Pre-Calculus
Right Triangle Trig

Navigation Applications
NOTES

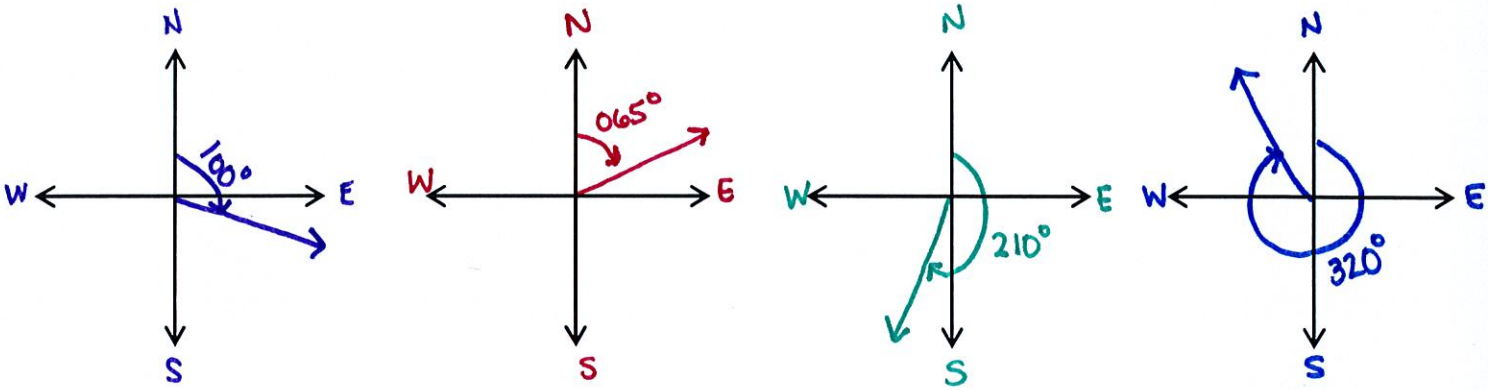
Name Key
Dec. 2014

The course of a ship or plane is the angle, measured Clockwise, from the north direction to the direction of the ship or the plane.

This "course" is called a bearing, and is denoted using three digits.

BEARING: A bearing measures the acute angle a path or line of sight makes with a fixed north-south line

Example 1:
Given the **NORTH-SOUTH** lines, draw the following bearings:



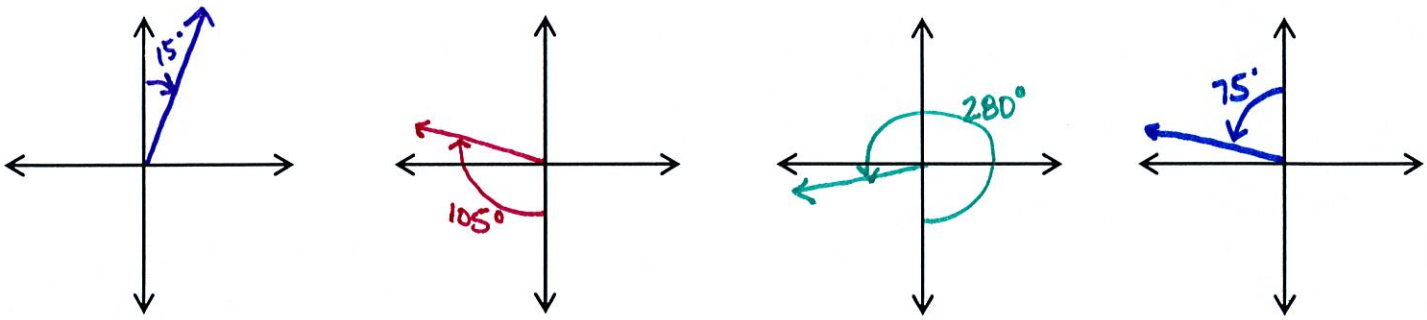
Bearing of 100° | Bearing of 065° | Bearing of 210° | Bearing of 320°

Sometimes, the bearing is described using north-south-east-west instead of just saying "bearing."

The 1st letter is the direction in which you start, the 2nd letter is the direction in which you go.

Also, you typically start with north or south then move east or west.

Example 2:
Given the **NORTH-SOUTH** lines, draw the following bearings:



$N\ 15°\ E$
North 15° to the east

$S\ 105°\ W$
South 105° to the west

$S\ 280°\ E$
South 280° to the east

$N\ 75°\ W$
north 75° to the west

Name these another way, using S instead of N, and vice versa.

S 165° E / S 195° W

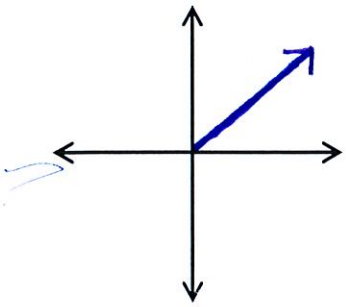
N 75° W / N 285° E

N 100° W / N 260° E

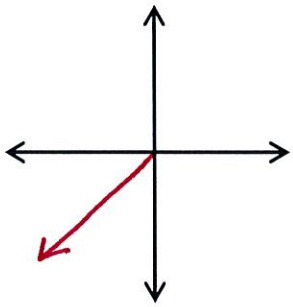
S 105° W / S 255° E

Sometimes, a degree measure is NOT given, and the direction is *implied*.

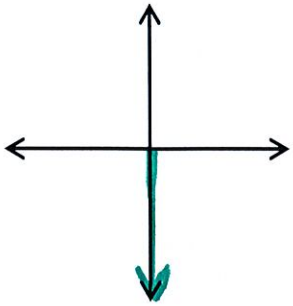
Example 3:
Given the **NORTH-SOUTH** lines, draw the following bearings:



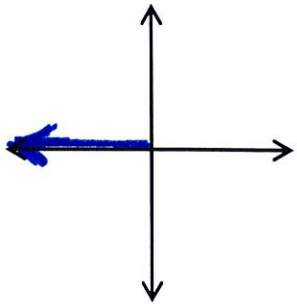
Northeast



Southwest



Proceeds South



Proceeds West

What is the bearing for each of the above courses?

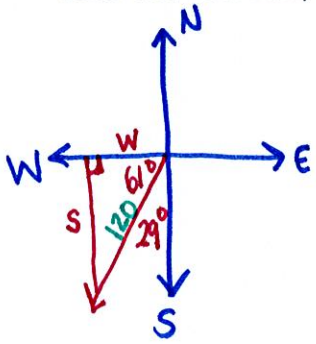
045° 225° 180° 270°

NAUTICAL MILE: • Distance at sea or in the air
• Knots ⊗ time = n.m.

Example 4: Draw the diagram first, then obtain the desired information.

A ship leaves port at noon and has a bearing of $S\ 29°\ W$. The ship sails at 20 knots. How many nautical miles south and how many nautical miles west will the ship have traveled by 6:00 p.m.?

distance = 20 × 6
= 120



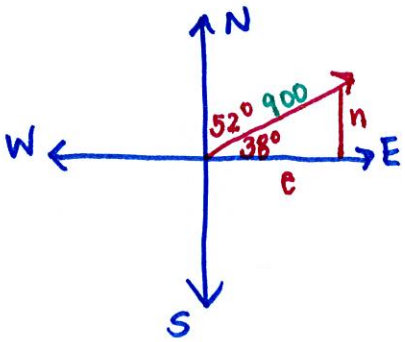
$\cos 61° = \frac{W}{120}$ $\sin 61° = \frac{S}{120}$

W = 58.2 nm S = 105.0 nm

Example 5: Draw the diagram first, then obtain the desired information.

An airplane flying at 600 miles per hour has a bearing of 52°. After flying for 1.5 hours, how far north and how far east has the plane traveled form its point of departure.

600 × 1.5 = 900 miles

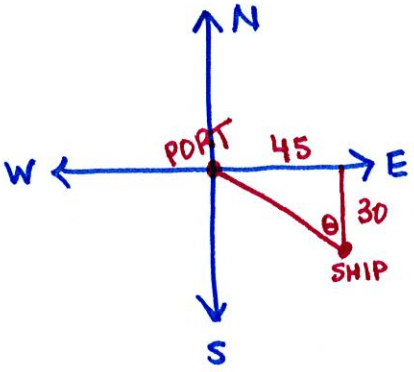


$\cos 38° = \frac{e}{900}$ $\sin 38° = \frac{n}{900}$

e = 709.2 miles n = 554.1 miles

Example 6: Draw the diagram first, then obtain the desired information.

A ship is 45 miles east and 30 miles south of port. (Hint: place "port" at the origin") The captain wants to sail directly to port. What bearing should be taken?



$\tan\theta = \frac{45}{30}$

$\theta = 56.31°$

N 56.31° W or a bearing of 303.69°

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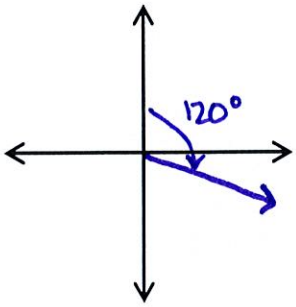
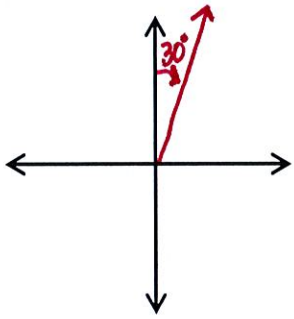
Pre-Calculus **Navigation Applications** **Name**
Right Triangle Trig **HOMEWORK** **Dec. 2014**

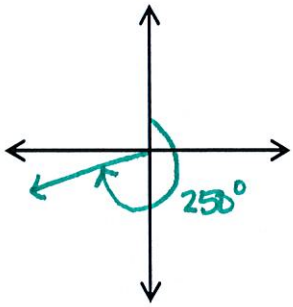
Given the NORTH-SOUTH lines, draw the following bearings:



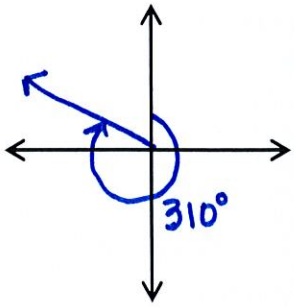
1. Bearing of 120°



2. Bearing of 030°

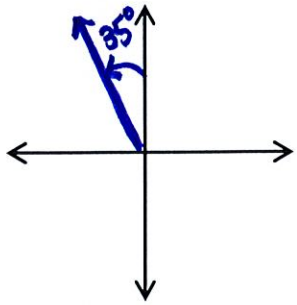


3. Bearing of 250°

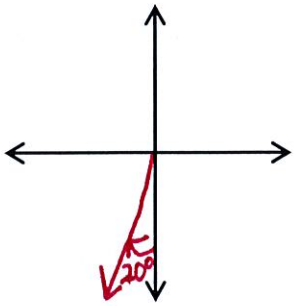


4. Bearing of 310°

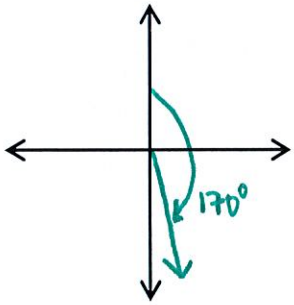
Given the NORTH-SOUTH lines, draw the following bearings:



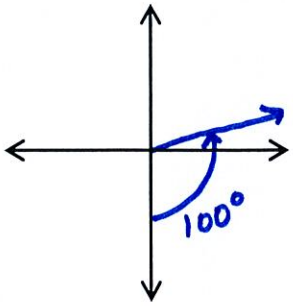
5. $N\ 35°\ W$



6. $S\ 20°\ W$

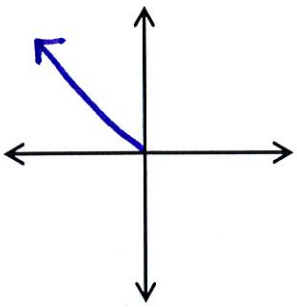


7. $N\ 170°\ E$

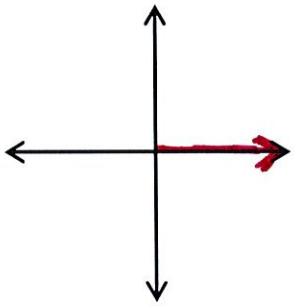


8. $S\ 100°\ E$

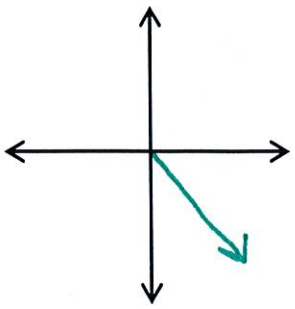
Given the NORTH-SOUTH lines, draw the following bearings:



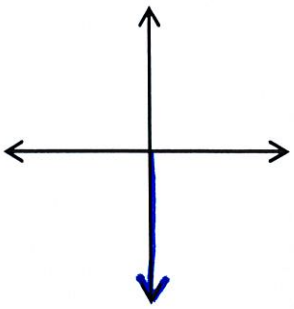
9. Northwest



10. Proceeds East



11. Southeast



12. South

What is the bearing for each of the above courses?

13. 315°

14. 90°

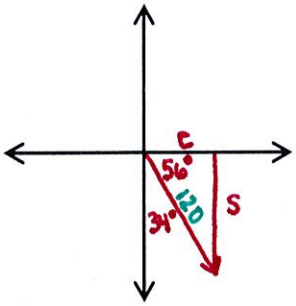
15. 135°

16. 180°

For each of the following, draw a picture and then obtain the desired information.

17. A ship leaves port at noon and has a bearing of $S\ 34°\ E$. The ship sails at 30 knots. How many nautical miles south and how many nautical miles east will the ship have travelled by 4:00 p.m.?

nm = 30 × 4 = 120



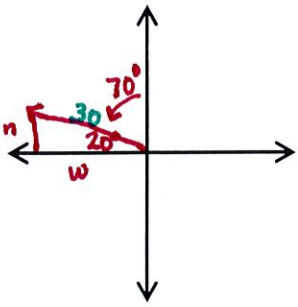
$\cos 56° = \frac{e}{120}$

$e = 67.1$ nm

$\sin 56° = \frac{S}{120}$

$S = 99.5$ nm

18. A fisherman leaves his home port and heads in the direction $N\ 70°\ W$. He travels 30 miles. How far north and how far west is he from his home port?



$\cos 20° = \frac{w}{30}$

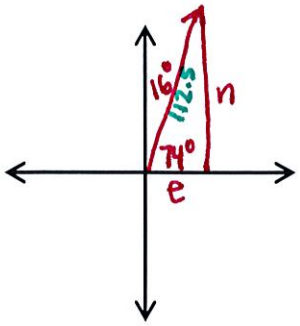
$w = 28.2$ miles

$\sin 20° = \frac{n}{30}$

$n = 10.3$ miles

19. A ship leaves port at 10:00 a.m. and has a bearing of $N\ 16°\ E$. The ship sails at 25 knots. How many nautical miles north and how many nautical miles east will the ship have travelled by 2:30 p.m.?

distance = $25 \times 4.5 = 112.5$



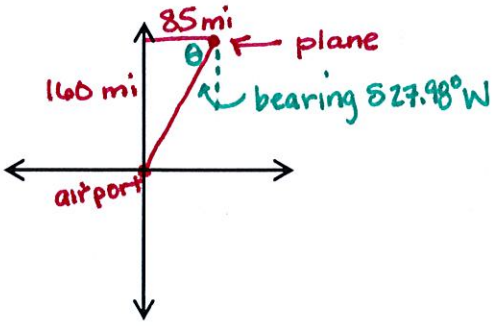
$\cos 74° = \frac{e}{112.5}$

$e = 31$ nm

$\sin 74° = \frac{n}{112.5}$

$n = 108.1$ nm

20. A plane is 160 miles north and 85 miles east of an airport. The pilot wants to fly directly to the airport. What bearing should be taken?



$\tan\theta = \frac{160}{85}$

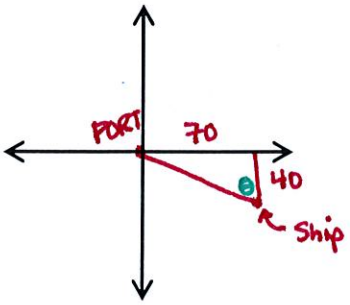
$\theta = 62.02°$

S 27.98° W

or

From the north! 207.98°

21. A ship is 70 miles east and 40 miles south of port. The captain wants to sail directly to port. What bearing should be taken?



$\tan\theta = \frac{70}{40}$

$\theta = 60.3°$

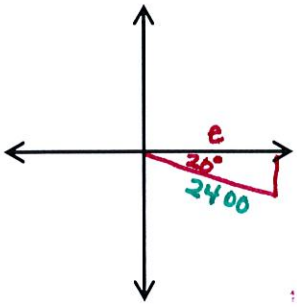
N 60.3° W

or

From the north! 299.77°

22. An airplane flies on a course of 110° at a speed of 1200 km/hr. How far east of its starting point is it after 2 hours?

distance $1200 \times 2 = 2400$

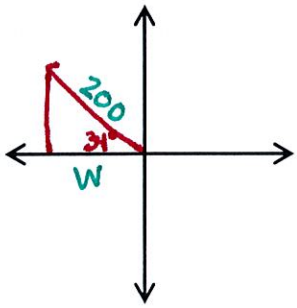


$\cos 20^\circ = \frac{e}{2400}$

$e = 2255.26$ km

23. An ship sails on a course of 304° at a speed of 50 knots. How far west of its starting point is it after 4 hours?

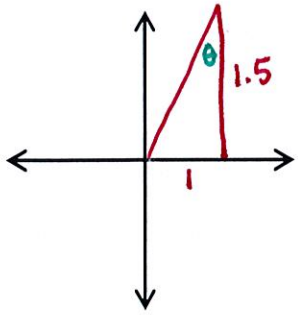
distance $= 50 \times 4 = 200$



$\cos 34^\circ = \frac{W}{200}$

$W = 165.8$ nm

24. A hunter walks east for 1 hour and then north for 1.5 hours. What course should the hunter take to return to his starting point?



$\tan\theta = \frac{1}{1.5}$

$\theta = \tan^{-1}\left(\frac{1}{1.5}\right)$

$\theta = 33.7^\circ$

S 33.7° W or

From the north! 213.7°

17. 67.1 nm east; 99.5 nm south
18. 10.3 miles north; 28.2 miles west
19. 31.0 nm east; 108.1 nm north
20. 207.98° or *S* 27.98° *W*
21. 299.77° or *N* 60.3° *W*
22. 2255.26 km
23. 165.8 nm west
24. 213.7° or *S* 33.7° *W*