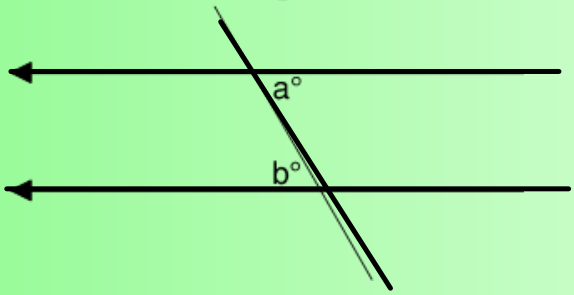
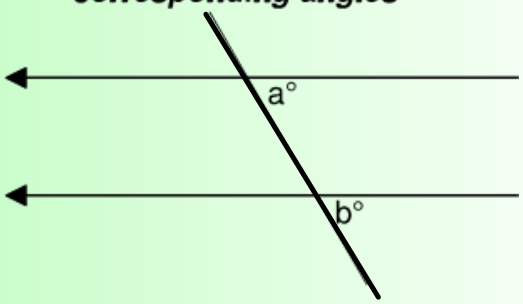
Chapter 7 - Angles and Parallel Lines

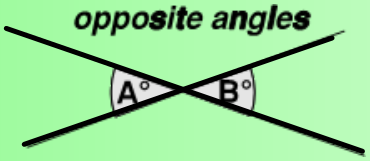
alternate angles



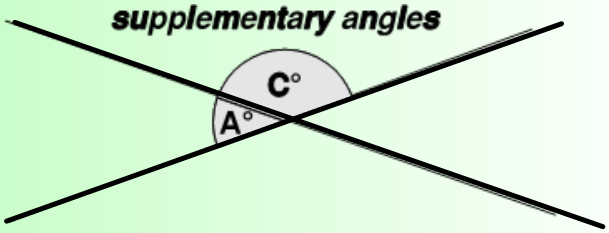
corresponding angles



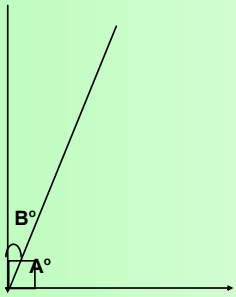
opposite angles



supplementary angles



Complementary angles



Let's Talk Angles

Who uses angles?

Architects, designers, surveyors, carpenters,
Air craft pilots, boat pilots, astronomers...etc

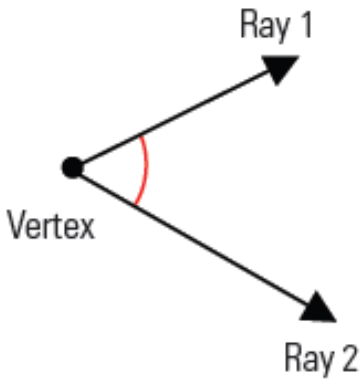
What is an angle?

An angle is formed when two rays meet at a common endpoint called a vertex.

Angels are measured with tools, such as a protractor, that are marked in degrees.

Key Terms...

angle: two rays that meet at a point called the vertex



angle referent: a common standard of angle measure, for example, 0°, 45°, 90°, 180°, and 360°; they are used to estimate angles

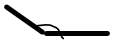
true bearing: the angle measured clockwise between true north and an intended path or direction, expressed in degrees

angle measure: a number representing the spread of the two rays of an angle, expressed in degrees

Some More Key Terms...

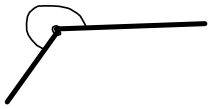
Acute angle - measure is between 0^o and 90^o 

Right angle  - measure is 90^o; the two rays are perpendicular to each other

Obtuse angle - measure is between 90^o and 180^o 

Straight angle - measure is 180^o 

Reflex angle - measure is between 180^o and 360^o

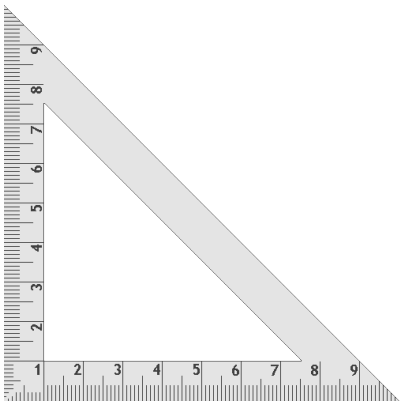


FIVE TYPES OF ANGLES	
Definition of angle	*Kind of angle*
greater than 0° but less than 90°	acute
90°	right
greater than 90° but less than 180°	obtuse
180° (two rays share a vertex and point in opposite directions)	straight
greater than 180° but less than 360°	reflex

Geometry Set... Bring tomorrow!

Protractor

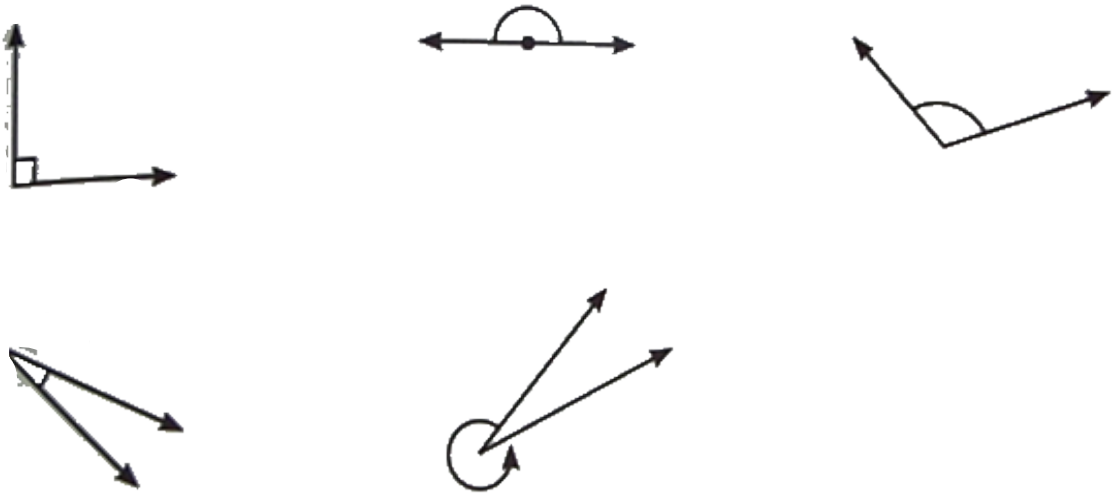
Right Triangle



Compass

Ruler

EXERCISE: Identify each of the following angles using the correct terminology...



Even More Key Terms...

complementary angles:
two angles that have measures that add up to 90°

supplementary angles:
two angles that have measures that add up to 180°

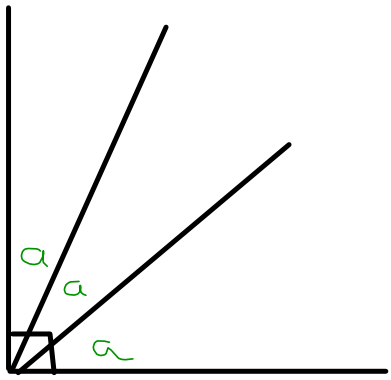
Sort the following angles into pairs of **complementary** and **supplementary** angles.

comp
∠A + ∠D
∠C + ∠F

∠A = 42°
∠B = 107°
∠C = 59°
∠D = 48°

∠E = 121°
∠F = 31°
∠G = 19°
∠H = 73°

sup
∠C + ∠E
∠B + ∠H



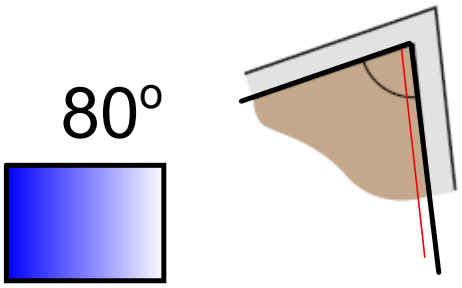
$3a = 90^\circ$ (comp $\angle$)

$a = 30^\circ$

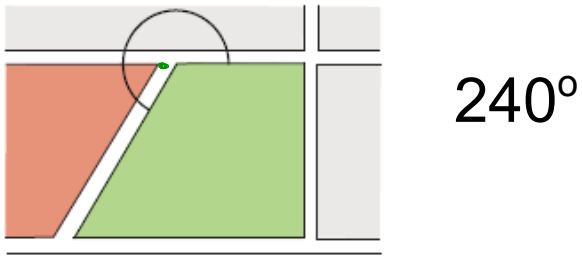
Mental Math and Estimation

Estimations are made in many trades that use angles. Imagine that you are working as a tradesperson in the situations below and make the following estimations (aim to be within 5°).

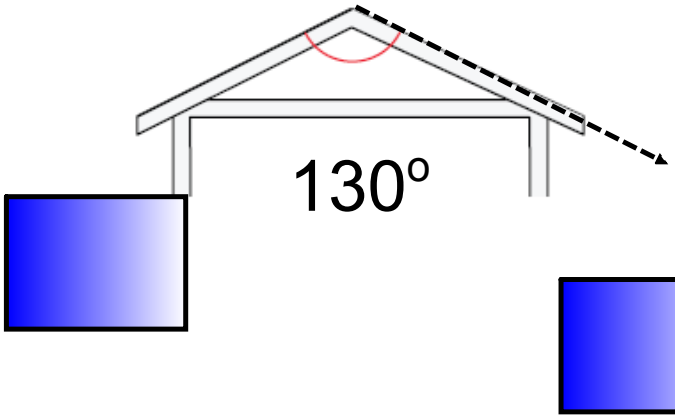
a) a landscaper estimating the angle of the corner of a garden bed



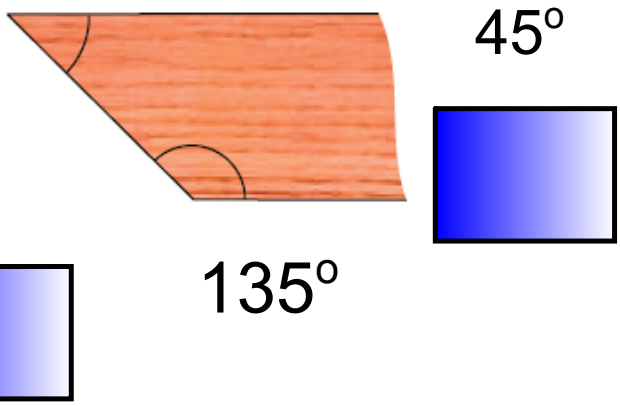
b) a surveyor estimating the angle of a property boundary line on a map



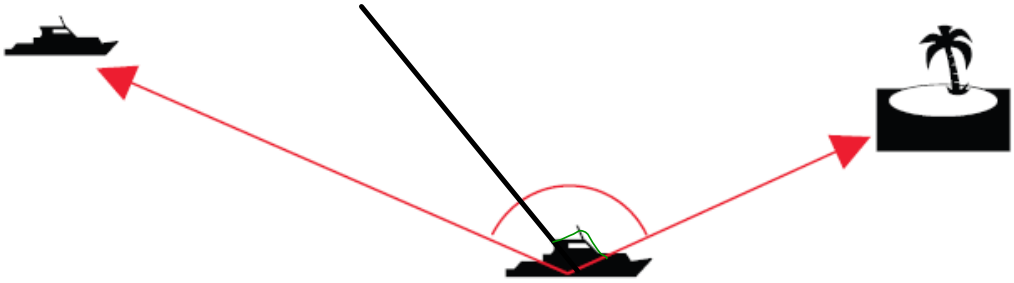
c) a roofer estimating the angle of the peak of a roof



d) a cabinet-maker estimating the angles of two corners of a shelf



Estimate the measure of this angle without using a measuring device.

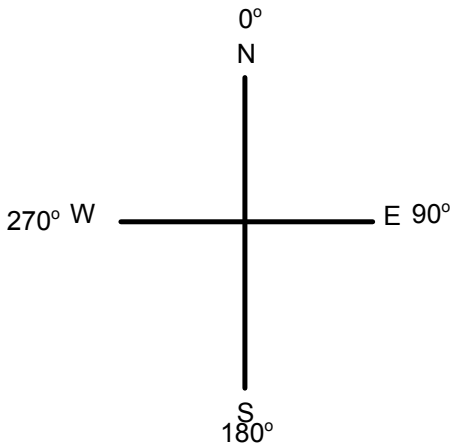


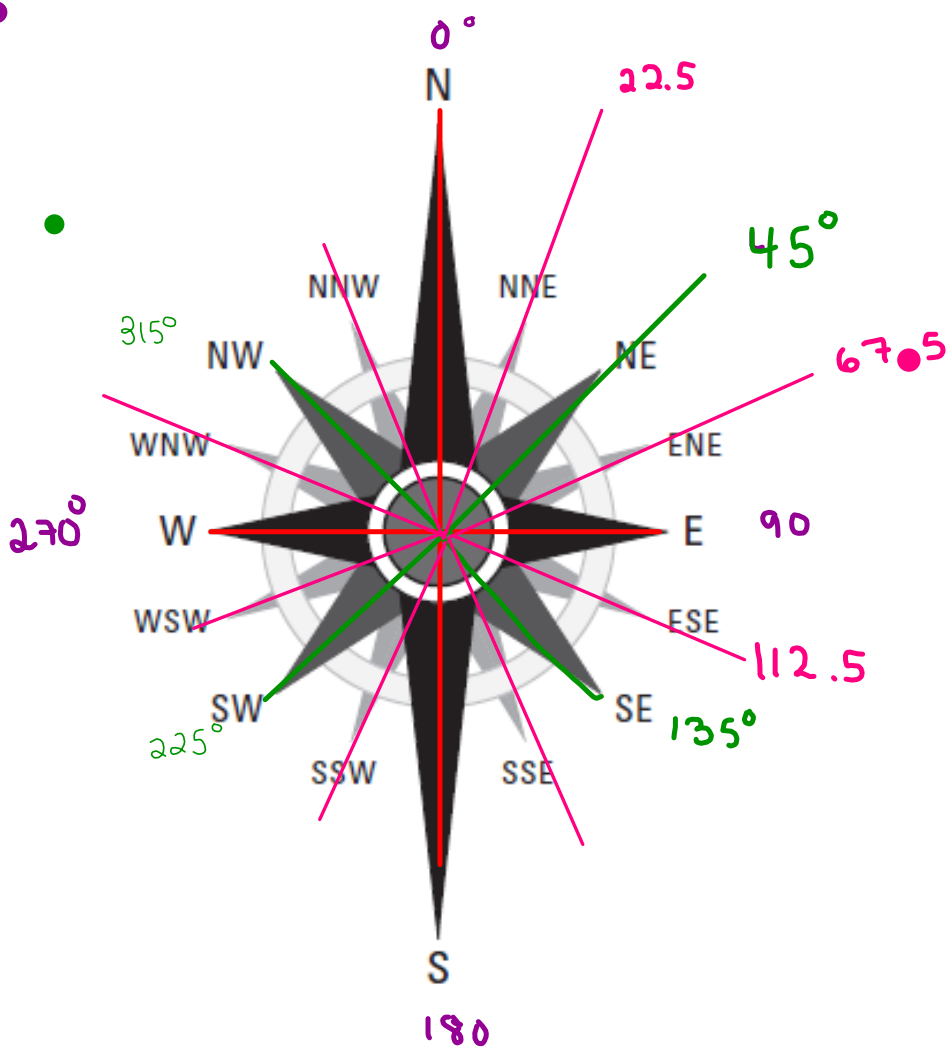
Working with True Bearing

True Bearing:

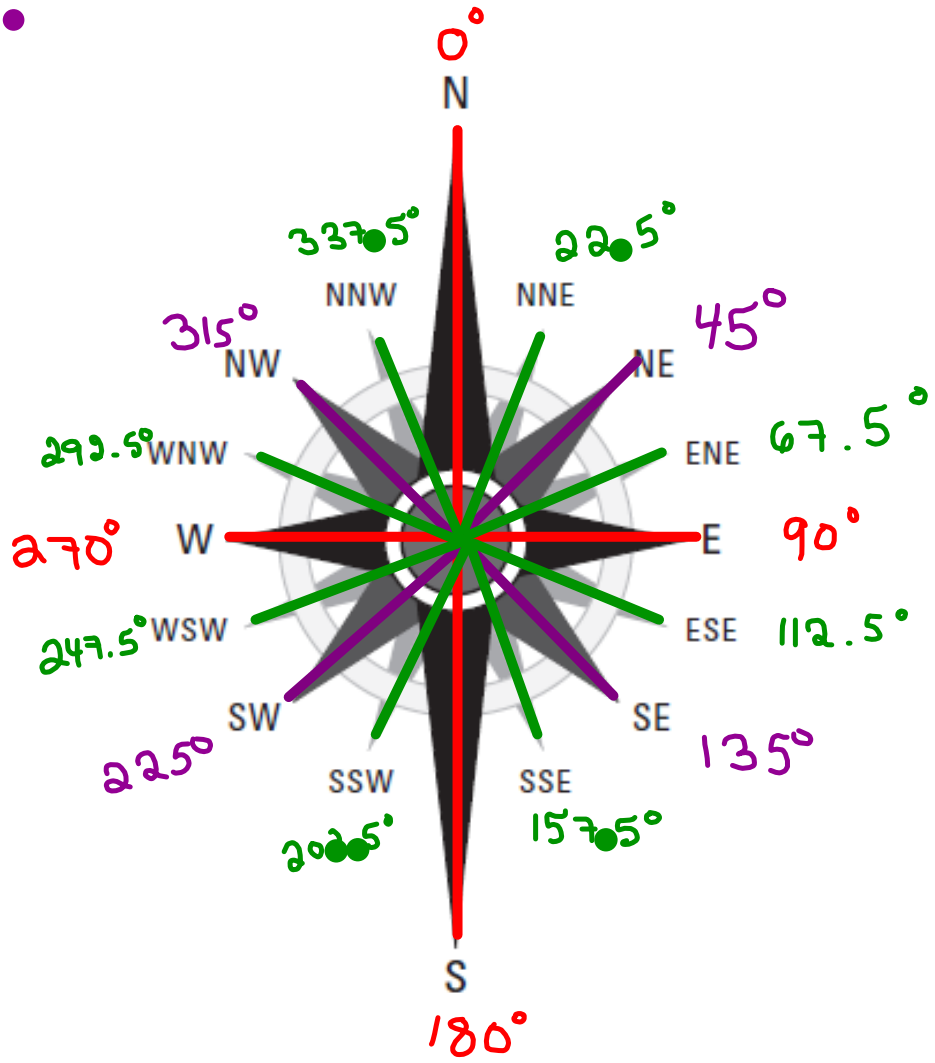
- Describes the number of degrees, measured clockwise, between an imaginary line pointing towards true north (geographic north) and another imaginary line pointing towards an intended direction or along a path.

* East is represent in land navigation and mapping at 90^{O} angle from true north





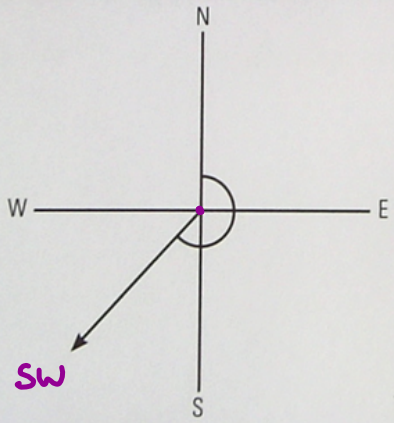
NAVIGATIONAL BEARI	
Direction	*Bearing*
N	
NNE	
NE	
ENE	
E	
ESE	
SE	
SSE	
S	
SSW	
SW	
WSW	
W	
WNW	
NW	
NNW	


0°
N
22.5°
NNE
45°
NE
67.5°
ENE
90°
E
112.5°
ESE
135°
SE
157.5°
SSE
180°
S
202.5°
SSW
225°
SW
247.5°
WSW
270°
W
292.5°
WNW
315°
NW
337.5°
NNW

EXAMPLE...

A boat is heading directly southwest. What is its true bearing?

SOLUTION



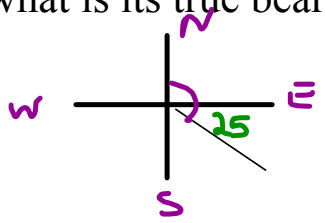
If the boat is heading southwest, measuring from the vertical will give you an obtuse angle of 225° (45° beyond a straight angle).

EXERCISE:

1) If a boat is travelling 25° south of straight east, what is its true bearing?

???

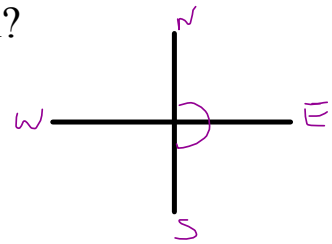
(Solution - 115°)



2) What is the true bearing of a boat travelling south?

???

(Solution - 180°)

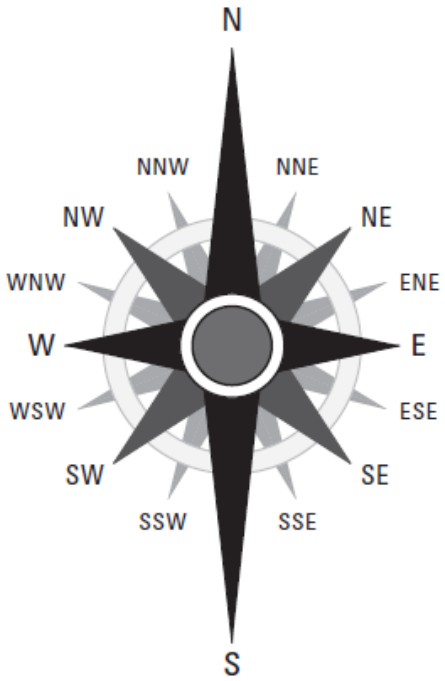


3) What is the true bearing of a boat travelling north-northwest?

???

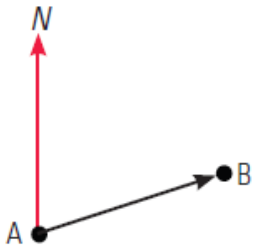
(Solution - 337.5°)

NAVIGATIONAL BEARING	
Direction	*Bearing*
N	0°
NNE	22.5°
NE	45°
ENE	67.5°
E	90°
ESE	112.5°
SE	135°
SSE	157.50°
S	180°
SSW	202.5°
SW	225°
WSW	247.5°
W	270°
WNW	292.5°
NW	315°
NNW	337.5°

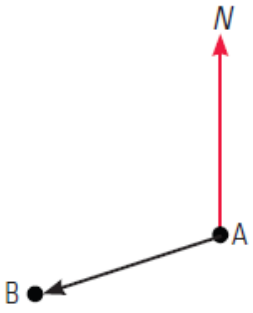


Examples...

a) Determine the true bearing between A and B.



b) Determine the true bearing between A and B.



Example 1

Use a ruler and compass to create the following angles.

a) Draw a 90° angle.

b) Replicate any existing angle.

How Can We Bisect An Angle???

angle bisector: a segment, ray, or line that separates two halves of a bisected angle

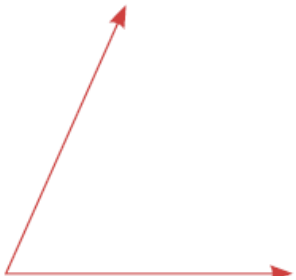
Method #1 - Paper Folding

Method #2 - Protractor and straight edge

Method #3 - Compass and straight edge

Example

Accurately bisect an angle like the one shown here.



SOLUTION

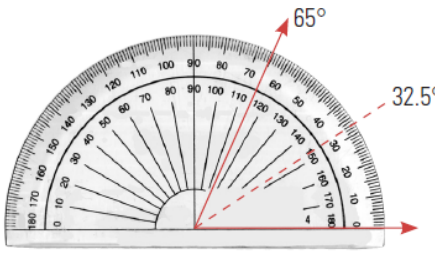
Measure the angle using a protractor. Divide that measure by 2.

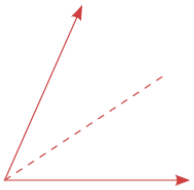
The angle measure is 65°.

65 ÷ 2 = 32.5

Use a protractor to measure and mark off a 32.5° angle.

Draw a line segment from the vertex to the mark you made.





The angle has been successfully divided into two equal parts.

ALTERNATIVE SOLUTION

Trace the angle on above onto a sheet of paper. Place one side of the angle over the other side, creating a fold that goes through the vertex of the angle. The angle has been successfully divided into two equal parts.

HOMEWORK...

p. 284 #1 - 7 (omit #6)

7.1 - Build Your Skills Detailed Solutions.pdf

7.1 - Measuring, Drawing and Estimating Angles

Homework
Determine the angles:

MATH *ON THE JOB*

Sue Rendell's job takes her from the digital world of graphic design and social media to granite cliffs inhabited by caribou, mink, and red fox. Sue and her partner Bob Hicks own and operate Gros Morne Adventures. Their guiding company takes customers on kayaking, hiking, snowshoeing, and ski touring trips through Gros Morne National Park. When guiding guests "we work with maps and a compass on some of our outings, which involves angles, bearings, and declination," says Sue.

Sue was born in Gander, NL, but grew up in Goose Bay, Labrador. Her ancestors arrived in Newfoundland from England and Ireland in the late 1700s and mid 1800s.

Susan went to high school at St. Paul's High School in Gander, NL.

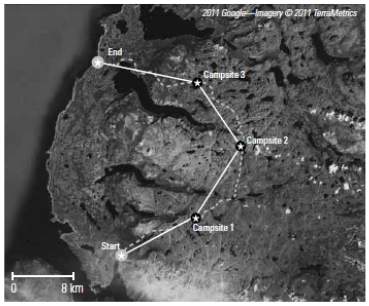
When not in the park, Sue markets her business through social media, photography, presentations, and print ads that she designs. This involves calculating dimension when she scales photos to include in advertisements. Her business also includes a café, so Sue must calculate food and labour costs and menu pricing. She also estimates staffing costs.

Sue guides hikes through Gros Morne National Park, NL, which is a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site. While they hike, her guests enjoy the park's mountains, fjords, waterfalls, and beaches.

Sue is planning to take guests on a challenging four-day hike along the Long Range Traverse route. Over the course of the hike, her guests will spend three nights at rough campsites along the route.

1. As a safety precaution, all hikers going into the backcountry need to know how to use a compass and map. Compasses are divided into 360°, as shown. Using the map provided, give the direction in degrees the hikers will need to take:
   a) From the start point to the first campsite.
   b) From the first campsite to the second campsite.
   c) From the second campsite to the third campsite.
   d) From the third campsite to the end point.
2. Using the scale provided, estimate the approximate length of the hike if hikers followed the route shown here.

SOLUTION



1. Using Blackline Master 7.1 (p. 458), have students draw line segments to show what the directions the hikers will roughly follow between destinations and then use a protractor to calculate the number of degrees between north and the line the hikers will be travelling along. Suggest to students that they can more easily measure the degrees by extending the lines beyond the destination points to that they line up with the markings on their protractor.
   a) 65°
   b) 33°
   c) 325°
   d) 282°
2. As students are being asked to estimate the length of the hike, the answers here will vary. Students should measure the route with a ruler then convert the measured value using the scale provided. Answers should range between 40 and 50 km.

HOMEWORK...

- Do Activity 7.4 on p. 290
- Build Your Skills #1 - 6 on p. 292

7.2 - Build Your Skills Detailed Solutions.pdf

PRACTICE THE 3 CONSTRUCTIONS...

(done with a straight edge and compass)

1) Perpendicular Bisector

2) Angle Replication

3) Bisect an Angle

QUIZ on these for Wednesday!!!

Attachments

7.1 - Build Your Skills Detailed Solutions.pdf

7.2 - Build Your Skills Solutions.pdf