Edexcel Maths FP1

Topic Questions from Papers

Complex Numbers

$f(x) = 2x^3 - 8x^2 + 7x - 3$			
Given t	that $x = 3$ is a solution of the equation $f(x) = 0$, solve $f(x) = 0$ completely.	(5)	

- **9.** Given that $z_1 = 3 + 2i$ and $z_2 = \frac{12 5i}{z_1}$,
 - (a) find z_2 in the form a + ib, where a and b are real.

(2)

(b) Show on an Argand diagram the point P representing z_1 and the point Qrepresenting z_2 .

(2)

(c) Given that O is the origin, show that $\angle POQ = \frac{\pi}{2}$.

(2)

The circle passing through the points O, P and Q has centre C. Find

(d) the complex number represented by C,

(2)

(e) the exact value of the radius of the circle.

1. The complex numbers z_1 and z_2 are given by

$$z_1 = 2 - i$$
 and $z_2 = -8 + 9i$

(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)

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(a) Find the	four roots of $f(x) = 0$.	(5)
(b) Find the	sum of these four roots.	(2)

The complex numbers z_1 and z_2 are given by

$$z_1 = 2 + 8i$$
 and $z_2 = 1 - i$

Find, showing your working,

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

(3)

(b) the value of $\left| \frac{z_1}{z_2} \right|$,

(2)

(c) the value of arg $\frac{z_1}{z_2}$, giving your answer in radians to 2 decimal places.

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6.	Given that 2	and $5 + 2i$	are roots o	f the equation
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$$x^3 - 12x^2 + cx + d = 0,$$
 $c, d \in \mathbb{R},$

(a) write down the other complex root of the equation.

(1)

(b) Find the value of c and the value of d.

(5)

(c) Show the three roots of this equation on a single Argand diagram.

1. $z = 2 - 3i$

(a) Show that $z^2 = -5 - 12i$.

(2)

Find, showing your working,

(b) the value of $|z^2|$,

(2)

(c) the value of $arg(z^2)$, giving your answer in radians to 2 decimal places.

(2)

(d) Show z and z^2 on a single Argand diagram.

(1)

Given that $f(x) = (x+3)(x^2 + ax + b)$, where a and b are real constants,

(a) find the value of a and the value of b.

(2)

(b) Find the three roots of f(x) = 0.

(4)

(c) Find the sum of the three roots of f(x) = 0.

(1)

1.	z = 5 - 3i,	w = 2 + 2i
1.	2 3 31,	VV 2 1 21

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

(a) z^2 ,

(2)

(b) $\frac{z}{w}$.

(3)

(Total 5 marks)

Given that 2 – 4i is a root of the equation $z^2 + pz + q = 0,$		
where p and q are real constants,		
(a) write down the other root of the equation,	(1)	
(b) find the value of p and the value of q .	(3)	

7. z = -24 - 7i

(a) Show z on an Argand diagram.

- (1)
- (b) Calculate arg z, giving your answer in radians to 2 decimal places.
- **(2)**

It is given that

$$w = a + bi$$
, $a \in \mathbb{R}$, $b \in \mathbb{R}$

Given also that |w| = 4 and $\arg w = \frac{5\pi}{6}$,

(c) find the values of a and b,

(3)

(d) find the value of |zw|.

(3)

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2.	$z_1 = -2 + 1$
4 •	1

(a) Find the modulus of z_1 .

(1)

(b) Find, in radians, the argument of z_1 , giving your answer to 2 decimal places.

(2)

The solutions to the quadratic equation

$$z^2 - 10z + 28 = 0$$

are z_2 and z_3 .

(c) Find z_2 and z_3 , giving your answers in the form $p \pm i \sqrt{q}$, where p and q are integers.

(3)

(d) Show, on an Argand diagram, the points representing your complex numbers z_1 , z_2 and z_3 .

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$z + 3 i z^* = -1 + 13i$	
where z^* is the complex conjugate of z .	(7)

- 1. Given that $z_1 = 1 i$,
 - (a) find $arg(z_1)$.

(2)

Given also that $z_2 = 3 + 4i$, find, in the form a + ib, $a, b \in \mathbb{R}$,

(b) $z_1 z_2$,

(2)

(3)

In part (b) and part (c) you must show all your working clearly.



5.	The roots	of the	equation
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$$z^3 - 8z^2 + 22z - 20 = 0$$

are z_1 , z_2 and z_3 .

(a) Given that $z_1 = 3 + i$, find z_2 and z_3 .

(4)

(b)	Show on a	single Arga	nd diagram	the points	representing	7 7	and 7
(U)	Show, on a	i siligic Alga	nu ulagram	, me pomis	representing	Z_1, Z_2	and Z_2

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(a) Show that $f(4) = 0$				
(a) Snow that	L(4) = 0	(1)		
(b) Use algebra	to solve $f(x) = 0$ completely.	(4)		

7.

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

- (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.

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

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.

5.	$f(x) = (4x^2 + 9)(x^2 - 6x + 34)$
	1(x) - (4x + 9)(x - 0x + 34)

(a) Find the four roots of f(x) = 0

Give your answers in the form x = p + iq, where p and q are real.

(5)

(b) Show these four roots on a single Argand diagram.

3. Given that $x = \frac{1}{2}$ is a root of the equation

$$2x^3 - 9x^2 + kx - 13 = 0, \qquad k \in \mathbb{R}$$

find

(a) the value of k,

(3)

(b) the other 2 roots of the equation.

(4)

- 7. $z_1 = 2 + 3i, \quad z_2 = 3 + 2i, \quad z_3 = a + bi, \quad a, b \in \mathbb{R}$
 - (a) Find the exact value of $|z_1 + z_2|$.

(2)

Given that $w = \frac{z_1 z_3}{z_2}$,

(b) find w in terms of a and b, giving your answer in the form x + iy, $x, y \in \mathbb{R}$

(4)

Given also that $w = \frac{17}{13} - \frac{7}{13}i$,

(c) find the value of a and the value of b,

(3)

(d) find arg w, giving your answer in radians to 3 decimal places.

1.	The	complex	numbers 2	z and	w are	given	by
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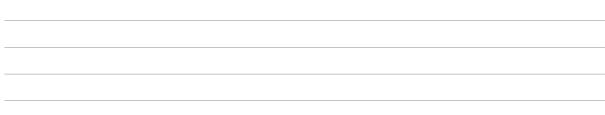
$$z = 8 + 3i$$
, $w = -2i$

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

(a)
$$z-w$$
,

(1)

(b)	zw.
(0)	_ ,,,,



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	$f(x) = (4x^2 + 9)(x^2 - 2x + 5)$	
(a) Find the four roots	of $f(x) = 0$	(4)
(b) Show the four root	as of $f(x) = 0$ on a single Argand diagram.	(2)

9. 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 .

Further Pure Mathematics FP1

Candidates sitting FP1 may also require those formulae listed under Core Mathematics C1 and C2.

Summations

$$\sum_{r=1}^{n} r^2 = \frac{1}{6} n(n+1)(2n+1)$$

$$\sum_{n=1}^{n} r^3 = \frac{1}{4} n^2 (n+1)^2$$

Numerical solution of equations

The Newton-Raphson iteration for solving f(x) = 0: $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$

Conics

	Parabola	Rectangular Hyperbola
Standard Form	$y^2 = 4ax$	$xy = c^2$
Parametric Form	$(at^2, 2at)$	$\left(ct, \frac{c}{t}\right)$
Foci	(a, 0)	Not required
Directrices	x = -a	Not required

Matrix transformations

Anticlockwise rotation through θ about $O: \begin{pmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{pmatrix}$

Reflection in the line $y = (\tan \theta)x$: $\begin{pmatrix} \cos 2\theta & \sin 2\theta \\ \sin 2\theta & -\cos 2\theta \end{pmatrix}$

In FP1, θ will be a multiple of 45°.

Core Mathematics C1

Mensuration

Surface area of sphere = $4\pi r^2$

Area of curved surface of cone = $\pi r \times \text{slant height}$

Arithmetic series

$$u_n = a + (n-1)d$$

$$S_n = \frac{1}{2}n(a+l) = \frac{1}{2}n[2a+(n-1)d]$$

Core Mathematics C2

Candidates sitting C2 may also require those formulae listed under Core Mathematics C1.

Cosine rule

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Binomial series

$$(a+b)^{n} = a^{n} + \binom{n}{1} a^{n-1}b + \binom{n}{2} a^{n-2}b^{2} + \dots + \binom{n}{r} a^{n-r}b^{r} + \dots + b^{n} \quad (n \in \mathbb{N})$$
where $\binom{n}{r} = {}^{n}C_{r} = \frac{n!}{r!(n-r)!}$

$$(1+x)^{n} = 1 + nx + \frac{n(n-1)}{1 \times 2} x^{2} + \dots + \frac{n(n-1)\dots(n-r+1)}{1 \times 2 \times \dots \times r} x^{r} + \dots \quad (|x| < 1, n \in \mathbb{R})$$

Logarithms and exponentials

$$\log_a x = \frac{\log_b x}{\log_b a}$$

Geometric series

$$u_n = ar^{n-1}$$

$$S_n = \frac{a(1-r^n)}{1-r}$$

$$S_{\infty} = \frac{a}{1-r}$$
 for $|r| < 1$

Numerical integration

The trapezium rule:
$$\int_{a}^{b} y \, dx \approx \frac{1}{2} h\{(y_0 + y_n) + 2(y_1 + y_2 + ... + y_{n-1})\}$$
, where $h = \frac{b - a}{n}$