Name ______________________ Class __________ Date __________

Reteaching

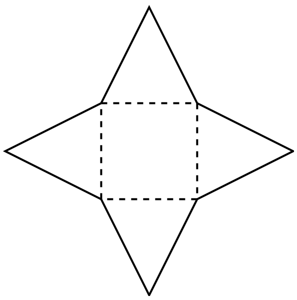
Nets and Drawings for Visualizing Geometry

A *net* is a two-dimensional flat diagram that represents a three-dimensional figure. It shows all of the shapes that make up the faces of a solid.

Stepping through the process of building a three-dimensional figure from a net will help you improve your ability to visualize the process. Here are the steps you would take to build a square pyramid.

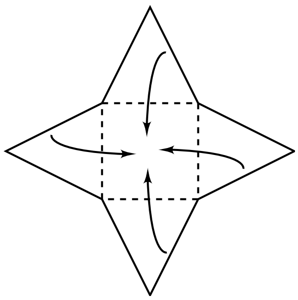
Step 1

Start with the net.



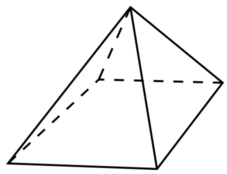
Step 2

Fold up on the dotted lines.

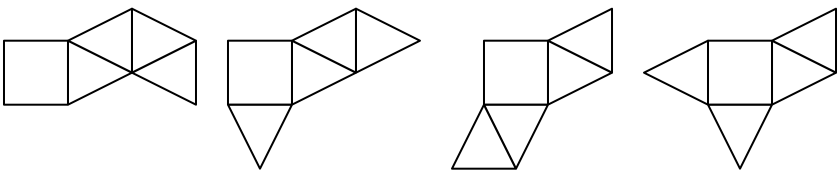


Step 3

Tape the adjacent triangle sides together.



Here are other examples of nets that also fold up into a square pyramid.



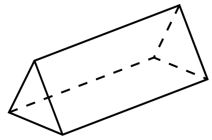
Problem

How can you be sure that none of the nets shown above are the same?

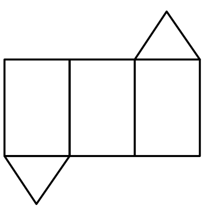
Make sure you cannot rotate or flip any net and place it on top of any other net.

Exercise

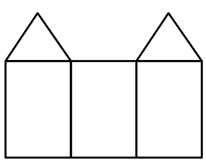
1. What is a possible net for the figure shown at the right? A



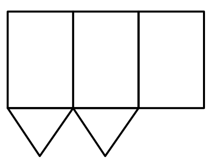
A.



B.



C.



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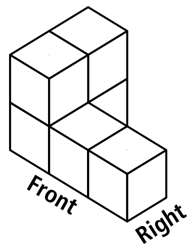
Reteaching (continued)

Nets and Drawings for Visualizing Geometry

An *isometric drawing* is a corner-view drawing of a three-dimensional figure. It shows the top, front, and side views.

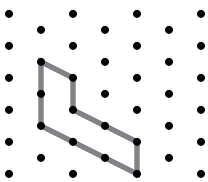


To make an isometric drawing, you can start by visualizing picking up a block structure and turning it so that you are looking directly at one face. Draw the edges of that face. Then visualize and draw the two other faces.

Follow the steps below to make an isometric drawing of the block structure at the right.

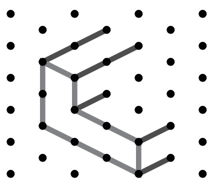
Step 1

Draw the edges that surround the front face.



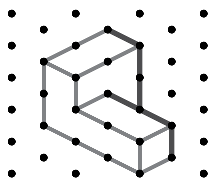
Step 2

Start at a vertex of the front face and draw an edge for the right side view. Edges only occur at bends and folds.



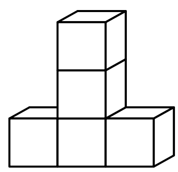
Step 3

Draw the back and top edges to connect the figure. Draw all parallel edges.

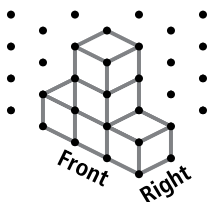


Problem

What is an isometric drawing of the block structure at the right?

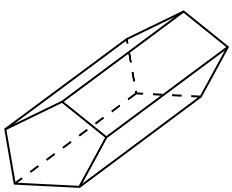


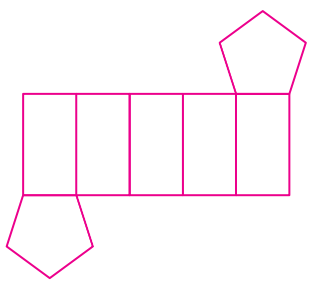
Isometric drawing:



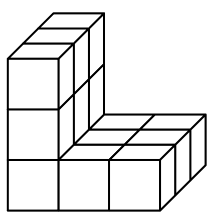
Exercises

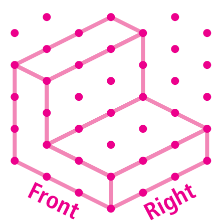
2. Draw a possible net for this figure.





3. Make the isometric drawing for this structure.





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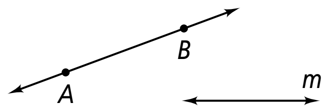
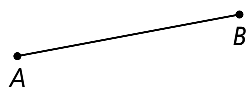
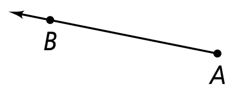
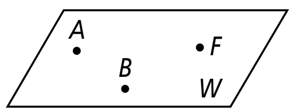
Reteaching

Points, Lines, and Planes

Review these important geometric terms.

Term	Examples of Labels	Diagram
Point	Italicized capital letter: *D*	
Line	Two capital letters with a line drawn over them: $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$ One italicized lowercase letter: *m*	
Line Segment	Two capital letters (called endpoints) with a segment drawn over them: $\overline{AB}$ or $\overline{BA}$	
Ray	Two capital letters with a ray symbol drawn over them: $\overrightarrow{AB}$	
Plane	Three capital letters: *ABF, AFB, BAF, BFA, FAB,* or *FBA* One italicized capital letter: *W*	

Remember:

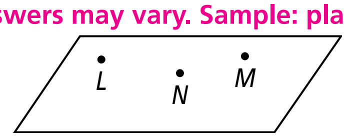
1. When you name a ray, an arrowhead is not drawn over the beginning point.
2. When you name a plane with three points, choose no more than two collinear points.
3. An arrow indicates the direction of a path that extends without end.
4. A plane is represented by a parallelogram. However, the plane actually has no edges. It is flat and extends forever in all directions.

Exercises

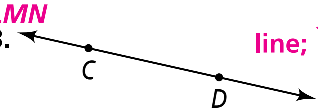
Identify each figure as a *point, segment, ray, line,* or *plane,* and name each.

1.

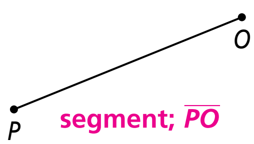
point; point *L*

2. 

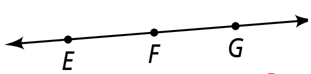
plane; Answers may vary. Sample: plane *LMN*

3. 

line; $\overleftrightarrow{CD}$

4. 

segment; $\overline{PO}$

5. 

line; answers may vary. Sample: $\overleftrightarrow{EG}$

6. 

ray; $\overrightarrow{ST}$

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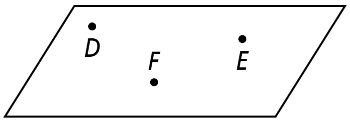
Reteaching (continued)

Points, Lines, and Planes

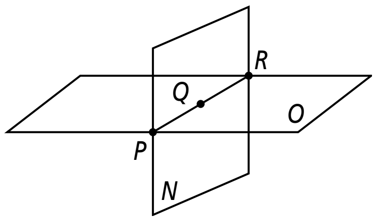
A *postulate* is a statement that is accepted as true.

Postulate 1–4 states that through any three noncollinear points, there is only one plane. Noncollinear points are points that do not all lie on the same line.



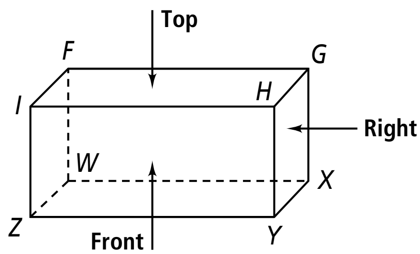
In the figure at the right, points *D, E,* and *F* are noncollinear. These points all lie in one plane.

Three noncollinear points lie in only one plane. Three points that are collinear can be contained by more than one plane. In the figure at the right, points *P, Q,* and *R* are collinear, and lie in both plane *O* and plane *N.*



Exercises

Identify the plane containing the given points as *front, back, left side, right side, top,* or *bottom.*



7. *F, G,* and *X* back

8. *F, G,* and *H* top

9. *H, I,* and *Z* front

10. *F, W,* and *X* back

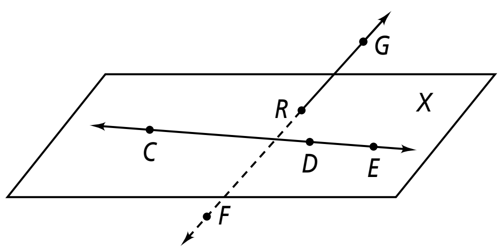
11. *I, W,* and *Z* left side

12. *Z, X,* and *Y* bottom

13. *H, G,* and *X* right side

14. *W, Y,* and *Z* bottom

Use the figure at the right to determine how many planes contain the given group of points. Note that $\overleftrightarrow{GF}$ pierces the plane at *R*, $\overleftrightarrow{GF}$ is not coplanar with *X*, and $\overleftrightarrow{GF}$ does not intersect $\overleftrightarrow{CE}$.



15. *C, D,* and *E*
infinite number of planes

16. *D, E,* and *F*
1 plane

17. *C, G, E,* and *F*
0 planes

18. *C* and *F*
infinite number of planes

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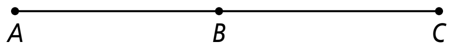
Reteaching

Measuring Segments

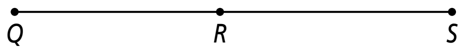
The *Segment Addition Postulate* allows you to use known segment lengths to find unknown segment lengths. If three points, A, B, and C, are on the same line, and point B is between points A and C, then the distance AC is the sum of the distances AB and BC.



$$AC = AB + BC$$

Problem

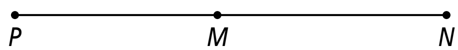
If $QS = 7$ and $QR = 3$, what is RS?



$QS = QR + RS$	Segment Addition Postulate
$QS - QR = RS$	Subtract QR from each side.
$7 - 3 = RS$	Substitute.
$4 = RS$	Simplify.

Exercises

For Exercises 1–5, use the figure at the right.



1. If $PN = 29$ cm and $MN = 13$ cm, then $PM =$ $\boxed{\text{16 cm}}$.

2. If $PN = 34$ cm and $MN = 19$ cm, then $PM =$ $\boxed{\text{15 cm}}$.

3. If $PM = 19$ and $MN = 23$, then $PN =$ $\boxed{42}$.

4. If $MN = 82$ and $PN = 105$, then $PM =$ $\boxed{23}$.

5. If $PM = 100$ and $MN = 100$, then $PN =$ $\boxed{200}$.

For Exercises 6–8, use the figure at the right.

6. If $UW = 13$ cm and $UX = 46$ cm, then $WX =$ $\boxed{\text{33 cm}}$.

7. $UW = 2$ and $UX = y$. Write an expression for WX. $y - 2$

8. $UW = m$ and $WX = y + 14$. Write an expression for UX. $m + y + 14$

On a number line, the coordinates of A, B, C, and D are -6, -2, 3, and 7, respectively. Find the lengths of the two segments. Then tell whether they are congruent.

9. $\overline{AB}$ and $\overline{CD}$ 4; 4; yes

10. $\overline{AC}$ and $\overline{BD}$ 9; 9; yes

11. $\overline{BC}$ and $\overline{AD}$ 5; 13; no

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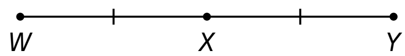
Reteaching (continued)

Measuring Segments

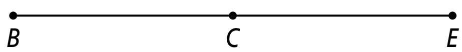
The *midpoint* of a line segment divides the segment into two segments that are equal in length. If you know the distance between the midpoint and an endpoint of a segment, you can find the length of the segment. If you know the length of a segment, you can find the distance between its endpoint and midpoint.



X is the midpoint of $\overline{WY}$. $XW = XY$, so $\overline{XW}$ and $\overline{XY}$ are congruent.

Problem

C is the midpoint of $\overline{BE}$. If $BC = t + 1$, and $CE = 15 - t$, what is BE?



$BC = CE$	Definition of midpoint
$t + 1 = 15 - t$	Substitute.
$t + t + 1 = 15 - t + t$	Add t to each side.
$2t + 1 = 15$	Simplify.
$2t + 1 - 1 = 15 - 1$	Subtract 1 from each side.
$2t = 14$	Simplify.
$t = 7$	Divide each side by 2.
$BC = t + 1$	Given.
$BC = 7 + 1$	Substitute.
$BC = 8$	Simplify.
$BE = 2(BC)$	Definition of midpoint.
$BE = 2(8)$	Substitute.
$BE = 16$	Simplify.

Exercises

12. W is the midpoint of $\overline{UV}$. If $UW = x + 23$, and $WV = 2x + 8$, what is x? **15**

13. W is the midpoint of $\overline{UV}$. If $UW = x + 23$, and $WV = 2x + 8$, what is WU? **38**

14. W is the midpoint of $\overline{UV}$. If $UW = x + 23$, and $WV = 2x + 8$, what is UV? **76**

15. Z is the midpoint of $\overline{YA}$. If $YZ = x + 12$, and $ZA = 6x - 13$, what is YA? **34**

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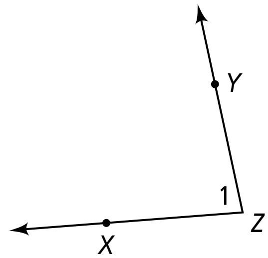
Reteaching

Measuring Angles

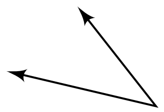
The *vertex* of an angle is the common endpoint of the rays that form the angle. An angle may be named by its vertex. It may also be named by a number or by a point on each ray and the vertex (in the middle).



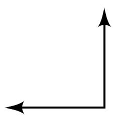
This is $\angle Z$, $\angle XZY$, $\angle YZX$, or $\angle 1$.

It is *not* $\angle ZYX$, $\angle XYZ$, $\angle YXZ$, or $\angle ZXY$.

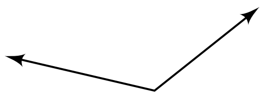
Angles are measured in *degrees,* and the measure of an angle is used to classify it.



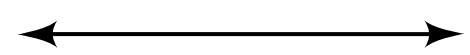
The measure of an *acute* angle is between 0 and 90.



The measure of a *right* angle is 90.



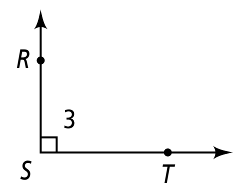
The measure of an *obtuse* angle is between 90 and 180.



The measure of a *straight* angle is 180.

Exercises

Use the figure at the right for Exercises 1 and 2.



1. What are three other names for $\angle S$? **$\angle RST$, $\angle TSR$, $\angle 3$**

2. What type of angle is $\angle S$? **right**

3. Name the vertex of each angle.

a. $\angle LGH$ **point *G***

b. $\angle MBX$ **point *B***

Classify the following angles as *acute, right, obtuse,* or *straight.*

4. $m\angle LGH = 14$ **acute**

5. $m\angle SRT = 114$ **obtuse**

6. $m\angle SLI = 90$ **right**

7. $m\angle 1 = 139$ **obtuse**

8. $m\angle L = 179$ **obtuse**

9. $m\angle P = 73$ **acute**

Use the diagram below for Exercises 10–18. Find the measure of each angle.

10. $\angle ADB$ **25**

11. $\angle FDE$ **35**

12. $\angle BDC$ **55**

13. $\angle CDE$ **65**

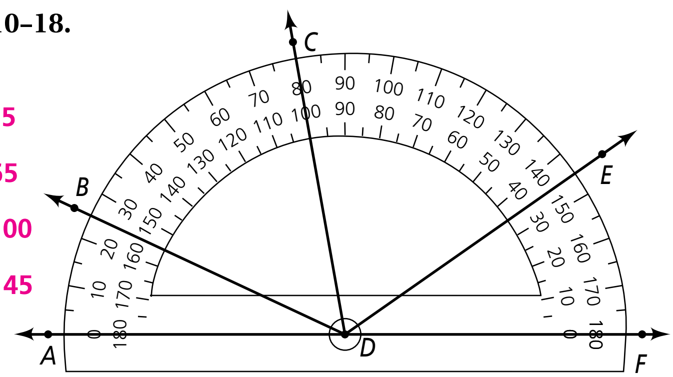
14. $\angle ADC$ **80**

15. $\angle FDC$ **100**

16. $\angle BDE$ **120**

17. $\angle ADE$ **145**

18. $\angle BDF$ **155**



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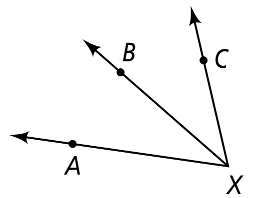
Reteaching (continued)

Measuring Angles

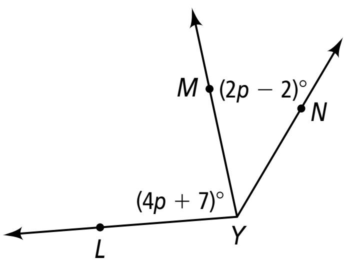
The *Angle Addition Postulate* allows you to use a known angle measure to find an unknown angle measure. If point B is in the interior of $\angle AXC$, the sum of $m\angle AXB$ and $m\angle BXC$ is equal to $m\angle AXC$.



$$m\angle AXB + m\angle BXC = m\angle AXC$$

Problem

If $m\angle LYN = 125$, what are $m\angle LYM$ and $m\angle MYN$?



Step 1 Solve for *p*.

$m\angle LYN = m\angle LYM + m\angle MYN$	Angle Addition Postulate
$125 = (4p + 7) + (2p - 2)$	Substitute.
$125 = 6p + 5$	Simplify.
$120 = 6p$	Subtract 5 from each side.
$20 = p$	Divide each side by 6.

Step 2 Use the value of *p* to find the measures of the angles.

$m\angle LYM = 4p + 7$	Given
$m\angle LYM = 4(20) + 7$	Substitute.
$m\angle LYM = 87$	Simplify.
$m\angle MYN = 2p - 2$	Given
$m\angle MYN = 2(20) - 2$	Substitute.
$m\angle MYN = 38$	Simplify.

Exercises

19. X is in the interior of $\angle LIN$. $m\angle LIN = 100$, $m\angle LIX = 14t$, and $m\angle XIN = t + 10$.

a. What is the value of t? **6**

b. What are $m\angle LIX$ and $m\angle XIN$? **84, 16**

20. Z is in the interior of $\angle GHI$. $m\angle GHI = 170$, $m\angle GHZ = 3s - 5$, and $m\angle ZHI = 2s + 25$.

a. What is the value of s? **30**

b. What are $m\angle GHZ$ and $m\angle ZHI$? **85, 85**

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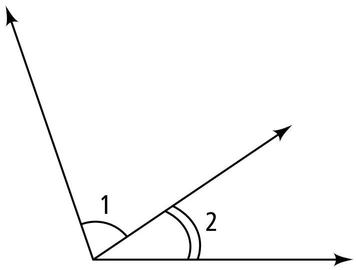
Reteaching

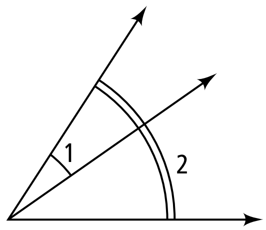
Exploring Angle Pairs

Adjacent Angles and Vertical Angles

Adjacent means "next to." Angles are adjacent if they lie next to each other. In other words, the angles have the same vertex and they share a side without overlapping.

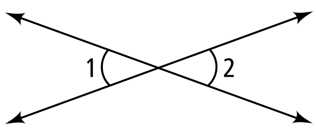


Adjacent Angles

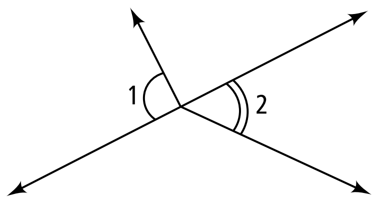


Overlapping Angles

Vertical means "related to the vertex." So, angles are vertical if they share a vertex, but not just any vertex. They share a vertex formed by the intersection of two straight lines. Vertical angles are always congruent.



Vertical Angles



Non-vertical Angles

Exercises

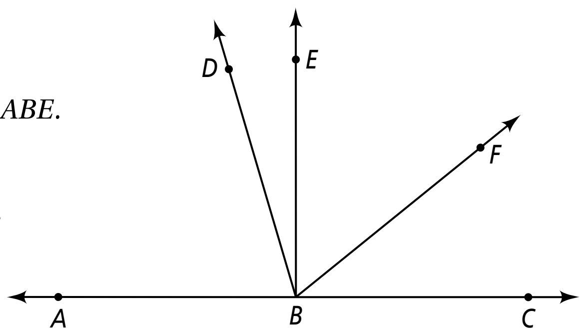
1. Use the diagram at the right.

a. Name an angle that is adjacent to $\angle ABE$.

$\angle EBF$ or $\angle EBC$

b. Name an angle that overlaps $\angle ABE$.

Answers may vary.
Sample: $\angle DBF$ or $\angle DBC$



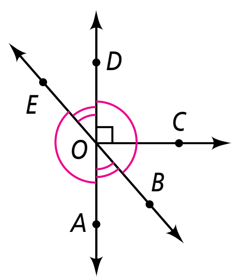
2. Use the diagram at the right.

a. Mark $\angle DOE$ and its vertical angle as congruent angles.

$\angle AOB$

b. Mark $\angle AOE$ and its vertical angle as congruent angles.

$\angle DOB$



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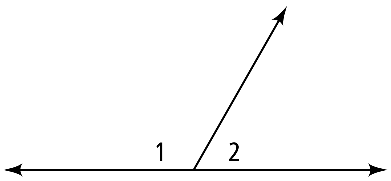
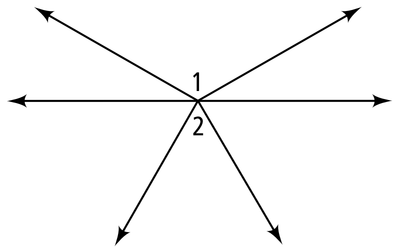
Reteaching (continued)

Exploring Angle Pairs

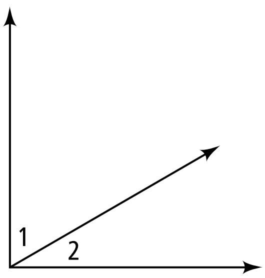
Supplementary Angles and Complementary Angles

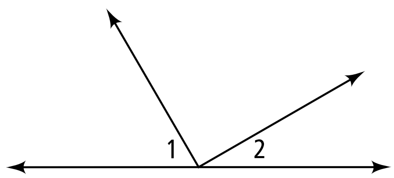
Two angles that form a line are supplementary angles. Another term for these angles is a linear pair. However, any two angles with measures that sum to 180 are also considered supplementary angles. In both figures below, $m\angle 1 = 120$ and $m\angle 2 = 60$, so $\angle 1$ and $\angle 2$ are supplementary.





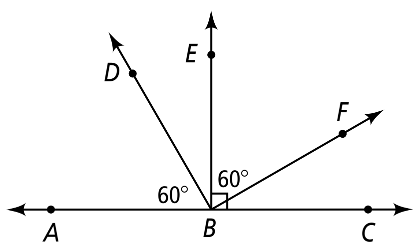
Two angles that form a right angle are complementary angles. However, any two angles with measures that sum to 90 are also considered complementary angles. In both figures below, $m\angle 1 = 60$ and $m\angle 2 = 30$, so $\angle 1$ and $\angle 2$ are complementary.





Exercises

3. Copy the diagram at the right.



a. Label $\angle ABD$ as $\angle 1$. **Label $\angle ABD$ as $\angle 1$.**

b. Label an angle that is supplementary to $\angle ABD$ as $\angle 2$. **Label $\angle DBC$ as $\angle 2$.**

c. Label as $\angle 3$ an angle that is adjacent and complementary to $\angle ABD$. **Label $\angle DBE$ as $\angle 3$.**

d. Label as $\angle 4$ a second angle that is complementary to $\angle ABD$. **Label $\angle FBC$ as $\angle 4$.**

e. Name an angle that is supplementary to $\angle ABE$. **$\angle CBE$**

f. Name an angle that is complementary to $\angle EBF$. **$\angle CBF$**

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Reteaching (continued)

Midpoint and Distance in the Coordinate Plane

Exercises

Find the coordinates of the midpoint of $\overline{AB}$ by finding the averages of the coordinates.

1. $A(4, 3)$ $M\left(\boxed{6}, \boxed{5.5}\right)$ $B(8, 8)$
2. $A(7, 2)$ $M\left(\boxed{4}, \boxed{3.5}\right)$ $B(1, 5)$
3. $A(-5, 6)$ $M\left(\boxed{-2}, \boxed{1.5}\right)$ $B(1, -3)$
4. $A(-7, -1)$ $M\left(\boxed{-6}, \boxed{-5}\right)$ $B(-5, -9)$

M is the midpoint of $\overline{XY}$. Find the coordinates of Y.

5. $X(3, 4)$ and $M(6, 10)$ **(9, 16)**
6. $X(-5, 1)$ and $M(3, -5)$ **(11, −11)**

To help find the distance between two points, make a sketch on graph paper.

Problem

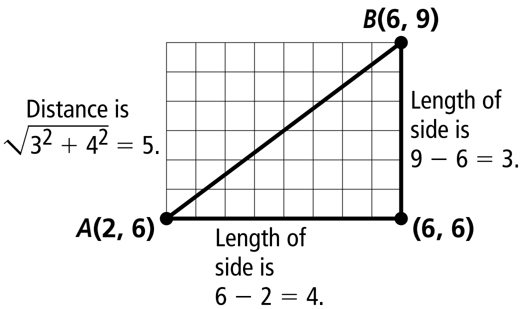
What is the distance between $A(2, 6)$ and $B(6, 9)$?

Step 1: Sketch the points on graph paper.

Step 2: Draw a right triangle along the gridlines.

Step 3: Find the length of each leg.

Step 4: Find the distance between the points.



Exercises

Find the distance between points A and B. If necessary, round to the nearest tenth.

7. $A(1, 4)$ and $B(6, 16)$ **13**
8. $A(-3, 2)$ and $B(1, 6)$ **5.7**
9. $A(-1, -8)$ and $B(1, -3)$ **5.4**
10. $A(-5, -5)$ and $B(7, 11)$ **20**

Find the midpoint between each pair of points. Then, find the distance between each pair of points. If necessary, round to the nearest tenth.

11. $C(3, 8)$ and $D(0, 3)$ **(1.5, 5.5); 5.8**
12. $H(-2, 4)$ and $I(4, -2)$ **(1, 1); 8.5**
13. $K(1, -5)$ and $L(-3, -9)$ **(−1, −7); 5.7**
14. $M(7, 0)$ and $N(-3, 4)$ **(2, 2); 10.8**
15. $O(-5, -1)$ and $P(-2, 3)$ **(−3.5, 1); 5**
16. $R(0, -6)$ and $S(-8, 0)$ **(−4, −3); 10**