

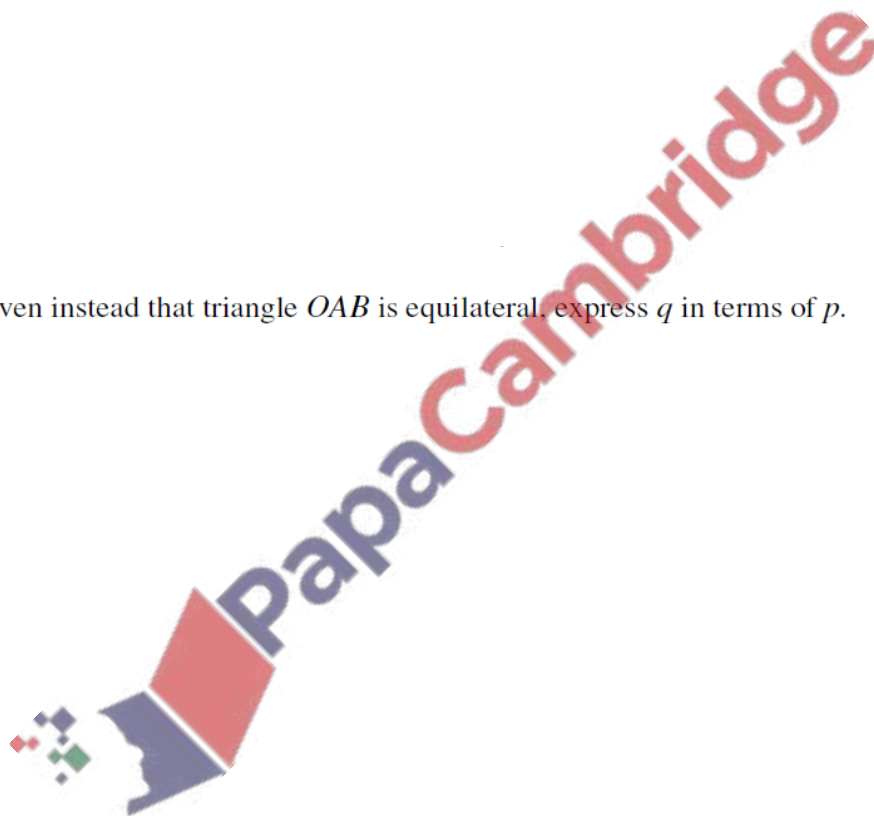
1. **June/2021/Paper\_9709/31/No.5**

- (a) Solve the equation  $z^2 - 2piz - q = 0$ , where  $p$  and  $q$  are real constants. [2]

In an Argand diagram with origin  $O$ , the roots of this equation are represented by the distinct points  $A$  and  $B$ .

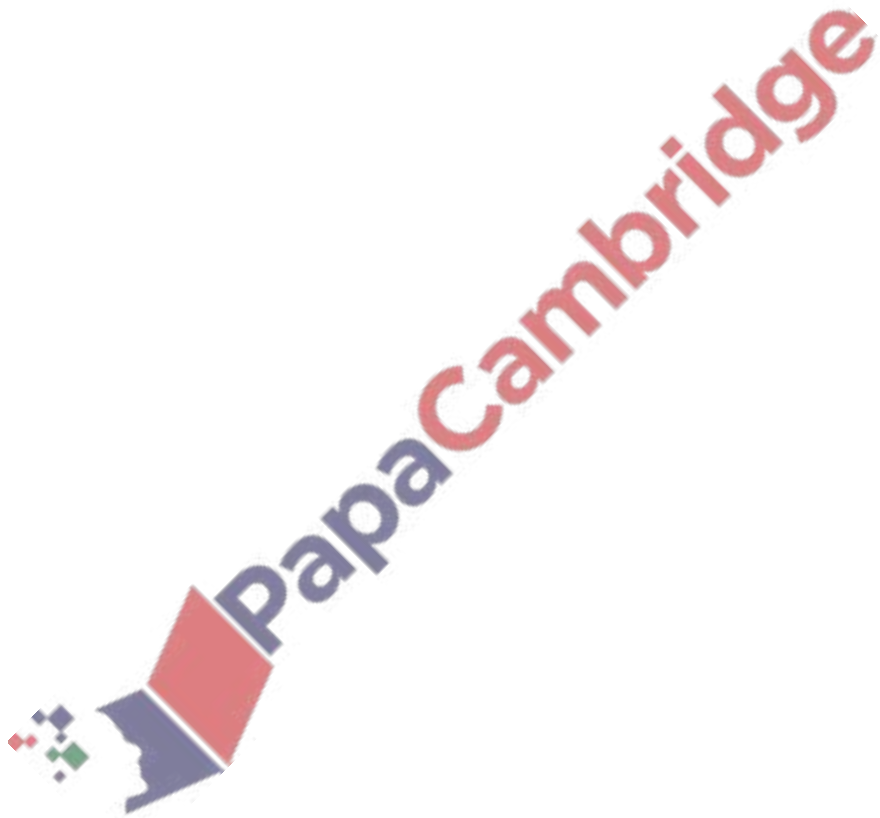
- (b) Given that  $A$  and  $B$  lie on the imaginary axis, find a relation between  $p$  and  $q$ . [2]

- (c) Given instead that triangle  $OAB$  is equilateral, express  $q$  in terms of  $p$ . [3]



2. June/2021/Paper\_9709/32/No.2

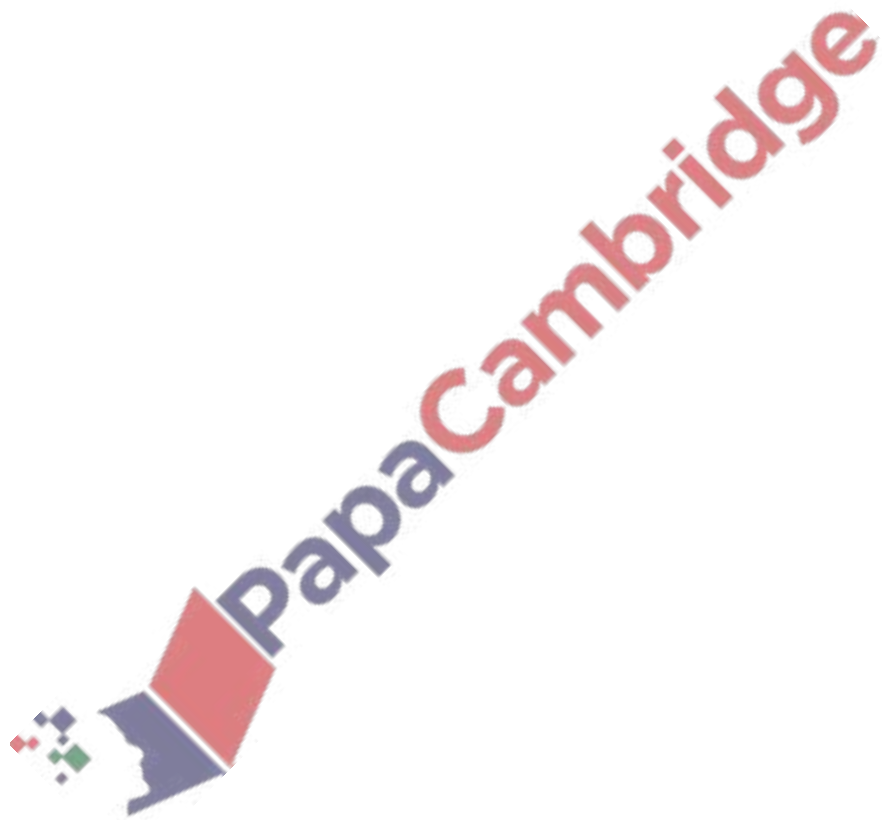
On a sketch of an Argand diagram, shade the region whose points represent complex numbers  $z$  satisfying the inequalities  $|z + 1 - i| \leq 1$  and  $\arg(z - 1) \leq \frac{3}{4}\pi$ . [4]



3. June/2021/Paper\_9709/32/No.5

The complex number  $u$  is given by  $u = 10 - 4\sqrt{6}i$ .

Find the two square roots of  $u$ , giving your answers in the form  $a + ib$ , where  $a$  and  $b$  are real and exact. [5]



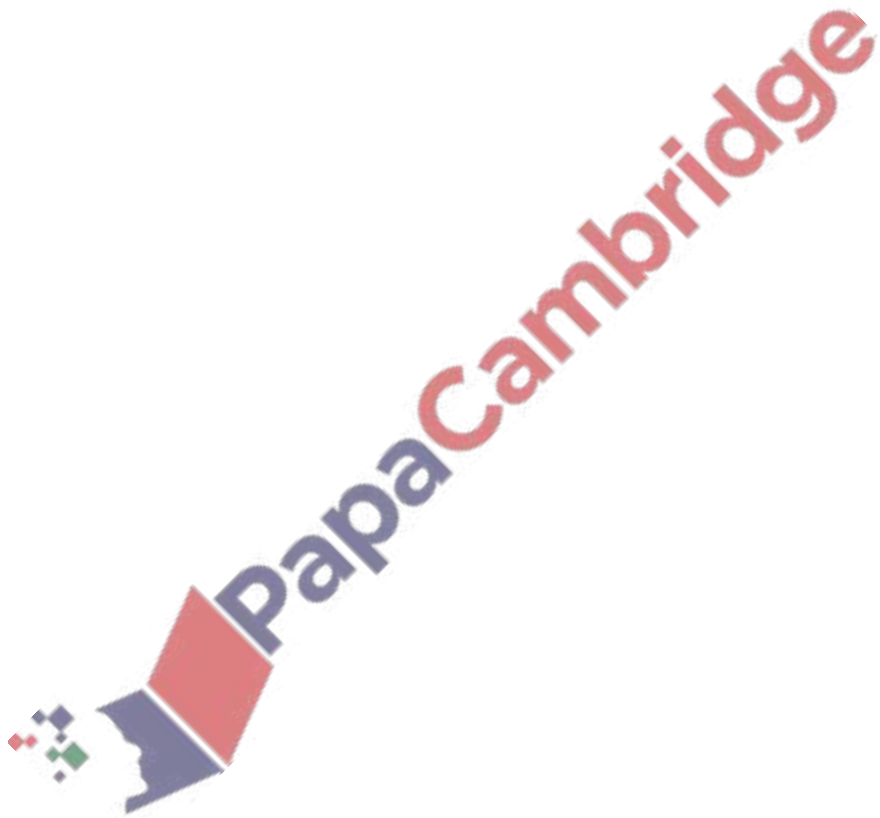
4. June/2021/Paper\_9709/33/No.10

(a) Verify that  $-1 + \sqrt{2}i$  is a root of the equation  $z^4 + 3z^2 + 2z + 12 = 0$ .

[3]

(b) Find the other roots of this equation.

[7]



5. March/2021/Paper\_9709/32/No.8

The complex numbers  $u$  and  $v$  are defined by  $u = -4 + 2i$  and  $v = 3 + i$ .

(a) Find  $\frac{u}{v}$  in the form  $x + iy$ , where  $x$  and  $y$  are real. [3]

(b) Hence express  $\frac{u}{v}$  in the form  $re^{i\theta}$ , where  $r$  and  $\theta$  are exact. [2]

In an Argand diagram, with origin  $O$ , the points  $A$ ,  $B$  and  $C$  represent the complex numbers  $u$ ,  $v$  and  $2u + v$  respectively.

(c) State fully the geometrical relationship between  $OA$  and  $BC$ . [2]

(d) Prove that angle  $AOB = \frac{3}{4}\pi$ . [2]

