7.1 - Measuring, Drawing and Estimating 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.

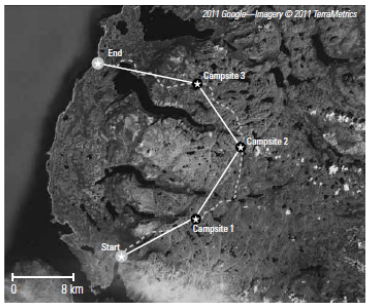
When not in the park, Sue markets her business through social media, photography, presentations, and print ads that she designs. This involves calculating dimension when she scales photos to include in advertisements. Her business also includes a café, so Sue must calculate food and labour costs and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

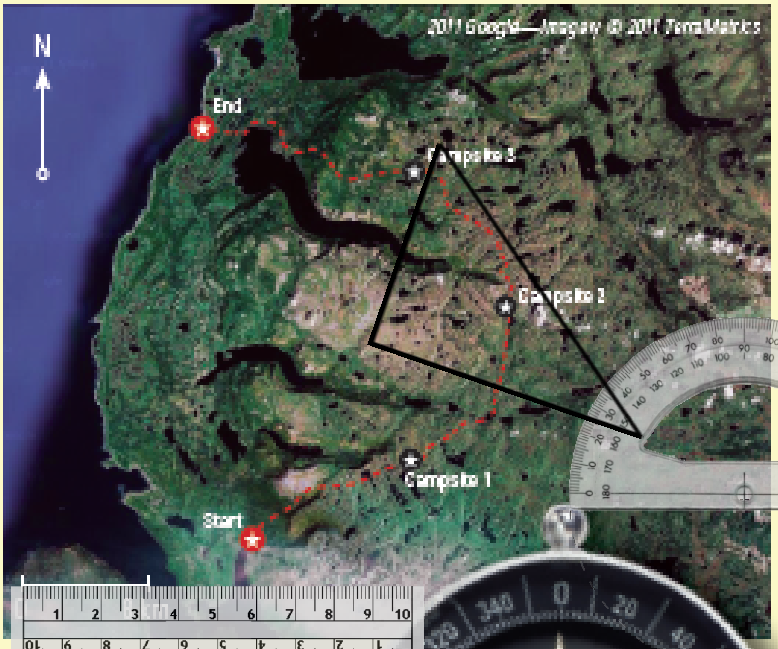


1. Using Blackline Master 7.1 (p. 458), have students draw line segments to show what the directions the hikers will roughly follow between destinations and then use a protractor to calculate the number of degrees between north and the line the hikers will be travelling along. Suggest to students that 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.

11.1
11.7
10.5
+14.2
47.5 km

include in
must calculate
staffing

Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site. While they hike, her guests enjoy the park's mountains, fjords, waterfalls, and beaches.



Scale
13mm ↔ 8km

$\frac{8km}{13mm} = \frac{x}{18mm}$ (18)

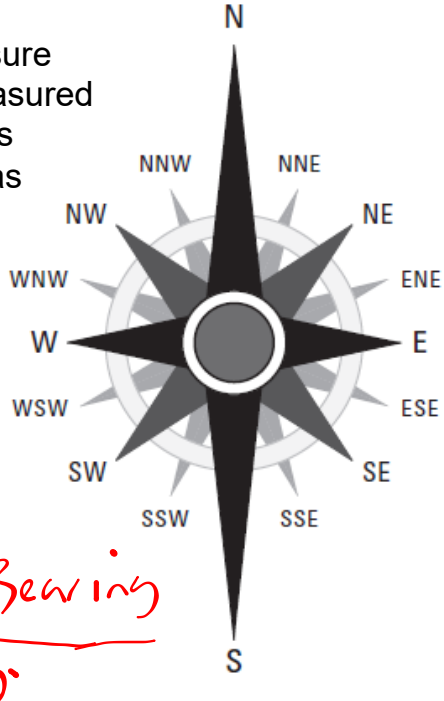
11.1km ≈ x

$$\frac{8\text{km}}{13\text{mm}} = \frac{x}{23\text{mm}}$$

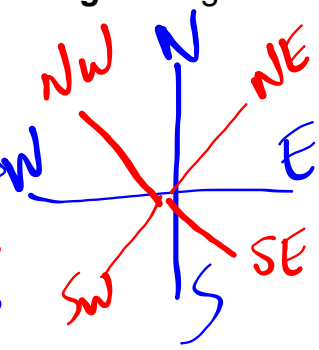
$$14.2 = x$$

Working with True Bearing

In navigation and map-making, people often measure angles from the vertical, or north. The angle, measured in a clockwise direction from a line pointing north is referred to as the ***true bearing.*** Straight north has a bearing of 0°



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°

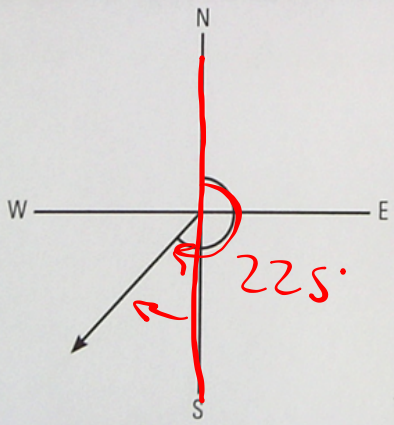


Direction	Bearing
N	0°
NE	45°
E	90°
SE	135°
S	180°
SW	225°
W	270°
NW	315°

EXAMPLE...

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

SOLUTION



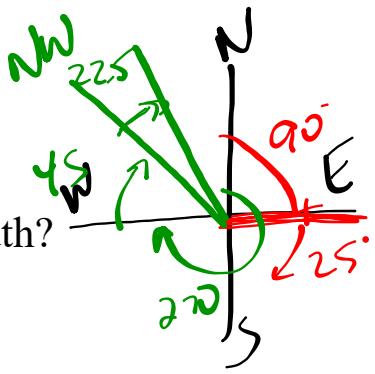
If the boat is heading southwest, measuring from the vertical will give you an obtuse angle of 225° (45° beyond a straight angle).

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?

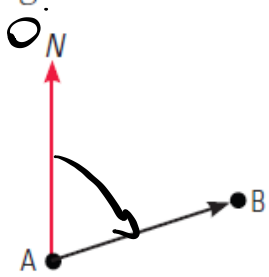
???

(Solution - 337.5°)

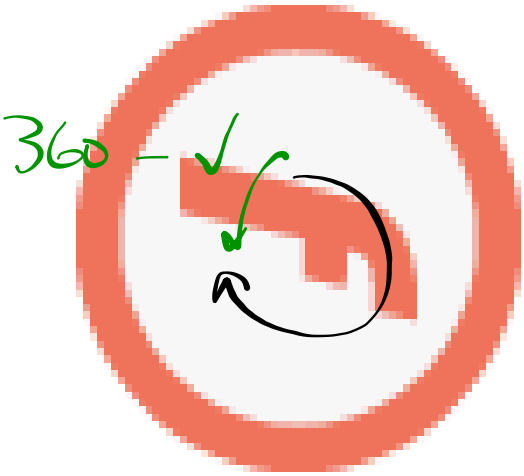
270 + 45 + 22.5

Examples...

a) Determine the true bearing between A and B.



b) Determine the true bearing between A and B.



HOMEWORK...

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

7.1 - Build Your Skills Detailed Solutions.pdf

Attachments

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