Geometry

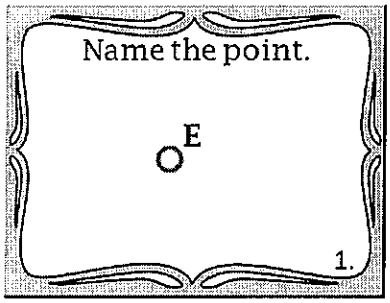
Unit 1-1

Geometric Definitions and Constructions

New Unit: Geometric Definitions and Constructions

Unit 1 Lesson 1: Geometric Definitions

1.



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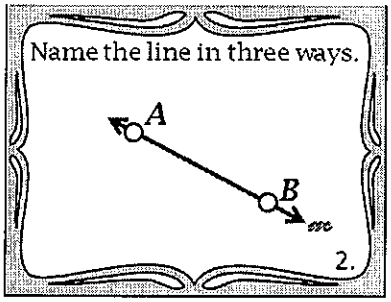

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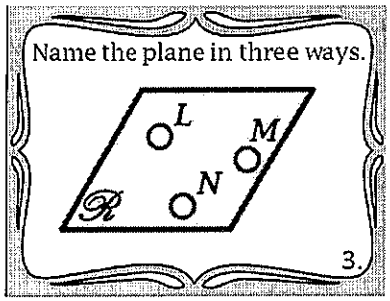

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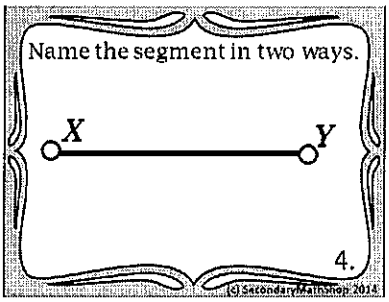
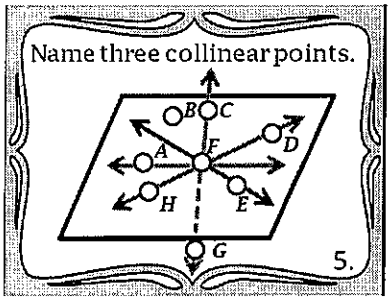


5.

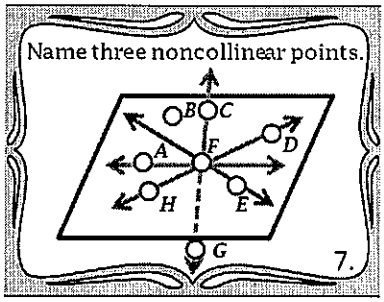
Name three collinear points.



5.

6.

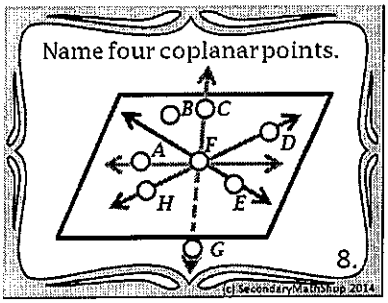
Name three noncollinear points.



7.

7.

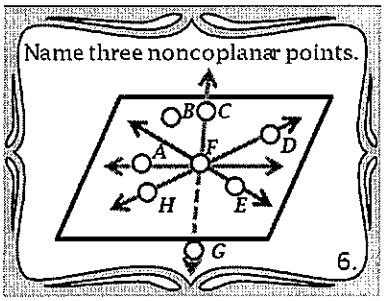
Name four coplanar points.



8.

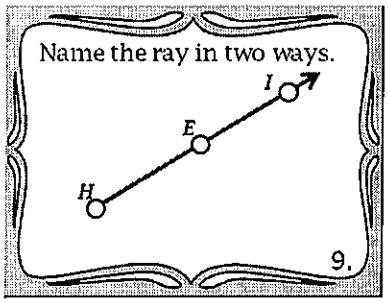
8.

Name three noncoplanar points.

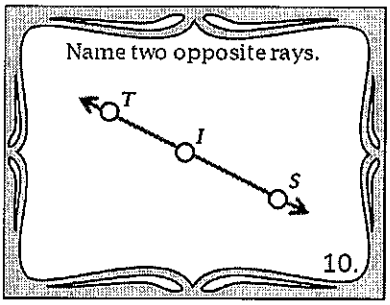


6.

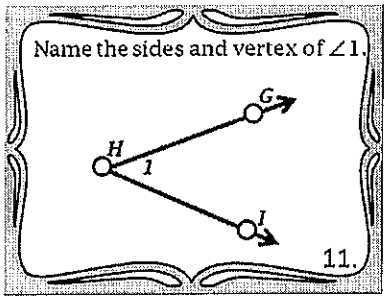
9.


Name the ray in two ways.
I
E
H
9.

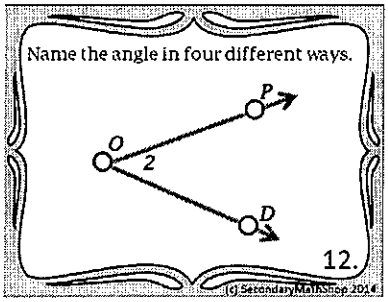
10.


Name two opposite rays.
T
I
S
10.

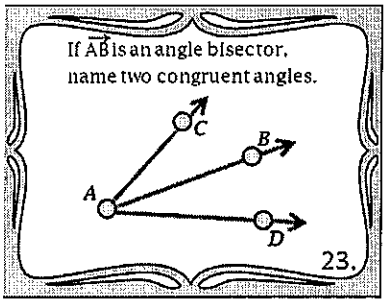
11.


Name the sides and vertex of ∠1.
G
H
1
I
11.

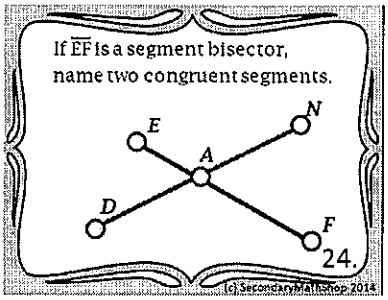
12.


Name the angle in four different ways.
P
O
2
D
12.
(c) SecondaryMathShop 2014

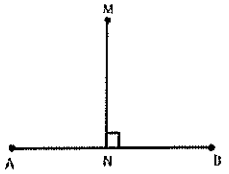
13. If $\overrightarrow{AB}$ is an angle bisector, name two congruent angles.



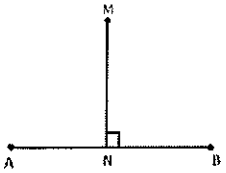
14. If $\overline{EF}$ is a segment bisector, name two congruent segments.



15. If $\overline{AB} \perp \overline{MN}$, name 2 right angles.



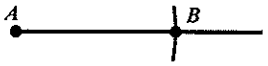
16. If $\overline{MN}$ is the perpendicular bisector of $\overline{AB}$ name 2 congruent segments.



Date _____ Geometry

Unit 1 lesson 1 HW: Geometric Definitions

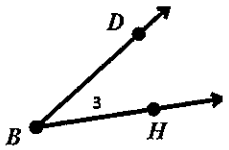
1. What is the best description for the distance from Point A to Point B?



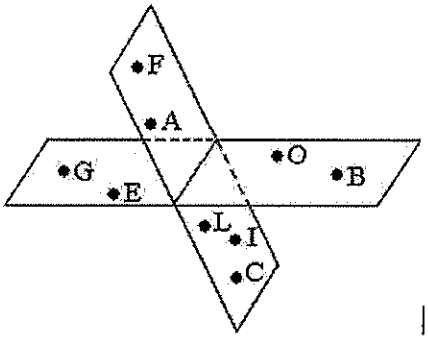
A) $\overline{AB}$ B) AB

2. A student is told that $\overline{AB}$ and $\overline{CD}$ have equal lengths. The student writes down $\overline{AB} = \overline{CD}$. What is wrong with this mathematical statement?

3. Provide all correct names for the angle.

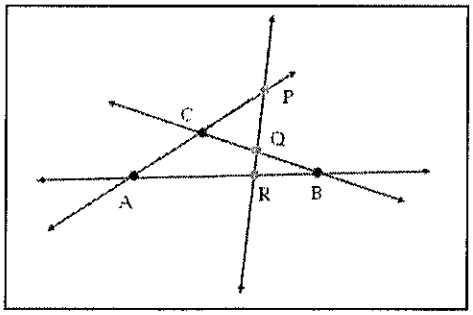


4. True or False



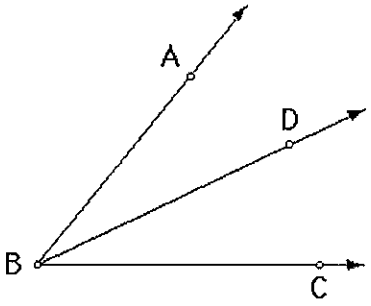
   a. F is coplanar with L and I.
   b. G is coplanar with F and A.
   c. F and G are coplanar.

5. True or False

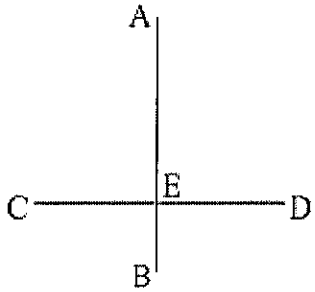


   a. C, P and R are collinear
   b. A, R, and B are collinear.

6. $\overrightarrow{BD}$ is the angle bisector of < ABC. If m< ABC = 100°, what is m< ABD?



7. If $\overline{AB}$ is the perpendicular bisector of $\overline{CD}$, state:



   a. Two congruent segments.
   b. One right angle.

8. **Convert the mathematical symbols to words.**

a) $\overline{AB}$ _____ b) $\overleftrightarrow{AB}$ _____

c) AB _____ d) $\overrightarrow{AB}$ _____

e) $\angle ABC$ _____ f) $m\angle ABC$ _____

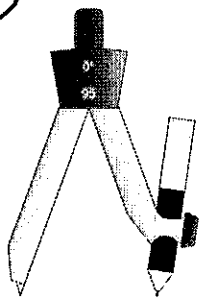
9. **What is the difference between $\overline{CD}$ and CD?**

10. **When do we use = and when do we use $\cong$?**

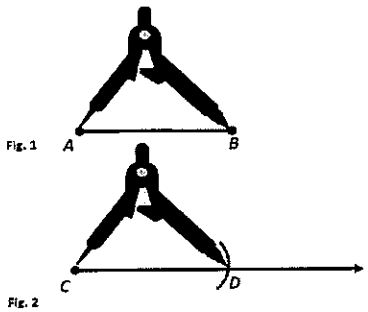
11. **What does it mean to bisect something?**

Unit 1 Lesson 2: Geometric Constructions 1

We will learn how to
- Copy a Segment
- Copy a Triangle
- Bisect a Segment

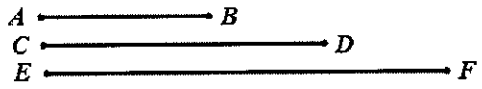


Constructing a segment congruent to another segment (COPYING A SEGMENT)



COPYING A SEGMENT

1. Given $\overline{AB}, \overline{CD}, \& \overline{EF}$. Use the copy segment construction to create the new lengths listed below.



3AB

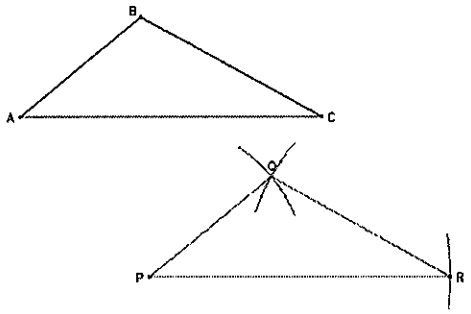
CD + EF

2CD + 1AB

EF - CD

http://www.mathopenref.com/constcopysegment.htm

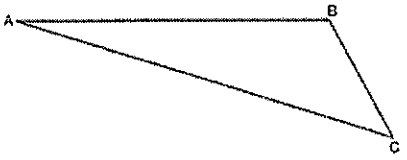
Constructing a triangle congruent to to another triangle (COPYING A TRIANGLE)



http://www.mathopenref.com/constcopytriangle.html

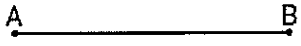
Example 2 :

Create a copy of the triangle below. Label it A'B'C'.



Example 3:

Using a compass and straightedge, and $\overline{AB}$ below, construct an equilateral triangle with all sides congruent to $\overline{AB}$. [Leave all construction marks.]



Example 4:

Construct a triangle with sides of lengths a, b, and c, as shown below. Be sure the longest side of your triangle lies on $\overline{PQ}$ and that point P is one of the triangle's vertices. [*Show all arcs necessary for a valid construction.*]

a ———

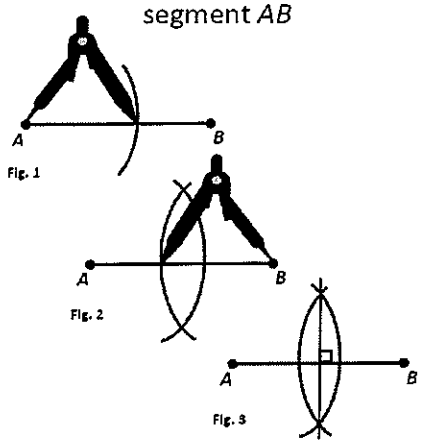
b ———————

c ———————————

P ———————————— Q

Constructing a midpoint of a segment/bisecting a segment (will also be perpendicular!)

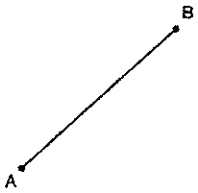
a perpendicular bisector of segment AB



http://www.mathopenref.com/constbisectline.html

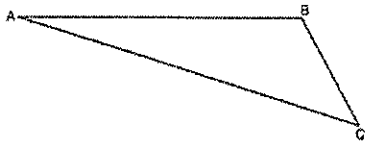
Example 5: Using only a compass and a straightedge, construct the perpendicular bisector of $\overline{AB}$ and label it c. [Leave all construction marks.]

Example 6: Using a compass and straightedge, construct the perpendicular bisector of $\overline{AB}$. [Leave all construction marks.]



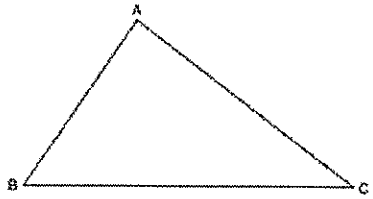
Example 7:

On the diagram of $\triangle ABC$ shown below, use a compass and straightedge to construct the perpendicular bisector of $\overline{AC}$. [Leave all construction marks.]



Example 8:

On the accompanying diagram of ΔABC, use a compass and a straightedge to construct a median from A to $\overline{BC}$.



Example 9:

Construct the new length listed:

1/4 EF

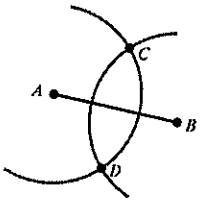
1.25EF

1.75EF

1. Which geometric instrument would I use to measure the length of a segment, the compass or the straightedge? Explain your answer.

2. What is the difference between drawing and constructing something? So for example, what is the difference between drawing a perpendicular line and constructing a perpendicular line?

3. A student has done the following construction. What was this student attempting to construct? Is there more than one thing that the student could be constructing? Explain.

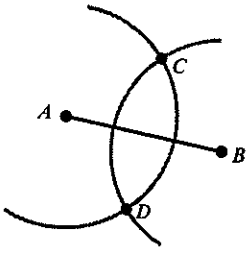


4. After learning the midpoint construction, Sally realizes that she could determine one-fourth the length of a segment. How could she do this? Explain & Diagram.

5. When given $\overline{AB}$ & $\overline{CD}$, a student uses her compass to measure them and then construct a new length EF. What is the exact length of $\overline{EF}$?

6. A teacher instructs the class to construct the midpoint of a segment. Jeff pulls out his ruler and measures the segment to the nearest millimeter and then divides the length by two to find the exact middle of the segment. Has he done this correctly?

7. A rhombus is a quadrilateral with 4 congruent sides. Hidden in this construction is a rhombus, can you find it and then explain why it MUST be a rhombus.

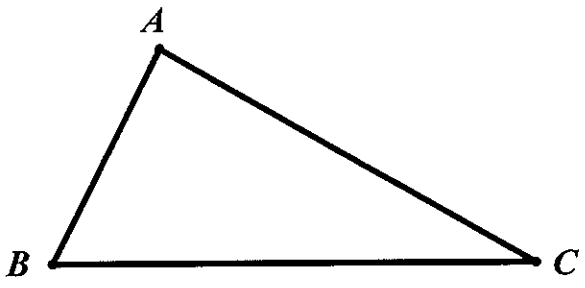


PRACTICE - CONSTRUCTION

8. Given $\overline{MN}$, construct 2.5 MN

9. Given $\overline{GH}$, construct 1.75 GH

10. Given ΔABC, construct a copy of it, ΔA'B'C'.



11. Given $\overline{VB}$ -- perform the midpoint construction. What other construction did you just perform?

Unit 1 Lesson 3: Constructions 2

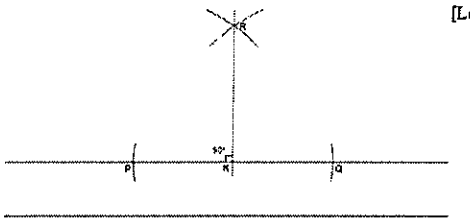
We will learn how to:

- Construct a line ⊥ to a line from a given point on that line.
- Construct a line ⊥ to a line from a given point NOT on that line.
- Construct an angle bisector
- Construct a congruent angle (Copy an angle)
- Construct parallel lines

Construct a line ⊥ to a line from a given point on that line.

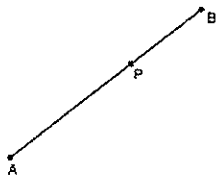
http://www.mathopenref.com/constperplinepoint.html

Done. The line KR is perpendicular to PQ at K



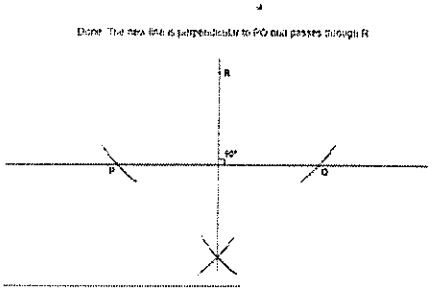
Example 1:

Using a compass and straightedge, construct a line perpendicular to $\overline{AB}$ through point P. [Leave all construction marks.]

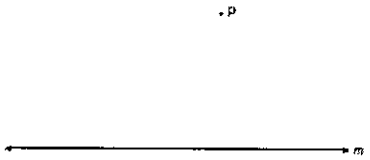


Construct a line ⊥ to a line from a given point NOT on that line.

http://www.mathopenref.com/constperpextpoint.html

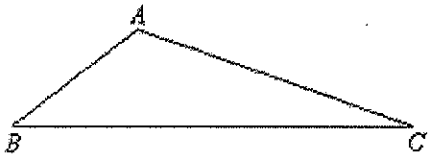


Example 2: Using a compass and straightedge, construct a line that passes through point P and is perpendicular to line m. [Leave all construction marks.]



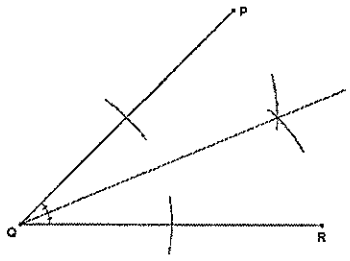
Example 3:

Construct Altitude $\overline{AD}$ to side $\overline{BC}$.



Construct an angle bisector

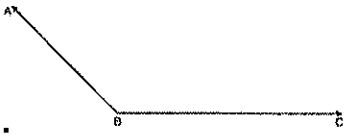
Done. The line just drawn bisects the angle PQR



http://www.mathopenref.com/constbisectangle.html

Example 4:

On the diagram below, use a compass and straightedge to construct the bisector of $\angle ABC$.
[Leave all construction marks.]

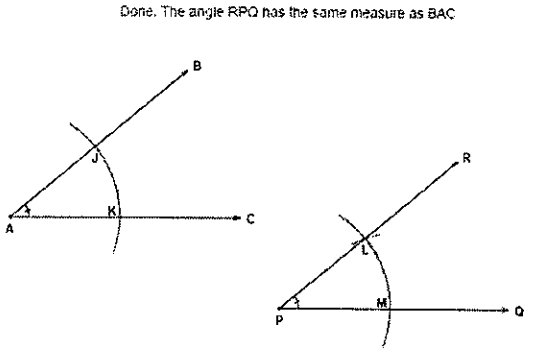


Example 5:

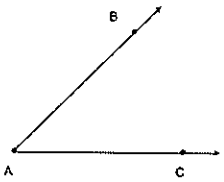
Using a compass and straightedge, construct an equilateral triangle with $\overline{AB}$ as a side. Using this triangle, construct a 30° angle with its vertex at A. [Leave all construction marks.]

A _____ B

Construct a congruent angle (Copy an angle)

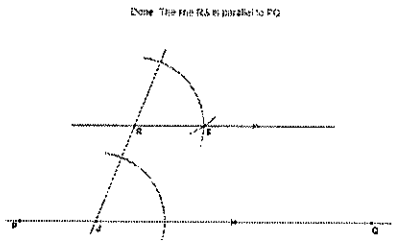


Example 6:
Construct
$\angle BAC \cong \angle B'A'C'$



http://www.mathopenref.com/constcopyangle.html

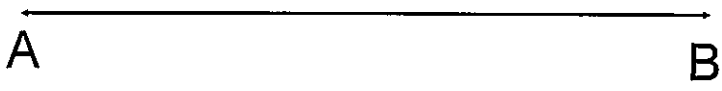
Construct parallel lines



http://www.mathopenref.com/constparallel.html

Example 7:

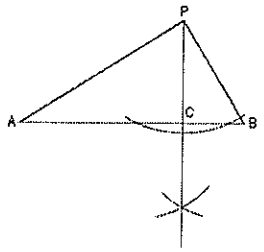
Construct a line parallel to $\overleftrightarrow{AB}$



Example 8:

In the accompanying diagram of a construction, what does $\overline{PC}$ represent?

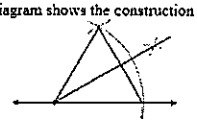
1) an altitude drawn to $\overline{AB}$
2) a median drawn to $\overline{AB}$
3) the bisector of $\angle APB$
4) the perpendicular bisector of $\overline{AB}$



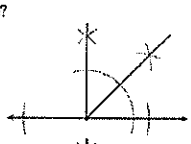
Example 9:

Which diagram shows the construction of a 45° angle?

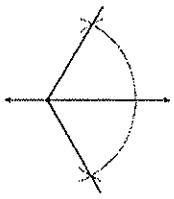
1)



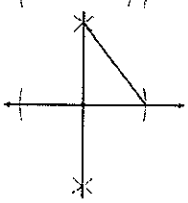
3)



2)

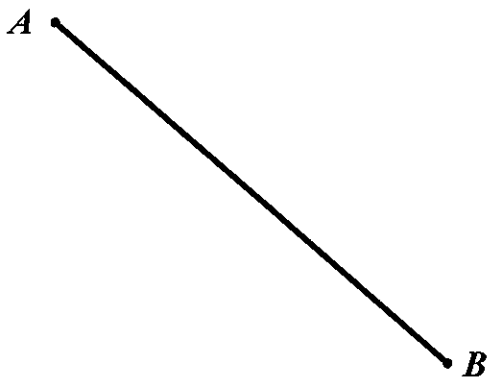


4)



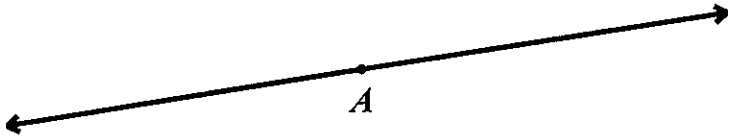
Constructing the Perpendicular Bisector (a ⊥ line through the midpoint of a segment).

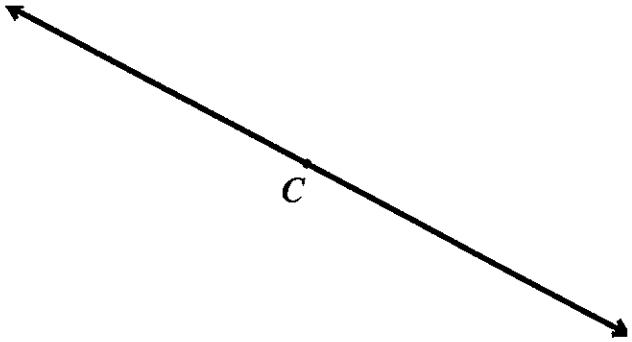
1. Given $\overline{AB}$. Use the midpoint construction to construct the perpendicular bisector.



Construct the perpendicular line THROUGH A POINT <u>ON</u> THE LINE.

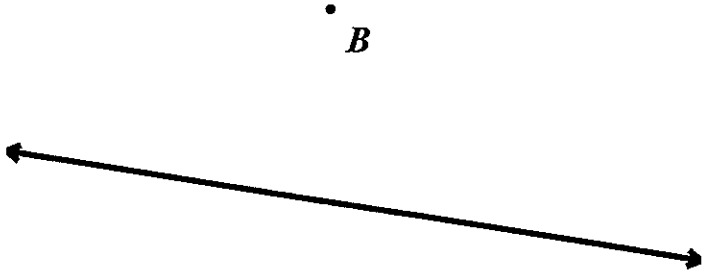
2. Work backwards from the midpoint construction.

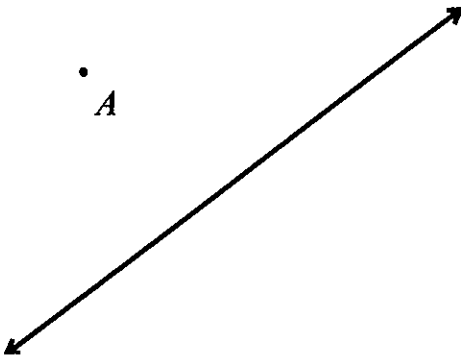




Construct the perpendicular line THROUGH A POINT <u>not on</u> THE LINE.

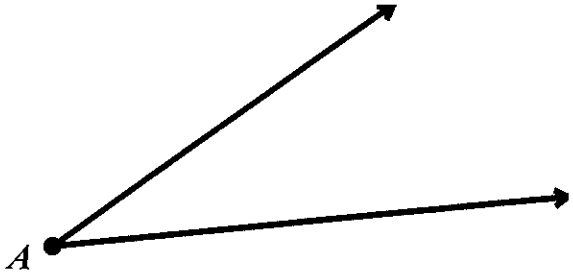
3. Work backwards through the midpoint construction.

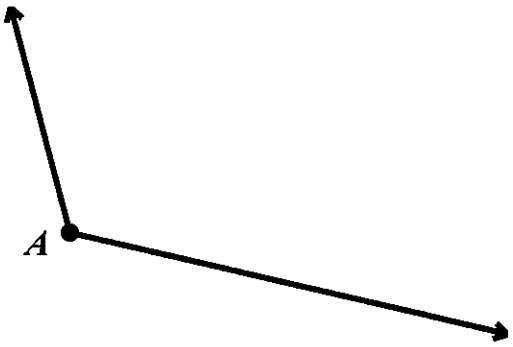




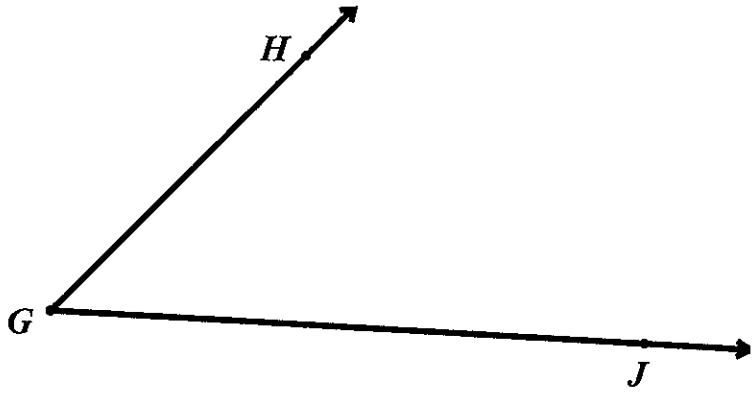
Construct the angle bisector.

4. Given ∠A, construct the angle bisector, ray $\overline{AD}$.

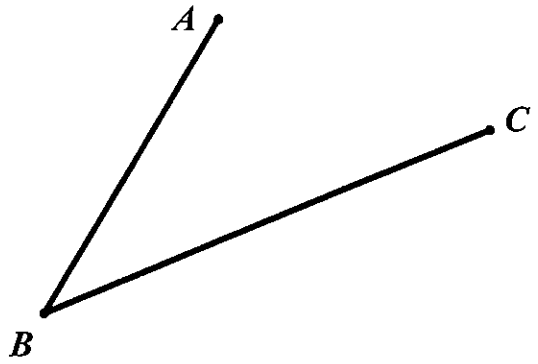




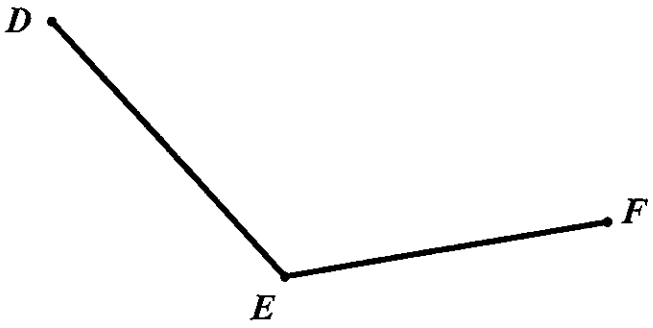
5. Why does this work? What shape is formed in this construction... again... Construct the angle bisector for the below angle but label everything to display where the Rhombus is found in the construction.

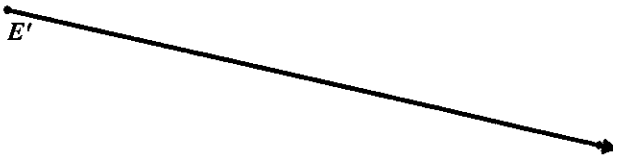


6. Given $\angle ABC$. Make a copy of $\angle ABC$, $\angle A'B'C'$.

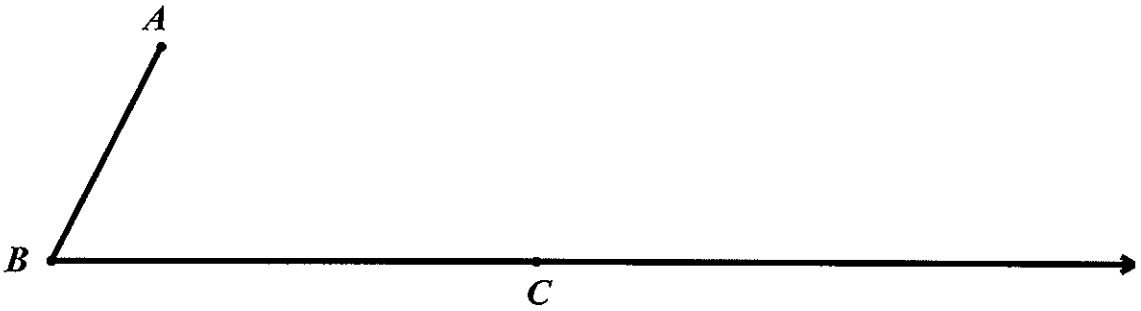


7. Given $\angle DEF$. Make a copy of $\angle DEF$, $\angle D'E'F'$.

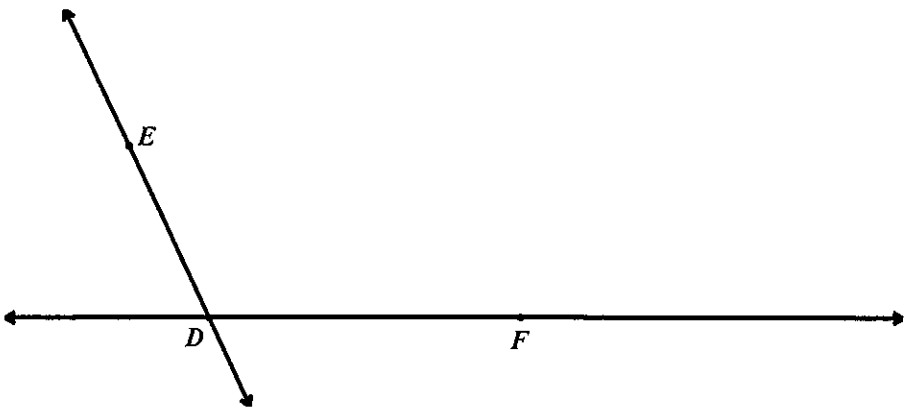




8. Construct a line parallel to $\overline{AB}$ through point C?



9. Create a parallel line to $\overleftrightarrow{DE}$ through point F.



Unit 1 Lesson 4:
Geometric Constructions 3
Constructing Polygons

We will learn how to:

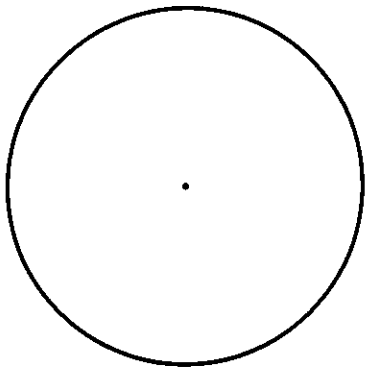
- Construct a square & rectangle
- Construct an inscribed equilateral triangle in a circle
- Construct an inscribed square in a circle
- Construct an inscribed regular hexagon in a circle
- Construct an inscribed regular octagon in a circle

Example 1:
Construct a rectangle with the given lengths:

Example 2:
Construct a square with the given length:

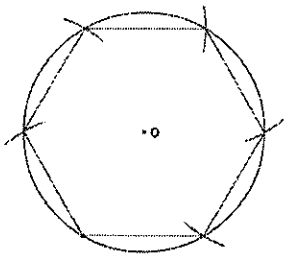
http://mathopenref.com/constsquare.html

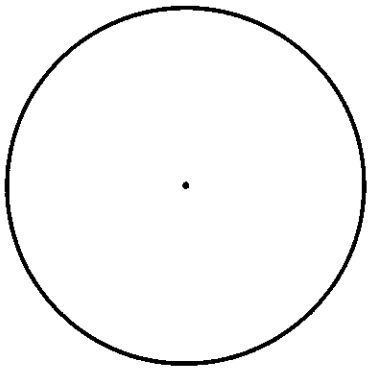
Constructing an Equilateral Triangle Inscribed in a Circle



Constructing a Regular Hexagon Inscribed in a Circle

Done. The result is a hexagon inscribed in the circle

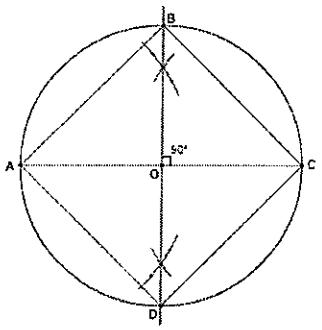


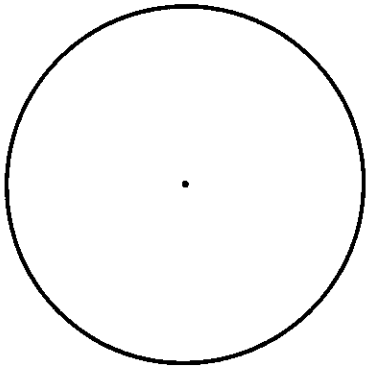


http://mathopenref.com/constinhexagon.html

Constructing a Square Inscribed in a Circle

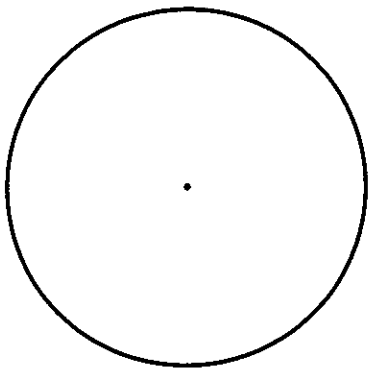
Done. The result is a square ABCD inscribed in the given circle





http://www.mathopenref.com/constinsquare.html

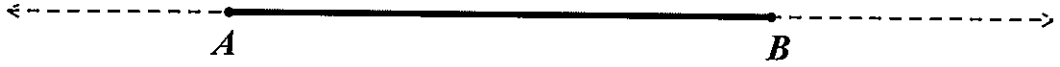
Constructing a Regular Octagon Inscribed in a Circle



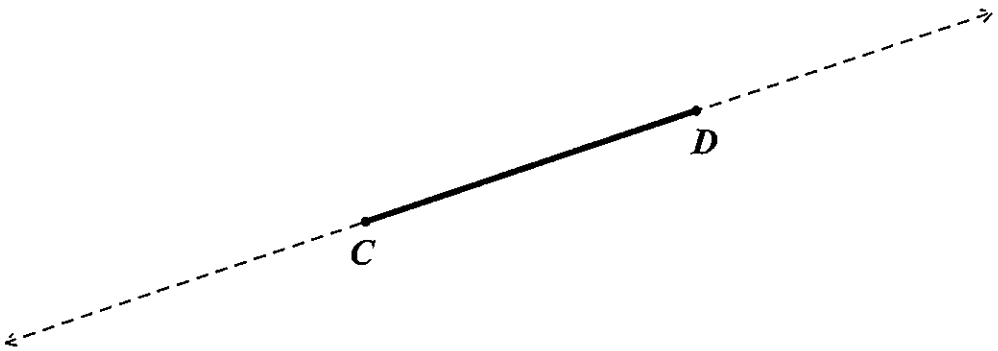
Unit 1 Lesson 4 HOMEWORK

NAME: _____

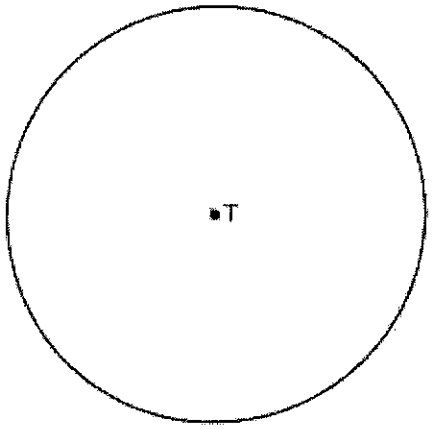
1. Given sides of a rectangle. Construct the rectangle.



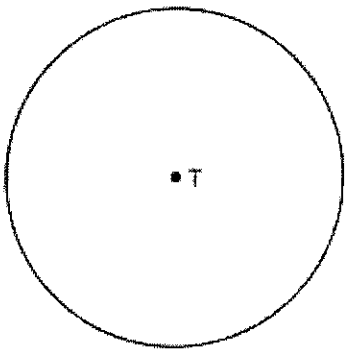
2. Given the side of a square. Construct the square.



3. Use a compass and straightedge to construct an inscribed square in circle T shown below. [Leave all construction marks.]



4. Construct an equilateral triangle inscribed in circle T shown below. [Leave all construction marks.]



Name: _____

Geometry CC **Unit 1-1** Geometric Definitions and Constructions REVIEW

1) Tell whether a point, a line, or a plane is illustrated by the tip of a pen.

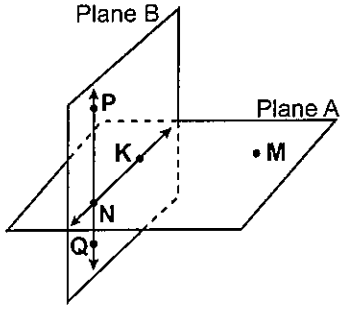
2) Tell whether a point, a line, or a plane is illustrated by the edge of a textbook.

3) $\overline{PQ}$ has only one endpoint. **TRUE FALSE**
A) True B) False

4) A line segment has exactly one midpoint. **TRUE FALSE**
A) False B) True

Question 5 refers to the following:

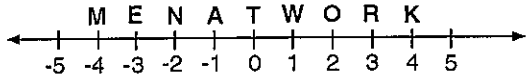
In the diagram below, points P, N, and Q are collinear. Indicate whether the given statement is True or False.



5) Points P, K, N, and Q are coplanar. **TRUE FALSE**
A) True B) False

Question 6 refers to the following:

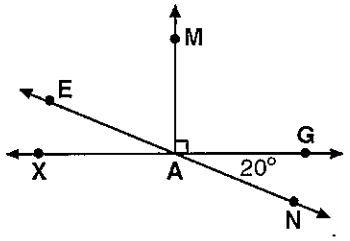
Use the figure below to name a segment, ray, or point that best completes the given statement.



6) the ray opposite $\overrightarrow{TK}$ is

Question 7 refers to the following:

In the diagram below, XG↔ and EN↔ intersect at A, AM→ ⊥ XG↔, and m∠GAN = 20°.



7) Name two right angles.

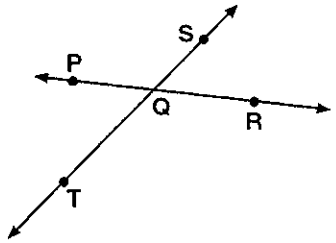
Question 8 refers to the following:

Given the line segments illustrated below.

x y z

8) Construct a line segment whose length is $y + z$.

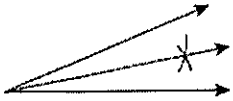
Question 9 refers to the following:



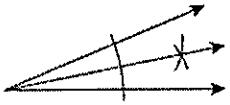
9) Points P, Q, and R are collinear. **TRUE FALSE**
A) True B) False

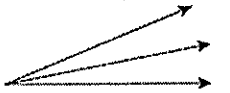
---

10. Which illustration shows the correct construction of an angle bisector?

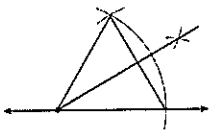
A) 

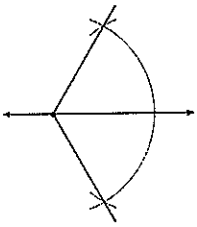
B) 

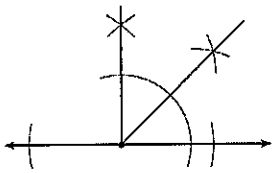
C) 

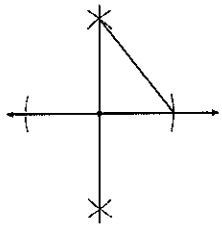
D) 

11. Which diagram shows the construction of a 45° angle?

A) 

B) 

C) 

D) 

12. The diagram below illustrates the construction of $\overleftrightarrow{PS}$ parallel to $\overleftrightarrow{RQ}$ through point *P*.

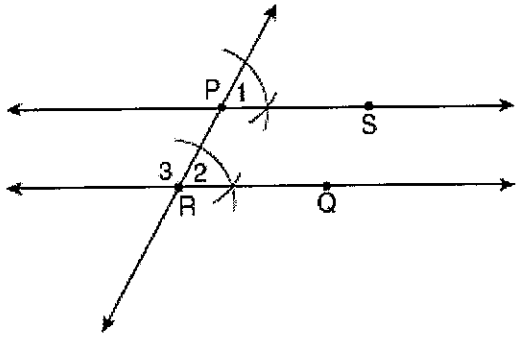
Which statement justifies this construction?

A) $m\angle 1 = m\angle 2$

B) $m\angle 1 = m\angle 3$

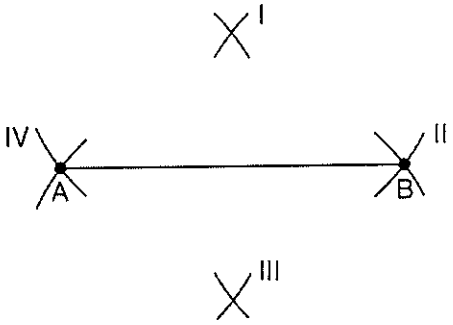
C) $\overline{PR} \cong \overline{RQ}$

D) $\overline{PS} \cong \overline{RQ}$



13. Line segment *AB* is shown in the diagram.
Which two sets of construction marks, labeled I, II, III, and IV, are part of the construction of the perpendicular bisector of line segment *AB*?

A) I and II
B) I and III
C) II and III
D) II and IV



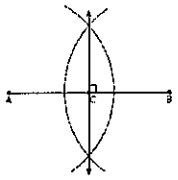
14. A student is told that $\overline{AB}$ and $\overline{CD}$ have equal lengths. The student writes down $\overline{AB} = \overline{CD}$. What is wrong with this mathematical statement?

15. One step in a construction uses the endpoints of $\overline{AB}$ to create arcs with the same radii. The arcs intersect above and below the segment. What is the relationship of $\overline{AB}$ and the line connecting the points of intersection of these arcs?

A) collinear
B) congruent
C) parallel
D) Perpendicular

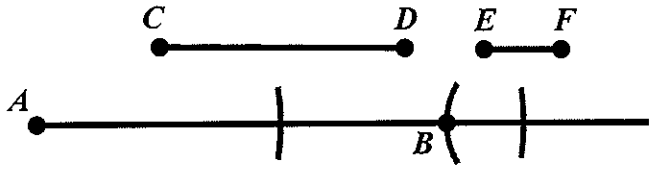
16. The diagram below shows the construction of the perpendicular bisector of $\overline{AB}$.
Which statement is *not* true?

A) $AC = CB$
B) $CB = \frac{1}{2}AB$
C) $AC = 2AB$
D) $AC + CB = AB$



17. What is the best description for the distance from Point A to Point B?

A) CD + 2EF
B) CD - EF
C) 2CD - EF
D) 2CD + EF



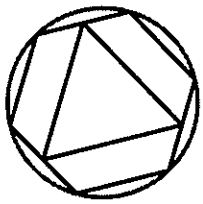
18. Given the diagram, determine the description which is false.

A) The circle circumscribes the hexagon.

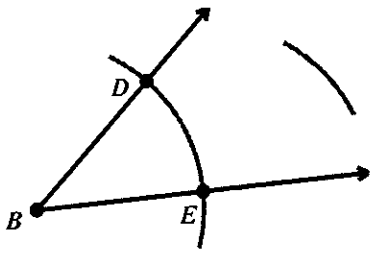
B) The hexagon circumscribes the triangle.

C) The hexagon is inscribed in the circle.

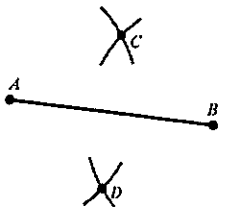
D) The triangle is inscribed in the circle.



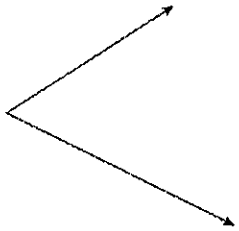
19. Jeff is constructing the angle bisector of $\angle DBE$. What is the next step? Be very specific as to what he should do next.



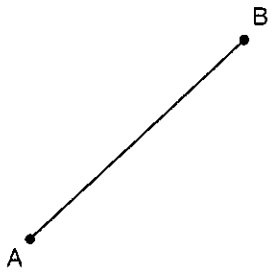
20. Lindsay notices that while doing a construction a 'hidden' shape appeared – a rhombus.
Where is the rhombus hidden in this shape?
Draw in the segments that form the rhombus and explain why must it be a rhombus?



21. Using a compass and straightedge, construct the bisector of the angle shown below. [*Leave all construction marks.*]



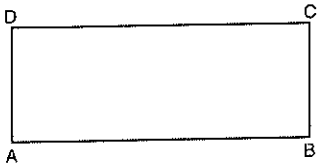
22. Using a compass and straightedge, construct the perpendicular bisector of $\overline{AB}$. [Leave all construction marks.]



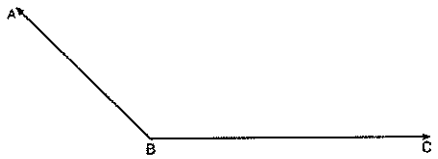
23. Using a compass and straightedge, and $\overline{AB}$ below, construct an equilateral triangle with all sides congruent to $\overline{AB}$. [Leave all construction marks.]

24. Using a compass and straightedge, and $\overline{AB}$ below, construct $2.25\ \overline{AB}$ [Leave all construction marks.]

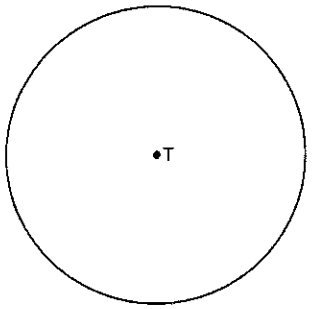
25. On the ray drawn below, using a compass and straightedge, construct an equilateral triangle with a vertex at *R*. The length of a side of the triangle must be equal to a length of the diagonal of rectangle *ABCD*.



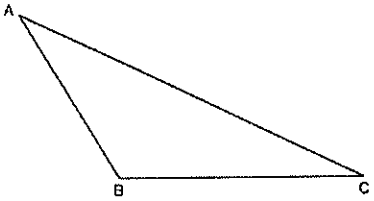
26. On the diagram below, use a compass and straightedge to construct an angle which is half of $\angle ABC$. [Leave all construction marks.]



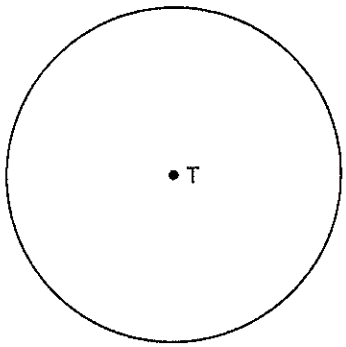
27. Use a compass and straightedge to construct an inscribed square in circle *T* shown below. [Leave all construction marks.]



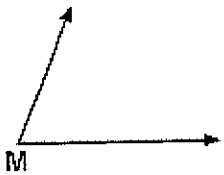
28. Using a compass and straightedge, construct an altitude of triangle *ABC* below. [Leave all construction marks.]



29. Construct an equilateral triangle inscribed in circle *T* shown below. [Leave all construction marks.]



30. Construct an angle congruent to <M.



31. Construct a line through P perpendicular to line *l*

32. Construct a lint through A that is parallel to $\overline{BC}$