ST. BRENDAN HIGH SCHOOL

Pre-AP Geometry Summer Math Packet

Instructions

The following review has several topics of basic geometry required for your next level mathematic course.

Every topic has a brief explanation followed by examples. Then there are several exercises you must complete in the space provided. If you need extra space, you can use scratch paper.

You are required to show all work when necessary. You don't need to show work for simple arithmetic calculations.

You are also required, whenever is necessary, to set the equation that solve for the variable.

Answers with no work will receive no credit.

The packet will be graded by percentage of completion. Try your best to answer all question, even if you are not sure of your answer.

This document is due **THE FIRST DAY OF SCHOOL**. **NO LATE SUBMISSION WILL BE ACCEPTED.**

You must print and turn in **only the practice exercises pages** of this document with your answers. Again, you do not need to print this entire document. You must submit only the practice exercises done with work. This can be done on separate pages and turn it.

After review these topics in class, you will have an evaluation test.

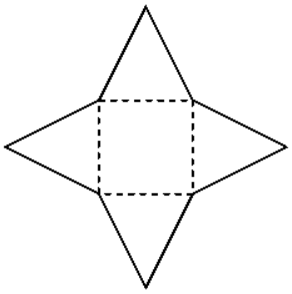
Lesson 1.1 Nets and Drawings for Visualizing Geometry

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.

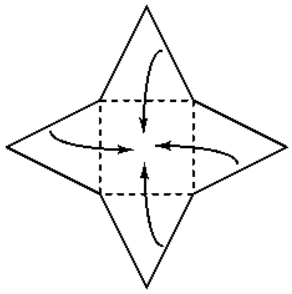
Step 1

Start with the net.



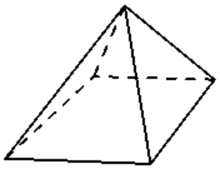
Step 2

Fold up on the dotted lines.

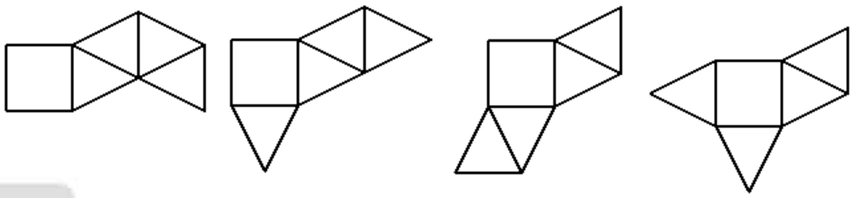


Step 3

Tape the adjacent triangle sides together.



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

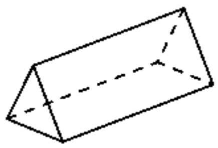


Problem

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

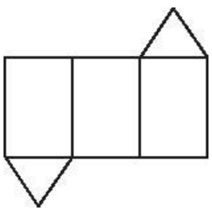
Make sure you cannot rotate or flip any net and place it on top of any other net.

Exercise

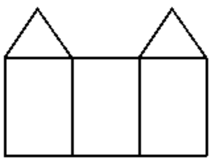


1. What is a possible net for the figure shown at the right?

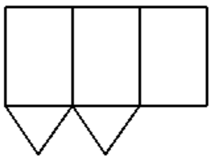
A.



B.



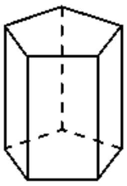
C.



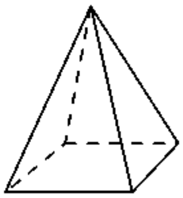
Lesson 1.1 Nets and Drawings for Visualizing Geometry –Practice Exercises Print this section.

Match each three-dimensional figure with its net.

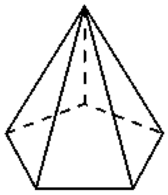
1.



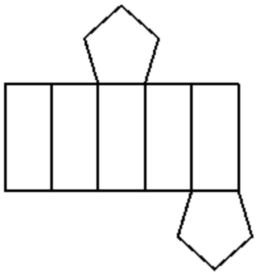
2.



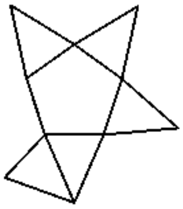
3.



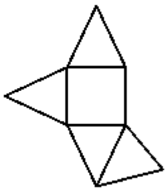
A.



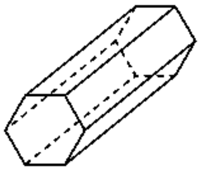
B



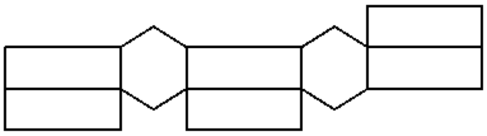
C.



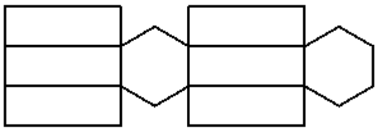
4. Error Analysis Two students draw nets for the solid shown below. Who is correct, Student A or Student B? Explain.



Student A:

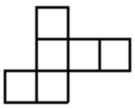


Student B:

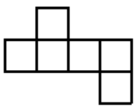


5. Choose the nets that will fold to make a cube.

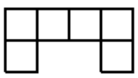
A.



B.

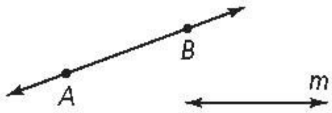
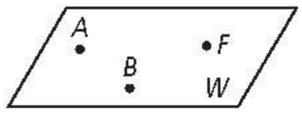


C.



Lesson 1.2 Points, Lines and Planes

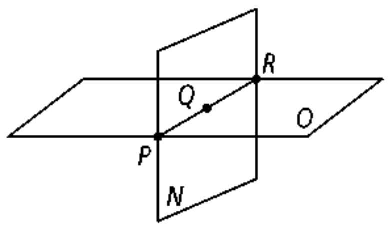
Review these important geometric terms.

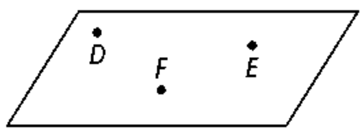
Term	Examples of Labels	Diagram
Point	Italicized capital letter: *D*	
Line	Two capital letters with a line drawn over them: $\overleftrightarrow{AB}$ or $\overleftrightarrow{BA}$ One italicized lowercase letter: *m*	
Line Segment	Two capital letters (called endpoints) with a segment drawn over them: $\overline{AB}$ 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.

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.*





Lesson 1.2 Points, Lines and Planes – Practice Exercises
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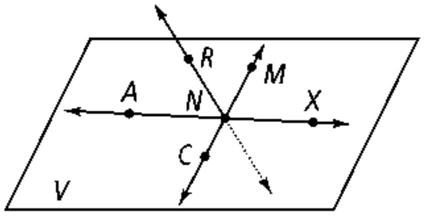
Use the figure below for Exercises 1–8. Note that $\overleftrightarrow{RN}$ pierces the plane at *N*. It is not coplanar with *V*.



1. Name two segments shown in the figure.

2. What is the intersection of $\overleftrightarrow{CM}$ and $\overleftrightarrow{RN}$?

3. Name three collinear points.

4. What are two other ways to name plane *V*?

5. Are points *R, N, M,* and *X* coplanar?

6. Name two rays shown in the figure.

7. Name the pair of opposite rays with endpoint *N*.

8. How many lines are shown in the drawing?

For Exercises 9–14, determine whether each statement is *always, sometimes,* or *never* true.

9. $\overrightarrow{GH}$ and $\overrightarrow{HG}$ are the same ray.

10. $\overrightarrow{JI}$ and $\overrightarrow{JL}$ are opposite rays.

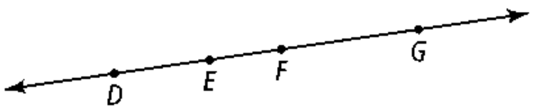
11. A plane contains only three points.

12. Three noncollinear points are contained in only one plane.

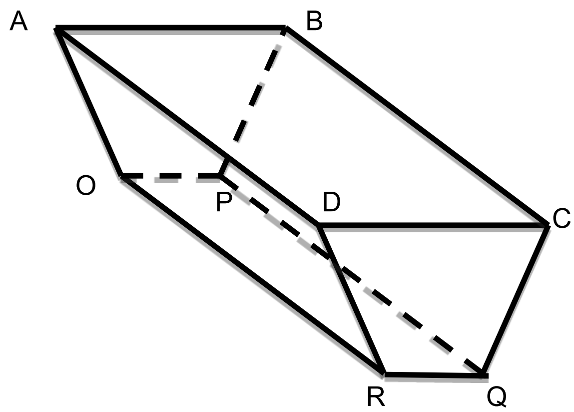
13. If $\overleftrightarrow{EG}$ lies in plane *X*, point *G* lies in plane *X*.

14. If three points are coplanar, they are collinear

15. How many segments can be named from the figure at the right?



Use the figure at the right for Exercises 16–21.
Name the intersection of each pair of planes or lines.



16. planes *ABP* and *BCD*

17. $\overleftrightarrow{RQ}$ and $\overleftrightarrow{RO}$

18. planes *ADR* and *DCQ*

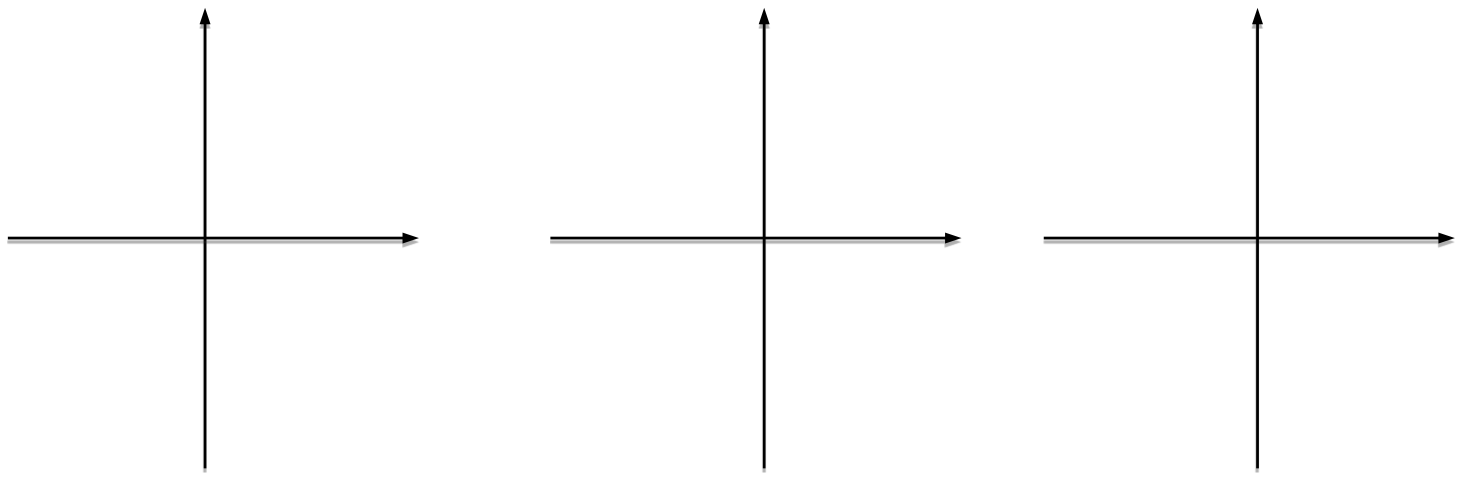
19. planes *BCD* and *BCQ*

20. $\overleftrightarrow{OP}$ and $\overleftrightarrow{QP}$

21. Name two planes that intersect in the given line $\overleftrightarrow{RO}$

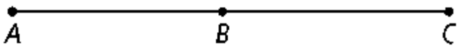
Coordinate Geometry Graph the points and state whether they are collinear.

22. (0, 0), (4, 2), (6, 3)
23. (–2, 0), (0, 4), (2, 0)
24. (–4, –1), (–1, –2), (2, –3)



Lesson 1.3 Measuring Segments

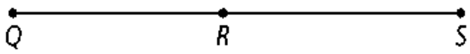
The ***Segment Addition Postulate*** allows you to use known segment lengths to find unknown segment lengths. If three points, *A, B,* and *C,* are on the same line, and point *B* is between points *A* and *C,* then the distance *AC* is the sum of the distances *AB* and *BC*



$$AC = AB + BC$$

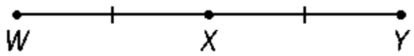
Problem

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

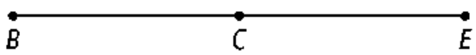
The ***midpoint*** of a line segment divides the segment into two segments that are equal in length. If you know the distance between the midpoint and an endpoint of a segment, you can find the length of the segment. If you know the length of a segment, you can find the distance between its endpoint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

Lesson 1.3 Measuring Segments – Practice Exercises
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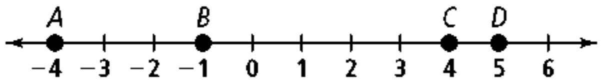
In Exercises 1–3, use the figure below. Find the length of each segment.



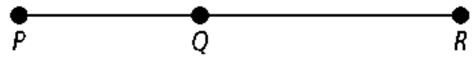
1. $\overline{AB}$ **2.** $\overline{BC}$ **3.** $\overline{AC}$

For Exercises 4–6, use the figure at the right.

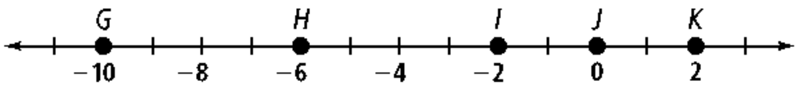
4. If $PQ = 7$ and $QR = 10$, then $PR =$ ______.

5. If $PR = 25$ and $PQ = 12$, then $QR =$ ______.

6. If $PR = 10$ and $PQ = 4$, then $QR =$ ______.



Use the number line below for Exercises 7–9. Tell whether the segments are congruent.



7. $\overline{GH}$ and $\overline{HI}$ **8.** $\overline{GH}$ and $\overline{IK}$ **9.** $\overline{HJ}$ and $\overline{IK}$

Algebra Use the figure at the right for Exercises 10.

10. Given: $ST = 3x + 3$ and $TU = 2x + 9$.

a. What is the value of *ST?*

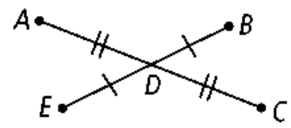
b. What is the value of *TU?*

11. You plan to drive north from city A to town B and then continue north to city C. The distance between city A and town B is 39 mi, and the distance between town B and city C is 99 mi.

a. Assuming you follow a straight driving path, after how many miles of driving will you reach the midpoint between city A and city C?

b. If you drive an average of 46 mi/h, how long will it take you to drive from city A to city C?

Algebra Use the diagram at the right for Exercises 12–14



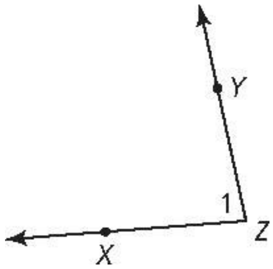
12. If $AD = 20$ and $AC = 3x + 4$, find the value of x. Then find AC and DC.

13. If $ED = 5y + 6$ and $DB = y + 30$, find the value of y. Then find ED, DB, and EB.

14. If $DC = 6x$ and $DA = 4x + 18$, find the value of x. Then find AD, DC, and AC

Lesson 1.4 Measuring Angles

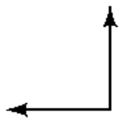
The ***vertex*** of an angle is the common endpoint of the rays that form the angle. An angle may be named by its vertex. It may also be named by a number or by a point on each ray and the vertex (in the middle)



This is $\angle Z$, $\angle XZY$, $\angle YZX$, or $\angle 1$.
It is *not* $\angle ZYX$, $\angle XYZ$, $\angle YXZ$, or $\angle ZXY$

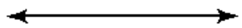
Angles are measured in *degrees,* and the measure of an angle is used to classify it.

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



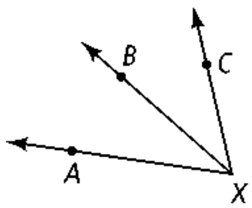
The measure of a *right* angle is 90.

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



The measure of a *straight* angle is 180.

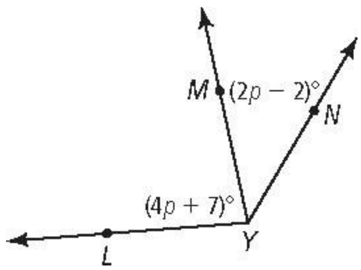
The ***Angle Addition Postulate*** allows you to use a known angle measure to find an unknown angle measure. If point *B* is in the interior of $\angle AXC$, the sum of $m\angle AXB$ and $m\angle BXC$ is equal to $m\angle AXC$



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

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

Lesson 1.4 Measuring Angles – Practice Exercises
Print this section.

Use the diagram below for Exercises 1–11. Find the measure of each angle

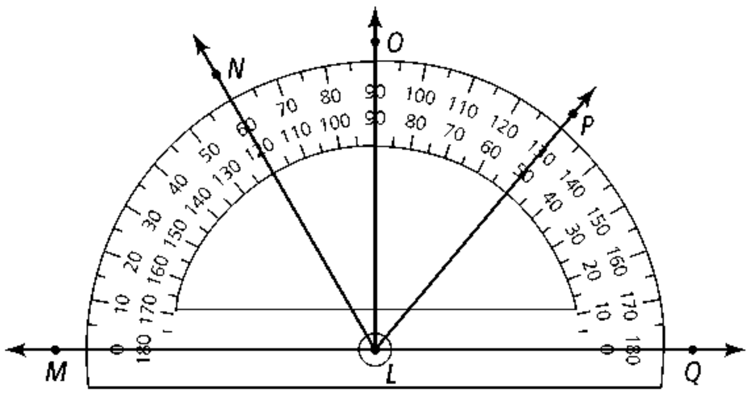
1. $\angle MLN$

2. $\angle NLP$

3. $\angle NLQ$

4. $\angle OLP$

5. $\angle MLQ$



Classify each angle as *acute, right, obtuse,* or *straight.*

6. $\angle MLN$ **7.** $\angle NLO$ **8.** $\angle MLP$

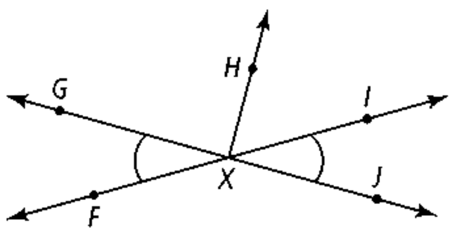
Use the figure at the right for Exercises 9–12. $m\angle FXH$ = 130 and $m\angle FXG$ = 49

9. $\angle FXG \cong$

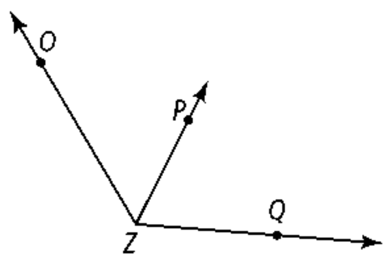
10. $m\angle GXH$ =

11. Name a straight angle in the figure

12. $\angle IXJ \cong$



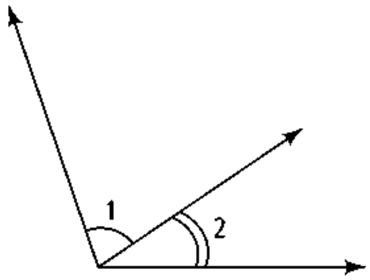
13. Algebra $m\angle OZP = 4r + 2$, $m\angle PZQ = 5r - 12$, and $m\angle OZQ = 125$.
What are $m\angle OZP$ and $m\angle PZQ$?



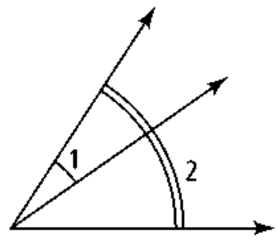
Lesson 1.5 Exploring Angle Pairs

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

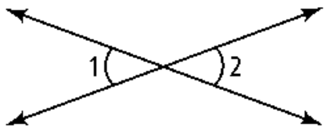


Adjacent Angles

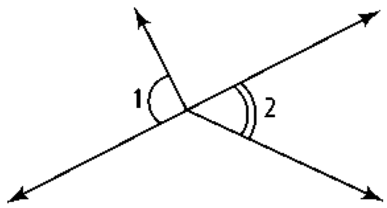


Overlapping Angles

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.



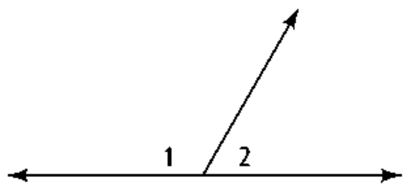
Vertical Angles

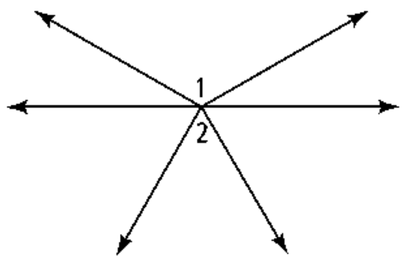


Non-Vertical Angles

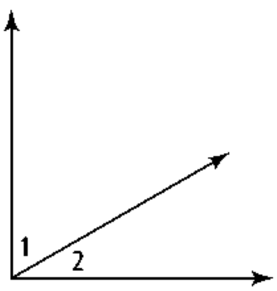
Supplementary Angles and Complementary Angles

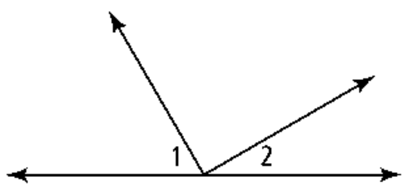
Two angles that form a line are ***supplementary angles***. Another term for these angles is a ***linear pair***. However, any two angles with measures that sum to 180 are also considered supplementary angles. In both figures below, $m\angle 1 = 120$ and $m\angle 2 = 60$, so $\angle 1$ and $\angle 2$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





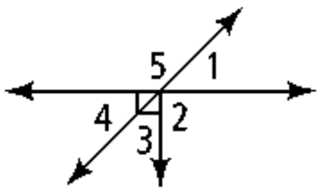
Lesson 1.5 Exploring Angle Pairs – Practice Exercises
Print this section.

Use the diagram at the right. Is each statement true?

1. $\angle 2$ and $\angle 5$ are adjacent angles

2. $\angle 1$ and $\angle 4$ are vertical angles

3. $\angle 4$ and $\angle 5$ are complementary

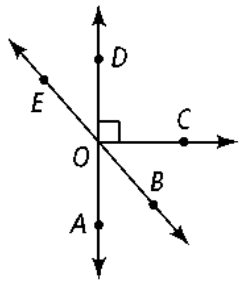


Name an angle or angles in the diagram described by each of the following.

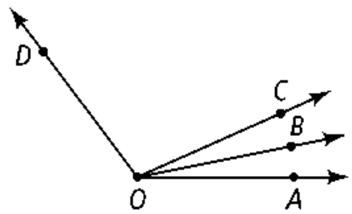
4. complementary to $\angle BOC$

5. supplementary to $\angle DOB$

6. adjacent and supplementary to $\angle AOC$



Use the diagram below for Exercises 7 and 8. Solve for *x*.
Find the angle measures



7. $m\angle AOB = 4x - 1$; $m\angle BOC = 2x + 15$; $m\angle AOC = 8x + 8$

8. $m\angle COD = 8x + 13$; $m\angle BOC = 3x - 10$; $m\angle BOD = 12x - 6$

9. $\angle ABC$ and $\angle EBF$ are a pair of vertical angles; $m\angle ABC = 3x + 8$ and $m\angle EBF = 2x + 48$. What are $m\angle ABC$ and $m\angle EBF$?

$\overrightarrow{QS}$ **bisects $\angle PQR$. Solve for *x* and find $m\angle PQR$.**

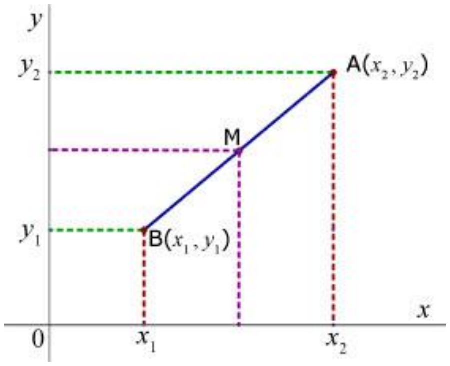
10. $m\angle PQS = 3x$; $m\angle SQR = 5x - 20$

11. $m\angle PQS = 2x + 1$; $m\angle RQS = 4x - 15$

12. $m\angle PQR = 3x - 12$; $m\angle PQS = 30$

1.7 Midpoint and Distance in the Coordinate Plane.

Average the *x*-coordinates of the endpoints to find the *x*-coordinate of the midpoint. Average the *y*-coordinates of the endpoints to find the *y*-coordinate of the midpoint



- **<u>Midpoint Formula :</u>** Midpoint coordinates for a point *M* between two end point in a coordinate plane.

If the end point coordinates are : $\boldsymbol{A(x_1, y_1), B(x_2, y_2)}$ then,

$$\boldsymbol{Midpoint\ Coordinatess\ for\ M} = \left(\frac{\boldsymbol{x_1 + x_2}}{\boldsymbol{2}}, \frac{\boldsymbol{y_1 + y_2}}{\boldsymbol{2}}\right)$$

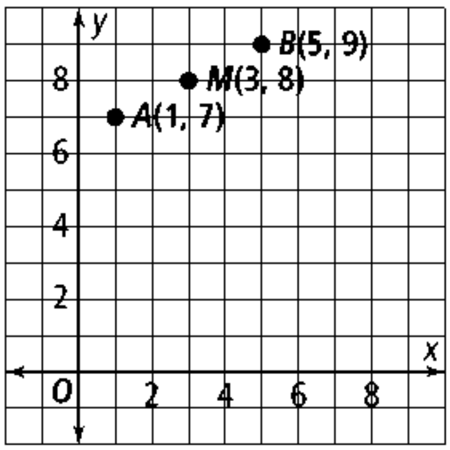
- **<u>Distance Formula :</u>** Distance between two points in a coordinate plane. If two point coordinates are :

$\boldsymbol{A(x_1, y_1), B(x_2, y_2)}$ then,

$$\boldsymbol{distance\ between\ A\ and\ B} = \sqrt{(\boldsymbol{x_2} - \boldsymbol{x_1})^2 + (\boldsymbol{y_2} - \boldsymbol{y_1})^2}$$

Problem

What is the midpoint of $\overline{AB}$ if the endpoints are *A*(1, 7) and *B*(5, 9)? What is the distance between points A and B?



Find the average of the *x*-coordinates.

$$\frac{1+5}{2} = 3$$

Repeat to find the *y*-coordinate of the midpoint.

$$\frac{7+9}{2} = 8$$

So, the midpoint of $\overline{AB}$ is (3, 8).

Remember the Midpoint Formula: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

The formula gives a point whose coordinates are the average of the *x*-coordinates and the *y*-coordinates.

So, the midpoint is halfway between the two points, and has coordinates that are the average of the coordinates of the two points.

To find an unknown endpoint, subtract the coordinates of the known endpoint from the coordinates of the midpoint. Add that number to the coordinates of the midpoint.

Finding the distance between A and B:

$$\text{Distance between A - B} = D_{AB} = \sqrt{(5-1)^2 + (9-7)^2}$$

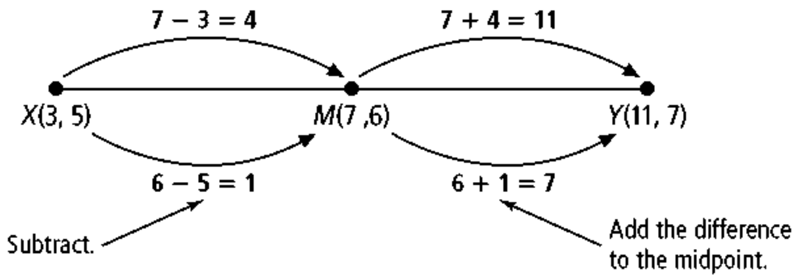
$$\text{Distance between A - B} = D_{AB} = \sqrt{4^2 + 2^2}$$

$$\text{Distance between A - B} = D_{AB} = \sqrt{16 + 4}$$

$$\text{Distance between A - B} = D_{AB} = \sqrt{20} = 2\sqrt{5}$$

Problem

The midpoint of $\overline{XY}$ is *M*(7, 6). One endpoint is *X*(3, 5). What are the coordinates of the other endpoint *Y*?



1.7 Midpoint and Distance in the Coordinate Plane – Practice Exercises
Print this section.

Find the coordinate of the midpoint of the segment with the given endpoints.

1. 3 and 5

2. –7 and 4

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

3. $A(6, 7)$, $B(4, 3)$

4. $A(-1, 5)$, $B(2, -3)$

5. $A(2.8, 1.1)$, $B(-3.4, 5.7)$

The coordinates of point Y are given. The midpoint of $\overline{XY}$ is (3, –5). Find the coordinates of point X

6. $Y(0, 2)$

7. $Y(-10, 5)$

8. $Y(4, -8)$

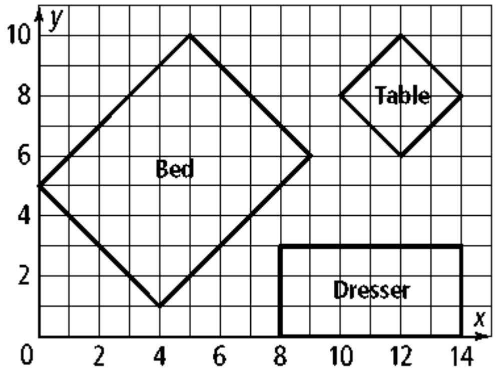
9. $Y(2.5, -6.5)$

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

10. $A(6, 7)$, $B(-1, 7)$

11. $H(20, -4)$, $I(-4, 3)$

The room shown below right is 14 ft by 10 ft. Find the dimensions of each piece of furniture to the nearest tenth.



12. length and width of the dresser.

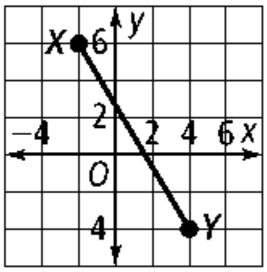
13. length and width of the table.

14. length and width of the bed

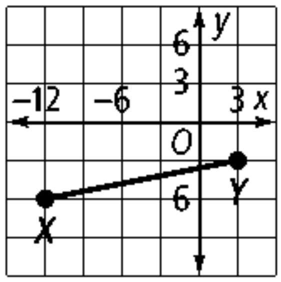
For each graph, find (a) ***X Y*** **to the nearest tenth and (b) the coordinates of the midpoint of** $\overline{XY}$

.

15.

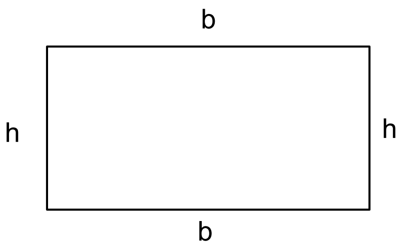


16.



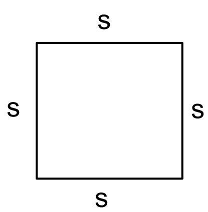
1.8 Perimeter, Circumference, and Area.

The ***perimeter of a rectangle*** is the sum of the lengths of its sides. So, the perimeter is the distance around its outside. The formula for the perimeter of a rectangle is $\boldsymbol{P = 2(b + h) = 2b+2h}$

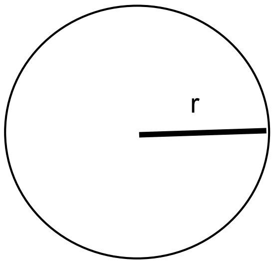


The ***area of a rectangle*** is the number of square units contained within the rectangle. The formula for the area of a rectangle is $\boldsymbol{A = bh}$.

A ***square*** is a rectangle that has four sides of the same length and four right angles. Because the perimeter is $s + s + s + s$, the formula for the perimeter of a square is $\boldsymbol{P = 4s}$. The formula for the area of a square is $\boldsymbol{A = s^2}$.



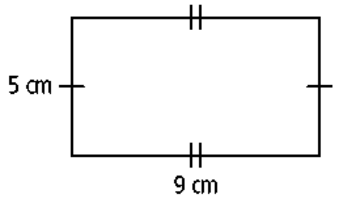
The ***circumference of a circle (AKA perimeter of the circle)*** is the distance around the circle. The formula for the circumference of a circle is $\boldsymbol{C = \pi d}$ **or** $\boldsymbol{C = 2\pi r}$. The ***area of a circle*** is the number of square units contained within the circle. The formula for the area of a circle is $\boldsymbol{A = \pi r^2}$



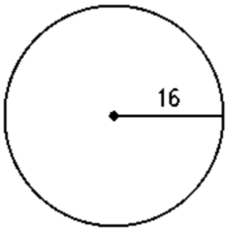
1.8 Perimeter, Circumference, and Area. – Practice Exercises
Print this section.

Find the perimeter of each figure.

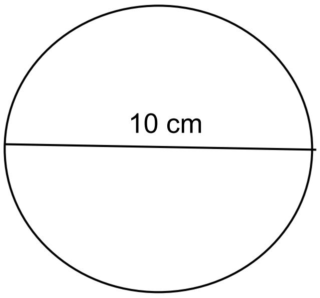
1.



2.



3.



Graph each figure in the coordinate plane. Find the perimeter.

4. $X(-4, 2)$, $Y(2, 10)$, $Z(2, 2)$

5. $R(1, 2)$, $S(1, -2)$, $T(4, -2)$

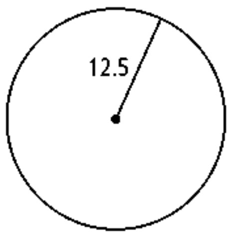
Find the area of the rectangle with the given base and height.

6. 4 ft, 15 in.

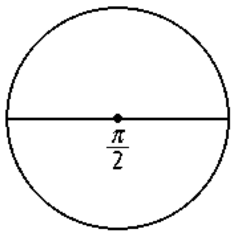
7. 90 in., 3 yd.

Find the area of each circle in terms of π.

8.

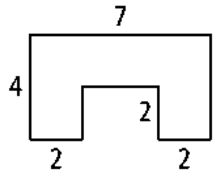


9.

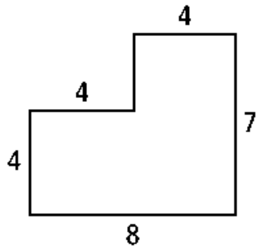


Find the area of each figure region. All angles are right angles.

10.



11.



Find the circumference and area of each circle, using π = 3.14. If necessary, round to the nearest tenth.

12. $r = 5$ m

13. $d = 2.1$ in

14. A rectangle has twice the area of a square. The rectangle is 18 in. by 4 in. What is the perimeter of the square?

15. Coordinate Geometry The center of a circle is $A(-3, 3)$, and $B(1, 6)$ is on the circle. Find the area of the circle in terms of π

16. The area of a circle is 25 π in.^{2}. What is its radius?