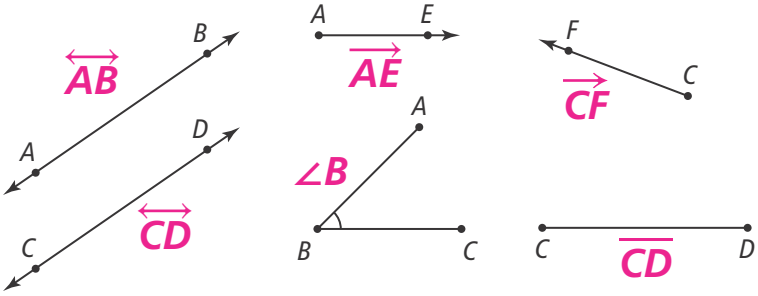
Name _____

1-1 Reteach to Build Understanding

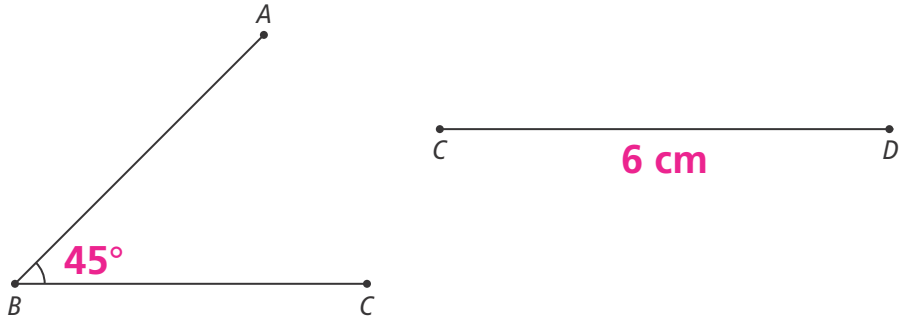
Measuring Segments and Angles

1. Match each diagram with its name.



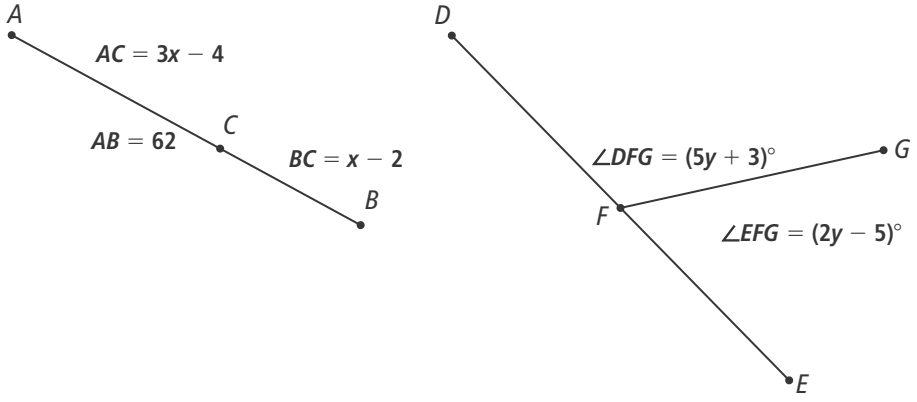
$\overrightarrow{CF}$ $\overrightarrow{FC}$ $\overleftrightarrow{AD}$ $\overleftrightarrow{AB}$ $\angle B$ $\overline{CD}$ $\overleftrightarrow{CD}$ $\angle ACB$ $\overrightarrow{AE}$

2. Measure the angle in degrees and the line segment in centimeters.



3. Find x and y in the figures below.

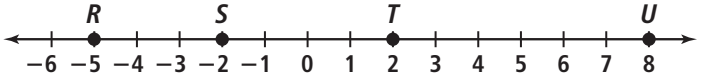
$x = 17$; $y = 26$



1-1 Additional Practice

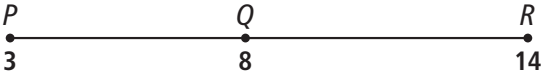
Measuring Segments and Angles

In Exercises 1–4, use the figure shown. Find the length of each segment.



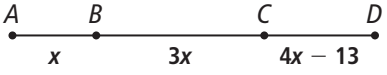
1. $RS =$ **3**
2. $RT =$ **7**
3. $ST =$ **4**
4. $RU =$ **13**

For Exercises 5–7, use the figure shown.



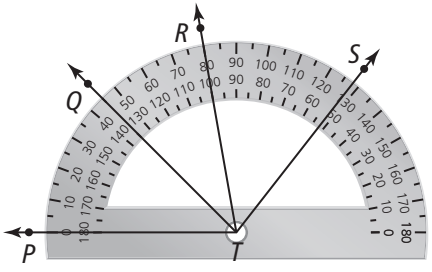
5. What is PQ? **5**
6. What is QR? **6**
7. What is PR? **11**

Points *A*, *B*, *C*, and *D* on the figure below are collinear. Use the figure for Exercises 8 and 9.



8. If $AC = 24$, what is AB? **6**
9. If $BC = 15$, what is BD? **22**

Use the figure shown for Exercises 10–13.



10. What is $m\angle PTR$? **80°**
11. What is $m\angle PTQ$? **45°**
12. What is $m\angle QTS$? **83°**
13. **Understand** Luis said that $m\angle QTR = 80°$. Explain Luis's error.

    Luis found $m\angle PTR$. To find $m\angle QTR$, Luis should have subtracted $m\angle PTR - m\angle PTQ$.

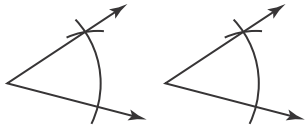
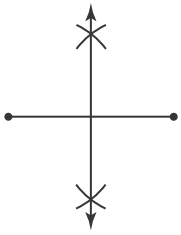
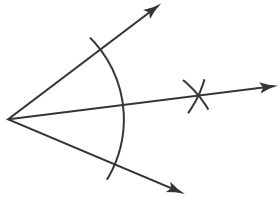
14. **Apply** A typical television newscast has three cameras. The center camera directly faces the news anchor's desk. The other two cameras are both angled 45° away from the center camera. Suppose each camera has a field of 60°. What is the total angle covered by the three cameras? Explain your reasoning.

    150°; the middle camera forms the vertex, and the sum of the two angles on either side of that vertex is 90°. Then, the left camera covers 30° to the left of the center of its field, and the right camera covers 30° to the right of the center of its field. The total is 150°.

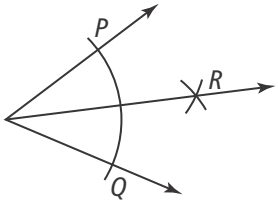
1-2 Reteach to Build Understanding

Basic Constructions

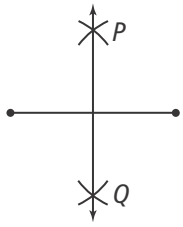
1. What is each construction?

copy of a segment	copy of an angle
	
perpendicular bisector	**angle bisector**
	

2. Order the steps used to bisect the angle below.



3. Order the steps used to construct the perpendicular bisector of the segment below.



1. Draw an arc centered at the vertex of the angle that intersects each side of the angle at points *P* and *Q*.

3. Draw the bisecting line from the vertex of the angle through point *R*.

2. Draw two arcs of the same radius, one from point *P* and one from point *Q*, so that they intersect at point *R*.

2. Draw arcs centered at the endpoints of the line segment that intersect each other above and below the line segment at points *P* and *Q*.

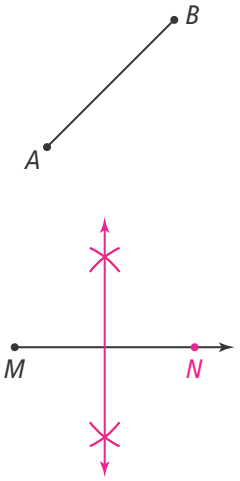
3. Draw the bisecting line from *P* to *Q*.

1. Open the compass to a radius that is more than half the width of the line segment.

1-2 Additional Practice

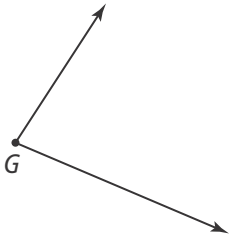
Basic Constructions

For Exercises 1–3, use the ray with endpoint *M*.

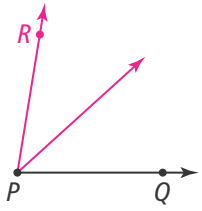


1. Explain how you can use a compass to mark point *N* on the ray with endpoint *M* so that $\overline{MN}$ is a copy of $\overline{AB}$.
   Open a compass so one end is on point *A* and the other end on point *B*. Using the same setting, place one end on point *M* and the other end on the ray, and mark point *N*.
2. Mark point *N*.
3. Construct the perpendicular bisector of *MN*.

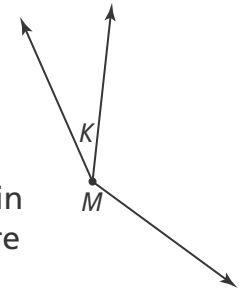
For Exercises 4–6, use $\overline{PQ}$.



4. Explain how you can use point *Q* to find point *R* such that ∠*RPQ* is a copy of ∠*G*.
   Open a compass so one end is on point *P* and the other end on point *Q*. Draw an arc centered at *P* using that setting. Then place the compass point on *G* and use the same setting to mark points on each side of ∠*G*. Open the compass so each compass end is on the marked points. Using the new setting, place one end on point *Q* and draw an arc intersecting the first arc. The intersection is point *R*.



5. Draw ∠*RPQ*.
6. Construct the angle bisector of ∠*RPQ*.



7. **Understand** In the figure at the right, ∠*M* is bisected twice to form ∠*K*. How much smaller than ∠*M* is ∠*K*?
   ∠*K* is $\frac{1}{4}$ the size of ∠*M*.
8. **Apply** A 50-ft × 300-ft parking lot is divided into sections for a craft fair by bisecting the width and the length. Each half is again bisected in length and width, forming 16 sections in all. What are the dimensions and area of each section? Show your work.
   $\frac{50}{2} = \frac{25}{2} = 12.5$; $\frac{300}{2} = \frac{150}{2} = 75$; the dimensions of each section are 12.5 ft × 75 ft.

1-3 Reteach to Build Understanding

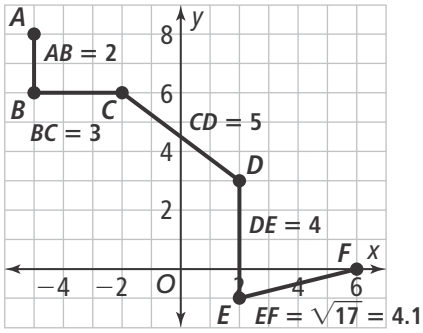
Midpoint and Distance

1. Find the length of each segment in the path shown. What is the total distance?

18.1

Example: $E(2, -1)$ and $F(6, 0)$. The distance d from point E to point F is calculated with the Distance Formula.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{(6 - 2)^2 + (0 - (-1))^2}$$
$$= \sqrt{(4)^2 + (1)^2}$$
$$= \sqrt{16 + 1}$$
$$= \sqrt{17} \approx 4.123$$



2. Find the midpoint of each segment in Exercise 1 above.

Example: The midpoint M between point E and point F is calculated with the Midpoint Formula.

$$M: \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{6 + 2}{2}, \frac{0 + (-1)}{2}\right) = \left(\frac{8}{2}, \frac{-1}{2}\right) = \left(4, \frac{-1}{2}\right)$$

$\overline{AB}$: (**–5, 7**)

$\overline{BC}$: (**–3.5, 6**)

$\overline{CD}$: (**0, 4.5**)

$\overline{DE}$: (**2, 1**)

$\overline{EF}$: (**4, –0.5**)

3. Cameron calculated the distance between point C and point D below. Is the distance correct? If not, what is her mistake?

$$d = \sqrt{((-2) + 2)^2 + (6 + 3)^2}$$
$$= \sqrt{(0)^2 + (9)^2}$$
$$= 9$$

No; she added the *x*-values and *y*-values instead of subtracting.

1-3 Additional Practice

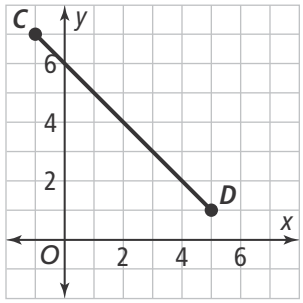
Midpoint and Distance

1. What is the midpoint formula? $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

For Exercises 2–5, find the midpoint of each segment with the given endpoints.

2. $A(-4, 6)$ and $B(10, -10)$ **(3, −2)**
3. $C(-3, -8)$ and $D(-6.5, -4.5)$ **(−4.75, −6.25)**
4. $E(3, 7)$ and $F(-8, -10)$ **(−2.5, −1.5)**
5. $G(-6, -13)$ and $H(-6.4, -3.8)$ **(−6.2, −8.4)**

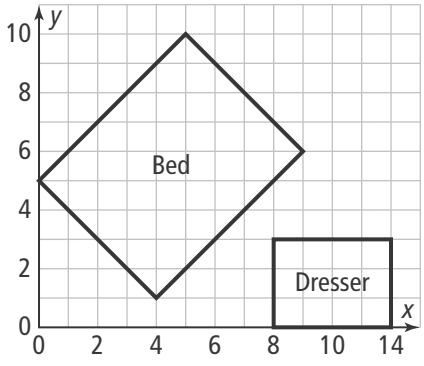
For Exercises 6–9, find the coordinates of each point described in relation to line segment *CD*.



6. $\frac{1}{3}$ of the way from C to D **(1, 5)**
7. $\frac{2}{3}$ of the way from D to C **(1, 5)**
8. $\frac{2}{3}$ of the way from C to D **(3, 3)**
9. $\frac{1}{3}$ of the way from D to C **(3, 3)**
10. What is the distance formula? $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

For Exercises 11–14, find the distance between each pair of points.

11. $A(6, 8)$, $B(-1, 8)$ **7**
12. $C(5, -6)$, $D(5, 6)$ **12**
13. $E(-2, 0)$, $F(11, 0)$ **13**
14. $Q(1, -5)$, $T(9, 1)$ **10**
15. **Understand** If M is the midpoint of $\overline{ST}$, write an equation that describes the relationship between ST and MT. **$ST = 2(MT)$**
16. **Apply** The axes in the coordinate grid at the right represent the walls of a bedroom. One corner of the room is at the origin. What is the distance from that corner of the room to the corner of the bed that is farthest away? If necessary, round to the nearest tenth of a foot. **11.2 feet**



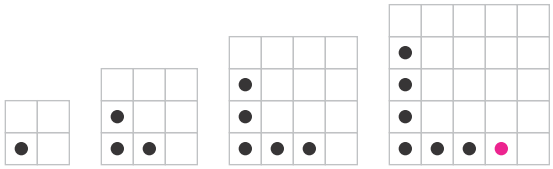
1-4 Reteach to Build Understanding

Inductive Reasoning

1. Inductive reasoning is generalizing from an observed pattern. Match each number pattern with the next three terms in the sequence.

1, 3, 6, 10, 15, **21**, **28**, **36**	21, 28, 36
8, 11, 14, 17, 20, **23**, **26**, **29**	16, 25, 36
1, 4, 9, **16**, **25**, **36**	23, 26, 29

2. Tyler drew the pattern below. Correct his mistake.



3. **Part A:** A **conjecture** is a conclusion made about on observed pattern. A **counterexample** is an example that disproves a conjecture.

Example: Conjecture: All fruits have seeds on the inside.

Counterexample: Strawberry

What conjecture describes the information shown below?

$\frac{3}{3} = 1$

$\frac{8}{8} = 1$

$\frac{4^3}{4^3} = 1$

$\frac{x}{x} = 1$

Sample: Any value divided by itself is equal to 1.

Part B: Match each conjecture with a counterexample.

All quadrilaterals with at least one pair of parallel sides are parallelograms.	Rectangle
All quadrilaterals with two pairs of sides with the same length are parallelograms.	Trapezoids
All quadrilaterals with four right angles are squares.	Kite

1-4 Additional Practice

Inductive Reasoning

For Exercises 1 and 2, find a pattern for each sequence. Use the pattern to find the next two terms.

1. 5, 11, 18, 26, 35, 45, …
   Pattern: Add 6. Then increase the number you add by 1 for each new term.
2. B, D, F, H, J, L, N, …
   Pattern: Skip 1 letter to find each new term.

Make a conjecture for each scenario. Show your work.

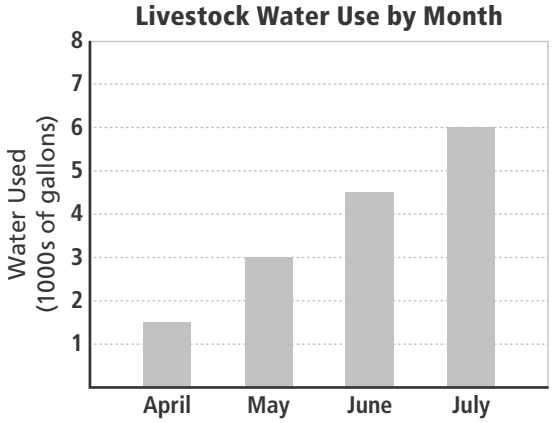
3. the square of an even number
   Answers may vary. Sample: The number is even.
4. the product of two odd numbers and a multiple of 2
   Answers may vary. Sample: The number is odd.

Find one counterexample to show that each conjecture is false.

5. For two real numbers a and b, a is either equal to b or greater than b.
   Answers may vary. Sample: Let $a = 1$ and $b = 2$: $a < b$.
6. All quadrilaterals are parallelograms.
   Answers may vary. Sample: Trapezoids are not parallelograms.

For each conjecture, verify it with several more examples or find a counterexample to disprove it.

7. For whole number n, n^3 will be odd if n is odd and even if n is even.
   Answers may vary. Sample: $1^3 = 1 \times 1 \times 1 = 1$; $2^3 = 2 \times 2 \times 2 = 8$; $3^3 = 3 \times 3 \times 3 = 27$
8. **Understand** Consider this statement: All families go to the movies together. What is required to prove that the statement is false?
   Find a family that does not go to the movies together.
9. **Apply** A farmer keeps track of the water his livestock uses each month. How can he use his data to predict the amount of water used in August?



Use the pattern that each month the water usage increases by 1,500 gallons. In August, the water usage should be close to 7,500 gallons.

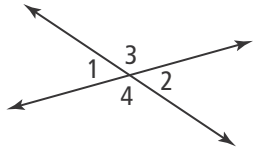
1-7 Reteach to Build Understanding

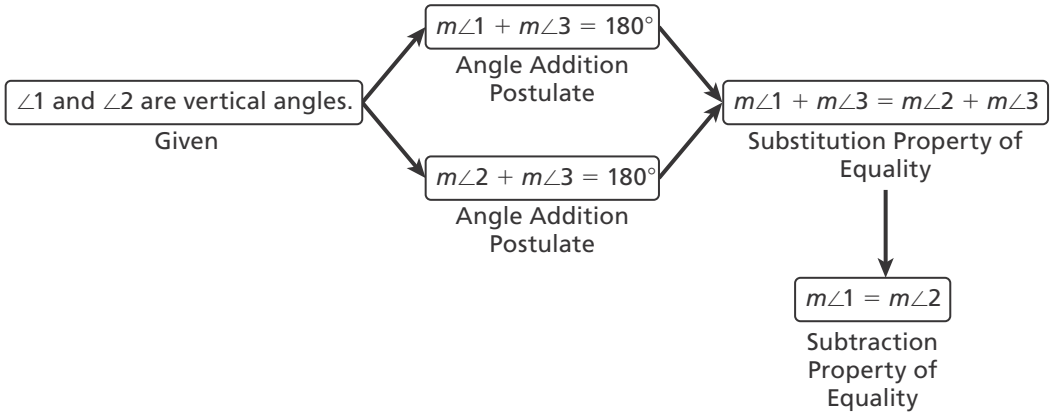
Writing Proofs

1. Complete the two-column proof below.

Given: $\angle 1$ and $\angle 2$ are vertical angles.

Prove: $\angle 1 \cong \angle 2$



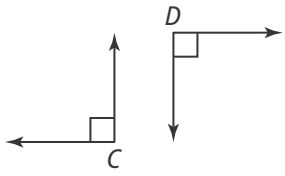


Statements	Reasons
1) $\angle 1$ and $\angle 2$ are vertical angles	1) Given
2) $m\angle 1 + m\angle 3 = 180°$ and $m\angle 2 + m\angle 3 = 180°$	2) Angle Addition Postulate
3) $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 3$	3) Substitution Property of Equality
4) $m\angle 1 = m\angle 2$	4) Subtraction Property of Equality
5) $\angle 1 \cong \angle 2$	5) Definition of congruent angles

2. Write a two-column proof of the Right Angle Congruence Theorem. Use the definition of a right angle and write the measure of each angle. Next use the Substitution Property of Equality, and finally the definition of congruent angles.

Given: $\angle C$ and $\angle D$ are right angles.

Prove: $\angle C \cong \angle D$



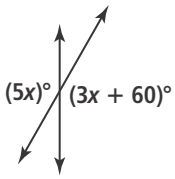
Statements	Reasons
1) $\angle 1$ and $\angle 2$ are right angles	1) Given
2) $m\angle C = 90°$ and $m\angle D = 90°$	2) Definition of a right angle
3) $m\angle C = m\angle D$	3) Substitution Property of Equality
4) $\angle C \cong \angle D$	4) Definition of congruent angles

1-7 Additional Practice

Writing Proofs

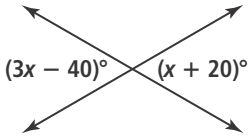
Find the value of each variable and the measure of each labeled angle.

1.



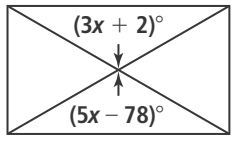
30; 150°

2.



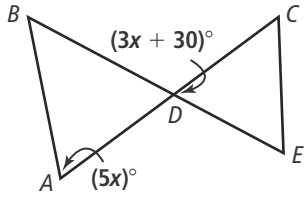
30; 50°

3.



40; 122°

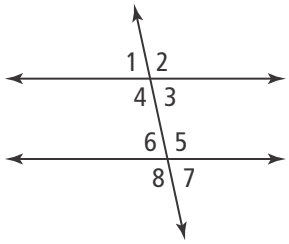
4. Write a paragraph proof based on the given information.



Given: $\angle A \cong \angle BDA$
Prove: $x = 15$

It is given that the measure of angle *CDE* is equal to $(3x + 30)°$. By the Vertical Angles Theorem, $\angle CDE$ is congruent to $\angle BDA$. Therefore, $m\angle BDA$ is also equal to $(3x + 30)°$. Given that angle *A* is congruent to $\angle BDA$ and the measure of angle *A* is equal to $5x°$, it follows that $(3x + 30)° = 5x°$. Solve for *x* to get $x = 15$.

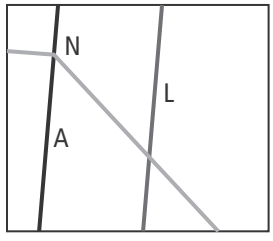
5. Understand Complete the proof by filling in the blanks.



Given: $\angle 1 \cong \angle 7$
Prove: $m\angle 6 + m\angle 2 = 180°$

Statements	Reasons
1. $\angle 1 \cong \angle 7$	1. Given
2. $\angle 6 \cong \angle 7$	2. Vertical Angles are $\cong$.
3. $\angle 1 \cong \angle 6$	3. Transitive Property of Congruence
4. $m\angle 1 = m\angle 6 = m\angle 7$	4. Definition of congruent angles
5. $m\angle 1 + m\angle 2 = 180°$	5. Linear Pairs Theorem
6. $m\angle 6 + m\angle 2 = 180°$	6. Substitution Property of Equality

6. Apply Streets A and L run parallel to each other. Boulevard N forms a 75° angle with Street L south of (below) their intersection. What angle does Boulevard N make with Street L north of (above) their intersection? Justify your answer.



75°; Boulevard N forms a transversal with Streets A and L. The angle formed south of their intersection is the angle below Boulevard N. The angle formed north of their intersection is the angle above Boulevard N. For Street L, those are vertical angles, so they are congruent by the Vertical Angles Theorem.