



ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION



Sub: Algebra and Geometry

Class: 7

Date: 06.05.20

STUDY MATERIAL: BASIC CONSTRUCTIONS

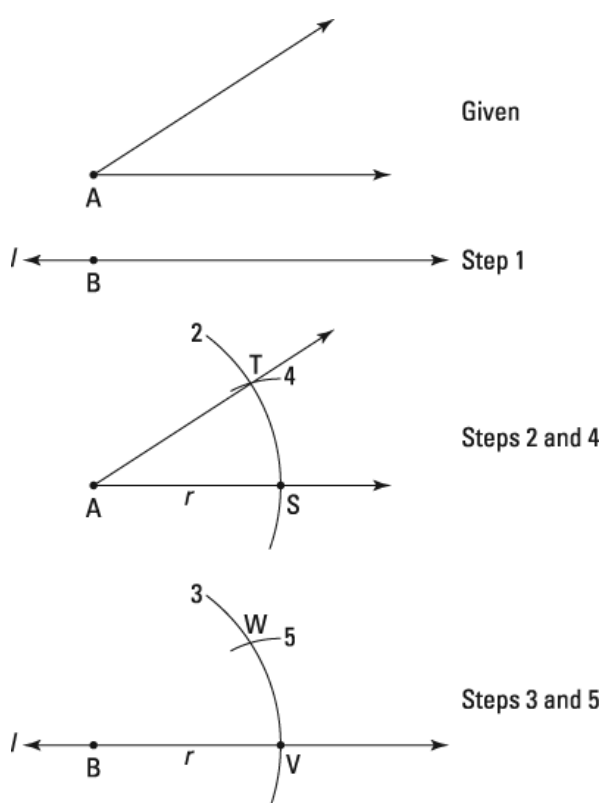
Concepts, Important Diagrams and Explanations

The basic idea behind copying a given angle is to use your compass to sort of measure how wide the angle is open; then you create another angle with the same amount of opening.

To Copy a Given Angle

Given: $\angle A$

Construct: An $\angle B$ congruent to $\angle A$



Refer to the figure as you work through these steps:

1. Draw a working line, l , with point B on it.

2. Open your compass to any radius r , and construct arc (A, r) intersecting the two sides of angle A at points S and T .
3. Construct arc (B, r) intersecting line l at some point V .
4. Construct arc (S, ST) .
5. Construct arc (V, ST) intersecting arc (B, r) at point W .
6. Draw line BW and you're done.

To Bisect a Given Angle PQR

We know that:

$$\frac{1}{2} \text{ of } 60^\circ = 30^\circ$$

So, to construct an angle of 30° , first construct a 60° angle and then bisect it. Often, we apply the following steps.

Step 1: Draw the arm PQ .

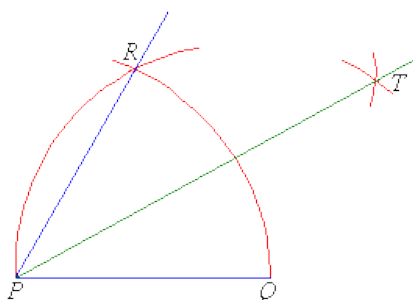
Step 2: Place the point of the compass at P and draw an arc that passes through Q .

Step 3: Place the point of the compass at Q and draw an arc that cuts the arc drawn in Step 2 at R .

Step 4: With the point of the compass still at Q , draw an arc near T as shown.

Step 5: With the point of the compass at R , draw an arc to cut the arc drawn in Step 4 at T .

Step 6: Join T to P . The angle QPT is 30° .



Perpendicular Bisector

The line drawn perpendicular through the midpoint of a given line segment is called the perpendicular bisector of the line segment.

To construct a perpendicular bisector of a line segment, you must need the following instruments.

1. Ruler
2. Compass

The steps for the construction of a perpendicular bisector of a line segment are :

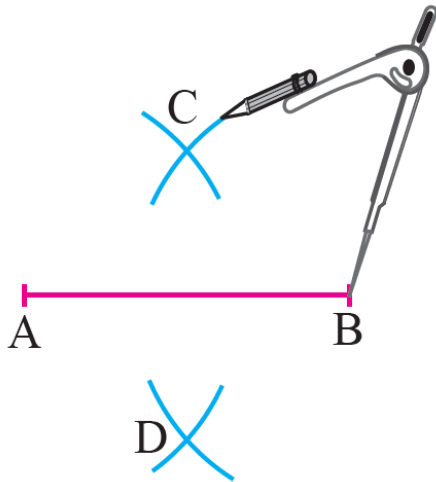
Step 1 :

Draw the line segment AB.



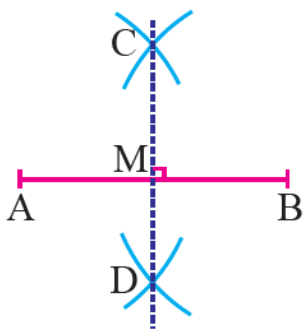
Step 2 :

With the two end points A and B of the line segment as centers and more than half the length of the line segment as radius draw arcs to intersect on both sides of the line segment at C and D.



Step 3 :

Join C and D to get the perpendicular bisector of the given line segment AB.



In the above figure, CD is the perpendicular bisector of the line segment AB.

This construction clearly shows how to draw the perpendicular bisector of a given line segment with compass and straightedge or ruler.

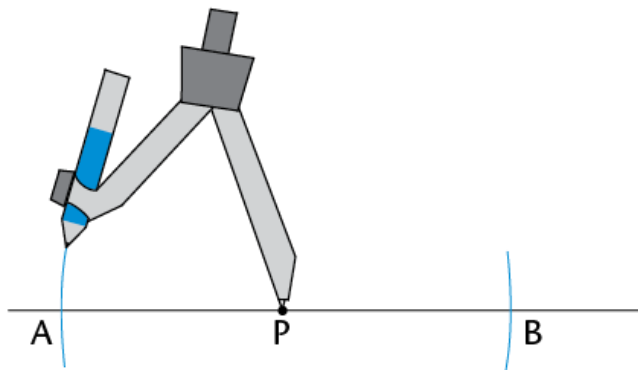
This bisects the line segment (That is, dividing it into two equal parts) and also perpendicular to it.

A perpendicular line at a given point on a line

1. Read through the following steps.

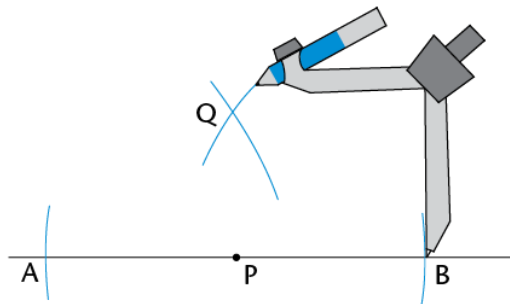
Step 1

Place your compass on the given point (P). Draw an arc across the line on each side of the given point. Do not adjust the compass width when drawing the second arc.



Step 2

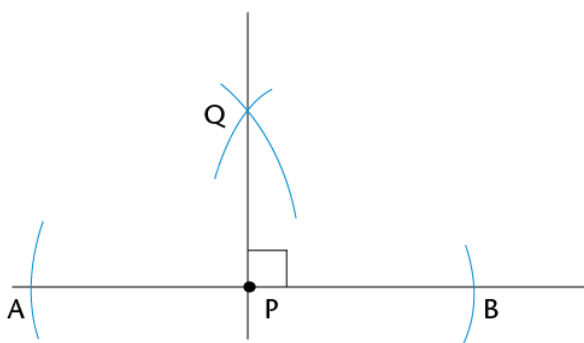
Open your compass so that it is wider than the distance from one of the arcs to the point P. Place the compass on each arc and draw an arc above or below the point P. The two new arcs will intersect.



Step 3

Use your ruler to join the given point (P) and the point where the arcs intersect (Q).

$PQ \perp AB$



Steps to Construct Perpendicular lines

Constructing a perpendicular to a line through a point on it

Given: A line segment AB with a point P on it.

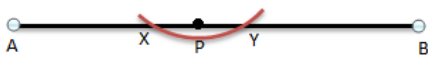
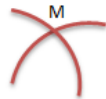
To construct A line perpendicular to line AB passing through point P.

Step 1: With P as center and any suitable radius, draw an arc cutting line segment AB at two distinct

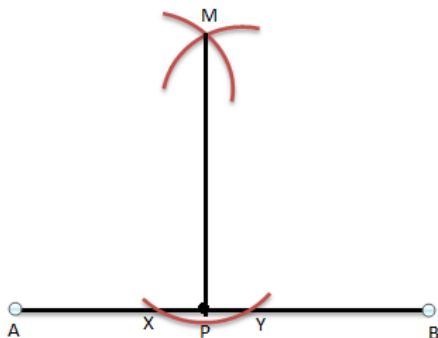


points as shown in the given figure.

Step 2: Now with X as center and a suitable radius draw an arc on either side of the given line segment AB. Also, with Y as center and same radius as previous, draw an arc on either side of the given line segment cutting the arc drawn through point X at M as shown in the given figure.

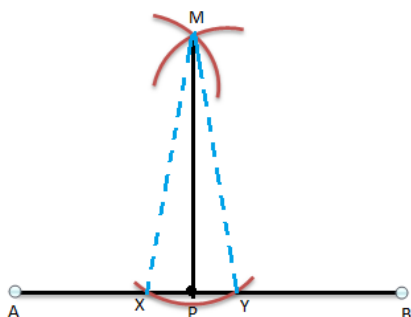


Step 3: Join the point M and P as shown, and the line segment MP is the required perpendicular to AB through point P.



Let us see if the line segment MP constructed is actually perpendicular to AB or not.

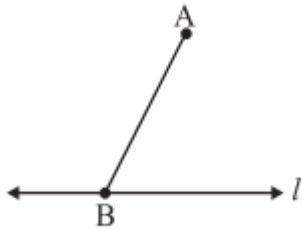
Join M to the points X and Y as shown:



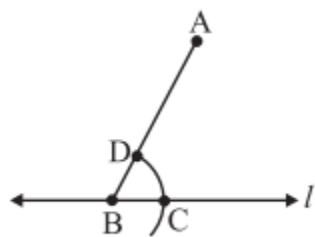
Thus, the constructed line segment MP is perpendicular to AB. Using the above construction, we can easily construct two perpendicular lines using compass and a ruler.

Steps of construction of a line parallel to a given line

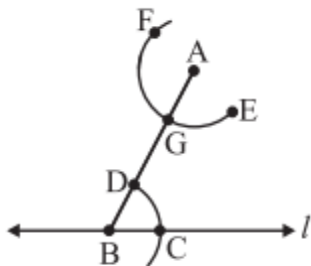
1. Take a line l and a point A outside l .
2. Take any point B on l and join it to A .



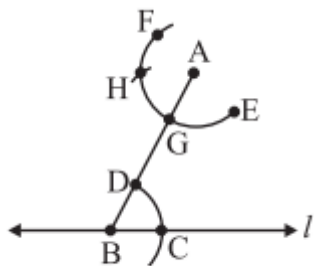
3. With B as the centre and a convenient radius, cut an arc on l at C and BA at D .



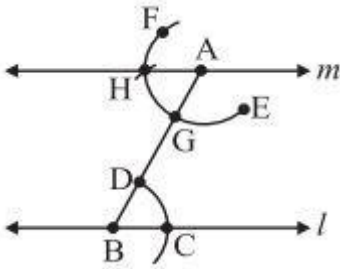
4. With A as the centre and same radius as in Step 3, cut an arc EF to cut AB at G .



5. Measure the arc length CD by placing pointed tip of the compass at C and pencil tip opening at D .
6. With this opening, keep G as centre and draw an arc to cut arc EF at H



7. Join **AH** to draw a line m



$\angle ABC$ and $\angle BAH$ are alternate interior angles. Therefore, $m \parallel l$

Previous Years Solution

2019

1st Term

(viii) Draw $\angle ABC = 125^\circ$ with the help of a protractor. Construct $\angle PQR = \angle ABC$.

Ans: Construction of an angle equal to a given angle $\angle ABC = 125^\circ$

2nd Term

v) Draw a line segment 6.8 cm long and draw its perpendicular bisector using compasses and ruler.

Ans – Perpendicular bisector should be drawn showing traces of construction.

vii) Draw a line segment $PQ=5\text{cm}$. Mark a point O above it. Through O draw a line parallel to PQ. Ans- Parallel line to PQ should be drawn showing traces of constructions.

3rd Term

v) Draw a line segment $AB=8.2\text{ cm}$. Mark a point M on AB such that $AM=5.7\text{ cm}$. Draw a perpendicular to AB at M.

Ans: Students should draw the required line segment $AB=8.2\text{ cm}$. Then mark a point M on AB such that $AM=5.7\text{ cm}$. Then construct a perpendicular to AB at M.

2018

1st Term

(viii) Construct an angle of 90° with a protractor and draw the bisector with the help of compass.

Ans: Bisector should be drawn showing traces of construction.

3rd Term

iv) Construct an angle of 120° . Divide it into four equal parts using compass.

Ans. Construct an angle of 120° . Then bisect it into two parts. Each part is equal to 60° . Next bisect each 60° into two parts. Each will be equal to 30° .

Exercise Problems

1. Draw angle $\angle ABC = 125^\circ$ with the help of a protractor. Construct $\angle PQR = \angle ABC$. Measure it and check.
2. Construct an angle of 75° . Draw its angular bisector.
3. Construct an angle of 120° . Divide it into four equal parts using compasses. Verify using a protractor that each part is equal to 30° .
4. Draw a line segment 6.8 cm long and draw its perpendicular bisector using compasses and ruler.
5. Draw a line segment $AB = 8.2$ cm. Mark a point M on AB such that $AM = 5.7$ cm. Draw a ray perpendicular to AB at M .
6. Draw a line segment $PQ = 6.5$ cm. Mark a point O below it at a sufficient distance. Draw a perpendicular from O to PQ .
7. Draw a line segment $PQ = 7$ cm. Mark a point O above it. Through O draw a line parallel to PQ .
8. Draw a line segment $AB = 7$ cm. Draw AC making an angle of 60° with AB . Mark $AC = 4$ cm. Through C , draw a line parallel to AB .

