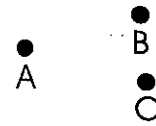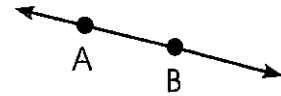# Identifying Lines and Parts of Lines   Points, Lines, and Angles

A **point** is a position in a plane or in space that has no dimensions. These points are named, or written, points A, B, and C, or point A, point B, and point C.
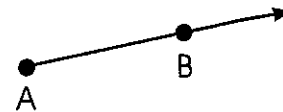
A **line** is a set of points in a straight path that extends infinitely in both directions. This line is named $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$. Any two points on a line may be used to name it.

A **line segment** is a finite portion of a line that has two endpoints. This line segment is named $\overline{AB}$ or $\overline{BA}$. A segment must be named by its two endpoints.
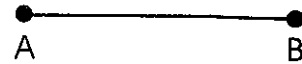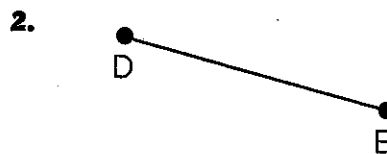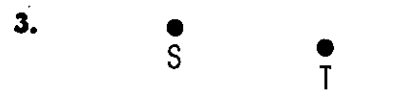
A **ray** is a portion of a line that extends from one endpoint infinitely in one direction. This ray is named $\overrightarrow{AB}$. The endpoint of a ray is written first, and any point on the ray may be used next.
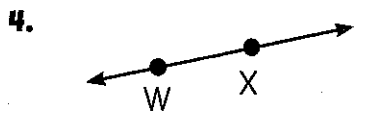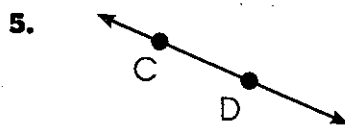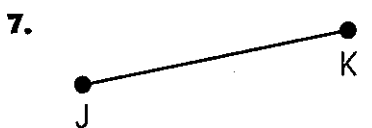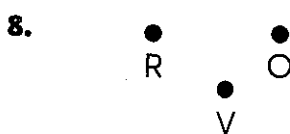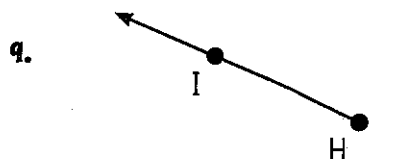
Name each point, line, line segment, or ray.

1.

X Y

_____

2.

D E

_____

3.

S   T

_____

4.

W X

_____

5.

C D

_____

6.

M L

_____

7.

J K

_____

8.

R O V

_____

9.

I H

_____
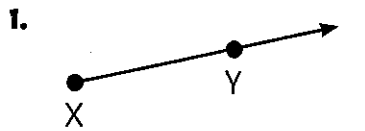
Drawing Lines and Parts of Lines

Points, Lines, and Angles

Draw and label each of the following.

1. $\overleftrightarrow{AB}$

2. points C and D

3. $\overline{RS}$

4. points L, M, and N

5. $\overrightarrow{MN}$
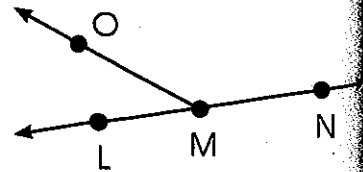
6. $\overleftrightarrow{JK}$

Use the figure to the right to answer each question.

7. Name four points. _____

8. Name two line segments. _____

9. Name three rays. _____

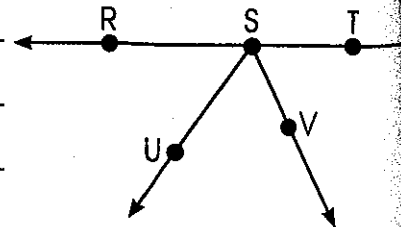10. Name the line three ways. _____

Use the figure to the right to answer each question.

11. Name five points. _____

12. Name two line segments. _____

13. Name four rays. _____
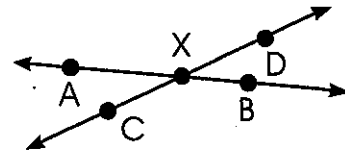
14. Name the line three ways. _____
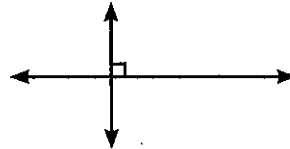
Intersecting and Parallel Lines   Points, Lines, and Angles

Intersecting lines are lines that cross each other at exactly one point, called the **point of intersection**.
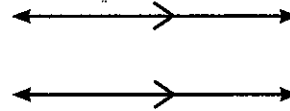
Point X is the point of intersection of $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$.

Perpendicular lines are two lines that form a right angle at their point of intersection.

Parallel lines are two lines that never intersect.

Identify each figure as parallel or perpendicular.

1.

_____
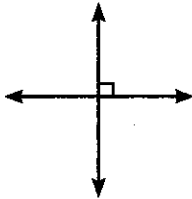
2.

_____
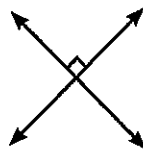
3.

_____
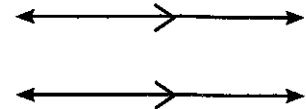
Use the figure to the right to answer each question.

4. Name the point of intersection. _____

5. Name the two lines that intersect. _____
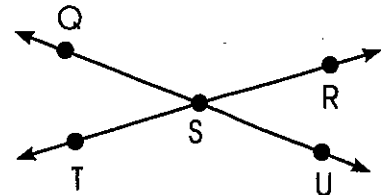
Draw and label each of the following.

6. $\overleftrightarrow{LM}$ intersects $\overleftrightarrow{NO}$ at point P

7. Y is the point at which $\overleftrightarrow{XZ}$ intersects $\overleftrightarrow{WV}$

8. $\overleftrightarrow{HI}$ is perpendicular to $\overleftrightarrow{JK}$

9. $\overleftrightarrow{RS}$ is parallel to $\overleftrightarrow{TU}$

Midpoints

A **midpoint** is a point that bisects, or divides, a line segment into two **congruent** p___

Point B is the midpoint of $\overline{AC}$. Therefore, $\overline{AB} \cong \overline{BC}$.

Name the midpoints.

1.

P   Q   R

_____

2.

W   X   Y   Z

_____

3.

J   K   L

_____
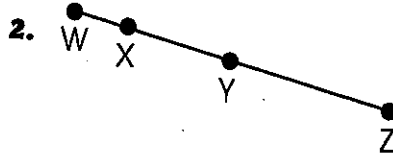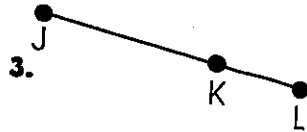
Draw and label each of the following.

4. L is the midpoint of $\overline{KM}$.   **5.** $\overline{CD}$ is bisected by point M.   **6.** $\overline{XY} \cong \overline{YZ}$, on $\overline{XZ}$.

Use the figure and information below to find the length of each segment.
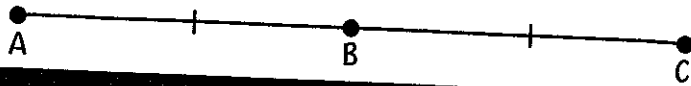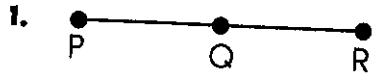
D is the midpoint of $\overline{CE}$.

B is the midpoint of $\overline{AC}$.

C is the midpoint of $\overline{AE}$.

A   B   C   D   6   E
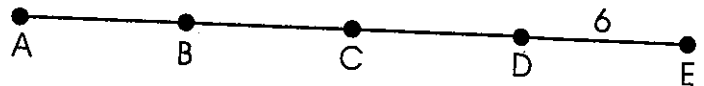
7. $\overline{AB} =$ _____

8. $\overline{BC} =$ _____

9. $\overline{AC} =$ _____

10. $\overline{CD} =$ _____

11. $\overline{CE} =$ _____

12. $\overline{AE} =$ _____

Use the figure and information below to find the length of each segment.

K bisects $\overline{JM}$.

J   K   2   L   3   M

13. $\overline{KM} =$ _____

14. $\overline{JK} =$ _____

15. $\overline{JM} =$ _____

Geome___
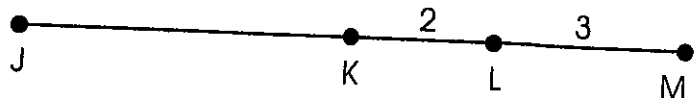
Collinear Points

When three or more points lie on the same line, they are **collinear**.

Points A, B, and C are collinear.
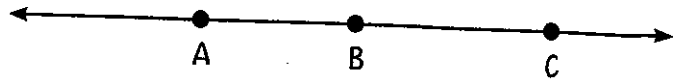
Points X, Y, and Z are not collinear.
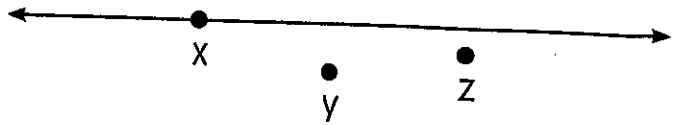
For each statement, circle *True* or *False*. Then, explain your answer

1. Points A, B, and C are collinear. True False _____

_____
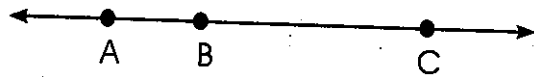
2. Points W, X, Y, and Z are collinear. True False _____

_____
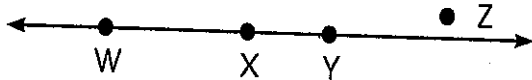
3. Points J, K, and L are not collinear. True False _____

_____
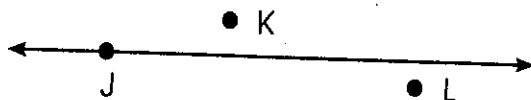
4. Points S and T are collinear. True False _____
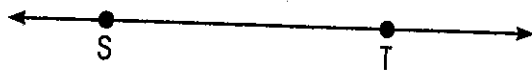
Use the figure to the right to answer each question.

5. Name all sets of collinear points.

_____
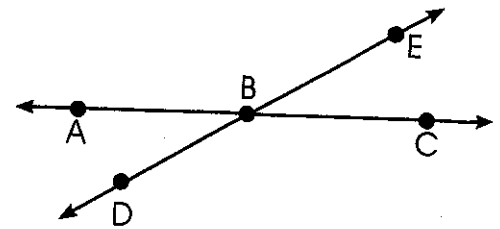
6. Name the points that are not collinear to $\overleftrightarrow{DE}$. _____

Use the provided information to draw and label the figure in the box to the right.

7. $\overleftrightarrow{BK}$ intersects $\overleftrightarrow{JM}$ at point L.
$\overleftrightarrow{RT}$ is parallel to $\overleftrightarrow{JM}$ and intersects $\overleftrightarrow{BK}$ at point C.

Use your drawing to name all sets of collinear points and two sets of points that are not collinear.

Collinear _____

Not collinear _____
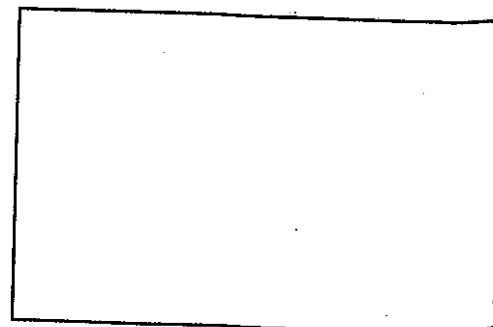
Identifying Planes

Points, Lines, and Angles

A **plane** is a flat surface that extends infinitely in all directions. Three points that are not collinear are needed to determine a plane.

When three or more points that are not collinear lie in the same plane, they are **coplanar**.
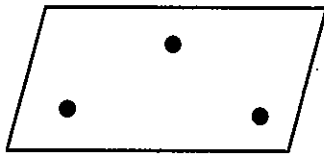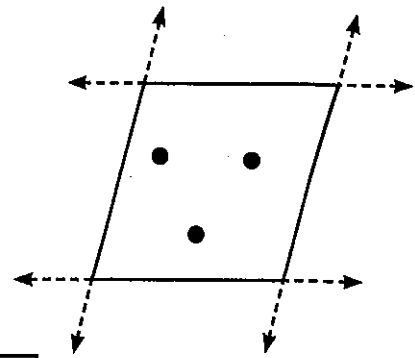
Points are coplanar.
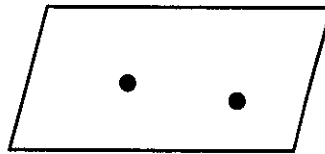
Points are not coplanar.

Decide whether each set of points determines a plane. Circle *Yes* or *No*.

1.

• A   • B

Yes   No

2.

• C   • E

• D

Yes   No

3.

• F   • G   • H

Yes   No

4.

• I

Yes   No

Identify the points in each figure as coplanar or not coplanar.
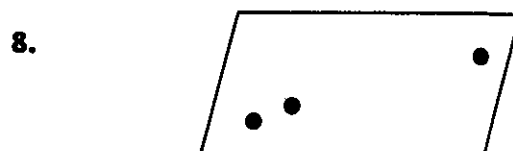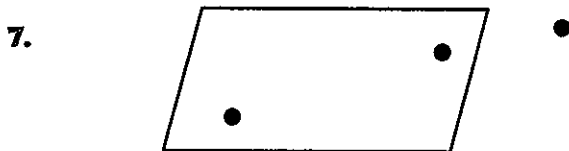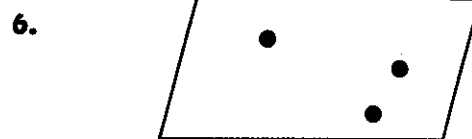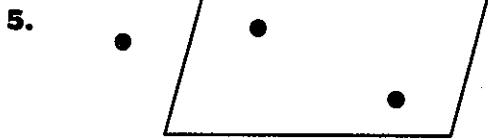
5.

_____

6.

_____

7.

_____

8.

_____

Coplanar Points
Flat-Plane Rule

Points, Lines, and Angles

If three points are coplanar, then the line containing two of the points is in the same plane.

Points A and B cannot form a line in plane L because they are not coplanar.
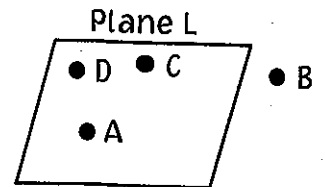
Points X and Y can form a line in plane M because they are coplanar.

Plane L

• D • C   • B
• A

Plane M

•
Y
•   •
X   Z
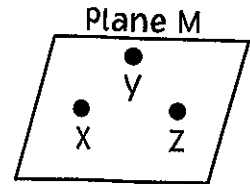
Determine whether the points can form a line in the given plane. Then, write *Yes* or *No*.

1.

• S
•   •
R   T

Points R and S _____

2.

• N
• L
• K
• M

Points M and N _____

3.

• A
• C
• B
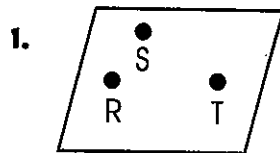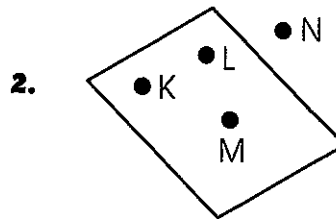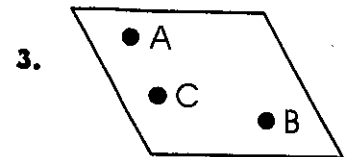
Points A and B _____

Draw and label each of the following.

4. Three collinear points in plane A

5. Three coplanar points in plane C

6. $\overleftrightarrow{LN}$ exists in plane M

7. One point that is not coplanar to plane S

8. Points D, E, F are collinear in plane A, but not in plane B

9. Collinear points Q, R, and S in plane P

Review   Points, Lines, and Angles

Write the letter for the correct term beside each definition.

1. _____ The point at which two lines intersect

2. _____ A set of points in a straight path that extends infinitely in both directions

3. _____ Two lines that form a right angle at their point of intersection

4. _____ Position in space, often represented by a dot

5. _____ A finite portion of a line that has two endpoints

6. _____ Three or more points that lie in the same line

7. _____ A point that bisects a line segment

8. _____ Lines in the same plane that never intersect

9. _____ A portion of a line that extends from one endpoint infinitely in one direction

10. _____ A flat surface that extends infinitely in all directions

11. _____ Two rays that share an endpoint and extend in opposite directions to form a line

12. _____ Something that relates to or resembles a line

13. _____ Three or more points that lie in the same plane

14. _____ If three points are coplanar, then the line containing two of the points is in the same plane.

A. opposite rays
B. point
C. ray
D. point of intersection
E. linear
F. midpoint
G. parallel lines
H. collinear points
I. perpendicular lines
J. line segment
K. line
L. plane
M. coplanar points
N. flat-plane rule

Write the letter for the correct term beside each diagram.

15.

16.

17.

18.

19.
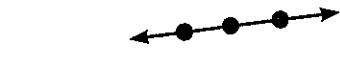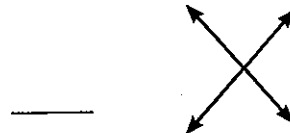
20.

A. intersecting lines
B. line
C. line segment
D. parallel lines
E. coplanar points
F. collinear points

Using a Protractor

Points, Lines, and Angles

Use a protractor to draw and measure angles accurately.

How to Use a Protractor

1. Find the center along the straight edge of the bottom of the protractor. Place the center over the vertex of the angle you wish to measure.

2. Position the protractor so that the 0° mark on the straight edge lines up with one side of the angle.

3. Determine the type of angle and which set of numbers to use. Find the point where the second side of the angle intersects the numbered edge of the protractor. If the angle does not extend far enough to intersect the lines, use the protractor like a ruler to extend the side.

4. Read the number that is written where the side crosses the protractor. This is the measure of the angle in degrees.

Use a protractor to measure each specified angle to the nearest degree. Write the type (*right*, *obtuse*, or *acute*) and measure of each angle.

1.

type:_____ measure: _____

2.

type:_____ measure: _____

3.

type:_____ measure: _____

4.

type:_____ measure: _____

5.

type:_____ measure: _____

6.
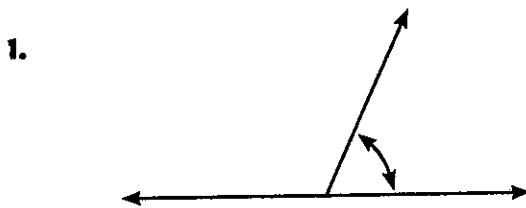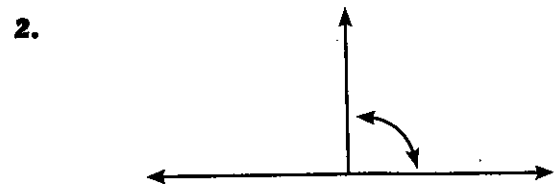
type:_____ measure: _____

Answer Key

For all lines, segments, and angles, accept reverse letter order for student answers.

Page 5

1. $\overrightarrow{XY}$; 2. $\overline{DE}$; 3. points S and T; 4. $\overleftrightarrow{WX}$; 5. $\overleftrightarrow{CD}$; 6. $\overrightarrow{LM}$; 7. $\overrightarrow{JK}$; 8. points R, V, and O; 9. $\overrightarrow{HI}$

Page 6

1.–6.: Drawings will vary; 7. points L, M, N, and O; 8. Answers will vary but may include $\overline{LM}$, $\overline{MN}$, $\overline{OM}$, $\overline{LN}$; 9. $\overri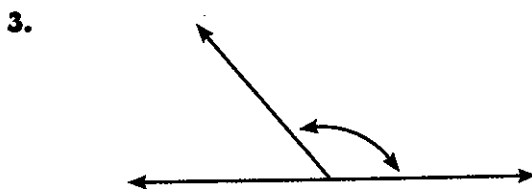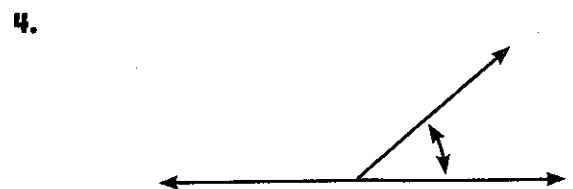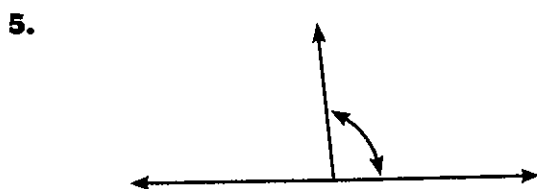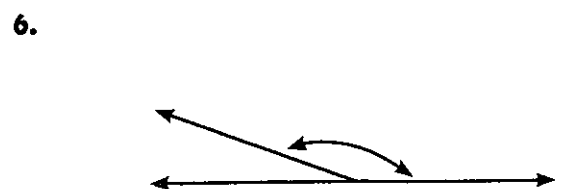ghtarrow{ML}$, $\overrightarrow{MO}$, $\overrightarrow{MN}$; 10. $\overleftrightarrow{LM}$, $\overleftrightarrow{LN}$, $\overleftrightarrow{MN}$; 11. points R, S, T, U, and V; 12. Answers will vary but may include $\overline{SU}$, $\overline{SV}$, $\overline{RS}$, $\overline{RT}$, $\overline{ST}$; 13. Answers will vary but may include $\overrightarrow{SR}$, $\overrightarrow{ST}$, $\overrightarrow{SU}$, $\overrightarrow{SV}$, $\overrightarrow{TR}$, $\overrightarrow{RT}$; 14. $\overleftrightarrow{RS}$, $\overleftrightarrow{RT}$, $\overleftrightarrow{ST}$

Page 7

1. perpendicular; 2. perpendicular; 3. parallel; 4. point S; 5. $\overleftrightarrow{TR}$, $\overleftrightarrow{QU}$; 6.–9. Drawings will vary.

Page 8

1. point Q; 2. point Y; 3. point K; 4.–6. Drawings will vary.; 7. 6; 8. 6; 9. 12; 10. 6; 11. 12; 12. 24; 13. 5; 14. 5; 15. 10

Page 9

1. $\overrightarrow{IH}$, $\overrightarrow{IJ}$; 2. Answers will vary but may include $\overleftrightarrow{HJ}$, $\overleftrightarrow{HI}$, $\overleftrightarrow{IJ}$; 3. $\overrightarrow{ED}$, $\overrightarrow{EF}$; 4. Answers will vary but may include $\overleftrightarrow{DF}$, $\overleftrightarrow{DE}$, $\overleftrightarrow{EF}$; 5. $\overrightarrow{IH}$, $\overrightarrow{IK}$; 6. $\overrightarrow{XW}$, $\overrightarrow{XZ}$; 7. $\overrightarrow{ST}$, $\overrightarrow{SU}$; $\overrightarrow{SR}$, $\overrightarrow{SV}$; 8. $\overrightarrow{BA}$, $\overrightarrow{BC}$; 9. $\overrightarrow{NP}$, $\overrightarrow{NM}$; $\overrightarrow{NQ}$, $\overrightarrow{NO}$; 10. $\overrightarrow{DC}$, $\overrightarrow{DE}$

Page 10

1. True, All three points are on the same line; 2. False, Point Z is not on the same line; 3. True, Point K is not on the same line; 4. False, Only two points are on the line.; 5. points A, B, C and points D, B, E; 6. points A and C; 7. Answers will vary but may include
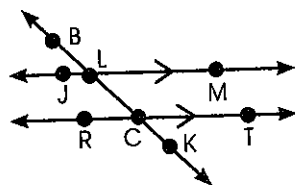
collinear: points J, L, M; points R, C, T; points B, L, C, K; not collinear: Answers will vary.
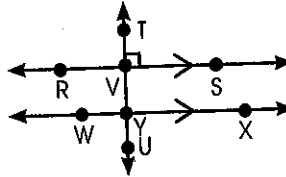
Page 11

1. No; 2. Yes; 3. Yes; 4. No; 5. not coplanar; 6. coplanar; 7. not coplanar; 8. coplanar

Page 12

1. Yes; 2. No; 3. Yes; 4.–9. Drawings will vary.

Page 13

1. 24 m; 2. $\overleftrightarrow{IH}$, $\overleftrightarrow{IJ}$, $\overleftrightarrow{HJ}$; 3. Answers will vary but may include

Yes, points W, Y, X, points T, V, Y, U, and points R, V, S; 4. Drawings will vary., Yes

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1. D; 2. K; 3. I; 4. B; 5. J; 6. H; 7. F; 8. G; 9. C; 10. L; 11. A; 12. E; 13. M; 14. N; 15. B; 16. C; 17. F; 18. A; 19. D; 20. E

Page 15

1. Answers will vary but may include $\overleftrightarrow{KM}$, $\overleftrightarrow{NO}$, $\overleftrightarrow{KL}$, $\overleftrightarrow{NL}$, $\overleftrightarrow{LO}$, $\overleftrightarrow{LM}$; 2. Answers will vary but may include $\overline{KL}$, $\overline{NL}$, $\overline{LO}$, $\overline{LM}$, $\overline{KM}$, $\overline{NO}$; 3. Answers will vary but may include $\overrightarrow{LK}$, $\overrightarrow{LN}$, $\overrightarrow{LO}$, $\overrightarrow{LM}$, $\overrightarrow{KM}$, $\overrightarrow{ON}$, $\overrightarrow{MK}$, $\overrightarrow{NO}$; 4. point L; 5. 9; 6. 18; 7. 9; 8. 9; 9. 18; 10. 36; 11. Answers will vary but may include $\overleftrightarrow{AB}$ and $\overleftrightarrow{DE}$; 12. points C and F; 13. Answers will vary but may include $\overleftrightarrow{CG}$; 14. points A, C, B; points D, F, E; points C, F, G; 15. yes; 16. no

Page 16

1. straight; 2. acute; 3. right; 4. obtuse; 5. obtuse; 6. acute; 7. acute; 8. obtuse; 9. right; 10. acute; 11. obtuse; 12. straight; 13.–15. Drawings will vary.

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1. ∠B or ∠ABC; 2. ∠H or ∠GHI; 3. ∠E or ∠DEF; 4. point R, $\overrightarrow{RQ}$ and $\overrightarrow{RS}$; 5. point B, $\overrightarrow{BA}$ and $\overrightarrow{BC}$; 6. point Y, $\overrightarrow{YX}$ and $\overrightarrow{YZ}$; 7. point F, $\overrightarrow{FE}$ and $\overrightarrow{FG}$; 8. point M, $\overrightarrow{ML}$ and $\overrightarrow{MN}$; 9. point U, $\overrightarrow{UT}$ and $\overrightarrow{UV}$; 10. $\overrightarrow{ML}$, $\overrightarrow{MN}$; 11. point M; 12. yes; 13. yes; 14. no, ∠DBE and ∠ABC do not share a side.

Page 18

1. linear pair; 2. FEG; 3. RUV, VUS; RUT, SUT; RUT, RUV; TUS, VUS; 4. 143°; 5. 100°; 6. 22°; 7. 145°, 35°, 145°; 8. 58°, 122°, 58°; 9. 46°, 134°, 46°

Page 19

1. 90°, complementary; 2. A, supplementary; 3. 47°, 137°, 133°; 4. 48°, 42°, 138°; 5. 180°; 6. 180°; 7. 90°; 8. 58°, 122°, 148°; 9. 45°, 135°, 45°; 10. 180°; 11. 90°; 12. complementary angles

Geometry