Algebra 2 Complex Number Unit Day 3 Name: Key Date: 11/14/15

Objective: How do you add, subtract, multiply and divide complex numbers?

Lesson Summary: Joshua told you that the answer $(3+i)^2$ to is 9. Explain to Joshua what common mistake that he made and show Joshua step by step how to get the correct answer.

Homework: HW5.3: Finish this worksheet. Show all work and complete the riddle.

Warm Up – Matching: Use Versa Tiles. Check your answer with your teacher.

1) i^{101} — i

2) $i^7 \cdot i^7$ — -1

3) $2i^2 \cdot 2i^2$ — 4

4) $i^2 + 2i^2$ — $-1 + -2 = -3$

5) $\frac{2i}{i}$ — 2

6) $(-2i)^2$ — -4

7) $-(2-i)$ — $-2+i$

8) $-2i+\sqrt{-4}$ — $-2i+2i = 0$

9) $\left(\sqrt{-2}\right)^2$ — -2

10) $\left(\sqrt{-2}\right)^3$ — $-2\sqrt{-2} = -2i\sqrt{2}$

11) $(-i)^3$ — i

12) $(-i)^4$ — 1

A) $-2+i$ B) -2 C) 4 D) -1 E) -4 F) $-2i\sqrt{2}$ G) -3 H) i I) 2 J) 0 K) 1 L) $-i$

Guided Practice: Simplify

A. $(2-3i)+(5-i)$

$2+5-3i-i$

$= \boxed{7-4i}$

B. $(8+2i)(4-3i)$

$= 32-24i+8i-6i^2$

$= 32-16i+6$

$= \boxed{38-16i}$

C. Multiply $-2-3i$ by its congugate

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

$= 4-9i^2 = 4+9 = \boxed{13}$

D. $(4i-5)^2$

$= (4i-5)(4i-5)$

$= 16i^2-40i+25$

$= -16-40i+25$

$= \boxed{9-40i}$

E. Solve: $x^2+20=-80$

$x^2 = -100$

$\sqrt{x^2} = \pm\sqrt{-100}$

$x = \pm 10i$

F. Solve: $4x^2+20=-80$

$4x^2 = -100$

$x^2 = -25$

$\sqrt{x^2} = \pm\sqrt{-25}$

$x = \pm 5i$

H. $\frac{(2+i)}{(3-i)} \cdot \frac{(3+i)}{(3+i)}$

$= \frac{6+5i+i^2}{9-i^2} = \frac{5+5i}{10} = \boxed{\frac{1+i}{2}}$

J. $\sqrt{-5} \cdot \sqrt{-20}$

$i\sqrt{5} \cdot i \cdot 2\sqrt{5}$

$= 2i^2 \cdot 5$

$= \boxed{-10}$

K. Multiply $(\sqrt{5}-5i)$ by its congugate

$= (\sqrt{5}-5i)(\sqrt{5}+5i)$

$= 5-25i^2 = 5+25 = \boxed{30}$

L. $\frac{\sqrt{-9}}{\sqrt{3}} = \frac{3i}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$= \frac{3i\sqrt{3}}{3} = \boxed{i\sqrt{3}}$

M. $\frac{4}{2-i} \cdot \frac{(2+i)}{(2+i)}$

$= \frac{4(2+i)}{4-i^2} = \frac{4(2+i)}{5}$

or $\boxed{\frac{8+4i}{5}}$

N. $-\frac{3\sqrt{-81}}{\sqrt{-9}} = -\frac{3 \cdot 9i}{3i} = \boxed{-9}$

Homework:

conjugates - middle terms drop out

1) $(\sqrt{3}+2i)(\sqrt{3}-2i)$

$3-4i^2 = 3+4 = \boxed{7}$

2) $(4-7i)+(2+3i)$

$= 4+2-7i+3i$

$= \boxed{6-4i}$

3) $(2-4i)-(2-i)$

$2-2-4i+i$

$= \boxed{-3i}$

4) $6-(8+4i)$

$6-8-4i$

$= \boxed{-2-4i}$

5) $(5-6i)-4i$

$= \boxed{5-10i}$

6) $\dfrac{10\sqrt{-100}}{5\sqrt{-25}} = \dfrac{10}{5} \cdot \dfrac{10i}{5i}$

$= 2 \cdot 2 = \boxed{4}$

7) $(4-2i)^2$

$(4-2i)(4-2i)$

$= 16 - 8i - 8i + 4i^2$

$= 16 - 16i - 4$

$= \boxed{12-16i}$

8) $\dfrac{\sqrt{-16}}{\sqrt{5}} = \dfrac{4i}{\sqrt{5}} \cdot \dfrac{\sqrt{5}}{\sqrt{5}}$

$= \boxed{\dfrac{4i\sqrt{5}}{5}}$

9) $(\sqrt{-3})^2 = \sqrt{-3}\sqrt{-3}$

$= \boxed{-3}$ (left)

10) $(\sqrt{-3})^3$

$\sqrt{-3}\sqrt{-3}\sqrt{-3}$

$= -3\sqrt{-3} = \boxed{-3i\sqrt{3}}$

11) $\sqrt{3} \cdot \sqrt{-27}$

$= \sqrt{3} \cdot \sqrt{-1 \cdot 3 \cdot 9}$

$= \sqrt{3} \cdot i\sqrt{3} \cdot 3$

$= \boxed{9i}$

12) $(-2\sqrt{-8})(3\sqrt{-2})$

$-2\sqrt{-1 \cdot 4 \cdot 2} \cdot 3\sqrt{-1 \cdot 2}$

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

$= -12i^2 \cdot 2 = \boxed{24}$

13) $\dfrac{5}{2i} \cdot \dfrac{i}{i} = \dfrac{5i}{2i^2} =$

$\boxed{\dfrac{5i}{-2}}$

14. $\dfrac{3+i}{3-i} \cdot \dfrac{(3+i)}{(3+i)}$

$= \dfrac{9+6i+i^2}{9-i^2} = \dfrac{8+6i}{10} = \boxed{\dfrac{4+3i}{5}}$

15) Solve for x: $3x^2+9=0$

$3x^2 = -9$

$x^2 = -3$

$x = \pm\sqrt{-3}$

$x = \pm i\sqrt{3}$

16) Multiply $3-3i$ by its conjugate

$(3-3i)(3+3i) = 9 - 9i^2$

$= 9+9 = \boxed{18}$

17) Find the additive inverse of $5-10i$?

$\boxed{-5+10i}$

I	L	O	V	E	M	A	T	H	E	M	A	T	I	C	S	!
16	9	8	6	4	1	7	3	2	15	5	10	12	11	14	13	17

Answer Bank

0	P	-1	F	$-3i\sqrt{3}$	A	$\frac{5}{2}i$	Z	$-2+4i$	W
1	X	-3	L	$\pm i\sqrt{3}$	E	$-\frac{5}{2}i$	S	$29-2i$	U
3	H	-4	J	$9i\sqrt{3}$	R	$\frac{4i\sqrt{5}}{5}$	O	$5-10i$	M
4	V	-27	Y	$9i$	I	$6-4i$	H	$-5+10i$	!
5	@	i	&	$10i$	D	$-2-4i$	E	$12-16i$	A
7	M	$-i$	#	$-10i$	K			$9+i\sqrt{3}$	$
9	W	$3i$	?	$18i$	G			$\frac{4+3i}{5}$	C
12	Q	$\pm 3i$	B						
18	I	$-3i$	T						
24	T								

Extra Credit

Imaginary Numbers Day 2 HW

Simplify.

1) $\sqrt{-49}$ $= \sqrt{49}\sqrt{-1}$ $= \boxed{7i}$

2) $\sqrt{-48}$ $= \sqrt{16 \cdot 3 \cdot (-1)}$ $= \boxed{4i\sqrt{3}}$

3) $\sqrt{-54}$ $= \sqrt{-1 \cdot 9 \cdot 6}$ $= \boxed{3i\sqrt{6}}$

4) $\sqrt{-45}$ $= \sqrt{-1 \cdot 9 \cdot 5}$ $= \boxed{3i\sqrt{5}}$

5) i^{42} $= i^{2} = \boxed{-1}$

$4\overline{)42}$ r 2, -40, 2

6) i^{56} $= i^{4} = \boxed{1}$

$4\overline{)56}$ r 0, 4, 16

7) i^{33} $= \boxed{i}$

$4\overline{)33}$ r 1, -32, 1

8) i^{25} $= \boxed{i}$

$4\overline{)25}$ r 1, 24, 1

9) i^{48} $= i^{4} = \boxed{1}$

$4\overline{)48}$ r 0, 48, 0

10) $12i \cdot 6i$

$72i^{2} = 72(-1)$ $= \boxed{-72}$

11) $7i^{2} \cdot 6i^{2}$

$42i^{4} = \boxed{42}$

12) $3i^{7} \cdot 5i^{11}$

$15i^{18} = 15i^{2} = \boxed{-15}$

$4\overline{)18}$ r 2, -16, 2

13) $7i + 9 + 14 - 23i$

$\boxed{23 - 16i}$

14) $(8 + 2i)(4 - 3i)$

$= 32 - 24i + 8i - 6i^{2}$

$= 32 - 16i + 6$

$= \boxed{38 - 16i}$

15) $(6 + 2i)(6 - 2i)$ conjugates

$= 36 - 4i^{2}$

$= 36 - 4(-1)$

$= \boxed{40}$

16) $(4i + 5)^{2}$

$= (4i + 5)(4i + 5)$

$= 16i^{2} + 40i + 25$

$= -16 + 40i + 25$

$= \boxed{9 + 40i}$

17) $x^{2} + 20 = -80$

$x^{2} = -100$

$x = \pm\sqrt{-100}$

$\boxed{x = \pm 10i}$

18) $4x^{2} + 20 = -80$

$4x^{2} = -100$

$x^{2} = -25$

$x = \pm\sqrt{-25}$

$\boxed{x = \pm 5i}$

19) $3x^{2} + 48 = -12$

$3x^{2} = -60$

$x^{2} = -20$

$x = \pm\sqrt{-20}$

$x = \pm\sqrt{-1 \cdot 4 \cdot 5}$

$\boxed{x = \pm 2i\sqrt{5}}$