

Length of a Line segment

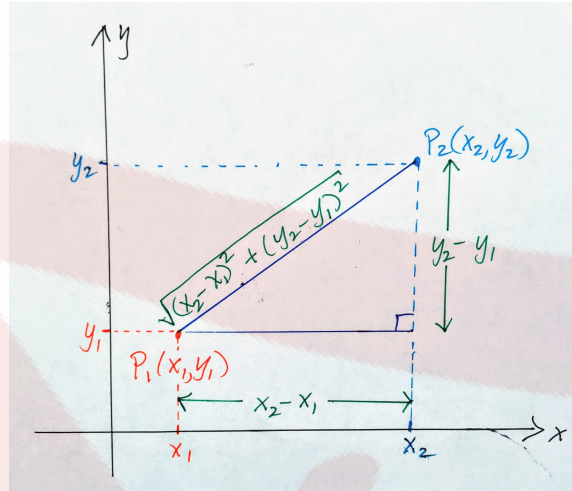
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## Length of a Line

How do you calculate the length of a line segment? Again, let's consider the points  $P_1(x_1, y_1)$  and  $P_2(x_2, y_2)$ .



Using the **Pythagorean Theorem**, we have that the length of the line segment  $P_2P_1$  is,

$$\text{length} = \overline{P_2P_1} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$$

Let's consider the example of the line segment with endpoints  $P_1(2, -3)$  and  $P_2(-4, 6)$ . The length of the line segment  $P_2P_1$  is,

$$\begin{aligned} \text{length} &= \sqrt{(-4 - 2)^2 + (6 - (-3))^2} \\ &= \sqrt{(-6)^2 + 9^2} \\ &= \sqrt{36 + 81} \\ &= \sqrt{117} \end{aligned}$$

So, the length of the line segment  $\overline{P_2P_1}$  is  $\sqrt{117}$ .

## Exercises

Find the length of the line segment  $\overline{PQ}$  given the points  $P$  and  $Q$  below.

a)  $P(3, 2), Q(0, 2)$

f)  $P(-2, 0), Q(1, 3)$

b)  $P(4, 1), Q(-1, 0)$

g)  $P(4, 0), Q(-1, 2)$

c)  $P(-1, 2), Q(2, 0)$

h)  $P(-1, -2), Q(4, 3)$

d)  $P(3, -2), Q(2, 2)$

i)  $P(-3, -4), Q(2, 0)$

e)  $P(-5, 3), Q(0, 1)$

j)  $P(0, -4), Q(3, 0)$