

Let's try to understand what a perpendicular bisector is by looking at the two words separately and then constructing one on graph paper.

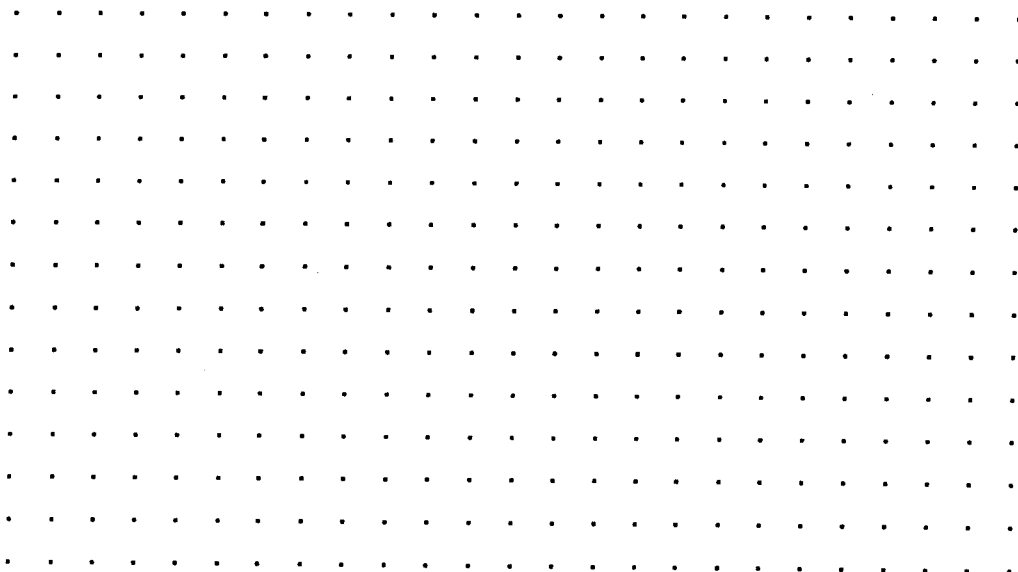
Perpendicular -

Bisector -

A **perpendicular bisector** is a line that _____

Let's graph one on the grid below and then determine its equation graphically.

- 1st Construct line segment AB between the points (-4, -5) and (8, 3).
- 2nd Place point C at the mid-point of AB. Do it visually.
- 3rd Construct line DE perpendicular to AB right through point C. Do not use a protractor. Work with the slopes to construct it accurately.
- 4th Determine the equation of the perpendicular bisector of line segment AB.



List the knowledge and skills required to determine the equation if you didn't have a graph to work with and the info that would be needed to start with.

- A. Info: _____
- B. Skill _____
- C. Skill _____
- D. Skill _____
- E. Skill _____

Let's determine the equation algebraically,

10 Academic Math 6. Perpendicular Bisector Problems

Use your knowledge of perpendicular slopes, mid-points, distance between two points and perpendicular bisectors to solve these problems.

1. Graph the line segment AB from point (2, 5) to (6, -3).

Graph the perpendicular bisector and determine its equation both in the forms of $y=mx+b$ and $Ax+By+C=0$

2. Graph the line segment CD from point (-7, -2) to (1, -4).

Graph the perpendicular bisector and determine its equation both in the forms of $y=mx+b$ and $Ax+By+C=0$

3. A line segment has endpoints (-5, 0) and (0, 5).

Determine the equations of the perpendicular lines that go through each endpoint.

4. Draw line segment FG from point (-1, -3) to (5, -1).

- a) Create an isosceles triangle using a perpendicular bisector to FG. The bisector starts at the mid-point and ends at the point (1,1) which is the 3rd vertex of the triangle. Label the top vertex of the triangle H.

- b) Determine the equations of HG and HF.

- c) Determine the lengths of HG and HF.

- d) Calculate the length of the perpendicular bisector segment.

- e) Measure all three angles and show that it is in fact an isosceles triangle.

5. Construct a triangle on graph paper. Label the vertices A, B and C.

- a) Write the co-ordinates of the three points.

- b) From each point, construct a line to the mid-point of the opposite side. What do you notice?

10 Academic Math

The Perpendicular Bisector

Let's try to understand what a perpendicular bisector is by looking at the two words separately and then constructing one on graph paper.

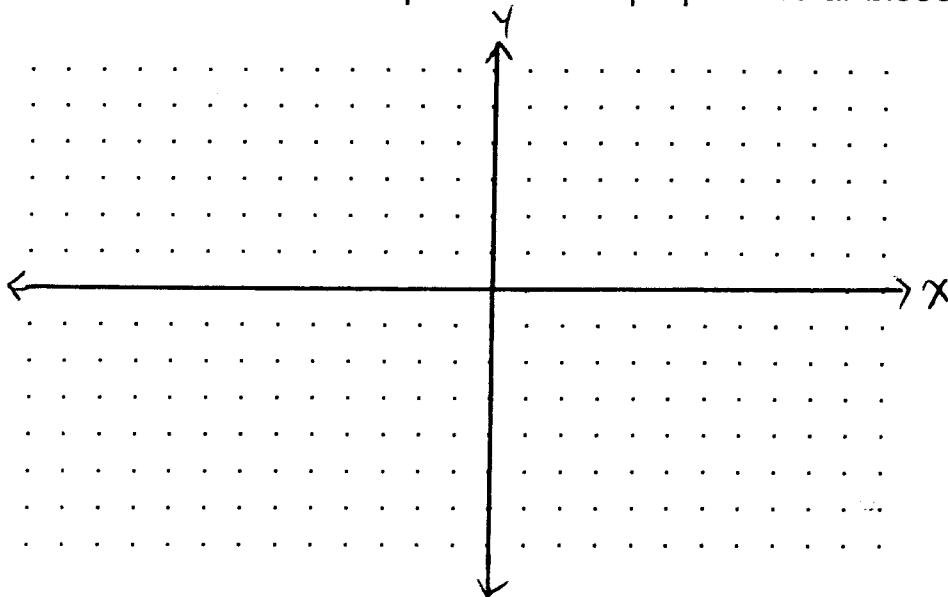
Perpendicular - at a right angle, 90°

Bisector - a line that intersects another line at its mid-point

A **perpendicular bisector** is a line that intersects a line segment at a right angle AND at its mid-point.

Let's graph one on the grid below and then determine its equation graphically.

- 1st Construct line segment AB between the points $(-4, -5)$ and $(8, 3)$.
- 2nd Place point C at the mid-point of AB. Do it visually.
- 3rd Construct line DE perpendicular to AB right through point C.
Do not use a protractor. Work with the slopes to construct it accurately.
- 4th Determine the equation of the perpendicular bisector of line segment AB.



Great! Now that wasn't too hard was it ???

List the knowledge and skills required to determine the equation if you didn't have a graph to work with and the info that would be needed to start with.

- A. Info: A line segment with the two endpoints.
- B. Skill Find the mid-point of the line segment.
- C. Skill Calculate the slope of the line segment.
- D. Skill The perpendicular slope for the new line.
- E. Skill Use $y=mx+b$ with the new slope and the mid-point.

Let's determine the equation algebraically.

Endpoints are $A(-4, -5)$ and $B(8, 3)$.

$$B. M_{AB} = \left(\frac{-4+8}{2}, \frac{-5+3}{2} \right) \\ = \left(\frac{4}{2}, \frac{-2}{2} \right)$$

$$\therefore M_{AB} = (2, -1)$$

$$C. \text{ Slope } AB = \frac{y_1 - y_2}{x_1 - x_2}$$

$$= \frac{-5 - 3}{-4 - 8}$$

$$= \frac{-8}{-12}$$

$$= \frac{2}{3}$$

D. The slope \perp to $\frac{2}{3}$ is $-\frac{3}{2}$.

E. For the equation of the new line:

$$y = mx + b$$

$$-1 = -\frac{3}{2} \left(\frac{2}{1} \right) + b \quad \text{or } -\frac{6}{2}$$

$$-1 = -3 + b$$

$$-1 + 3 = b$$

$$2 = b$$

(use the midpt!
and \perp slope.)

$\therefore y = -\frac{3}{2}x + 2$ is the equation
of the perpendicular bisector
of AB .