Complex Number Operations

IMAGINARY NUMBERS

$$i = \sqrt{-1}$$

$$i^2 = -1$$

ADD COMPLEX NUMBERS

SUBTRACT COMPLEX NUMBERS

MULTIPLY COMPLEX NUMBERS

Perfect Squares

$1^2 = 1$
$2^2 = 4$
$3^2 = 9$
$4^2 = 16$
$5^2 = 25$
$6^2 = 36$
$7^2 = 49$
$8^2 = 64$
$9^2 = 81$
$10^2 = 100$
$11^2 = 121$
$12^2 = 144$
$13^2 = 169$
$14^2 = 196$
$15^2 = 225$
$20^2 = 400$

Complex Number Operations

a + bi

real # **imaginary #**

- Powers of i repeat in cycles of 4
- Divide n by 4 & look at the remainder...

$i^1 = i$	Remainder = 1, $i^n = i$
$i^2 = -1$	Remainder = 2, $i^n = -1$
$i^3 = -i$	Remainder = 3, $i^n = -i$
$i^4 = 1$	Remainder = 0, $i^n = 1$

Simplify:

1. $\sqrt{-16}$ $\sqrt{16 \cdot -1} = 4i$
2. $\sqrt{-12}$ $\sqrt{4 \cdot 3 \cdot -1} = 2i\sqrt{3}$
3. $\sqrt{-75}$ $i\sqrt{75} = i\sqrt{25 \cdot 3} = 5i\sqrt{3}$
4. i^7 $4\overline{)7}$ R3 ← look at i^3 $= -i$
5. $i^2 = -1$
6. i^{97} $4\overline{)97}$ R1 ← look at i^1 $= i$
7. i^{28} $4\overline{)28}$ $= 1$ (28 / 0 R look at i^4)

8. $(2 + 5i) + (3 + 8i)$ (real, imag. + real, imag.)

$5 + 13i$

9. $(6 - 4i) + (-1 - 7i)$

$5 - 11i$

10. $(10 + 1i) + (-10 + 8i)$

$0 + 9i$

$9i$

Add real numbers, then add imaginary numbers. Write your answer in standard form.

$(a + bi) + (c + di)$

1) Keep the first complex number the same.
2) Change subtraction to addition by distributing -1 to the 2nd complex number
3) Add real numbers together and imaginary numbers together.

$(a + bi) - (c + di)$
$(a + bi) - 1(c + di)$
$(a + bi) + (-c - di)$

★change to add the opposite

11. $(5 + 2i) - (7 + 3i)$

$(5 + 2i) + (-7 - 3i)$

$-2 - i$

Keep + opposite

12. $(12 - i) - (6 - 3i)$

$(12 - i) + (-6 + 3i)$

$6 + 2i$

13. $(2 + 5i)(1 + 3i)$

$2 + 6i + 5i + 15i^2$

$2 + 11i - 15$ ($15(-1)$)

$-13 + 11i$

14. $(6 - i)(4 + 5i)$

$24 + 30i - 4i - 5i^2$ ($-5(-1)$)

$24 + 26i + 5$

$29 + 26i$

Multiply using FOIL or box method.

$i \cdot i = i^2 = -1$

Simplify any term with i^2 (Remember that $i^2 = -1$)

Combine like terms

$(a + bi)(c + di)$