2 JEE Main 2021 (Online) 18th March Morning Shift

MCQ (Single Correct Answer)

For the four circles M, N, O and P, following four equations are given :

Circle M : $x^2 + y^2 = 1$

Circle N : $x^2 + y^2 - 2x = 0$

Circle O : $x^2 + y^2 - 2x - 2y + 1 = 0$

Circle P : $x^2 + y^2 - 2y = 0$

If the centre of circle M is joined with centre of the circle N, further center of circle N is joined with centre of the circle O, centre of circle O is joined with the centre of circle P and lastly, centre of circle P is joined with centre of circle M, then these lines form the sides of a :

A Rhombus

B Square

C Rectangle

D Parallelogram

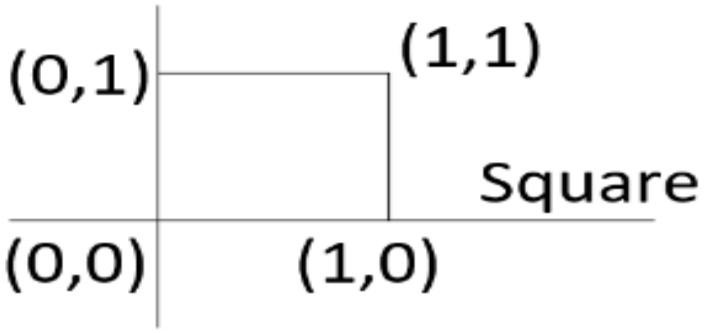
Explanation

$C_M = (0, 0)$

$C_N = (1, 0)$

$C_O = (1, 1)$

$C_P = (0, 1)$



3 JEE Main 2021 (Online) 18th March Morning Shift

MCQ (Single Correct Answer)

Choose the correct statement about two circles whose equations are given below :

$x^2 + y^2 - 10x - 10y + 41 = 0$

$x^2 + y^2 - 22x - 10y + 137 = 0$

A circles have same centre

B circles have no meeting point

C circles have only one meeting point

D circles have two meeting points

Explanation

Let $S_1 : x^2 + y^2 - 10x - 10y + 41 = 0$

$\Rightarrow (x-5)^2 + (y-5)^2 = 9$

Centre $(C_1) = (5, 5)$

Radius $r_1 = 3$

$S_2 : x^2 + y^2 - 22x - 10y + 137 = 0$

$\Rightarrow (x-11)^2 + (y-5)^2 = 9$

Centre $(C_2) = (11, 5)$

Radius $r_2 = 3$

distance $(C_1C_2) = \sqrt{(5-11)^2 + (5-5)^2}$

distance $(C_1C_2) = 6$

$\because r_1 + r_2 = 3 + 3 = 6$

$\therefore$ circles touch externally

Hence, circle have only one meeting point.

JEE Main 2021 (Online) 22th July Evening Shift

MCQ (Single Correct Answer)

Let the circle S : $36x^2 + 36y^2 - 108x + 120y + C = 0$ be such that it neither intersects nor touches the co-ordinate axes. If the point of intersection of the lines, $x - 2y = 4$ and $2x - y = 5$ lies inside the circle S, then :

A $\frac{25}{6} < C < \frac{13}{3}$

B $100 < C < 165$

C $81 < C < 156$

D $100 < C < 156$

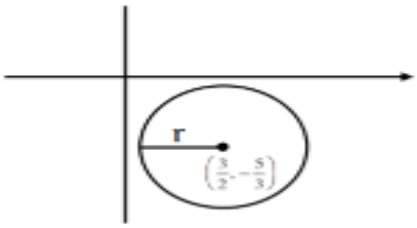
Explanation

$S : 36x^2 + 36y^2 - 108x + 120y + C = 0$

$\Rightarrow x^2 + y^2 - 3x + \frac{10}{3}y + \frac{C}{36} = 0$

Centre $= (-g, -f) = \left(\frac{3}{2}, \frac{-10}{6}\right)$

radius $= r = \sqrt{\frac{9}{4} + \frac{100}{36} - \frac{C}{36}}$



Now,

$\Rightarrow r < \frac{3}{2}$

$\Rightarrow \frac{9}{4} + \frac{100}{36} - \frac{C}{36} < \frac{9}{4}$

$\Rightarrow C > 100$ ..... (1)

Now, point of intersection of $x - 2y = 4$ and $2x - y = 5$ is $(2, -1)$, which lies inside the circle S.

$\therefore S(2, -1) < 0$

$\Rightarrow (2)^2 + (-1)^2 - 3(2) + \frac{10}{3}(-1) + \frac{C}{36} < 0$

$\Rightarrow 4 + 1 - 6 - \frac{10}{3} + \frac{C}{36} < 0$

$C < 156$ ..... (2)

From (1) & (2)

$100 < C < 156$ Ans.