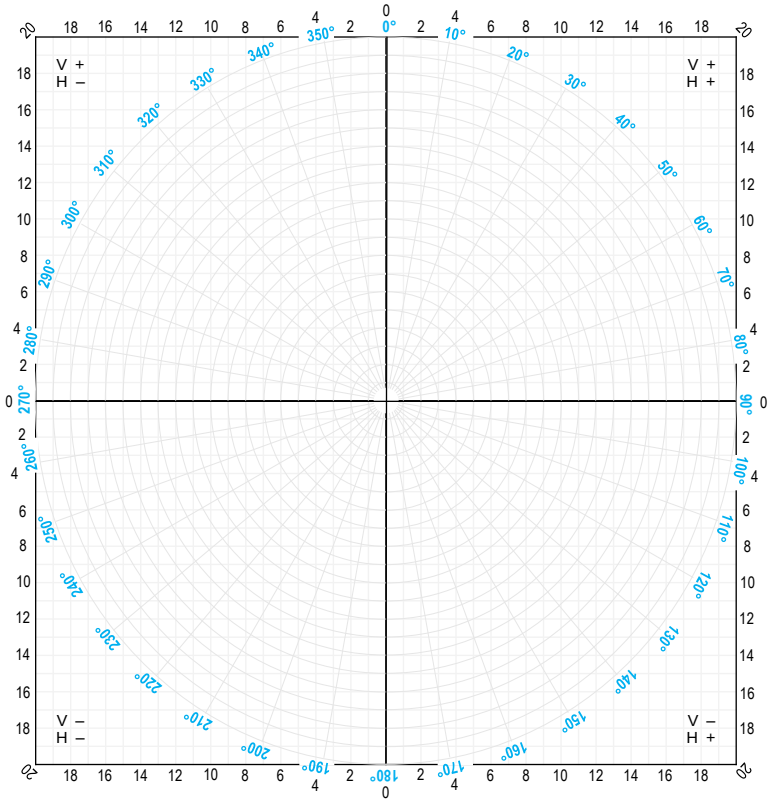
NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)

You decide how you want to design your
PLOTTER CHART / COORDINATE GRAPH.

On the next page is MY EXAMPLE of a coordinate graph and plotter chart, combined with other data entries.

(The next several pages will be explained on how to use it)



FINISH POINT = V ____ , H ____ / LOCATION : _____

V = ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____ = ____

H = ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____, ____ = ____

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

NOTES _____

PLOTTER

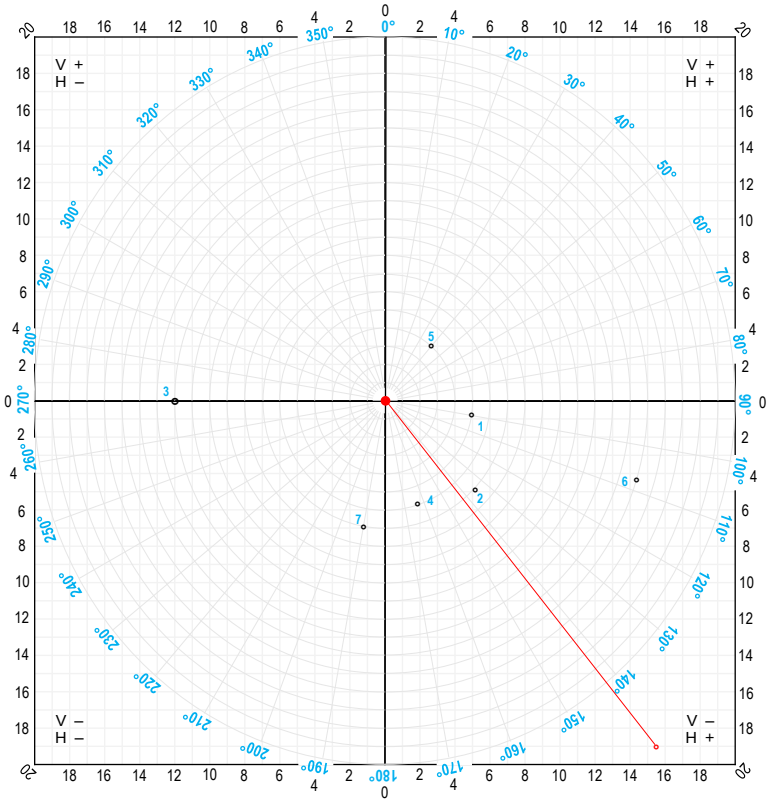
UNITS OF MEASURE SCALE

NOTE

UNITS = yards or meters
UNITS = miles or kilometers
UNITS = foot steps or clock time
UNITS = any measurement desired

N

START POINT								FINISH POINT
#	L / R	Heading	Start	Stop	Elapse Time	Speed	UNITS	Terrain Features / NOTES
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								



FINISH POINT = V -19 , H 15.5 / LOCATION : CAMP SITE / HEADING FROM TRAIL 142° / 250 YARDS

V = -0.8, -4.7, 0, -5.6, 3.1, -4.2, -6.9 = -19

H = 5, 5, -12, 1.8, 2.6, 14.3, -1.2 = 15.5

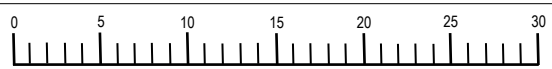
NOTES

Intermediate Landmarks used to stay on course.

Speed was calculated as group speed (3 people in group).

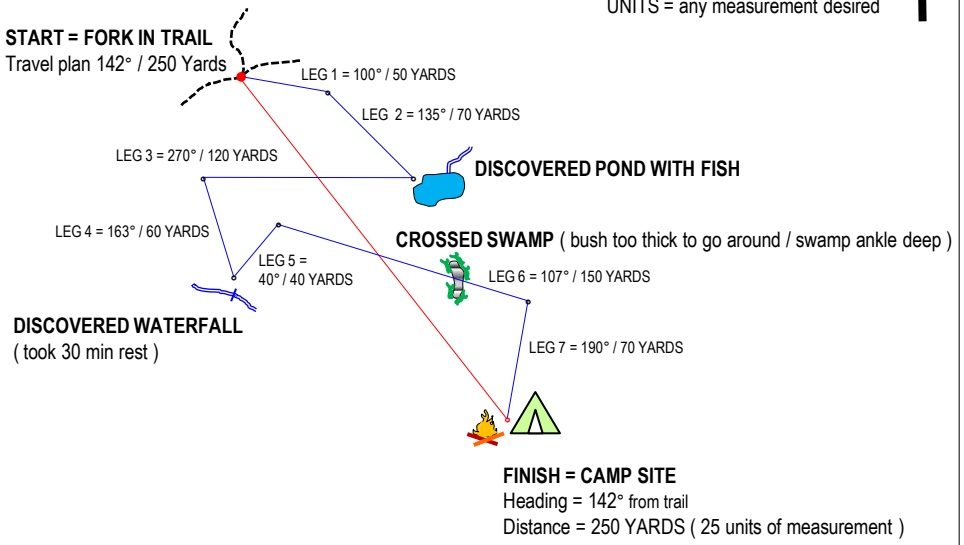
Pond from camp is 168° / 130 yards.

PLOTTER



NOTE
UNITS = yards or meters
UNITS = miles or kilometers
UNITS = foot steps or clock time
UNITS = any measurement desired

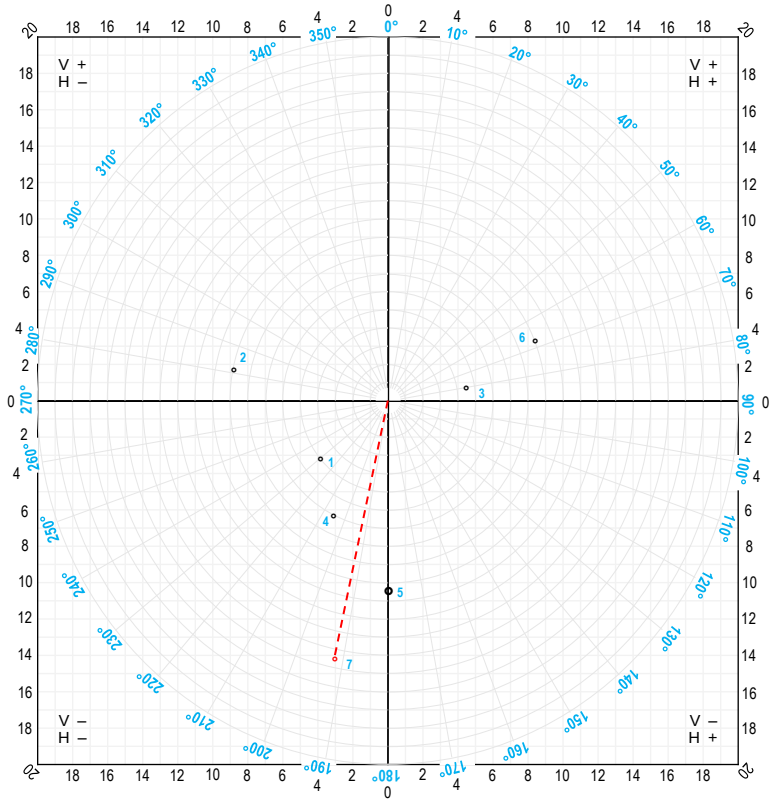
N



* YPH = Yards Per Hour

START POINT			FORK IN TRAIL / HEADING 142° / 250 YARDS					FINISH POINT	CAMP SITE / BACK HEADING TO TRAIL 322° / 250 YARDS
#	L / R	Heading	Start	Stop	Elapse Time	Speed	UNITS		Terrain Features / NOTES
1	L	100	0600	0615	15 MIN	200 YPH *	50 yards		Open field
2	R	135	0615	0700	45 MIN	100 YPH	70 yards		Tree and brush / found pond with fish
3	R	270	0700	0755	55 MIN	150 YPH	120 yards		Trees (no brush) / one 5 min stop
4	L	163	0755	0910	1 H / 15 M	50 YPH	60 yards		Rocky ground and big boulders
5	L	40	0940	1005	25 MIN	100 YPH	40 yards		30 min rest waterfall / Trees and brush
6	R	107	1005	1120	1 H / 15 M	120 YPH	150 yards		Trees / Swamp ankle deep
7	R	190	1120	1150	45 MIN	90 YPH	70 yards		Several small mounds to cross / some brush / no trees
8									
9					**5 H / 35 M**		**560 yards**		**TOTAL TRAVEL TIME & DISTANCE**
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

EXAMPLE



FINISH POINT = V -14.2, H -2.9 / LOCATION : 193° & 145 METERS SOUTH OF CAMPS SITE / BACK HEADING IS 13°

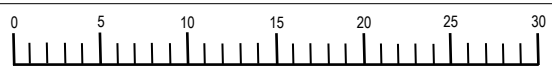
V = -3.2, 1.8, 0.7, -6.2, -10.5, 3.2, = -14.2

H = -3.9, -8.8, 4.5, -3.1, 0, 8.4, = -2.9

NOTES: Intermediate **Landmarks** used to stay on course.

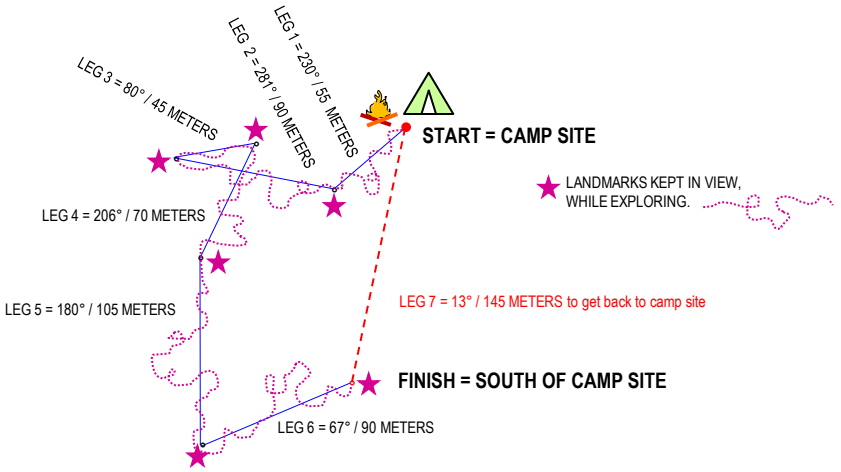
Casual exploration of surrounding area.

PLOTTER



NOTE
UNITS = yards or meters
UNITS = miles or kilometers
UNITS = foot steps or clock time
UNITS = any measurement desired

N



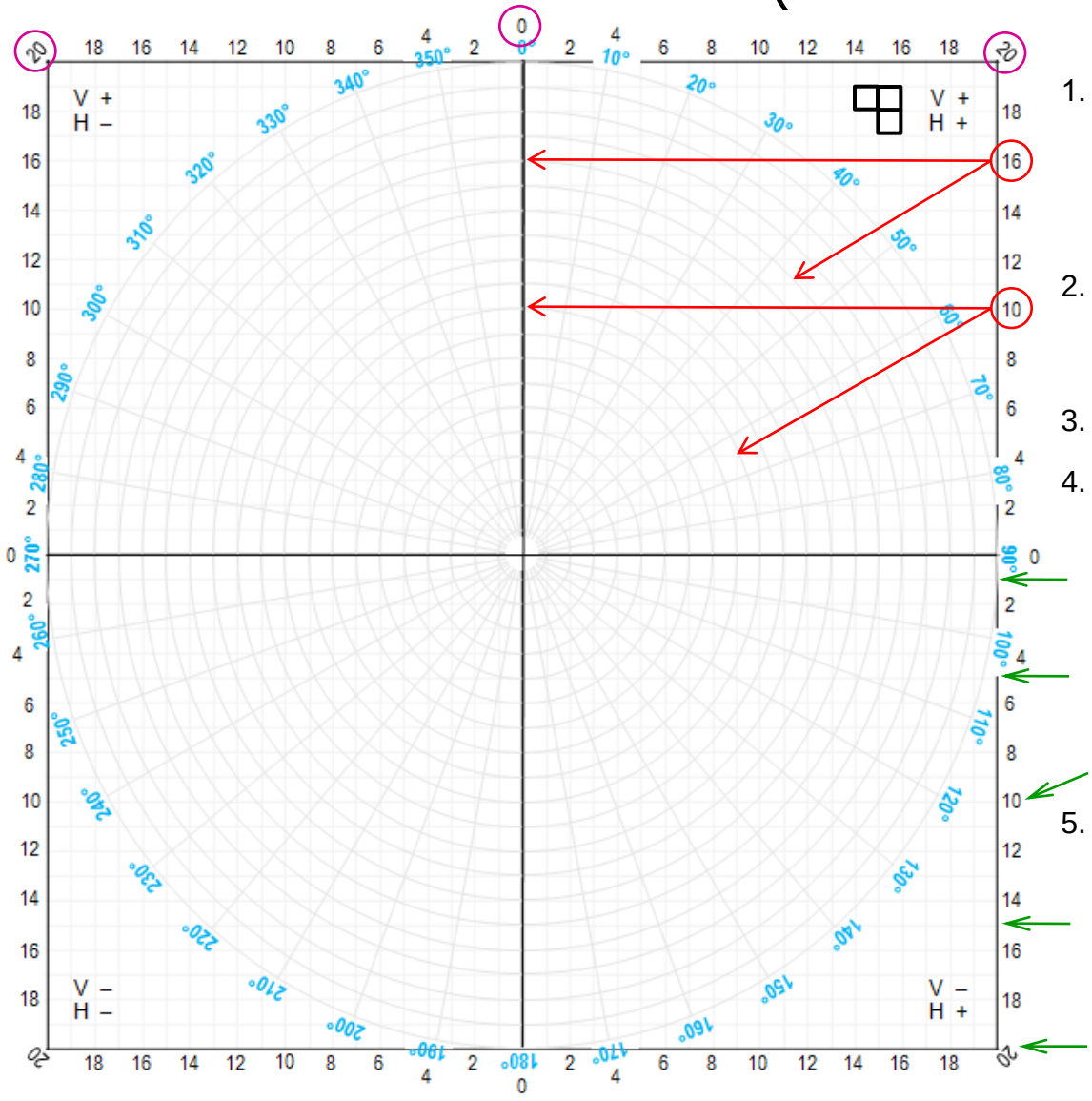
* Time not tracked / casual exploration of surrounding area.

START POINT			RANDOM EXPLORATION					FINISH POINT	193° / 145 METERS SOUTH OF CAMP / BACK HEADING IS 13°
#	L / R	Heading	Start	Stop	Elapse Time	Speed	UNITS		Terrain Features / NOTES
1	R	230	*	*	*	*	55 Meters		
2	R	281					90 Meters		
3	R	80					45 Meters		
4	R	206					70 Meters		
5	L	180					105 Meters		
6	L	67					90 Meters		
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

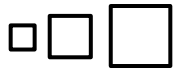
EXAMPLE

NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)



1. The Coordinate Chart is for…
   - LEG / ROUTE Headings
   - Units of Measurements
   - VERTICAL and HORIZONTAL numbers
2. Compass Card is in increments of **10° degrees**.
   - Degrees can be in any increment
     1°, **5°**, or **10°**, etc.
3. The **CIRCLES** equal the Units of Measurement.
4. Units of Measurements can be any **number** and size of **squares**. Here the **squares** are **40** x **40** to get **20<0>20**.
   - 10 x 10 = 5<0>5
   - 50 x 50 = 25<0>25
   - 200 x 200 = 100<0>100
   - The **squares** can be any size, just as long it can fit on the paper.

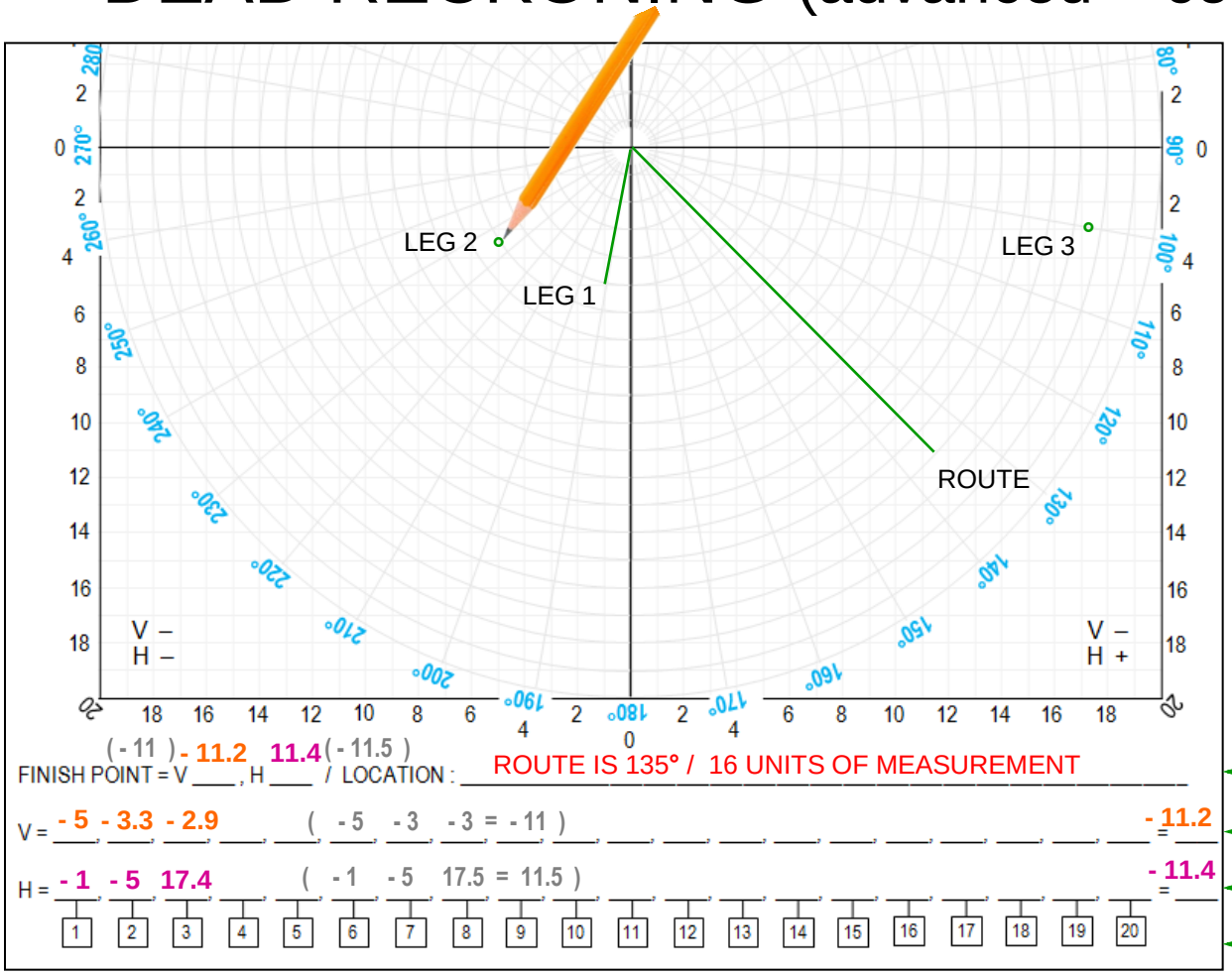


5. Units of Measurement numbers can be any value. Yard, pace count, time, decimal sys, etc.

1 = 0.1	1	10	100	1000
5 = 0.5	5	50	500	5000
10 = 1.0	10	100	1000	10000
15 = 1.5	15	150	1500	15000
20 = 2.0	20	200	2000	20000

NAVIGATING DIFFERENT TERRAINS

DEAD RECKONING (advanced – compass and plotter)



DESTINATION

VERTICAL NUMBERS

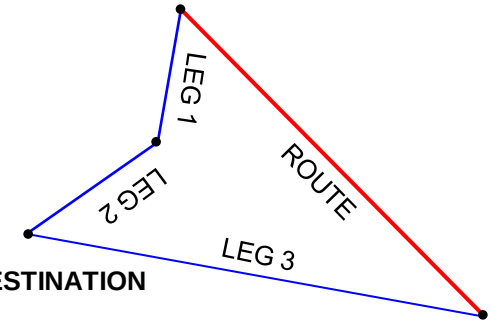
HORIZONTAL NUMBERS

LEGS / ROUTES

Coordinate Chart being used…

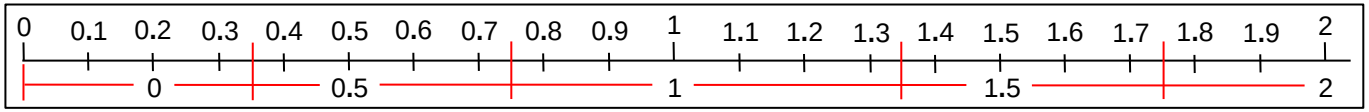
1. **LEG** / **ROUTE** - draw **line** or **circle**
   - Units of Measurements
   - Vertical / Horizontal numbers
   - Heading

2. Calculations
   - ROUTE = **135°** / **16** UNITS.
   - LEG 1 = **190°** / **5** UNITS
   - LEG 2 = **235°** / **6** UNITS
   - LEG 3 = **100°** / **17.5** UNITS



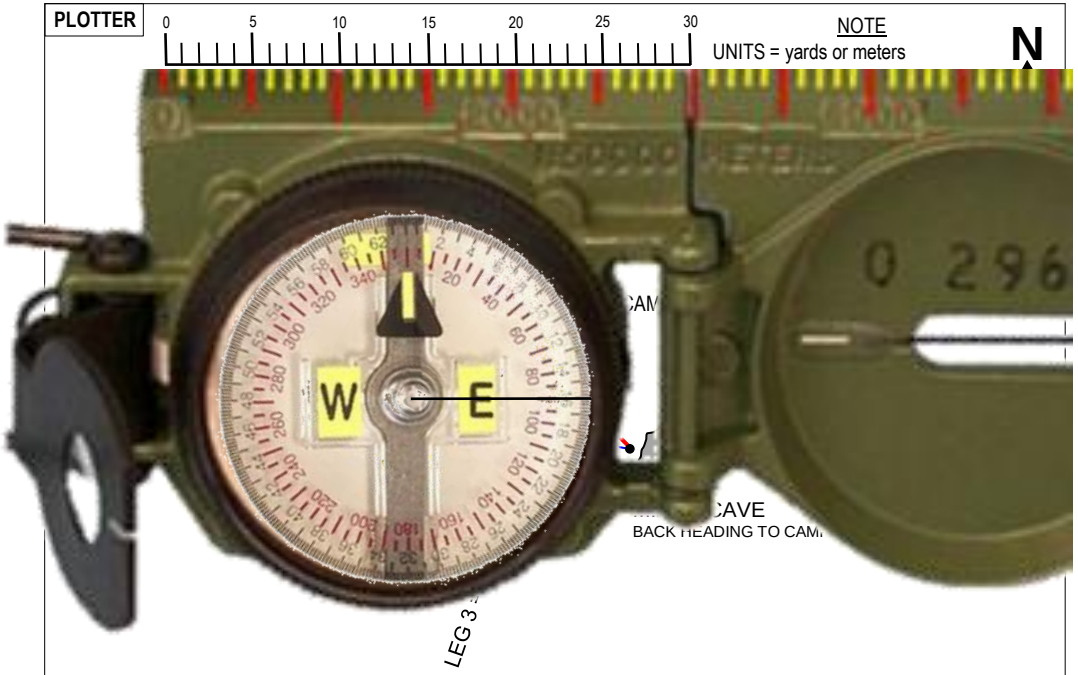
ROUNDING NUMBERS – numbers can be rounded up and down. Round in increments of **0.5** (0 , 0.5 , 1.5 , 2.0 , 2.5 , etc)

Round to **down** if 0.1 , 0.2 , 0.3
Round to **0.5** if 0.4 , 0.5 , 0.6 , 0.7
Round to **up** if 0.8 , 0.9



PLOTTER being used…

1. To draw PATH TRAVELED
   - Draw lines to UNITS OF MEASURE SCALE



START POINT			CAMP SITE / HEADING 135° / 160 YARDS					FINISH POINT	MINERS CAVE / BACK HEADING TO CAMP 315° / 160 YARDS
#	L / R	Heading	Start	Stop	Elapse Time	Speed	UNITS	Terrain Features / NOTES	
1	R	190°					50 YARDS		
2	R	235°					60 YARDS		
3	L	100°					175 YARDS		
4									
5									
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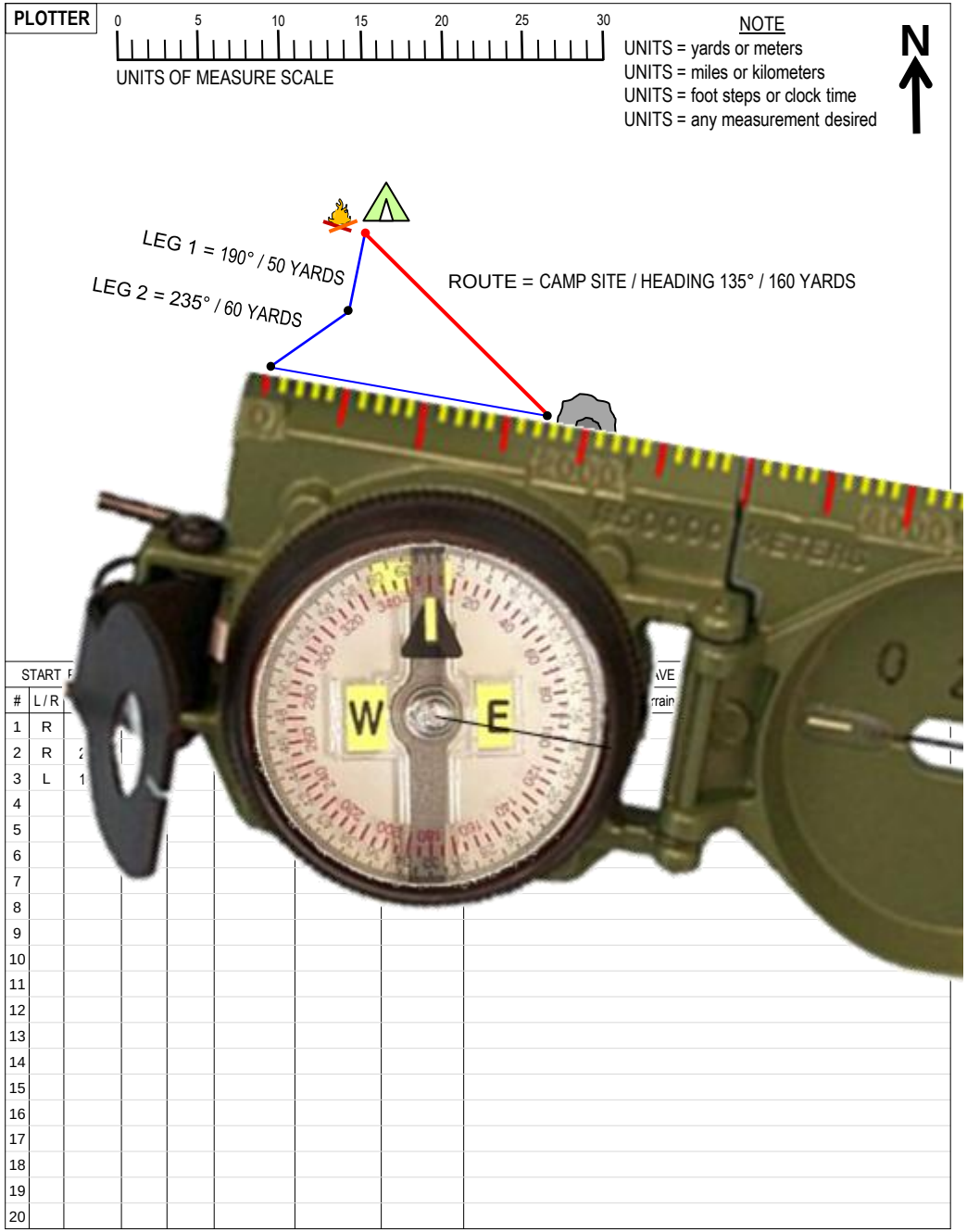
20									

PLOTTER being used…

1. To draw PATH TRAVELED
   - Draw lines to UNITS OF MEASURE SCALE
   - Use Lensatic Compass for HEADINGS and ruler to draw straight UNITS OF MEASURE lines.

2. Write information about lines.
   - ROUTE = **135°** / 160 YARDS (**16 UNITS**)
   - LEG 1 = **190°** / 50 YARDS (**5 UNITS**)
   - LEG 2 = **235°** / 60 YARDS **(6 UNITS**)
   - LEG 3 = **100°** / 175 YARDS (**17.5 UNITS**)

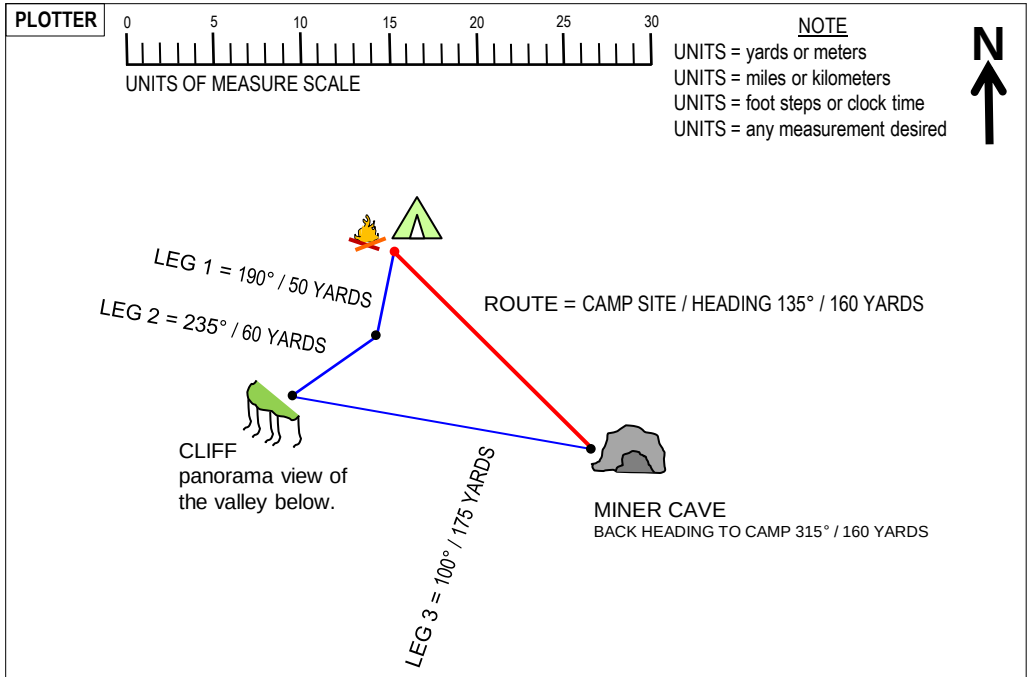


PLOTTER being used…

1. To draw PATH TRAVELED
   - Draw lines to UNITS OF MEASURE SCALE
   - Use Lensatic Compass for HEADINGS and ruler to draw straight UNITS OF MEASURE lines.

2. Write information about lines.
   - ROUTE = **135°** / 160 YARDS (**16 UNITS**)
   - LEG 1 = **190°** / 50 YARDS (**5 UNITS**)
   - LEG 2 = **235°** / 60 YARDS **(6 UNITS**)
   - LEG 3 = **100°** / 175 YARDS (**17.5 UNITS**)

3. Add any other information on the sheet.
   - Left / Right turns
   - Elapse Time
   - Notes
   - Symbols



START POINT			CAMP SITE / HEADING 135° / 160 YARDS				FINISH POINT	MINERS CAVE / BACK HEADING TO CAMP 315° / 160 YARDS
#	L / R	Heading	Start	Stop	Elapse Time	Speed	UNITS	Terrain Features / NOTES
1	R	190°					50 YARDS	
2	R	235°					60 YARDS	
3	L	100°					175 YARDS	
4								
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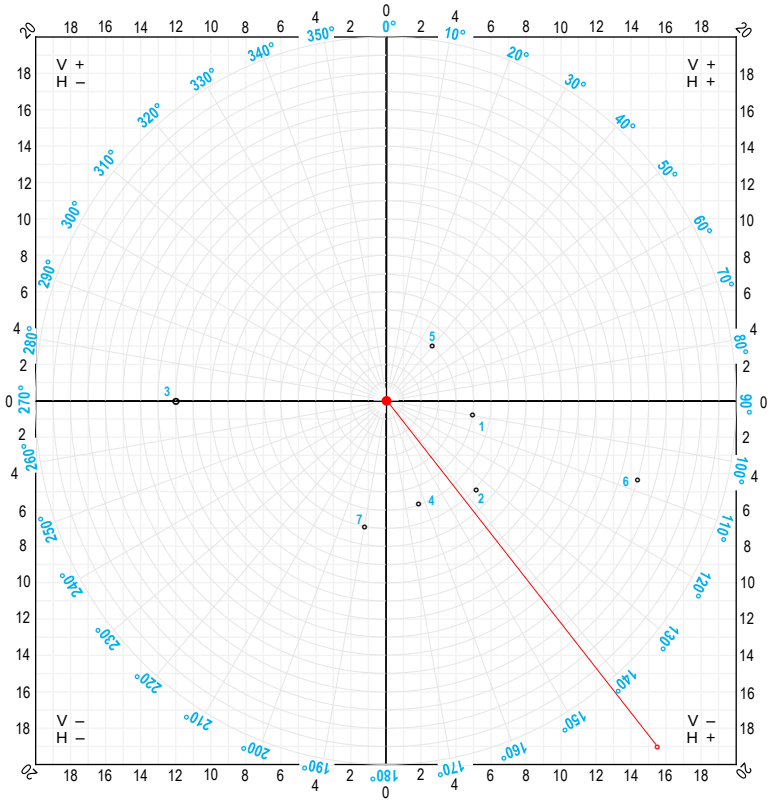


FINISH POINT = V -19 , H 15.5 / LOCATION : CAMP SITE / HEADING FROM TRAIL 142° / 250 YARDS

V = -0.8, -4.7, 0, -5.6, 3.1, -4.2, -6.9 = -19

H = 5, 5, -12, 1.8, 2.6, 14.3, -1.2 = 15.5

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)

NOTES

Intermediate Landmarks used to stay on course.

Speed was calculated as group speed (3 people in group).

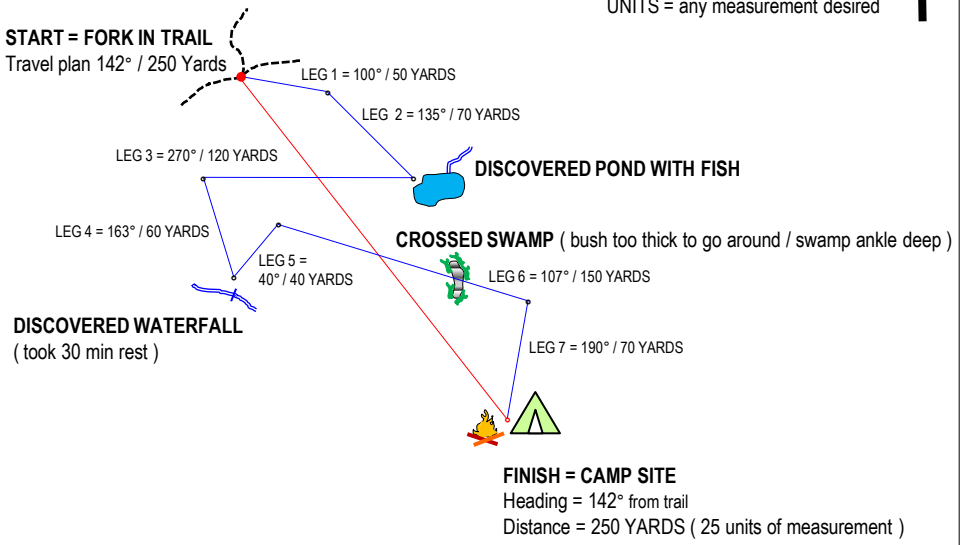
Pond from camp is 168° / 130 yards.

PLOTTER

NOTE

UNITS = yards or meters
UNITS = miles or kilometers
UNITS = foot steps or clock time
UNITS = any measurement desired

N



* YPH = Yards Per Hour

START POINT			FORK IN TRAIL / HEADING 142° / 250 YARDS					FINISH POINT	CAMP SITE / BACK HEADING TO TRAIL 322° / 250 YARDS
#	L / R	Heading	Start	Stop	Elapse Time	Speed	UNITS		Terrain Features / NOTES
1	L	100	0600	0615	15 MIN	200 YPH *	50 yards		Open field
2	R	135	0615	0700	45 MIN	100 YPH	70 yards		Tree and brush / found pond with fish
3	R	270	0700	0755	55 MIN	150 YPH	120 yards		Trees (no brush) / one 5 min stop
4	L	163	0755	0910	1 H / 15 M	50 YPH	60 yards		Rocky ground and big boulders
5	L	40	0940	1005	25 MIN	100 YPH	40 yards		30 min rest waterfall / Trees and brush
6	R	107	1005	1120	1 H / 15 M	120 YPH	150 yards		Trees / Swamp ankle deep
7	R	190	1120	1150	45 MIN	90 YPH	70 yards		Several small mounds to cross / some brush / no trees
8									
9					**5 H / 35 M**		**560 yards**		**TOTAL TRAVEL TIME & DISTANCE**
10									
11									
12									
13									
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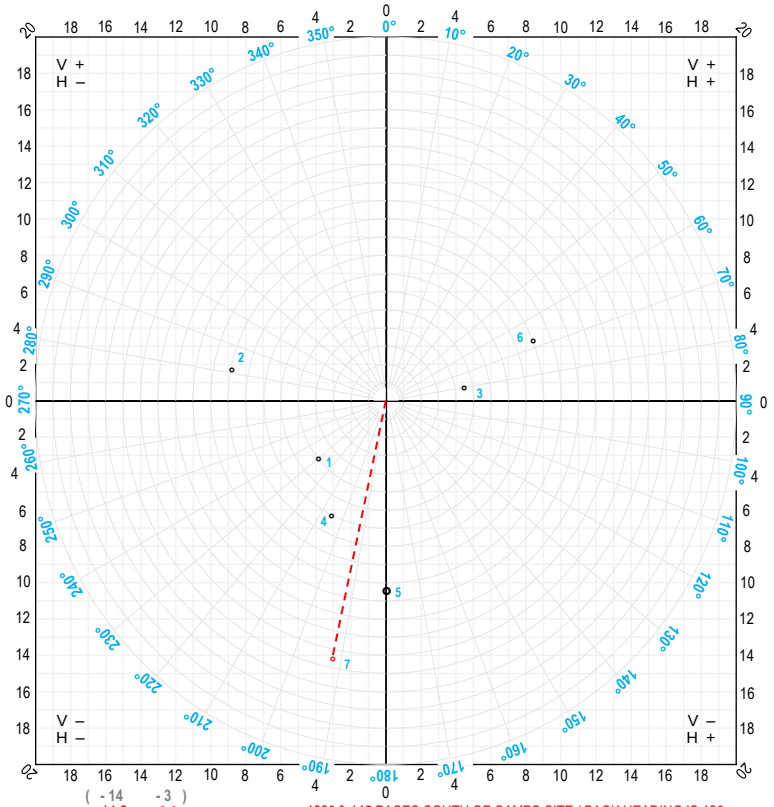
15									
16									
17									
18									
19									
20									

EXAMPLE



(-14 -3)

FINISH POINT = V -14.2, H -2.9 / LOCATION : 193° & 145 PACES SOUTH OF CAMPS SITE / BACK HEADING IS 13°

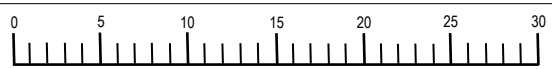
V = -3.2, 1.8, 0.7, -6.2, -10.5, 3.2, ___, ___ (-3, 2, 0.5, -6, -10.5, 3 = -14) [numbers rounded 0.5] = -14.2

H = -3.9, -8.8, 4.5, -3.1, 0, 8.4, ___, ___ (-4, -9, 4.5, -3, 0, 8.5 = -3) [numbers rounded 0.5] = -2.9

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

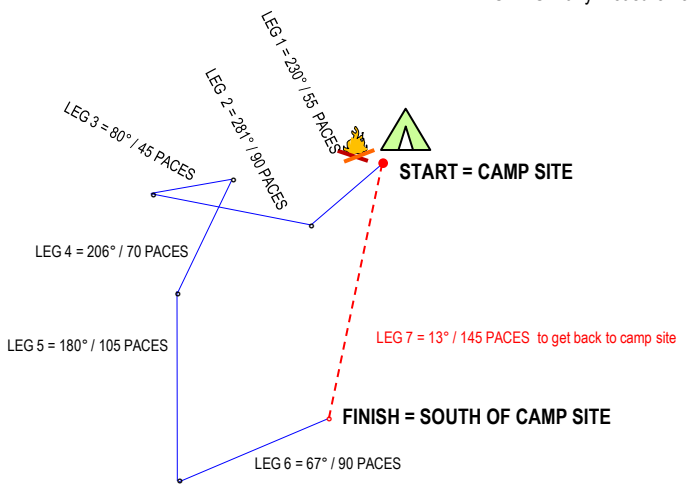
NOTES Intermediate Landmarks used to stay on course.

PLOTTER



NOTE
UNITS = yards or meters
UNITS = miles or kilometers
UNITS = foot steps or clock time
UNITS = any measurement desired

N



START POINT			CAMP SITE 230° / RANDOM EXPLORATION					FINISH POINT	193° / 145 YARDS FROM CAMPS SITE / BACK HEADING 13°
#	L / R	Heading	Start	Stop	Elapse Time	Speed	UNITS	Terrain Features / NOTES	
1		230	0815	0830	15 Min	PACES	55 Paces	Up hill terrain with loose gravel	
2	R	281	0835	0850	15 Min	PACES	90 Paces	Flat clear terrain	
3	R	80	0850	0900	10 min	PACES	45 Paces		
4	R	206	0900	0920	20 Min	PACES	70 Paces		
5	L	180	1000	1030	30 Min	PACES	105 Paces	Thick brush and trees	
6	L	67				PACES	90 Paces		
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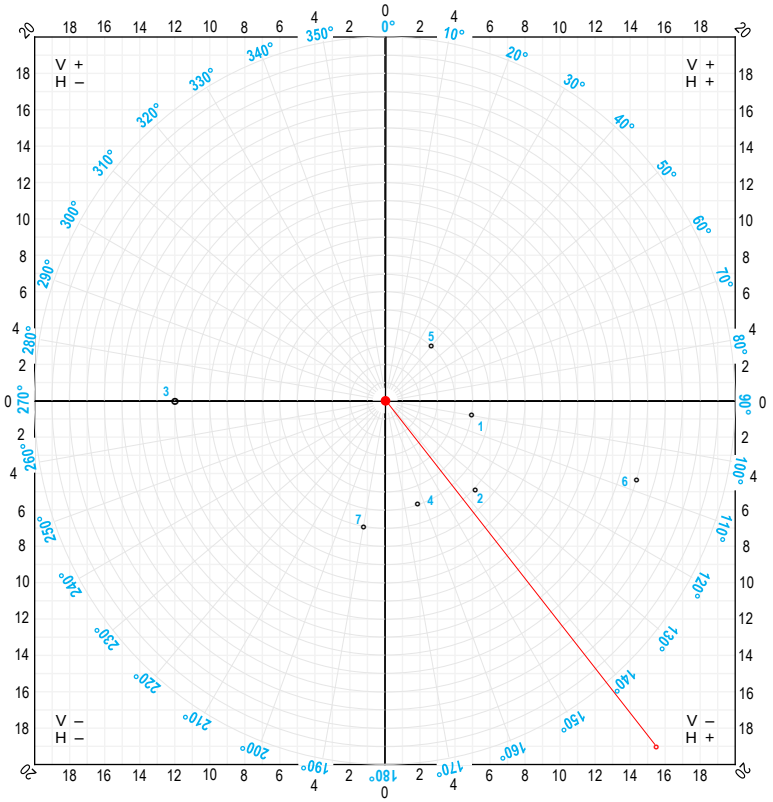
EXAMPLE



FINISH POINT = V -19 , H 15.5 / LOCATION : CAMP SITE / HEADING FROM TRAIL 142° / 250 YARDS

V = -0.8, -4.7, 0, -5.6, 3.1, -4.2, -6.9 = -19

H = 5, 5, -12, 1.8, 2.6, 14.3, -1.2 = 15.5

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20)

NOTES

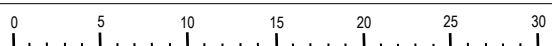
Intermediate Landmarks used to stay on course.

Speed was calculated as group speed (3 people in group).

Pond from camp is 168° / 130 yards.

Here you can use the PROTRACTOR to calculate Headings and draw lines.
The paper does not have to be oriented to NORTH.

PLOTTER

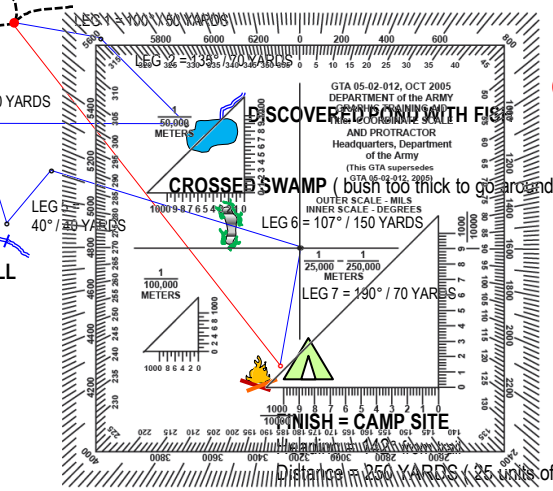


UNITS OF MEASURE SCALE

NOTE
UNITS = yards or meters
UNITS = miles or kilometers
UNITS = foot steps or clock time
UNITS = any measurement desired

N

START = FORK IN TRAIL
Travel plan 142° / 250 Yards



* YPH = Yards Per Hour

START POINT			FORK IN TRAIL / HEADING 142° / 250 YARDS					FINISH POINT	CAMP SITE / BACK HEADING TO TRAIL 322° / 250 YARDS
#	L / R	Heading	Start	Stop	Elapse Time	Speed	UNITS		Terrain Features / NOTES
1	L	100	0600	0615	15 MIN	200 YPH *	50 yards		Open field
2	R	135	0615	0700	45 MIN	100 YPH	70 yards		Tree and brush / found pond with fish
3	R	270	0700	0755	55 MIN	150 YPH	120 yards		Trees (no brush) / one 5 min stop
4	L	163	0755	0910	1 H / 15 M	50 YPH	60 yards		Rocky ground and big boulders
5	L	40	0940	1005	25 MIN	100 YPH	40 yards		30 min rest waterfall / Trees and brush
6	R	107	1005	1120	1 H / 15 M	120 YPH	150 yards		Trees / Swamp ankle deep
7	R	190	1120	1150	45 MIN	90 YPH	70 yards		Several small mounds to cross / some brush / no trees
8									
9					**5 H / 35 M**		**560 yards**		**TOTAL TRAVEL TIME & DISTANCE**
10									
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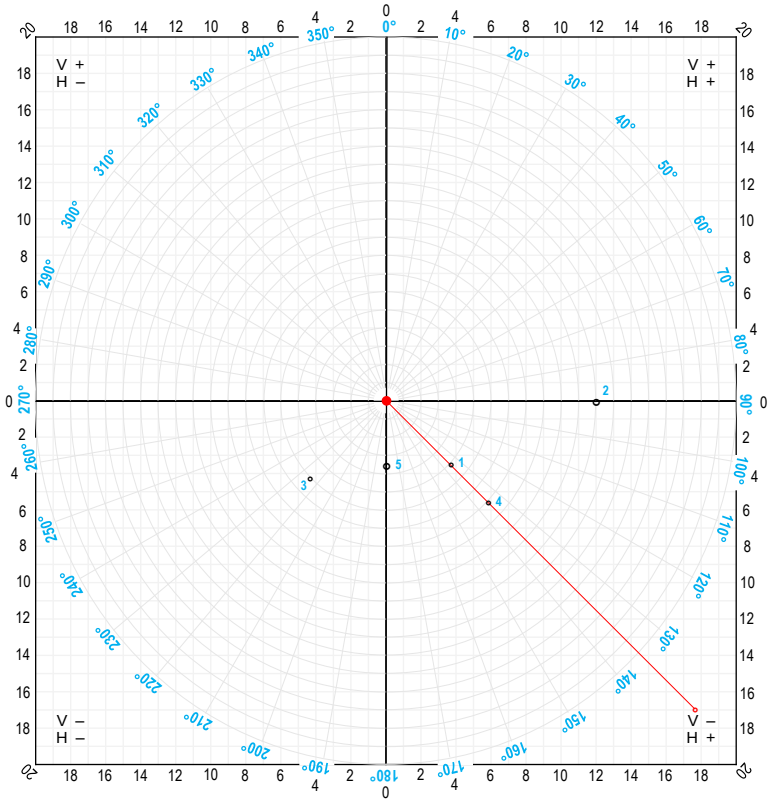
EXAMPLE



FINISH POINT = V -17 , H 17.6 / LOCATION : _____

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
V =	-3.5	0	-4.3	-5.7	-3.5																= -17
H =	3.8	12	-4.4	6	0																= 17.4

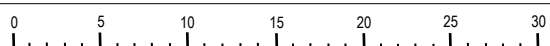
NOTES: Intermediate Landmarks used to stay on course.

This process can be used WITHOUT A COMPASS.
Just use your body as a reference for directions.

* FIRST find NORTH using other techniques.*

REMEMBER THIS METHOD WITHOUT A COMPASS
IS A VERY CRUDE ESTIMATE
ACCURACY IS NOT GUARANTEED
BUT IT WILL GET YOU NEAR YOUR DESTINATION

PLOTTER



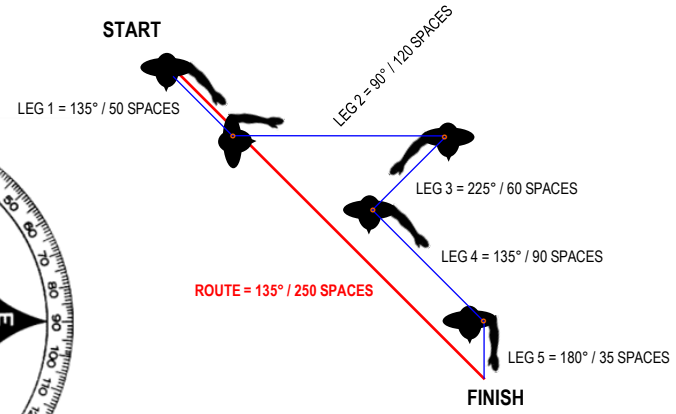
UNITS OF MEASURE SCALE

NOTE
UNITS = yards or meters
UNITS = miles or kilometers
UNITS = foot steps or clock time
UNITS = any measurement desired

N

YOUR BODY
FRONT

Use your body as an estimated compass in relation to NORTH



START POINT		HEADING 135° / 250 PACES						FINISH POINT
#	L / R	Heading	Start	Stop	Elapse Time	Speed	UNITS	Terrain Features / NOTES
1		135					50 paces	
2	L	90					120 paces	
3	R	225					60 paces	
4	L	135					90 paces	
5	R	180					35 paces	
6								
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EXAMPLE

Any Questions?

Note:

Prior to being issued any training *equipment, you will be required to sign a "statement of liability" agreeing to pay for anything you damage or lose.

All items will be inspected and inventoried prior to your signature and at the end of the training day too.

If you do not intend to sign this statement, then you may be denied training.

* **You may use your own equipment.**

THE END OF
LAND NAVIGATION
PRESENTATION
PART 4
supplement