Practice 1: Exponents & Polynomials

Directions: Evaluate each expression.

1. -9^2

-81

2. $(-9)^2$

81

3. $-3^4 \cdot (-2)^6$

$-81 \cdot 64 = -5184$

4. $3^7 \cdot 3^{-3}$

$3^4 = 81$

5. $\dfrac{(-7)^{-6}}{(-7)^{-4}}$

$(-7)^{-2} = \dfrac{1}{49}$

6. $\left(\dfrac{5}{4}\right)^{-2}$

$\dfrac{16}{25}$

7. $\left(\dfrac{3}{4}\right)^3 \cdot (-16)^2$

$\dfrac{27}{64} \cdot 256 = 108$

8. $(4^3)^{-2} \cdot (-8)^3$

$(4)^{-6} \cdot (-8)^3$

$\dfrac{1}{4096} \cdot -512 = -\dfrac{1}{8}$

9. $(-5)^0 \cdot \dfrac{(-5)}{(-5)^{-2}}$

$(-5)^3 = -125$

Directions: Simplify each expression. Final answers must contain positive exponents.

10. $7x^9 \cdot (-3x^4)$

$-21x^{13}$

11. $\left(-\dfrac{9}{4}a^{-2}b^7\right) \cdot (-16a^{-3}b^{-6})$

$= 36a^{-5}b$

$= \dfrac{36b}{a^5}$

12. $(2c^{-4}d^5)^{-5}$

$\dfrac{1}{32}c^{20}d^{-25}$

$= \dfrac{c^{20}}{32d^{25}}$

13. $\dfrac{24p^{-3}q^8r^C}{3p^{-5}q^{-4}r^4}$

$8p^2q^{12}r^{-4}$

$= \dfrac{8p^2q^{12}}{r^4}$

14. $\dfrac{(-4m)^3}{10m^{-5}}$

$\dfrac{-64m^3}{10m^{-5}}$

$= \dfrac{-32m^8}{5}$

15. $\left(\dfrac{2u^4}{4uv^{-5}}\right)^{-3}$

$\left(\dfrac{u^3}{2v^{-5}}\right)^{-3}$

$= \dfrac{8}{u^9v^{15}}$

16. $\left(\dfrac{-6rs^{-3}}{15r^7s^{-3}}\right)^2$

$\dfrac{36r^2s^{-6}}{225r^{14}s^{-6}}$

$= \dfrac{4}{25r^{12}}$

17. $\left(\dfrac{a^3}{3b}\right)^4 \cdot \left(\dfrac{6b^3}{a^4}\right)^2$

$\dfrac{a^{12}}{81b^4} \cdot \dfrac{36b^6}{a^8}$

$= \dfrac{4a^4b^2}{9}$

18. $\dfrac{(-4r^7s^{-1})^4}{16rs^{-5} \cdot 6rs^{-2}}$

$\dfrac{256r^{28}s^{-4}}{96r^2s^{-7}}$

$= \dfrac{8r^{26}s^3}{3}$

19. $\left(\frac{c^{-3}d^{-1}}{5c^{7}d^{-4}}\right)^{-2}$

$\frac{25c^{6}d^{2}}{c^{-14}d^{8}}$

$= \boxed{\frac{25c^{20}}{d^{6}}}$

20. $(-9m^{6}n^{4})^{2} - 6m^{10}n^{3} \cdot (-7m^{2}n^{5})$

$81m^{12}n^{8} + 42m^{12}n^{8}$

$= \boxed{123m^{12}n^{8}}$

21. $8x^{-9} + (-3x^{-3}y^{-2})\left(\frac{5}{x^{6}y^{-2}}\right)$

$8x^{-9} - 15x^{-9}$

$= -7x^{-9}$

$= \boxed{\frac{-7}{x^{9}}}$

Directions: Simplify each expression. Classify each answer by degree and number of terms.

22. $(11x-5)+(3x-14)$

$\boxed{14x - 19;\ \text{Linear Binomial}}$

23. $(1-7a)-(7a-16)$

$\boxed{-14a + 17;\ \text{Linear Binomial}}$

24. $(-5k^{2}-11k+18)+(3k^{2}+8k-2)$

$\boxed{-2k^{2} - 3k + 16;\ \text{Quadratic Trinomial}}$

25. $(7y^{3}+16y^{2}-14)-(8y^{3}-5y-11)$

$\boxed{-y^{3} + 16y^{2} + 5y - 3;\ \text{Cubic Polynomial}}$

26. $8(-3m+3)-6(5m+4)$

$-24m + 24 - 30m - 24$

$= \boxed{-54m;\ \text{Linear Monomial}}$

27. $m(m^{3}-5m^{2}+7m)-m(m^{2}-1)$

$m^{4} - 5m^{3} + 7m^{2} - m^{3} + m$

$= \boxed{m^{4} - 6m^{3} + 7m^{2} + m;\ \text{Quartic Polynomial}}$

28. $(3x-8)(2x+1)$

$6x^{2} + 3x - 16x - 8$

$= \boxed{6x^{2} - 13x - 8;\ \text{Quadratic Trinomial}}$

29. $(8p^{2}-4)(p-2)$

$\boxed{8p^{3} - 16p^{2} - 4p + 8;\ \text{Cubic Polynomial}}$

30. $(x-4y)(5x+3y)$

$5x^{2} + 3xy - 20xy - 12y^{2}$

$= \boxed{5x^{2} - 17xy - 12y^{2};\ \text{Quadratic Trinomial}}$

31. $(7c-d)(7c+d)$

$49c^{2} + 7cd - 7cd - d^{2}$

$= \boxed{49c^{2} - d^{2};\ \text{Quadratic Binomial}}$

32. $(3v+4)^{2}$

$(3v+4)(3v+4)$

$= 9v^{2} + 12v + 12v + 16$

$= \boxed{9v^{2} + 24v + 16;\ \text{Quadratic Trinomial}}$

33. $(9-5y)^{2}$

$(9-5y)(9-5y)$

$= 81 - 45y - 45y + 25y^{2}$

$= \boxed{25y^{2} - 90y + 81;\ \text{Quadratic Trinomial}}$

34. $(2w-1)^{3}$

$(2w-1)(4w^{2} - 4w + 1)$

$= 8w^{3} - 8w^{2} + 2w - 4w^{2} + 4w - 1$

$= \boxed{8w^{3} - 12w^{2} + 6w - 1;\ \text{Cubic Polynomial}}$

35. $(n+4)^{2}(3n^{2}-7n+1)$

$(n^{2} + 8n + 16)(3n^{2} - 7n + 1)$

$= 3n^{4} - 7n^{3} + n^{2} + 24n^{3} - 56n^{2} + 8n + 48n^{2} - 112n + 16$

$= \boxed{3n^{4} + 17n^{3} - 7n^{2} - 104n + 16;\ \text{Quartic Polynomial}}$

Practice 2: Factoring Polynomials

Directions: Factor out the greatest common factor.

1. $8x^4 + 12x^2 - 20x$

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

2. $-18a^3b + 27a^2b$

$-9a^2b(2a - 3)$

3. $5c^4d - 15cd^3 - 3cd$

$cd(5c^3 - 15d^2 - 3)$

4. $-10r^5s^2 + 18r^2s^3 - 6rs^4$

$-2rs^2(5r^4 - 9rs + 3s^2)$

Directions: Identify the special factoring pattern, then factor.

5. $4m^4 - 25n^2$ Diff. of squares

$(2m^2 + 5n)(2m^2 - 5n)$

6. $\frac{1}{9}k^2 - 64$ Diff. of squares

$(\frac{1}{3}k + 8)(\frac{1}{3}k - 8)$

7. $8a^3 + 729b^3$ Sum of cubes

$(2a + 9b)(4a^2 - 18ab + 81b^2)$

8. $1 - 125k^3$ Diff of cubes

$(1 - 5k)(1 + 5k + 25k^2)$

9. $64x^3 - y^6$ Diff of cubes

$(4x - y^2)(16x^2 + 4xy^2 + y^4)$

10. $216p^3 + 125q^3$ Sum of cubes

$(6p + 5q)(36p^2 - 30pq + 25q^2)$

Directions: Factor each trinomial.

11. $x^2 + 12x + 35$

$(x + 5)(x + 7)$

12. $n^2 + 8n - 9$

$(n + 9)(n - 1)$

13. $p^4 - 14p^2 + 48$

$(p^2 - 6)(p^2 - 8)$

14. $c^4 - 5c^2 - 84$

$(c^2 - 12)(c^2 + 7)$

15. $3x^2 + 13x - 10$

$3x^2 + 15x - 2x - 10$

$3x(x + 5) - 2(x + 5)$

$(3x - 2)(x + 5)$

16. $2m^2 + 13m + 20$

$2m^2 + 8m + 5m + 20$

$2m(m + 4) + 5(m + 4)$

$(2m + 5)(m + 4)$

17. $5k^2 - 16k + 12$

$5k^2 - 10k - 6k + 12$

$5k(k - 2) - 6(k - 2)$

$(5k - 6)(k - 2)$

18. $6a^2 - 17a - 14$

$6a^2 - 21a + 4a - 14$

$3a(2a - 7) + 2(2a - 7)$

$(3a + 2)(2a - 7)$

19. $12w^2 - w - 6$

$12w^2 - 9w + 8w - 6$

$3w(4w - 3) + 2(4w - 3)$

$(3w + 2)(4w - 3)$

20. $9v^2 + 6v + 1$

$9v^2 + 3v + 3v + 1$

$3v(3v + 1) + 1(3v + 1)$

$(3v + 1)(3v + 1) = (3v + 1)^2$

Directions: Factor each polynomial by grouping terms.

21. $x^3+2x^2+5x+10$

$x^2(x+2)+5(x+2)$

$(x^2+5)(x+2)$

22. $4m^3-12m^2+3m-9$

$4m^2(m-3)+3(m-3)$

$(4m^2+3)(m-3)$

23. $2k^3+8k^2-k-4$

$2k^2(k+4)-1(k+4)$

$(2k^2-1)(k+4)$

24. $20w^3-5w^2-8w+2$

$5w^2(4w-1)-2(w-1)$

$(5w^2-2)(4w-1)$

Directions: Factor each expression completely.

25. $3x^4-48x^2$

$3x^2(x^2-16)$

$3x^2(x+4)(x-4)$

26. $m^6n-m^2n^5$

$m^2n(m^4-n^4)$

$m^2n(m^2+n^2)(m^2-n^2)$

$m^2n(m^2+n^2)(m+n)(m-n)$

27. $-54k^4+2k$

$-2k(27k^3-1)$

$-2k(3k-1)(9k^2+3k+1)$

28. $4p^4q+32pq^4$

$4pq(p^3+8q^3)$

$4pq(p+2q)(p^2-2pq+4q^2)$

29. $8w^5-8w^4-48w^3$

$8w^3(w^2-w-6)$

$8w^3(w-3)(w+2)$

30. $-x^4y+6x^3y-5x^2y$

$-x^2y(x^2-6x+5)$

$-x^2y(x-5)(x-1)$

31. $2c^4d^2+28c^3d^2+98c^2d^2$

$2c^2d^2(c^2+14c+49)$

$2c^2d^2(c+7)(c+7)$

32. $-3a^4+15a^2+108$

$-3(a^4-5a^2-36)$

$-3(a^2-9)(a^2+4)$

$-3(a+3)(a-3)(a^2+4)$

33. $12n^2-20n-24$

$4(3n^2-5n-6)$

34. $20r^4s-20r^3s+5r^2s$

$5r^2s(4r^2-4r+1)$

$5r^2s(2r-1)(2r-1)$

35. $9n^3-9n^2-25n+25$

$9n^2(n-1)-25(n-1)$

$(9n^2-25)(n-1)$

$(3n+5)(3n-5)(n-1)$

36. $5x^5-20x^3+5x^2-20$

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

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

$5(x^3+1)(x^2-4)$

$5(x+1)(x^2-x+1)(x+2)(x-2)$

Practice 3: Rational Expressions

Directions: Simplify each expression.

1. $\frac{2x^2-2x}{4x^4-4x^2}$

$= \frac{2x(x-1)}{4x^2(x^2-1)}$

$= \frac{x-1}{2x(x+1)(x-1)}$

$= \boxed{\frac{1}{2x(x+1)}}$

2. $\frac{a^2+a-20}{36a-9a^2}$

$= \frac{(a+5)(a-4)}{9a(4-a)}$

$= \boxed{-\frac{(a+5)}{9a}}$

3. $\frac{2k^2-5k-3}{k^3-27}$

$= \frac{(2k+1)(k-3)}{(k-3)(k^2+3k+9)}$

$= \boxed{\frac{2k+1}{k^2+3k+9}}$

Directions: Find each product or quotient. Give your answer in simplest form.

4. $\frac{x^2+2x-24}{x^3+6x^2} \cdot \frac{x^2+3x}{x^2-x-12}$

$= \frac{(x+6)(x-4)}{x^2(x+6)} \cdot \frac{x(x+3)}{(x-4)(x+3)}$

$= \frac{x}{x^2} = \boxed{\frac{1}{x}}$

5. $\frac{4w^2-11w-3}{16w^2-1} \cdot \frac{8w-2}{9-w^2}$

$= \frac{(4w+1)(w-3)}{(4w+1)(4w-1)} \cdot \frac{2(4w-1)}{(3-w)(3+w)}$

$= \boxed{\frac{-2}{3+w}}$

6. $\frac{c^2-1}{c^4-1} \div \frac{c+1}{c^2+1}$

$= \frac{(c+1)(c-1)}{(c^2+1)(c^2-1)} \cdot \frac{c^2+1}{c+1}$

$= \frac{c-1}{(c+1)(c-1)} = \boxed{\frac{1}{c+1}}$

7. $\frac{2m^2+3m}{2m^2-7m-15} \div \frac{8m^2+12m}{m^2-25}$

$= \frac{m(2m+3)}{(2m+3)(m-5)} \cdot \frac{(m+5)(m-5)}{4m(2m+3)}$

$= \frac{m(m+5)}{4m(2m+3)} = \frac{m+5}{4(2m+3)}$

Directions: Find each sum or difference. Give your answer in simplest form.

8. $\frac{1}{6a} - \frac{3}{4a^2}$ (·2a, ·3)

$= \frac{2a}{12a^2} - \frac{9}{12a^2}$

$= \boxed{\frac{2a-9}{12a^2}}$

9. $2 - \frac{x+1}{x-3}$ ($\frac{x-3}{x-3}$)

$= \frac{2x-6}{x-3} - \frac{x+1}{x-3}$

$= \boxed{\frac{x-7}{x-3}}$

p4 p-10. $\frac{3}{p+4}+\frac{2p+32}{p^2-16}$

$=\frac{3p-12}{p^2-16}+\frac{2p+32}{p^2-16}$

$=\frac{5p+20}{p^2-16}=\frac{5(p+4)}{(p-4)(p+4)}=\boxed{\frac{5}{p-4}}$

11. $\frac{n^2+7n-18}{n^2-5n+6}-\frac{1}{n-3}\cdot\frac{n-2}{n-2}$

$=\frac{n^2+7n-18}{n^2-5n+6}-\frac{n-2}{n^2-5n+6}$

$=\frac{n^2+6n-16}{n^2-5n+6}=\frac{(n+8)(n-2)}{(n-2)(n-3)}=\boxed{\frac{n+8}{n-3}}$

y-4 12. $\frac{2}{y-7}+\frac{1}{y-4}\cdot\frac{y-7}{y-7}$

$=\frac{2y-8}{y^2-11y+28}+\frac{y-7}{y^2-11y+28}$

$=\frac{3y-15}{y^2-11y+28}=\boxed{\frac{3(y-5)}{(y-7)(y-4)}}$

r+5 13. $\frac{r}{r^2-9}-\frac{1}{r^2+8r+15}\cdot\frac{r-3}{r-3}$

$\frac{r^2+5r-r+3}{(r+5)(r+3)(r-3)}$

$=\frac{r^2+4r+3}{(r+5)(r+3)(r-3)}=\frac{(r+3)(r+1)}{(r+5)(r+3)(r-3)}=\boxed{\frac{r+1}{(r+5)(r-3)}}$

Directions: Simplify each complex fraction.

k/k 14. $\frac{4-\frac{1}{k}}{\frac{8}{k}-\frac{2}{k^2}}$

$=\frac{4k-1}{k}\cdot\frac{k^2}{8k-2}$

$=\frac{4k-1}{k}\cdot\frac{k^2}{2(4k-1)}$

$=\boxed{\frac{k}{2}}$

2/2 15. $\frac{3+\frac{v}{2}}{\frac{v}{4}-\frac{9}{v}}\cdot\frac{4}{4}$

$=\frac{6+v}{2}\cdot\frac{4v}{v^2-36}$

$=\frac{6+v}{2}\cdot\frac{4v}{(v+6)(v-6)}$

$=\boxed{\frac{2v}{v-6}}$

2a/2a 16. $\frac{\frac{2a}{9b}-\frac{b}{2a}}{\frac{a}{3b^2}+\frac{1}{2b}}\cdot\frac{9b}{9b}$

$=\frac{4a^2-9b^2}{18ab}\cdot\frac{6b^2}{2a+3b}$

$=\frac{(2a+3b)(2a-3b)}{18ab}\cdot\frac{6b^2}{2a+3b}$

$=\boxed{\frac{b(2a-3b)}{3a}}$

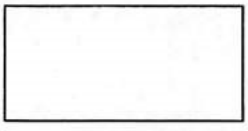
x/x 17. $\frac{x^2+\frac{1}{x}}{\frac{(x+1)^2}{4x}}$

$=\frac{x^3+1}{x}\cdot\frac{4x}{(x+1)^2}$

$=\frac{(x+1)(x^2-x+1)}{x}\cdot\frac{4x}{(x+1)^2}$

$=\boxed{\frac{4(x^2-x+1)}{x+1}}$

18. Write an expression to represent the **area** of the rectangle below in **simplest form**.



$\frac{2x^3-32x}{x+4}$

x/x $\frac{\frac{1}{x}-\frac{4}{x^2}}{4(x-4)^2}$

$\frac{2x(x^2-16)}{x+4}\cdot\frac{x-4}{x^2}\cdot\frac{x^2}{4(x-4)^2}$

$=\frac{2x(x+4)(x-4)}{x+4}\cdot\frac{x-4}{x^2}\cdot\frac{1}{4(x-4)^2}$

$=\frac{2x}{4x^2}=\boxed{\frac{1}{2x}}$

Practice 4: Radicals and Rational Exponents

Directions: Simplify each expression.

1. $\sqrt{80}$

$\sqrt{16}\sqrt{5}$

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

2. $-9\sqrt[3]{250}$

$-9\sqrt[3]{125}\sqrt[3]{2}$

$-9 \cdot 5\sqrt[3]{2}$

$= \boxed{-45\sqrt[3]{2}}$

3. $5\sqrt[4]{112}$

$5\sqrt[4]{16}\sqrt[4]{7}$

$5 \cdot 2\sqrt[4]{7}$

$= \boxed{10\sqrt[4]{7}}$

4. $\sqrt{36x^4y^9}$

$\sqrt{36x^4y^8}\sqrt{y}$

$= \boxed{6x^2y^4\sqrt{y}}$

5. $\sqrt{75m^{16}n^7}$

$\sqrt{25m^{16}n^6}\sqrt{3n}$

$= \boxed{5m^8n^3\sqrt{3n}}$

6. $\sqrt[3]{-108p^{12}q^4}$

$\sqrt[3]{-27p^{12}q^3}\sqrt[3]{4q}$

$= \boxed{-3p^4q\sqrt[3]{4q}}$

Directions: Find each sum or difference. Give your answer in simplest radical form.

7. $-5\sqrt{12} + 2\sqrt{147}$

$-5\sqrt{4}\sqrt{3} + 2\sqrt{49}\sqrt{3}$

$-10\sqrt{3} + 14\sqrt{3} = \boxed{4\sqrt{3}}$

8. $-\sqrt{20} + \sqrt{48} - 3\sqrt{125}$

$-\sqrt{4}\sqrt{5} + \sqrt{16}\sqrt{3} - 3\sqrt{25}\sqrt{5}$

$-2\sqrt{5} + 4\sqrt{3} - 15\sqrt{5}$

$= \boxed{-17\sqrt{5} + 4\sqrt{3}}$

9. $\sqrt[4]{32} + 5\sqrt[4]{2}$

$\sqrt[4]{16}\sqrt[4]{2} + 5\sqrt[4]{2}$

$2\sqrt[4]{2} + 5\sqrt[4]{2} = \boxed{7\sqrt[4]{2}}$

10. $9x\sqrt[3]{3x^4} - 2\sqrt[3]{24x^7}$

$9x\sqrt[3]{x^3}\sqrt[3]{3x} - 2\sqrt[3]{8x^6}\sqrt[3]{3x}$

$9x^2\sqrt[3]{3x} - 4x^2\sqrt[3]{3x} = \boxed{5x^2\sqrt[3]{3x}}$

Directions: Find each product. Give your answer in simplest radical form.

11. $-3\sqrt{20} \cdot 7\sqrt{8}$

$-21\sqrt{160}$

$-21\sqrt{16}\sqrt{10}$

$-21 \cdot 4\sqrt{10}$

$= \boxed{-84\sqrt{10}}$

12. $\sqrt{xy^2} \cdot \sqrt{x^3y^7}$

$\sqrt{x^4y^9}$

$\sqrt{x^4y^8}\sqrt{y}$

$= \boxed{x^2y^4\sqrt{y}}$

13. $\sqrt[4]{2w^6} \cdot \sqrt[4]{8w^3}$

$\sqrt[4]{16w^9}$

$\sqrt[4]{16w^8}\sqrt[4]{w}$

$= \boxed{2w^2\sqrt[4]{w}}$

14. $\sqrt{2}(\sqrt{20} + \sqrt{8})$

$\sqrt{40} + \sqrt{16}$

$\sqrt{4}\sqrt{10} + 4$

$= \boxed{4 + 2\sqrt{10}}$

15. $(8 + 2\sqrt{3})(8 - 2\sqrt{3})$

$64 - 16\sqrt{3} + 16\sqrt{3} - 4\sqrt{9}$

$64 - 12$

$= \boxed{52}$

16. $(\sqrt{5} - 1)^2$

$(\sqrt{5} - 1)(\sqrt{5} - 1)$

$\sqrt{25} - \sqrt{5} - \sqrt{5} + 1$

$5 - 2\sqrt{5} + 1$

$= \boxed{6 - 2\sqrt{5}}$

Directions: Find each quotient. Rationalize the denominator when necessary.

17. $\frac{-12\sqrt{56}}{4\sqrt{2}}$

$-3\sqrt{28}$

$-3\sqrt{4}\sqrt{7}$

$\boxed{-6\sqrt{7}}$

18. $\sqrt{\frac{48u^{10}w^{15}}{3uw^3}}$

$\sqrt{16u^9w^{12}}$

$\sqrt{16u^8w^{12}}\sqrt{u}$

$= \boxed{4u^4w^6\sqrt{u}}$

19. $\frac{\sqrt[3]{-80x^9}}{\sqrt[3]{2x^2}}$

$\sqrt[3]{-40x^7}$

$\sqrt[3]{-8x^6}\ \sqrt[3]{5x}$

$= \boxed{-2x^2\sqrt[3]{5x}}$

20. $\frac{2}{\sqrt{6}} \cdot \frac{\sqrt{6}}{\sqrt{6}}$

$\frac{2\sqrt{6}}{6} = \boxed{\frac{\sqrt{6}}{3}}$

21. $\frac{5\sqrt{3}}{10\sqrt{8}} \cdot \frac{\sqrt{8}}{\sqrt{8}}$

$\frac{5\sqrt{24}}{10\sqrt{64}} = \frac{10\sqrt{6}}{80}$

$= \boxed{\frac{\sqrt{6}}{8}}$

22. $\frac{x\sqrt{18x}}{3\sqrt{5x^3}} \cdot \frac{\sqrt{5x^3}}{\sqrt{5x^3}}$

$\frac{x\sqrt{90x^4}}{3\sqrt{25x^6}} = \frac{3x^3\sqrt{10}}{15x^3}$

$= \boxed{\frac{\sqrt{10}}{5}}$

23. $\frac{(5-2\sqrt{2})\cdot\sqrt{12}}{\sqrt{12}\cdot\sqrt{12}}$

$\frac{5\sqrt{12} - 2\sqrt{24}}{\sqrt{144}} = \frac{10\sqrt{3} - 4\sqrt{6}}{12}$

$= \boxed{\frac{5\sqrt{3} - 2\sqrt{6}}{6}}$

24. $\frac{(\sqrt{3}-2)(5+2\sqrt{3})}{(5-2\sqrt{3})(5+2\sqrt{3})}$

$\frac{5\sqrt{3} + 2\sqrt{9} - 10 - 4\sqrt{3}}{25 + 10\sqrt{3} - 10\sqrt{3} - 4\sqrt{9}} = \frac{\sqrt{3} + 6 - 10}{25 - 12}$

$= \boxed{\frac{-4+\sqrt{3}}{13}}$

Directions: Write each expression in simplest radical form.

25. $125^{\frac{1}{3}}$

$\sqrt[3]{125}$

$= \boxed{5}$

26. $m^{\frac{7}{4}} \cdot n^{\frac{1}{4}}$

$\sqrt[4]{m^7n}$

$\sqrt[4]{m^4}\sqrt[4]{m^3n} = \boxed{m\sqrt[4]{m^3n}}$

27. $(2p)^{\frac{3}{2}}$

$\sqrt{(2p)^3}$

$\sqrt{8p^3} = \boxed{2p\sqrt{2p}}$

Directions: Write each expression in exponential form.

28. $\sqrt{26k}$ $\boxed{(26k)^{1/2}}$

29. $\sqrt[3]{(9w)^4}$ $\boxed{(9w)^{4/3}}$

30. $\sqrt[5]{12y^3}$ $\boxed{(12y^3)^{1/5}}$

Directions: Simplify each expression. Write each answer in simplest radical form.

31. $k^{\frac{2}{3}} \cdot k^{\frac{5}{6}} = k^{3/2}$

$= \sqrt{k^3}$

$= \sqrt{k^2}\sqrt{k} = \boxed{k\sqrt{k}}$

32. $\frac{p^2}{p^{\frac{1}{4}}} = p^{7/4}$

$= \sqrt[4]{p^7}$

$= \sqrt[4]{p^4}\sqrt[4]{p^3} = \boxed{p\sqrt[4]{p^3}}$

33. $(m^{\frac{3}{4}})^{\frac{20}{9}} = m^{5/3}$

$= \sqrt[3]{m^5}$

$= \sqrt[3]{m^3}\sqrt[3]{m^2} = \boxed{m\sqrt[3]{m^2}}$

34. $(6a)^{\frac{1}{4}} \cdot (27a)^{\frac{1}{4}} = \sqrt[4]{162a^2}$

$= \sqrt[4]{81}\sqrt[4]{2a^2}$

$= \boxed{3\sqrt[4]{2a^2}}$

35. $(4c^5d^2)^{\frac{3}{2}} = \sqrt{64c^{15}d^6}$

$= \sqrt{64c^{14}d^6}\sqrt{c}$

$= \boxed{8c^7d^3\sqrt{c}}$

36. $\left(\frac{x^{-\frac{1}{2}}}{x^{-5}}\right)^{\frac{7}{6}} = \left(x^{\frac{9}{2}}\right)^{\frac{7}{6}}$

$= x^{\frac{21}{4}}$

$= \sqrt[4]{x^{21}} = \boxed{x^5\sqrt[4]{x}}$

Practice 5: Complex Numbers

Directions: Write each radical as a complex number.

1. $\sqrt{-121}$

$= \boxed{11i}$

2. $\sqrt{-45}$ $\sqrt{-9}\ \sqrt{5}$

$= \boxed{3i\sqrt{5}}$

3. $\sqrt{-\frac{81}{4}}$ $= \boxed{\frac{9i}{2}}$

Directions: Evaluate.

4. i^2

$= \boxed{-1}$

5. i^{59}

$= (i^4)^{14} \cdot i^3$

$= 1 \cdot -i = \boxed{-i}$

6. $4i^{15} \cdot 5i^6$

$= 20\, i^{21}$

$= 20 \cdot (i^4)^5 \cdot i = \boxed{20i}$

7. $(-3i^{16})^3$

$= -27\, i^{48}$

$= -27(i^4)^{12} = \boxed{-27}$

8. $(2i)^7 \cdot (-5i^9)^2$

$= 128 i^7 \cdot 25\, i^{18}$

$= 32000\, i^{25}$

$= 32000 (i^4)^6 \cdot i = \boxed{32000\, i}$

9. $(i^4\sqrt{6})^2 \cdot (-4i)^3$

$= 6i^8 \cdot -64\, i^3$

$= -384\, i^{11}$

$= -384(i^4)^2 \cdot i^3 = \boxed{384i}$

Directions: Simplify.

10. $(5+7i)+(-13-4i)$

$\boxed{-8+3i}$

11. $(8+5i)-(6+4i)$

$\boxed{2+i}$

12. $(-7-i)-(-9+5i)$

$\boxed{2-6i}$

13. $(-16-3i)+(-3-8i)$

$\boxed{-19-11i}$

14. $3i(-5+7i)$

$-15i + 21i^2$

$\boxed{-21-15i}$

15. $-i(8+2i)-4i(10-3i)$

$-8i - 2i^2 - 40i + 12i^2$

$2 - 48i - 12$

$\boxed{-10-48i}$

16. $(5+i)(2-i)$

$10 - 5i + 2i - i^2$

$10 - 3i + 1$

$\boxed{11-3i}$

17. $(-1-4i)(11+6i)$

$-11 - 6i - 44i - 24i^2$

$-11 - 50i + 24$

$\boxed{13-50i}$

18. $(-7+2i)(-7-2i)$

$49 + 14i - 14i - 4i^2$

$49 + 4 = \boxed{53}$

19. $(2-3i)^2$

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

$4 - 6i - 6i + 9i^2$

$4 - 12i - 9 = \boxed{-5-12i}$

20. $-\frac{1}{2i}\cdot\frac{i}{i}$

$= -\frac{i}{2i^2} = \boxed{\frac{i}{2}}$

21. $\frac{(-5-2i)\cdot i}{6i\cdot i}$

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

22. $\frac{(4+i)\cdot i}{-9i\cdot i}$

$= \frac{4i+i^2}{-9i^2} = \boxed{\frac{-1+4i}{9}}$

23. $\frac{7i}{(6+2i)}\frac{(6-2i)}{(6-2i)}$

$= \frac{42i-14i^2}{36-12i+12i-4i^2} = \frac{14+42i}{40} = \boxed{\frac{7+21i}{20}}$

24. $\frac{(4+10i)(-3+i)}{(-3-i)(-3+i)}$

$= \frac{-12+4i-30i+10i^2}{9-3i+3i-i^2} = \frac{-22-26i}{10}$

$= \boxed{\frac{-11-13i}{5}}$

Directions: Simplify each expression. Write your answer as a complex number in simplest form.

25. $\sqrt{-24}\cdot\sqrt{3}$

$= i\sqrt{24}\cdot\sqrt{3}$

$= i\sqrt{72}$

$= i\sqrt{36}\sqrt{2} = \boxed{6i\sqrt{2}}$

26. $\sqrt{-8}\cdot\sqrt{-12}$

$= i\sqrt{8}\cdot i\sqrt{12}$

$= i^2\sqrt{96}$

$= i^2\sqrt{16}\sqrt{6} = \boxed{-4\sqrt{6}}$

27. $\sqrt{-6}(\sqrt{-8}-2\sqrt{2})$

$= i\sqrt{6}(i\sqrt{8}-2\sqrt{2})$

$= i^2\sqrt{48} - 2i\sqrt{12}$

$= -\sqrt{16}\sqrt{3} - 2i\sqrt{4}\sqrt{3}$

$= \boxed{-4\sqrt{3} - 4i\sqrt{3}}$

28. $5\sqrt{-2}(4+\sqrt{-10})$

$= 5i\sqrt{2}(4+i\sqrt{10})$

$= 20i\sqrt{2} + 5i^2\sqrt{20}$

$= 20i\sqrt{2} - 5\sqrt{4}\sqrt{5}$

$= \boxed{-10\sqrt{5} + 20i\sqrt{2}}$

29. $(5-\sqrt{-24})(5+\sqrt{-24})$

$= (5-i\sqrt{24})(5+i\sqrt{24})$

$= 25 + 5i\sqrt{24} - 5i\sqrt{24} - 24i^2$

$= 25 + 24 = \boxed{49}$

30. $(-3+\sqrt{-12})^2$

$= (-3+i\sqrt{12})(-3+i\sqrt{12})$

$= 9 - 3i\sqrt{12} - 3i\sqrt{12} + 12i^2$

$= 9 - 6i\sqrt{12} - 12$

$= -3 - 6i\sqrt{4}\sqrt{3} = \boxed{-3-12i\sqrt{3}}$

31. $\frac{6-\sqrt{-64}}{10}$

$= \frac{6-8i}{10} = \boxed{\frac{3-4i}{5}}$

32. $\frac{2+\sqrt{-32}}{4}$

$= \frac{2+i\sqrt{32}}{4}$

$= \frac{2+i\sqrt{16}\sqrt{2}}{4} = \frac{2+4i\sqrt{2}}{4} = \boxed{\frac{1+2i\sqrt{2}}{2}}$

Practice 6: Linear & Absolute Value Equations

Directions: Solve each equation.

1. $-7(m-9)-2m=12$

$-7m+63-2m=12$

$-9m=-51$

$\boxed{m=\frac{17}{3}}$

2. $\frac{-2(9-5k)}{8}=-6$

$-18+10K=-48$

$10K=-30$

$\boxed{K=-3}$

3. $16=9-4(2r+7)-1$

$16=9-8r-28-1$

$16=-8r-20$

$36=-8r$

$\boxed{r=\frac{-9}{2}}$

4. $\frac{4}{9}\left(\frac{3}{2}x-18\right)=\frac{1}{6}x+7$

$\frac{2}{3}x-8=\frac{1}{6}x+7$

$\frac{1}{2}x=15$

$\boxed{x=30}$

5. $-8(4n-1)=2(9-3n)$

$-32n+8=18-6n$

$-26n=10$

$\boxed{n=\frac{-5}{13}}$

6. $-3(4-8p)+6=4(6p-1)-2$

$-12+24p+6=24p-4-2$

$24p-6=24p-6$

$-6=-6$

$\boxed{\infty}$

7. $-\frac{4}{3}(12v-18)+32=-8(7+2v)$

$-16v+24+32=-56-16v$

$-16v+56=-56-16v$

$56\neq -56$

$\boxed{\emptyset}$

8. $5(x-3)-(2x-1)=-8\left(4-\frac{1}{2}x\right)$

$5x-15-2x+1=-32+4x$

$3x-14=4x-32$

$\boxed{18=x}$

Directions: Solve each equation for the specified variable.

9. $l=\frac{x\cdot 2\pi r}{360}$ (solve for r)

$360l=x\,2\pi r$

$\frac{360l}{x\cdot 2\pi}=r$

$\boxed{r=\frac{180l}{x\pi}}$

10. $c=\frac{1}{3}(a^2+b)$ (solve for a)

$3c=a^2+b$

$3c-b=a^2$

$\boxed{a=\pm\sqrt{3c-b}}$

11. $\frac{3y-x}{3-2x}=-4$ (solve for y)

$3y-x=-12+8x$

$3y=-12+9x$

$\boxed{y=-4+3x}$

12. $r-rs=2rs+5$ (solve for r)

$r-3rs=5$

$r(1-3s)=5$

$\boxed{r=\frac{5}{1-3s}}$

Directions: Solve each equation. Check for extraneous solutions.

13. $|7x+7|=77$

$7x+7=77$ $\quad$ $7x+7=-77$

$7x=70$ $\quad$ $7x=-84$

$x=10$ $\quad$ $x=-12$

$\boxed{X=\{-12,10\}}$

14. $64=|-11w|+9$

$55=|-11w|$

$55=-11w$ $\quad$ $-55=-11w$

$w=-5$ $\quad$ $w=5$

$\boxed{W=\{-5,5\}}$

15. $|6a+9|+1=4$

$|6a+9|=3$

$6a+9=3$ $\quad$ $6a+9=-3$

$6a=-6$ $\quad$ $6a=-12$

$a=-1$ $\quad$ $a=-2$

$\boxed{a=\{-2,-1\}}$

16. $5|p-2|-1=29$

$5|p-2|=30$

$|p-2|=6$

$p-2=6$ $\quad$ $p-2=-6$

$p=8$ $\quad$ $p=-4$

$\boxed{p=\{-4,8\}}$

17. $-92=-10|2-4n|+8$

$-100=-10|2-4n|$

$10=|2-4n|$

$10=2-4n$ $\quad$ $-10=2-4n$

$8=-4n$ $\quad$ $-12=-4n$

$-2=n$ $\quad$ $3=n$

$\boxed{n=\{-2,3\}}$

18. $9|r+8|-4=-22$

$9|r+8|=-18$

$|r+8|=-2$

$\boxed{\text{No Solution}}$

19. $4v-3=|2v+9|$

$4v-3=2v+9$ $\quad$ $-4v+3=2v+9$

$2v=12$ $\quad$ $-6v=6$

$v=6$ $\quad$ $v=-1$

$\boxed{V=6}$

20. $\frac{1}{2}|9a+3|-1=3a-7$

$\frac{1}{2}|9a+3|=3a-6$

$|9a+3|=6a-12$

$9a+3=6a-12$ $\quad$ $9a+3=-6a+12$

$3a=15$ $\quad$ $15a=9$

$a=5$ $\quad$ $a=\frac{3}{5}$

$\boxed{\text{No Solution}}$

Practice 7: Quadratic Equations

Directions: Solve each equation by factoring.

1. $x^2 + x - 56 = 0$

$(x+8)(x-7) = 0$

$x = -8 \mid x = 7$

$x = \{-8, 7\}$

2. $-6n^2 - 8n = 0$

$-2n(3n+4) = 0$

$n = 0 \mid n = -4/3$

$n = \{-\frac{4}{3}, 0\}$

3. $3x^2 - 8x = x^2 + 42$

$2x^2 - 8x - 42 = 0$

$2(x^2 - 4x - 21) = 0$

$2 \mid (x-7)(x+3) = 0$

$2 \neq 0 \mid x = 7 \mid x = -3$

$x = \{-3, 7\}$

4. $5y^2 + 16 = 42y$

$5y^2 - 42y + 16 = 0$

$(5y - 2)(y - 8) = 0$

$y = \frac{2}{5} \mid y = 8$

$y = \{\frac{2}{5}, 8\}$

Directions: Solve each equation by square roots. Write all irrational and complex answers in simplest form.

5. $9p^2 - 1 = 0$

$9p^2 = 1$

$p^2 = \frac{1}{9}$

$p = \pm\sqrt{\frac{1}{9}}$

$p = \pm\frac{1}{3}$

6. $\frac{1}{4}k^2 - 17 = -7$

$\frac{1}{4}k^2 = 10$

$k^2 = 40$

$k = \pm\sqrt{40}$

$k = \pm 2\sqrt{10}$

7. $2w^2 + 29 = -21$

$2w^2 = -50$

$w^2 = -25$

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

$w = \pm 5i$

8. $-3w^2 - 78 = 138$

$-3w^2 = 216$

$w^2 = -72$

$w = \pm\sqrt{-72}$

$w = \pm 6i\sqrt{2}$

Directions: Solve each equation by completing the square. Write all irrational and complex answers in simplest form.

9. $x^2 + 4x + 8 = 0$

$x^2 + 4x = -8$

$x^2 + 4x + 4 = -8 + 4$

$(x+2)^2 = -4$

$x + 2 = \pm\sqrt{-4}$

$x + 2 = \pm 2i$

$x = -2 \pm 2i$

10. $v^2 - 16v - 48 = -4$

$v^2 - 16v = 44$

$v^2 - 16v + 64 = 44 + 64$

$(v-8)^2 = 108$

$v - 8 = \pm\sqrt{108}$

$v - 8 = \pm 6\sqrt{3}$

$v = 8 \pm 6\sqrt{3}$

11. $n^2+15n+43=0$

$n^2+15n=-43$

$n^2+15n+\frac{225}{4}=-43+\frac{225}{4}$

$(n+\frac{15}{2})^2=\frac{53}{4}$

$n+\frac{15}{2}=\pm\sqrt{\frac{53}{4}}$

$n=\frac{-15}{2}\pm\frac{\sqrt{53}}{2}$ $\quad n=\left\{\frac{-15\pm\sqrt{53}}{2}\right\}$

12. $2p^2-6p-58=0$

$p^2-3p-29=0$

$p^2-3p=29$

$p^2-3p+\frac{9}{4}=29+\frac{9}{4}$

$(p-\frac{3}{2})^2=\frac{261}{4}$

$p-\frac{3}{2}=\pm\sqrt{\frac{261}{4}}$

$p=\frac{3}{2}\pm\frac{3\sqrt{29}}{2}$ $\quad p=\left\{\frac{3\pm3\sqrt{29}}{2}\right\}$

13. $4w^2+10w+12=0$

$4w^2+10w=-12$

$w^2+\frac{5}{2}w=-3$

$w^2+\frac{5}{2}w+\frac{25}{16}=-3+\frac{25}{16}$

$(w+\frac{5}{4})^2=\frac{-23}{16}$

$w+\frac{5}{4}=\pm\sqrt{\frac{-23}{16}}$ $\quad w=\left\{\frac{-5\pm i\sqrt{23}}{4}\right\}$

14. $6a^2-4a-22=0$

$6a^2-4a=22$

$a^2-\frac{2}{3}a=\frac{11}{3}$

$a^2-\frac{2}{3}a+\frac{1}{9}=\frac{11}{3}+\frac{1}{9}$

$(a-\frac{1}{3})^2=\frac{34}{9}$

$a-\frac{1}{3}=\pm\sqrt{\frac{34}{9}}$

$a=\frac{1}{3}\pm\frac{\sqrt{34}}{3}$ $\quad a=\left\{\frac{1\pm\sqrt{34}}{3}\right\}$

Directions: Solve each equation using the quadratic formula. Write all irrational and complex answers in simplest form.

15. $5n^2-4n+2=0$

$n=\frac{4\pm\sqrt{(-4)^2-4(5)(2)}}{2(5)}$

$n=\frac{4\pm\sqrt{-24}}{10}$

$n=\frac{4\pm2i\sqrt{6}}{10}$ $\quad n=\left\{\frac{2\pm i\sqrt{6}}{5}\right\}$

16. $8r^2+4r-1=0$

$r=\frac{-4\pm\sqrt{(4)^2-4(8)(-1)}}{2(8)}$

$r=\frac{-4\pm\sqrt{48}}{16}$

$r=\frac{-4\pm4\sqrt{3}}{16}$ $\quad r=\left\{\frac{-1\pm\sqrt{3}}{4}\right\}$

Use the following information to answer questions 17-18: A bullet is fired straight upward with an initial speed of 720 ft/s. Its path is modeled by the equation $h=-16t^2+720t$, where h is the height of the bullet t seconds after it was fired.

17. When does the bullet fall back to the ground?

$-16t^2+720t=0$

$-16t(t-45)=0$

$t=0 \mid t=45$

45 sec

18. When does the bullet reach a height of 4,000 feet?

$-16t^2+720t=4000$

$-16t^2+720t-4000=0$

$t=\frac{-720\pm\sqrt{(720)^2-4(-16)(-4000)}}{2(-16)}$

$t=\frac{-720\pm\sqrt{262400}}{-32}$ $\quad t=6.5, 38.5$

6.5 sec or 38.5 sec

Practice 8: Radical Equations

Directions: Solve each equation. Check for extraneous solutions.

1. $\sqrt{3x-22}^2 = \sqrt{-x+10}^2$

$3x-22 = -x+10$

$4x-22 = 10$

$4x = 32$

$\boxed{x = 8}$

2. $\sqrt[4]{\frac{a}{3}}^4 = \sqrt[4]{14-2a}^4$

$\frac{a}{3} = 14-2a$

$a = 42-6a$

$7a = 42$

$\boxed{a = 6}$

3. $\sqrt[3]{28-2k}^3 = \sqrt[3]{2k-24}^3$

$28-2k = 2k-24$

$28 = 4k-24$

$52 = 4k$

$\boxed{13 = k}$

4. $\sqrt{9-2u}^2 = \sqrt{-7u-6}^2$

$9-2u = -7u-6$

$15-2u = -7u$

$15 = -5u$

$\boxed{-3 = u}$

5. $\frac{3\sqrt{7y+4}}{3} = \frac{15}{3}$

$\sqrt{7y+4}^2 = 5^2$

$7y+4 = 25$

$7y = 21$

$\boxed{y = 3}$

6. $\sqrt[3]{-1-13m}+8 = 12$

$\sqrt[3]{-1-13m}^3 = 4^3$

$-1-13m = 64$

$-13m = 65$

$\boxed{m = -5}$

7. $8-\sqrt[3]{p-5} = 9$

$-\sqrt[3]{p-5} = 1$

$\sqrt[3]{p-5}^3 = (-1)^3$

$p-5 = -1$

$\boxed{p = 4}$

8. $-6\sqrt{10-3c}+2 = -10$

$-6\sqrt{10-3c} = -12$

$\sqrt{10-3c}^2 = 2^2$

$10-3c = 4$

$-3c = -6$

$\boxed{c = 2}$

9. $\sqrt{-1-2r}^2 = r^2$

$-1-2r = r^2$

$0 = r^2+2r+1$

$0 = (r+1)(r+1)$

$r \neq -1 \mid r \neq -1$

No Solution

10. $z^2 = \sqrt{9z-20}^2$

$z^2 = 9z-20$

$z^2-9z+20 = 0$

$(z-4)(z-5) = 0$

$z=4 \mid z=5$

$z = \{4, 5\}$

11. $b = 1+\sqrt{7-3b}$

$(b-1)^2 = \sqrt{7-3b}^2$

$b^2-2b+1 = 7-3b$

$b^2+b-6 = 0$

$(b+3)(b-2) = 0$

$b \neq -3 \mid b=2$

$b=2$

12. $\sqrt{11y+78}+7 = y+13$

$\sqrt{11y+78}^2 = (y+6)^2$

$11y+78 = y^2+12y+36$

$0 = y^2+y-42$

$0 = (y+7)(y-6)$

$y \neq -7 \mid y=6$

$y=6$

13. $\left((-4-3v)^{\frac{1}{2}}\right)^2 = \left((4-v)^{\frac{1}{2}}\right)^2$

$-4-3v = 4-v$

$-4 = 4+2v$

$-8 = 2v$

$-4 = v$

14. $(12h-16)^{\frac{4}{3}}-1 = 15$

$\left((12h-16)^{\frac{4}{3}}\right)^{\frac{3}{4}} = 16^{3/4}$

$12h-16 = \pm 8$

$12h-16 = 8$ | $12h-16 = -8$

$12h = 24$ | $12h = 8$

$h = 2$ | $h = 2/3$

$h = \{\frac{2}{3}, 2\}$

15. $256 = 2(10j-6)^{\frac{7}{6}}$

$128^{6/1} = \left((10j-6)^{7/6}\right)^{6/7}$

$64 = 10j-6$

$70 = 10j$

$7 = j$

16. $\left((6x^2+30x)^{\frac{3}{2}}\right)^{\frac{2}{3}} = 216^{\frac{2}{3}}$

$6x^2+30x = 36$

$x^2+5x = 6$

$x^2+5x-6 = 0$

$(x+6)(x-1) = 0$

$x=-6 \mid x=1$

$x = \{-6, 1\}$

Practice 9: Rational Equations

Directions: Solve each equation. Check for extraneous solutions.

1. $\frac{x-8}{x+1}=\frac{5}{4}$

$4(x-8)=5(x+1)$

$4x-32=5x+5$

$-32=x+5$

$\boxed{x=-37}$

2. $\frac{6}{2m+7}=\frac{10}{3m-8}$

$6(3m-8)=10(2m+7)$

$18m-48=20m+70$

$-48=2m+70$

$-118=2m$

$\boxed{m=-59}$

3. $\frac{p+4}{3}=\frac{13}{p-6}$

$(p+4)(p-6)=39$

$p^2-2p-24=39$

$p^2-2p-63=0$

$(p-9)(p+7)=0$

$p=9 \mid p=-7$

$\boxed{p=\{-7,9\}}$

4. $\frac{2}{2w-3}=\frac{w-2}{3w-7}$

$2(3w-7)=(2w-3)(w-2)$

$6w-14=2w^2-7w+6$

$0=2w^2-13w+20$

$0=(2w-5)(w-4)$

$w=\frac{5}{2} \mid w=4$

$\boxed{w=\{\frac{5}{2},4\}}$

5. $\left[\frac{1}{6}+\frac{1}{6a}=\frac{2}{a}\right]\cdot 6a$

$a+1=12$

$\boxed{a=11}$

6. $\left[\frac{1}{3n}-\frac{n-4}{3n^2}=\frac{1}{3}\right]\cdot 3n^2$

$n-n+4=n^2$

$4=n^2$

$\pm 2=n$

$\boxed{n=\{\pm 2\}}$

7. $\left[\frac{q^2-q-30}{q}+3=\frac{q^2+4q-12}{q}\right]\cdot q$

$q^2-q-30+3q=q^2+4q-12$

$q^2+2q-30=q^2+4q-12$

$-18=2q$

$\boxed{q=-9}$

8. $\left[\frac{x^2+2x-15}{x}=\frac{x-1}{2}+\frac{x-1}{x}\right]\cdot 2x$

$2x^2+4x-30=x^2-x+2x-2$

$2x^2+4x-30=x^2+x-2$

$x^2+3x-28=0$

$(x+7)(x-4)=0$

$x=-7 \mid x=4$

$\boxed{x=\{-7,4\}}$

9. $\left[\frac{3}{r}+1=\frac{r^2-3r-18}{2r}\right]\cdot 2r$

$6+2r=r^2-3r-18$

$0=r^2-5r-24$

$0=(r-8)(r+3)$

$r=8 \mid r=-3$

$r=\{-3,8\}$

10. $\left[\frac{1}{2a^2}=\frac{a^2-4a-5}{4a^2}+\frac{5a-10}{2a^2}\right]\cdot 4a^2$

$2=a^2-4a-5+2(5a-10)$

$2=a^2-4a-5+10a-20$

$0=a^2+6a-27$

$0=(a+9)(a-3)$

$a=-9 \mid a=3$

$a=\{-9,3\}$

11. $\left[3+\frac{3}{w}=\frac{w+6}{2w^2}\right]\cdot 2w^2$

$6w^2+6w=w+6$

$6w^2+5w-6=0$

$(2w+3)(3w-2)=0$

$w=\frac{-3}{2} \mid w=\frac{2}{3}$

$w=\left\{\frac{-3}{2},\frac{2}{3}\right\}$

12. $\left[\frac{1}{y+2}+\frac{5y-15}{y+2}=6\right]\cdot y+2$

$1+5y-15=6(y+2)$

$5y-14=6y+12$

$-26=y$

13. $\left[\frac{1}{3v+3}=\frac{5}{3v+3}+\frac{1}{3}\right]\ 3v+3$

$1=5+v+1$

$1=v+6$

$-5=v$

14. $\left[\frac{3k-15}{k^2-2k}-\frac{1}{k}=\frac{k+6}{k^2-2k}\right]\cdot k^2-2k$

$3k-15-(k-2)=k+6$

$3k-15-k+2=k+6$

$2k-13=k+6$

$k=19$

15. $\left[m+1-\frac{m-5}{m-3}=\frac{m-2}{2}\right]\cdot 2(m-3)$

$(m+1)(2m-6)-2(m-5)=(m-2)(m-3)$

$2m^2-4m-6-2m+10=m^2-5m+6$

$2m^2-6m+4=m^2-5m+6$

$m^2-m-2=0$

$(m-2)(m+1)=0$

$m=2 \mid m=-1$

$m=\{-1,2\}$

16. $\left[\frac{x-3}{x-5}-\frac{1}{x-5}=\frac{6x-12}{x^2-4x-5}\right]\ x^2-4x-5$

$(x-3)(x+1)-(x+1)=6x-12$

$x^2-2x-3-x-1=6x-12$

$x^2-3x-4=6x-12$

$x^2-9x+8=0$

$(x-8)(x-1)=0$

$x=8 \mid x=1$

$x=\{1,8\}$

Practice 10: Inequalities

Directions: Solve, graph, and write each solution in interval notation.

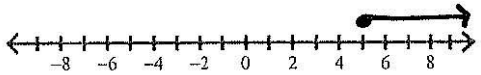
1. $-8(2-7x) \geq 264$

$-16 + 56x \geq 264$

$56x \geq 280$

$x \geq 5$

$[5, \infty)$



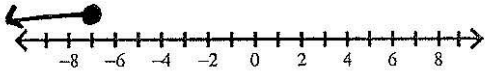
2. $-14 - 2x \geq 8(x+7)$

$-14 - 2x \geq 8x + 56$

$-10x \geq 70$

$x \leq -7$

$(-\infty, -7]$



3. $4(1+8p)+6<106$

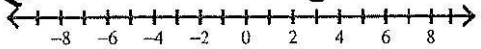
$4 + 32p + 6 < 106$

$32p + 10 < 106$

$32p < 96$

$p < 3$

$(-\infty, 3)$



4. $-3+8(-2y-4) \leq -163$

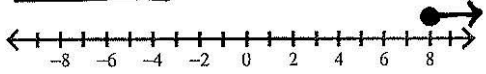
$-3 - 16y - 32 \leq -163$

$-16y - 35 \leq -163$

$-16y \leq -128$

$y \geq 8$

$[8, \infty)$



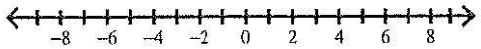
5. $5-6w < 2(-3w+1)+3$

$5 - 6w < -6w + 2 + 3$

$5 - 6w < -6w + 5$

$5 < 5$

$\emptyset$



6. $-11-8k > -3-8(1-6k)$

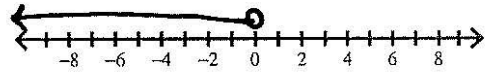
$-11 - 8k > -3 - 8 + 48k$

$-11 - 8k > -11 + 48k$

$0 > 56k$

$0 > k$; $k < 0$

$(-\infty, 0)$



7. $|5-2a| \leq 9$

$5 - 2a \leq 9$

$-2a \leq 4$

$a \geq -2$

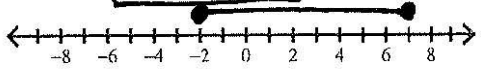
$5 - 2a \geq -9$

$-2a \geq -14$

$a \leq 7$

$-2 \leq a \leq 7$

$[-2, 7]$



8. $|3d+5| > 17$

$3d + 5 > 17$

$3d > 12$

$d > 4$

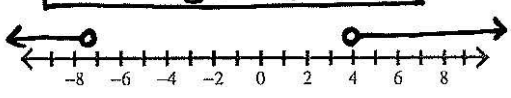
$3d + 5 < -17$

$3d < -22$

$d < -\frac{22}{3}$

$d < -\frac{22}{3}$ or $d > 4$

$(-\infty, -\frac{22}{3}) \cup (4, \infty)$



9. $-10+|-8z+7|<15$

$|-8z+7|<25$

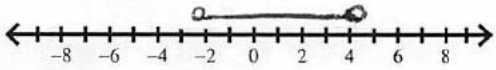
$-8z+7<25$ $\quad$ $-8z+7>-25$

$-8z<18$ $\quad$ $-8z>-32$

$z>\frac{-9}{4}$ $\quad$ $z<4$

$\boxed{-\frac{9}{4}<z<4}$

$\boxed{(-\frac{9}{4},4)}$



10. $|4-x|+9>12$

$|4-x|>3$

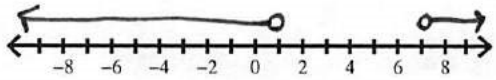
$4-x>3$ $\quad$ $4-x<-3$

$-x>-1$ $\quad$ $-x<-7$

$x<1$ $\quad$ $x>7$

$\boxed{x<1 \text{ or } x>7}$

$\boxed{(-\infty,1)\cup(7,\infty)}$



11. $\frac{|5s+5|}{2}\le 5$

$|5s+5|\le 10$

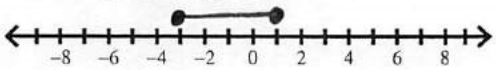
$5s+5\le 10$ $\quad$ $5s+5\ge -10$

$5s\le 5$ $\quad$ $5s\ge -15$

$s\le 1$ $\quad$ $s\ge -3$

$\boxed{-3\le s\le 1}$

$\boxed{[-3,1]}$



12. $-5|3y+10|>-25$

$|3y+10|<5$

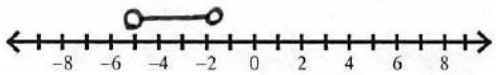
$3y+10<5$ $\quad$ $3y+10>-5$

$3y<-5$ $\quad$ $3y>-15$

$y<\frac{-5}{3}$ $\quad$ $y>-5$

$\boxed{-5<y<\frac{-5}{3}}$

$\boxed{(-5,\frac{-5}{3})}$



13. $-7|6-9k|-4<-88$

$-7|6-9x|<-84$

$|6-9x|>12$

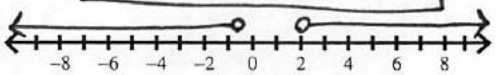
$6-9x>12$ $\quad$ $6-9x<-12$

$-9x>6$ $\quad$ $-9x<-18$

$x<\frac{-2}{3}$ $\quad$ $x>2$

$\boxed{x<\frac{-2}{3} \text{ or } x>2}$

$\boxed{(-\infty,-\frac{2}{3})\cup(2,\infty)}$



14. $10+8|2x-7|\ge 82$

$8|2x-7|\ge 72$

$|2x-7|\ge 9$

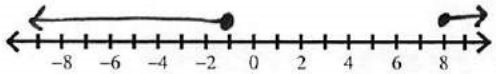
$2x-7\ge 9$ $\quad$ $2x-7\le -9$

$2x\ge 16$ $\quad$ $2x\le -2$

$x\ge 8$ $\quad$ $x\le -1$

$\boxed{x\le -1 \text{ or } x\ge 8}$

$\boxed{(-\infty,-1]\cup[8,\infty)}$



Summary Review for Fundamental Skills

Topic 1: Exponents and Polynomial Expressions

Simplify each expression. Write all answers with positive exponents and in standard form.

1. $\left(\frac{8a^{-5}b^{4}}{12a^{-6}b^{-2}}\right)^{2}$

$= \frac{64a^{-10}b^{8}}{144a^{-12}b^{-4}}$

$= \boxed{\frac{4a^{2}b^{12}}{9}}$

2. $\left(\frac{1}{4}x^{3}y^{-2}\right)^{-2}\left(-4x^{-1}y\right)^{-3}$

$= (16x^{-6}y^{4}) \cdot \left(-\frac{1}{64}x^{3}y^{-3}\right)$

$= -\frac{1}{4}x^{-3}y = \boxed{\frac{-y}{4x^{3}}}$

3. $(5k^{2}-7k+9)-(-2k+6k^{2}+11)$

$= \boxed{-k^{2}-5k-2}$

4. $-5s^{4}t^{3}(3s^{5}t-7s)+4s^{3}\cdot 2s^{6}t^{4}$

$= -15s^{9}t^{4}+35s^{5}t^{3}+8s^{9}t^{4}$

$= \boxed{-7s^{9}t^{4}+35s^{5}t^{3}}$

5. $(-5g+11)(-5g-11)$

$= 25g^{2}+55g-55g-121$

$= \boxed{25g^{2}-121}$

6. $(2r-5)^{3}$

$= (2r-5)(2r-5)(2r-5)$

$= (2r-5)(4r^{2}-20r+25)$

$= 8r^{3}-40r^{2}+50r-20r^{2}+100r-125$

$= \boxed{8r^{3}-60r^{2}+150r-125}$

Completely factor each expression.

7. $12w^{3}+26w^{2}-10w$

$= 2w(6w^{2}+13w-5)$

$= \boxed{2w(3w-1)(2w+5)}$

8. $64c^{4}-121d^{6}$

$= \boxed{(8c^{2}-11d^{3})(8c^{2}+11d^{3})}$

9. $27r^{3}+216$

$= 27(r^{3}+8)$

$= \boxed{27(r+2)(r^{2}-2r+4)}$

10. $32m-162m^{5}$

$= 2m(16-81m^{4})$

$= 2m(4+9m^{2})(4-9m^{2})$

$= \boxed{2m(4+9m^{2})(2+3m)(2-3m)}$

11. $x^{4}+9x^{2}-112$

$= \boxed{(x^{2}+16)(x^{2}-7)}$

12. $8v^{3}+20v^{2}-18v-45$

$= 4v^{2}(2v+5)-9(2v+5)$

$= (4v^{2}-9)(2v+5)$

$= \boxed{(2v+3)(2v-3)(2v+5)}$

Topic 2: Rational Expressions

Simplify each expression.

13. $\dfrac{10m^3+20m^2}{15m^3+15m^2-30m}$

$= \dfrac{10m^2(m+2)}{15m(m^2+m-2)}$

$= \dfrac{2m(m+2)}{3(m+2)(m-1)} = \boxed{\dfrac{2m}{3(m-1)}}$

14. $\dfrac{8a^3+24a^2}{18a+54} \cdot \dfrac{5a^2+43a+24}{10a^2+6a}$

$= \dfrac{8a^2(a+3)}{18(a+3)} \cdot \dfrac{(5a+3)(a+8)}{2a(5a+3)}$

$= \dfrac{8a^2(a+8)}{36a} = \boxed{\dfrac{2a(a+8)}{9}}$

15. $\dfrac{7k^2-36k+5}{3k^2-12k-15} \cdot \dfrac{42k+6}{1-49k^2}$

$= \dfrac{(7k-1)(k-5)}{3(k-5)(k+1)} \cdot \dfrac{6(7k+1)}{(1-7k)(1+7k)}$

$= \dfrac{-6}{3(k+1)} = \boxed{\dfrac{-2}{k+1}}$

16. $\dfrac{3p+1}{p^2-1} - \dfrac{1}{(p+1)(p-1)}$

$= \dfrac{3p+1-p+1}{(p+1)(p-1)}$

$= \dfrac{2p+2}{(p+1)(p-1)} = \dfrac{2(p+1)}{(p+1)(p-1)} = \boxed{\dfrac{2}{p-1}}$

17. $\dfrac{3x}{(2x-3)} - \dfrac{3}{(x+6)}$ (multiply by $\frac{(x+6)}{(x+6)}$ and $\frac{(2x-3)}{(2x-3)}$)

$= \dfrac{3x(x+6)-3(2x-3)}{(2x-3)(x+6)}$

$= \dfrac{3x^2+18x-6x+9}{(2x-3)(x+3)} = \boxed{\dfrac{3x^2+12x+9}{(2x-3)(x+6)}}$

18. $\dfrac{\frac{1}{2}-\frac{r^2}{18}}{\frac{1}{3}-\frac{1}{r}}$ (multiply by $\frac{9}{9}$ and $\frac{r}{r}$)

$= \dfrac{9-r^2}{18} \cdot \dfrac{3r}{r-3}$

$= \dfrac{(3-r)(3+r)}{18} \cdot \dfrac{3r}{r-3}$

$= \boxed{\dfrac{-r(3+r)}{6}}$

Topic 3: Radicals and Rational Exponents

Simplify each expression.

19. $\sqrt{294p^7}$

$= \sqrt{49p^6} \cdot \sqrt{6p}$

$= \boxed{7p^3\sqrt{6p}}$

20. $2\sqrt[3]{-104x^6y^7}$

$= 2\sqrt[3]{-8x^6y^6} \cdot \sqrt[3]{13y}$

$= \boxed{-4x^2y^2\sqrt[3]{13y}}$

21. $-5\sqrt[4]{64m^{11}}$

$= -5\sqrt[4]{16m^8} \cdot \sqrt[4]{4m^3}$

$= \boxed{-10m^2\sqrt[4]{4m^3}}$

22. $-4\sqrt{27}+6\sqrt{45}-\sqrt{75}$

$= -4\sqrt{9}\sqrt{3}+6\sqrt{9}\sqrt{5}-\sqrt{25}\sqrt{3}$

$= -12\sqrt{3}+18\sqrt{5}-5\sqrt{3}$

$= \boxed{-17\sqrt{3}+18\sqrt{5}}$

23. $-2\sqrt[3]{2k^5} \cdot \sqrt[3]{-40k^2}$

$= -2\sqrt[3]{-80k^7}$

$= -2\sqrt[3]{-8k^6} \cdot \sqrt[3]{10k}$

$= \boxed{4k^2\sqrt[3]{10k}}$

24. $2\sqrt{5}(\sqrt{10}-\sqrt{20})$

$= 2\sqrt{50} - 2\sqrt{100}$

$= 2\sqrt{25}\sqrt{2} - 2\cdot 10$

$= \boxed{-20+10\sqrt{2}}$

25. $(3\sqrt{2}-7)^2$

$= (3\sqrt{2}-7)(3\sqrt{2}-7)$

$= 9\sqrt{4} - 21\sqrt{2} - 21\sqrt{2} + 49$

$= 18 - 42\sqrt{2} + 49$

$= \boxed{67-42\sqrt{2}}$

26. $\dfrac{24\sqrt{112}}{16\sqrt{2}} = \dfrac{3}{2}\sqrt{56}$

$= \dfrac{3}{2}\sqrt{4}\sqrt{14}$

$= \boxed{3\sqrt{14}}$

27. $\dfrac{(2+\sqrt{3})(5-\sqrt{3})}{(5+\sqrt{3})(5-\sqrt{3})}$

$= \dfrac{10-2\sqrt{3}+5\sqrt{3}-\sqrt{9}}{25-5\sqrt{3}+5\sqrt{3}-\sqrt{9}}$

$= \boxed{\dfrac{7+3\sqrt{3}}{22}}$

28. Rewrite in exponential form; $\sqrt{2k^5}$

$= \boxed{(2k^5)^{1/2}}$ or $\boxed{2^{1/2}k^{5/2}}$

29. Rewrite in simplest radical form: $(24x^7)^{\frac{1}{3}}$

$= \sqrt[3]{24x^7}$

$= \sqrt[3]{8x^6}\sqrt[3]{3x} = \boxed{2x^2\sqrt[3]{3x}}$

Simplify each expression. Write your answer in simplest radical form.

30. $k^{\frac{1}{4}}\cdot k^{\frac{3}{2}} = k^{7/4}$

$= \sqrt[4]{k^7}$

$= \boxed{k\sqrt[4]{k^3}}$

31. $\dfrac{u^{\frac{1}{3}}\cdot u^{-\frac{5}{6}}}{u^{-2}} = \dfrac{u^{-1/2}}{u^{-2}} = u^{3/2}$

$= \sqrt{u^3}$

$= \boxed{u\sqrt{u}}$

Topic 4: Complex Numbers

Simplify each expression.

32. $i^{52} = (i^4)^{13}$

$= 1^{13} = \boxed{1}$

33. $(-3i^7)^3\cdot 2i^{12}$

$= -27i^{21}\cdot 2i^{12}$

$= -54i^{33} = -54(i^4)^8\cdot i$

$= \boxed{-54i}$

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

$= -5i + i^2 + 6 - 14i$

$= -19i - 1 + 6$

$= \boxed{5-19i}$

35. $(-2+9i)^2$

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

$= 4 - 18i - 18i + 81i^2$

$= 4 - 36i - 81 = \boxed{-77-36i}$

36. $\dfrac{(-6-10i)\cdot i}{9i\cdot i} = \dfrac{-6i-10i^2}{9i^2}$

$= \dfrac{10-6i}{-9} = \boxed{\dfrac{-10+6i}{9}}$

37. $\dfrac{(-7-4i)(-8-i)}{(-8+i)(-8-i)} = \dfrac{56+7i+32i+4i^2}{64+8i-8i-i^2}$

$= \dfrac{56+39i-4}{64+1}$

$= \dfrac{52+39i}{65} = \boxed{\dfrac{4+3i}{5}}$

Topic 5: Linear & Absolute Value Equations

Solve each equation.

38. $8-4(n-1)=-2n+18$

$8-4n+4=-2n+18$

$-4n+12=-2n+18$

$-2n=6$

$\boxed{n=-3}$

39. $\frac{15}{4}\left(12x-\frac{8}{3}\right)=9(2+5x)$

$45x-10=18+45x$

$-10\neq 18$

$\boxed{\emptyset}$

40. $\frac{5p+q^2}{7}=8$ (solve for q)

$5p+q^2=56$

$q^2=56-5p$

$\boxed{q=\pm\sqrt{56-5p}}$

41. $4a-7b=ab+3$ (solve for a)

$4a-ab=7b+3$

$a(4-b)=7b+3$

$\boxed{a=\frac{7b+3}{4-b}}$

Solve each equation. Be sure to check for extraneous solutions.

42. $|5-2x|=11$

$5-2x=11$ $\quad$ $5-2x=-11$

$-2x=6$ $\quad$ $-2x=-16$

$x=-3$ $\quad$ $x=8$

$\boxed{x=\{-3,8\}}$

43. $|4p-9|=6+p$

$4p-9=6+p$ $\quad$ $4p-9=-6-p$

$3p=15$ $\quad$ $5p=3$

$p=5$ $\quad$ $p=\frac{3}{5}$

$\boxed{p=\left\{\frac{3}{5},5\right\}}$

44. $-7|10+3m|-7=-63$

$-7|10+3m|=-56$

$|10+3m|=8$

$10+3m=8$ $\quad$ $10+3m=-8$

$3m=-2$ $\quad$ $3m=-18$

$m=\frac{-2}{3}$ $\quad$ $m=-6$

$\boxed{m=\left\{-6,\frac{-2}{3}\right\}}$

45. $-5-|-3-4x|=11$

$-|-3-4x|=16$

$|-3-4x|=-16$

$\boxed{\emptyset}$

Topic 6: Quadratic Equations

Solve each equation. Simplify all irrational and complex solutions.

46. $2w^2+3w-5=0$

$(2w+5)(w-1)=0$

$w=\frac{-5}{2}$ $\quad$ $w=1$

$\boxed{w=\left\{-\frac{5}{2},1\right\}}$

47. $36c^2+8=4$

$36c^2=-4$

$c^2=-\frac{1}{9}$

$c=\pm\sqrt{\frac{-1}{9}}$

$\boxed{c=\pm\frac{1}{3}i}$

48. $r^2+9r+65=-r$

$r^2+10r=-65$

$r^2+10r+25=-65+25$

$(r+5)^2=-40$

$r+5=\pm\sqrt{-40}$

$r=-5\pm i\sqrt{40}$

$\boxed{r=\{-5\pm 2i\sqrt{10}\}}$

49. $4y^2-28=8y$

$4y^2-8y-28=0$

$y=\dfrac{8\pm\sqrt{(-8)^2-4(4)(-28)}}{2(4)}$

$y=\dfrac{8\pm\sqrt{512}}{8}$

$y=\dfrac{8\pm 16\sqrt{2}}{8}$

$\boxed{y=\{1\pm 2\sqrt{2}\}}$

50. Janell is standing on a set of bleachers and throws a ball into the air at an initial velocity of 35 ft/s. The height of the ball, h, at t seconds is modeled by the equation $\boldsymbol{h = -16t^2 + 35t + 6}$. How many seconds will it take the ball to reach the ground?

$-16t^2+35t+6=0$

$t=\dfrac{-35\pm\sqrt{35^2-4(-16)(6)}}{2(-16)}$

$t=\dfrac{-35\pm\sqrt{1609}}{-32}$

$t=-0.16,\ 2.35$

$\boxed{2.35\text{ sec}}$

Topic 7: Radical Equations

Solve each equation. Be sure to check for extraneous solutions.

51. $\sqrt[3]{5x-17}=\sqrt[3]{3x-5}$

$5x-17=3x-5$

$2x-17=-5$

$2x=12$

$\boxed{x=6}$

52. $4\sqrt[4]{8-2k}-7=1$

$4\sqrt[4]{8-2k}=8$

$\sqrt[4]{8-2k}^{4}=2^4$

$8-2k=16$

$-2k=8$

$\boxed{k=-4}$

53. $u=\sqrt{30-13u}^{\,2}$

$u^2=30-13u$

$u^2+13u-30=0$

$(u+15)(u-2)=0$

$u\neq -15 \mid u=2$

$\boxed{u=2}$

54. $\sqrt{-4m+13}+2=m$

$\sqrt{-4m+13}^{\,2}=(m-2)^2$

$-4m+13=m^2-4m+4$

$0=m^2-9$

$0=(m+3)(m-3)$

$m\neq -3 \mid m=3$

$\boxed{m=3}$

55. $7-2(3b)^{\frac{4}{3}}=-155$

$-2(3b)^{4/3}=-162$

$\left((3b)^{4/3}\right)^{3/4}=81^{3/4}$

$3b=\pm 27$

$b=\pm 9$

$\boxed{b=\{-9,9\}}$

56. $\left((z^2-8z)^{\frac{3}{2}}\right)^{\frac{2}{3}}=27^{\frac{2}{3}}$

$z^2-8z=9$

$z^2-8z-9=0$

$(z-9)(z+1)=0$

$z=9 \mid z=-1$

$\boxed{z=\{-1,9\}}$

Topic 8: Rational Equations

Solve each equation. Be sure to check for extraneous solutions.

57. $\frac{k+6}{4-k} = \frac{2}{k-4}$

$(k+6)(k-4) = 2(4-k)$

$k^2+2k-24 = 8-2k$

$k^2+4k-32 = 0$

$(k+8)(k-4) = 0$

$k=-8 \mid k \neq 4$

$\boxed{k=-8}$

58. $\left[\frac{1}{2k^2} - \frac{3}{k} = \frac{1}{k^2}\right] \cdot 2k^2$

$1-6k = 2$

$-6k = 1$

$\boxed{k = \frac{-1}{6}}$

59. $\left[u+3 = \frac{u^2+3u-4}{u-2} + \frac{3}{u-2}\right] \cdot (u-2)$

$(u+3)(u-2) = u^2+3u-4+3$

$u^2+u-6 = u^2+3u-1$

$-6 = 2u-1$

$-5 = 2u$

$\boxed{\frac{-5}{2} = u}$

60. $\left[\frac{y+3}{y-5} + \frac{y^2-8y+12}{y^2-4y-5} = \frac{6y-6}{y+1}\right] (y^2-4y-5)$

$(y+3)(y+1) + y^2-8y+12 = (6y-6)(y-5)$

$y^2+4y+3+y^2-8y+12 = 6y^2-36y+30$

$2y^2-4y+15 = 6y^2-36y+30$

$0 = 4y^2-32y+15$

$0 = (2y-15)(2y-1)$

$y = \frac{15}{2} \mid y = \frac{1}{2}$

$\boxed{y = \left\{\frac{1}{2}, \frac{15}{2}\right\}}$

Topic 9: Linear & Absolute Value Inequalities

Solve, graph, and write each solution in interval notation.

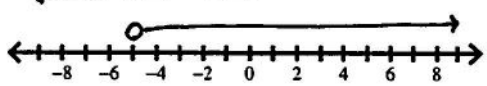
61. $-6(4d+3)+8 < 110$

$-24d-18+8 < 110$

$-24d-10 < 110$

$-24d < 120$

$\boxed{d > -5 \;;\; (-5, \infty)}$



62. $|2x+7| \leq 3$

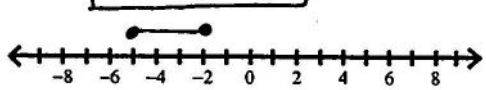
$2x+7 \leq 3$ and $2x+7 \geq -3$

$2x \leq -4$ and $2x \geq -10$

$x \leq -2$ and $x \geq -5$

$\boxed{-5 \leq x \leq -2}$

$\boxed{[-5, -2]}$



63. $-3|-10x-2| < -54$

$|-10x-2| > 18$

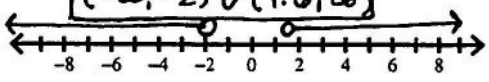
$-10x-2 > 18$ or $-10x-2 < -18$

$-10x > 20$ or $-10x < -16$

$x < -2$ or $x > 1.6$

$\boxed{x < -2 \text{ or } x > 1.6}$

$\boxed{(-\infty, -2) \cup (1.6, \infty)}$



64. $2-3|-3t+6| \geq -61$

$-3|-3t+6| \geq -63$

$|-3t+6| \leq 21$

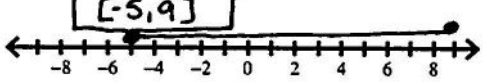
$-3t+6 \leq 21$ and $-3t+6 \geq -21$

$-3t \leq 15$ and $-3t \geq -27$

$t \geq -5$ and $t \leq 9$

$\boxed{-5 \leq t \leq 9}$

$\boxed{[-5, 9]}$



Quiz Part 1- From Practice 1 - Practice 3: Polynomials, Factoring, and Rational Expressions

Directions: Simplify each expression. Final answer must contain only positive exponents.

1. $(-5x^{-2}y)\cdot(6x^{7}y^{-1})+7x^{5}$

$= -30x^{5} + 7x^{5}$

2. $(7m^{-3}n^{8})^{-2}$

$= \frac{1}{49} m^{6} n^{-16}$

3. $\left(\frac{p^{-1}q^{8}}{3p^{6}q^{-2}}\right)^{3}$

$= \frac{p^{-3}q^{24}}{27p^{18}q^{-6}}$

4. $\left(-\frac{1}{2}c^{-3}d^{-8}\right)^{2}\cdot(-6c^{2}d)^{3}$

$= \frac{1}{4}c^{-6}d^{-16}\cdot(-216c^{6}d^{3})$

$= -54c^{0}d^{-13}$

1. $-23x^{5}$
2. $\frac{m^{6}}{49n^{16}}$
3. $\frac{q^{30}}{27p^{21}}$
4. $\frac{-54}{d^{13}}$

Directions: Simplify each expression. Write each answer in standard form.

5. $(3k^{2}-7k)-(5k^{2}+2k-8)$

6. $(3a+7)^{2}-5a(a-4)$

$9a^{2}+21a+21a+49$

$-5a^{2}+20a$

7. $(7m-4)(2m-3)+(2-9m)$

$= 14m^{2}-21m-8m+12$

$+2-9m$

8. $(x-2y)^{3}$

$= (x-2y)(x-2y)(x-2y)$

$= (x-2y)(x^{2}-4xy+4y^{2})$

$= x^{3}-4x^{2}y+4xy^{2}-2x^{2}y+8xy^{2}-8y^{3}$

5. $-2k^{2}-9k+8$
6. $4a^{2}+62a+49$
7. $14m^{2}-38m+14$
8. $x^{3}-6x^{2}y+12xy^{2}-8y^{3}$

Directions: Factor each expression completely.

9. $20c^{5}d^{3}-16c^{2}d$

$= 4c^{2}d(5c^{3}d^{2}-4)$

10. $p^{5}-81p$

$= p(p^{4}-81)$

$= p(p^{2}+9)(p^{2}-9)$

11. $27m^{3}+125n^{3}$

12. $16k^{4}-2k$

$= 2k(8k^{3}-1)$

13. $2v^{3}+10v^{2}-48v$

$= 2v(v^{2}+5v-24)$

14. $-n^{4}-n^{2}+20$

$= (-n^{2}+4)(-n^{2}-5)$

$= (-n+2)(-n-2)(-n^{2}-5)$

9. $4c^{2}d(5c^{3}d^{2}-4)$
10. $p(p^{2}+9)(p+3)(p-3)$
11. $(3m+5n)(9m^{2}-15mn+25n^{2})$
12. $2k(2k-1)(4k^{2}+2k+1)$
13. $2v(v+8)(v-3)$
14. $(-n+2)(-n-2)(-n^{2}-5)$

15. $6m^2 - 25m - 9$

$6m^2 - 27m + 2m - 9$

$3m(2m-9) + 1(2m-9)$

$(3m+1)(2m-9)$

16. $9k^3 + 45k^2 - 4k - 20$

$= 9k^2(k+5) - 4(k+5)$

$= (9k^2-4)(k+5)$

15. $(2m-9)(3m+1)$

16. $(3k+2)(3k-2)(k+5)$

Directions: Simplify each expression.

17. $\dfrac{x^2-16x+63}{49-x^2}$

$= \dfrac{(x-9)(x-7)}{(7+x)(7-x)}$

18. $\dfrac{c^2-4}{12c^3+60c^2} \cdot \dfrac{4c^2+20c}{3c^4-6c^3}$

$= \dfrac{(c+2)(c-2)}{12c^2(c+5)} \cdot \dfrac{4c(c+5)}{3c^3(c-2)}$

$= \dfrac{4c(c+2)}{36c^5}$

19. $\dfrac{4w-24}{w^2+3w-4} \cdot \dfrac{9w^2-9}{3w^2-15w-18}$

$= \dfrac{4(w-6)}{(w+4)(w-1)} \cdot \dfrac{9(w^2-1)}{3(w^2-5w-6)}$

$= \dfrac{4(w-6)}{(w+4)(w-1)} \cdot \dfrac{3(w+1)(w-1)}{(w-6)(w+1)}$

20. $\dfrac{2y^2+5y-12}{4y^2-8y+3} \div \dfrac{y^2+8y+16}{2y-1}$

$= \dfrac{(2y-3)(y+4)}{(2y-1)(2y-3)} \cdot \dfrac{2y-1}{(y+4)(y+4)}$

21. $\dfrac{3y}{3y} \cdot \dfrac{6y}{5x^2} + \dfrac{4}{3xy} \cdot \dfrac{5x}{5x}$

$= \dfrac{18y^2}{15x^2y} + \dfrac{20x}{15x^2y}$

22. $\dfrac{r-1}{r-1} \cdot \dfrac{r}{r-4} - \dfrac{r+8}{r^2-5r+4}$

$= \dfrac{r^2-r-r-8}{(r-1)(r-4)}$

$= \dfrac{r^2-2r-8}{(r-1)(r-4)} = \dfrac{(r-4)(r+2)}{(r-1)(r-4)}$

23. $\dfrac{\frac{4x}{4x} \cdot 6 + \frac{3}{4x}}{\frac{2x}{2x} \cdot \frac{4}{5x} + \frac{1}{10x^2}}$

$= \dfrac{24x+3}{4x} \cdot \dfrac{10x^2}{8x+1}$

$= \dfrac{3(8x+1)}{2} \cdot \dfrac{5x}{8x+1}$

24. $\dfrac{\frac{p^2}{p^2} \cdot \frac{1}{6} - \frac{8}{3p^2}}{\frac{2}{2} \cdot \frac{2}{p} - \frac{1}{2}} \cdot \dfrac{2}{\frac{p}{p}}$

$= \dfrac{p^2-16}{6p^2} \cdot \dfrac{2p}{4-p}$

$= \dfrac{(p-4)(p+4)}{6p^2} \cdot \dfrac{2p}{4-p} = \dfrac{-2p(p+4)}{6p^2}$

17. $-\dfrac{x-9}{7+x}$

18. $\dfrac{c+2}{9c^4}$

19. $\dfrac{12}{w+4}$

20. $\dfrac{1}{y+4}$

21. $\dfrac{18y^2+20x}{15x^2y}$

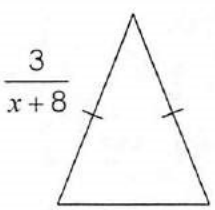
22. $\dfrac{r+2}{r-1}$

23. $\dfrac{15x}{2}$

24. $-\dfrac{p+4}{3p}$

25. $\dfrac{x^2+14x+30}{(x+5)(x+8)}$

25. Write an expression to represent the **perimeter** of the triangle below in simplest form.



$= \dfrac{3}{x+8} + \dfrac{3}{x+8} + \dfrac{x}{x+5}$

$\dfrac{x+5}{x+5} \cdot \dfrac{6}{x+8} + \dfrac{x}{x+5} \cdot \dfrac{x+8}{x+8}$

$= \dfrac{6x+30+x^2+8x}{(x+5)(x+8)} = \dfrac{x^2+14x+30}{(x+5)(x+8)}$

Quiz Part 2- From Practice 4 - Practice 5: Radical Expressions & Complex Numbers

Directions: Simplify each expression.

1. $\sqrt{320}$

$\sqrt{64}\sqrt{5}$

2. $\sqrt[3]{-54}$

$\sqrt[3]{-27}\ \sqrt[3]{2}$

3. $\sqrt{48a^{16}b^{7}}$

$\sqrt{16a^{14}b^{6}}\ \sqrt{3b}$

4. $\sqrt[4]{81p^{11}q^{8}}$

$\sqrt[4]{81p^{8}q^{8}}\ \sqrt[4]{p^{3}}$

Directions: Perform the operation. Give each answer in simplest form.

5. $\sqrt[4]{14}\cdot\sqrt[4]{8}$

$\sqrt[4]{112}$

$\sqrt[4]{16}\ \sqrt[4]{7}$

6. $\sqrt{10w^{6}}\cdot\sqrt{15w^{2}}$

$\sqrt{150w^{8}}$

$\sqrt{25w^{8}}\ \sqrt{6}$

7. $-4\sqrt{75}-\sqrt{24}+7\sqrt{12}$

$-4\sqrt{25}\sqrt{3}-\sqrt{4}\sqrt{6}+7\sqrt{4}\sqrt{3}$

$-20\sqrt{3}-2\sqrt{6}+14\sqrt{3}$

8. $2\sqrt[3]{135x^{7}}-x^{2}\sqrt[3]{40x}$

$2\sqrt[3]{27x^{6}}\ \sqrt[3]{5x}-x^{2}\ \sqrt[3]{8}\ \sqrt[3]{5x}$

$6x^{2}\sqrt[3]{5x}-2x^{2}\sqrt[3]{5x}$

9. $\sqrt{15}(\sqrt{3}-\sqrt{5})$

$\sqrt{45}-\sqrt{75}$

$\sqrt{9}\sqrt{5}-\sqrt{25}\sqrt{3}$

10. $(7-\sqrt{2})(1-4\sqrt{2})$

$7-28\sqrt{2}-\sqrt{2}+4\sqrt{4}$

$7-29\sqrt{2}+8$

11. $\dfrac{2\sqrt{5}}{8\sqrt{18}}\cdot\dfrac{\sqrt{18}}{\sqrt{18}}$

$\dfrac{2\sqrt{90}}{8\cdot 18}=\dfrac{6\sqrt{10}}{144}$

12. $\sqrt{\dfrac{20}{3x}}\cdot\dfrac{\sqrt{3x}}{\sqrt{3x}}$

$=\dfrac{\sqrt{60x}}{3x}=\dfrac{\sqrt{4}\ \sqrt{15x}}{3x}$

13. $\dfrac{\left(3\sqrt{5}-2\sqrt{3}\right)\cdot\sqrt{12}}{\sqrt{12}\cdot\sqrt{12}}$

$\dfrac{3\sqrt{60}-2\sqrt{36}}{12}=\dfrac{6\sqrt{15}-12}{12}$

14. $\dfrac{5\sqrt{3}}{(2-\sqrt{3})}\ \dfrac{(2+\sqrt{3})}{(2+\sqrt{3})}$

$\dfrac{10\sqrt{3}+5\sqrt{9}}{4+2\sqrt{3}-2\sqrt{3}-\sqrt{9}}=\dfrac{10\sqrt{3}+15}{1}$

1. $8\sqrt{5}$
2. $-3\sqrt[3]{2}$
3. $4a^{8}b^{3}\sqrt{3b}$
4. $3p^{2}q^{2}\sqrt[4]{p^{3}}$
5. $2\sqrt[4]{7}$
6. $5w^{4}\sqrt{6}$
7. $-6\sqrt{3}-2\sqrt{6}$
8. $4x^{2}\sqrt[3]{5x}$
9. $3\sqrt{5}-5\sqrt{3}$
10. $15-29\sqrt{2}$
11. $\dfrac{\sqrt{10}}{24}$
12. $\dfrac{2\sqrt{15x}}{3x}$
13. $\dfrac{\sqrt{15}-2}{2}$
14. $10\sqrt{3}+15$

Directions: Write expression in exponential form.

15. $\sqrt[4]{x^7}$

16. $\sqrt{ab^5}$

15. $x^{7/4}$

16. $(ab^5)^{1/2}$

Directions: Perform the operation. Write each answer in simplest radical form.

17. $k^{\frac{11}{12}} \cdot k^{\frac{7}{3}}$

$k^{13/4} = \sqrt[4]{k^{13}}$

18. $(64x^8)^{\frac{1}{3}}$

$\sqrt[3]{64x^8}$

19. $\frac{6^{\frac{5}{2}}}{6}$

$6^{\frac{3}{2}} = \sqrt{216}$

20. $\frac{\left(w^{\frac{7}{6}}\right)^2}{w^{\frac{4}{3}}}$

$w^{11/3} = \sqrt[3]{w^{11}}$

17. $k^3\sqrt[4]{k}$

18. $4x^2\sqrt[3]{x^2}$

19. $6\sqrt{6}$

20. $w^3\sqrt[3]{w^2}$

Directions: Write each expression as a complex number.

21. $\sqrt{-98}$

$i\sqrt{49}\sqrt{2}$

22. $\sqrt{-24} \cdot \sqrt{-8}$

$i\sqrt{24} \cdot i\sqrt{8}$

$i^2\sqrt{192}$

$-\sqrt{64}\sqrt{3}$

21. $7i\sqrt{2}$

22. $-8\sqrt{3}$

Directions: Simplify each expression.

23. i^{20}

$(i^4)^5 = 1^5$

24. $(2i^{16})^3 \cdot -5i^7$

$8i^{48} \cdot -5i^7$

$-40i^{55}$

$-40(i^4)^{13}\, i^3 = -40 \cdot -i$

25. $(-1+5i)-(8-9i)$

26. $6i(3-2i)+(-8-7i)$

$18i - 12i^2 - 8 - 7i$

$11i + 12 - 8$

27. $(-7-2i)(8+2i)$

$-56-14i-16i-4i^2$

$-56-30i+4$

28. $(4+3i)^2$

$(4+3i)(4+3i)$

$16+12i+12i+9i^2$

$16+24i-9$

23. 1

24. $40i$

25. $-9+14i$

26. $4+11i$

27. $-52-30i$

28. $7+24i$

29. $\frac{10+3i}{2}$

30. $\frac{4-13i}{10}$

29. $\frac{(-3+10i)\cdot i}{2i \cdot i}$

$\frac{-3i+10i^2}{2i^2} = \frac{-3i-10}{-2}$

30. $\frac{(6-i)(2-4i)}{(2+4i)(2-4i)}$

$\frac{12-24i-2i+4i^2}{4-8i+8i-16i^2} = \frac{12-26i-4}{4+16} = \frac{8-26i}{20}$

Quiz Part 3- From Practice 6 - Practice 9: Equations

Part I – Linear & Absolute Value Equations: Solve each equation. Check for extraneous solutions.

1. $7a-(3a+1)=-5(2a+17)$

$7a-3a-1=-10a-85$

$4a-1=-10a-85$

$14a=-84$

$a=-6$

2. $-8\left(1-\frac{3}{4}x\right)=10x-4(x+2)$

$-8+6x=10x-4x-8$

$-8+6x=6x-8$

$-8=-8$

3. $9|-2r-4|+6=60$

$9|-2r-4|=54$

$|-2r-4|=6$

$-2r-4=6$ $\quad$ $-2r-4=-6$

$-2r=10$ $\quad$ $-2r=-2$

$r=-5$ $\quad$ $r=1$

4. $|6w-15|=3w-21$

$6w-15=3w-21$

$3w=-6$

$w\neq -2$

$6w-15=-3w+21$

$9w=36$

$w\neq 4$

1. $a=-6$
2. ∞
3. $r=\{-5,1\}$
4. $\emptyset$

Part II – Literal Equations: Solve each equation for the indicated variable.

5. $3a-5b=7(a-b)$ (solve for a)

$3a-5b=7a-7b$

$-4a=-2b$

$a=\frac{1}{2}b$

6. $x=\frac{1}{2}y^2-z$ (solve for y)

$x+z=\frac{1}{2}y^2$

$2x+2z=y^2$

$y=\pm\sqrt{2x+2z}$

5. $a=\frac{1}{2}b$
6. $y=\pm\sqrt{2x+2z}$

Part III – Quadratic Equations: Solve each equation. Simplify all irrational and complex solutions.

7. $x^2-4x-45=0$

$(x-9)(x+5)=0$

$x=9$ $\quad$ $x=-5$

8. $\frac{1}{2}k^2+53=5$

$\frac{1}{2}k^2=-48$

$k^2=-96$

$k=\pm\sqrt{-96}$

7. $x=\{-5,9\}$
8. $k=\pm 4i\sqrt{6}$

9. $v^2+14v+17=0$

$v^2+14v=-17$

$v^2+14v+49=-17+49$

$(v+7)^2=32$

$v+7=\pm\sqrt{32}$

$v=-7\pm4\sqrt{2}$

10. $p^2-12p+88=0$

$p^2-12p=-88$

$p^2-12p+36=-88+36$

$(p-6)^2=-52$

$p-6=\pm\sqrt{-52}$

$p=6\pm2i\sqrt{13}$

9. $v=\{-7\pm4\sqrt{2}\}$

10. $p=\{6\pm2i\sqrt{13}\}$

11. $y=\{-\frac{1}{3},\frac{7}{2}\}$

12. $r=\left\{\frac{-4\pm\sqrt{14}}{2}\right\}$

11. $6y^2-19y-7=0$

$y=\frac{19\pm\sqrt{(-19)^2-4(6)(-7)}}{2(6)}$

$y=\frac{19\pm\sqrt{529}}{12}$

$y=\frac{19\pm23}{12}$

$y=\frac{42}{12},\ -\frac{4}{12}$

12. $2r^2+8r+1=0$

$r=\frac{-8\pm\sqrt{8^2-4(2)(1)}}{2(2)}$

$r=\frac{-8\pm\sqrt{56}}{4}$

$r=\frac{-8\pm2\sqrt{14}}{4}$

Part IV – Radical Equations: Solve each equation. Check for extraneous solutions.

13. $\sqrt{3x-28}^{\,2}=\sqrt{16-x}^{\,2}$

$3x-28=16-x$

$4x=44$

$x=11$

14. $5-2\sqrt[3]{9w-1}=13$

$-2\sqrt[3]{9w-1}=8$

$\sqrt[3]{9w-1}^{\,3}=(-4)^3$

$9w-1=-64$

$9w=-63$

$w=-7$

13. $x=11$

14. $w=-7$

15. $n = \sqrt{6n+30} - 5$

$(n+5)^2 = \sqrt{6n+30}^2$

$n^2 + 10n + 25 = 6n + 30$

$n^2 + 4n - 5 = 0$

$(n+5)(n-1) = 0$

$n = -5 \mid n = 1$

16. $45 = 5(-1-7p)^{\frac{2}{3}}$

$9^{3/2} = \left((-1-7p)^{2/3}\right)^{3/2}$

$\pm 27 = -1-7p$

$27 = -1-7p$ $\qquad -27 = -1-7p$

$28 = -7p$ $\qquad -26 = -7p$

$-4 = p$ $\qquad \frac{26}{7} = p$

15. $n = \{-5, 1\}$

16. $p = \{-4, \frac{26}{7}\}$

Part V – Rational Equations: Solve each equation. Check for extraneous solutions.

17. $\frac{2}{x+5} = \frac{x+2}{3x+11}$

$6x + 22 = (x+5)(x+2)$

$6x + 22 = x^2 + 7x + 10$

$0 = x^2 + x - 12$

$0 = (x+4)(x-3)$

$x = -4 \mid x = 3$

18. $\left[\frac{a+7}{2a^2} + \frac{1}{a^2} = \frac{1}{4a}\right] \cdot 4a^2$

$2(a+7) + 4 = a$

$2a + 14 + 4 = a$

$2a + 18 = a$

$18 = -a$

$a = -18$

17. $x = \{-4, 3\}$

18. $a = -18$

19. $n = 1$

20. $c = \{-1, \frac{3}{2}\}$

19. $\left[\frac{n-1}{n+3} = \frac{1}{n+3} - \frac{1}{n^2+3n}\right] \cdot n^2+3n$

$n(n-1) = n - 1$

$n^2 - n = n - 1$

$n^2 - 2n + 1 = 0$

$(n-1)(n-1) = 0$

$n = 1 \mid n = 1$

20. $\left[\frac{2c}{c+2} - \frac{1}{c} = \frac{1}{c^2+2c}\right] \cdot c^2+2c$

$2c^2 - (c+2) = 1$

$2c^2 - c - 2 = 1$

$2c^2 - c - 3 = 0$

$(2c-3)(c+1) = 0$

$c = \frac{3}{2} \mid c = -1$