

BACK TO SCHOOL

Chapter 1

Functions and Graphs



1.1 Distance and Midpoint Formulas

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Chapter 1.1

Homework



1.1 p9 1 1-19 odd, 23-45 odd

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Learning Targets



8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles.

8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

G-GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

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Success Criteria



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.

Learning Target

8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles.

Success Criteria

I can apply the Pythagorean Theorem to determine unknown lengths in right triangles..



Applying the Pythagorean Theorem



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.



What is the Theorem of Pythagorus?



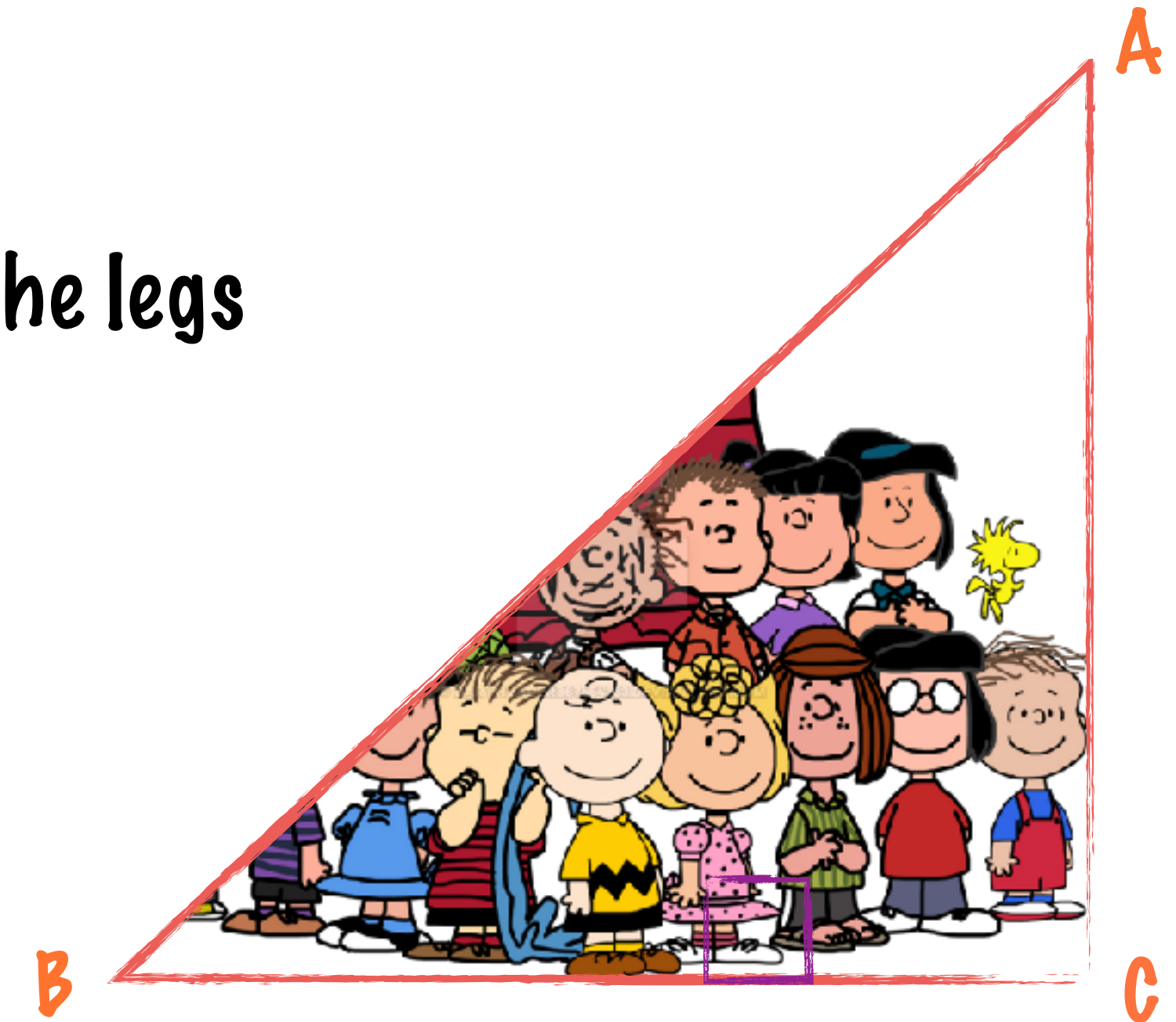
No, it is not $a^2 + b^2 = c^2$



In a right triangle, the sum of the squares of the lengths of the legs equals the square of the length of the hypotenuse.

In a right triangle **If** the legs have length **a** and **b**, and the hypotenuse has length **c**,...

then $a^2 + b^2 = c^2$



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Applying the Pythagorean Theorem



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.



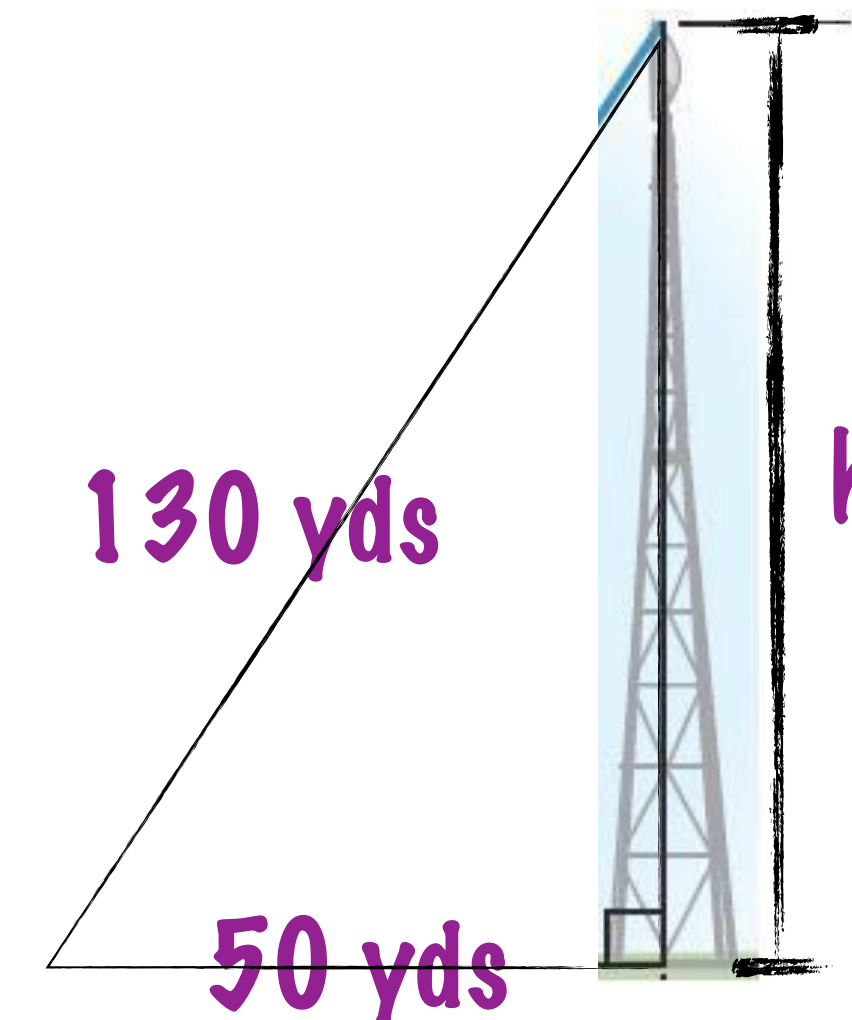
A radio tower is supported by two wires that are each 130 yards long and attached to the ground 50 yards from the base of the tower. How tall is the tower?

Step 1: Write what is given in the problem. When possible, **draw a picture** to illustrate the conditions.

Wires = 130 yds, attached 50 yds out

Step 2: Write the question. You cannot find a solution unless you are certain what is being asked.

How tall is the tower?



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Applying the Pythagorean Theorem



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.



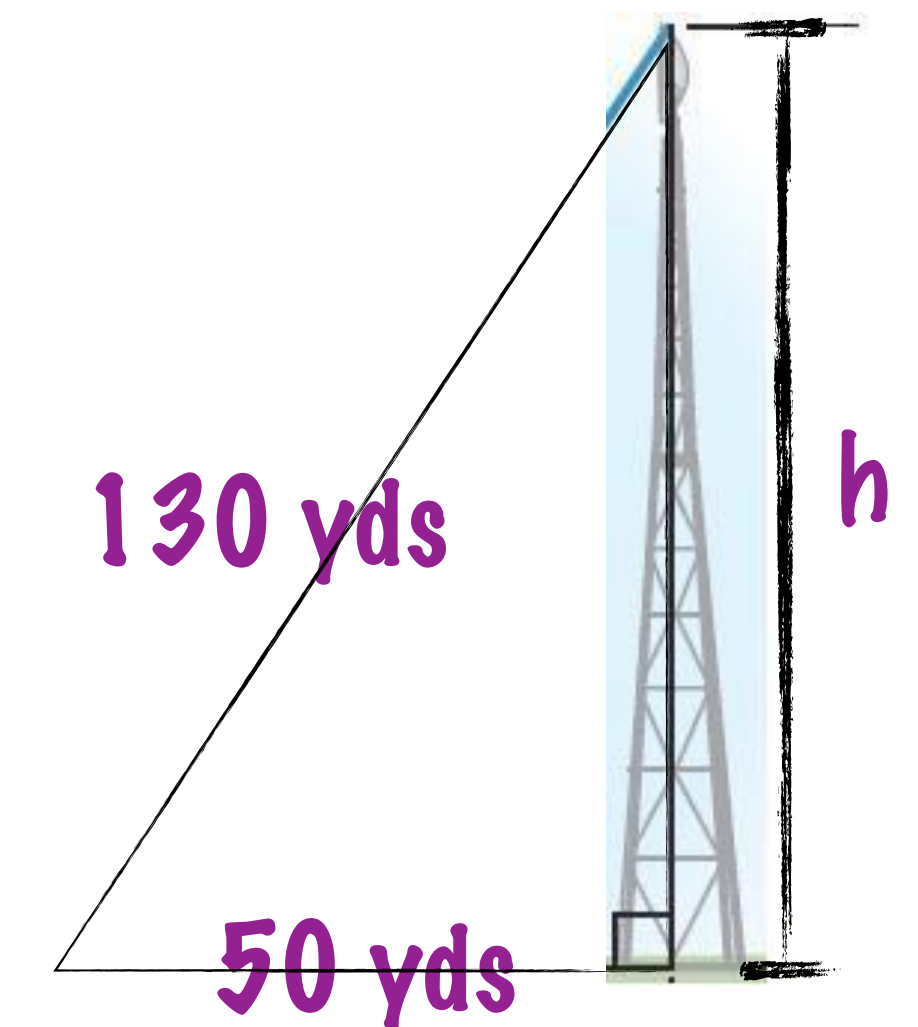
A radio tower is supported by two wires that are each 130 yards long and attached to the ground 50 yards from the base of the tower. How tall is the tower?

Step 3: Choose variables for the unknown quantities. Write all unknown quantities in terms of the variable.

Let h be height of the tower.

Step 4: Write a **verbal model** that models **in words** the conditions of the problem and how the solution is found.

Wire length² = tower height² + ground length².



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Applying the Pythagorean Theorem



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.



A radio tower is supported by two wires that are each 130 yards long and attached to the ground 50 yards from the base of the tower. How tall is the tower?

$$\text{Wire length}^2 = \text{tower height}^2 + \text{ground length}^2.$$

Step 5: Translate the verbal model into an equation and solve the equation.
Check your solution.

$$\text{Wire length}^2 = \text{tower height}^2 + \text{ground length}^2.$$

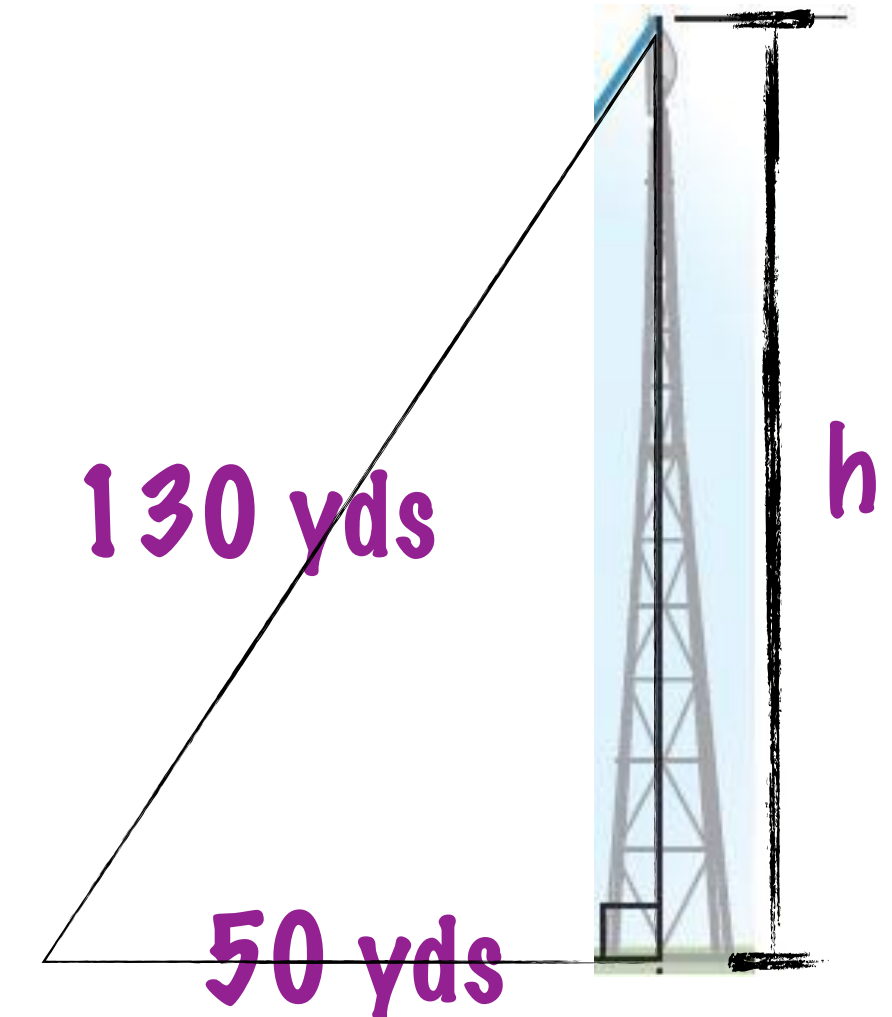
$$130^2 = h^2 + 50^2$$

$$16900 = h^2 + 2500$$

$$h^2 = 14400 \quad h = \pm 120 \text{ ft}$$

The height cannot be negative, so h is 120 ft.

$$\text{Check: } 50^2 + 120^2 = 2500 + 14400 = 16900 = 130^2$$



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Learning Target

G-GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Success Criteria

I can apply the Pythagorean Theorem.



The Distance Formula



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.



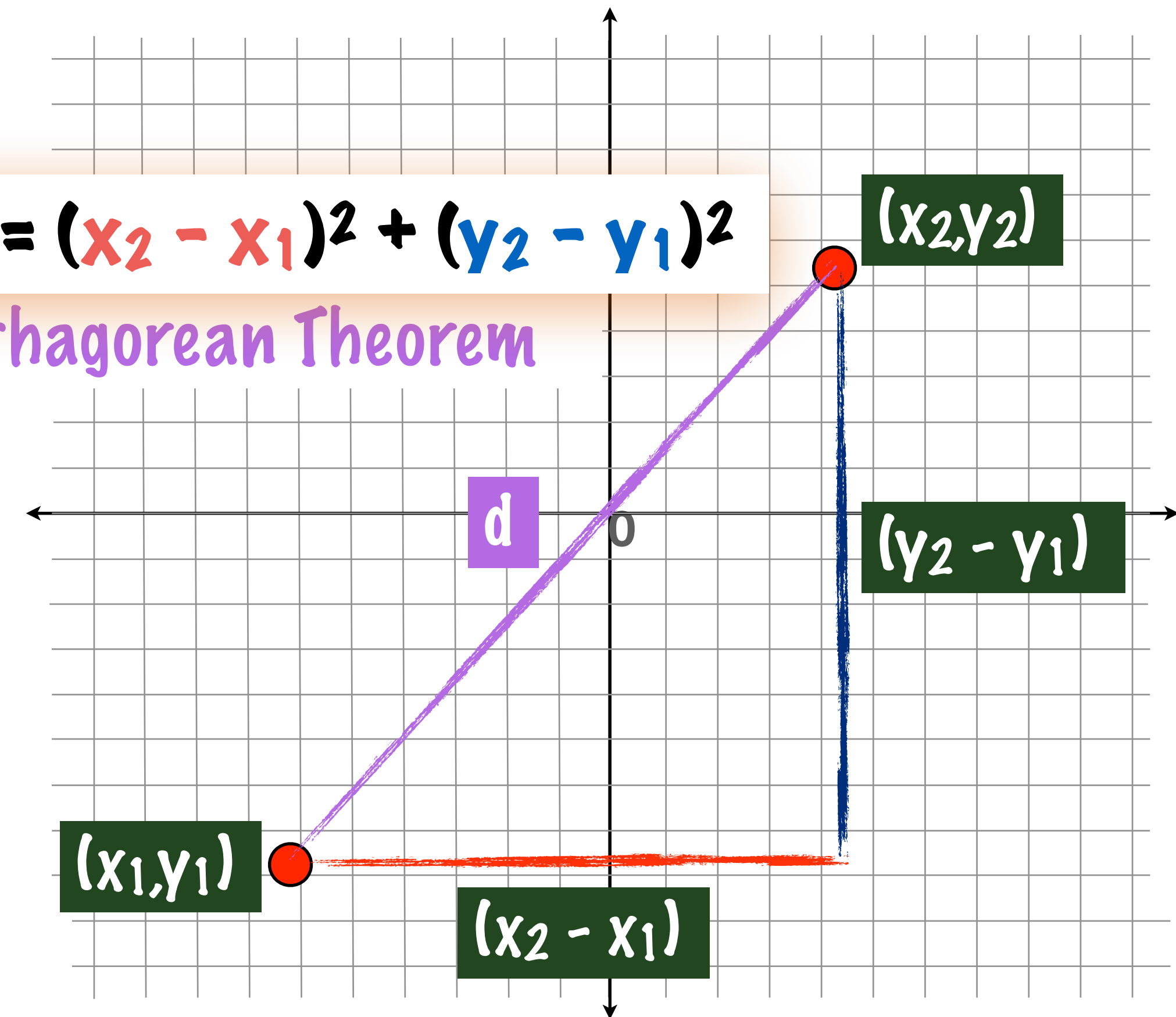
The distance, d , between the points (x_1, y_1) and (x_2, y_2) in the rectangular coordinate system is ...

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d = \sqrt{(\Delta x)^2 + (\Delta y)^2}$$

$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

Pythagorean Theorem



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Applying the Distance Formula



- I can apply the Pythagorean Theorem.
- I can find the distance between two points.
- I can find the midpoint of a line segment.

 Find the distance between $(-1, -3)$ and $(2, 3)$. Express the answer in exact radical form, then estimate to one decimal place.

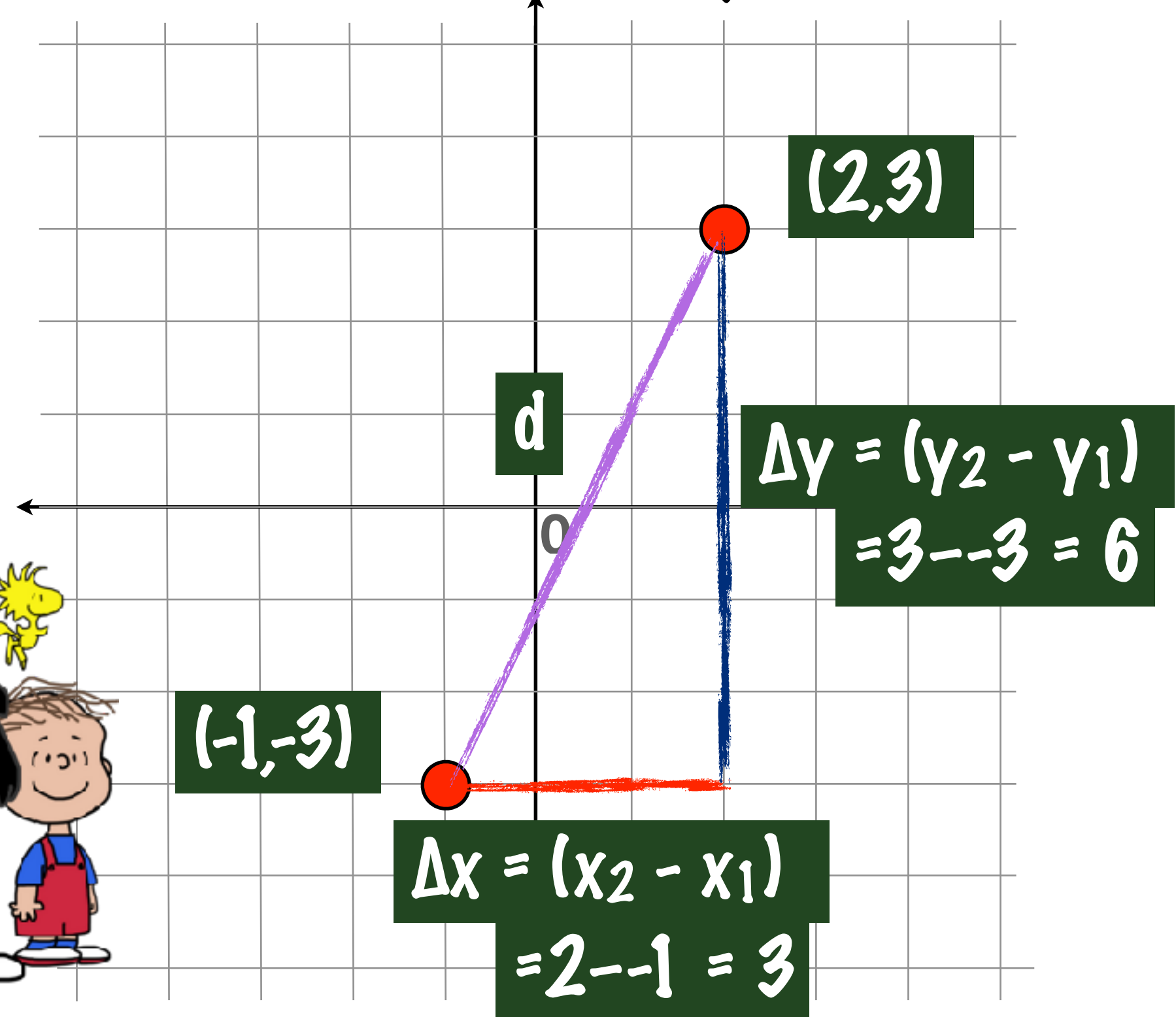
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d = \sqrt{(2 - -1)^2 + (3 - -3)^2}$$

$$d = \sqrt{(3)^2 + (6)^2}$$

$$d = \sqrt{45} = 3\sqrt{5} \quad \text{If you must}$$

$$\sqrt{45} \approx 6.7$$



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Applying the Distance Formula



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.

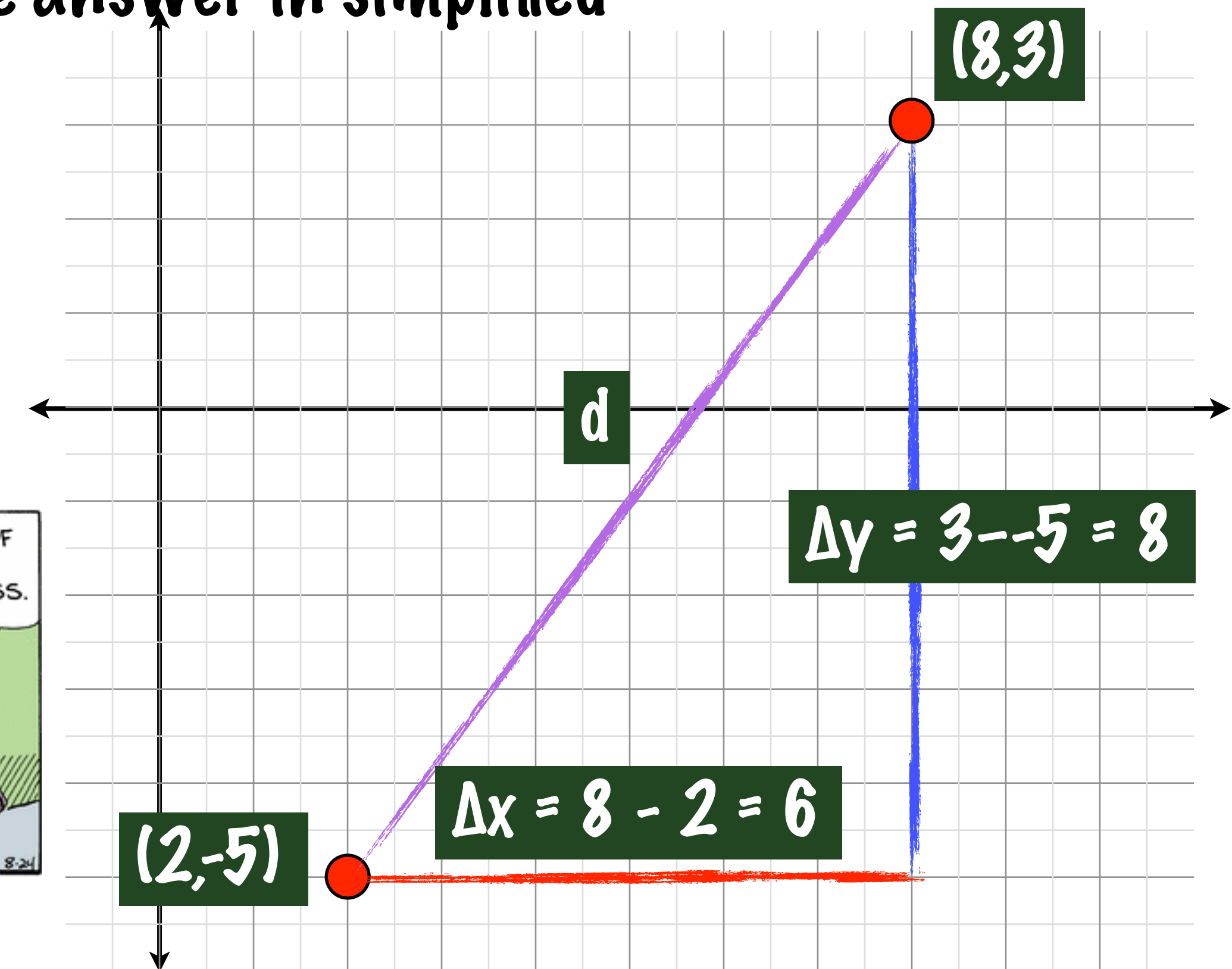
 Find the distance between $(2, -5)$ and $(8, 3)$. Express the answer in simplified radical form and then estimate to one decimal place.

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} = \sqrt{(\Delta x)^2 + (\Delta y)^2}$$

$$d = \sqrt{(8 - 2)^2 + (3 - -5)^2}$$

$$d = \sqrt{(6)^2 + (8)^2}$$

$$d = \sqrt{100} = 10$$



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Example: Using the Distance Formula



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.

🏠 Show that the points (1, -3), (3, 2), and (-2, 4) form an isosceles triangle.

🏠 By graphing we can see which legs might be congruent.

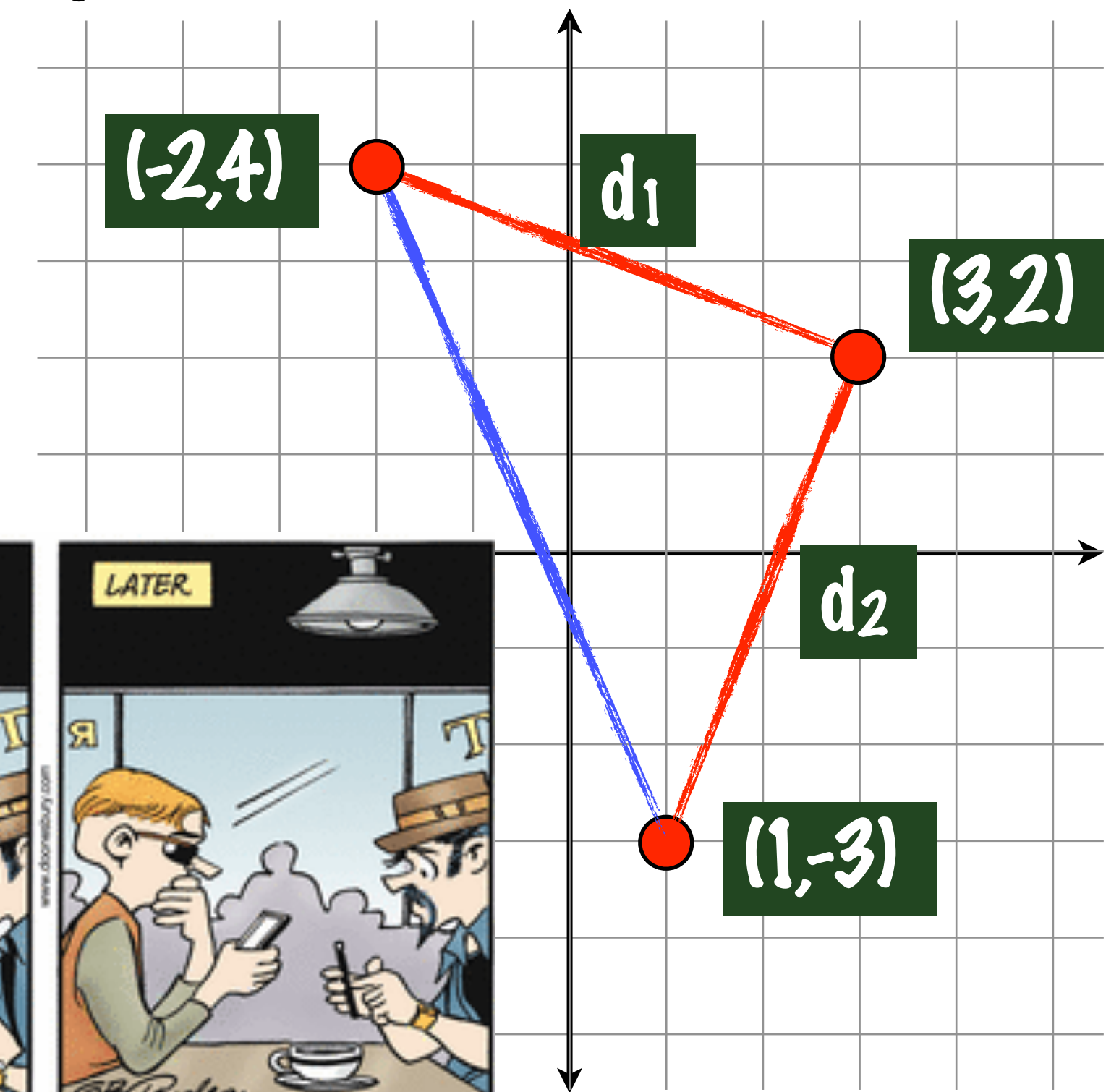
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$d_1 = \sqrt{(-2 - 3)^2 + (4 - 2)^2}$$

$$d_1 = \sqrt{(-5)^2 + (2)^2} = \sqrt{29}$$

$$d_2 = \sqrt{(3 - 1)^2 + (2 - -3)^2}$$

$$d_1 = \sqrt{(2)^2 + (5)^2} = \sqrt{29}$$



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Learning Target

8-G.6 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Success Criteria

I can find the midpoint of a line segment.



The Midpoint Formula



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.

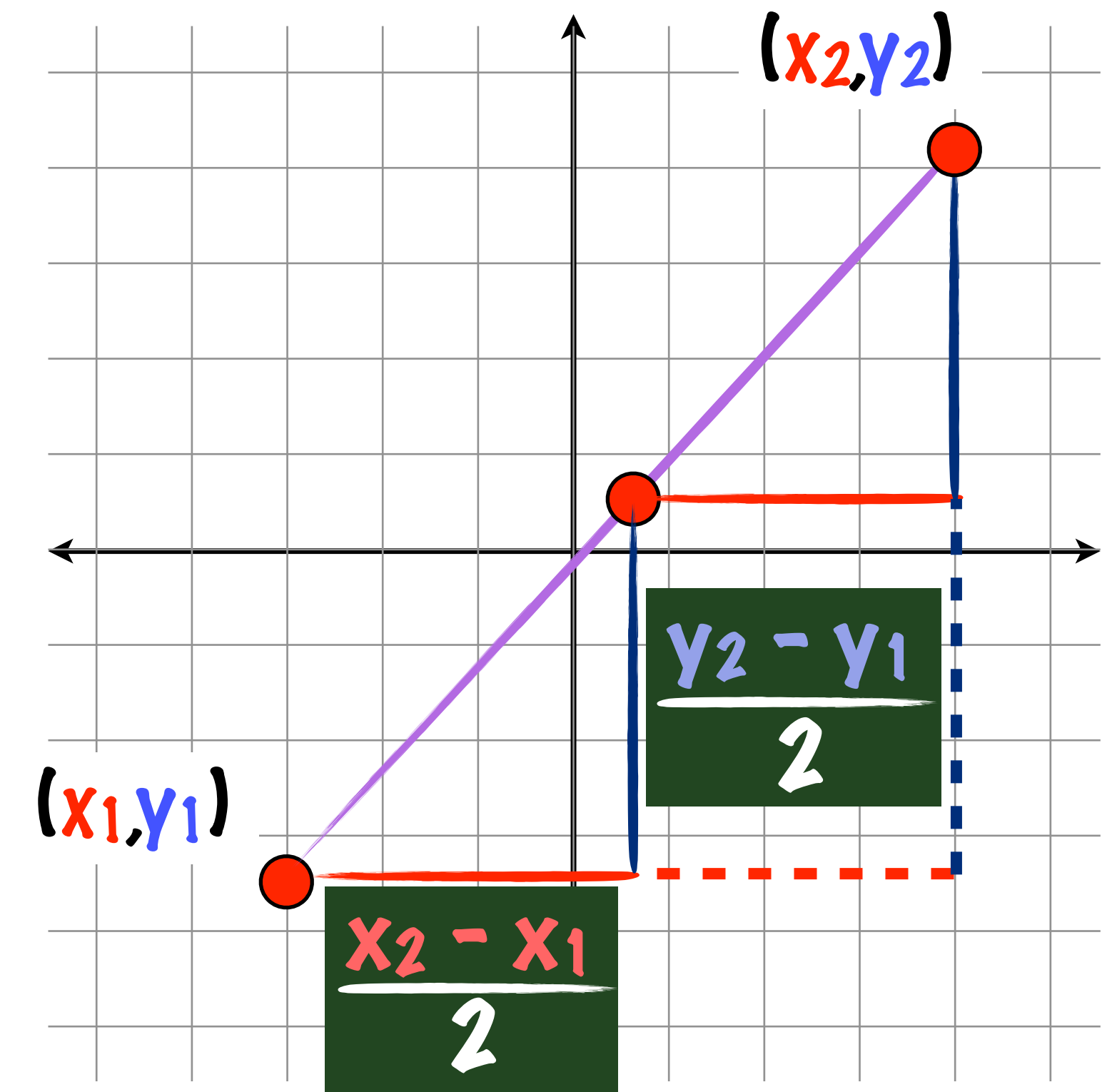
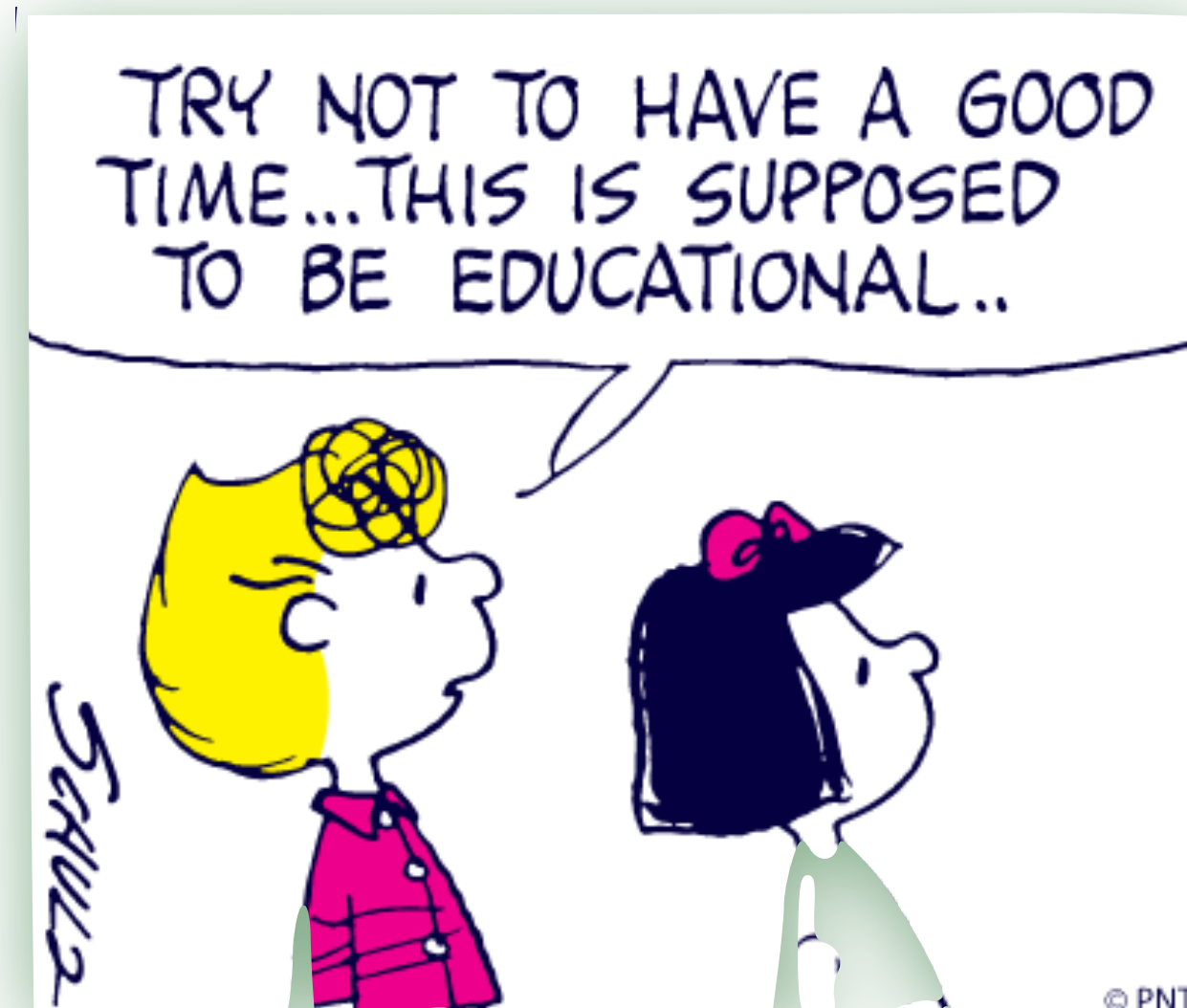
Consider a line segment whose endpoints are (x_1, y_1) and (x_2, y_2) .

The coordinates of the segment's **midpoint** are...

$$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2} \right)$$

$$x_1 + \frac{x_2 - x_1}{2} = \frac{2x_1}{2} + \frac{x_2 - x_1}{2} = \frac{x_1 + x_2}{2}$$

$$y_1 + \frac{y_2 - y_1}{2} = \frac{2y_1}{2} + \frac{y_2 - y_1}{2} = \frac{y_1 + y_2}{2}$$



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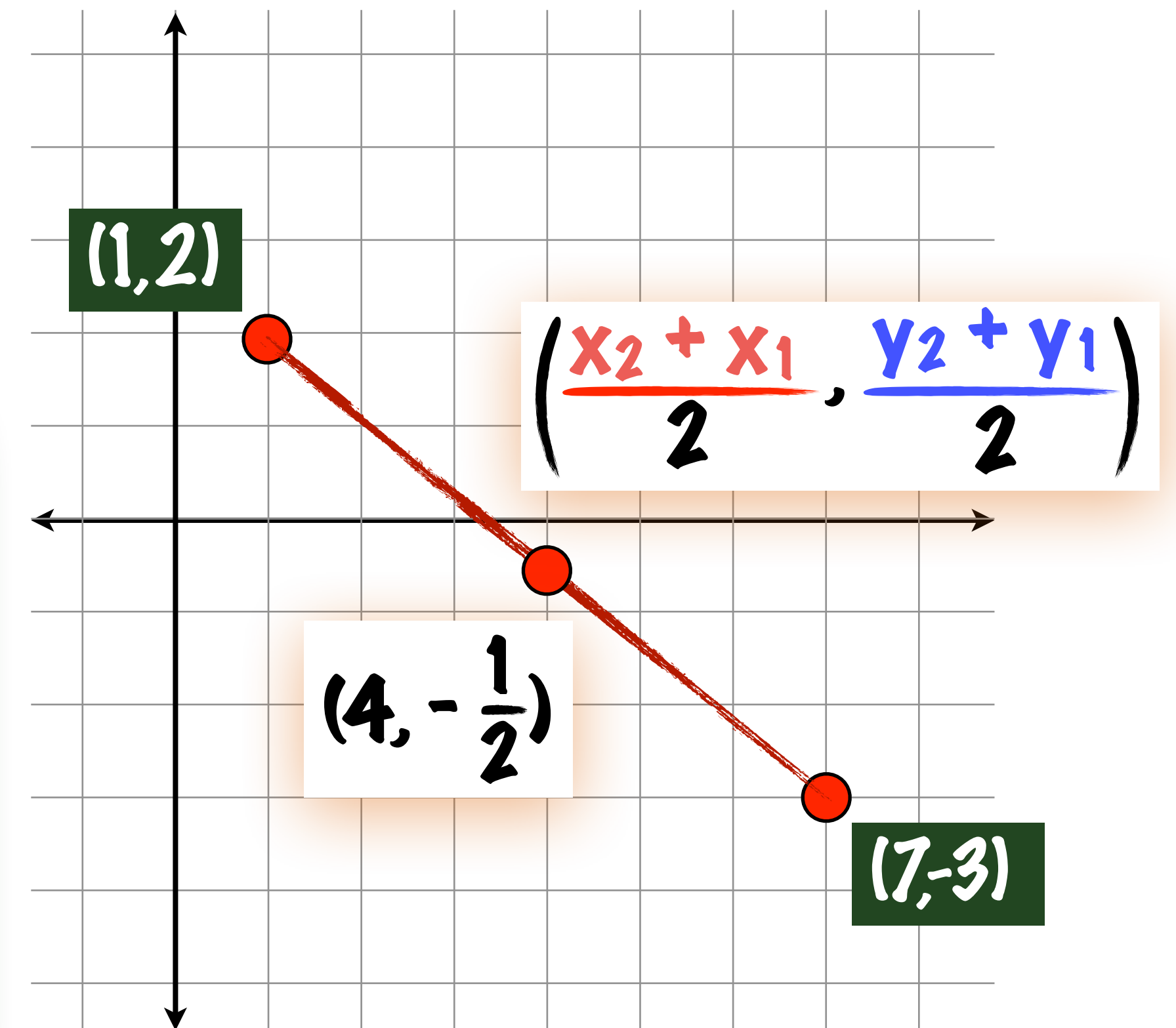
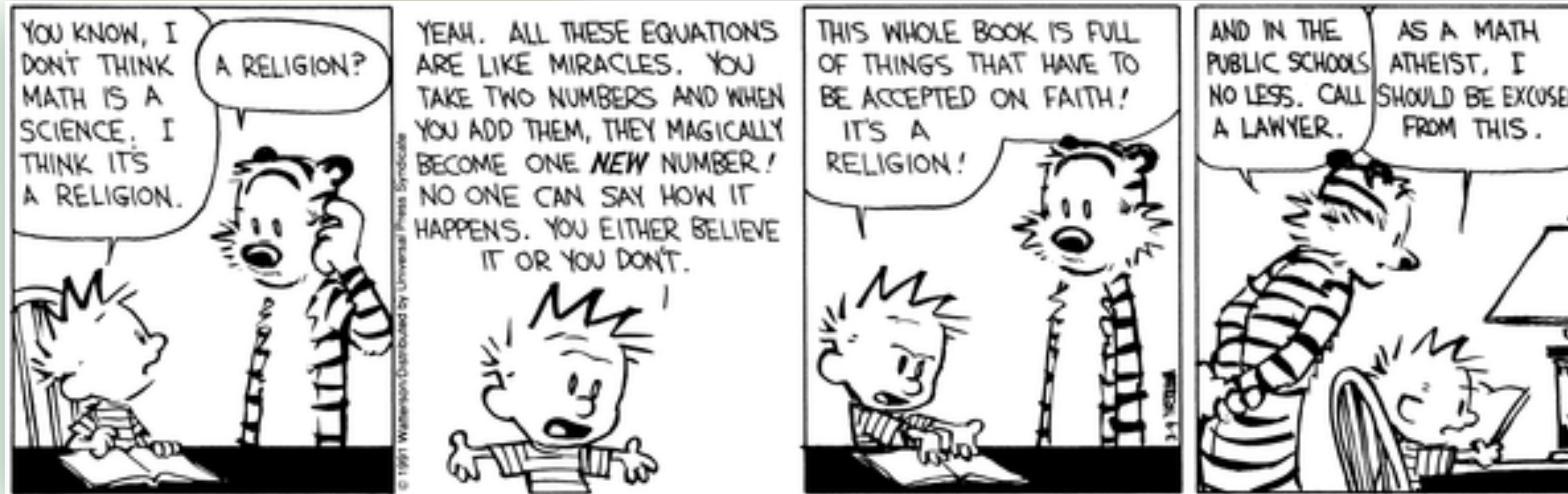
Applying the Midpoint Formula



- I can apply the Pythagorean Theorem.
- I can find the distance between two points.
- I can find the midpoint of a line segment.

Find the midpoint of the line segment with endpoints (1, 2) and (7, -3).

$$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2} \right) = \left(\frac{1 + 7}{2}, \frac{2 + -3}{2} \right) = \left(4, -\frac{1}{2} \right)$$



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Applying the Midpoint Formula

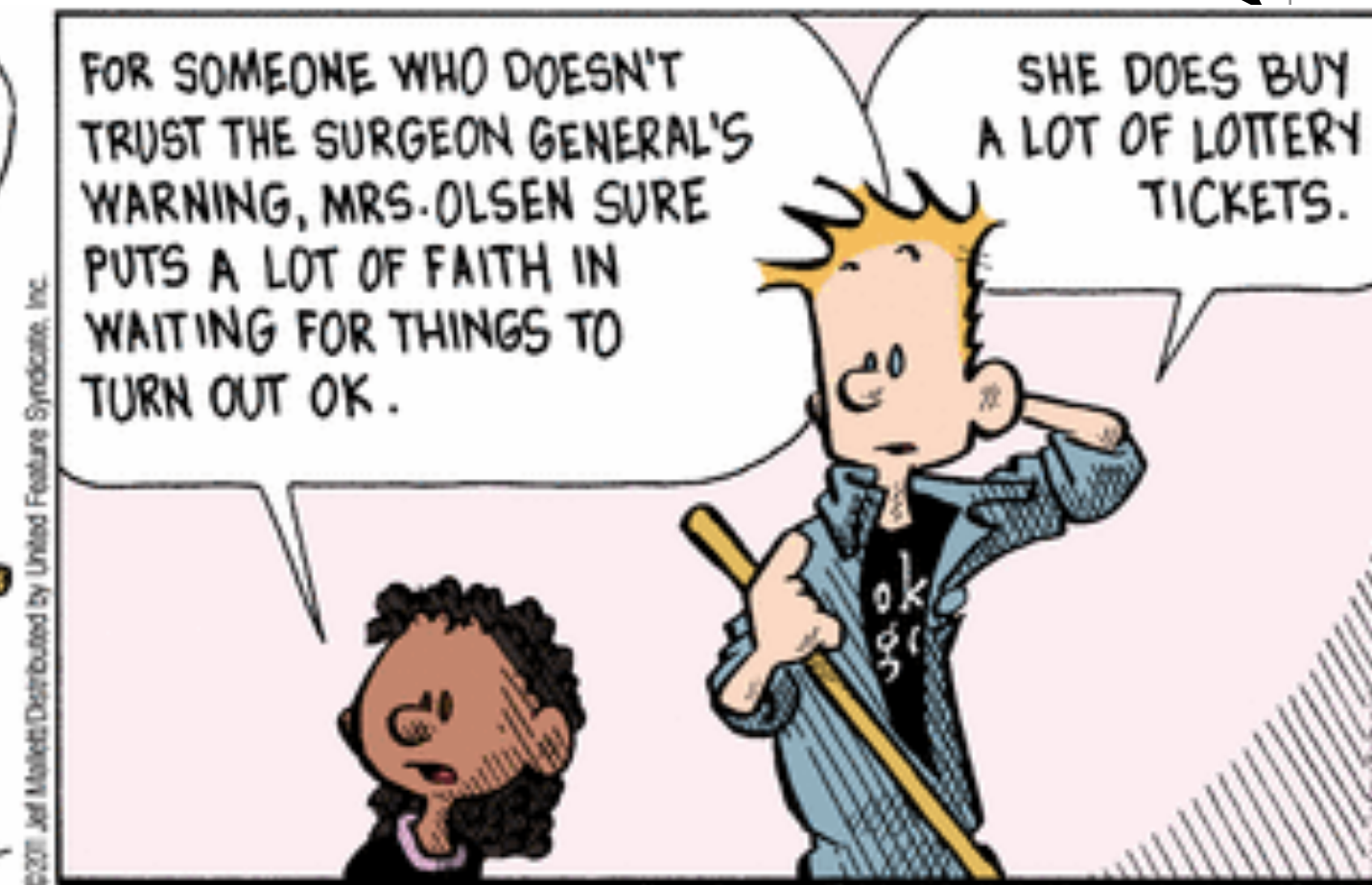
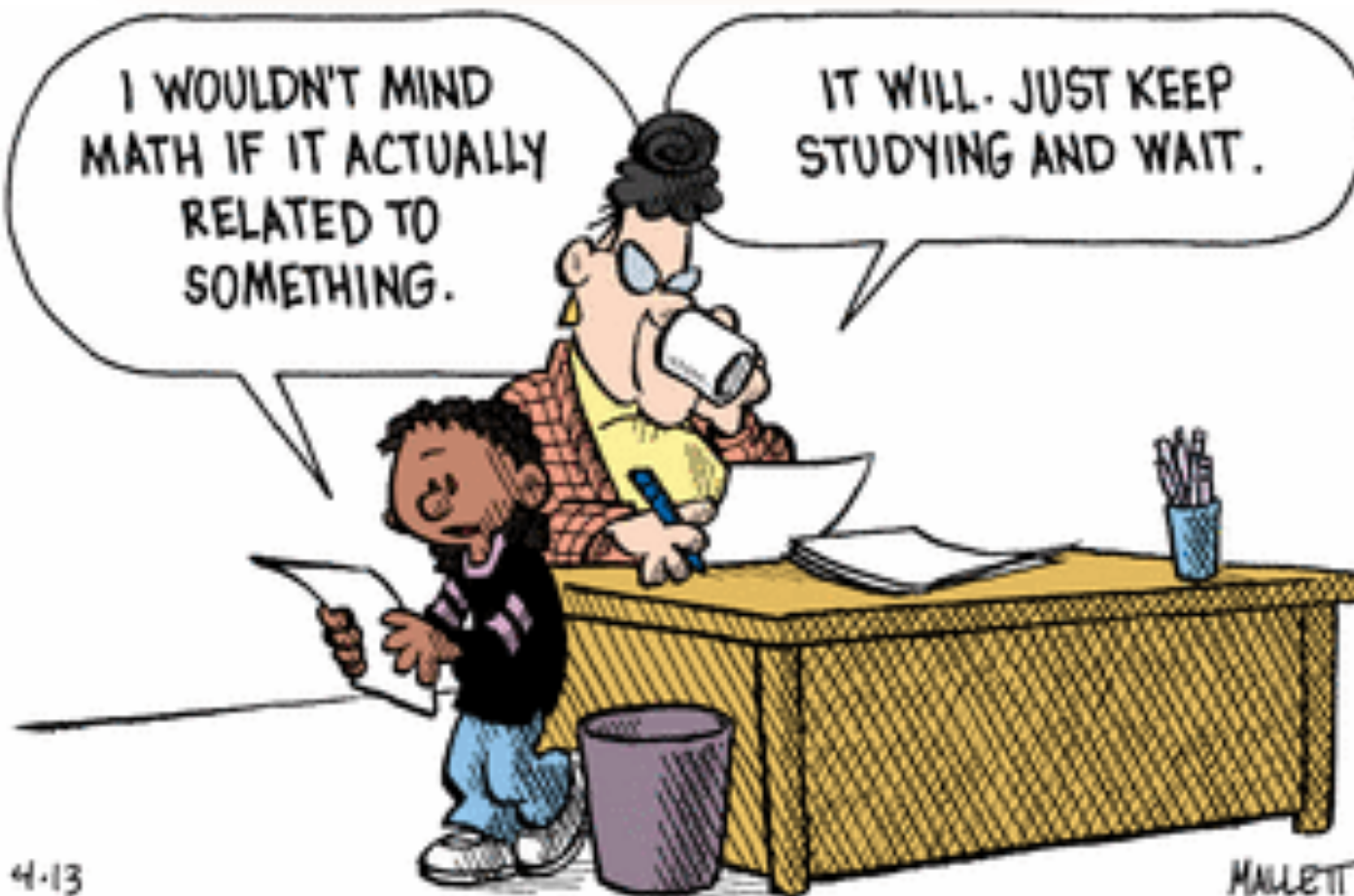
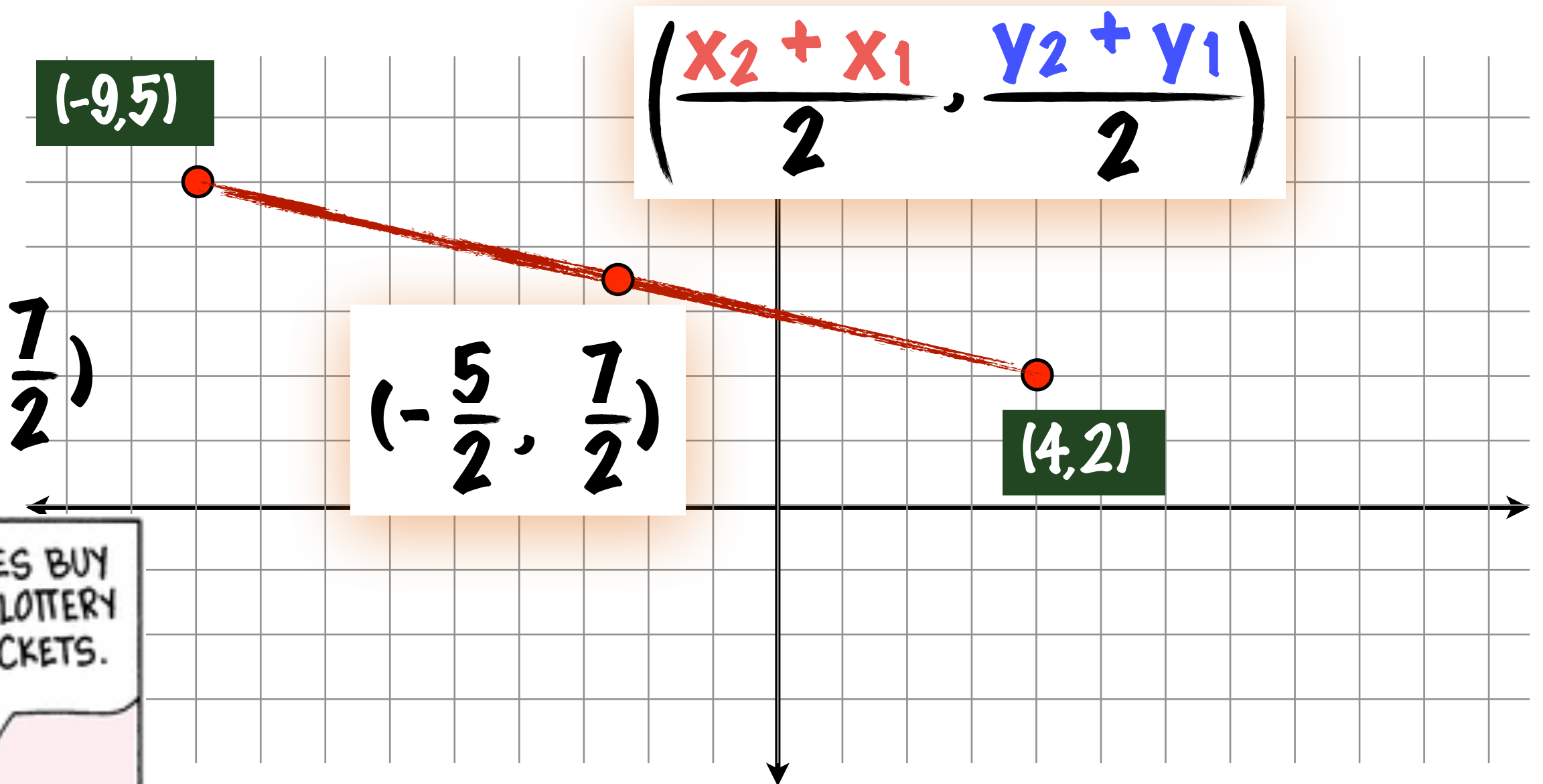


- I can apply the Pythagorean Theorem.
- I can find the distance between two points.
- I can find the midpoint of a line segment.



Find the midpoint of the line segment with endpoints $(-9, 5)$ and $(4, 2)$.

$$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2} \right) = \left(\frac{-9 + 4}{2}, \frac{5 + 2}{2} \right) = \left(-\frac{5}{2}, \frac{7}{2} \right)$$



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Applying the Midpoint Formula



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.

Find the **endpoint** of the line segment with one endpoint $(-1, 7)$ and midpoint $(5, 1)$.

$$\left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2} \right) \quad \left(\frac{-1 + x}{2}, \frac{7 + y}{2} \right) = (5, 1)$$

$$\frac{-1 + x}{2} = 5$$

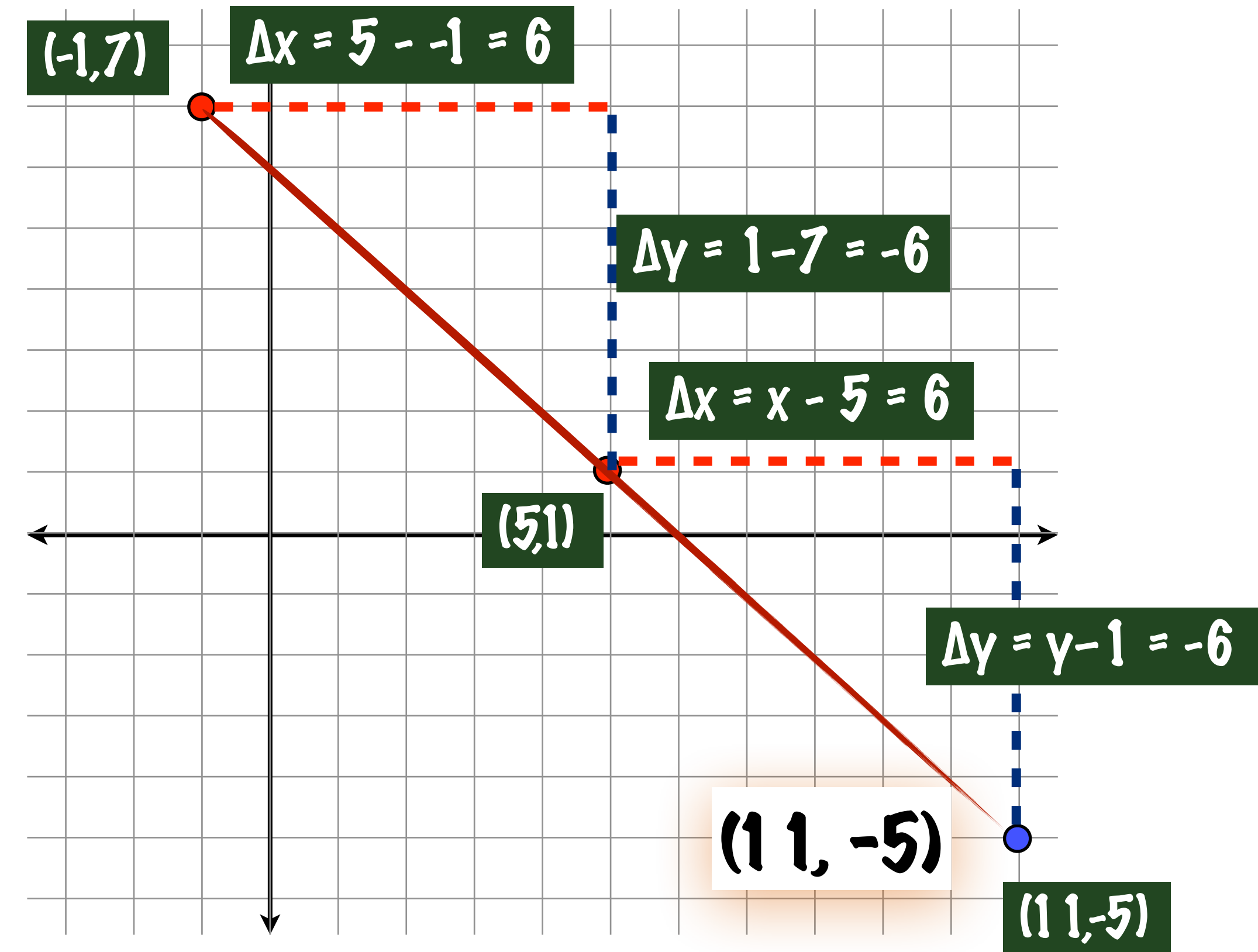
$$-1 + x = 10$$

$$x = 11$$

$$\frac{7 + y}{2} = 1$$

$$7 + y = 2$$

$$y = -5$$



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Formulae



I can apply the Pythagorean Theorem.
I can find the distance between two points.
I can find the midpoint of a line segment.



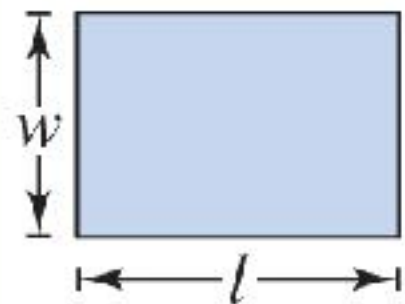
There are some common formulae with which you should be familiar. If these are not familiar, introduce yourself.

Common Formulas for Area A , Perimeter P , Circumference C , and Volume V

Rectangle

$$A = lw$$

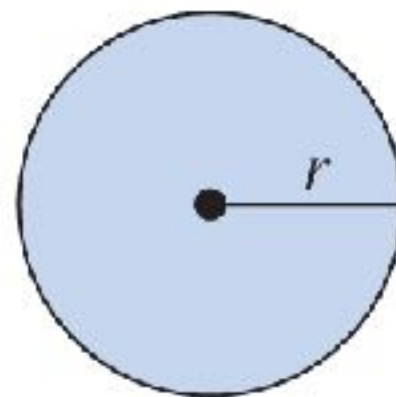
$$P = 2l + 2w$$



Circle

$$A = \pi r^2$$

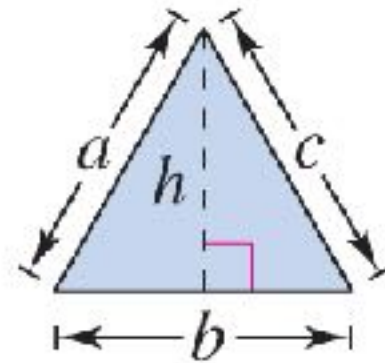
$$C = 2\pi r$$



Triangle

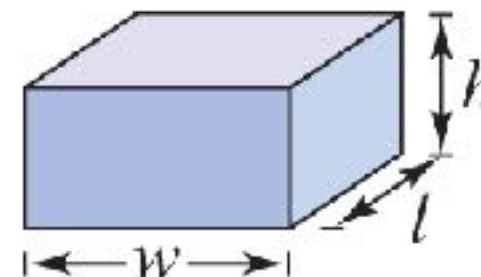
$$A = \frac{1}{2}bh$$

$$P = a + b + c$$



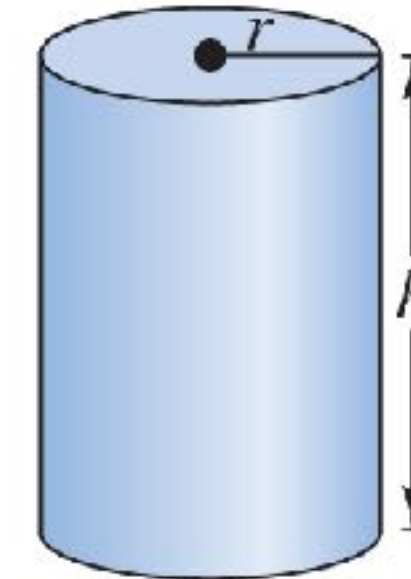
Rectangular Solid

$$V = lwh$$



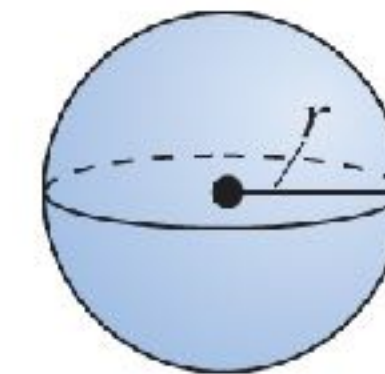
Circular Cylinder

$$V = \pi r^2 h$$



Sphere

$$V = \frac{4}{3}\pi r^3$$



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