Chapter 1 – Tools For Geometry

Terms, Postulates and Theorems

1.1

Undefined terms in geometry: point, line, and plane

Point indicates a location. It has no dimension, is represented by a dot.

Line is represented by a straight path that extends indefinitely in two directions and has no thickness or width. A line contains infinite many points.

Plane is represented by a flat surface that extends without end in two dimensions and has not thickness. A plane contains infinite many points.

collinear points - points that lie on the same line.

Coplanar - coplanar points are points that lie in the same plane.

Space - space is the set of all points

Segment - Two points and all the points between them.

Ray - a segment that is extended indefinitely in one direction

Opposite rays - two collinear rays that extend in opposite directions

Postulate – a conditional statement that is accepted as being true.

Postulate 1-1 – Through any two points is exactly one line.

Postulate 1-2 – If two lines intersect, then their intersection is exactly one point.

Postulate 1-3 – If two planes intersect, then their intersection is a line.

Postulate 1-4 – Through any three noncollinear points there is exactly one plane.

1.2

Congruent Segments – $\overline{OX} \cong \overline{EN}$ iff $OX = EN$

Definition of Midpoint - If M is the midpoint of $\overline{PQ}$, then M is the point between P and Q such that $PM = MQ$.

Segment Bisector - any segment, line, or plane that intersects a segment at its midpoint.

Midpoint in the Coordinate Plane - The coordinates of the midpoint of a line segment whose endpoints have coordinates (x_1, y_1) and (x_2, y_2)

$$M = \left(\frac{\Sigma x}{2}, \frac{\Sigma y}{2}\right)$$

Distance formula - The distance, d, between any points with coordinates (x_1, y_1) and (x_2, y_2) is given by the following formula:

$$d = \sqrt{[\Delta x]^2 + [\Delta y]^2}$$

1.3

Ray: a segment that is extended indefinitely in one direction

Vertex: the endpoint of a ray

Angle: a figure that consists of two rays with a common endpoint

Sides: the two rays of an angle

Measure of an angle: the number of degrees in an angle

Opposite rays: two collinear rays that extend in opposite directions

Straight angle: the figure formed by two opposite rays

Acute Angle: an angle whose measure is less than 90 and greater than zero.

Obtuse Angle: an angle whose measure is greater than 90 and less than 180.

Right Angle: an angle whose measure is 90.

Congruent Angles – $\angle CAT \cong \angle DOG$ iff $m\angle CAT = m\angle DOG$

Angle Bisector: a line, ray, or segment that separates an angle into two congruent angles.

1.4

Segment – A segment consists of two endpoints and all the points between them.

Segment Addition Postulate – A is between C and T iff $CA + AT = CT$.

Angle Addition Postulate – R is in the interior of $\angle PQS$ iff $m\angle PQR + m\angle RQS = m\angle PQS$.

1.5

Postulate – A statement that assumed to be true.

Theorem – A statement that can be proved true using established facts.

Adjacent Angles – two angles that have the same vertex, share common ray, and have no common interior points.

Complementary Angles – two angles that sum to $90°$.

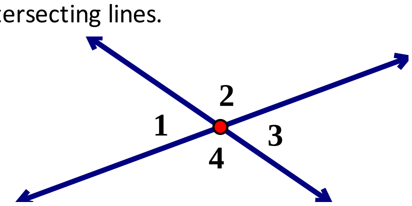
Complement Theorem – If the noncommon sides of two adjacent angles form a right angle, then the angles are complementary.

Supplementary Angles – two angles that sum to $180°$.

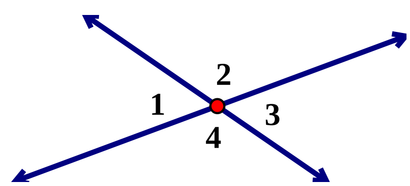
Linear Pair – two adjacent angles whose non-common sides form opposite rays (form a straight angle).

Supplement Theorem – If two angles form a linear pair, then they are supplementary.

Vertical Angles - two nonadjacent angles formed by intersecting lines.



Vertical Angles Theorem: Vertical angles are congruent.



Points, Lines & Planes

Notes Section 1.1

Undefined terms in geometry: point, line, and plane

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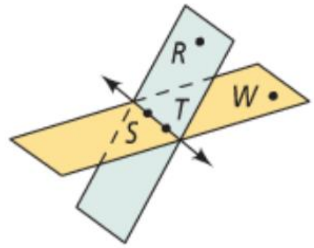
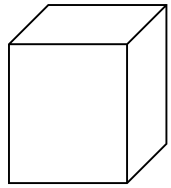
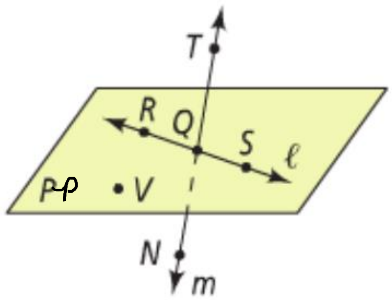


Postulate 1-4 – Through any three noncollinear points there is exactly one plane.



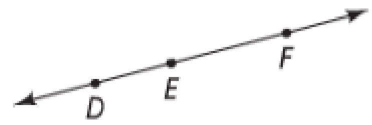


1. What are two other ways to name $\overleftrightarrow{QT}$?

2. What are two other ways to name $\mathcal{P}$?

3. Name three collinear points.

4. Name a point not coplanar with points R, S, and V.

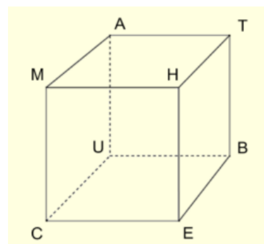


5. Name the three line segments.

6. Name the four rays.

7. Which rays are opposite rays?

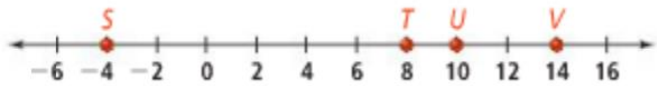
8. What is the intersection of plane CUE and plane EBT?



Segments, Distance & Midpoint

Congruent Segments – $\overline{OX} \cong \overline{EN}$ iff $OX = EN$

Equal vs Congruent

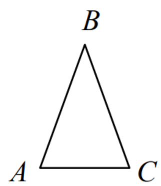


$\overline{ST}$

ST

$AB = 4\ cm$

$BC = 4\ cm$



Definition of Midpoint - If M is the midpoint of $\overline{PQ}$, then M is the point between P and Q such that $PM = MQ$.

Segment Bisector - any segment, line, or plane that intersects a segment at its midpoint.

Notes Section 1.2

Midpoint in the Coordinate Plane - The coordinates of the midpoint of a line segment whose endpoints have coordinates (x_1, y_1) and (x_2, y_2)

$$M = \left(\frac{\Sigma x}{2}, \frac{\Sigma y}{2}\right)$$

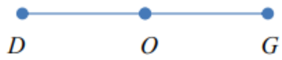
Distance formula - The distance, d, between any points with coordinates (x_1, y_1) and (x_2, y_2) is given by the following formula:

$$d = \sqrt{[\Delta x]^2 + [\Delta y]^2}$$

1. **Given** O is the midpoint of $\overline{DG}$

$DO = 6x - 7$

$OG = 5x + 1$



Find DO

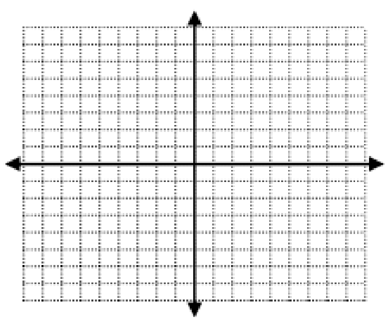
2. $\overline{JM}$ bisects $\overline{AX}$ at M. $AM = 2x + 45$, $MX = 3x + 30$, find MX.

3. Find the midpoint and length of $\overline{AB}$.

EASY

A (-5,3)

B (-1,3)



Midpoint of $\overline{AB} =$

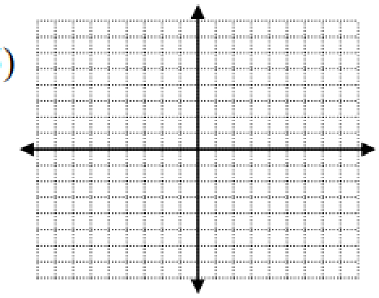
$AB =$

4. Find the midpoint and length of $\overline{CD}$.

NOT SO EASY

C (-6,-5)

D (7,3)



Midpoint of $\overline{CD} =$

$CD =$

5. $\overline{ME}$ has the endpoints of M(-6, 4) and E(5, -2). Find the midpoint and length of $\overline{ME}$.

Angles Measures

Notes Section 1.3

Ray: a segment that is extended indefinitely in one direction

Vertex: the endpoint of a ray

Angle: a figure that consists of two rays with a common endpoint

Sides: the two rays of an angle

Interior and exterior of an angle:

Measure of an angle: the number of degrees in an angle

Opposite rays: two collinear rays that extend in opposite directions

Straight angle: the figure formed by two opposite rays

Acute Angle: an angle whose measure is less than 90 and greater than zero.

Obtuse Angle: an angle whose measure is greater than 90 and less than 180.

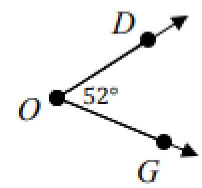
Right Angle: an angle whose measure is 90.

Congruent Angles – $\angle CAT \cong \angle DOG$ iff $m\angle CAT = m\angle DOG$

Equal vs Congruent

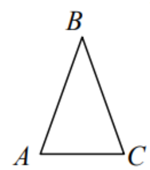
$m\angle DOG =$

$\angle DOG \cong$

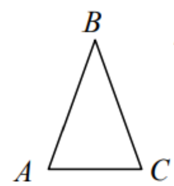


$m\angle A = 70°$

$m\angle BCA = 70°$



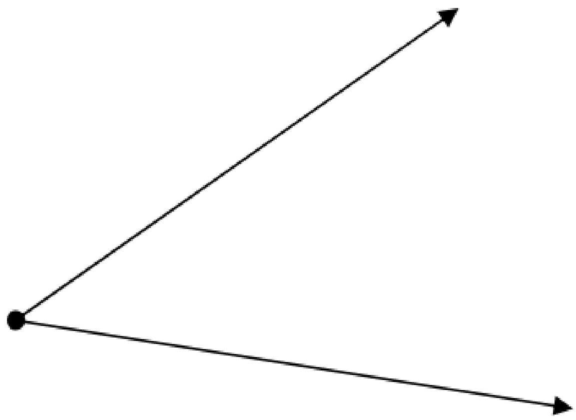
$\angle 1 \cong \angle 2$



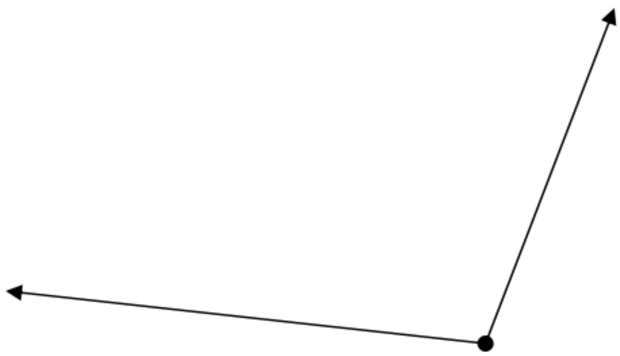
ΔABC is isosceles

Angle Bisector: a line, ray, or segment that separates an angle into two congruent angles.

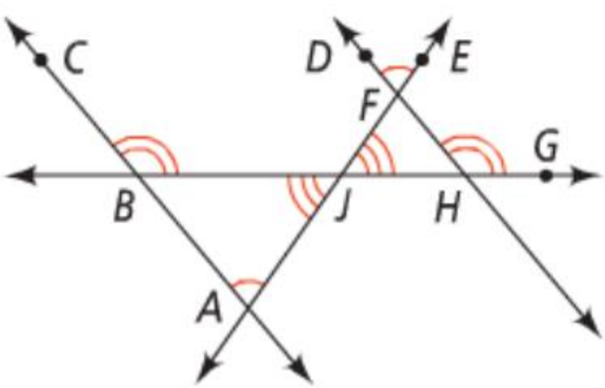
6. Estimate, measure and classify each angle using a protractor



7.



Use the diagram to answer each question.



8. $\angle CBJ \cong$

9. $\angle FJH \cong$

10. If $m\angle EFD = 75$, then $m\angle JAB =$

11. If $m\angle GHF = 130$, then $m\angle JBC =$

12.

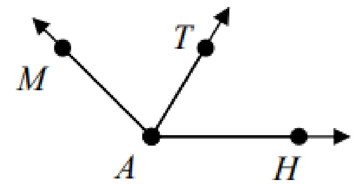
Given

$\overrightarrow{AT}$ is the angle bisector of $\angle MAH$

$m\angle MAT = 60°$

$m\angle TAH = 4x + 20$

Find x



13.

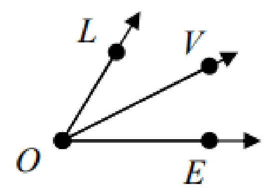
Given

$\angle LOV \cong \angle VOE$

$m\angle LOV = 7x - 14$

$m\angle VOE = 3x + 12$

Find x



Find $m\angle LOV$

Addition Postulates

Notes Section 1.4

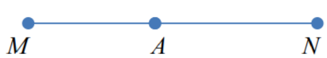
Between –

Segment – A segment consists of two endpoints and all the points between them.

Segment Addition Postulate – A is between C and T iff $CA + AT = CT$.

1. Find OG if O is between D and G, $DO = 2x - 4$, $OG = 3x$, and $DG = 26$.

2.



Given $MA = 5x - 3$

$AN = 30$

$MN = 8x + 6$

FIND X.

<u>Angle Addition Postulate</u>: R is in the interior of $\angle PQS$ iff $m\angle PQR + m\angle RQS = m\angle PQS$.

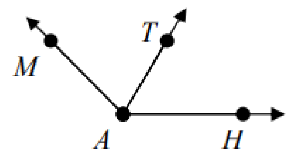
3.

Given

$m\angle MAT = 60°$

$m\angle MAH = 140°$

$m\angle TAH = 4x + 20$



Find *x*

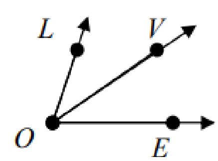
4.

Given

$m\angle LOE = 84°$

$m\angle LOV = 4x + 1$

$m\angle VOE = 5x + 2$



Find *x*

Find $m\angle LOV$

Angle Pairs

Notes Section 1.5

Postulate – A statement that assumed to be true.

Theorem – A statement that can be proved true using established facts.

PAIRS OF ANGLES

Adjacent Angles – two angles that have the same vertex, share common ray, and have no common interior points.

Complementary Angles – two angles that sum to 90°.
Each angle is called the complement.

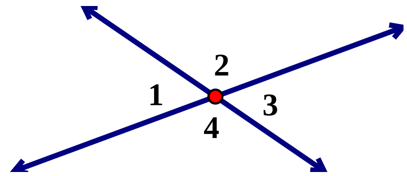
Complement Theorem – If the noncommon sides of two adjacent angles form a right angle, then the angles are complementary.

Supplementary Angles – two angles that sum to 180°.
Each angle is called the supplement.

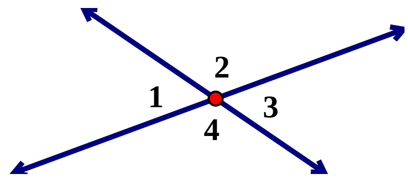
Linear Pair – two adjacent angles whose non-common sides form opposite rays (form a straight angle).

Supplement Theorem – If two angles form a linear pair, then they are supplementary.

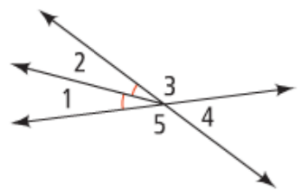
Vertical Angles - two nonadjacent angles formed by intersecting lines.



Vertical Angles Theorem: Vertical angles are congruent.



Identify Angle Pairs



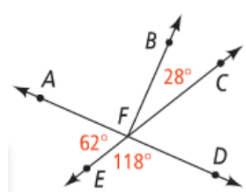
ANGLES

Adjacent:

Vertical:

Complementary:

Supplementary:



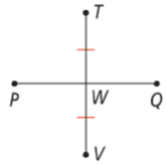
$\angle AFE$ and $\angle EFD$ are

$\angle AFE$ and $\angle BFC$ are

$\angle BFC$ and $\angle CFD$ are

$\angle AFE$ and $\angle CFD$ are

Diagrams

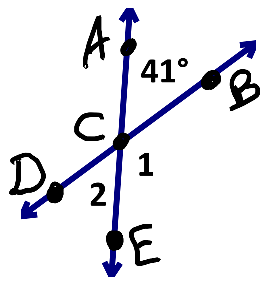
OK to assume true!		Do **NOT** assume
		

1. ∠DOG and ∠GOT are complementary angles. If m∠DOG = 2x + 18 and m∠GOT = 7x + 9, then find m∠DOG.

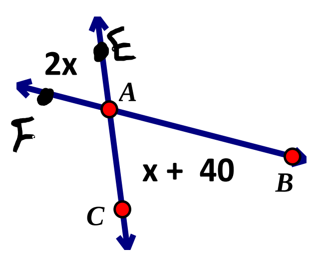
2. ∠HAM and ∠CES are supplementary. If m∠HAM = 4x + 27 and m∠CES = 14x + 9, then find the value of x.

3. ∠SUP and ∠PUT form a linear pair. If m∠SUP = 2x – 20, and m∠PUT = 3x + 10, then find the value of x.

4. Find m∠1 & m∠2



5. Find x and m∠CAB



Chapter 1 Summary

1. Summarize the main idea of the chapter

2. Terms (Include name and definition). Also include key example or picture for each term

3. Theorems and Postulates. Also include key example for each theorem or postulate

4. Key examples of the most unique or most difficult problems from notes, homework or application.

Chapter 2 – Reasoning and Proof

2.1

Inductive Reasoning: looking at several specific situations to arrive at a conjecture.

Conjecture: an educated guess.

Counterexample: a false example; an example that proves a conjecture false.

Conditional Statement: A statement that can be written in "if-then" form.

Hypothesis: the portion of a if-then statement that immediately follows "if."

Conclusion: the portion of a if-then statement that immediately follows "then."

Converse: a statement made by interchanging the hypothesis and conclusion.

Inverse: a statement made by negating both the hypothesis and conclusion of the conditional.

Contrapositive: a statement made by negating both the hypothesis and conclusion of the converse statement

Terms, Postulate and Theorems

2.2

Properties of Equality

For all real numbers a, b and c, the following are true…

Reflexive Property of Equality
For every number a, $a = a$.

Symmetric Property of Equality
If $a = b$, then $b = a$.

Transitive Property of Equality
If $a = b$, and $b = c$, then $a = c$.

Addition & Subtraction Properties of Equality
If $a = b$, then $a \pm c = b \pm c$.

Multiplication & Division Properties of Equality
If $a = b$, then $a \bullet c = b \bullet c$, and $a/c = b/c$.

Distributive Property of Equality
$a(b + c) = ab + ac$.

Substitution Property of Equality
If $a = b$, then a may be replaced by b in an equation.

2.3

Theorem: A statement that must be proved true through deductive reasoning using definitions, postulates, and undefined terms.

Proof: A logical argument in which each statement is supported by a statement that is accepted as being true.

Midpoint Theorem
If M is the midpoint of $\overline{AB}$, then $\overline{AM} \cong \overline{MB}$

Theorem 2-1: Congruence of segments is reflexive, symmetric, and transitive.

2.4

Theorem 2-5: Congruence of angles is reflexive, symmetric, and transitive.

Theorem 2-6: Angles supplementary to the same angle or to congruent angles are congruent.

Theorem 2-7: Angles complementary to the same angle or to congruent angles are congruent.

Theorem 2-9: Perpendicular lines intersect to form four right angles.

Theorem 2-10: All right angles are congruent.

NOTE: For your quiz…

Any "unnamed" theorem or postulate will not be matching, but be multiple choice. For example,

Theorem 2-5: Congruence of angles is reflexive, symmetric, and transitive.

Congruence of angles is reflexive, symmetric and

A. Transitive
B. Systematic
C. Hyperbolic
D. Generic

Inductive Reasoning

Notes Section 2.1

Inductive Reasoning: looking at several specific situations to arrive at a conjecture.

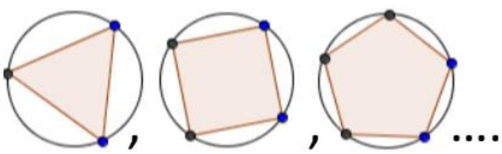
Conjecture: an educated guess.

Counterexample: a false example; an example that proves a conjecture false.

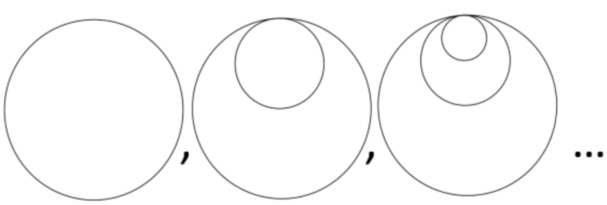
Use inductive reasoning to conjecture about the next 2 numbers in the pattern.

1. 1, 4, 16, 64 ...

2.

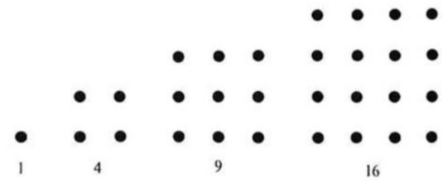


3.



4. 16, 8, 4, 2, 1 ...

5. How many dots in the 20th figure.



6.

Try and figure out the 43rd term of the following sequence:

A, E, I, O, U, A, E, ...

Give a counterexample for each of the false conjectures given.

1. If the name of a month starts with the letter J, it is a summer month.

Counterexample:____________________

2. Multiplying a number by -2 makes the product negative.

Counterexample:____________________

3. If you teach Geometry, you are bald.

Counterexample:____________________

Conditional Statement = A statement that can be written in "if-then" form.

1. Write a conditional statements.

Hypothesis = the portion of a if-then statement that immediately follows "if."

2. Identify the hypothesis from 1.

Conclusion = the portion of a if-then statement that immediately follows "then."

3. Identify the conclusion from 1.

Write the following conditionals in "if-then" form.

4. "Adjacent angles have a common vertex."

5. "Vertical angles are congruent."

Converse = a statement made by interchanging the hypothesis and conclusion.

6. Write the converse of the conditionals from 5.

Inverse = a statement made by negating both the hypothesis and conclusion of the conditional.

7. Write the inverse of the conditionals you made from 5.

Contrapositive = a statement made by negating both the hypothesis and conclusion of the converse statement

8. Write the contrapositive of the conditionals you made from 5.

The contrapositive will **ALWAYS have the same truth-value** as the original conditional! The converse and inverse MIGHT have the same truth-value, but it also MIGHT NOT have the same truth-value.

Summary of Related Conditional Statements		
Conditional Statement	$p \to q$	If p, then q.
Converse	$q \to p$	If q, then p.
Inverse	$\sim p \to \sim q$	If not p, then not q.
Contrapositive*	$\sim q \to \sim p$	If not q, then not p.

* Same truth value as the conditional

If you notice, the inverse is the contrapositive of the converse. Therefore, the inverse and the converse will always have the same truth-value.

Algebraic Proofs

Notes Section 2.2

Properties of Equality

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If $a = b$, and $b = c$, then $a = c$.

Addition & Subtraction Properties of Equality
If $a = b$, then $a \pm c = b \pm c$.

Multiplication & Division Properties of Equality
If $a = b$, then $a \bullet c = b \bullet c$, and $a/c = b/c$.

Distributive Property of Equality
$a(b + c) = ab + ac$.

Substitution Property of Equality
If $a = b$, then a may be replaced by b in an equation.

Examples: **Tell which property justifies each conclusion.**

1. Given: $6x + 2 = 12$

Conclusion: $6x = 10$

2. Given: $45 = x$

Conclusion: $x = 45$

3. Given: $3x - 7x = 20$

Conclusion: $-4x = 20°$

4. Given: $4(q - x) = r$

Conclusion: $4q - 4x = r$

5. If $a = r$ and $r = 60°$, then $a = 60°$.

6. If B is the midpoint of $\overline{GH}$, then…_______________

A two-column proof lists each statement on the left with a justification on the right. Each step follows logically from the line before it.

Fill in the missing statements or reasons for the following two-column proof.

Given: $45 + 2(x - 10) = 85$
Prove: $x = 30$

← This line tells you everything that has been ________, or everything that is known to be true.

← This line tells you what you must ________.

Statement	Reason
1. $45 + 2(x - 10) = 85$	1.
2. $2(x - 10) = 40$	2.
3. $2x - 20 = 40$	3.
4. $2x = 60$	4.
5. $x = 30$	5.

Prove the following.

#8. Prove that if $2x - 7 = \frac{1}{3}x - 2$, then x = 3.

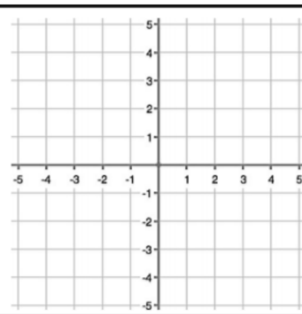
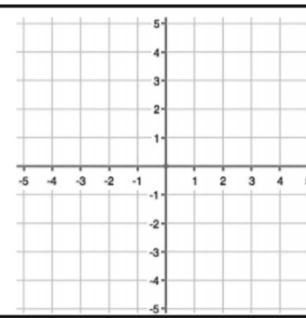
Given:________________________________

Prove:________________________________

Statement	Reason
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.

9. Justify each step in solving the equation. $2x - 3 = \frac{2}{3}$

Statement	Reason
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Solve each equation for x!		Multiply!	Factor!
1. $10x - 3 = 12$	2. $2x + -4 = 3x - 4$	3. $x(x - 3)$	4. $2x^2 - 32x$
5. Graph the equation: $y = -x$ 		6. Graph the equation: $y = -2$ 	

Proving Segments

Notes Section 2.3

Theorem = A statement that must be proved true through deductive reasoning using definitions, postulates, and undefined terms.

Proof = A logical argument in which each statement is supported by a statement that is accepted as being true.

Midpoint Theorem

If M is the midpoint of $\overline{AB}$, then $\overline{AM} \cong \overline{MB}$

Theorem 2-1: Congruence of segments is reflexive, symmetric, and transitive.

Reflexive Property

Symmetric Property

Transitive Property

Prove the Midpoint Theorem using a two-column proof.
(If the directions tell you to write a proof, always do a TWO COLUMN proof.)

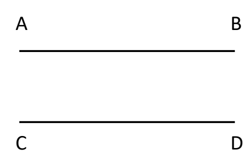
1. Given

   Prove

Statement	Reason
#1)	#1)
#2)	#2)
#3)	#3)

2. Prove the symmetric part of Theorem 2-1

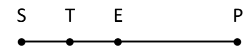
   Given $\overline{AB} \cong \overline{CD}$
   Prove $\overline{CD} \cong \overline{AB}$



Statement	Reason
1) $\overline{AB} \cong \overline{CD}$	1)
2) AB = CD	2)
3) CD = AB	3)
4) $\overline{CD} \cong \overline{AB}$	4)

3. Given $\overline{STEP}$

Prove SP = ST + TE + EP

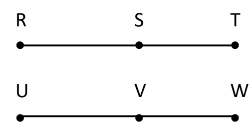


Statement	Reason
1) $\overline{STEP}$	1)
2) SP = ST + TP	2)
3) TP = TE + EP	3)
4) SP = ST + TE + EP	4)

4. Given $\overline{RS} \cong \overline{UV}$

$\overline{ST} \cong \overline{VW}$

Prove $\overline{RT} \cong \overline{UW}$



Statement	Reason
1) $\overline{RS} \cong \overline{UV}$ $\overline{ST} \cong \overline{VW}$	1)
2)	2)
3)	3)
4)	4)
5)	5)
6)	6)

Proving Angles

Notes Section 2.4

Theorem 2-5: Congruence of angles is reflexive, symmetric, and transitive.

Reflexive Property

Symmetric Property

Transitive Property

Theorem 2-6: Angles supplementary to the same angle or to congruent angles are congruent.

Theorem 2-7: Angles complementary to the same angle or to congruent angles are congruent.

Theorem 2-9: Perpendicular lines intersect to form four right angles.

Theorem 2-10: All right angles are congruent.

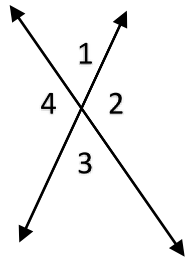
1. Prove transitive part of theorem 2-5:

Given $\angle 1 \cong \angle 2$
$\angle 2 \cong \angle 3$

Prove $\angle 1 \cong \angle 3$

Statement	Reason
#1)	#1)
#2)	#2)
#3)	#3)
#4)	#4)

2. Prove Vertical Angles Theorem:

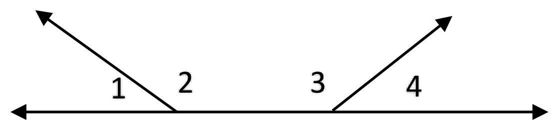


Given $\angle 1$ and $\angle 2$ form a linear pair
$\angle 2$ and $\angle 3$ form a linear pair

Prove $\angle 1 \cong \angle 3$

Statement	Reason
#1)	#1)
#2)	#2)
#3)	#3)

3. Prove theorem 2-6 – Angles supplementary to congruent angles are congruent.



Given $\angle 1$ and $\angle 2$ are supplementary
$\angle 3$ and $\angle 4$ are supplementary
$\angle 1 \cong \angle 4$

Prove $\angle 2 \cong \angle 3$

Statement	Reason
#1)	#1)
#2)	#2)
#3)	#3)
#4)	#4)
#5)	#5)
#6)	#6)
#7)	#7)

Chapter 2 Summary

1. Summarize the main idea of the chapter

2. Terms (Include name and definition). Also include key example or picture for each term

3. Theorems and Postulates. Also include key example for each theorem or postulate

4. Key examples of the most unique or most difficult problems from notes, homework or application.

Chapter 3 – Transversals

Terms, Postulates and Theorems

3.1

Parallel Lines – Two coplanar lines that never intersect.

Skew Lines – Two noncoplanar lines that never intersect.

Parallel Planes – Two planes that never intersect.

Transversal – A line that intersects 2 or more lines in different places.

Alternate Interior Angles – when a transversal intersects two lines, these pair of angles are on opposite sides of the transversal and between the non-transversal lines.

Consecutive Interior Angles (aka Same-Side Interior Angles) – when a transversal intersects two lines, these pair of angles are on same sides of the transversal and between the non-transversal lines.

Corresponding Angles – When a transversal intersects two lines, these pair of angles are in the same position but a different intersection.

Alternate Exterior Angles – when a transversal intersects two lines, these pair of angles are on opposite sides of the transversal and outside the non-transversal lines.

Consecutive Exterior Angles – when a transversal intersects two lines, these pair of angles are on the same sides of the transversal and outside the non-transversal lines.

3.2

Corresponding Angles Postulate – If two parallel lines are cut by a transversal, then corresponding angles are congruent.

Alternate Interior Angles Theorem – If two parallel lines are cut by a transversal, then alternate interior angles are congruent.

Alternate Exterior Angles Theorem – If two parallel lines are cut by a transversal, then alternate exterior angles are congruent.

Consecutive Interior Angles Theorem – If two parallel lines are cut by a transversal, then consecutive interior angles are supplementary.

Consecutive Exterior Angles Theorem – If two parallel lines are cut by a transversal, then consecutive exterior angles are supplementary.

3.3

Converse to the Corresponding Angles Postulate –
If corresponding angles are congruent, then a transversal cuts two parallel lines.

Converse to the Alternate Interior Angles Theorem –
If alternate interior angles are congruent, then a transversal cuts two parallel lines.

Converse to the Alternate Exterior Angles Theorem –
If alternate exterior angles are congruent, then a transversal cuts two parallel lines.

Converse to the Consecutive Interior Angles Theorem –
If consecutive interior angles are supplementary, then a transversal cuts two parallel lines.

Converse to the Consecutive Exterior Angles Theorem –
If consecutive exterior angles are supplementary, then a transversal cuts two parallel lines.

3.4

Postulate 3.2 – Given a line m and a point *A* not on the line, there is only one line n though the point *A* parallel to the line m

Angle Sum Theorem (aka Triangle Sum Theorem) – The sum of the interior angles of a triangle is $180°$.

Auxiliary Line – When you extend a segment in a figure.

Exterior Angle Theorem – The measure of an exterior angle is equal to the sum of its two remote interior angles.

3.5

Formula for slope of a line

$$m = \frac{\Delta y}{\Delta x}$$

Slope-Intercept form

$$y = mx + b$$

Point-Slope form

$$y - y_1 = m(x - x_1)$$

3.6

Postulate 3.3 – Two nonvertical lines are parallel if they have the same slope

Postulate 3.4 – Two lines are perpendicular if and only if their slopes are negative reciprocals.

NOTE: For your quiz…

Any "unnamed" theorem or postulate will not be matching, but be multiple choice. For example,

Theorem 2-5: Congruence of angles is reflexive, symmetric, and transitive.

Congruence of angles is reflexive, symmetric and

E. Transitive
F. Systematic
G. Hyperbolic
H. Generic

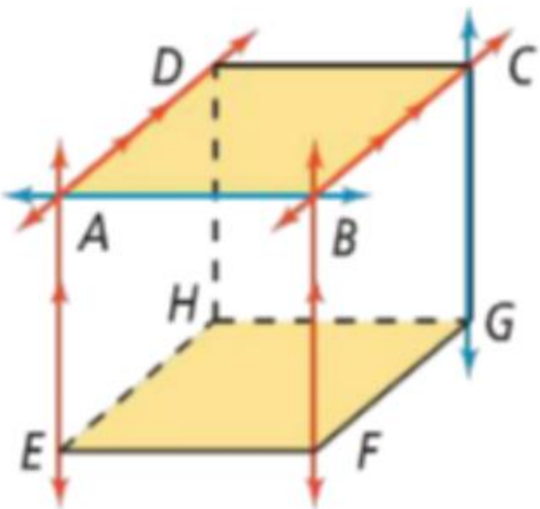
Lines & Angles

Notes Section 3.1

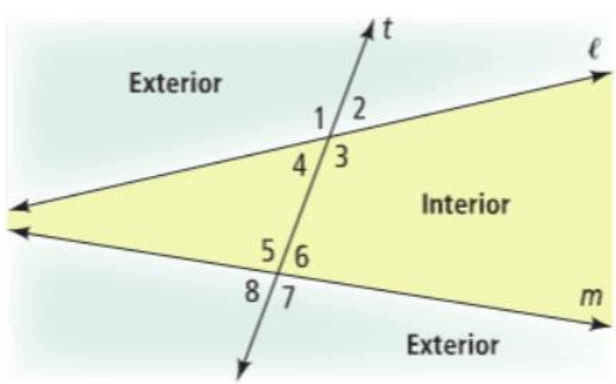
Parallel Lines – Two coplanar lines that never intersect.

Skew Lines – Two noncoplanar lines that never intersect.

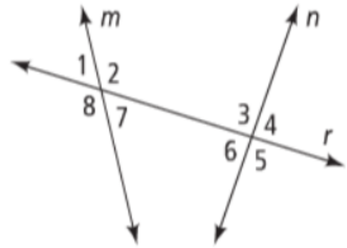
Parallel Planes – Two planes that never intersect.



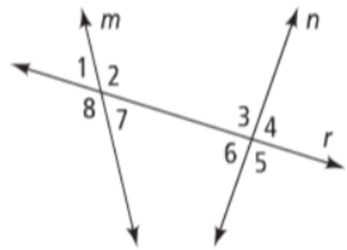
Transversal – A line that intersects 2 or more lines in different places.



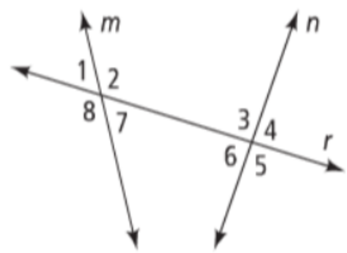
Alternate Interior Angles – when a transversal intersects two lines, these pair of angles are on opposite sides of the transversal and between the non-transversal lines.



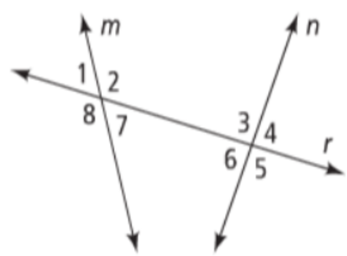
Consecutive Interior Angles (aka Same-Side Interior Angles) – when a transversal intersects two lines, these pair of angles are on same sides of the transversal and between the non-transversal lines.



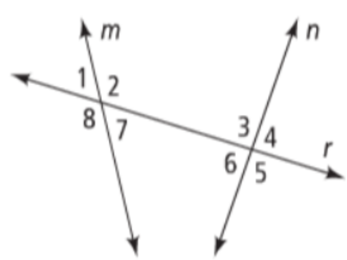
Corresponding Angles – When a transversal intersects two lines, these pair of angles are in the same position but a different intersection.



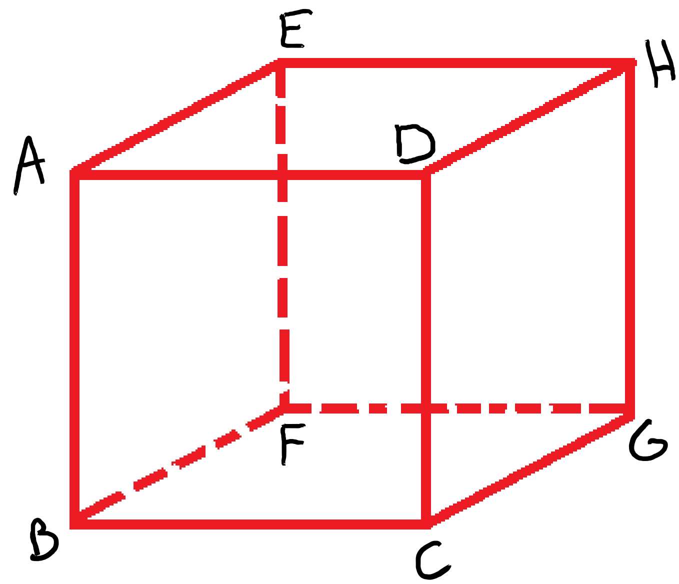
Alternate Exterior Angles – when a transversal intersects two lines, these pair of angles are on opposite sides of the transversal and outside the non-transversal lines.



Consecutive Exterior Angles – when a transversal intersects two lines, these pair of angles are on the same sides of the transversal and outside the non-transversal lines.



Using the figure on the right, name as many parts as possible.



#1) Parallel segments

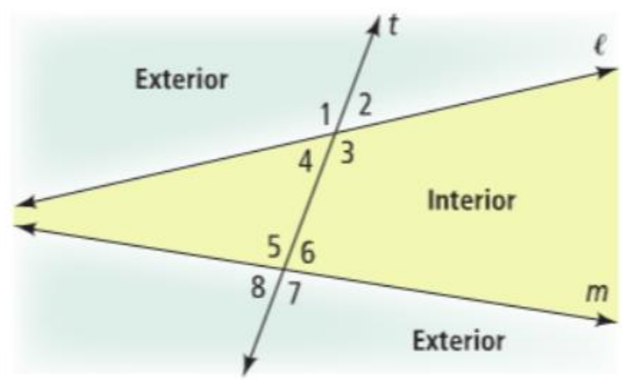
#2) Parallel lines

#3) Skew segments

#4) Skew lines

#5) Parallel Planes

Using the figure on the right, name 2 pairs of each.



#6) Alternate interior angles

#7) Alternate exterior angles

#8) Consecutive interior angles

#9) Consecutive exterior angles

#10) Corresponding angles

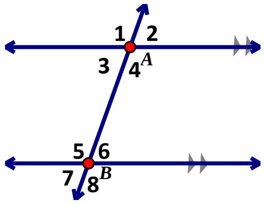
#11) Linear pair

#12) Vertical angles

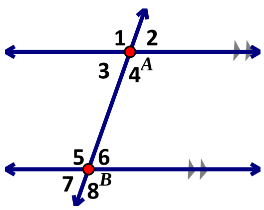
Properties of Parallel Lines

Notes Section 3.2

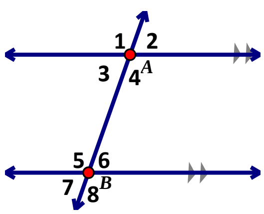
Corresponding Angles Postulate – If two parallel lines are cut by a transversal, then corresponding angles are congruent.



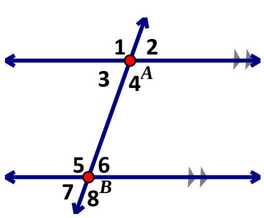
Alternate Interior Angles Theorem – If two parallel lines are cut by a transversal, then alternate interior angles are congruent.



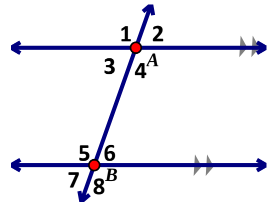
Alternate Exterior Angles Theorem – If two parallel lines are cut by a transversal, then alternate exterior angles are congruent.



Consecutive Interior Angles Theorem – If two parallel lines are cut by a transversal, then consecutive interior angles are supplementary.



Consecutive Exterior Angles Theorems – If two parallel lines are cut by a transversal, then consecutive exterior angles are supplementary.



Fill in the chart with the angle relationships that we have just learned.

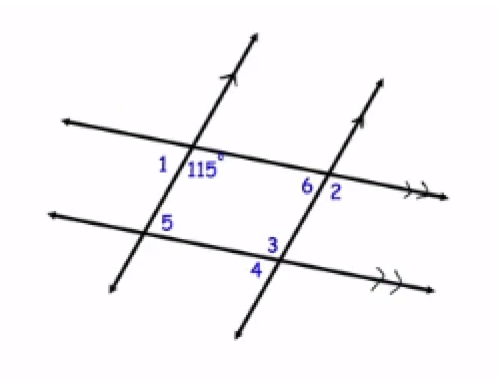
CONGRUENT

SUPPLEMENTARY

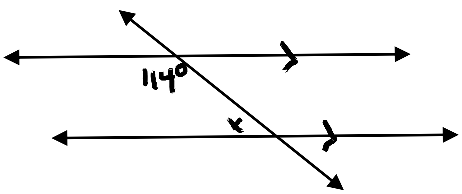
The above chart is only true if the transversal cuts

____

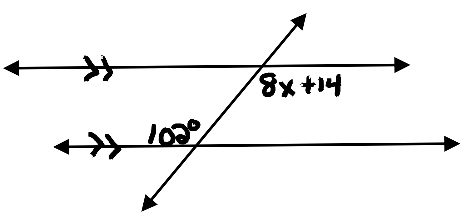
Ex 1: Find the measure of each angle and give a reason for knowing it.



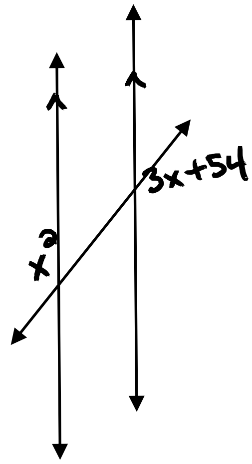
Ex 2: Solve for x.



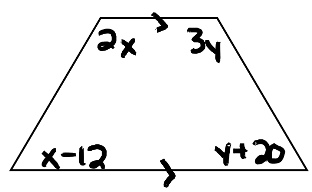
Ex 3: Solve for x.



Ex 4: Solve for x.



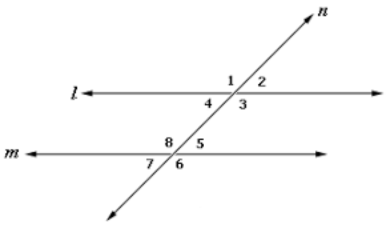
Ex 5: Find the value of x and y.



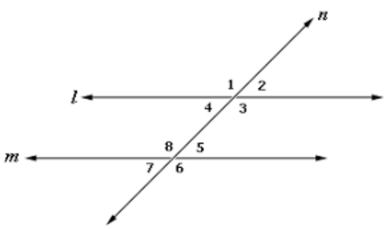
Proving Lines Parallel

Notes Section 3.3

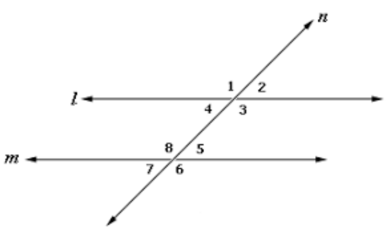
Converse to the Corresponding Angles Postulate – If corresponding angles are congruent, then a transversal cuts two parallel lines.



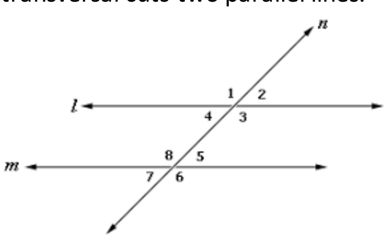
Converse to the Alternate Interior Angles Theorem – If alternate interior angles are congruent, then a transversal cuts two parallel lines.



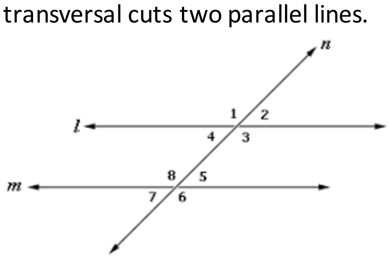
Converse to the Alternate Exterior Angles Theorem – If alternate exterior angles are congruent, then a transversal cuts two parallel lines.



Converse to the Consecutive Interior Angles Theorem – If consecutive interior angles are supplementary, then a transversal cuts two parallel lines.



Converse to the Consecutive Exterior Angles Theorem – If consecutive exterior angles are supplementary, then a transversal cuts two parallel lines.



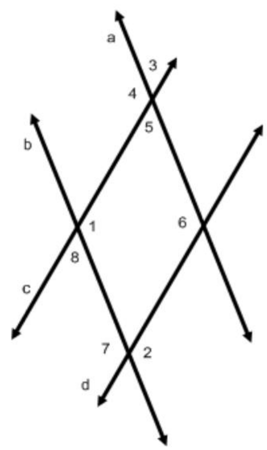
Which lines are parallel?

#1) $\angle 1 \cong \angle 2$

#2) $\angle 2 \cong \angle 6$

#3) $m\angle 1 + m\angle 5 = 180°$

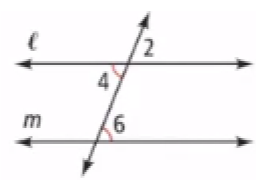
#4) $\angle 8 \cong \angle 3$



Ex 5: Complete the flow proof.

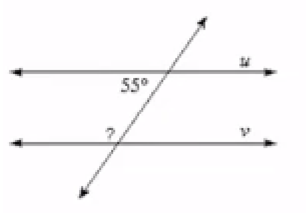
Given: $\angle 4 \cong \angle 6$

Prove: $l \parallel m$

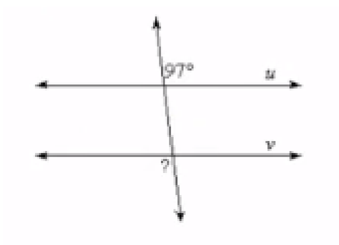


Find the degree of the missing angle what would make lines u and v parallel.

Ex 6:

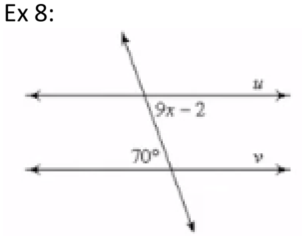


Ex 7:

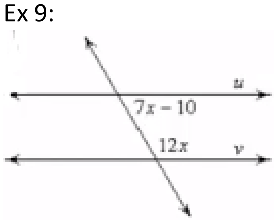


Find the value of x that would make the lines u and v parallel.

Ex 8:

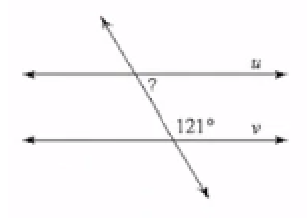


Ex 9:



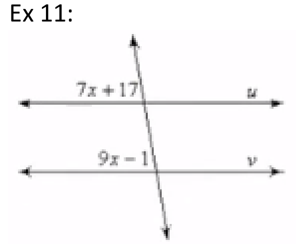
Find the degree of the missing angle what would make lines u and v parallel.

Ex 10:



Find the value of x that would make the lines u and v parallel.

Ex 11:

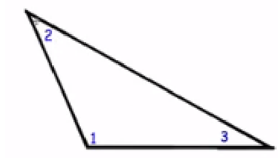


Parallel Lines and Triangles

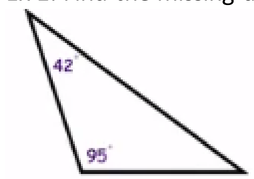
Notes Section 3.4

Postulate 3.2 – Given a line m and a point A not on the line, there is only one line n though the point A parallel to the line m

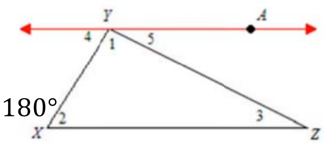
Angle Sum Theorem (aka Triangle Sum Theorem) – The sum of the interior angles of a triangle is $180°$.



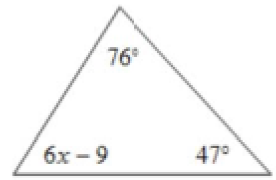
Ex 1: Find the missing angle.



Ex 2: Complete the proof.
Given: ΔXYZ, $\overleftrightarrow{YA} \parallel \overleftrightarrow{XZ}$
Prove: $m\angle 1 + m\angle 2 + m\angle 3 = 180°$



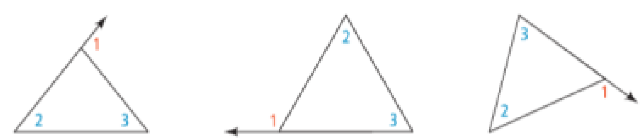
Ex 3: Find the value of x.



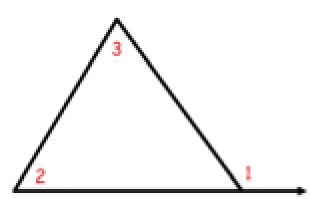
Auxiliary Line – When you extend a segment in a figure.

Exterior Angle of a Polygon –

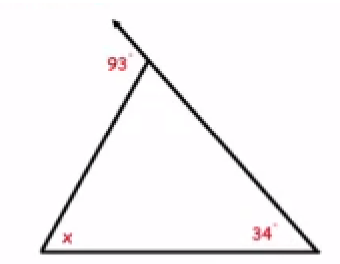
Remote Interior Angles –



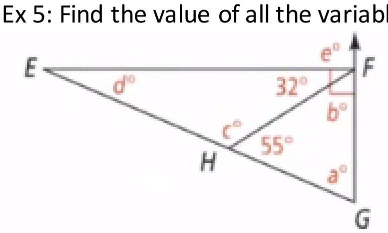
Exterior Angle Theorem – The measure of an exterior angle is equal to the sum of its two remote interior angles.



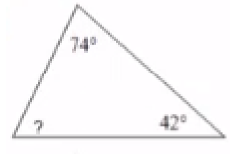
Ex 4: Find $m\angle 1$



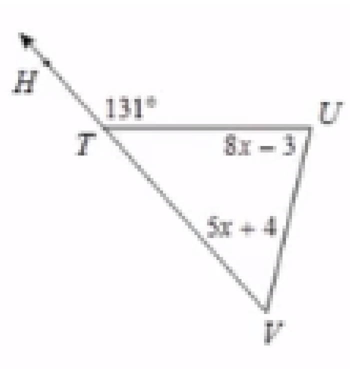
Ex 5: Find the value of all the variables.



Ex 6: Find the missing angle.



Ex 7: Find the value of x.



Equations of Lines in the Coordinate Plane

Notes Section 3.5

Formula for slope of a line

$$m = \frac{\Delta y}{\Delta x}$$

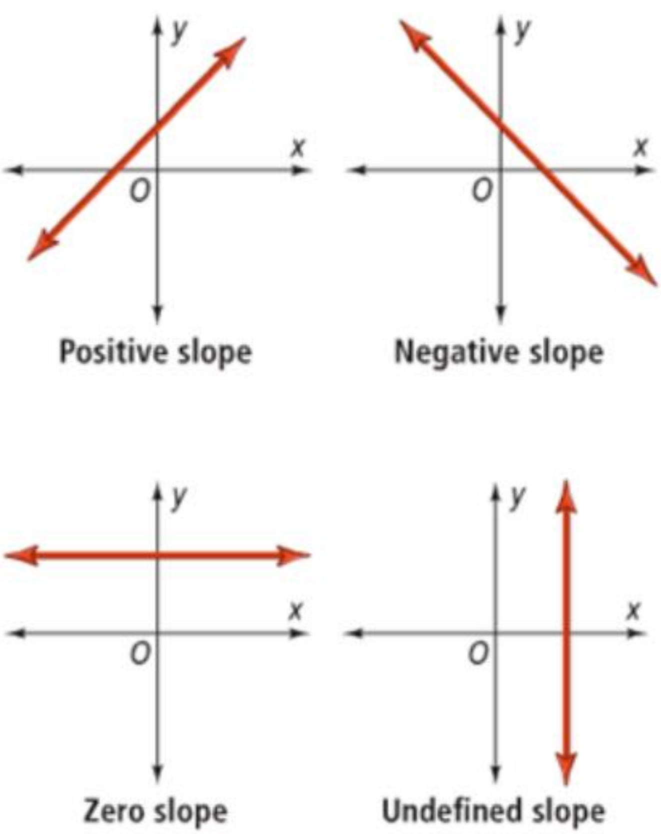
Slope-Intercept form

$$y = mx + b$$

Point-Slope form

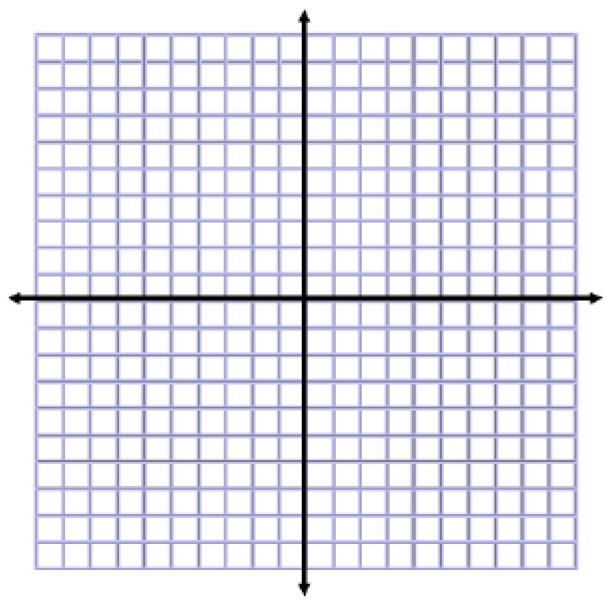
$$y - y_1 = m(x - x_1)$$

Types of Slope



1. Find the slope of a line containing (4,6) and (-3,4)

2. Graph $y = -2x + 5$



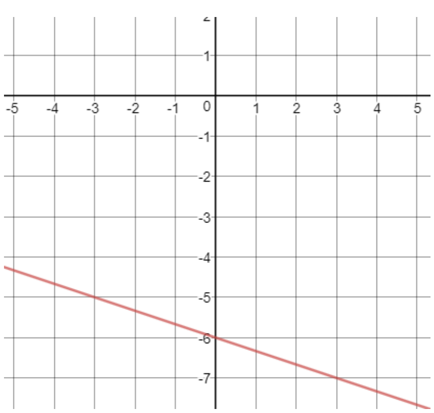
3. Graph $x = 6$

4. Graph $y = -5$

5. Write the equation of the line with slope of 5 and y-intercept of -3.

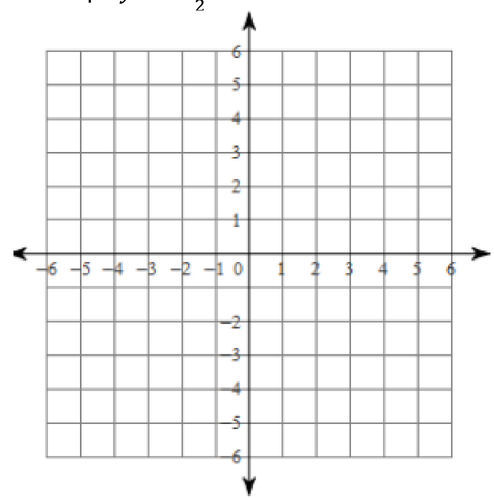
6. Write the equation of the line through the point (-3, 6) with the slope -2.

7. Write the equation of the line.



8. Write the equation of the line through (-3,1) and (4,8)

9. Graph $y = -\frac{3}{2}x + 1$

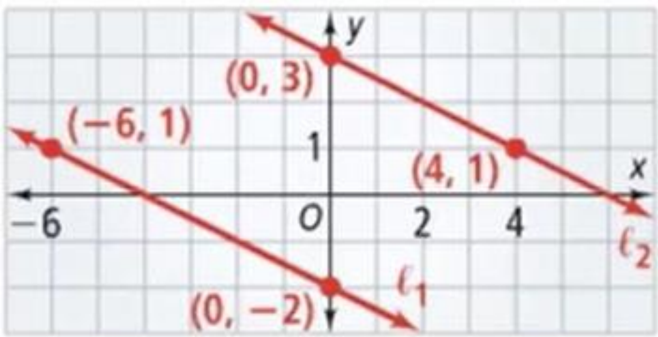


10. Write the equation of the line through (4,1) and (0,4).

Slopes of Parallel and Perpendicular Lines
Notes Section 3.6

Postulate 3.3 – Two nonvertical lines are parallel if they have the same slope

Any two vertical lines are parallel and any two horizontal lines are parallel.

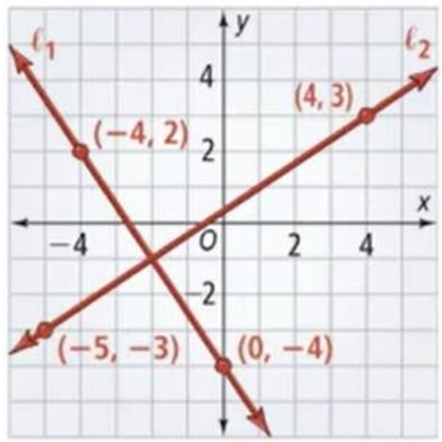


1. Write the equation of the line that is parallel to y = - 3x - 5 and goes through the point (-1, 8)

2. Are the following lines parallel? Why or why not?
   3x - y = 6 -6x + 2y = 24

Postulate 3.4 – Two lines are perpendicular if and only if their slopes are negative reciprocals.

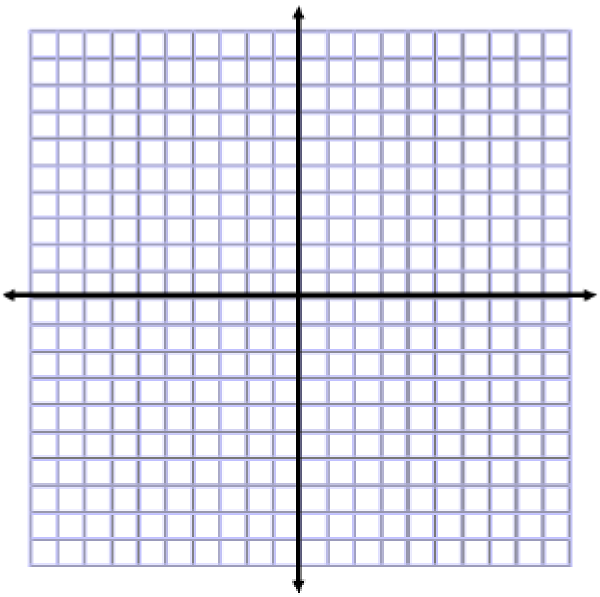
Vertical and horizontal lines are perpendicular



3. Write the equation of a line that is perpendicular to y = x + 2 and contains the point (15, -4).

4. Are the following equations perpendicular? Why or why not? y = 4x + 8 8x - 2y = 10

A rectangle is a quadrilateral that has opposite sides that are parallel and adjacent sides that are perpendicular. Is quadrilateral ABCD a rectangle? Why or why not? A(1,1), B(5, 3), C(7, 1) and D(3, 0)



Try these…Write the equation of the line described.

5. Through (1, -5) and parallel to y = -9x

6. Through (-3,2) and perpendicular to y = 3x - 4

Chapter 3 Summary

1. Summarize the main idea of the chapter

2. Terms (Include name and definition). Also include key example or picture for each term

3. Theorems and Postulates. Also include key example for each theorem or postulate

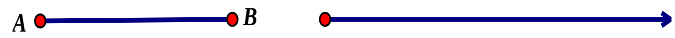
4. Key examples of the most unique or most difficult problems from notes, homework or application.

Constructions – Segments & Angles

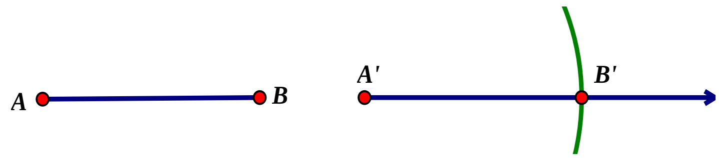
Notes Section A.1 ***G.CO.D.12***

1. Copying a segment

(a) Using your compass, place the pointer at Point A and extend it until reaches Point B. Your compass now has the measure of AB.



(b) Place your pointer at A', and then create the arc using your compass. The intersection is the same radii, thus the same distance as AB. You have copied the length AB.



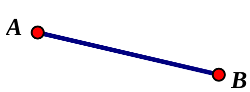
NYTS (Now You Try Some)

Copy the given segment.

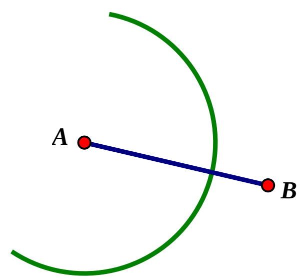
Create the length 3AB

2. Bisect a segment

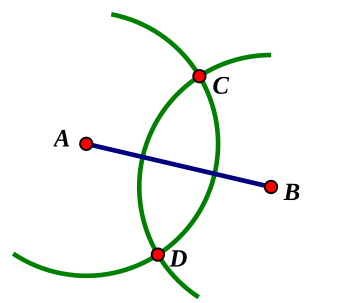
(a) Given $\overline{AB}$



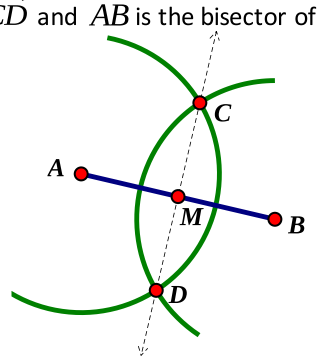
(b) Place your pointer at A, extend your compass so that the distance exceeds half way. Create an arc.



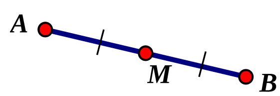
(c) Without changing your compass measurement, place your point at B and create the same arc. The two arcs will intersect. Label those points C and D.



(d) Place your straightedge on the paper so that it forms $\overleftrightarrow{CD}$. The intersection of $\overleftrightarrow{CD}$ and $\overline{AB}$ is the bisector of $\overline{AB}$.

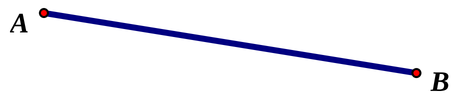


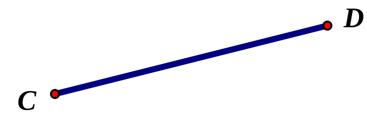
(e) I labeled it M, because it is the midpoint of $\overline{AB}$.



<u>NYTS (Now You Try Some)</u>

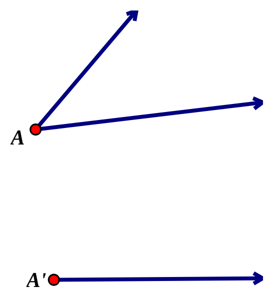
Bisect the segment (find the midpoint).



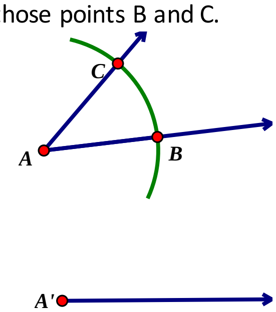


3. Copy an angle

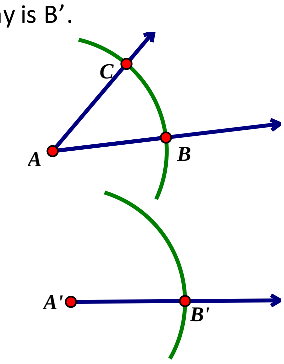
(a) Given an angle and a ray.



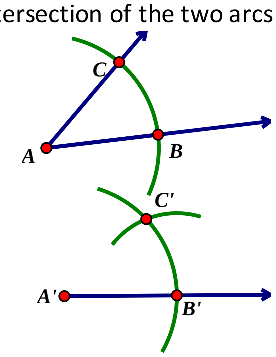
(b) Create an arc of any size, such that it intersects both rays of the angle. Label those points B and C.



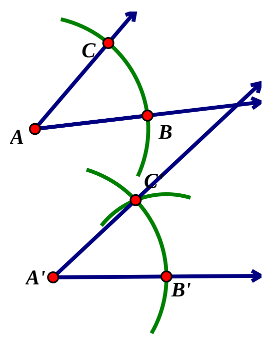
(c) Create the same arc by placing your pointer at A'. The intersection with the ray is B'.



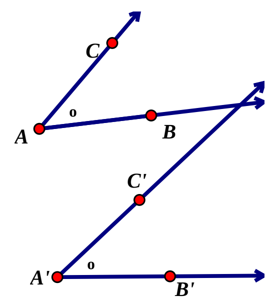
(d) Place your compass at point B and measure the distance from B to C. Use that distance to make an arc from B'. The intersection of the two arcs is C'.



(e) Draw the ray $\overrightarrow{A'C'}$

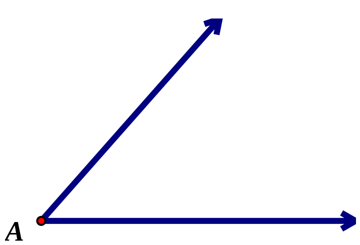


(f) The angle has been copied.



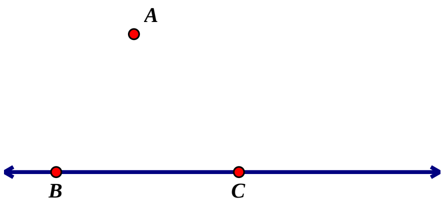
<u>NYTS (Now You Try Some)</u>

Copy the given angle.

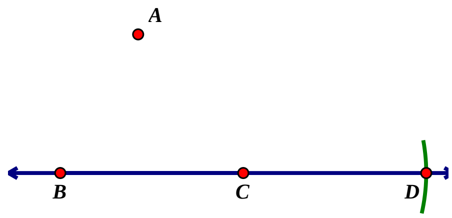


4. Construct a line parallel to a given line through a point not on the line.

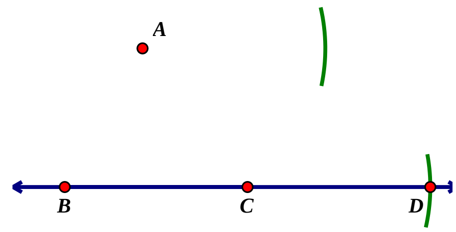
(a) Given a point not on the line.



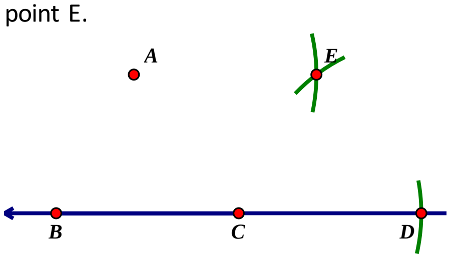
(b) Place your pointer at point B and measure from B to C. Now place your pointer at C and use that distance to create an arc. Label that intersection D.



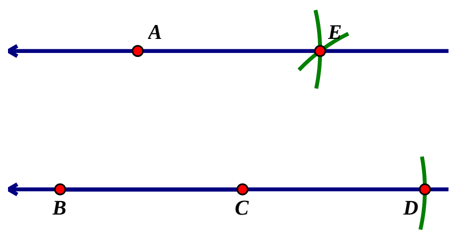
(c) Using that same distance, place your pointer at point A, and create an arc as shown.



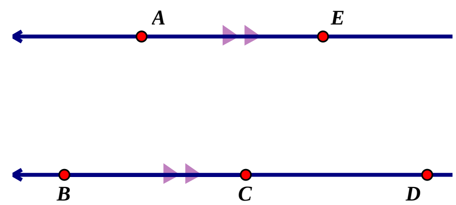
(d) Now place your pointer at C, and measure the distance from C to A. Using that distance, place your pointer at D and create an arc that intersects the one already created. Label that point E.



(e) Create $\overleftrightarrow{AE}$.

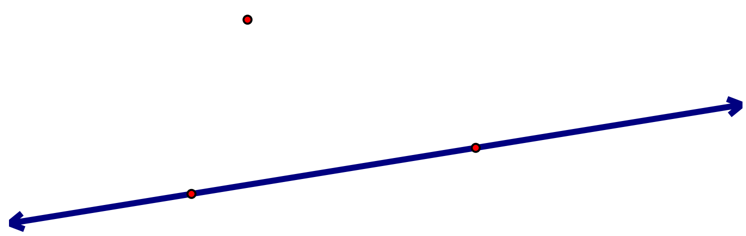


(f) $\overleftrightarrow{AE}$ is parallel to



NYTS (Now You Try Some)

Find the parallel line though the point not on the line.

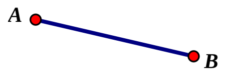


Perpendiculars & Bisectors

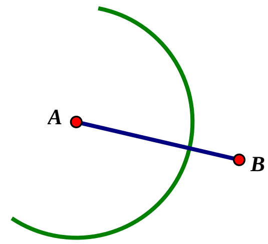
Notes Section A.2

1. Construct the perpendicular bisector of a line segment

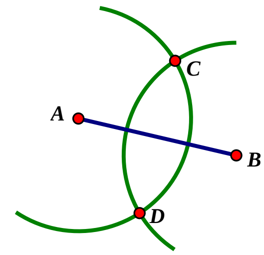
(a) Given $\overline{AB}$



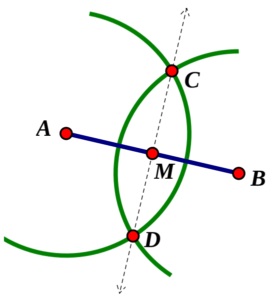
(b) Place your pointer at A, extend your compass so that the distance exceeds half way. Create an arc.



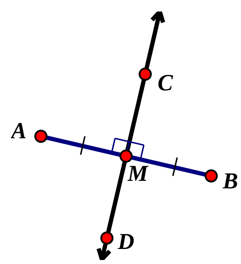
(c) Without changing your compass measurement, place your point at B and create the same arc. The two arcs will intersect. Label those points C and D.



(d) Place your straightedge on the paper and create $\overleftrightarrow{CD}$.

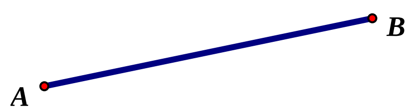


(e) $\overleftrightarrow{CD}$ is the perpendicular bisector of $\overleftrightarrow{AB}$.



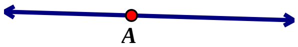
<u>NYTS (Now You Try Some)</u>

Construct the perpendicular bisector.

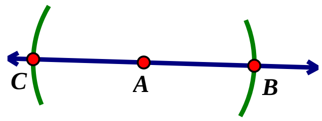


2. Construct a line perpendicular to a given segment through a point on the line.

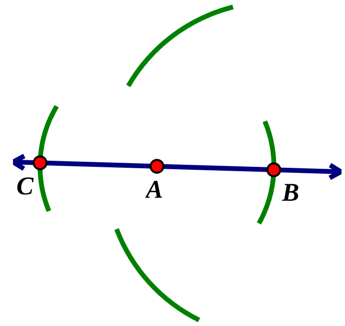
(a) Given a point on a line.



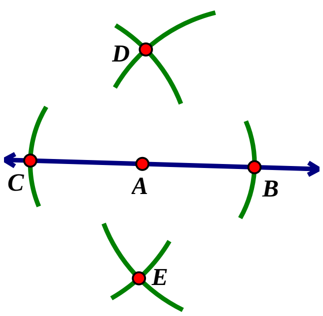
(b) Place your pointer a point A. Create arcs equal distant from A on both sides using any distance. Label the intersection points B and C.



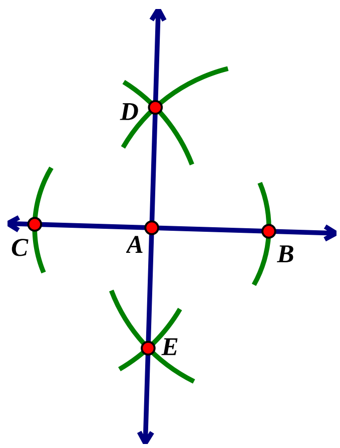
(c) Place your pointer on point B and extend it past A. Create an arc above and below point A.



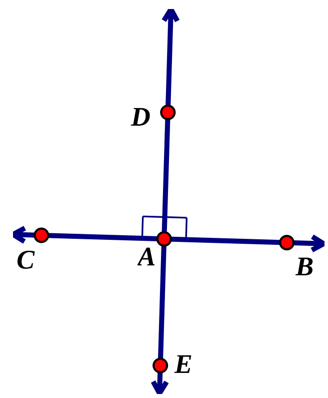
(d) Place your pointer on point C and using the same distance, create an arc above and below A. Label the intersections as points D and E.



(e) Create $\overleftrightarrow{DE}$.

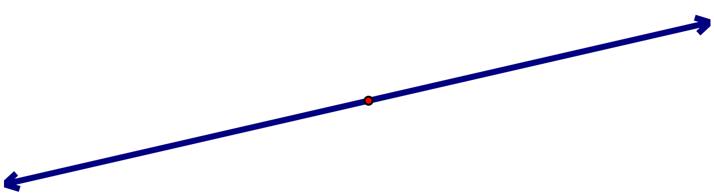


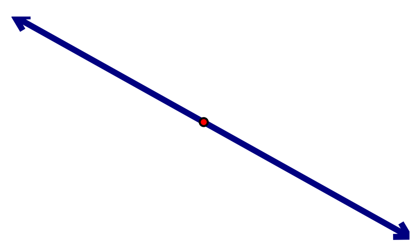
f) $\overleftrightarrow{DE}$ is perpendicular to the line through A.



NYTS (Now You Try Some)

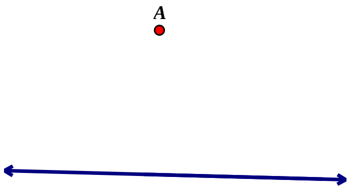
Construct the perpendicular line through a point on the line.



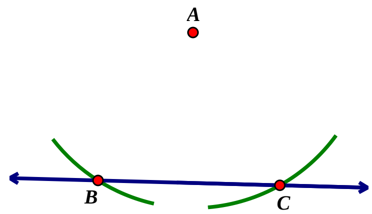


3. Construct a line perpendicular to a given line through a point not on the line.

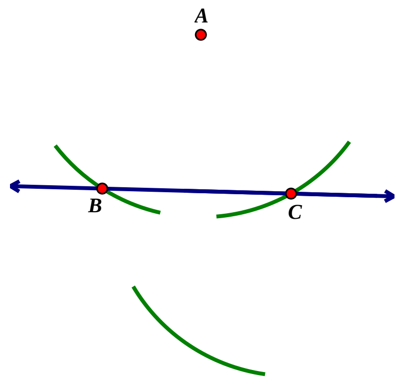
(a) Given a point A not on the line.



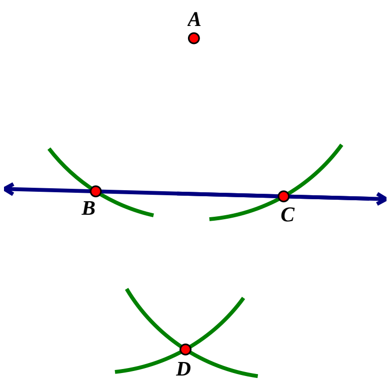
(b) Place your pointer on point A, and extend It so that it will intersect with the line in two places. Label the intersections points B and C.



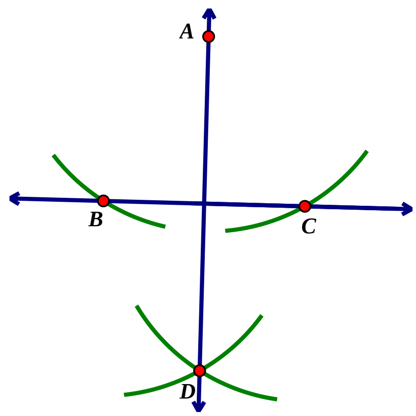
(c) Using the same distance, place your pointer on point C and create an arc on the opposite side of point A.



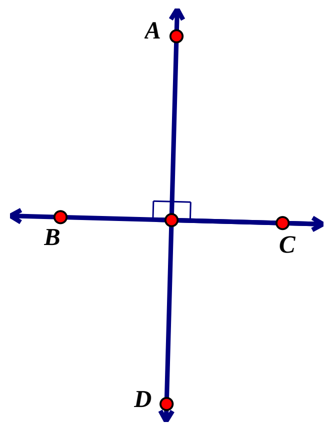
(d) Do the same things as step (c) but placing your pointer on point B. Label the intersection of the two arcs as point D.



(e) Create $\overleftrightarrow{AD}$

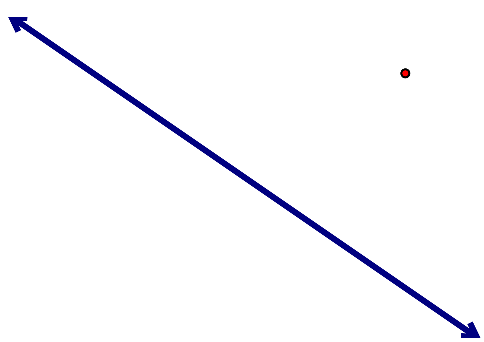


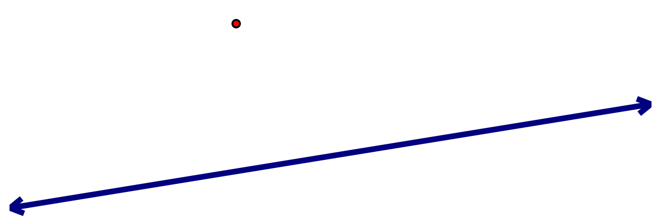
(f) $\overleftrightarrow{AD}$ is perpendicular to the given line through point A.



NYTS (Now You Try Some)

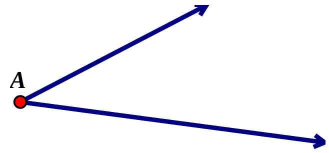
Construct the perpendicular line through a point not on the line.



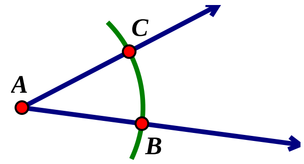


4. Bisect an angle

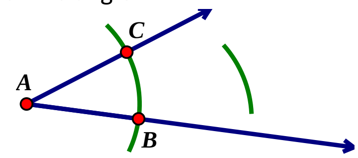
(a) Given an angle.



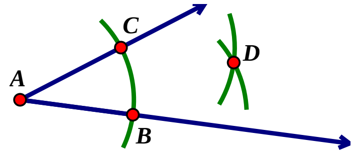
(b) Create an arc of any size, such that it intersects both rays of the angle. Label those points B and C.



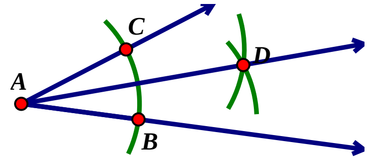
(c) Leaving the compass the same measurement, place your pointer on point B and create an arc in the interior of the angle.



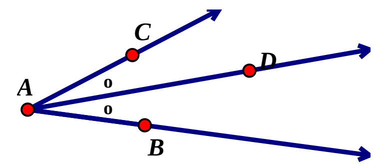
(d) Do the same as step (c) but placing your pointer at point C. Label the intersection D.



(e) Create $\overrightarrow{AD}$. $\overrightarrow{AD}$ is the angle bisector.

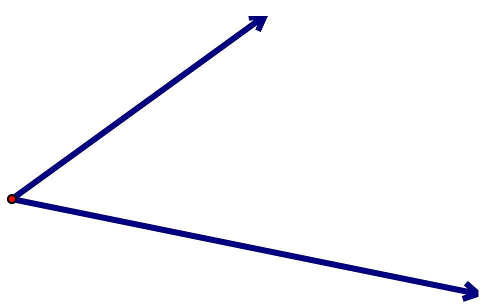


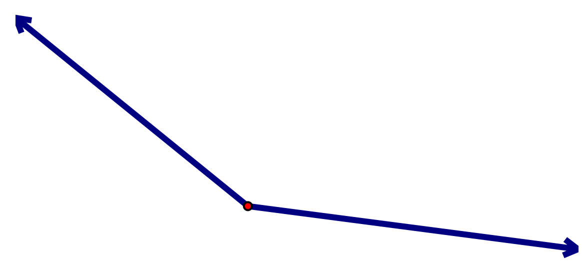
(f) $\overrightarrow{AD}$ is the angle bisector.



<u>NYTS (Now You Try Some)</u>

Bisect the angle.



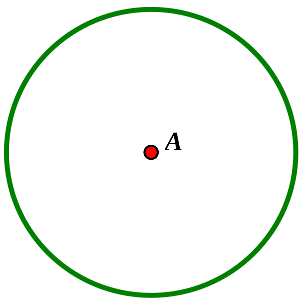


Inscribed Polygons

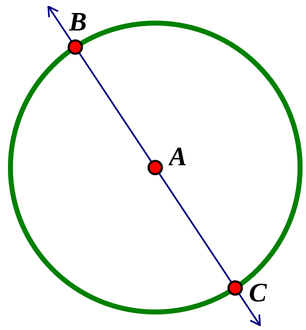
Notes Section A.3

1. The construction of an inscribed equilateral.

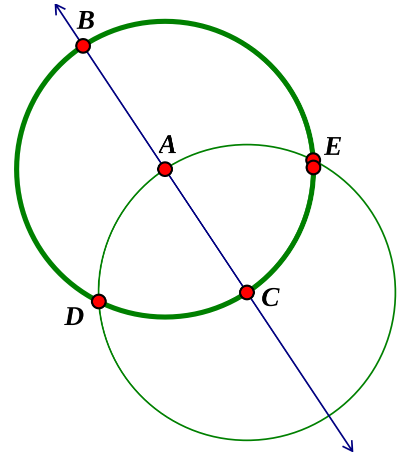
(A) Given Circle A



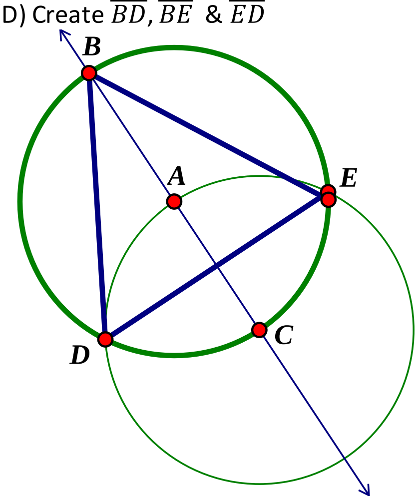
(B) Create a diameter $\overline{BC}$



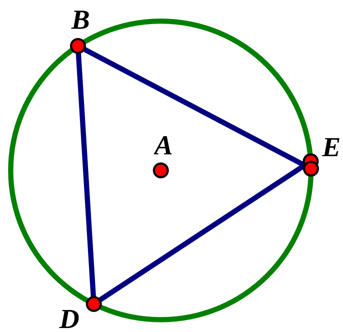
(C) Create a circle at C with radius $\overline{AC}$. Label the two intersections D and E.



(D) Create $\overline{BD}$, $\overline{BE}$ & $\overline{ED}$

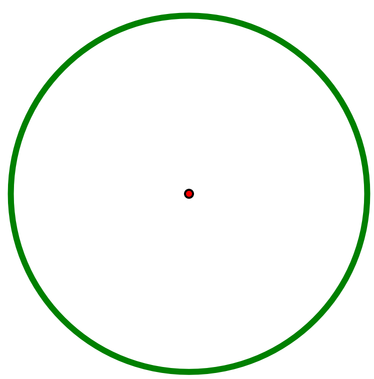


(E) The inscribed Equilateral



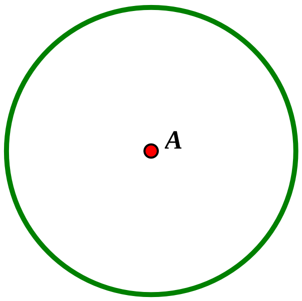
NYTS (Now You Try Some)

Construct an inscribed Equilateral.

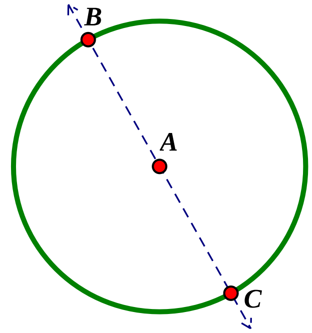


2. The construction of an inscribed square.

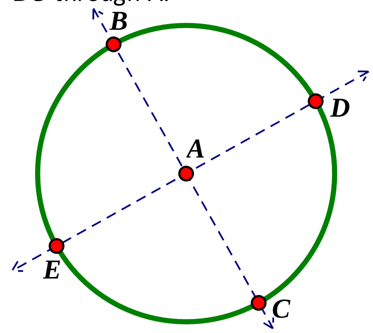
(A) Given Circle A



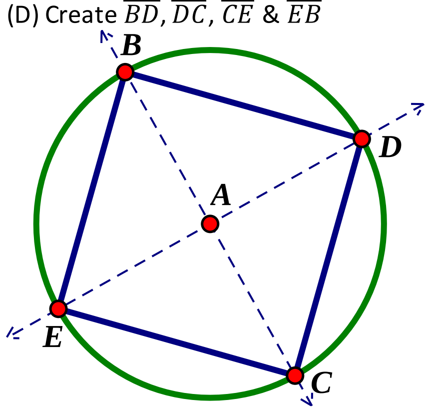
(B) Create a diameter $\overline{BC}$



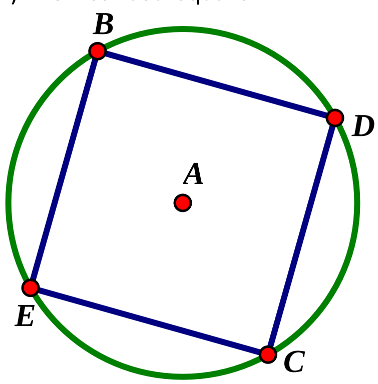
(C) Construct a perpendicular line to $\overline{BC}$ through A.



(D) Create $\overline{BD}$, $\overline{DC}$, $\overline{CE}$ & $\overline{EB}$

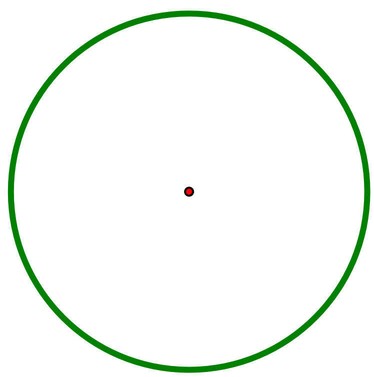


(E) The inscribed Square



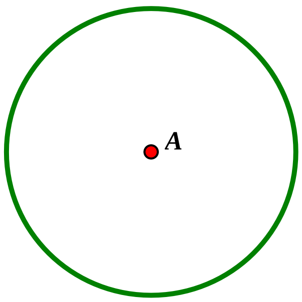
<u>NYTS (Now You Try Some)</u>

Construct an inscribed Square.

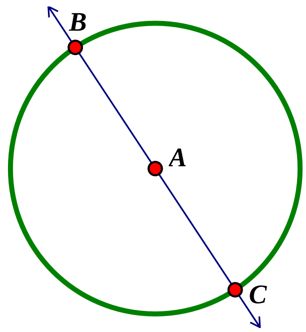


3. The construction of an inscribed hexagon.

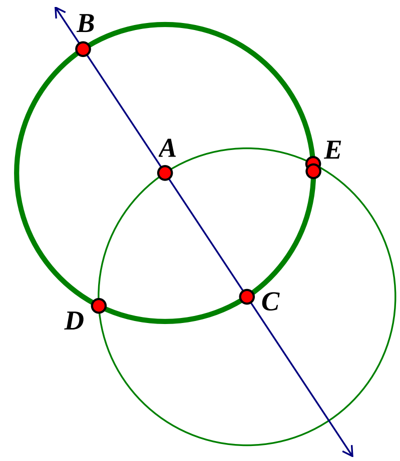
(A) Given Circle A



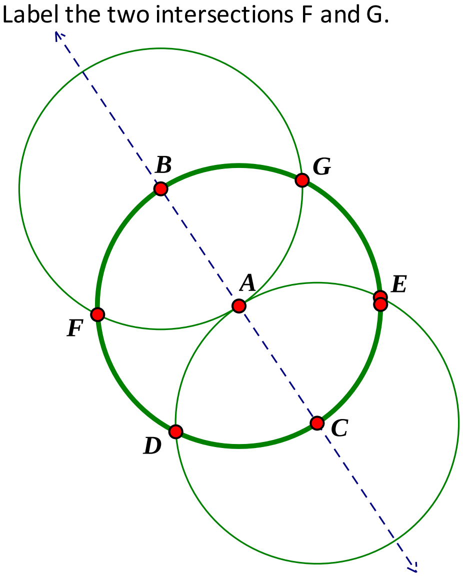
(B) Create a diameter $\overline{BC}$



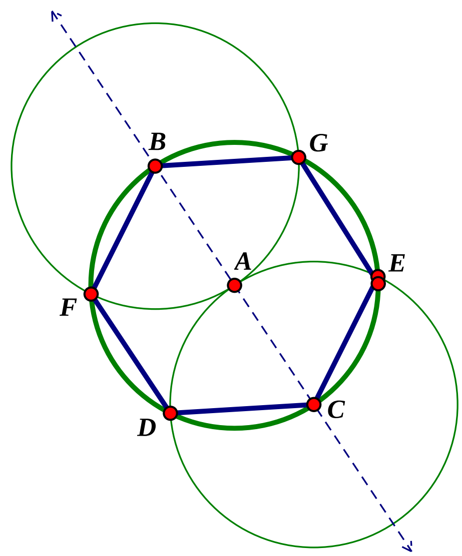
(C) Create a circle at C with radius $\overline{AC}$. Label the two intersections D and E.



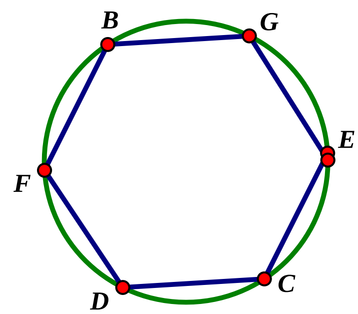
(D) Create a circle at B with radius $\overline{BA}$. Label the two intersections F and G.



(E) Create $\overline{CD}$, $\overline{DF}$, $\overline{FB}$, $\overline{BG}$, $\overline{GE}$ & $\overline{EC}$

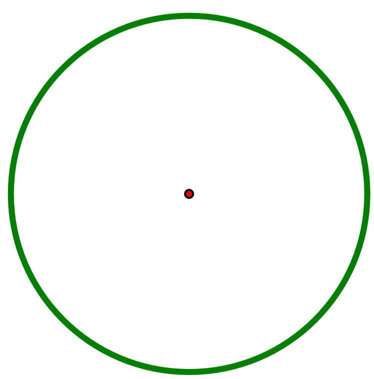


(F) The inscribed Hexagon



NYTS (Now You Try Some)

Construct an inscribed Hexagon.



Constructions Summary

Can you do these things from the constructions chapter?

	I know what construct means
	I know each step to construct a segment bisector
	I know each step to construct a perpendicular bisector
	I know each step to construct a copy of a segment
	I know each step to construct a copy of an angle
	I know each step to construct a line parallel to a given line through a point not on the line
	I know each step to construct a line perpendicular to a given segment through a point on a line
	I know each step to construct a line perpendicular to a given segment through a point not on the line
	I know each step to construct the bisector of an angle
	I know each step to construct an inscribed equilateral triangle
	I know each step to construct an inscribed square
	I know each step to construct an inscribed hexagon
	I know the difference between inscribed and circumscribed

1. Summarize the main idea of the chapter

2. Terms (Include name and definition). Also include key example or picture for each term

3. Theorems and Postulates. Also include key example for each theorem or postulate

4. Key examples of the most unique or most difficult problems from notes, homework or application.