



TMUA 2021 Paper 1 Question 1

1 Two circles have the same radius.

The centre of one circle is  $(-2, 1)$ .

The centre of the other circle is  $(3, -2)$ .

The circles intersect at two distinct points.

What is the equation of the straight line through the two points at which the circles intersect?

A  $3x - 5y = 4$

B  $3x + 5y = -1$

C  $5x - 3y = -4$

D  $5x - 3y = -1$

E  $5x - 3y = 1$

F  $5x - 3y = 4$

G  $5x + 3y = 1$

The circles have the same radius, therefore we are looking for the perpendicular bisector of the line segment between the two circle centres.

Let  $p$  be the midpoint of the line segment. Then  $p$  lies on the perpendicular bisector and  $p$  is  $(\frac{3-2}{2}, \frac{-2+1}{2}) = (\frac{1}{2}, -\frac{1}{2})$

Let  $m$  be the gradient of the perpendicular bisector.

Then  $m$  will be the negative reciprocal of  $\frac{-2-1}{3-(-2)} = -\frac{3}{5}$

i.e.  $m = \frac{5}{3}$

Then I have  $y - y_1 = m(x - x_1)$

using  $p$ , so  $(x_1, y_1) = (\frac{1}{2}, -\frac{1}{2})$   
 $y + \frac{1}{2} = \frac{5}{3}(x - \frac{1}{2})$   
 $y + \frac{1}{2} = \frac{5}{3}x - \frac{5}{6}$

$$\begin{aligned} 6y + 3 &= 10x - 5 \\ -10x + 6y &= -8 \\ 5x - 3y &= 4 \end{aligned}$$

which is option F.