



Complex Numbers – Basic Operations Exam Questions (Edexcel)

Q1.

The complex numbers z and w are given by

$$z = 8 + 3i, w = -2i$$

Express in the form $a + bi$, where a and b are real constants,

(a) $z - w$,

(1)

(b) zw .

(2)

(Total 3 marks)

(Q02 6667/01/R, June 2013)

Q2.

The complex number w is given by

$$w = 10 - 5i$$

(a) Find $|w|$.

(1)

(b) Find $\arg w$, giving your answer in radians to 2 decimal places.

(2)

The complex numbers z and w satisfy the equation

$$(2 + i)(z + 3i) = w$$

(c) Use algebra to find z , giving your answer in the form $a + bi$, where a and b are real numbers.

(4)

Given that

$$\arg(\lambda + 9i + w) = \frac{\pi}{4}$$

where λ is a real constant,

(d) find the value of λ .

(2)

(Total 9 marks)

(Q06 6667/01/R, June 2013)



Q3.

$$z = \frac{50}{3 + 4i}$$

Find, in the form $a + ib$ where $a, b \in \mathbb{R}$,

(a) z , (2)

(b) z^2 . (2)

Find
(c) $|z|$, (2)

(d) $\arg z^2$, giving your answer in degrees to 1 decimal place. (2)

(Total 8 marks)

(Q04 6667/01, Jan 2013)

Q4.

(i) The complex number w is given by

$$w = \frac{p - 4i}{2 - 3i}$$

where p is a real constant.

(a) Express w in the form $a + bi$, where a and b are real constants.
Give your answer in its simplest form in terms of p . (3)

Given that $\arg w = \frac{\pi}{4}$
(b) find the value of p . (2)

(ii) The complex number z is given by

$$z = (1 - \lambda i)(4 + 3i)$$

where λ is a real constant.

Given that

$$|z| = 45$$

find the possible values of λ

Give your answers as exact values in their simplest form. (3)

(Total for question = 8 marks)

(Q04 6667/01, June 2017)



Q5.

Given that $z = x + iy$, find the value of x and the value of y such that

$$z + 3i z^* = -1 + 13i$$

where z^* is the complex conjugate of z .

(7)

(Total 7 marks)

(Q05 6667/01, June 2011)

Q6.

$$z = \sqrt{3} - i.$$

z^* is the complex conjugate of z .

(a) Show that $\frac{z}{z^*} = \frac{1}{2} - \frac{\sqrt{3}}{2}i$.

(3)

(b) Find the value of $\left| \frac{z}{z^*} \right|$.

(2)

(c) Verify, for $z = \sqrt{3} - i$, that $\arg \frac{z}{z^*} = \arg z - \arg z^*$.

(4)

(d) Display z , z^* and $\frac{z}{z^*}$ on a single Argand diagram.

(2)

(e) Find a quadratic equation with roots z and z^* in the form $ax^2 + bx + c = 0$, where a , b and c are real constants to be found.

(2)

(Total 13 marks)

(Q02 6674/01, June 2007)



Q7.

The complex numbers z_1 and z_2 are given by

$$z_1 = 2 - i \quad \text{and} \quad z_2 = -8 + 9i$$

(a) Show z_1 and z_2 on a single Argand diagram.

(1)

Find, showing your working,

(b) the value of $|z_1|$,

(2)

(c) the value of $\arg z_1$, giving your answer in radians to 2 decimal places,

(2)

(d) $\frac{z_2}{z_1}$ in the form $a + bi$, where a and b are real.

(3)

(Total 8 marks)

(Q03 6667/01, June 2009)

Q8.

$$z = \frac{50}{3 + 4i}$$

Find, in the form $a + ib$ where $a, b \in \mathbb{R}$,

(a) z ,

(2)

(b) z^2 .

(2)

Find

(c) $|z|$,

(2)

(d) $\arg z^2$, giving your answer in degrees to 1 decimal place.

(2)

(Total 8 marks)

(Q03 6667/01, Jan 2013)



Q9.

The complex number z is defined by

$$z = \frac{a + 2i}{a - i}, \quad a \in \mathbb{R}, \quad a > 0.$$

Given that the real part of z is $\frac{1}{2}$, find

(a) the value of a ,

(4)

(b) the argument of z , giving your answer in radians to 2 decimal places.

(3)

(Total 7 marks)

(Q03 6674/01, June 2008)

Q10.

$$z = 2 - i\sqrt{3}$$

(a) Calculate $\arg z$, giving your answer in radians to 2 decimal places.

(2)

Use algebra to express

(b) $z + z^2$ in the form $a + bi\sqrt{3}$, where a and b are integers,

(3)

(c) $\frac{z + 7}{z - 1}$ in the form $c + di\sqrt{3}$, where c and d are integers.

(4)

Given that

$$w = \lambda - 3i$$

where λ is a real constant, and $\arg(4 - 5i + 3w) = -\frac{\pi}{2}$,

(d) find the value of λ .

(2)

(Total 11 marks)

(Q05 6667/01, June 2012)