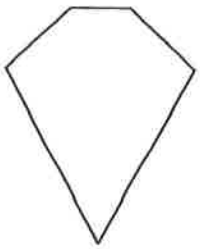
ACE Applications | Connections | Extensions

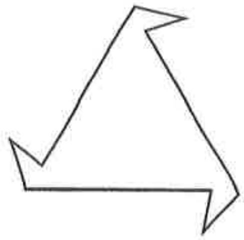
Applications

1. Tell whether each figure is a polygon. Explain how you know.

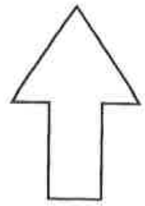
a.



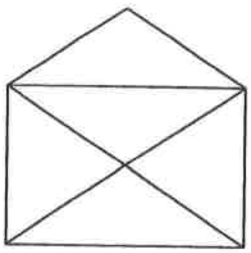
b.



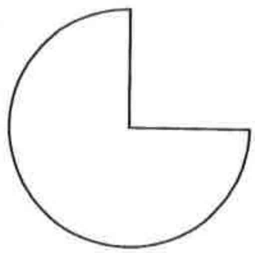
c.



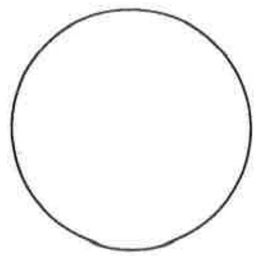
d.



e.



f.



2. Copy and complete the table. Sort the Shapes Set into groups by polygon name.

Common Polygons

Number of Sides	Polygon Name	Examples in the Shapes Set
3	triangle	■
4	quadrilateral	■
5	pentagon	■
6	hexagon	■
7	heptagon	■
8	octagon	■
9	nonagon	■
10	decagon	■
12	dodecagon	■

3. A figure is called a *regular polygon* if all sides are the same length and all angles are equal. List the members of the Shapes Set that are regular polygons.

4. Name the polygons used in these street and highway signs (ignore slightly rounded corners).

a.

b.

c.

d.

e.

f.

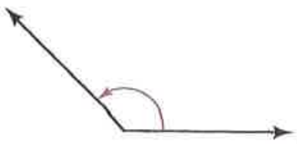
g.

h.

i.

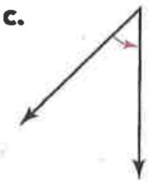
5. An angle whose measure is less than 90° is called an *acute angle*. An angle whose measure is greater than 90° and less than 180° is called an *obtuse angle*. Which of these angles are acute, which are obtuse, and which are right?

a.

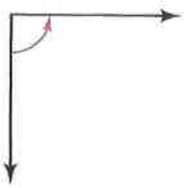


b.

c.

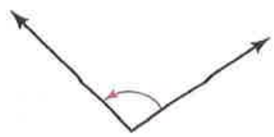


d.



e.

f.



6. For two different angles, the angle with the greater turn from one side to the other is considered the larger angle. A test question asked to choose the larger angle.

In one class, most students chose Angle 2. Do you agree? Why or why not?

7. List all polygons in the Shapes Set that have:

a. only right angle corners.

b. only obtuse angle corners.

c. only acute angle corners.

d. at least one angle of each type—acute, right, and obtuse.

8. Snowboarders use angle measures to describe their flips and spins. Explain what a snowboarder would mean by each statement.

   a. I did a 720.
   b. I did a 540.
   c. I did a 180.

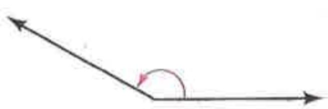
9. Which benchmark angles (multiples of 30° or 45°) are closest to the rotation angles below?

   a. 40°
   b. 140°
   c. 175°
   d. 220°
   e. 250°
   f. 310°

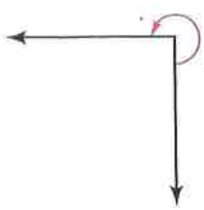
10. In parts (a)–(h), decide whether each angle is closest to 30°, 60°, 90°, 120°, 150°, 180°, 270°, or 360° without measuring. Explain your reasoning.

   a.

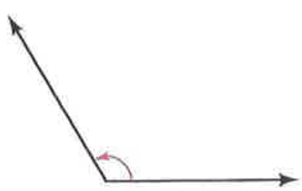

   b.

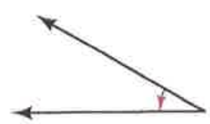

   c.


   d.


   e.


   f.


   g.


   h.


   i. For each angle in parts (a)–(h), classify them as right, acute, or obtuse.

11. Give the degree measure of each angle.

a. one sixth of a right angle

b. three fourths of a right angle

c. five fourths of a right angle

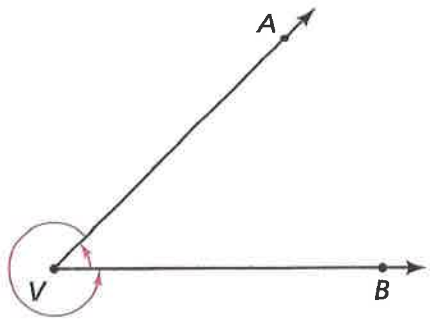
d. five thirds of a right angle

e. two thirds of a full turn

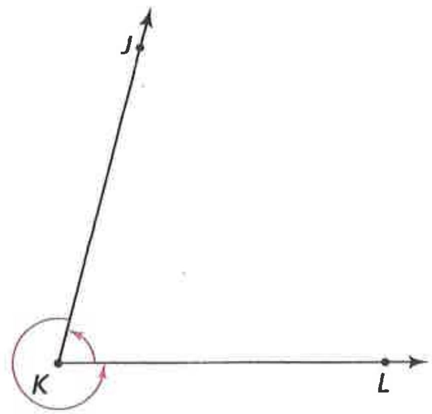
f. one and a half full turns

12. For each pair of angles in parts (a)–(d), estimate the measure of each angle. Then, check your estimates by measuring with an angle ruler or a protractor.

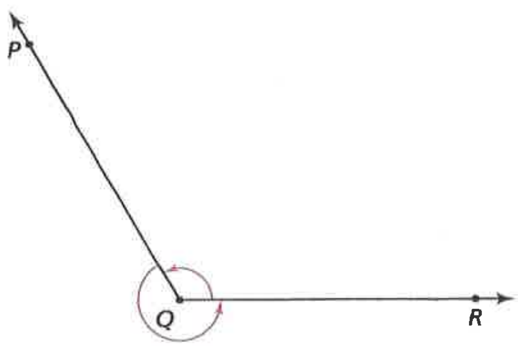
a.



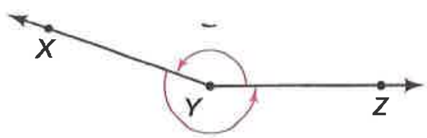
b.



c.

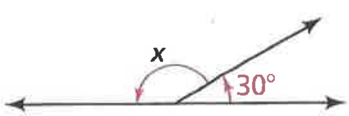


d.

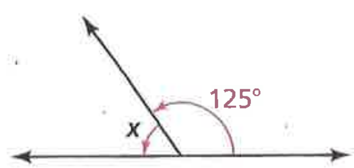


For Exercises 13–16, write an equation and find the measure of the angle labeled *x*, *without* measuring.

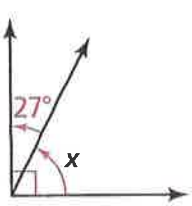
13.



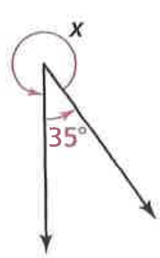
14.



15.



16.



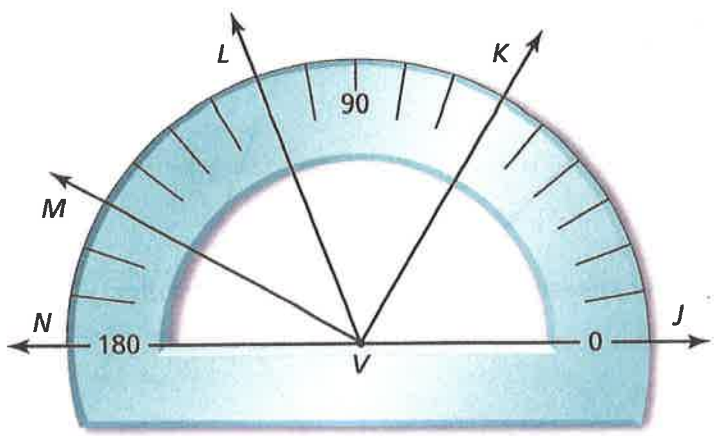
17. At the start of each hour, the minute hand points straight up at 12. In parts (a)–(f), determine the angle between the minute hand at the start of an hour and the minute hand after the given amount of time passes. For each situation, sketch the angle and indicate the rotation of the minute hand.

a. 15 minutes
b. 30 minutes
c. 20 minutes
d. one hour
e. 5 minutes
f. one and one-half hours

18. One common definition of an angle is two rays with a common endpoint. There are many times when you are really interested in the region or area between the two rays. For example, when a pizza is cut into six or eight pieces, you are interested in the slice of pizza, not the cuts. Suppose a pizza is cut into equal size pieces. Calculate the measure of the angle for one slice given the number of pieces.

a. 6 pieces
b. 8 pieces
c. 10 pieces

For Exercises 19–28, find the angle measures. Use the diagram of the protractor below. $\angle JVK$ and $\angle KVL$ are called adjacent angles because they have a common vertex and a common side.



19. $m\angle JVK$

20. $m\angle JVL$

21. $m\angle JVM$

22. $m\angle KVL$

23. $m\angle KVM$

24. $m\angle LVM$

25. the complement of $\angle JVK$

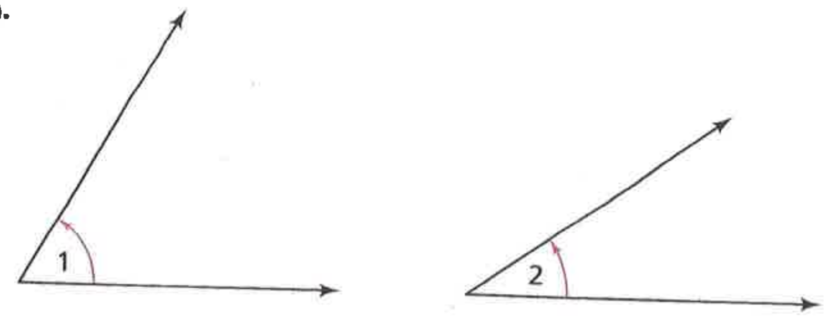
26. the supplement of $\angle JVK$

27. the complement of $\angle MVL$

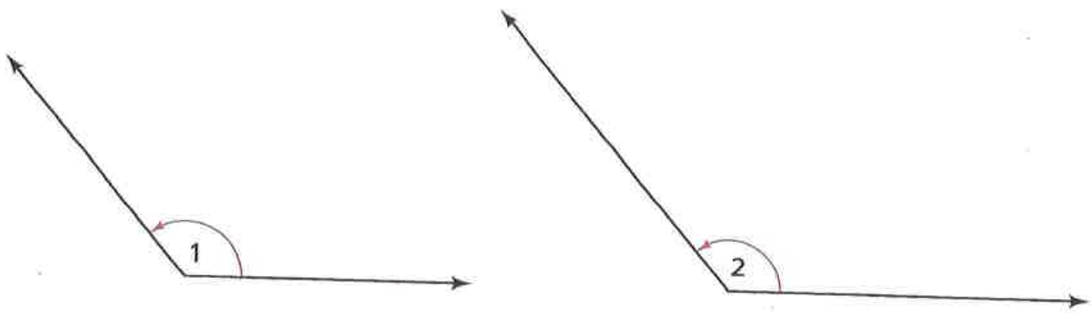
28. the supplement of $\angle JVL$

29. Without measuring, decide whether the angles in each pair have the same measure. If they do not, tell which angle has the greater measure. Then, find the measure of the angles with an angle ruler or protractor to check your work.

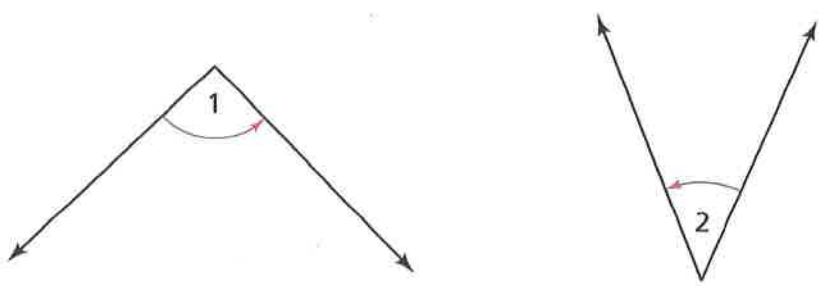
a.



b.

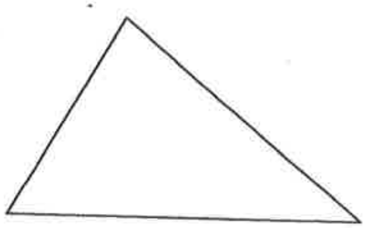


c.

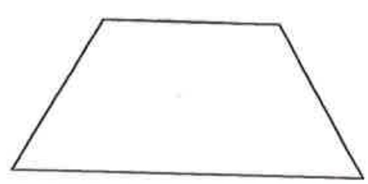


30. For each polygon below, measure the angles with an angle ruler.

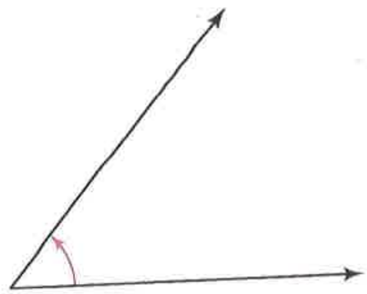
a.

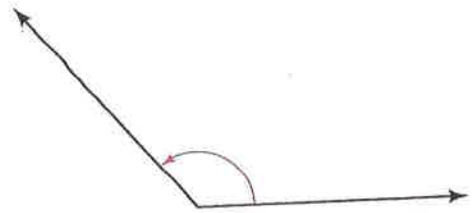


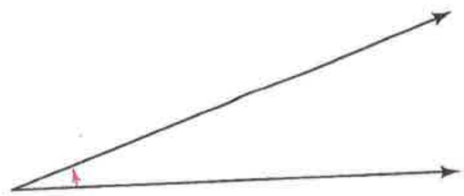
b.

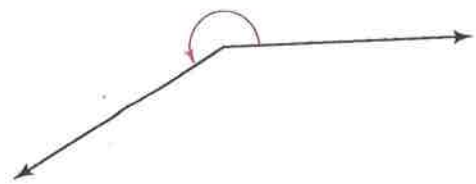


31. Estimate the measure of each angle, then check your answers with an angle ruler or a protractor.

a. 

b. 

c. 

d. 

e. 

32. Draw an angle for each measure. Include an arc indicating the turn.

a. 45°

b. 25°

c. 180°

d. 200°

In Exercises 33–36, draw the polygons described. If there is more than one (or no) shape that you can draw, explain how you know that.

33. Draw a rectangle. Perimeter = 24 cm and side of 8 cm.

34. Draw a triangle. Side $\overline{AB} = 2$ in. Side $\overline{AC} = 1$ in. $\angle BAC = 75°$.

35. Draw a triangle. $\angle BAC = 75°$ and $\angle ACB = 75°$.

36. Draw a trapezoid $PQRS$. $\angle QPS = 45°$. $\angle RQP = 45°$. Side $\overline{PS} = 1$ in. Side $\overline{PQ} = 2$ in.

Connections

In Exercises 37–40, find two equivalent fractions for each fraction. Find one fraction with a denominator less than the one given. Find another fraction with a denominator greater than the one given.

37. $\frac{4}{12}$

38. $\frac{9}{15}$

39. $\frac{15}{35}$

40. $\frac{20}{12}$

In Exercises 41–44, copy the fractions. Insert $<$, $>$, or $=$ to make a true statement.

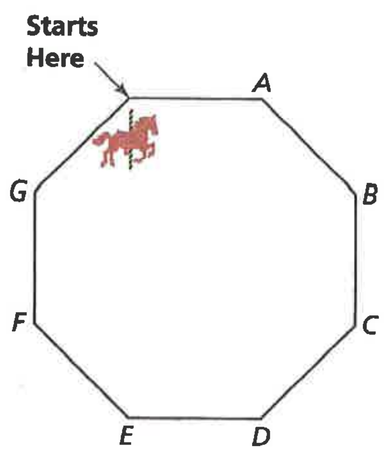
41. $\frac{5}{12}$ ■ $\frac{9}{12}$

42. $\frac{15}{35}$ ■ $\frac{12}{20}$

43. $\frac{7}{13}$ ■ $\frac{20}{41}$

44. $\frac{45}{36}$ ■ $\frac{35}{28}$

45. Marissa takes a ride on a merry-go-round. It is shaped like the octagon shown. Marissa's starting point is also shown.



a. Multiple Choice Where will Marissa be after the ride completes $\frac{4}{8}$ of a full turn?

A. point C

B. point D

C. point E

D. point G

b. Multiple Choice Where will Marissa be after the ride completes $\frac{1}{2}$ of a full turn?

F. point B

G. point C

H. point D

J. point F

46. **Multiple Choice** Choose the correct statement.

A. $\frac{5}{6} = \frac{11}{360}$

B. $\frac{3}{4} = \frac{300}{360}$

C. $\frac{1}{4} = \frac{90}{360}$

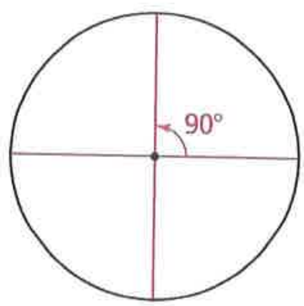
D. $\frac{3}{36} = \frac{33}{360}$

47. The number 360 has many factors. This may be why it was chosen for the number of degrees in a full turn.

a. List all of the factors of 360.

b. Find the prime factorization of 360.

48. You can think of a right angle as one quarter of a complete rotation.



a. How many degrees is $\frac{1}{3}$ of a quarter-rotation?

b. How many degrees is two times a quarter-rotation?

c. How many degrees is two and one third times a quarter-rotation?

For Exercises 49–52, replace the ■ with a number that makes the sentence true.

49. $\frac{1}{2} = \frac{\blacksquare}{360}$

50. $\frac{1}{10} = \frac{36}{\blacksquare}$

51. $\frac{1}{\blacksquare} = \frac{40}{360}$

52. $\frac{\blacksquare}{3} = \frac{120}{360}$

53. A full turn is 360°. Find the fraction of a turn or number of turns for the given measurement.

a. 90°

b. 270°

c. 720°

d. How many degrees is $\frac{25}{360}$ of a full turn?

54. The minute hand on a watch makes a full rotation each hour. In 30 minutes, the minute hand makes half of a full rotation.

a. In how many minutes does the hand make $\frac{1}{6}$ of a rotation?

b. In how many minutes does the hand make $\frac{1}{6}$ of half a rotation?

c. What fraction of an hour is $\frac{1}{6}$ of half a rotation?

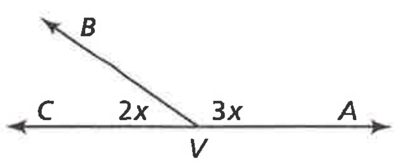
d. How many degrees has the minute hand moved in $\frac{1}{6}$ of half a rotation?

55. A ruler is used to measure the length of line segments. An angle ruler is used to measure the size of (or turn in) angles.

a. What is the unit of measure for each kind of ruler?

b. Compare the method for measuring angles to the method for measuring lines. Use a few sentences.

56. Use the diagram below. Write an equation using the angle measures shown. Then, find the measures of $\angle AVB$ and $\angle BVC$.

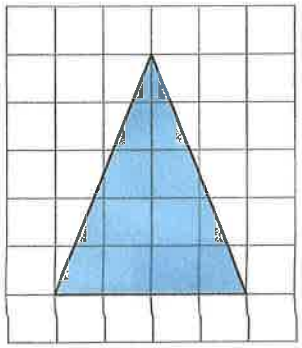


57. Ms. Cosgrove asked her students to estimate the measure of the angle shown.

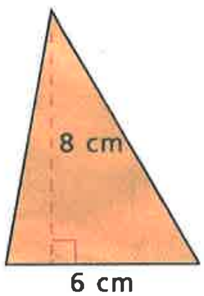
Carly thought 150° would be a good estimate. Hannah said it should be 210°. Who is closer to the exact measurement? Explain.

58. Find the area of the following polygons.

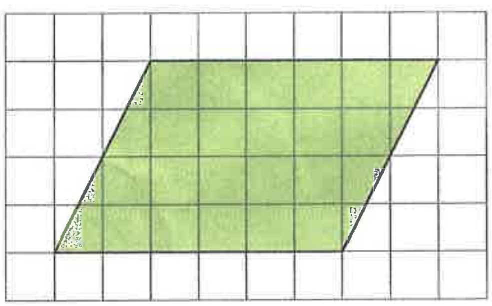
a.



b.



c.



For Exercises 59–63, draw a polygon with the given properties (if possible). Decide if the polygon is unique. If not, design a different second polygon with the same properties.

59. a triangle with a height of 5 cm and a base of 10 cm

60. a triangle with a base of 6 cm and an area of 48 cm

61. a triangle with an area of 12 square centimeters

62. a parallelogram with an area of 24 square centimeters

63. a parallelogram with a height of 4 cm and a base of 8 cm

Extensions

64. Copy and complete the table. Sort the quadrilaterals from the Shapes Set into groups by name and description.

Common Quadrilaterals

Sides and Angles	Name	Examples in the Shapes Set
All sides are the same length.	rhombus	
All sides are the same length and all angles are right angles.	square	
All angles are right angles.	rectangle	
Opposite sides are parallel.	parallelogram	
Only one pair of opposite sides are parallel.	trapezoid	

65. Which of the following statements are true? Be able to justify your answers.

a. All squares are rectangles.

b. No squares are rhombuses.

c. All rectangles are parallelograms.

d. Some rectangles are squares.

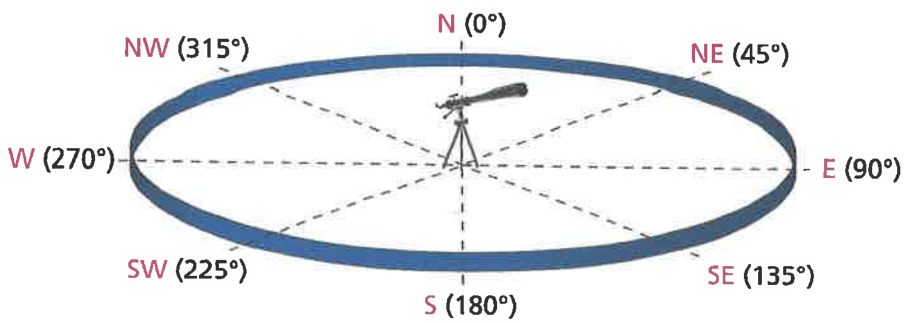
e. Some rectangles are trapezoids.

f. No trapezoids are parallelograms.

g. Every quadrilateral is a parallelogram, a trapezoid, a rectangle, a rhombus, or a square.

66. Design a new polar coordinate grid for Four in a Row in Problem 1.2. Play your game with a friend or family member. What ideas did you use to design your new grid? Explain. How does playing on your grid compare to playing on the original grids?

67. A *compass* is a tool used in wilderness navigation. On a compass, *North* is assigned the direction label 0°, *East* is 90°, *South* is 180°, and *West* is 270°. Directions that are between those labels are assigned degree labels such as NE at 45°, for example.



a. What degree measures would you expect for the direction south-southwest? For north-northwest?

b. A ship at sea is on a heading of 300°. Approximately what direction is it traveling?

68. Major airports label runways with the numbers by the compass heading. For example, a plane on runway 15 is on a compass heading of 150°. A plane on runway 9 is on a compass heading of 90°.

a. What is the runway number of a plane that is taking off on a heading due west? On a heading due east?

b. What is the compass heading of a plane landing on runway 6? On runway 12?

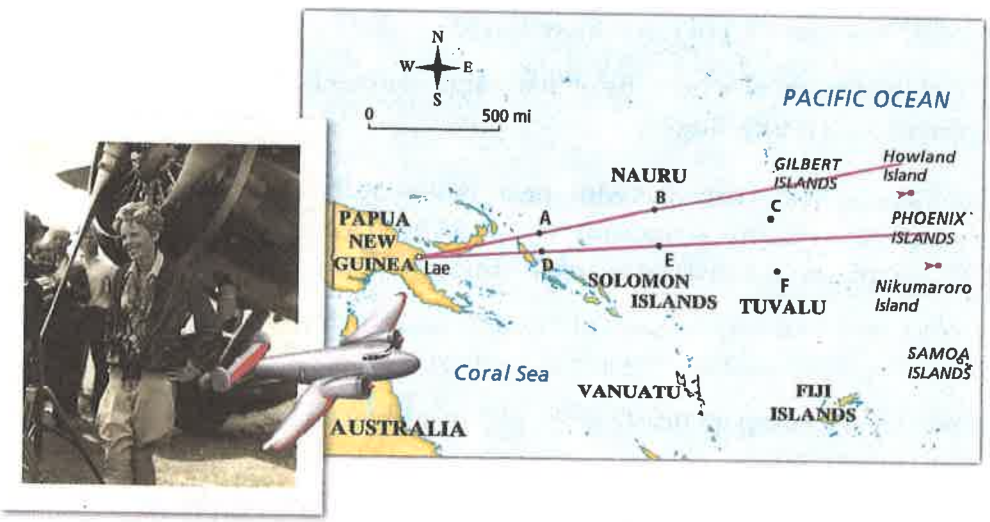
c. Each actual runway has two direction labels. The label depends on the direction in which a landing or taking off plane is headed. How are those labels related to each other?

69. When you and your classmates measure an angle, you have found that your measurements are slightly different. No measuring tool is absolutely precise, so there is a little error in every measurement. For example, when using angle measures to navigate an airplane, even small errors can lead a flight far astray.

In 1937, Amelia Earhart tried to become the first woman to fly around the world. On June 1, she left Miami, Florida. On July 2, she left Lae, New Guinea and headed towards Howland Island in the Pacific Ocean. She never arrived.

In 2012, 75 years later, investigators found evidence of the crash on the deserted island of Nikumaroro, far off her intended course. An error may have been made in plotting Earhart's course.

The map shows Lae, New Guinea; Howland Island (Earhart's intended destination); and Nikumaroro Island (the crash site).



a. How many degrees off course was Earhart's crash site from her intended destination?

b. Suppose two planes fly along the paths formed by the rays of the angle indicated on the map. Both planes leave Lae, New Guinea, at the same time. They fly at the same speed. Use the scale in the upper left corner of the map. Find the distance between the planes at each pair of points labeled on the map (A and D, B and E, and C and F).

c. Amelia Earhart apparently flew several degrees south of her intended course. Suppose you start at New Guinea and are trying to reach Howland, but you fly 20° south. On which island might you land?