IB Maths: AA HL

Complex Numbers

Topic Questions

These practice questions can be used by students and teachers and is Suitable for IB Maths AA HL Topic Questions

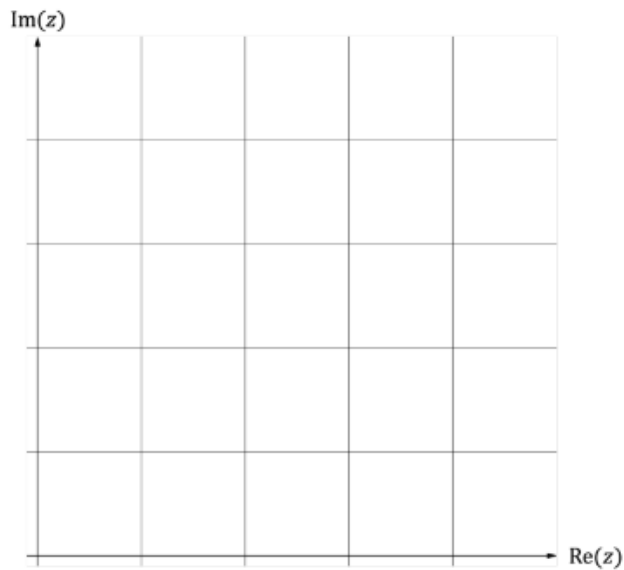| Course	IB Maths
Section	1. Number & Algebra
Topic	1.8 Complex Numbers
Difficulty	Medium

Level: IB Maths

Subject: IB Maths AA HL

Board: IB Maths

Topic: Complex Numbers

Question 1a

Consider the complex numbers $z_1 = 2 + 2i$ and $z_2 = 2 + 2\sqrt{3}i$.

a)

Sketch z_1 and z_2 on the Argand diagram below, be sure to include an appropriate scale.

[2 marks]

b)

Find the modulus of z_1 and z_2.

[3 marks]

c)

Find the argument of z_1 and z_2.

[3 marks]

Question 2

Solve the following equations for x

(i)

$$x^2 + 4x + 5 = 0$$

(ii)

$$x^2 = -625$$

(iii)

$$x^4 = 24 - 2x^2$$

[7 marks]

Question 3

$let \ w_1 = z_1 z_2$, where $z_1 = 5 + i \ and \ z_2 = 1 + 2i$.

a)

Express w in the form $w = a + bi$.

[2 marks]

b)

Find the modulus and argument for w

[4 marks]

Question 4

$let\ z = \dfrac{w_1}{w_2}$, where $w_1 = 4 - i\ and\ w_2 = 1 - 2i.$

a)

Express z in the form $z = a + bi$.

[3 marks]

b)

Find the modulus and argument for z.

[4 marks]

Question 5a

Consider the complex numbers $z = 3 - 4i\ and\ w = 7 - 2i.$

a)

Find

(i)

z +w

(ii)

w −z.

[2 marks]

Question 5b

let z^* and w^* represent the complex conjugates of z and w, respectively.

b)

Write down z^* and w^*, giving your answers in the form a +bi.

[2 marks]

Question 5c

c)

Find

(i)

$z^* w$

(ii)

$\frac{w^*}{z}$.

[4 marks]

Question 6

Find all possible real values for a and b such that

(i)

a +bi=8i

(ii)

$(2+3i)(a +bi) =13$

(iii)

$(a +i)(2+bi) = -6+22i$.

[7 marks]

Question 7

Consider the complex numbers $w = iz$ and $w + 2z = 7 + 6i$.

Find

(i)

Re(w)

(ii)

Im(w)

(iii)

Re(z)

(iv)

Im(z).

[7 marks]

Question 8

It is given that $z_1 = 3 + 4i$ and $z_2 = -2 + 2i$.

Find

(i)

$iz_1 + z_2$

(ii)

$\dfrac{z_1}{iz_2}$

(iii)

$i\left(z_1 z_2\right)$

[7 marks]

Question 9

Find the complex numbers *z* and *w* such that

$$2z - iw^* = 5 + 7i$$

$$w + iz^* = 5 + 16i$$
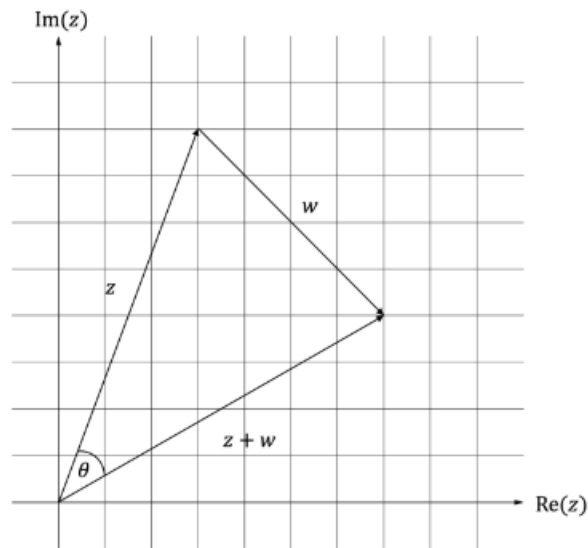
[7 marks]

Question 10

Let z =3+8i and w =4−4i.

a)

Find θ , the angle shown on the diagram below.

[5 marks]

b)

Find the area of the triangle formed in the diagram above.

[3 marks]

Question 11

Let z = −1−3i and w =1+i.
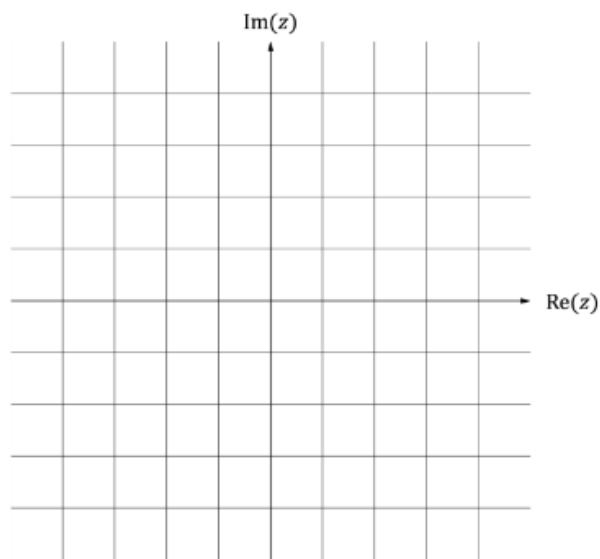
a)

Find zw.

[2 marks]

b)

Sketch z,w and zw on the Argand diagram below.

[3 marks]

Question 11c

Let θ be the angle between *z* and *zw* and *φ* be the angle between w and zw.

c)

Find the angles *θ* and *φ*, giving your answers in degrees.

[4 marks]

Question 12

$let\ w\ =\ \dfrac{z+1}{z^{*}+1}$, where z =a +bi, a, b ∈R.

a)

Write w in the form x +yi, x, y ∈R.

[4 marks]

b)

Determine the conditions under which w is purely imaginary.

[3 marks]