5

AB = $A = (3, 4)$ $B = 6, 7$

$C = 9, 4$ $D = 6, 1$

$AB = \sqrt{(x_2 - x_1) + (y_2 - y_1)}$

$= \sqrt{(6 - 3)^2 + (7 - 4)^2}$

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

$\sqrt{18}$

$3\sqrt{2}$

$=$

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

$= \sqrt{(9 - 6)^2 + (4 - 7)^2}$

$= (3)^2 + (-3)^2$

$= \sqrt{28} = 3\sqrt{5}$

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

$= \sqrt{(6-9)^2 + (1-4)^2}$

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

$= \sqrt{9+9}$

$= \sqrt{18}$

$= 3\sqrt{2}$

Champa ~~is~~ connect.

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

$= \sqrt{(3-6)^2 + (4-1)^2}$

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

$= \sqrt{18}$

$= 3\sqrt{2}$

Also diagonal $AC = \sqrt{(9-3)^2 + (4-4)^2}$

$= \sqrt{(6)^2 + (0)^2}$

$= \sqrt{36}$

$= 6$

and diagonal $BD = \sqrt{(6-6)^2 + (1-7)^2}$

$= \sqrt{(0)^2 + (6)^2}$

$= \sqrt{36}$

$= 6$

$\therefore AB = BC = CD = DA = 3\sqrt{2}$

and Diagonals $AC = BD$

Hence ~~that~~ ABCD is a square and champa is connect.

6

(i) distance between two points:
$\sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$

$AB = \sqrt{(1+1)^2 + (0+2)^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2}$

$BC = \sqrt{(-1-1)^2 + (2-0)^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2}$

$CD = \sqrt{(-3+1)^2 + (0-2)^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2}$

$AD = \sqrt{(-3+1)^2 + (0+2)^2} = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2}$

$BD = \sqrt{(-3-1)^2 + (0-0)^2} = \sqrt{16+0} = \sqrt{16} = 4$

Here, $AC = BD$, $AB = BC = CD = AD$

Hence, the quadrilateral ABCD is a square

(ii) $AB = \sqrt{(3+3)^2 + (1-5)^2}$
$= \sqrt{36+16}$
$= \sqrt{52} = 2\sqrt{13}$

$BC = \sqrt{(0-3)^2 + (3-1)^2}$
$= \sqrt{(9+4)} = \sqrt{13}$

$CD = \sqrt{(-1-0)^2 + (-4-3)^2}$
$= \sqrt{1+49}$
$= 5\sqrt{2}$

$AD = \sqrt{(-3+1)^2 + (5+4)^2}$
$= \sqrt{4+81} = \sqrt{85}$

Then don't form a quadrilateral

(iii) let points be $A(4,5)$ $B(7,6)$ $C(4,3)$
$D(1,2)$

$AB = \sqrt{(7-4)^2 + (6-5)^2} = \sqrt{9+1} = \sqrt{10}$

$BC = \sqrt{(4-7)^2 + (3-6)^2} = \sqrt{9+9} = 3\sqrt{2}$

$CD = \sqrt{(1-4)^2 + (2-3)^2} = \sqrt{9+1} = \sqrt{10}$

$AC = \sqrt{(4-4)^2 + (3-5)^2} = \sqrt{4} = 2$

$BD = \sqrt{(1-7)^2 + (2-6)^2} = \sqrt{36+16} = \sqrt{52} = 2\sqrt{13}$

Here $AB = CD$, $BC = AD$
and $AC \neq BD$

The quadrilateral is a parallelogram

7. $A(2,-5)$ $B = (-2,9)$
let $P(x,0)$ be the point

$PA = PB$
$PA^2 = PB^2$

Then
$(x-2)^2 + (0+5)^2 = (x+2)^2 + (0-9)^2$
$(x+2)^2 - (x-2)^2 = 81-25$
$(x-2+x+2)(x-2-x-2) = 56$
$(2x)(-4) = 56$
$-8x = 56$
$x = -7$

Hence, the required point is $(-7,0)$

8. $\sqrt{(x_2-x_1)^2+(y_2-y_1)^2} = PQ = \sqrt{(10-2)^2+(y+3)^2} = 10$

$\Rightarrow 64+y^2+9+6y = 100$

$\Rightarrow y^2+6y+73-100=0$

$\Rightarrow y^2+6y-27=0$

$\Rightarrow y(y+9)-3(y+9)=0 \Rightarrow (y-3)(y+9)=0$

$y-3=0$ or $y+9=0$

$y=3$ or -9.

9 Given $Q(0,1)$ $P(5,-3)$ $R(x,6)$

$QP = QR \Rightarrow QP^2 = QR^2$

$\Rightarrow (5-0)^2+(-3-1)^2 = (x-0)^2+(6-1)^2$

$25+16 = x^2+25$

$x^2 = 16 \Rightarrow x = \pm 4$

$QR = \sqrt{(x-0)^2+(6-1)^2}$

$= \sqrt{x^2+5^2}$

$= \sqrt{(4)^2+(5)^2} = \sqrt{16+25} = \sqrt{41}$

$PR = \sqrt{(x-5)^2+(6+3)^2}$

$= \sqrt{(4-5)^2+(6+3)^2}$

$= \sqrt{(-1)^2+(9)^2}$

$= \sqrt{1+81}$

$= \sqrt{82}$

Also $PR = \sqrt{(-4-5)^2+(6+3)^2}$ [taking $x=-4$]

$= \sqrt{(-9)^2+9^2} = \sqrt{162} = 9\sqrt{2}$

Hence, $QR = \sqrt{41}$ and $PR = \sqrt{82}, 9\sqrt{2}$

10

Points $A(3,6)$ and $B(-3,4)$ are equidistant from point $P(x,y)$

$AP = BP \Rightarrow \sqrt{(x-3)^2+(y-6)^2} = \sqrt{(x+3)^2+(y-4)^2}$

$\Rightarrow (x-3)^2+(y-6)^2 = (x+3)^2+(y-4)^2$

$x^2+9-6x+y^2+36-12y = x^2+9+6x+y^2+16-8y$

$-6x-6x-12y+8y+45-25 = 0 \Rightarrow -12x-4y+20=0$

$3x+y-5=0$