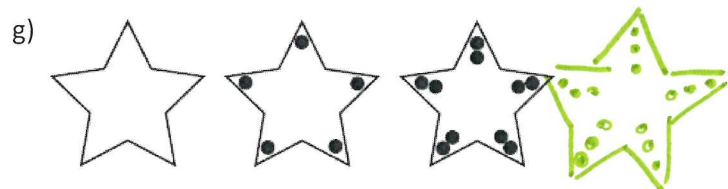
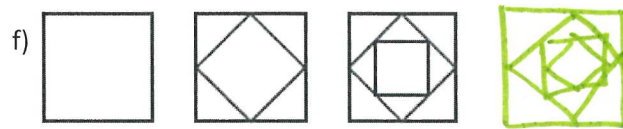
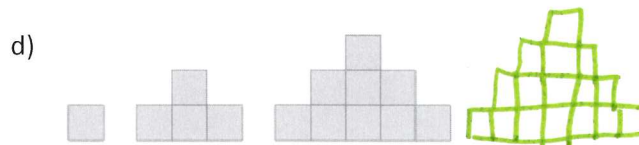
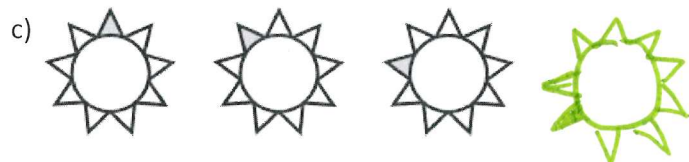
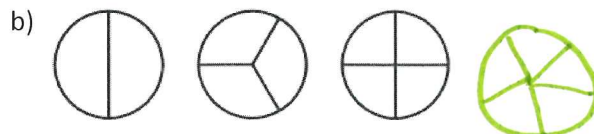
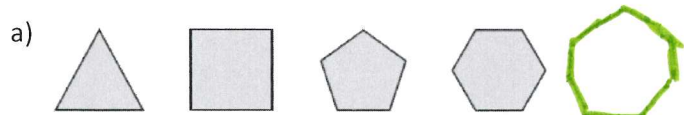


1.1 Finding and Describing Patterns

Goal: Find patterns and use them to make predictions.

Sketch the next figure that you expect in the pattern.



Describe the pattern and write the next two numbers.

a) 3, 6, 9, 12, 15, 18, 21, 24

Description of Pattern: add 3

b) $1^2, 2^2, 3^2, 4^2, 5^2$
1, 4, 9, 16, 25, 36, 49, 64

Description of Pattern: perfect squares OR add the next odd #

c) 4, 12, 36, 108, 324, 972

Description of Pattern: multiply previous # by 3

d) ^{r1 +2 +3 +4 +5}
5, 6, 8, 11, 15, 20, 26, 34

Description of Pattern: add one more than previous time

e) 9, 4, -1, -6, -11, -16

Description of Pattern: subtract 5

f) -9, 3, -1, 1/3, -1/9, 1/27

Description of Pattern: divide by -3

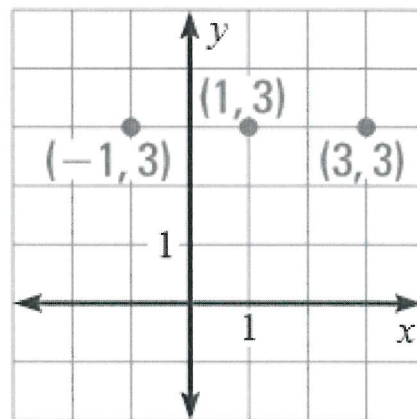
Find a pattern in the coordinates of the points. Then write the coordinates of another point in the pattern.

Pattern:

x's: add 2

y's: always 3

Coordinates: (5, 3) OR (-3, 3)

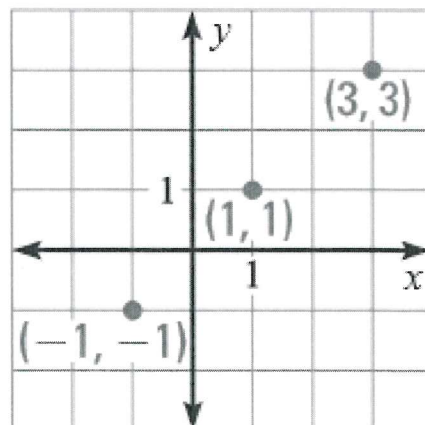


Pattern:

x's: plus 2

y's: plus 2

Coordinates: (5, 5) OR (-3, -3)



1.2 Inductive Reasoning

Goal: Use inductive reasoning to make conjectures.

Conjecture: an unproven statement that is based on a pattern or observation

Inductive Reasoning: looking for patterns and making conjectures

Sum = add difference = subtract square = x^2
product = multiply quotient = divide

Complete each conjecture by first writing several examples and then completing the statement.

a) Conjecture: The sum of any two odd numbers is even.

Examples: $1 + 1 = 2$
 $1 + 5 = 6$
 $3 + 7 = 10$

b) Conjecture: The product of any two odd numbers is odd.

Examples: $3 \times 5 = 15$
 $7 \times 9 = 63$
 $3 \times 7 = 21$

c) Conjecture: The product of a positive number and a negative number is negative.

Examples: $3(-5) = -15$
 $1(-7) = -7$
 $-8(2) = -16$

d) Conjecture: The difference of any two odd numbers is even.

Examples: $7 - 5 = 2$ $9 - 1 = 8$
 $3 - 1 = 2$ $11 - 7 = 4$

e) Conjecture: The square of an even number is even.

Examples: $2^2 = 4$
 $4^2 = 16$
 $8^2 = 64$

Just because something is true from several examples does not prove that it is true in general. To prove that a conjecture is true, you need to prove it true in ALL cases. A conjecture is considered false if it is not always true.

Counterexample: an example that shows that a conjecture is false.

↳ can be a picture, a sentence, or a math equation

Show each conjecture is false by finding a counterexample.

a) Conjecture: All birds can fly.

Counterexample: Penguins can't fly


b) Conjecture: All high schools are in school at 9:00 AM.

Counterexample: It could be summer or a weekend

c) Conjecture: The sum of two numbers is always greater than the larger of the two numbers.

Counterexample: $3 + -5 = -2$

d) Conjecture: All shapes with four sides the same length are squares.

Counterexample: 

e) Conjecture: If the product of two numbers is even, then the numbers must be even.

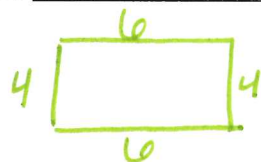
Counterexample: $7 \cdot 8 = 56$

f) Conjecture: If a shape has two sides the same length, it must be a rectangle.

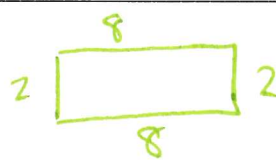
Counterexample: 

g) Conjecture: All rectangles with a perimeter of 20 feet have the same area.

Counterexample: _____



$$P = 20$$
$$A = 24$$






$$P = 20$$
$$A = 16$$



1.3 Points, Lines, and Planes

Goal: Use postulates and undefined terms.

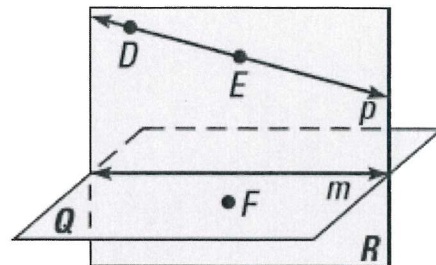
Undefined terms: terms that cannot be mathematically defined using other known words

Undefined Terms in Geometry			
Term	Definition	Picture	Label/Name
Point	<u>NO</u> dimension		A
Line	<u>1</u> dimension -Extends without end in <u>2</u> directions		\overleftrightarrow{BC} \overleftrightarrow{CB} line l
Plane	<u>2</u> dimensions -Extends without end in <u>All</u> directions		plane G OR plane DEF

Postulate: statements that are accepted without further justification.

Postulates 1 and 2			
	Words	Picture	Symbols
Postulate 1	Through any two points there is exactly <u>1</u> line		Line <u>n</u> passes through points <u>P</u> and <u>Q</u>
Postulate 2	Through any three points not on a line there is exactly <u>1</u> plane		Plane <u>T</u> passes through points <u>A</u> , <u>B</u> , and <u>C</u>

Use the diagram at the right.



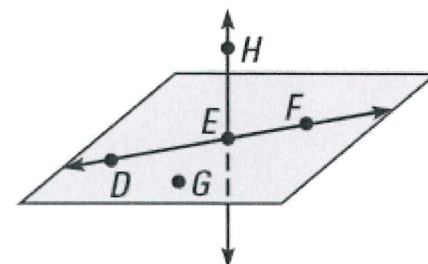
- Name three points: D, E, F
- Name two lines: line p, line m, \overleftrightarrow{DE} , \overleftrightarrow{ED}
- Name two planes: plane Q, plane R

Collinear points: points that lie on the same line

Coplanar points: points that lie on the same plane

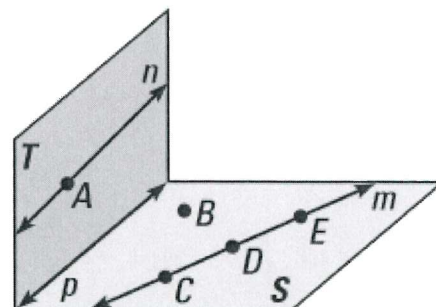
Coplanar lines: lines that lie on the same plane

Use the diagram at the right.



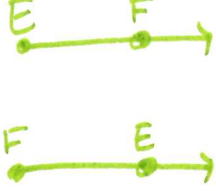






- Name three points that are collinear: D, E, F
- Name four points that are coplanar: D, E, F, G
- Name three points that are not collinear: H, F, G

Use the diagram at the right.



- Name two lines: line n, line m, line p, \overleftrightarrow{CE}
- Name two planes: plane T + plane S
- Name three points that are collinear: C, D, E
- Name three points that are not collinear: A, B, C
- Name four points that are coplanar: B, C, D, E
- Name two lines that are coplanar: line n + line p
OR
line p + line m

	Definition	Picture	Symbols
Line	<u>NO</u> endpoints		\overleftrightarrow{AB} \overleftrightarrow{BA}
Segment	<u>2</u> endpoints		\overline{CD} \overline{DC}
Ray	<u>1</u> endpoints * Make sure to name correctly		\overrightarrow{EF} \overrightarrow{FE}

	Picture	Line, Segment, or Ray?	How many arrowheads?	Name any endpoints.
\overleftrightarrow{JK}		line	2	None
\overrightarrow{KL}		ray	1	K
\overline{LJ}		segment	0	L & J
\overrightarrow{LK}		ray	1	L

Draw \overleftrightarrow{AB} and \overleftrightarrow{AC} . Are the lines the same? Explain.

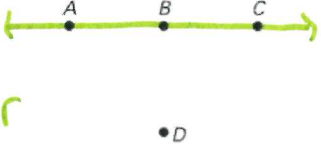
yes, A, B, + C are colinear

Draw \overline{AC} and \overline{BD} . Are the segments the same? Explain.

No they have different endpoints

Draw \overrightarrow{CA} and \overrightarrow{CB} . Are the rays the same? Explain.

yes, they both have the same endpoint & go in the same direction

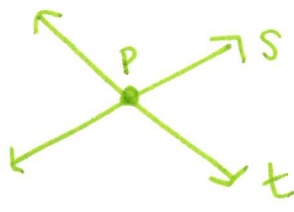
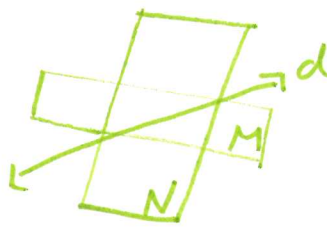


1.4 Sketching Intersections

Goal: Sketch simple figures and their intersections

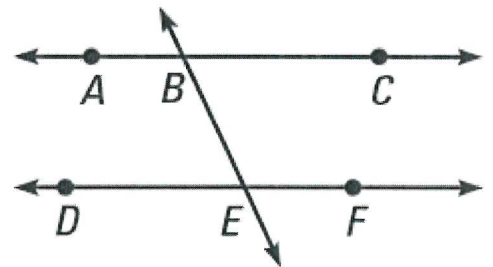
Intersect: When figures have any points in common

Intersection point: the point or points that all the figures have in common

Postulates 3 and 4			
	Words	Picture	Symbols
Postulate 3	If two <u>lines</u> intersect, then their intersection is a <u>point</u>		Lines <u>s</u> and <u>t</u> intersect at point <u>P</u>
Postulate 4	If two <u>planes</u> intersect, then their intersection is a <u>line</u>		Planes <u>M</u> and <u>N</u> intersect at line <u>d</u>

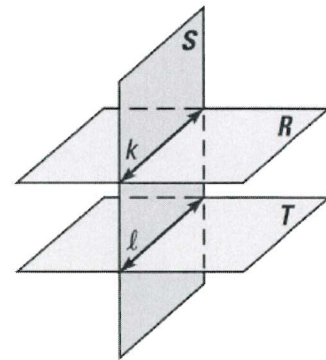
Use the diagram at the right.

- a) Name the intersection of \overleftrightarrow{AC} and \overleftrightarrow{BE} : B
- b) Name the intersection of \overleftrightarrow{BE} and \overleftrightarrow{DF} : E
- c) Name the intersection of \overleftrightarrow{AC} and \overleftrightarrow{DF} : none



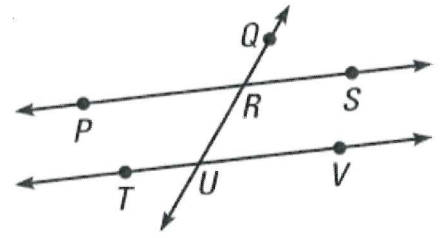
Use the diagram at the right.

- a) Name the intersection of planes S and R: line k
- b) Name the intersection of planes R and T: none
- c) Name the intersection of planes T and S: line l



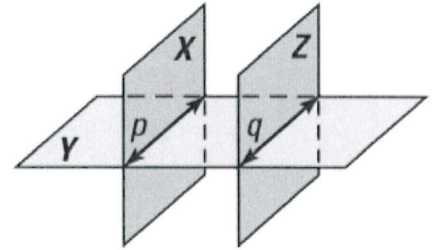
Use the diagram at the right.

- a) Name the intersection of \overleftrightarrow{PS} and \overleftrightarrow{QR} : R
- b) Name the intersection of \overleftrightarrow{TV} and \overleftrightarrow{QU} : U
- c) Name the intersection of \overleftrightarrow{PS} and \overleftrightarrow{UV} : none



Use the diagram at the right.

- a) Name the intersection of planes X and Y: line p
- b) Name the intersection of planes Y and Z: line q
- c) Name the intersection of planes Z and X: none

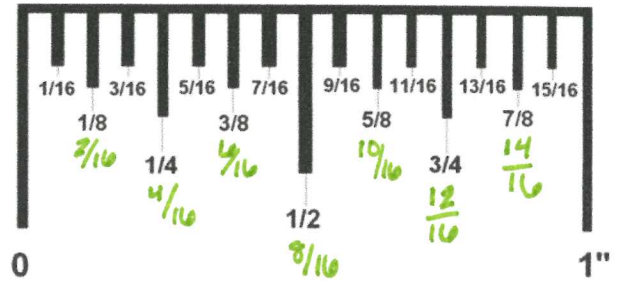


Sketching Lines and Planes	
<p>a) A line that is in a plane</p>	<p>b) A line that does not intersect the plane</p>
<p>c) A line that intersects the plane at a point</p>	<p>d) Two planes that intersect in a line</p>
<p>e) Three lines that lie in a plane</p>	<p>f) Two lines that intersect a plane at the same point</p>
<p>g) Two planes that do not intersect</p>	<p>h) Three lines that intersect in a point</p>

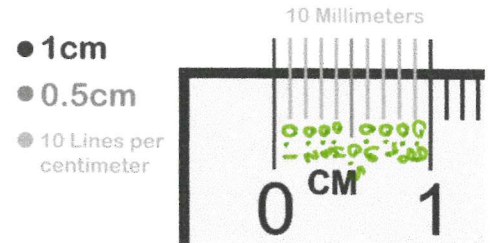
1.4.5 Measuring Segments and Angles

Goal: Use a ruler to measure segments and a protractor to measure angles.

On a ruler there are 16 tick marks between each inch. Always write the fraction in simplest terms.



On a ruler there are 10 tick marks between each centimeter. You can write your answer as a decimal.



Use a ruler to accurately measure each segment in inches and in centimeters. Label all answers.

a) Inches: 2 1/2 in
Centimeters: 6.4 cm



b) Inches: 1 1/4 in
Centimeters: 3.1 cm



c) Inches: 1 15/16 in
Centimeters: 4.9 cm



d) Inches: 4 1/4 in
Centimeters: 10.6 cm



e) Inches: 2 7/16 in
Centimeters: 6.2 cm



Measure of an angle: how many degrees an angle has

Right Angle
Angle that makes a square corner, is 90°

Obtuse Angle
Angle larger than a right angle, more than 90°

Acute Angle
Angle smaller than a right angle, less than 90°

Straight Angle
A straight line with 2 arrows Measures 180°

How To Use a Protractor

This angle is 100°

- Place the center point of the protractor on the vertex of the angle.
- Line up the 0 on the bottom line of the protractor with the bottom ray of the angle.
- To find the angle measure, look at the number the second ray passes through.

To measure angles opening from the left, use the **TOP** set of numbers.

To measure angles opening from the right, use the **BOTTOM** set of numbers.

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Classify each angle.

- | | | |
|---|---|---|
| a) $m\angle A = 130^\circ$
<u>obtuse</u> | b) $m\angle B = 90^\circ$
<u>right</u> | c) $m\angle C = 45^\circ$
<u>acute</u> |
| d) $m\angle D = 90.01^\circ$
<u>obtuse</u> | e) $m\angle E = 89.9^\circ$
<u>acute</u> | f) $m\angle F = 180^\circ$
<u>straight</u> |

Use a protractor to find the measure of each angle.

a) 50°
acute



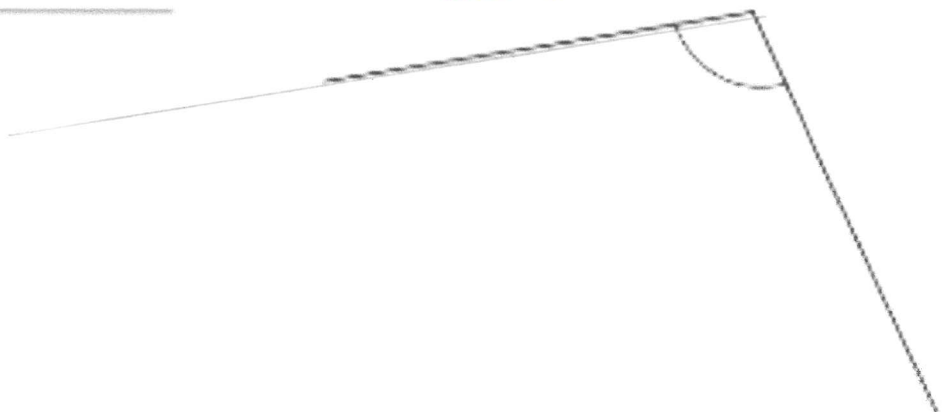
b) 88°
acute



c) 123°
obtuse



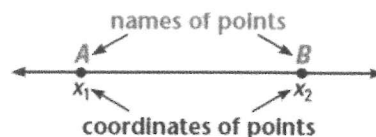
d) 105°
obtuse



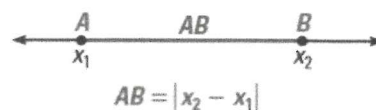
1.5 Segments and Their Measures

Goal: Use the segment addition postulate to find lengths.

Coordinate: the real number that corresponds to a point on a number line



Distance: the absolute value of the difference of the coordinates A and B written as AB



Length: the same as the distance

↳ can never be negative

Between: when three coordinates lie on a line, one of them is between the other two

↳ must be collinear



Segment Addition Postulate	If B is between A and C, then <u>$AC = AB + BC$</u>	
	If $AC = AB + BC$, then B is between <u>A</u> and <u>C</u>	

Draw a sketch of the three collinear points. Then write the Segment Addition Postulate for the points.

a) X is between Y and Z



$YX + XZ = YZ$

b) A is between R and D



$RA + AD = RD$

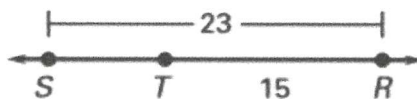
Find each length.

a) $AC = 20$



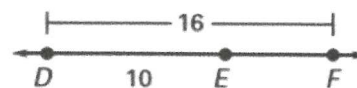
$14 + 6 = 20$

b) $ST = 8$



$23 - 15 = 8$

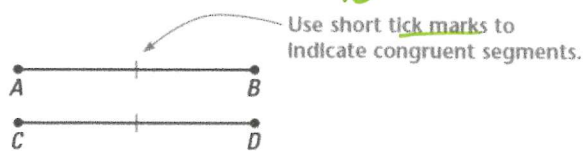
c) $EF = 6$



$16 - 10 = 6$

Congruent Segments: segments that have the same

length



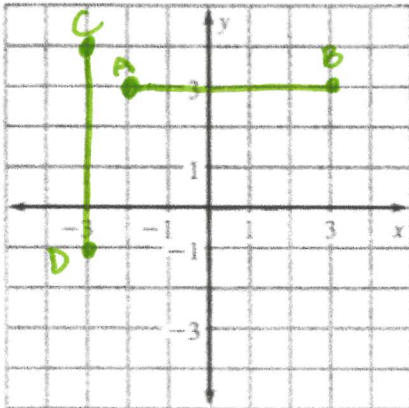
↳ means congruent

-objects are \cong , distances are $=$

Words	Symbols
The length of AB is <u>length</u> to the length of CD	$AB = CD$
Segment \overline{AB} is <u>congruent</u> to segment \overline{CD}	$\overline{AB} \cong \overline{CD}$

Plot the points in the coordinate plane. Then decide whether AB and CD are congruent.

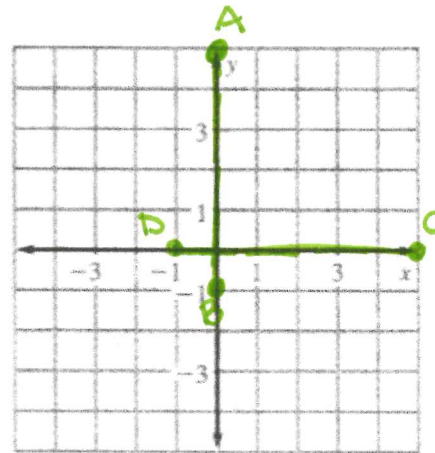
a) A(-2, 3) B(3, 3) C(-3, 4) D(-3, -1)



$AB = 5$ $CD = 5$

$\overline{AB} \cong \overline{CD}$

b) A(0, 5) B(0, -1) C(5, 0) D(-1, 0)



$AB = 6$ $CD = 6$

$\overline{AB} \cong \overline{CD}$

Use the Segment Addition Postulate to write and solve an equation for x. Then find the lengths.

a) Let $PR = 47$

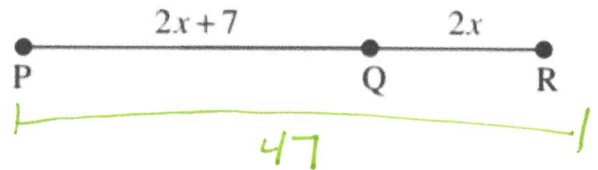
Equation: $\underline{PQ + QR = PR}$

$2x + 7 + 2x = 47$

$4x + 7 = 47$

$4x = 40$

$x = 10$



$PQ = 2(10) + 7$

$PQ = 27$

$QR = 2(10)$

$QR = 20$

$x = \underline{10}$

$PQ = \underline{27}$

$QR = \underline{20}$

b) Let $PR = 26$

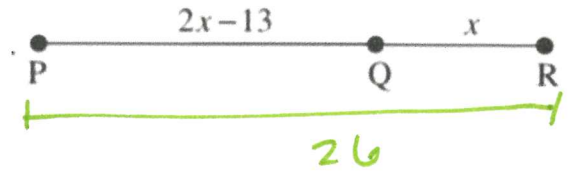
Equation: $PQ + QR = PR$

$$2x - 13 + x = 26$$

$$3x - 13 = 26$$

$$3x = 39$$

$$x = 13$$



$$PQ = 2(13) - 13$$

$$QR = 13$$

$$PQ = 13$$

$x = 13$

$PQ = 13$

$QR = 13$

c) Let $PR = 40$

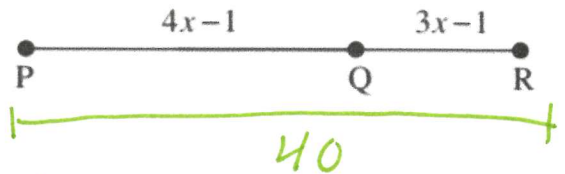
Equation: $PQ + QR = PR$

$$4x - 1 + 3x - 1 = 40$$

$$7x - 2 = 40$$

$$7x = 42$$

$$x = 6$$



$$PQ = 4(6) - 1$$

$$PQ = 23$$

$$QR = 3(6) - 1$$

$$QR = 17$$

$x = 6$

$PQ = 23$

$QR = 17$

d) Let $RG = 7x + 3$, $GQ = 3x + 13$, and $RQ = 56$. Find the value of x and the indicated lengths.

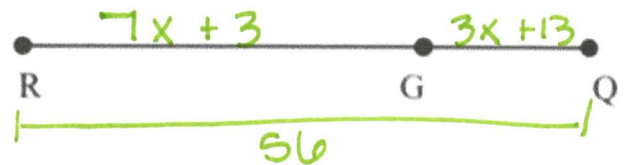
Equation: $RG + GQ = RQ$

$$7x + 3 + 3x + 13 = 56$$

$$10x + 16 = 56$$

$$10x = 40$$

$$x = 4$$



$$RG = 7(4) + 3$$

$$RG = 31$$

$$GQ = 3(4) + 13$$

$$GQ = 25$$

$x = 4$

$RG = 31$

$GQ = 25$

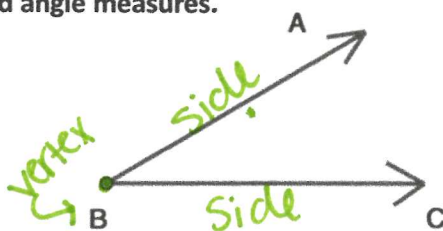
1.6 Angles and Their Measures

Goal: Measure and classify angles. Add angle measures.

Angle: two rays that have the same endpoint

Sides: the two rays of the angle

Vertex: the point of the angle



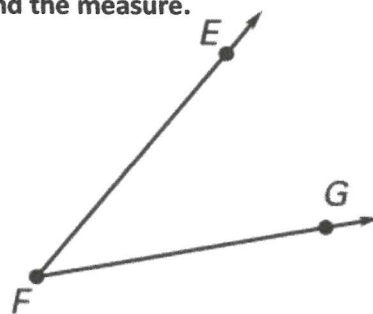
Name the angle, vertex, and sides of each angle. Then use a protractor to find the measure.

a) Angle names: $\angle F$, $\angle EFG$, $\angle GFE$

Vertex: F

Sides: \vec{FE} \vec{FG}

Measure: 40°

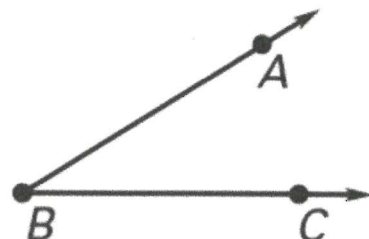


b) Angle names: $\angle B$, $\angle ABC$, $\angle CBA$

Vertex: B

Sides: \vec{BA} \vec{BC}

Measure: 32°

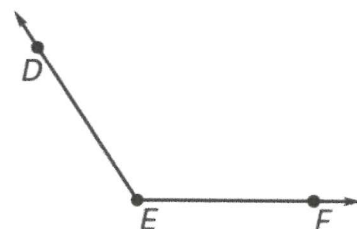


c) Angle names: $\angle E$, $\angle DEF$, $\angle FED$

Vertex: E

Sides: \vec{ED} \vec{EF}

Measure: 122°



d) Angle names: $\angle B$, $\angle ABC$, $\angle CBA$

Vertex: B

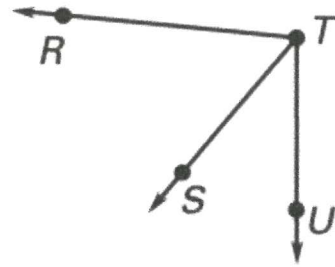
Sides: \vec{BA} \vec{BC}

Measure: 180°



a) Name all the angles in the figure.

$\angle RTS$ $\angle RTU$ $\angle STU$
 $\angle STR$ $\angle UTR$ $\angle UTS$



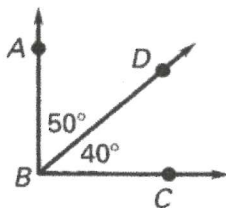
b) Why should you not name any of the angles $\angle T$?

T is the vertex of 3 different \angle 's. If you just said $\angle T$, we would not know which angle it was referring to

<p>Angle Addition Postulate</p>	<p>If P is in the interior of $\angle RST$, then $m\angle RSP + m\angle PST =$ $m\angle RST$</p>	
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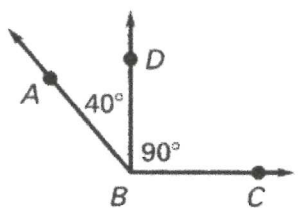
Find the measure of $\angle ABC$.

a) $m\angle ABC = 90^\circ$



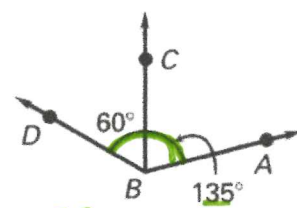
$50 + 40$

b) $m\angle ABC = 130^\circ$



$40 + 90$

c) $m\angle ABC = 75^\circ$



$135 - 60$

Use the angle addition postulate to write and solve an equation for x. Find the angle measures.

a) Let $m\angle ABC = 94^\circ$

Equation: $3x + 15 + x + 7 = 94$

$4x + 22 = 94$

$4x = 72$

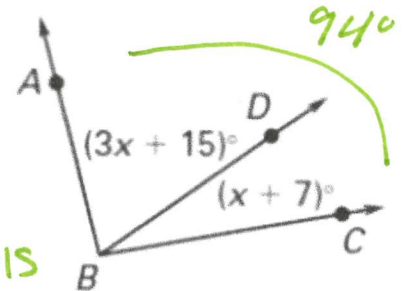
$x = 18$

$m\angle ABD = 3(18) + 15$

$m\angle ABD = 69^\circ$

$m\angle DBC = 18 + 7$

$m\angle DBC = 25^\circ$



$x = 18$ $m\angle ABD = 69^\circ$ $m\angle DBC = 25^\circ$

b) Let $m\angle QST = 135^\circ$

Equation: $3x + 1 + 2x - 6 = 135$

$$5x - 5 = 135$$

$$5x = 140$$

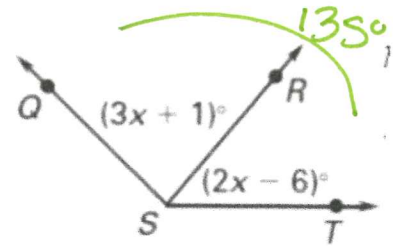
$$x = 28$$

$$m\angle QSR = 3(28) + 1$$

$$m\angle QSR = 85^\circ$$

$$m\angle RST = 2(28) - 6$$

$$m\angle RST = 50^\circ$$



$x = 28$ $m\angle QSR = 85^\circ$ $m\angle RST = 50^\circ$

c) Let $m\angle ADC = 71^\circ$

Equation: $x + 7 + 2x + 19 = 71$

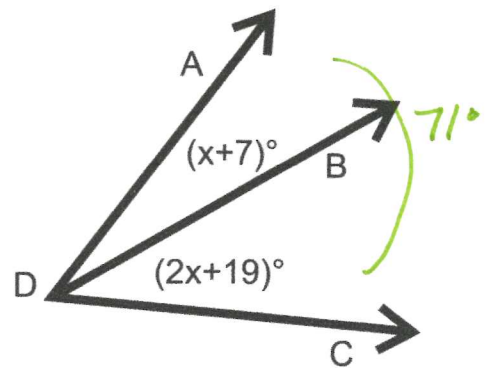
$$3x + 26 = 71$$

$$3x = 45$$

$$x = 15$$

$$m\angle ADB = 15 + 7$$

$$m\angle ADB = 22$$



$$m\angle BDC = 2(15) + 19$$

$$m\angle BDC = 49$$

$x = 15$ $m\angle ADB = 22^\circ$ $m\angle BDC = 49^\circ$

d) Let $m\angle ABD = 121^\circ$

Equation: $4x + 2 + 3x - 7 = 121$

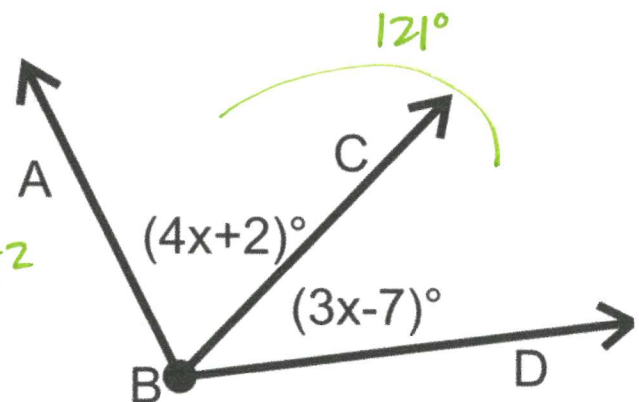
$$7x - 5 = 121$$

$$7x = 126$$

$$x = 18$$

$$m\angle ABC = 4(18) + 2$$

$$m\angle ABC = 74$$



$$m\angle CBD = 3(18) - 7$$

$$m\angle CBD = 47$$

$x = 18$ $m\angle ABC = 74^\circ$ $m\angle CBD = 47^\circ$