NAME _____ DATE _____ PERIOD _____

5-4 Practice

Complex Numbers

Simplify.

1. $\sqrt{-36}$ $= i\sqrt{36}$ $6i$

2. $\sqrt{-8} \cdot \sqrt{-32}$ $i\sqrt{8} \cdot i\sqrt{32}$ $i2\sqrt{2} \cdot i4\sqrt{2} = i^2 8\sqrt{4}$ $= 8\sqrt{4}$ $-8 \cdot 2 = -16$

3. $\sqrt{-15} \cdot \sqrt{-25}$ $i\sqrt{15} \cdot 5i = 5i^2\sqrt{15}$ $-5\sqrt{15}$

4. $(-3i)(4i)(-5i)$ $-12i^2(-5i)$ $60i^3$ $(-i)$ $= -60i$

5. $(7i)^2(6i)$ $49i^2 \cdot 6i$ $-49 \cdot 6i = -294i$

6. i^{42} $4\overline{)42}$ $i^2 = -1$

7. i^{55} $4\overline{)55}$ $i^3 = -i$

8. i^{89} $4\overline{)89}$ $i^1 = i$

9. $(5 - 2i) + (-13 - 8i)$ $-8 - 10i$

10. $(7 - 6i) + (9 + 11i)$ $16 + 5i$

11. $(-12 + 48i) + (15 + 21i)$ $3 + 69i$

12. $(10 + 15i) - (48 - 30i)$ $-38 + 45i$

13. $(28 - 4i) + (-10 + 30i)$ $18 + 26i$

14. $(6 - 4i)(6 + 4i)$ $36 + 24i - 24i - 16i^2$ $36 - 16(-1) = 36 + 16 = 52$

15. $(8 - 11i)(8 - 11i)$ $64 - 176i + 121i^2$ $64 - 176i - 121 = -57 - 176i$

16. $(4 + 3i)(2 - 5i)$ $8 - 20i + 6i - 15i^2$ $8 - 14i + 15 = 23 - 14i$

17. $(7 + 2i)(9 - 6i)$ $63 - 42i + 18i - 12i^2$ $63 - 24i + 12$

18. $\dfrac{6 + 5i}{-2i} \cdot \dfrac{i}{i}$ $\dfrac{6i + 5i^2}{-2i^2}$ $\dfrac{-5 + 6i}{2}$

19. $\dfrac{2}{7 - 8i} \cdot \dfrac{(7 + 8i)}{(7 + 8i)}$ $14 + 16i - 14i + 23$ $\dfrac{14 + 16i}{49 - 64i^2} = \dfrac{14 + 16i}{49 + 64} = \dfrac{14 + 16i}{113}$

20. $\dfrac{3 - i}{2 - i} \cdot \dfrac{(2 + i)}{(2 + i)}$ $6 + 3i - 2i - i^2$ $\dfrac{6 + i - (-1)}{4 - i^2} = \dfrac{6 + i + 1}{5} = \dfrac{7 + i}{5}$

21. $\dfrac{2 - 4i}{1 + 3i} \cdot \dfrac{1 - 3i}{1 - 3i} = \dfrac{2 - 6i - 4i + 12i^2}{1 - 9i^2} = \dfrac{2 - 10i - 12}{1 + 9}$ $-1 - i$ $\dfrac{-10i - 10}{10}$

Solve each equation.

22. $5n^2 + 35 = 0$ $5(n^2 + 7) = 0$ $n^2 + 7 = 0$ $n^2 = -7$ $n = \pm\sqrt{-7}$ $n = \pm i\sqrt{7}$

23. $2m^2 + 10 = 0$ $2(m^2 + 5) = 0$ $m^2 + 5 = 0$ $m^2 = -5$ $m = \pm\sqrt{-5}$ $m = \pm i\sqrt{5}$

24. $4m^2 + 76 = 0$ $4(m^2 + 19) = 0$ $m^2 + 19 = 0$ $m = \pm\sqrt{-19}$ $m = \pm i\sqrt{19}$

25. $-2m^2 - 6 = 0$ $-2m^2 = 6$ $m^2 = -3$ $m = \pm\sqrt{3}$ $m = \pm i\sqrt{3}$

26. $-5m^2 - 65 = 0$ $-5(m^2 + 13) = 0$ $m^2 = -13$ $m = \sqrt{-13}$ $m = \pm i\sqrt{13}$

27. $\dfrac{3}{4}x^2 + 12 = 0$ $\dfrac{3}{4}x^2 = -12$ $\cdot\dfrac{4}{3}$ $x^2 = -16$ $x = \pm\sqrt{-16}$ $x = \pm 4i$

Find the values of ℓ and m that make each equation true.

28. $15 - 28i = 3\ell + (4m)i$ $\ell = 5$ $m = -7$

29. $(6 - \ell) + (3m)i = -12 + 27i$ $\ell = 18$ $m = 9$

30. $(3\ell + 4) + (3 - m)i = 16 - 3i$ $\ell = 4$ $m = 6$

31. $(7 + m) + (4\ell - 10)i = 3 - 6i$ $m = -4$ $\ell = 4$

32. **ELECTRICITY** The impedance in one part of a series circuit is $1 + 3j$ ohms and the impedance in another part of the circuit is $7 - 5j$ ohms. Add these complex numbers to find the total impedance in the circuit. $(1 + 3j) + (7 - 5j) = 8 - 2j$

33. **ELECTRICITY** Using the formula $E = IZ$, find the voltage E in a circuit when the current I is $3 - j$ amps and the impedance Z is $3 + 2j$ ohms.

$E = (3 - j)(3 + 2j)$

$9 + 6j - 3j - 2j^2$

$9 + 3j + 2$

$11 + 3j$

(19) $\dfrac{2}{7 - 8i} \cdot \dfrac{7 + 8i}{7 + 8i} = \dfrac{14 + 16i}{49 - 64i^2} = \dfrac{14 + 16i}{113}$ $49 + 64$

(20) $\dfrac{3 - i}{2 - i} \cdot \dfrac{2 + i}{2 + i} = \dfrac{6 + i - i^2}{4 - i^2} = \dfrac{6 + i - (-1)}{4 - (-1)}$ $\dfrac{7 + i}{5}$