IB Math HL Name: _____

Intro to Complex Numbers Period: ____

(A) Polynomial Operations

- Combining like terms
- Distributive property
- FOIL method of multiplying binomials
- Multiplying polynomials with 3 or more terms

1.) $4(2x^2-7x+3)-(3x+7)(x-3)$

2.) $(4x^2-x+5)(3x^2+2x+10)$

(B) Simplifying Radicals

- Perfect square factor inside radical
- Square root in the denominator
- Fraction inside the radical
- Adding and subtracting radicals

3.) $\sqrt{480}$

4.) $\sqrt{72}-\sqrt{32}+\sqrt{27}$

5.) $\frac{21}{\sqrt{98}}$

6.) $\sqrt{\frac{81}{24}}$

(C) Radicals with Conjugates

- Simplifying with radical in denominator along with another term

7.) $\frac{1}{2+\sqrt{6}}$

8.) $\frac{\sqrt{5}}{5-\sqrt{10}}$

9.) $\frac{8-\sqrt{6}}{1+\sqrt{3}}$

(D) Simplifying solutions using the Quadratic Formula

- Two real solutions
- One real repeated solution
- Two imaginary solutions

Solve the following equations using the Quadratic Formula. Give the exact solutions in simplified form.

10.) $x^2 - 2x - 15 = 0$ 11.) $3x^2 + 27 = 18x$ 12.) $x^2 + 2x = 12$

(E) Imaginary Numbers – What are they (Negative inside a root)

- The letter i as a number
- Powers of i, i^2 = -1 most important

Solve the following quadratic equations. Express your solution(s) in simplified form.

13.) $x^2 = -16$ 14.) $4x^2 + 32 = 0$ 15.) $\left(x^2 - 1\right)(x^2 + 9) = 0$

Express the powers of ***i*** in simplest form (no powers of ***i*** greater than 1).

16.) i^7 17.) $i^{10} + i^{12}$ 18.) $i \cdot i^3 \cdot i^5 \cdot i^7$ 19.) $\left(i^{11}\right)^5$

(F) Complex Numbers

- Algebraic Perspective
  - Adding, subtracting and multiplying complex numbers
  - Dividing complex numbers using complex conjugates

Determine the real and imaginary part of the following expressions.

20.) $1-4i+7+8i-11$

21.) $2(3+2i)-7(5+6i)$

22.) $(4-9i)(7-8i)$

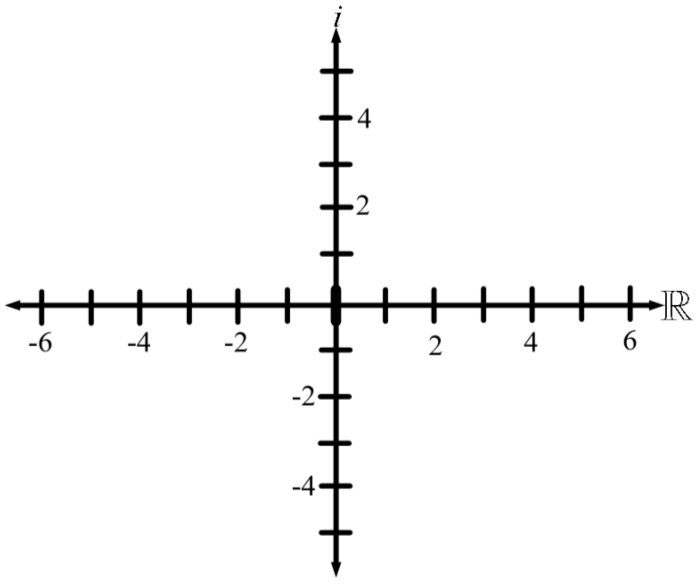
23.) $\frac{2}{1+i}$

24.) $\frac{6i}{4-3i}$

25.) $\frac{6-5i}{3-2i}$

- Graphical Perspective
  - Argand diagram with real and imaginary axes
  - *Complex numbers as vectors (skipping for now)*
  - *Tip to tail method of adding vectors (skipping for now)*

26.) Plot the following complex numbers on the complex plane (Argand diagram) below.



-2

$2-i$

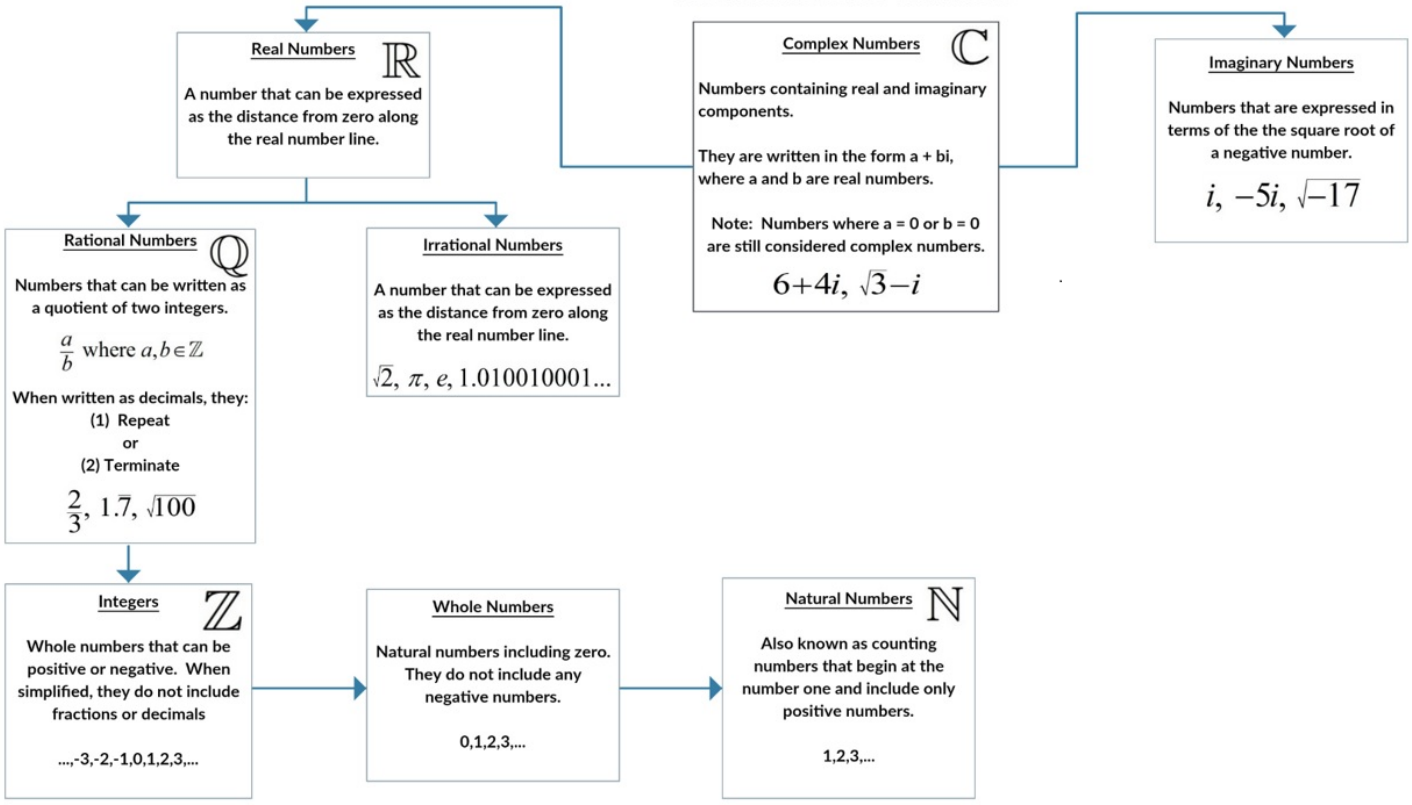
$3+2i$

$-4+i$

$-3-3i$

$3i$

Classifications of Numbers



Exercise 3F

1 Find the real and imaginary parts of the following complex numbers.

a $z = -4\text{i}$ **b** $z = 5$

c $z = -24 + 7\text{i}$ **d** $z = \dfrac{5 - 12\text{i}}{13}$

e $z = \dfrac{2\text{i} - 1}{\sqrt{5}}$

3 Given the complex numbers $z_1 = 3 - 4\text{i}$, $z_2 = 5 + \text{i}$ and $z_3 = -1 + 2\text{i}$, calculate the following and check your answers with a calculator.

a $z_1 - z_2 + z_3$ **b** $2z_1 + 3z_2 - 4z_3$

c $-\dfrac{1}{2}z_1 + \dfrac{2}{3}z_2 - \dfrac{1}{4}z_3$ **d** $\dfrac{4z_3 - 5z_1 + 2z_2}{3}$