

# Further Pure Mathematics 1

## Complex Numbers

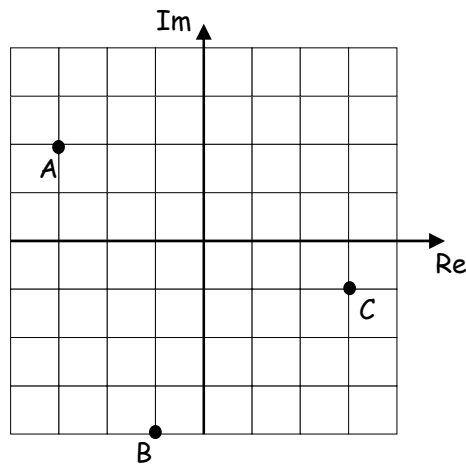
### Section 2: The Argand diagram

#### Multiple Choice Test

1) The modulus of the complex number  $z = 2 - 5j$  is

- (a)  $\sqrt{29}$  (b) 29  
(c) 7 (d)  $\sqrt{7}$   
(e) I don't know

Questions 2 – 4 refer to the Argand diagram below.



2) In the Argand diagram, the point A represents the complex number

- (a)  $3 - 2j$  (b)  $-3 + 2j$   
(c)  $2 - 3j$  (d)  $-2 + 3j$   
(e) I don't know

3) In the Argand diagram, the point B represents the complex number

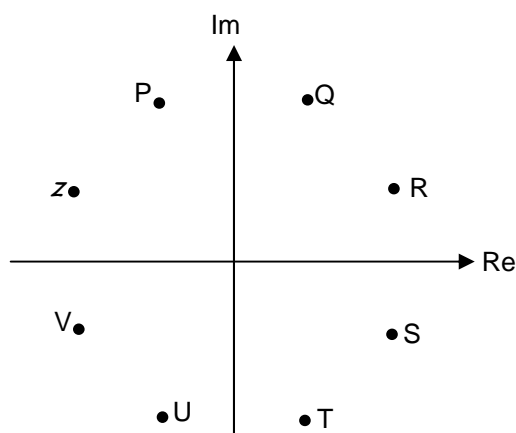
- (a)  $4 + j$  (b)  $-4 - j$   
(c)  $1 + 4j$  (d)  $-1 - 4j$   
(e) I don't know

4) In the Argand diagram, the point C represents the complex number

- (a)  $3 - j$  (b)  $1 - 3j$   
(c)  $-3 + j$  (d)  $-1 + 3j$   
(e) I don't know

# Further Pure Mathematics 1

Questions 5-7 refer to the Argand diagram below. The point representing the complex number  $z$  is shown on the diagram.



5) The point which represents  $z^*$  is

- (a) V
- (b) R
- (c) Q
- (d) T
- (e) I don't know

6) The point which represents  $jz$  is

- (a) U
- (b) S
- (c) P
- (d) Q
- (e) I don't know

7) The point which represents  $-z$  is

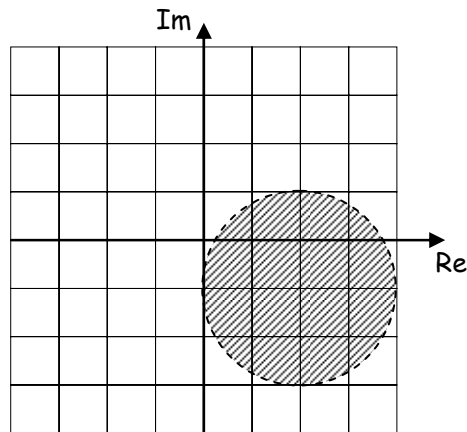
- (a) V
- (b) R
- (c) S
- (d) T
- (e) I don't know

8) The set of points for which  $|z - 2 + 3j| = 4$  is

- (a) a circle, centre  $-2 + 3j$ , radius 4
- (b) a circle, centre  $2 - 3j$ , radius 2
- (c) a circle, centre  $2 - 3j$ , radius 4
- (d) a circle, centre  $-2 + 3j$ , radius 2
- (e) I don't know

# Further Pure Mathematics 1

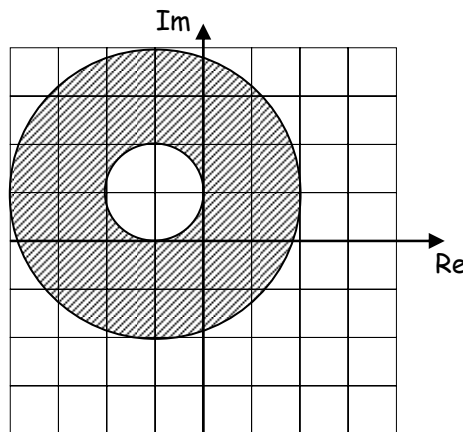
9)



The shaded area in the Argand diagram represents the points  $z$  for which

- |                          |                          |
|--------------------------|--------------------------|
| (a) $ z + 2 - j  \leq 2$ | (b) $ z - 2 + j  \leq 2$ |
| (c) $ z + 2 - j  < 2$    | (d) $ z - 2 + j  < 2$    |
| (e) I don't know         |                          |

10)



The shaded area in the Argand diagram above represents the points  $z$  for which

- |                                 |                                 |
|---------------------------------|---------------------------------|
| (a) $2 \leq  z + 1 - j  \leq 6$ | (b) $1 \leq  z + 1 - j  \leq 3$ |
| (c) $2 \leq  z - 1 + j  \leq 6$ | (d) $1 \leq  z - 1 + j  \leq 3$ |
| (e) I don't know                |                                 |

# Further Pure Mathematics 1

## Solutions to Multiple Choice Test

1) The correct answer is (a)

$$\begin{aligned}|2 - 5j| &= \sqrt{2^2 + 5^2} \\ &= \sqrt{29}\end{aligned}$$

2) The correct answer is (b)

A has coordinates  $(-3, 2)$ . This represents the complex number  $-3 + 2j$ .

3) The correct answer is (d)

B has coordinates  $(-1, -4)$ . This represents the complex number  $-1 - 4j$ .

4) The correct answer is (a)

C has coordinates  $(3, -1)$ . This represents the complex number  $3 - j$ .

5) The correct answer is (a)

Let the point representing  $z$  have coordinates  $(-a, b)$ , where  $a$  and  $b$  are positive.  
The complex number  $z$  is therefore  $-a + bj$ .  
The complex number  $z^*$  is therefore  $-a - bj$ .  
This is represented by the point  $v$ .

6) The correct answer is (a)

The complex number  $jz$  is  $j(-a + bj) = -aj - b = -b - aj$ .  
This is represented by the point  $u$ .

7) The correct answer is (c)

The complex number  $-z$  is  $-(-a + bj) = a - bj$ .  
This is represented by the point  $s$ .

8) The correct answer is (c)

## Further Pure Mathematics 1

$$|z - 2 + 3j| = 4$$

$$|z - (2 - 3j)| = 4$$

This means that the distance of the point  $z$  from the point  $2 - 3j$  is always 4. Therefore the set of points is a circle, centre  $2 - 3j$ , radius 4.

9) The correct answer is (d)

The shaded area is the area inside the circle with centre  $(2, -1)$  and radius 2. So this is the locus of a point  $z$  whose distance from the point  $2 - j$  is always less than 2.

This is the set of points given by  $|z - (2 - j)| < 2$

$$|z - 2 + j| < 2$$

10) The correct answer is (b)

The shaded area is the area between (and including) the circles which both have centre  $(-1, 1)$ , with radii 1 and 3.

So this is the locus of a point  $z$  whose distance from the point  $-1 + j$  is always greater than or equal to 1 and less than or equal to 3.

This is the set of points given by  $1 \leq |z - (-1 + j)| \leq 3$

$$1 \leq |z + 1 - j| \leq 3$$