Cambridge International AS & A Level

---

https://babacambridgesolutions.com

Mathematics 9709/32

Paper 3 Pure Mathematics 3 **May/June 2021**

Question No (2)

2 On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z + 1 - i| \leqslant 1$ and $\arg(z - 1) \leqslant \frac{3}{4}\pi$.

Solution:

$$|Z + 1 - i| \leq 1$$

$$|x + iy + 1 - i| \leq 1 \qquad \because Z = x + iy$$

$$|(x + 1) + i(y - 1)| \leq 1$$

if $Z = x + iy$ *then*

$$|Z| = \sqrt{x^2 + y^2}$$

$$\sqrt{(x + 1)^2 + (y - 1)^2} \leq 1$$

Squaring

$$(x + 1)^2 + (y - 1)^2 \leq 1$$

Equation of circle with center (a, b) *and radius* r

$$(x - a)^2 + (y - b)^2 = (r)^2$$

This is a circle with centre $(-1, \quad 1)$ *and radius* 1

$$As \ \arg\ (Z - 1) \leq \frac{3\pi}{4}$$

$$\arg(x + iy - 1) \leq \frac{3\pi}{4}$$

$$\arg(x - 1 + iy) \leq \frac{3\pi}{4}$$

$$tan^{-1}\left(\frac{y}{x - 1}\right) = \frac{3\pi}{4}$$

$$\frac{y}{x - 1} = \tan\left(\frac{3\pi}{4}\right) = -1$$

$$y = -(x - 1)$$

$$y = -x + 1$$

$It\ is\ a\ line\ making\ an\ angle \frac{3\pi}{4}\ anticlockwise.$

$$As\ y = -x + 1$$

$$at\ y = 0$$

$$x = 1$$