Outcome 3 – Dividing complex numbers

Worked Example:

Express $\frac{9+7i}{2+3i}$ in the form $a+bi$, where a and b are real numbers.

$$\frac{9+7i}{2+3i} \quad \begin{matrix}\times(2-3i)\\ \times(2-3i)\end{matrix}$$

$$= \frac{18-27i+14i+21}{4-6i+6i+9}$$

$$= \frac{39-13i}{13}$$

$$= 3-i$$

Key Facts/Formulae:

i, the imaginary number, is defined as $i=\sqrt{-1}$

A complex number, z, is one that can be written in the form $a+bi$.

a is the real part b is the imaginary part

To add/subtract complex numbers;

- add/subtract the real parts
- add/subtract the imaginary parts

To multiply complex numbers;

- form and multiply out brackets

Every complex number $z=a+bi$ has a complex conjugate, denoted $\bar{z}$, where $\bar{z}=a-bi$.

To divide complex numbers;

- Multiply top and bottom by the complex conjugate of the denominator

Essential knowledge!

$i^2=-1$ $i^3=-i$ $i^4=1$

Questions...

Express the following in the form $a+bi$, where a and b are real numbers;

1. $\frac{5+5i}{3+i}$
2. $\frac{42+11i}{5+2i}$
3. $\frac{27+14i}{6-i}$
4. $\frac{14+23i}{4+3i}$
5. $\frac{19+8i}{1+2i}$
6. $\frac{84-5i}{8+3i}$

Answers

1 $2 + i$

2 $27 + 14i$

3 $4 + 3i$

4 $5 + 2i$

5 $7 - 6i$

6 $9 - 4i$