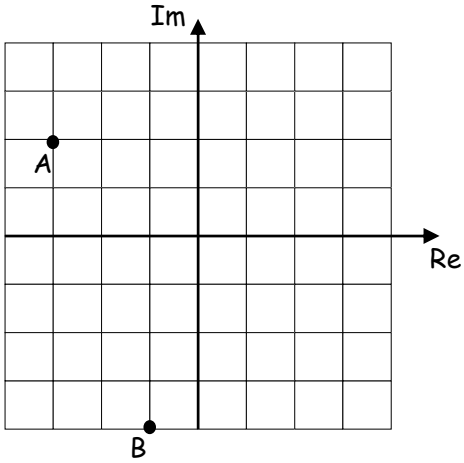
EdExcel Further Pure 1

Complex Numbers

Section 2: The Argand diagram and the modulus-argument form

Multiple Choice Test

Questions 1 and 2 refer to the Argand diagram below.



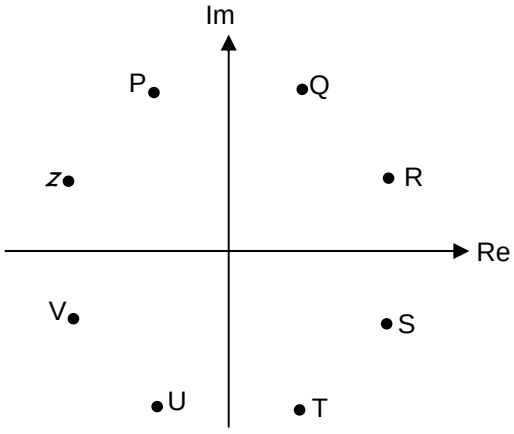
1) In the Argand diagram, the point A represents the complex number

(a) –3 + 2i
(b) 3 – 2i
(c) 2 – 3i
(d) –2 + 3i
(e) I don't know

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

(a) 1 + 4i
(b) –4 – i
(c) –1 – 4i
(d) 4 + i
(e) I don't know

Questions 3 – 5 refer to the Argand diagram below. The point representing the complex number z is shown on the diagram.



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3) The point which represents z^* is

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

4) The point which represents iz is

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

5) The point which represents $-z$ is

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

6) The modulus of the complex number $z = 2 - 5i$ is

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

7) The principal argument of the complex number $-1+i\sqrt{3}$ is

(a) $-\frac{\pi}{3}$
(b) $-\frac{2\pi}{3}$
(c) $\frac{\pi}{3}$
(d) $\frac{2\pi}{3}$
(e) I don't know

8) The complex number $2 - 2i$ can be written in modulus-argument form as

(a) $2\left(\cos\left(-\frac{\pi}{4}\right)+i\sin\left(-\frac{\pi}{4}\right)\right)$
(b) $2\sqrt{2}\left(\cos\left(-\frac{\pi}{4}\right)+i\sin\left(-\frac{\pi}{4}\right)\right)$
(c) $2\sqrt{2}\left(\cos\left(\frac{\pi}{4}\right)-i\sin\left(\frac{\pi}{4}\right)\right)$
(d) $2\left(\cos\left(\frac{\pi}{4}\right)-i\sin\left(\frac{\pi}{4}\right)\right)$
(e) I don't know

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9) The complex number with modulus 2 and argument -1.5 is

(a) 0.14 – 1.99i
(b) 1.99 – 0.14i
(c) –0.14 + 1. 99i
(d) –1.99 +0.14i
(e) I don't know

10) The complex numbers *w* and *z* are given by $z = 2\left(\cos\frac{2\pi}{3} + \mathrm{i}\sin\frac{2\pi}{3}\right)$ and $w = 4 - 3\mathrm{i}$.

The modulus of the complex number *wz* is given by

(a) 8
(b) 7
(c) 5
(d) 10
(e) I don't know

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Solutions to Multiple Choice Test

1) The correct answer is (a)

A is the point (-3, 2).
This represents the complex number -3 + 2i.

2) The correct answer is (c)

B is the point (-1, -4).
This represents the complex number -1 – 4i.

3) The correct answer is (b)

If $z = x + iy$, then $z^* = x - iy$.
So the point which represents z^* is the reflection of the point which represents z in the x-axis.
This is point V.

4) The correct answer is (d)

If $z = x + iy$, then $iz = ix - y = -y + ix$.
The point which represents iz has x-coordinate equal to the y-coordinate of z, but with opposite sign, and y-coordinate equal to the x-coordinate of z.
This is point U.

5) The correct answer is (c)

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

6) The correct answer is (a)

$$|2 - 5i| = \sqrt{2^2 + 5^2} = \sqrt{29}$$

7) The correct answer is (d)

$z = -1 + \sqrt{3}i$

$\tan\theta = \dfrac{\sqrt{3}}{-1} = -\sqrt{3}$

Since θ is in the second quadrant, $\theta = \dfrac{2\pi}{3}$.

8) The correct answer is (b)

$z = 2 - 2i$

$|z| = \sqrt{2^2 + 2^2} = 2\sqrt{2}$

$\tan\theta = \dfrac{-2}{2} = -1$

Since θ is in the fourth quadrant, $\theta = -\dfrac{\pi}{4}$.

$z = 2\sqrt{2}\left(\cos\left(-\dfrac{\pi}{4}\right) + i\sin\left(-\dfrac{\pi}{4}\right)\right)$

9) The correct answer is (a)

Let $z = x + iy$

$|z| = 2 \quad \Rightarrow x^2 + y^2 = 2$

$\cos\theta = \dfrac{x}{2} \quad \Rightarrow x = 2\cos\theta = 2\cos(-1.5) = 0.14$ (2 d.p.)

$\sin\theta = \dfrac{y}{2} \Rightarrow y = 2\sin\theta = 2\sin(-1.5) = -1.99$ (2 d.p.)

The complex number with modulus 2 and argument -1.5 is 0.14 – 1.99i

10) The correct answer is (d)

$|z| = 2$

$|w| = \sqrt{4^2 + (-3)^2} = 5$

$|wz| = |w||z| = 2 \times 5 = 10$