

12.1

Answer Key



$$\textcircled{1} \frac{y-4}{y^2-16} = \frac{\cancel{(y-4)}}{\cancel{(y-4)}(y+4)} = \boxed{\frac{1}{y+4}}$$

$$\textcircled{2} \frac{x+3}{x^2-9} = \frac{\cancel{(x+3)}}{\cancel{(x+3)}(x-3)} = \boxed{\frac{1}{x-3}}$$

$$\textcircled{3} \frac{a^2-a}{a-1} = \frac{a\cancel{(a-1)}}{\cancel{(a-1)}} = \boxed{a}$$

$$\textcircled{4} \frac{m^2-2m}{m-2} = \frac{m\cancel{(m-2)}}{\cancel{(m-2)}} = \boxed{m}$$

$$\textcircled{5} \frac{2x^2+6}{2x+6} = \frac{\cancel{2}(x^2+3)}{\cancel{2}(x+3)} = \boxed{\frac{x^2+3}{x+3}}$$

$$\textcircled{6} \frac{3n^2-9}{3n-9} = \frac{\cancel{3}(n^2-3)}{\cancel{3}(n-3)} = \boxed{\frac{n^2-3}{n-3}}$$

$$\textcircled{7} \frac{-4y^2}{2y^2-4y^3} = \frac{-4\cancel{y^2}}{2\cancel{y^2}(1-2y)} = \boxed{\frac{-2}{1-2y}}$$

$$\textcircled{8} \frac{3a^2}{3a^3+6a^2b} = \frac{\cancel{3a^2}}{\cancel{3a^2}(a+2b)} = \boxed{\frac{1}{a+2b}}$$

$$\textcircled{9} \frac{x+6}{x^2+7x+6} = \frac{\cancel{(x+6)}}{\cancel{(x+6)}(x+1)} = \boxed{\frac{1}{x+1}}$$

$$\textcircled{10} \frac{x-3}{x^2+x-12} = \frac{\cancel{(x-3)}}{\cancel{(x-3)}(x+4)} = \boxed{\frac{1}{x+4}}$$

$$\textcircled{11} \frac{9-a^2}{a^2-a-6} = \frac{(3-a)(3+a)}{(a-3)(a+2)}$$

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

$$\textcircled{12} \frac{25-4x^2}{2x^2+x-15} = \frac{(5-2x)(5+2x)}{2x^2+6x-5x-15}$$

$$\frac{(5-2x)(5+2x)}{2x(x+3)-5(x+3)} = \frac{(5-2x)(5+2x)}{(x+3)(2x-5)}$$

$$\frac{-\cancel{(2x-5)}(5+2x)}{\cancel{(x+3)}(2x-5)} = \boxed{\frac{-(5+2x)}{x+3}}$$

$$\textcircled{13} \frac{x^2-3x+2}{2x-2x^2} = \frac{(x-2)(x-1)}{2x(1-x)}$$

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

$$\textcircled{14} \frac{9a-3a^2}{3a^2-3a-18} = \frac{3a(3-a)}{3(a^2-a-6)} = \frac{3a(3-a)}{3(a-3)(a+2)}$$

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

$$\textcircled{15} \frac{m^2-2m-8}{m^2-m-6} = \frac{(m-4)(m+2)}{(m-3)(m+2)} = \boxed{\frac{m-4}{m-3}}$$

$$\textcircled{16} \frac{x^2+x-12}{x^2+2x-15} = \frac{(x+4)(x-3)}{(x+5)(x-3)} = \boxed{\frac{x+4}{x+5}}$$

$$\textcircled{17} \frac{2a^2-ab-b^2}{b^2+ab-2a^2} = \frac{2a^2-2ab+ab-b^2}{(b+2a)(b-a)}$$

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

$$\frac{-(b-a)}{(b-a)} = \boxed{-1}$$

$$\textcircled{18} \frac{3x^2-3y^2}{y^2-x^2} = \frac{3(x^2-y^2)}{y^2-x^2} = \frac{-3(y^2-x^2)}{(y^2-x^2)} = \boxed{-3}$$

$$\textcircled{19} \frac{a^4-5a^2+4}{a^2-a-2} = \frac{(a^2-4)(a^2-1)}{(a-2)(a+1)}$$

$$\frac{(a+2)\cancel{(a-2)}(a+1)(a-1)}{\cancel{(a-2)}(a+1)} = \boxed{(a+2)(a-1)}$$

$$\textcircled{20} \frac{y^4-13y^2+36}{y^2+5y+6} = \frac{(y^2-9)(y^2-4)}{(y+3)(y+2)}$$

$$\frac{\cancel{(y+3)}(y-3)\cancel{(y+2)}(y-2)}{\cancel{(y+3)}\cancel{(y+2)}} = \boxed{(y-3)(y-2)}$$

12.2

Answer Key



$$\textcircled{1} \frac{6a^2n}{8n^2} \cdot \frac{12n}{9a} = \frac{72a^2n^2}{72an^2} = \boxed{a}$$

$$\textcircled{2} \frac{10n^3}{6x^3} \cdot \frac{12n^2x^4}{25n^2x^2} = \frac{120n^5x^4}{150n^2x^5} = \boxed{\frac{4n^3}{5x}}$$

$$\textcircled{3} \frac{3a-3b}{a} \cdot \frac{a^2}{a-b} = \frac{3a^2(\cancel{a-b})}{a(\cancel{a-b})} = \boxed{3a}$$

$$\textcircled{4} \frac{a^2-b^2}{a-b} \cdot \frac{7}{a+b} = \frac{7(\cancel{a-b})(\cancel{a+b})}{(\cancel{a-b})(\cancel{a+b})} = \boxed{7}$$

$$\textcircled{5} \frac{x-5}{x^2-7x+10} \cdot \frac{x-2}{3} = \frac{\cancel{(x-5)}(\cancel{x-2})}{3(\cancel{x-5})(\cancel{x-2})} = \boxed{\frac{1}{3}}$$

$$\textcircled{6} \frac{x+1}{x^2-2x-3} \cdot \frac{x-3}{x+2} = \frac{\cancel{(x+1)}(\cancel{x-3})}{(\cancel{x-3})(\cancel{x+1})(x+2)} = \boxed{\frac{1}{x+2}}$$

$$\textcircled{7} \frac{a^2-b^2}{2a^2+3ab+b^2} \cdot \frac{2a+b}{b-a} = \frac{(a-b)(a+b)(\cancel{2a+b})}{(2a^2+2ab+ab+b^2)(\cancel{b-a})}$$

$$\frac{(a-b)(a+b)(\cancel{2a+b})}{(a+b)(\cancel{2a+b})(\cancel{b-a})} = \frac{-\cancel{(b-a)}(a+b)(\cancel{2a+b})}{(a+b)(\cancel{2a+b})(\cancel{b-a})} = \boxed{-1}$$

$$\textcircled{8} \frac{2x-y}{x^2-y^2} \cdot \frac{(x+y)^2}{y^2-xy-2x^2} = \frac{(2x-y)(x+y)(x+y)}{(x+y)(x-y)(y-2x)(\cancel{y+x})}$$

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

$$\textcircled{9} \frac{y^2}{x+2} \div \frac{y}{x+2}$$

$$\frac{y^2}{\cancel{(x+2)}} \cdot \frac{\cancel{(x+2)}}{y}$$

$$\frac{y^2}{y} = \boxed{y}$$

$$\textcircled{10} \frac{2a^3}{a+1} \div \frac{a^2}{a+1}$$

$$\frac{2a^3}{a+1} \cdot \frac{a+1}{a^2}$$

$$\frac{2a^3}{a^2} = \boxed{2a}$$

$$\textcircled{11} \frac{m^2+2m+1}{2} \div \frac{m+1}{m-1} = \frac{(m+1)(m+1)}{2}$$

$$\frac{m-1}{m+1} = \boxed{\frac{m^2-1}{2}}$$

$$\textcircled{12} \frac{y^2-16}{y^2-64} \div \frac{y+4}{y-8} = \frac{(y-4)(\cancel{y+4})}{(\cancel{y-8})(y+8)} \cdot \frac{\cancel{(y-8)}}{\cancel{(y+4)}}$$

$$\boxed{\frac{y-4}{y+8}}$$

$$\textcircled{13} \frac{x}{x+2} \div \frac{x^2}{x^2+5x+6} = \frac{x}{\cancel{(x+2)}} \cdot \frac{\cancel{(x+3)}(\cancel{x+2})}{x^2} = \boxed{\frac{x+3}{x}}$$

$$\textcircled{14} \frac{x^2+x-2}{x^2+5x+6} \div \frac{x^2+2x-3}{x^2+7x+12}$$

$$\frac{\cancel{(x+2)}(\cancel{x-1})}{(x+3)(\cancel{x+2})} \cdot \frac{\cancel{(x+4)}(\cancel{x+3})}{\cancel{(x+3)}(\cancel{x-1})} = \boxed{\frac{x+4}{x+3}}$$

$$\textcircled{15} \frac{a^2+3a-10}{a^2+8a+15} \div \frac{a^2-6a+8}{8-2a}$$

$$\frac{\cancel{(a+5)}(\cancel{a-2}) \cdot 2(4-a)}{\cancel{(a+5)}(a+3)(\cancel{a-4})(\cancel{a-2})} = \frac{-2(\cancel{a+4})}{(\cancel{a+3})(\cancel{a-4})} = \boxed{\frac{-2}{a+3}}$$

$$\textcircled{16} \frac{2x^2-x-15}{x^2-2x-3} \div \frac{2x^2+3x-5}{1-x^2}$$

$$\frac{\cancel{(x-3)}(\cancel{2x+5})}{\cancel{(x-3)}(\cancel{x+1})} \cdot \frac{(1-x)(\cancel{1+x})}{\cancel{(2x+5)}(\cancel{x-1})} = \frac{-\cancel{(x-1)}}{\cancel{(x-1)}} = \boxed{-1}$$

12.3

Answer Key



$$\textcircled{1} \frac{7}{3a} - \frac{4}{6a^2} = \left(\frac{2a}{2a}\right) \frac{7}{3a} - \frac{4}{6a^2}$$

$$\frac{14a-4}{6a^2} = \frac{2(7a-2)}{6a^2} = \boxed{\frac{7a-2}{3a^2}}$$

$$\textcircled{2} \frac{5b}{7x} + \frac{3a}{21x^2} = \left(\frac{3x}{3x}\right) \frac{5b}{7x} + \frac{3a}{21x^2}$$

$$\frac{15xb+3a}{21x^2}$$

$$\frac{3(5xb+a)}{21x^2} = \boxed{\frac{5xb+a}{7x^2}}$$

$$\textcircled{3} \frac{2}{t} - \frac{t+3}{5} = \left(\frac{5}{5}\right)\frac{2}{t} - \left(\frac{t}{t}\right)\frac{t+3}{5}$$

$$\frac{2s - (t^2+3t)}{5t} = \boxed{\frac{2s - t^2 - 3t}{5t}}$$

$$\textcircled{4} \frac{7}{a} - \frac{x-1}{b} = \left(\frac{b}{b}\right)\frac{7}{a} - \left(\frac{a}{a}\right)\frac{x-1}{b}$$

$$\frac{7b - (ax-a)}{ab} = \boxed{\frac{7b - ax + a}{ab}}$$

$$\textcircled{5} \frac{a}{a+b} + \frac{8}{b} = \left(\frac{b}{b}\right)\frac{a}{a+b} + \left(\frac{a+b}{a+b}\right)\frac{8}{b}$$

$$\boxed{\frac{ab + 8a + 8b}{ab + b^2}}$$

$$\textcircled{6} \frac{m}{m-n} - \frac{5}{m} = \left(\frac{m}{m}\right)\frac{m}{m-n} - \left(\frac{m-n}{m-n}\right)\frac{5}{m}$$

$$\frac{m^2 - (5m-5n)}{m^2 - mn} = \boxed{\frac{m^2 - 5m + 5n}{m^2 - mn}}$$

$$\textcircled{7} \frac{x+y}{y-2} + \frac{x-y}{2-y} \quad \text{multiply by (1) twice}$$

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

$$\frac{x+y-x+y}{y-2} = \boxed{\frac{2y}{y-2}}$$

$$\textcircled{8} \frac{a+b}{x-3} + \frac{a+b}{3-x} \quad \text{multiply by (-) twice}$$

$$\frac{a+b}{x-3} - \frac{a+b}{x-3} = \frac{(a+b) - (a+b)}{x-3}$$

$$\frac{a+b-a-b}{x-3} = \frac{0}{x-3} = \boxed{0}$$

$$\textcircled{9} \frac{2y}{y^2-25} + \frac{y+5}{y-5} = \frac{2y}{(y+5)(y-5)} + \left(\frac{y+5}{y+5}\right)\frac{y+5}{y-5} = \frac{2y + (y+5)(y+5)}{(y+5)(y-5)} = \boxed{\frac{y^2 + 12y + 25}{y^2 - 25}}$$

$$\textcircled{10} \frac{m-n}{m+n} - \frac{1}{m^2-n^2} = \left(\frac{m-n}{m-n}\right)\frac{m-n}{m+n} - \frac{1}{(m-n)(m+n)} = \frac{(m-n)^2 - 1}{(m-n)(m+n)} = \boxed{\frac{m^2 - 2mn + n^2 - 1}{m^2 - n^2}}$$

$$\textcircled{11} \frac{x^2-1}{x+1} + \frac{x^2+1}{x-1} = \frac{(x+1)(x-1)}{(x+1)} + \frac{x^2+1}{x-1}$$

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

$$\boxed{\frac{2x^2-2x+2}{x-1}} \quad \text{or} \quad \boxed{\frac{2(x^2-x+1)}{x-1}}$$

$$\textcircled{12} \frac{k}{2k+1} - \frac{2}{k+2} = \left(\frac{k+2}{k+2}\right)\frac{k}{2k+1} - \left(\frac{2k+1}{2k+1}\right)\frac{2}{k+2}$$

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

$$\textcircled{13} \frac{-18}{y^2-9} + \frac{7}{3-y} = \frac{-18}{(y+3)(y-3)} + \frac{7}{3-y} \left(\frac{-1}{-1}\right)$$

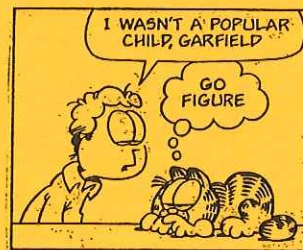
$$\frac{-18}{(y+3)(y-3)} - \frac{7}{(y-3)} \left(\frac{y+3}{y+3}\right)$$

$$\frac{-18 - (7y+21)}{y^2-9} = \boxed{\frac{-7y-39}{y^2-9}}$$

$$\textcircled{14} \frac{-3}{5-a} + \frac{5}{a^2-25} = \left(\frac{-1}{-1}\right)\frac{-3}{5-a} + \frac{5}{(a+5)(a-5)}$$

$$\frac{3}{a-5} \left(\frac{a+5}{a+5}\right) + \frac{5}{(a+5)(a-5)}$$

$$\frac{(3a+15)+5}{(a+5)(a-5)} = \boxed{\frac{3a+20}{a^2-25}}$$



$$\textcircled{15} \frac{a}{a-b} + \frac{b}{2b+3a} = \left(\frac{2b+3a}{2b+3a}\right) \frac{a}{a-b} + \left(\frac{a-b}{a-b}\right) \frac{b}{2b+3a} = \frac{(2ab+3a^2)+(ab-b^2)}{(2b+3a)(a-b)} = \boxed{\frac{3a^2+3ab-b^2}{3a^2-ab-2b^2}}$$

$$\textcircled{16} \frac{m-1}{m+1} + \frac{4}{2m+5} = \left(\frac{2m+5}{2m+5}\right) \frac{m-1}{m+1} + \left(\frac{m+1}{m+1}\right) \frac{4}{2m+5} = \frac{(2m^2+3m-5)+(4m+4)}{2m^2+7m+5} = \boxed{\frac{2m^2+7m-1}{2m^2+7m+5}}$$

$$\textcircled{17} \frac{4a}{6a^2-a-2} - \frac{5a+1}{2-3a} = \frac{4a}{(2a+1)(3a-2)} + \frac{5a+1}{3a-2} = \frac{4a}{(2a+1)(3a-2)} + \left(\frac{2a+1}{2a+1}\right) \frac{5a+1}{3a-2} = \frac{4a+(10a^2+7a+1)}{(2a+1)(3a-2)}$$

$$\boxed{\frac{10a^2+11a+1}{6a^2-a-2}}$$



$$\textcircled{18} \frac{2x+1}{(x-1)^2} + \frac{x-2}{(1-x)(x+4)}$$

$$\frac{2x+1}{(x-1)^2} - \frac{x-2}{(x-1)(x+4)} = \left(\frac{x+4}{x+4}\right) \frac{2x+1}{(x-1)^2} - \left(\frac{x-1}{x-1}\right) \frac{x-2}{(x-1)(x+4)} = \frac{(2x^2+9x+4)-(x^2-3x+2)}{(x+4)(x-1)^2} = \boxed{\frac{x^2+12x+2}{(x+4)(x-1)^2}}$$

$$\textcircled{19} \frac{2t^2-t-21}{2t^2-15t+28} = \frac{(t+3)(2t-7)}{(t-4)(2t-7)} = \boxed{\frac{t+3}{t-4}}$$



$$\textcircled{20} \frac{x^2-4x+4}{x^2+4x-12} = \frac{(x-2)(x-2)}{(x+6)(x-2)} = \boxed{\frac{x-2}{x+6}}$$

$$\textcircled{21} \frac{x^2-15x+50}{x^2-9x+20} \cdot \frac{x^2-11x+24}{x^2-18x+80} = \frac{\cancel{(x-5)}(x-10)}{\cancel{(x-5)}(x-4)} \cdot \frac{\cancel{(x-8)}(x-3)}{\cancel{(x-8)}(x-10)} = \boxed{\frac{x-3}{x-4}}$$

$$\textcircled{22} \frac{y}{5} \div \frac{y^2-25}{5-y} = \frac{y}{5} \cdot \frac{5-y}{(y-5)(y+5)} = \frac{y}{5} \cdot \frac{-(y-5)}{\cancel{(y-5)}(y+5)} = \boxed{\frac{-y}{5y+25}}$$

$$\textcircled{23} \frac{x^2-16}{16-x^2} \div \frac{7}{x}$$

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

$$\textcircled{24} \frac{x^4-37x^2+36}{x^2-7x+6} = \frac{(x^2-36)(x^2-1)}{(x-6)(x-1)}$$

$$\frac{(x-6)(x+6)(x+1)(x-1)}{\cancel{(x-6)}(x-1)}$$

$$\boxed{(x+6)(x+1)} \text{ or } \boxed{(x^2+7x+6)}$$

12.4

Answer Key



$$\textcircled{1} \frac{x^2}{y} \div \frac{y}{x^3} = \frac{x^2}{y} \cdot \frac{x^3}{y} = \boxed{\frac{x^5}{y^2}}$$

$$\textcircled{2} \frac{a^3}{b^2} \cdot \frac{b}{a^2}$$

$$\frac{a^3}{b^2} \cdot \frac{a^2}{b}$$

$$\boxed{\frac{a^5}{b^3}}$$

$$\textcircled{6} \frac{x^3y}{z^2} \cdot \frac{z^2x}{y^2}$$

$$\frac{x^3y}{z^2} \cdot \frac{y^2}{z^2x}$$

$$\boxed{\frac{x^2y^3}{z^4}}$$

$$\textcircled{10} \frac{a}{b} + \frac{a}{c} = \frac{ac+ab}{bc} = \frac{a(c+b)}{bc} \cdot \frac{b(c-b)}{a}$$

$$\frac{(b+c)(b-c)}{c} = \boxed{\frac{b^2-c^2}{c}}$$

$$\textcircled{11} \frac{x^2+8x+15}{x^2+x-6} = \frac{(x+5)(x+3)}{(x+3)(x-2)} \cdot \frac{(x-3)(x+1)}{(x+3)(x-3)}$$

$$\boxed{\frac{x+1}{x-2}}$$

$$\textcircled{3} \frac{x^2}{y^3} \cdot \frac{y}{x^3}$$

$$\frac{x^2}{y^3} \cdot \frac{y}{x^3}$$

$$\boxed{\frac{1}{xy^2}}$$

$$\textcircled{7} \frac{x+y}{a+b} \cdot \frac{x^2-y^2}{a^2-b^2}$$

$$\frac{(x+y)}{(a+b)} \cdot \frac{(a+b)(a-b)}{(x+y)(x-y)}$$

$$\boxed{\frac{a-b}{x-y}}$$

$$\textcircled{12} \frac{a^2-6a+5}{a^2+3a+42} \cdot \frac{a^2-4a+3}{a^2+3a-18}$$

$$\frac{(a-5)(a-1)}{(a+6)(a+7)} \cdot \frac{(a+3)(a-3)}{(a-3)(a-1)} = \boxed{\frac{a-5}{a+7}}$$



$$\textcircled{4} \frac{a^2}{b} \cdot \frac{a}{b^2}$$

$$\frac{a^2}{b} \cdot \frac{a}{b^2}$$

$$\boxed{ab}$$

$$\textcircled{8} \frac{4n^2-m^2}{n^2} \cdot \frac{2n+m}{n}$$

$$\frac{(2n+m)(2n-m)}{n^2} \cdot \frac{n}{(2n+m)}$$

$$\boxed{\frac{2n-m}{n}}$$

$$\textcircled{13} \frac{y^2-1}{y^2+3y-4} = \frac{(y+1)(y-1)}{(y+4)(y-1)}$$

$$\frac{(y+1)}{(y+4)} \cdot \frac{1}{(y+1)} = \boxed{\frac{1}{y+4}}$$

$$\textcircled{5} \frac{a^2b^3}{c^2} \cdot \frac{b}{ac^2}$$

$$\frac{a^2b^3}{c^2} \cdot \frac{b}{ac^2}$$

$$\boxed{\frac{ab^4}{c^4}}$$

$$\textcircled{9} \frac{1}{x} + \frac{1}{y} \cdot \frac{1}{x} - \frac{1}{y}$$

$$\frac{y+x}{xy} = \frac{y+x}{xy} \cdot \frac{xy}{y-x} = \boxed{\frac{y+x}{y-x}}$$

$$\textcircled{14} \frac{a^2-2a-3}{a^2-1} = \frac{(a-3)(a+1)}{(a-1)(a+1)}$$

$$\frac{(a-3)}{(a-1)} \cdot \frac{1}{(a-3)} = \boxed{\frac{1}{a-1}}$$



$$\textcircled{15} \frac{x+5 + \frac{3}{x+1}}{x-1 - \frac{3}{x+1}} = \frac{\frac{(x+5)(x+1)}{(x+1)} + \frac{3}{(x+1)}}{\frac{(x-1)(x+1)}{(x+1)} - \frac{3}{(x+1)}}$$

$$= \frac{\frac{(x+5)(x+1)+3}{(x+1)}}{\frac{(x-1)(x+1)-3}{(x+1)}} = \frac{x^2+6x+8}{x^2-4}$$

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

$$\boxed{\frac{x+4}{x-2}}$$



$$\textcircled{16} \frac{x+2 + \frac{2}{x+5}}{x+6 + \frac{6}{x+1}} = \frac{\frac{(x+2)(x+5)+2}{(x+5)}}{\frac{(x+6)(x+1)+6}{(x+1)}}$$

$$\frac{x^2+7x+12}{x+5} = \frac{(x^2+7x+12)}{x+5} \cdot \frac{x+1}{(x^2+7x+12)}$$

$$\boxed{\frac{x+1}{x+5}}$$



$$\textcircled{17} \frac{x-1 - \frac{15}{x+1}}{x-4} = \frac{\frac{(x-1)(x+1)-15}{(x+1)}}{(x-4)}$$

$$\frac{x^2-16}{x+1} = \frac{(x-4)(x+4)}{(x+1)} \cdot \frac{1}{(x-4)}$$

$$\boxed{\frac{x+4}{x+1}}$$



$$\textcircled{18} \frac{a^2-a-1}{a-1} = \frac{a^2-a-1}{a-1} = \frac{a^2-a-1}{a-1} = \boxed{1}$$

$$\textcircled{19} \frac{x+5 + \frac{4}{x+1}}{x+3} = \frac{\frac{(x+5)(x+1)+4}{(x+1)}}{(x+3)}$$

$$\frac{x^2+6x+9}{x+1} = \frac{(x+3)(x+3)}{(x+1)} \cdot \frac{1}{(x+3)} = \boxed{\frac{x+3}{x+1}}$$

$$\textcircled{20} \frac{a^2+a-6}{a^2+8a+15} = \frac{(a+3)(a-2)}{(a+5)(a+3)} = \boxed{\frac{a-2}{a+5}}$$

$$\textcircled{21} \frac{x^2-y^2}{x^2+2xy+y^2} = \frac{(x+y)(x-y)}{(x+y)(x+y)} = \boxed{\frac{x-y}{x+y}}$$

$$\textcircled{22} \frac{x^2-4}{x^2-3x-10} \cdot \frac{x^2+x-30}{x^2+3x-18}$$

$$\frac{(x+2)(x-2)}{(x-5)(x+2)} \cdot \frac{(x+6)(x-5)}{(x+6)(x-3)} = \boxed{\frac{x-2}{x-3}}$$

$$\textcircled{23} \frac{a+b}{a^2-a-6} \div \frac{a+b}{(a+2)^2}$$

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

$$\textcircled{24} \frac{3}{x^2-3x-10} - \frac{3}{x-5}$$

$$\frac{3}{(x-5)(x+2)} - \frac{3}{x-5} \left(\frac{x+2}{x+2} \right)$$

$$\frac{3-3(x+2)}{(x-5)(x+2)} = \frac{3-3x-6}{x^2-3x-10}$$

$$\boxed{\frac{-3x-3}{x^2-3x-10}} \text{ or } \boxed{\frac{-3(x+1)}{(x-5)(x+2)}}$$

$$\textcircled{25} \quad \frac{2}{x^2-10x+21} + \frac{4}{7-x}$$

$$\frac{2}{(x-7)(x-3)} - \frac{4}{(x-7)}$$

$$\frac{2}{(x-7)(x-3)} - \frac{4}{(x-7)} \left(\frac{x-3}{x-3} \right)$$

$$\frac{2-4(x-3)}{(x-7)(x-3)} = \frac{2-4x+12}{x^2-10x+21}$$

$$\boxed{\frac{-4x+14}{x^2-10x+21}} \quad \text{or} \quad \boxed{\frac{-2(2x-7)}{(x-7)(x-3)}}$$

$$\textcircled{5} \quad \left[\frac{m}{m+1} + \frac{5}{m-1} = 1 \right] (m+1)(m-1)$$

$$m(m-1)+5(m+1)=1(m+1)(m-1)$$

$$m^2-m+5m+5=m^2-1$$

$$4m=-6 \quad \boxed{m=-3/2}$$

$$\textcircled{6} \quad \left[\frac{r-1}{r+1} - \frac{2r}{r-1} = -1 \right] (r+1)(r-1)$$

$$(r-1)(r-1) - 2r(r+1) = -1(r+1)(r-1)$$

$$(r^2-2r+1) - (2r^2+2r) = -r^2+1$$

$$r^2-2r+1-2r^2-2r = -r^2+1$$

$$-4r=0 \quad \boxed{r=0}$$

$$\textcircled{7} \quad \frac{5}{5-p} + \frac{p^2}{p-5} = -2$$

$$\left[\frac{5}{5-p} - \frac{p^2}{5-p} = -2 \right] (5-p)$$

$$5-p^2 = -2(5-p)$$

$$5-p^2 = -10+2p$$

$$0 = p^2+2p-15$$

$$(p+5)(p-3) = 0 \quad \boxed{p = -5, 3}$$

$$\textcircled{8} \quad \frac{r^2}{r-7} + \frac{50}{7-r} = 14$$

$$\left[\frac{r^2}{r-7} - \frac{50}{r-7} = 14 \right] (r-7)$$

$$r^2-50 = 14(r-7)$$

$$r^2-50 = 14r-98$$

$$r^2-14r+48 = 0$$

$$(r-6)(r-8) = 0 \quad \boxed{r = 6, 8}$$

$$\textcircled{1} \quad \left[\frac{x+1}{x} + \frac{x+4}{x} = 6 \right] \text{ mult. by } x$$

$$(x+1) + (x+4) = 6x$$

$$2x+5 = 6x$$

$$5 = 4x \quad \boxed{x = 5/4}$$

$$\textcircled{2} \quad \left[\frac{18}{b} = \frac{3}{b} + 5 \right] \text{ mult. by } b$$

$$18 = 3+5b$$

$$15 = 5b \quad \boxed{b=3}$$

$$\textcircled{3} \quad \left[\frac{11}{2x} - \frac{2}{3x} = \frac{1}{6} \right] \text{ mult. by } 6x$$

$$33-4 = x \quad \boxed{x=29}$$

$$\textcircled{4} \quad \left[\frac{2}{3x} - \frac{5}{2x} = \frac{11}{6} \right] \text{ mult. by } 6x$$

$$4-15 = 11x$$

$$-11 = 11x \quad \boxed{x=-1}$$

$$\textcircled{9} \quad \left[\frac{2b-5}{b-2} - 2 = \frac{3}{b+2} \right] (b-2)(b+2)$$

$$(2b-5)(b+2) - 2(b-2)(b+2) = 3(b-2)$$

$$(2b^2-b-10) - (2b^2-8) = 3b-6$$

continued 36

12.5

Answer Key



$$2b^2 - b - 10 - 2b^2 + 8 = 3b - 6$$

$$-4b = -4 \quad \boxed{b=1}$$

$$\textcircled{10} \left[\frac{z+3}{z-1} + \frac{z+1}{z-3} = 2 \right] (z+1)(z-3)$$

$$(z+3)(z-3) + (z+1)(z-1) = 2(z-1)(z-3)$$

$$(z^2-9) + (z^2-1) = 2z^2-8z+6$$

$$2z^2-10 = 2z^2-8z+6$$

$$-16 = -8z \quad \boxed{z=2}$$

$$\textcircled{11} \left[\frac{7}{k-3} - \frac{1}{2} = \frac{3}{k-4} \right] (2)(k-3)(k-4)$$

$$7(2)(k-4) - 1(k-3)(k-4) = 3(2)(k-3)$$

$$(14k-56) - (k^2-7k+12) = 6k-18$$

$$0 = k^2-15k+50$$

$$0 = (k-5)(k-10) \quad \boxed{k=5, 10}$$

$$\textcircled{12} \left[\frac{x+2}{x-2} - \frac{2}{x+2} = \frac{-7}{3} \right] (3)(x-2)(x+2)$$

$$(x+2)(3)(x+2) - 2(3)(x-2) = -7(x-2)(x+2)$$

$$(3x^2+12x+12) - (6x-12) = -7(x^2+4)$$

$$3x^2+12x+12-6x+12 = -7x^2+28$$

$$10x^2+6x-4=0$$

$$2(5x^2+3x-2)=0$$

$$2(5x^2+5x-2x-2)=0$$

$$2[5x(x+1)-2(x+1)]=0$$

$$2(5x-2)(x+1)=0 \quad \boxed{x=2/5, -1}$$

$$\textcircled{13} \left[\frac{x-2}{x} - \frac{x-3}{x-6} = \frac{1}{x} \right] (x)(x-6)$$

$$(x-2)(x-6) - (x-3)(x) = 1(x-6)$$

$$(x^2-8x+12) - (x^2-3x) = x-6$$

$$x^2-8x+12-x^2+3x = x-6$$

$$-5x+12 = x-6$$

$$-6x = -18$$

$$\boxed{x=3}$$



$$\textcircled{14} \left[\frac{14}{n-6} = \frac{1}{2} + \frac{6}{n-8} \right] (2)(n-6)(n-8)$$

$$14(2)(n-8) = 1(n-6)(n-8) + 6(2)(n-6)$$

$$28n-224 = (n^2-14n+48) + (12n-72)$$

$$28n-224 = n^2-14n+48+12n-72$$

$$0 = n^2-30n+200$$

$$0 = (n-10)(n-20) \quad \boxed{n=10, 20}$$

$$\textcircled{15} \frac{5}{x-3} + \frac{-x}{3-x} = x$$

$$\left[\frac{5}{x-3} + \frac{x}{x-3} = x \right] (x-3)$$

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

$$5+x = x^2-3x$$

$$0 = x^2-4x-5$$

$$0 = (x-5)(x+1) \quad \boxed{x=5, -1}$$

$$\textcircled{16} \frac{c}{c-4} - \frac{6}{4-c} = c$$

$$\left[\frac{c}{c-4} + \frac{6}{c-4} = c \right] (c-4)$$

$$c+6 = c(c-4)$$

$$c+6 = c^2-4c$$

$$0 = c^2-5c-6$$

$$0 = (c-6)(c+1) \quad \boxed{c=6, -1}$$

$$\textcircled{17} \frac{2n^2-5n+2}{2n^2-7n+3} = \frac{2n^2-4n-n+2}{2n^2-6n-n+3}$$

$$\frac{2n(n-2)-1(n-2)}{2n(n-3)-1(n-3)} = \frac{\cancel{2n}(n-2)}{\cancel{2n}(n-3)} = \boxed{\frac{n-2}{n-3}}$$

$$\textcircled{18} \frac{x+3}{x-4} \div \frac{2x^2+11x+15}{2x^2-8x}$$

$$\frac{x+3}{x-4} \div \frac{(2x+5)(x+3)}{2x(x-4)}$$

$$\frac{\cancel{x+3}}{\cancel{x-4}} \cdot \frac{2x\cancel{(x-4)}}{(2x+5)\cancel{(x+3)}} = \boxed{\frac{2x}{2x+5}}$$

$$(19) \frac{a}{a+1} - \frac{1}{a^2+a} = \frac{a}{a+1} - \frac{1}{a(a+1)}$$

$$\frac{a}{a+1} \left(\frac{a}{a} \right) - \frac{1}{a(a+1)} = \frac{a^2-1}{a(a+1)}$$

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

$$(20) \frac{n+2 - \frac{30}{n+1}}{n - \frac{2(n+6)}{n+1}} = \frac{n+2 \left(\frac{n+1}{n+1} \right) - \frac{30}{n+1}}{n \left(\frac{n+1}{n+1} \right) - \frac{2n+12}{n+1}}$$

$$\frac{(n^2+3n+2)-30}{n+1} = \frac{n^2+3n-28}{n+1}$$

$$\frac{(n^2+n)-2n-12}{n+1} = \frac{n^2+n-12}{n+1}$$

$$\frac{(n+7)(n-4)}{(n+1)}$$

$$\frac{(n+3)(n-4)}{(n+1)}$$



$$\frac{(n+7)(\cancel{n-4})}{(\cancel{n+1})} \cdot \frac{(\cancel{n+1})}{(\cancel{n+3})(\cancel{n-4})} = \boxed{\frac{n+7}{n+3}}$$

12.6

Answer Key



$$(1) \text{ Jane } \frac{r}{4} \cdot t = \frac{w}{4}$$

$$\text{ Jim } \frac{r}{6} \cdot t = \frac{w}{6}$$

$$\frac{t}{4} + \frac{t}{6} = 1$$

$$(24) \left[\frac{t}{4} + \frac{t}{6} = 1 \right]$$

$$6t + 4t = 24$$

$$10t = 24$$

$$t = 12/5$$

$$\boxed{2\frac{2}{5} \text{ hrs}}$$

or

$$\boxed{2:24}$$

$$(2) \text{ Mark } \frac{r}{6} \cdot t = \frac{w}{6}$$

$$\text{ Rosetta } \frac{r}{8} \cdot t = \frac{w}{8}$$

$$(24) \left[\frac{t}{6} + \frac{t}{8} = 1 \right]$$

$$4t + 3t = 24$$

$$7t = 24$$

$$t = 24/7$$

$$\boxed{3\frac{3}{7} \text{ hrs}}$$

or

$$\boxed{\approx 3:26}$$

$$(3) \text{ Helena } \frac{r}{5} \cdot t = \frac{w}{5}$$

$$\text{ Jeff } \frac{r}{8} \cdot t = \frac{w}{8}$$

$$(40) \left[\frac{t}{5} + \frac{t}{8} = 1 \right]$$

$$8t + 5t = 40$$

$$13t = 40$$

$$t = 40/13$$

$$\boxed{3\frac{1}{13} \text{ days}}$$

$$(4) \text{ Frank } \frac{r}{10} \cdot t = \frac{w}{10}$$

$$\text{ Keith } \frac{r}{15} \cdot t = \frac{w}{15}$$

$$(30) \left[\frac{t}{10} + \frac{t}{15} = 1 \right]$$

$$3t + 2t = 30$$

$$5t = 30$$

$$t = 6$$

$$\boxed{6 \text{ hours}}$$

$$(5) \text{ Pipe \#1 } \frac{r}{12} \cdot t = \frac{w}{12}$$

$$\text{ Pipe \#2 } \frac{r}{4} \cdot t = \frac{w}{4}$$

$$(12) \left[\frac{t}{12} + \frac{t}{4} = 1 \right]$$

$$t + 3t = 12$$

$$4t = 12$$

$$t = 3$$

$$\boxed{3 \text{ hours}}$$

⑥ Pipe #1 $\frac{r}{3} \cdot t = \frac{w}{3}$
 Pipe #2 $\frac{r}{10} \cdot t = \frac{w}{10}$

(30) $\left[\frac{t}{3} + \frac{t}{10} = 1 \right]$

$10t + 3t = 30$

$13t = 30$

$t = \frac{30}{13}$

$2\frac{4}{13}$ hours
 or
 $\approx 2:18$

⑦ Fill Pipe $\frac{r}{10} \cdot t = \frac{w}{10}$
 Drain Pipe $\frac{r}{15} \cdot t = \frac{w}{15}$

(30) $\left[\frac{t}{10} - \frac{t}{15} = 1 \right]$

$3t - 2t = 30$

$t = 30$

30 hours

⑧ Fill Pipe #1 $\frac{r}{6} \cdot t = \frac{w}{6}$
 Fill Pipe #2 $\frac{r}{4} \cdot t = \frac{w}{4}$
 Drain Pipe $\frac{r}{12} \cdot t = \frac{w}{12}$

(12) $\left[\frac{t}{6} + \frac{t}{4} - \frac{t}{12} = 1 \right]$

$2t + 3t - t = 12$

$4t = 12$

$t = 3$

3 hours

⑨ Cindy $\frac{r}{6} \cdot 18/5 = 3/5$
 Erica $r \cdot 18/5 = 2/5$

once it is determined that Cindy did $3/5$ of the work, Erica must have done the remaining $2/5$

$\frac{18r}{5} = \frac{2}{5}$

$18r = 2$ $r = 1/9$ 9 hours

⑩ Ben $\frac{r}{3} \cdot 15/8 = 5/8$
 Jason $r \cdot 15/8 = 3/8$

$\frac{15r}{8} = \frac{3}{8}$ $15r = 3$ $r = 1/5$ 5 days

⑪ John $r \cdot t = w$
 $3 \cdot 1/5 = 3/5$
 Denise $r \cdot 1/5 = 2/5$

$\frac{r}{5} = \frac{2}{5}$ $r = 2$ $1/2$ hour

⑫ Ann $r \cdot t = w$
 $3r \cdot 3/4 = 9r/4$
 Phil $r \cdot 3/4 = 3r/4$

(4) $\left[\frac{9r}{4} + \frac{3r}{4} = 1 \right]$

$9r + 3r = 4$

$12r = 4$

$r = 1/3$

$3r = 1$

reciprocal of
 $1 = 1$

1 hour

⑬ $\frac{n^4 - 26n^2 + 25}{n^2 + 4n - 5} = \frac{(n^2 - 25)(n^2 - 1)}{(n+5)(n-1)}$

$\frac{(n+5)(n-5)(n+1)(n-1)}{(n+5)(n-1)}$

$(n-5)(n+1)$ or $n^2 + 4n - 5$

⑭ $\frac{9}{x^2 - 7x + 12} = \frac{5}{x-3} + \frac{2}{x-4}$

$(x-3)(x-4) \left[\frac{9}{(x-3)(x-4)} = \frac{5}{x-3} + \frac{2}{x-4} \right]$

$9 = 5(x-4) + 2(x-3)$

$9 = 5x - 20 + 2x - 6$

$35 = 7x$ $x = 5$

Unit 12

REVIEW

Answer Key



$$\textcircled{1} \frac{x+y}{x^2-y^2} = \frac{\cancel{(x+y)}}{\cancel{(x+y)}(x-y)} = \boxed{\frac{1}{x-y}}$$

$$\textcircled{2} \frac{x+y}{x^2+2xy+y^2} = \frac{\cancel{(x+y)}}{\cancel{(x+y)}(x+y)} = \boxed{\frac{1}{x+y}}$$

$$\textcircled{3} \frac{2b-2a}{a^2-b^2} = \frac{2(b-a)}{(a-b)(a+b)}$$

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

$$\textcircled{4} \frac{12-3x}{x^2-x-12} = \frac{3(4-x)}{(x-4)(x+3)}$$

$$\frac{-3(\cancel{x-4})}{(\cancel{x-4})(x+3)} = \boxed{\frac{-3}{x+3}}$$

$$\textcircled{5} \frac{6x^2+17x-14}{3x^2-20x+12}$$

$$\frac{(\cancel{3x-2})(2x+7)}{(\cancel{3x-2})(x-6)} = \boxed{\frac{2x+7}{x-6}}$$

$$\textcircled{6} \frac{3m^2+8m-3}{6m^2+17m-3}$$

$$\frac{(3m-1)(\cancel{m+3})}{(6m-1)(\cancel{m+3})} = \boxed{\frac{3m-1}{6m-1}}$$

$$\textcircled{7} \frac{n^4-13n^2+36}{n^2-5n+6} = \frac{(n^2-4)(n^2-9)}{(n-3)(n-2)}$$

$$\frac{(n+2)(\cancel{n-2})(n+3)(\cancel{n-3})}{(\cancel{n-3})(\cancel{n-2})}$$

$$\boxed{n^2+5n+6}$$

$$\textcircled{8} \frac{x^4-25x^2+144}{x^2-x-12} = \frac{(x^2-9)(x^2-16)}{(x-4)(x+3)}$$

$$\frac{\cancel{(x+3)}(x-3)(x+4)(\cancel{x-4})}{(\cancel{x-4})(x+3)}$$

$$\boxed{x^2+x-12}$$

$$\textcircled{9} \frac{6m^3n}{16a^2} \cdot \frac{4a^2m}{9n^3} = \boxed{\frac{m^4}{6n^2}}$$

$$\textcircled{10} \frac{7xy^3}{11z^2} \cdot \frac{44z^3}{21x^2y} = \boxed{\frac{4y^2z}{3x}}$$

$$\textcircled{11} \frac{n^2+20n+99}{n+9} \cdot \frac{n+7}{n^2+12n+11}$$

$$\frac{\cancel{(n+11)}(\cancel{n+9})(n+7)}{\cancel{(n+9)}(\cancel{n+11})(n+1)} = \boxed{\frac{n+7}{n+1}}$$

$$\textcircled{12} \frac{x^2+19x+84}{x-3} \cdot \frac{x^2-9}{x^2+15x+36}$$

$$\frac{(\cancel{x+12})(x+7)(\cancel{x+3})(x-3)}{(\cancel{x-3})(\cancel{x+3})(x+12)} = \boxed{x+7}$$

$$\textcircled{13} \frac{t^2+8t+16}{w^2-6w+9} \div \frac{2t+8}{3w-9}$$

$$\frac{(t+4)(\cancel{t+4})}{(w-3)(\cancel{w-3})} \cdot \frac{3(\cancel{w-3})}{2(\cancel{t+4})} = \boxed{\frac{3t+12}{2w-6}}$$

$$\textcircled{14} \frac{k^2-81}{2k^2-72} \div \frac{k-9}{2k+12}$$

$$\frac{(k+9)(\cancel{k-9})}{2(\cancel{k+6})(k-6)} \cdot \frac{2(\cancel{k+6})}{(\cancel{k-9})} = \boxed{\frac{k+9}{k-6}}$$

$$\textcircled{15} \frac{a^2+a-6}{3a^2+13a+12} \div \frac{a^2+3a-10}{3a^2+7a+4}$$

$$\frac{(\cancel{a-2})(a+3)}{3(\cancel{a+4})(a+3)} \cdot \frac{(a+1)(\cancel{3a+4})}{(3a+4)(a+3)} = \boxed{\frac{a+1}{a+5}}$$



$$(16) \frac{2n^3+6n^2}{n^2-1} \div \frac{n^2+6n+9}{n^2-n}$$

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

$$(17) \frac{x+8}{x^2-64} + \frac{1}{8-x} = \frac{x+8}{(x-8)(x+8)} - \frac{1}{(x-8)(x+8)}$$

$$\frac{(x+8)-(x+8)}{x^2-64} = \frac{0}{x^2-64} = \boxed{0}$$

$$(18) \frac{3}{a+b} + \frac{1}{b^2-a^2} = \frac{3}{a+b} - \frac{1}{a^2-b^2}$$

$$\left(\frac{a-b}{a-b}\right) \frac{3}{a+b} - \frac{1}{(a-b)(a+b)} = \boxed{\frac{3a-3b-1}{a^2-b^2}}$$

$$(19) \frac{2x+3}{x^2-4} + \frac{6}{x+2} = \frac{2x+3}{(x+2)(x-2)} + \frac{6}{x+2} \left(\frac{x-2}{x-2}\right)$$

$$\frac{2x+3+6x-12}{(x+2)(x-2)} = \boxed{\frac{8x-9}{x^2-4}}$$

$$(20) \frac{-3}{a-5} + \frac{-6}{a^2-5a}$$

$$\frac{-3}{a-5} \left(\frac{a}{a}\right) + \frac{-6}{a(a-5)} = \boxed{\frac{-3a-6}{a^2-5a}}$$

$$(21) \frac{3a+2}{3a-6} - \frac{a+2}{a^2-4} = \frac{3a+2}{3(a-2)} - \frac{a+2}{(a-2)(a+2)}$$

$$\frac{3a+2}{3(a-2)} \left(\frac{a+2}{a+2}\right) - \frac{a+2}{(a-2)(a+2)} \left(\frac{3}{3}\right)$$

$$\frac{(3a^2+8a+4)-(3a+6)}{3(a-2)(a+2)} = \frac{3a^2+5a-2}{3(a-2)(a+2)}$$

$$\frac{(3a-1)(a+2)}{3(a-2)(a+2)} = \boxed{\frac{3a-1}{3a-6}}$$

$$(22) \frac{n-2}{n+2} - \frac{16}{n^2-4} = \frac{n-2}{n+2} - \frac{16}{(n+2)(n-2)}$$

continued

$$\frac{n-2}{n+2} \left(\frac{n-2}{n-2}\right) - \frac{16}{(n+2)(n-2)}$$

$$\frac{(n^2-4n+4)-16}{(n+2)(n-2)} = \frac{n^2-4n-12}{(n+2)(n-2)}$$

$$\frac{(n-6)(n+2)}{(n+2)(n-2)} = \boxed{\frac{n-6}{n-2}}$$

$$(23) \frac{30-6a}{a^2-9} - \frac{a-5}{3-a} = \frac{30-6a}{(a+3)(a-3)} + \frac{a-5}{a-3} \left(\frac{a+3}{a+3}\right)$$

$$\frac{(30-6a)+(a^2-2a-15)}{(a-3)(a+3)} = \frac{a^2-8a+15}{(a-3)(a+3)}$$

$$\frac{(a-5)(a-3)}{(a-3)(a+3)} = \boxed{\frac{a-5}{a+3}}$$

$$(24) \frac{-n-5}{n^2+2n-15} - \frac{n}{3-n} = \frac{-n-5}{(n+5)(n-3)} + \frac{n}{n-3} \left(\frac{n+5}{n+5}\right)$$

$$\frac{(-n-5)+(n^2+5n)}{(n+5)(n-3)} = \frac{n^2+4n-5}{(n+5)(n-3)}$$

$$\frac{(n+5)(n-1)}{(n+5)(n-3)} = \boxed{\frac{n-1}{n-3}}$$

$$(25) \frac{a+b}{c} = \frac{(a+b)}{c} \cdot \frac{c^2}{(a+b)(a-b)}$$

$$\boxed{\frac{c}{a-b}}$$

$$(26) \frac{n^2-9}{n^2-4} \cdot \frac{n^2-4n+3}{n+2}$$

$$\frac{(n+3)(n-3)}{(n+2)(n-2)} \cdot \frac{(n+2)}{(n-3)(n-1)}$$

$$\boxed{\frac{n+3}{n^2-3n+2}}$$



$$\textcircled{27} \frac{n - \frac{n-4}{n-3}}{n+1 - \frac{2n+17}{n+5}} = \frac{n\left(\frac{n-3}{n-3}\right) - \frac{n-4}{n-3}}{n+1\left(\frac{n+5}{n+5}\right) - \frac{2n+17}{n+5}}$$

$$\frac{(n^2-3n) - (n-4)}{n-3} = \frac{n^2-4n+4}{n-3}$$

$$\frac{(n^2-3n) - (n-4)}{(n^2+6n+5) - (2n+17)} = \frac{n^2-4n+4}{n^2+4n-12}$$

$$\frac{(n-2)(n-2)}{(n-3)}, \frac{(n+5)}{(n+6)(n-2)}$$

$$\boxed{\frac{n^2+3n-10}{n^2+3n-18}}$$

$$\textcircled{28} \frac{x+3 - \frac{x+18}{x+2}}{x - \frac{8x-6}{x+3}} = \frac{x+3\left(\frac{x+2}{x+2}\right) - \frac{x+18}{x+2}}{x\left(\frac{x+3}{x+3}\right) - \frac{8x-6}{x+3}}$$

$$\frac{(x^2+5x+6) - (x+18)}{x+2} = \frac{x^2+4x-12}{x+2}$$

$$\frac{(x^2+5x+6) - (x+18)}{(x^2+3x) - (8x-6)} = \frac{x^2+4x-12}{x^2-5x+6}$$

$$\frac{(x+6)(x-2)}{(x+2)}, \frac{(x+3)}{(x-3)(x-2)}$$

$$\boxed{\frac{x^2+9x+18}{x^2-x-6}}$$

$$\textcircled{29} \frac{\frac{1}{x} - \frac{1}{y}}{\frac{y}{x} - 1} = \frac{\frac{1}{x}\left(\frac{y}{y}\right) - \frac{1}{y}\left(\frac{x}{x}\right)}{\frac{y}{x} - 1\left(\frac{x}{x}\right)}$$

$$\frac{\frac{y-x}{xy}}{\frac{y-x}{x}} = \frac{(y-x)}{xy} \cdot \frac{x}{(y-x)} = \boxed{\frac{1}{y}}$$

$$\textcircled{30} \frac{\frac{a}{b} - \frac{b}{a}}{\frac{a}{b} + 1} = \frac{\frac{a}{b}\left(\frac{a}{a}\right) - \frac{b}{a}\left(\frac{b}{b}\right)}{\frac{a}{b} + 1\left(\frac{b}{b}\right)}$$

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

$$\textcircled{31} (a-3)(a+3) \left[\frac{2a-3}{a-3} - 2 = \frac{12}{a+3} \right]$$

$$(2a-3)(a+3) - 2(a-3)(a+3) = 12(a-3)$$

$$(2a^2+3a-9) - (2a^2-18) = 12a-36$$

$$3a+9 = 12a-36$$

$$-9a = -45 \quad \boxed{a=5}$$

$$\textcircled{32} (2x)(x-5) \left[\frac{3}{x} + \frac{1}{x-5} = \frac{1}{2x} \right]$$

$$3(2)(x-5) + 1(2x) = 1(x-5)$$

$$6x-30+2x = x-5$$

$$7x = 25 \quad \boxed{x = \frac{25}{7}}$$

$$\textcircled{33} \frac{4m}{m-3} + \frac{6}{3-m} = m$$

$$(m-3) \left[\frac{4m}{m-3} - \frac{6}{m-3} = m \right]$$

$$4m-6 = m(m-3)$$

$$4m-6 = m^2-3m$$

$$0 = m^2-7m+6$$

$$0 = (m-6)(m-1) \quad \boxed{m=6, 1}$$

$$\textcircled{34} (3)(m-1)(m-3) \left[\frac{m+3}{m-1} + \frac{m+1}{m-3} = \frac{22}{3} \right]$$

$$(m+3)(m-3)(3) + (m+1)(m-1)(3) = 22(m-1)(m-3)$$

$$(3m^2-27) + (3m-3) = 22m^2-88m+66$$

$$6m^2-30 = 22m^2-88m+66$$

continued

$$0 = 16m^2 - 88m + 96$$

$$0 = 2m^2 - 11m + 12$$

$$0 = 2m^2 - 8m - 3m + 12$$

$$0 = 2m(m-4) - 3(m-4)$$

$$0 = (m-4)(2m-3)$$

$$m = 4, \frac{3}{2}$$

(35) Sharon $\frac{r}{\frac{1}{4}} \cdot t = \frac{w}{\frac{1}{4}}$
 mike $\frac{1}{5} \cdot t = \frac{t}{5}$

$$(20) \left[\frac{t}{4} + \frac{t}{5} = 1 \right]$$

$$5t + 4t = 20$$

$$9t = 20$$

$$t = 20/9$$

$$\boxed{2\frac{2}{9} \text{ hours}} \\ \text{or} \\ \boxed{\approx 2:13}$$

(36) Andy $\frac{r}{\frac{2}{5}} \cdot t = \frac{w}{\frac{2}{5}}$
 Pam $\frac{2}{3} \cdot t = \frac{2t}{3}$

$$\text{rate} \quad (15) \left[\frac{2t}{5} + \frac{2t}{3} = 1 \right]$$

$$\frac{1}{2\frac{1}{2}} = \frac{2}{5}$$

$$\frac{1}{1\frac{1}{2}} = \frac{2}{3}$$

$$6t + 10t = 15$$

$$16t = 15$$

$$t = 15/16$$

$$\boxed{15/16 \text{ hours or } \approx 56 \text{ min.}}$$

(37) Faucet $\frac{r}{6} \cdot t = \frac{w}{6}$
 Drain $\frac{1}{4} \cdot t = \frac{t}{4}$

$$6t - 4t = 1$$

$$2t = 1 \quad t = \frac{1}{2}$$

$$\boxed{\frac{1}{2} \text{ hr. or}} \\ \boxed{30 \text{ min.}}$$

(38) Hose $\frac{r}{3} \cdot t = \frac{w}{3}$
 Hose $\frac{1}{3} \cdot t = \frac{t}{3}$
 Drain $\frac{1}{2} \cdot t = \frac{t}{2}$

$$2(3t) - 2t = 1$$

$$4t = 1$$

$$t = \frac{1}{4}$$

$$\boxed{\frac{1}{4} \text{ hr. or } 15 \text{ min.}}$$

(39) Phil $\frac{r}{r} \cdot \frac{t}{\frac{3}{2}} = \frac{w}{\frac{5}{8}}$
 Evan $\frac{1}{4} \cdot \frac{3}{2} = \frac{3}{8}$

$$\frac{3r}{2} = \frac{5}{8}$$

$$r = \frac{5}{12} \text{ reciprocal } \frac{12}{5}$$

$$24r = 10$$

$$\boxed{2\frac{2}{5} \text{ hrs. or } 2:24}$$

(40) Ben $\frac{r}{\frac{1}{5}} \cdot 3 = \frac{w}{\frac{3}{5}}$
 Jerry $\frac{r}{r} \cdot 3 = \frac{3}{5}$

$$3r = \frac{2}{5}$$

$$\text{reciprocal } \frac{5}{2}$$

$$15r = 2$$

$$r = \frac{2}{15}$$

$$\boxed{7\frac{1}{2} \text{ hrs. or } 7:30}$$



Unit 12 SKILL CHECK

$$(1) \frac{2x + 6y}{x^2 + 2xy - 3y^2} = \frac{2(\cancel{x+3y})}{(\cancel{x+3y})(x-y)} = \boxed{\frac{2}{x-y}}$$

$$(2) \frac{2x^2 + 13x + 20}{2x^2 + 5x} = \frac{(\cancel{2x+5})(x+4)}{x(\cancel{2x+5})} = \boxed{\frac{x+4}{x}}$$

$$(3) \frac{14a^2b}{6ac} \cdot \frac{2ac^3}{7b^3} = \boxed{\frac{2a^2c^2}{3b^2}}$$

$$(4) \frac{x^2 + 3x + 2}{3x^2 - 14x + 8} \div \frac{x^3 + 2x^2}{x^2 - 4x}$$

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

$$\textcircled{5} \frac{4-2a}{a^2-5a+6} + \frac{a}{a-3} = \frac{4-2a}{(a-3)(a-2)} + \frac{a}{a-3} \cdot \frac{(a-2)}{(a-2)}$$

$$\frac{(4-2a) + (a^2-2a)}{(a-3)(a-2)} = \frac{a^2-4a+4}{(a-3)(a-2)}$$

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

$$\textcircled{6} \frac{y^2+xy}{x^2-y^2} - \frac{x+y}{y-x}$$

$$\frac{y^2+xy}{(x+y)(x-y)} + \frac{x+y}{x-y} \cdot \frac{(x+y)}{(x+y)}$$

$$\frac{(y^2+xy) + (x^2+2xy+y^2)}{(x+y)(x-y)}$$

$$\frac{x^2+3xy+2y^2}{(x+y)(x-y)}$$

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

$$\textcircled{7} \frac{\frac{a}{b^2} - \frac{2}{b}}{\frac{a^2-ab-2b^2}{b}} = \frac{\frac{a}{b^2} - \frac{2}{b} \cdot \frac{b}{b}}{\frac{(a-2b)(a+b)}{b}}$$

$$\frac{\frac{a-2b}{b^2}}{\frac{(a-2b)(a+b)}{b}} = \frac{(a-2b)}{b^2} \cdot \frac{b}{(a-2b)(a+b)}$$

$$\boxed{\frac{1}{ab+b^2}}$$

$$\textcircled{8} \frac{a + \frac{a+2}{a-4}}{a+3 - \frac{4a-8}{a-2}} = \frac{a \cdot \frac{(a-4)}{(a-4)} + \frac{a+2}{a-4}}{a+3 \cdot \frac{(a-2)}{(a-2)} - \frac{4a-8}{a-2}}$$

$$\frac{(a^2-4a) + (a+2)}{a-4} = \frac{a^2-3a+2}{a-4}$$

$$\frac{(a^2-4a) + (a+2)}{a-4} = \frac{a^2-3a+2}{a-4}$$

$$\frac{a^2-3a+2}{a-4} \cdot \frac{a-2}{a^2-3a+2} = \boxed{\frac{a-2}{a-4}}$$

$$\textcircled{9} (n-5)(n+4) \left[\frac{n-1}{n-5} - \frac{9n+1}{n^2-n-20} \right] = \frac{2n+1}{n+4}$$

$$(n-1)(n+4) - (9n+1) = (2n+1)(n-5)$$

$$(n^2+3n-4) - (9n+1) = (2n^2-9n-5)$$

$$n^2+3n-4-9n-1 = 2n^2-9n-5$$

$$0 = n^2-3n$$

$$0 = n(n-3)$$

$$\boxed{n = 0, 3}$$

$$\textcircled{10} \text{ Pipe \#1 } \frac{r}{6} \cdot t = \frac{w}{6}$$

$$\text{Pipe \#2 } \frac{1}{8} \cdot t = \frac{t}{8}$$

$$\text{Drain } \frac{1}{12} \cdot t = \frac{t}{12}$$

$$24 \left[\frac{t}{6} + \frac{t}{8} - \frac{t}{12} \right] = 1$$

$$4t+3t-2t=24$$

$$5t=24$$

$$t = \frac{24}{5}$$

$$\boxed{4\frac{4}{5} \text{ hrs or } 4:48}$$

$$\textcircled{11} \text{ Jan } \frac{r}{3/2} \cdot \frac{t}{1/4} = \frac{w}{3/8}$$

$$\text{Dean } r \cdot \frac{t}{1/4} = \frac{5}{8}$$

$$40 \text{ min (Jan)} = \frac{2}{3} \text{ hrs}$$

$$\text{reciprocal } \frac{3}{2} \text{ (Jan's rate)}$$

$$\frac{r}{4} = \frac{5}{8}$$

$$\text{reciprocal is } \frac{2}{5}$$

$$8r=20$$

$$r = \frac{5}{2}$$

$$\boxed{\frac{2}{5} \text{ hrs or } 24 \text{ min.}}$$



Unit 12 REMEDICATION

$$\textcircled{1} \frac{a^2 - b^2}{3a^2 - ab - 2b^2} = \frac{(a-b)(a+b)}{(3a+2b)(a-b)} = \boxed{\frac{a+b}{3a+2b}}$$

$$\textcircled{2} \frac{3x^2 + 10x + 3}{x^3 + 3x^2} = \frac{(3x+1)(x+3)}{x^2(x+3)} = \boxed{\frac{3x+1}{x^2}}$$

$$\textcircled{3} \frac{9xy^2z}{4z^3} \cdot \frac{2x^3z}{15xy^4} = \frac{18x^4y^2z^2}{60xy^4z^3} = \boxed{\frac{3x^3}{10y^2z}}$$

$$\textcircled{4} \frac{n^2 + 10n + 21}{2n^2 + 9n + 4} \div \frac{n^2 + 7n}{n^3 + 4n^2}$$

$$\frac{(n+3)(n+7)}{(2n+1)(n+4)} \cdot \frac{n^2(n+4)}{n(n+7)} = \boxed{\frac{n^2 + 3n}{2n+1}}$$

$$\textcircled{5} \frac{-x^2 + 3x - 2}{x^2 + 5x - 6} + \frac{2x+1}{x+6}$$

$$\frac{-x^2 + 3x - 2}{(x+6)(x-1)} + \frac{2x+1}{x+6} \left(\frac{x-1}{x-1} \right)$$

$$\frac{(-x^2 + 3x - 2) + (2x^2 - x - 1)}{(x+6)(x-1)}$$

$$\frac{x^2 + 2x - 3}{(x+6)(x-1)} = \frac{(x+3)(x-1)}{(x+6)(x-1)} = \boxed{\frac{x+3}{x+6}}$$



$$\textcircled{6} \frac{-a^2 + 3ab + 4b^2}{a^2 - b^2} - \frac{2a+b}{b-a}$$

$$\frac{-a^2 + 3ab + 4b^2}{(a+b)(a-b)} + \frac{2a+b}{a-b} \left(\frac{a+b}{a+b} \right)$$

$$\frac{(-a^2 + 3ab + 4b^2) + (2a^2 + 3ab + b^2)}{(a+b)(a-b)}$$

$$\frac{a^2 + 6ab + 5b^2}{(a+b)(a-b)} = \frac{(a+5b)(a+b)}{(a+b)(a-b)}$$

$$\boxed{\frac{a+5b}{a-b}}$$



$$\textcircled{7} \frac{\frac{z}{x} - \frac{5}{y}}{\frac{6x}{x^2} - \frac{15}{y}} = \frac{\frac{zy-5x}{xy}}{\frac{6xy-15x^2}{x^2y}}$$

$$\frac{\cancel{(2y-5x)}}{xy} \cdot \frac{x^2y}{3x(2y-5x)} = \frac{x^2y}{3x^2y} = \boxed{\frac{1}{3}}$$

$$\textcircled{8} \frac{n+2 - \frac{2n+4}{n+3}}{n+4 - \frac{2}{n+3}} = \frac{n+2 \left(\frac{n+3}{n+3} \right) - \frac{2n+4}{n+3}}{n+4 \left(\frac{n+3}{n+3} \right) - \frac{2}{n+3}}$$

$$\frac{(n^2 + 5n + 6) - (2n+4)}{n+3} = \frac{n^2 + 3n + 2}{n+3}$$

$$\frac{(n^2 + 7n + 12) - (2)}{n+3} = \frac{n^2 + 7n + 10}{n+3}$$

$$\frac{(n+2)(n+1)}{(n+3)} \cdot \frac{(n+3)}{(n+5)(n+2)} = \boxed{\frac{n+1}{n+5}}$$

$$\textcircled{9} (n+3)(n+2) \left[\frac{5}{n+3} + \frac{10n}{n^2+5n+6} \right] = \frac{3n+2}{n+2}$$

$$5(n+2) + 10n = (3n+2)(n+2)$$

$$5n + 10 + 10n = 3n^2 + 11n + 6$$

$$0 = 3n^2 - 4n - 4$$

$$0 = 3n^2 - 6n + 2n - 4$$

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

$$0 = (n-2)(3n+2) \quad \boxed{n=2, -2/3}$$

$$\textcircled{10} \begin{array}{l} \text{Pipe} \quad \frac{r}{4} \cdot t = \frac{w}{4} \\ \text{Hose} \quad \frac{1}{8} \cdot t = \frac{t}{8} \\ \text{Drain} \quad \frac{1}{6} \cdot t = \frac{t}{6} \end{array}$$

$$24 \frac{t}{4} + \frac{t}{8} - \frac{t}{6} = 1$$

$$6t + 3t - 4t = 24$$

$$5t = 24$$

$$t = \frac{24}{5}$$

$$\boxed{4\frac{4}{5} \text{ hrs or } 4:48}$$

$$\textcircled{11} \begin{array}{l} \text{Peter} \quad r \cdot t = w \\ \quad \quad \quad \frac{4}{3} \cdot \frac{1}{3} = \frac{4}{9} \\ \text{Gordon} \quad r \cdot \frac{1}{3} = \frac{5}{9} \end{array}$$

45 min is $\frac{3}{4}$ hr (Peter's time)
Reciprocal is $\frac{4}{3}$ (Peter's rate)

$$\frac{r}{3} = \frac{5}{9} \quad \text{reciprocal is } \frac{3}{5}$$

$$9r = 15$$

$$r = \frac{5}{3}$$

$$\boxed{\frac{3}{5} \text{ hr. or}} \\ \boxed{36 \text{ minutes}}$$

$$\textcircled{9} \frac{a-4}{a+3} + \frac{-7}{a^2+5a+6}$$

$$\frac{(a-4)\cancel{(a+2)}}{(a+3)\cancel{(a+2)}} + \frac{-7}{(a+3)(a+2)}$$

$$\frac{(a^2-2a-8)-7}{(a+3)(a+2)}$$

$$\frac{\cancel{(a+3)}(a-5)}{\cancel{(a+3)}(a+2)} = \boxed{\frac{a-5}{a+2}}$$

$$\textcircled{10} \frac{2x+10}{x^2+x-2} + \frac{x+4}{x+2}$$

$$\frac{2(x+5)}{(x+2)(x-1)} + \frac{(x+4)\cancel{(x-1)}}{(x+2)\cancel{(x-1)}}$$

$$\frac{(2x+10)+(x^2+3x-4)}{(x+2)(x-1)}$$

$$\frac{x^2+5x+6}{(x+2)(x-1)}$$

$$\frac{(x+3)\cancel{(x+2)}}{\cancel{(x+2)}(x-1)} = \boxed{\frac{x+3}{x-1}}$$

$$\textcircled{11} \frac{9n+4}{n^2+4n} - \frac{-2n}{n+4}$$

$$\frac{9n+4}{n(n+4)} - \frac{-2n}{(n+4)\cancel{n}}$$

$$\frac{(9n+4)+2n^2}{n(n+4)}$$

$$\frac{2n^2+9n+4}{n(n+4)}$$

$$\frac{(n+4)(2n+1)}{n(n+4)} = \boxed{\frac{2n+1}{n}}$$

$$\textcircled{12} \frac{-16}{x^2-16} - \frac{x+2}{4-x}$$

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

$$\frac{(-16)+(x^2+2x-8)}{(x+4)(x-4)}$$

$$\frac{x^2+2x-24}{(x+4)(x-4)} = \frac{(x-4)(x+6)}{(x+4)(x-4)} = \boxed{\frac{x+6}{x+4}}$$

$$\textcircled{13} \frac{n+3}{n^3}$$

$$\frac{n^2+5n+6}{n^2}$$

$$\frac{\cancel{(n+3)}, n^2}{n^3 \cancel{(n+3)}(n+2)}$$

$$\boxed{\frac{1}{n(n+2)}}$$

$$\textcircled{14} \frac{3}{a^2} - \frac{2}{a^3}$$

$$\frac{3a^2+10a-8}{a^3}$$

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

$$\frac{(a+4)(3a-2)}{a^3}$$

$$\frac{\cancel{(3a-2)}, a}{a^3 \cancel{(3a-2)}(a+4)}$$

$$\boxed{\frac{1}{a^2(a+4)}}$$

$$\textcircled{15} \frac{2x}{x^2+4x+3} = \frac{2}{x+1} + \frac{6}{x+3}$$

$$\left[\frac{2x}{(x+3)(x+1)} = \frac{2}{x+1} + \frac{6}{x+3} \right] (x+1)(x+3)$$

$$2x = 2(x+3) + 6(x+1)$$

$$2x = 2x+6+6x+6$$

$$-6x = 12 \quad \boxed{x = -2}$$

$$\textcircled{16} \left[\frac{2}{n+3} + \frac{4}{n^2-9} = \frac{3n+1}{n-3} \right] (n^2-9)$$

$$2(n-3)+4 = (3n+1)(n+3)$$

$$2n-6+4 = 3n^2+10n+3$$

$$3n^2+8n+5=0$$

$$3n^2+3n+5n+5=0$$

$$3n(n+1)+5(n+1)=0$$

$$(n+1)(3n+5)=0$$

$$\boxed{n = -1, -\frac{5}{3}}$$

Unit 12

EXTRA PRACTICE

$$\textcircled{1} \frac{2x-4}{x^2-8x+12} = \frac{2(x-2)}{(x-6)\cancel{(x-2)}} = \boxed{\frac{2}{x-6}}$$

$$\textcircled{2} \frac{-2b+2a}{a^2-b^2} = \frac{-2(b-a)}{(a+b)(a-b)} = \frac{2(a-b)}{(a+b)\cancel{(a-b)}} = \boxed{\frac{2}{a+b}}$$

$$\textcircled{3} \frac{2n^2-7n-4}{n^2-7n+12} = \frac{(n-4)(2n+1)}{(n-4)(n-3)} = \boxed{\frac{2n+1}{n-3}}$$

$$\textcircled{4} \frac{2n^2-2n-4}{n+1} = \frac{2(n-2)\cancel{(n+1)}}{\cancel{(n+1)}} = \boxed{2(n-2)}$$

$$\textcircled{5} \frac{3ab^4}{10c^2} \cdot \frac{5c}{12a^3b^2} = \boxed{\frac{b^2}{8a^2c}}$$

$$\textcircled{6} \frac{n^2-2n-15}{n^2+5n+6} \cdot \frac{2n^2+6n+4}{n-5}$$

$$\frac{(n-5)\cancel{(n+3)}}{\cancel{(n+2)}(n+3)} \cdot \frac{2(n+2)\cancel{(n+1)}}{\cancel{(n-5)}} = \boxed{2(n+1)}$$

$$\textcircled{7} \frac{x^2+7x+12}{8} \div \frac{x+3}{6}$$

$$\frac{(x+4)\cancel{(x+3)}}{8} \cdot \frac{6}{\cancel{(x+3)}} = \boxed{\frac{3(x+4)}{4}}$$

$$\textcircled{8} \frac{3x+12}{3x^2+x-2} \div \frac{x^3+4x^2}{x^6+x^5}$$

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

Algebra Skills Review

Part I (Units 1-8)

"A"

⑰ Francis $\frac{R}{\frac{1}{6}} \cdot \frac{T}{t} = \frac{W}{\frac{5}{6}}$
 Scott $\frac{1}{4} \cdot t = \frac{t}{4}$

$$\left[\frac{t}{6} + \frac{t}{4} = 1 \right] 12$$

$$2t + 3t = 12$$

$$5t = 12$$

$$t = 12/5$$

$2\frac{2}{5}$ hrs or 2:24

⑱ Fill Pipe $\frac{R}{\frac{1}{4}} \cdot \frac{T}{t} = \frac{W}{\frac{t}{4}}$
 Drain $\frac{1}{6} \cdot t = \frac{t}{6}$

$$\left[\frac{t}{4} - \frac{t}{6} = 1 \right] 12$$

$$3t - 2t = 12$$

$$t = 12$$

12 hours

⑲ $\frac{n+1 - \frac{n+5}{n-1}}{n - \frac{4-n}{n-1}}$

$$\frac{(n-1)(n+1) - (n+5)}{n-1}$$

$$\frac{(n-1)(n) - (4-n)}{n-1}$$

$$\frac{n^2 - 1 - n + 5}{n^2 - n - 4 + n} = \frac{n^2 - n + 6}{n^2 - 4}$$

$$\frac{(n-3)(n+2)}{(n-2)(n+2)} = \frac{n-3}{n-2}$$



⑳ Pablo $\frac{R}{\frac{2}{3}} \cdot \frac{T}{\frac{1}{2}} = \frac{W}{\frac{1}{3}}$
 Chris $r \cdot \frac{1}{2} = \frac{r}{2}$

Pablo's time is $\frac{3}{2}$, rate is reciprocal of time ($\frac{2}{3}$)

$$\left[\frac{1}{3} + \frac{r}{2} = 1 \right] 6$$

$$2 + 3r = 6$$

$$3r = 4$$

$$r = \frac{4}{3}$$

reciprocal = $\frac{3}{4}$

$\frac{3}{4}$ hrs or 0:45

① Additive Inverse

② $2a^2 - 3ab + a^3$
 $2(-2)^2 - 3(-2)(-3) + (-2)^3$
 $2(4) - 3(6) + (-8)$
 $8 + (-18) + (-8) = -18$

③ $3ab - 2a(a-3b) - 4a^2$
 $3ab - 2a^2 + 6ab - 4a^2$
 $9ab - 6a^2$

④ $\frac{2n}{3} - 3(n-1) = -4(n+4) - 1$
 $\frac{2n}{3} - 3n + 3 = -4n - 16 - 1$
 $2n - 9n + 9 = -12n - 5$
 $5n = -60$
 $n = -12$

⑤ $\frac{2x+9}{5} > \frac{x+4}{3}$

$$3(2x+9) > 5(x+4)$$

$$6x+27 > 5x+20$$

$x > -7$

⑥ $3nc - 2 = 5n$
 $3nc - 5n = 2$
 $n(3c - 5) = 2$

$n = \frac{2}{3c-5}$ for $c \neq \frac{5}{3}$
--



$$\begin{aligned} \textcircled{7} \quad & |a+2| - 4 \geq 2 \\ & |a+2| \geq 6 \\ & a+2 \geq 6 \text{ or } a+2 \leq -6 \end{aligned}$$

$$\boxed{a \geq 4 \text{ or } a \leq -8}$$



$$\begin{aligned} \textcircled{8} \quad & |3a-9| < 6 \text{ and } |a| \neq 2 \\ & 3a-9 < 6 \text{ and } 3a-9 > -6 \\ & 3a < 15 \text{ and } 3a > 3 \\ & (a < 5 \text{ and } a > 1) \text{ and } (a \neq \pm 2) \end{aligned}$$

$$\boxed{(1 < a < 5) \text{ and } (a \neq 2)}$$

"a" cannot equal (-2) and still be between +1 and +5



$$\begin{aligned} \textcircled{9} \quad & \left(\frac{1}{2}x^2y^3z\right)^2 (-2xy^{-1}z^2)^3 \\ & \left(\frac{1}{4}x^4y^6z^2\right) (-8x^3y^{-3}z^6) \\ & \boxed{-2x^7y^3z^8} \end{aligned}$$

$$\textcircled{10} \quad \frac{-18a^2b^3c^{-3}}{8a^{-3}b^2c^{-1}} = \boxed{\frac{-9a^5b}{4c^2}}$$

$$\begin{aligned} \textcircled{11} \quad & (.03 \times 10^{-3})(.14 \times 10^{-2}) \\ & .0042 \times 10^{-5} = \boxed{4.2 \times 10^{-8}} \end{aligned}$$

$$\begin{aligned} \textcircled{12} \quad & (4x+7)(2x-5) \\ & \boxed{8x^2-6x-35} \end{aligned}$$

$$\begin{aligned} \textcircled{13} \quad & \begin{array}{r} 2a^2+3a+2 \quad -\frac{3}{a-1} \\ a-1 \overline{) 2a^3+a^2-a-5} \\ \underline{2a^3-2a^2} \\ 3a^2-a \\ \underline{3a^2-3a} \\ 2a-5 \\ \underline{2a-2} \\ -3 \end{array} \end{aligned}$$



$$\begin{aligned} \textcircled{14} \quad & (2ab^{x+2}-3c^{4x})^2 \\ & \boxed{4a^2b^{2x+4}-12ab^{x+2}c^{4x}+9c^{8x}} \end{aligned}$$

$$\begin{aligned} \textcircled{15} \quad & (4x^n+y^{n-3})(4x^n-y^{n-3}) \\ & \boxed{16x^{2n}-y^{2n-6}} \end{aligned}$$

$$\textcircled{16} \quad 12a^2b, 30ab^3c, 56abc^2$$

$$12 = 2^2 \cdot 3$$

$$30 = 2 \cdot 3 \cdot 5$$

$$56 = 2^3 \cdot 7$$

$$\text{GCF} = 2$$

$$\text{LCM} = 2^3 \cdot 3 \cdot 5 \cdot 7$$

$$\boxed{\text{GCF} = 2ab \quad \text{LCM} = 840a^2b^3c^2}$$

$$\textcircled{17} \quad n^8-1 = (n^4+1)(n^4-1) = (n^4+1)(n^2+1)(n^2-1)$$

$$\boxed{(n^4+1)(n^2+1)(n+1)(n-1)}$$

$$\textcircled{18} \quad 6n^2+14n-12$$

$$2(3n^2+7n-6) = 2(3n^2+9n-2n-6)$$

$$2[3n(n+3)-2(n+3)] = \boxed{2(n+3)(3n-2)}$$

$$\textcircled{19} \quad (3n-2x)^2 - (n+5x)^2$$

$$[(3n-2x)+(n+5x)][(3n-2x)-(n+5x)]$$

$$\boxed{(4n+3x)(2n-7x)}$$

$$\textcircled{20} \quad a^2b^2 - a^4 + a^2b^2 - b^4$$

$$a^2(b^2-a^2) + b^2(a^2-b^2)$$

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

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

$$\boxed{(b+a)(b-a)(a+b)(a-b)}$$

$$\textcircled{21} \quad 2n^3+6n = -8n^2$$

$$2n^3+8n^2+6n = 0$$

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

$$2n(n+3)(n+1) = 0$$

$$\boxed{n = 0, -3, -1}$$

$$\textcircled{22} \quad (-2, -10) \quad (4, -15)$$

$$(-10) - (-15) = 5$$

$$(-2) - (4) = -6$$

$$5 = A \quad A = 5$$

$$-6 = -B \quad B = 6$$

$$\boxed{5x+6y = -70}$$

$$5x+6y = C$$

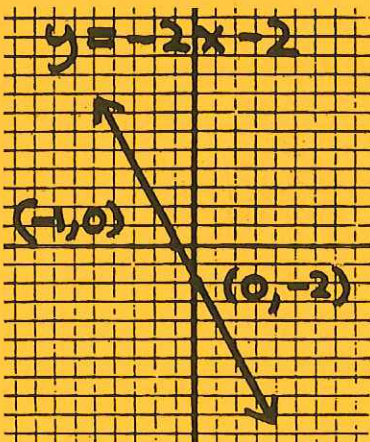
$$5(-2)+6(-10) = -70$$



②③ $2x - y = 12$ slope = 2
 \perp slope = $-\frac{1}{2}$
 $y = -\frac{1}{2}x + b$ $(-3, 9)$
 $9 = -\frac{1}{2}(-3) + b$
 $9 = \frac{3}{2} + b$
 $b = \frac{15}{2}$ $y = -\frac{1}{2}x + \frac{15}{2}$

②④ $y = \frac{2}{5}x - 4$ $m = \frac{2}{5}$ $(-2, -5)$
 $y + 5 = \frac{2}{5}(x + 2)$

②⑤ $4x + 4 = -2y$ divide by -2
 $-2x - 2 = y$
 $y = -2x - 2$
slope -2
y-int $(0, -2)$
x-int $(-1, 0)$



"B"



Alg. Skills Review Part I (Units 1-8)

① Commutative Property of Addition

② $a^3 - 3b^2 + 3ab$
 $(-1)^3 - 3(-4)^2 + 3(-1)(-4)$
 $(-1) - 3(16) + 3(4)$
 $(-1) + (-48) + (12) = \boxed{-37}$

③ $4x(2x - y) - 3x(y + 2x)$
 $8x^2 - 4xy - 3xy - 6x^2 = \boxed{2x^2 - 7xy}$

④ $12 + \frac{3x}{5} = -3(x + 8)$
 $12 + \frac{3x}{5} = -3x - 24$ (5)
 $60 + 3x = -15x - 120$
 $18x = -180$ $x = -10$

⑤ $\frac{3(2n+1)}{7} \geq \frac{12-n}{-2}$ Denominator must be positive before cross multiplying an inequality
 $\frac{6n+3}{7} \geq \frac{n-12}{2}$

$2(6n+3) \geq 7(n-12)$
 $12n+6 \geq 7n-84$
 $5n \geq -90$ $n \geq -18$

②⑥ $(-9, 7)$ $(-3, 5)$

x	y
$(-9) + (-3)$	$(7) + (5)$
2	2

 $(-6, 6)$

②⑦ $2(3x + y) = 3y(x - 1)$
 $6x + 2y = 3xy - 3y$
 $6x - 3xy = -5y$
 $x(6 - 3y) = -5y$
 $x = \frac{-5y}{6 - 3y}$ for $y \neq 2$

②⑦ $f[g(m+3)]$
 $g(x) = x - 5$
 $g(m+3) = (m+3) - 5 = m - 2$
 $f(x) = x - x^2$
 $f(x-5) = (m-2) - (m-2)^2$
 $-m^2 + 5m - 6$

②⑦ $|n-1| + 3 < 9$
 $|n-1| < 6$
 $n-1 < 6$ and $n-1 > -6$
 $n < 7$ and $n > -5$
 $-5 < n < 7$

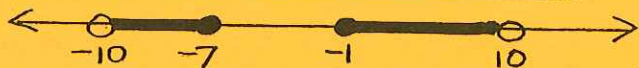


$$\textcircled{8} |n+4|-1 \geq 2 \text{ and } |n| < 10$$

$$|n+4| \geq 3$$

$$[n+4 \geq 3 \text{ or } n+4 \leq -3] \text{ and } [n < 10 \text{ and } n > -10]$$

$$(n \geq -1 \text{ or } n \leq -7) \text{ and } (-10 < n < 10)$$



$$\textcircled{9} \left(-\frac{1}{3}a^2b^3c\right)^2 (-3ab^{-1}c)^3$$

$$\left(\frac{1}{9}a^4b^6c^2\right) (-27a^3b^{-3}c^3)$$

$$\boxed{-3a^7b^3c^5}$$

$$\textcircled{10} \frac{-30a^{-3}bc^{-2}}{-6ab^4c^{-5}} = \boxed{\frac{5c^3}{a^4b^3}}$$

$$\textcircled{11} \frac{.0063 \times 10^4}{9 \times 10^7} = .0007 \times 10^{-3} = \boxed{7 \times 10^{-7}}$$

$$\textcircled{12} (3a+5b)(a-6b) = \boxed{3a^2 - 3ab - 30b^2}$$

$$\textcircled{13} \begin{array}{r} 5a^2 - 10ab + 20b^2 - 42b^3 \div a+2b \\ a+2b \overline{) 5a^3 + 10a^2b - 10a^2b - 20ab^2} \\ \underline{5a^3 + 10a^2b} \\ -10a^2b - 20ab^2 \\ \underline{-10a^2b - 20ab^2} \\ 20ab^2 - 2b^3 \\ \underline{20ab^2 + 40b^3} \\ -42b^3 \end{array}$$



$$\textcircled{14} (3c^{x+3} + d^{3x})^2$$

$$\boxed{9c^{2x+6} + 6c^{x+3}d^{3x} + d^{6x}}$$

$$\textcircled{15} (2a^{n-1} + 3b^{n+4})(2a^{n-1} - 3b^{n+4})$$

$$\boxed{4a^{2n-2} - 9b^{2n+8}}$$

$$\textcircled{16} 75xyz, 40x^2y, 12y^2$$

$$75 = 3 \cdot 5^2 \quad \text{GCF: } 1$$

$$40 = 2^3 \cdot 5 \quad \text{LCM:}$$

$$12 = 2^2 \cdot 3 \quad 2^3 \cdot 3 \cdot 5^2$$

$$\boxed{\text{GCF} = y \quad \text{LCM} = 600x^2y^2z}$$

$$\textcircled{17} 3x^3 + 6x^2 + 15x$$

$$\boxed{3x(x^2 + 2x + 5)}$$

$$\textcircled{18} 4a^2 + 18ab + 8b^2$$

$$2(2a^2 + 9ab + 4b^2)$$

$$2(2a^2 + 8ab + ab + 4b^2)$$

$$2[2a(a+4b) + b(a+4b)]$$

$$\boxed{2(a+4b)(2a+b)}$$

$$\textcircled{19} (a+4)^2 + 3(a+4) - 10$$

$$[(a+4)+5][(a+4)-2]$$

$$\boxed{(a+9)(a+2)}$$

$$\textcircled{20} x^6 - x^4y^2 + 16y^2 - 16x^2$$

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

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

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

$$\boxed{(x+y)(x-y)(x^2+4)(x+2)(x-2)}$$

$$\textcircled{21} 4a^3 + 6a = 14a^2$$

$$4a^3 - 14a^2 + 6a = 0$$

$$2a(2a^2 - 7a + 3) = 0$$

$$2a(2a^2 - 6a - a + 3) = 0$$

$$2a[2a(a-3) - 1(a-3)] = 0$$

$$2a(a-3)(2a-1) = 0$$

$$\boxed{a = 0, 3, \frac{1}{2}}$$

$$\textcircled{22} (-2, 5) (-4, 9)$$

$$5 - 9 = -4 \quad y = -2x + b$$

$$(-2) - (-4) = 2 \quad (5) = -2(-2) + b$$

$$m = -2$$

$$5 = 4 + b$$

$$b = 1$$

$$\boxed{y = -2x + 1}$$

$$\textcircled{23} y = \frac{1}{2}x + 3 \quad m = -\frac{1}{2} \quad (8, -6)$$

$$\frac{1}{-2} = \frac{A}{-B} \quad A = 1$$

$$x + 2y = C$$

$$(8) + 2(-6) = -4$$

$$\boxed{x + 2y = -4}$$

②④ $2x - 3y = 8$ $m = 2/3$ $(-2, -6)$
 $\perp m = -3/2$

$y + 6 = -\frac{3}{2}(x + 2)$

②⑤ $y = \frac{1}{4}x - 2$

$4y = x - 8$

$-x + 4y = -8$

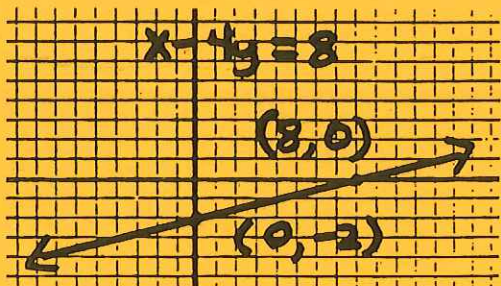
$x - 4y = 8$

$x - 4y = 8$

slope $1/4$

y-int $(0, -2)$

x-int $(8, 0)$



②⑥ $A(-2, 9)$ $P(5, -1)$

x: -2 to 5 (up 7)

y: 9 to -1 (down 10)

$5 + 7, -1 - 10$ $(12, -11)$

②⑦ $f[g(a+b)]$ $f(x) = -2x$
 $g(x) = x^2$

$g(a+b) = (a+b)^2$
 $(a^2 + 2ab + b^2)$

$f(a^2 + 2ab + b^2) = -2(a^2 + 2ab + b^2)$

$-2a^2 - 4ab - 2b^2$



"C"

Alg. Skills Review Part I (Units 1-8)

① Multiplicative Inverse

② $4x^2y - 2(x+2y)$
 $4(-1)^2(-5) - 2[(-1) + 2(-5)]$
 $4(1)(-5) - 2(-11)$
 $(-20) - (-22) = \boxed{2}$

③ $3n^2 - 2n(n+m) + 2mn - n^2$
 $3n^2 - 2n^2 - 2mn + 2mn - n^2 = \boxed{0}$

④ $5(n-2) = \frac{n}{2} + 3n - 1$
 $2[5n - 10 = \frac{n}{2} + 3n - 1]$
 $10n - 20 = n + 6n - 2$
 $10n - 20 = 7n - 2$
 $3n = 18$
 $n = \boxed{6}$

⑤ $3(n+4) > \frac{4n+6}{3}$
 $3n+12 > \frac{4n+6}{3}$
 $3(3n+12) > 4n+6$
 $9n+36 > 4n+6$
 $5n > -30$
 $n > \boxed{-6}$

⑥ $xy - 3ab = 2a(x+b)$
 $xy - 3ab = 2ax + 2ab$
 $xy - 2ax = 5ab$
 $x(y-2a) = 5ab$

$x = \frac{5ab}{y-2a}$

for $y - 2a \neq 0$

$$\begin{aligned} 7) |2a-1| - 2 > 7 \\ |2a-1| > 9 \\ 2a-1 > 9 \text{ or } 2a-1 < -9 \\ 2a > 10 \text{ or } 2a < -8 \\ \boxed{a > 5 \text{ or } a < -4} \end{aligned}$$



$$\begin{aligned} 8) |a+4| \leq 7 \text{ and } |a| \neq 2 \\ (a+4 \leq 7 \text{ and } a+4 \geq -7) \text{ and } (a \neq \pm 2) \\ (a \leq 3 \text{ and } a \geq -11) \text{ and } (a \neq \pm 2) \\ \boxed{(-11 \leq a \leq 3) \text{ and } (a \neq \pm 2)} \end{aligned}$$



$$\begin{aligned} 9) (2x^{-2}y^3)^5 (-\frac{1}{2}x^4y^{-2})^3 \\ (32x^{-10}y^{15}) (-\frac{1}{8}x^{12}y^{-6}) = \boxed{-4x^2y^9} \end{aligned}$$

$$10) \frac{-12x^3y^{-2}}{-20x^{-2}y^4z^{-2}} = \boxed{\frac{3x^5z^2}{5y^6}}$$

$$11) \frac{7000 \times 10^{-4}}{.5 \times 10^{-2}} = 14,000 \times 10^{-2}$$

$$\boxed{1.4 \times 10^2}$$

$$12) (2a-7b)(3a-5b) = \boxed{6a^2 - 31ab + 35b^2}$$

$$\begin{array}{r} 13) \begin{array}{r} 4x^3 + 12x^2y + 36xy^2 + 108y^3 + \frac{319y^4}{x-3y} \\ x-3y \overline{) 4x^4} \\ \underline{4x^4 - 12x^3y} \\ 12x^3y \\ \underline{12x^3y - 36x^2y^2} \\ 36x^2y^2 \\ \underline{36x^2y^2 - 108xy^3} \\ 108xy^3 - 5y^4 \\ \underline{108xy^3 - 324y^4} \\ 319y^4 \end{array} \end{array}$$



$$14) (x^{3n-2} - 4y^{2n+1})^2$$

$$\boxed{x^{6n-4} - 8x^{3n-2}y^{2n+1} + 16y^{4n+2}}$$

$$15) (3a^{3x} + b^{x-1})(3a^{3x} - b^{x-1})$$

$$\boxed{9a^{6x} - b^{2x-2}}$$

$$\begin{aligned} 16) 60a^3b^5c^2, 100a^4b^2c^3, 108a^2b^3c^4 \\ 60 = 2^2 \cdot 3 \cdot 5 \quad \text{GCF} = 2^2 \\ 100 = 2^2 \cdot 5^2 \quad \text{LCM} = 2^2 \cdot 3^3 \cdot 5^2 \\ 108 = 2^2 \cdot 3^3 \end{aligned}$$

$$\boxed{\text{GCF} = 4a^2b^2c^2 \quad \text{LCM} = 2700a^4b^5c^4}$$

$$\begin{aligned} 17) 3a^6b^2 - 3a^2b^6 = 3a^2b^2(a^4 - b^4) \\ 3a^2b^2(a^2 + b^2)(a^2 - b^2) \end{aligned}$$

$$\boxed{3a^2b^2(a^2 + b^2)(a+b)(a-b)}$$

$$\begin{aligned} 18) 6a^2 - 3ab - 9b^2 \\ 3(2a^2 - ab - 3b^2) \\ 3(2a^2 - 3ab + 2ab - 3b^2) \\ 3[a(2a - 3b) + b(2a - 3b)] \end{aligned}$$

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

$$\begin{aligned} 19) (2n+5)^2 - (n-4)^2 \\ [(2n+5) + (n-4)][(2n+5) - (n-4)] \\ \boxed{(3n+1)(n+9)} \end{aligned}$$

$$\begin{aligned} 20) a^6 - a^4b^2 - a^2b^4 + b^6 \\ a^4(a^2 - b^2) - b^4(a^2 - b^2) \\ (a^2 - b^2)(a^4 - b^4) \\ (a+b)(a-b)(a^2 + b^2)(a^2 - b^2) \end{aligned}$$

$$\boxed{(a^2 + b^2)(a+b)^2(a-b)^2}$$

$$\begin{aligned} 21) 9a^3 = 4a \\ 9a^3 - 4a = 0 \\ a(9a^2 - 4) = 0 \\ a(3a+2)(3a-2) = 0 \\ \boxed{a = 0, -2/3, 2/3} \end{aligned}$$



$$22) (-4, 5)(-3, 9)$$

$$\frac{5-9}{-4-(-3)} = \frac{-4}{-1} = 4$$

$$4x - y = c$$

$$4(-4) - (5) = -21$$

$$\frac{4}{1} = \frac{A}{-B} \quad A=4 \quad B=-1$$

$$\boxed{4x - y = -21}$$

②③ $3x+2y=4$ slope $= -3/2$
 \perp slope $= 2/3$

$y = \frac{2}{3}x + b$ $(-1, 5)$

$(5) = \frac{2}{3}x(-1) + b$

$\frac{15}{3} + \frac{2}{3} = b$ $y = \frac{2}{3}x + \frac{17}{3}$

②④ $y+6 = \frac{2}{3}(x-3)$

change to standard form

$3[y+6 = \frac{2}{3}(x-3)]$

$3y+18 = 2x-6$

$-2x+3y = -24$

$2x-3y = 24$

slope $2/3$
 y-int $(0, -8)$
 x-int $(12, 0)$

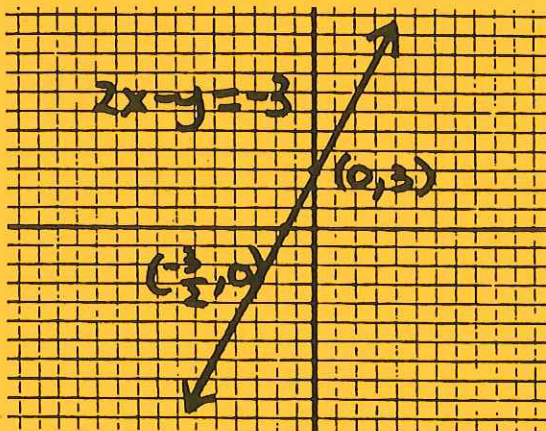
②⑤ $[-\frac{4}{3}x + \frac{2}{3}y = 2] (3)$

$-4x+2y = 6$

$4x-2y = -6$

$2x-y = -3$

slope 2
 y-int $(0, 3)$
 x-int $(-3/2, 0)$



②⑥ $A(5, -12)$ $B(-1, 4)$

$x: \frac{5+(-1)}{2}$ $y: \frac{(-12)+4}{2}$

midpoint $(2, -4)$

②⑦ $f[g(n-3)]$

$f(x) = 6-x^2$

$g(x) = x-1$ continued

$g(n-3) = (n-3)-1 = n-4$

$f(n-4) = 6-(n-4)^2$

$6-(n^2-8n+16)$

$6-n^2+8n-16$

$-n^2+8n-10$



Algebra Skills Review

Part II (Units 9-12)

"A"

① $4x-y=6$ slope 4 y-int $(0, -6)$
 $12x-3y=18$ slope 4 y-int $(0, -6)$

consistent, dependent
 infinite solutions

② $5x-2y=17$
 $x+3y=0 \quad \times(-5)$

$5x-2y=17$
 $-5x-15y=0$

$-17y=17$

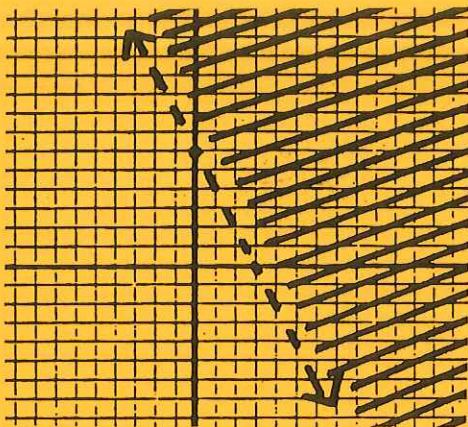
$y=-1$

$x=3$

$(3, -1)$ ←



③ $2x + y > 6$ $y > -2x + 6$



⑥ $\sqrt{54x^2y^3z^8} = \boxed{3|x|yz^4\sqrt{6y}}$

⑦ $\frac{14.28}{\sqrt{204.0000}} \approx \boxed{14.3}$

$$\begin{array}{r} \sqrt{104} \\ 2\overline{4} \\ \underline{96} \\ 800 \\ \underline{564} \\ 23600 \end{array}$$

⑬ (3,5) to (5,9)
 $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$
 $d = \sqrt{(3-5)^2 + (5-9)^2}$
 $d = \sqrt{4+16} = \sqrt{20}$

$\boxed{2\sqrt{5}}$

⑧ $\sqrt{2}(3\sqrt{6} - \sqrt{10}) - 2\sqrt{3}$
 $3\sqrt{12} - \sqrt{20} - 2\sqrt{3}$
 $6\sqrt{3} - 2\sqrt{5} - 2\sqrt{3}$

$\boxed{4\sqrt{3} - 2\sqrt{5}}$

⑭ $y = x^2 - 10x + 21$
 axis $x = -b/2a$

$\boxed{x = 5}$

⑨ $\frac{2\sqrt{3}}{3\sqrt{2}-\sqrt{3}} \cdot \frac{3\sqrt{2}+\sqrt{3}}{3\sqrt{2}+\sqrt{3}}$

$\frac{6\sqrt{6}+6}{18-3} = \frac{6\sqrt{6}+6}{15}$

$\boxed{\frac{2\sqrt{6}+2}{5}}$

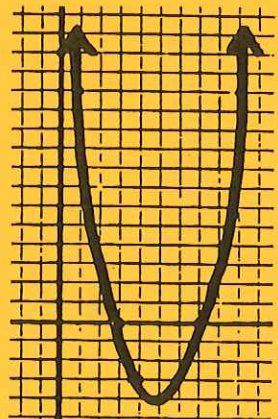
vertex
 $y = (5)^2 - 10(5) + 21$
 $25 - 50 + 21 = -4$
 $\boxed{(5, -4)}$

⑩ $\sqrt{1156} = 34$
 $\sqrt{1179}$
 $\sqrt{1225} = 35$

$34 \frac{23}{69} = \boxed{34\frac{1}{3}}$

x	y
4	$4^2 - 10(4) + 21$
3	$3^2 - 10(3) + 21$
1	$1^2 - 10(1) + 21$

⑪ $\sqrt{2x+5} - 1 = 2$
 $\sqrt{2x+5} = 3$
 $2x+5 = 9$
 $2x = 4$ $\boxed{x=2}$



⑫ $a^2 + b^2 = c^2$
 $4^2 + b^2 = 8^2$
 $16 + b^2 = 64$
 $b^2 = 48$
 $b = \sqrt{48}$
 $\boxed{4\sqrt{3} \text{ m}}$

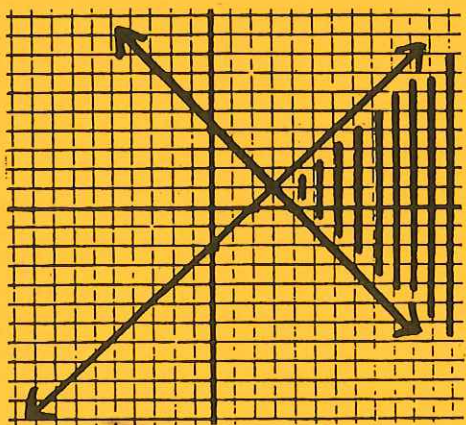


④ $|y-1| + 3 \leq x$

$|y-1| \leq x-3$

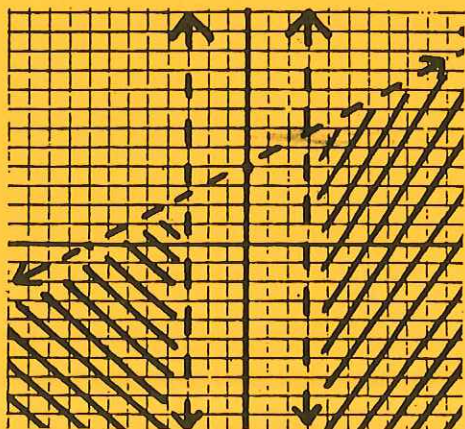
$y-1 \leq x-3$ and $y-1 \geq -x+3$

$\boxed{y \leq x-2 \text{ and } y \geq -x+4}$



⑤ $y < \frac{1}{2}x + 4$ and $|x| > 3$

$(y < \frac{1}{2}x + 4)$ and
 $(x > 3 \text{ or } x < -3)$



$$\begin{aligned} (15) \quad & 2x^2 - 11x + 15 = 0 \\ & 2x^2 - 6x - 5x + 15 = 0 \\ & 2x(x-3) - 5(x-3) = 0 \\ & (x-3)(2x-5) = 0 \\ & \boxed{x = 3, 5/2} \end{aligned}$$

$$\begin{aligned} (16) \quad & 2n^2 - 12n + 14 = 0 \\ & n^2 - 6n = -7 \\ -3 \quad & n^2 - 6n + 9 = -7 + 9 \\ & (n-3)^2 = 2 \\ & n-3 = \pm\sqrt{2} = \boxed{3 \pm \sqrt{2}} \end{aligned}$$

$$\begin{aligned} (17) \quad & -4n^2 + 8n = -3 \\ & -4n^2 + 8n + 3 = 0 \\ & a = -4 \quad b = 8 \quad c = 3 \\ & n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \end{aligned}$$

$$\frac{-8 \pm \sqrt{(8)^2 - 4(-4)(3)}}{2(-4)}$$

$$\frac{-8 \pm \sqrt{112}}{-8} = \frac{-8 \pm 4\sqrt{7}}{-8}$$

$$\boxed{\frac{2 \pm \sqrt{7}}{2}}$$

$$\begin{aligned} (18) \quad & x^2 + 5x + 3 = 0 \\ & b^2 - 4ac > 0 \\ & (5)^2 - 4(1)(3) = 13 \end{aligned}$$

2 real roots
Irrational

$$\begin{aligned} (19) \quad & \frac{2x^2 + x - 1}{x^2 + 5x + 6} \cdot \frac{x+3}{x+1} \\ & \frac{(2x-1)(x+1)}{(x+3)(x+2)} \cdot \frac{(x+3)}{(x+1)} \end{aligned}$$

$$\boxed{\frac{2x-1}{x+2}}$$

$$(20) \quad \frac{n^2 - 16}{n^2 - 64} \div \frac{n+4}{n-8}$$

$$\frac{(n-4)(n+4)}{(n+8)(n-8)} \cdot \frac{(n-8)}{(n+4)} = \boxed{\frac{n-4}{n+8}}$$

$$\begin{aligned} (21) \quad & \frac{4}{5-n} - \frac{3}{n^2-5n} = \frac{4}{5-n} - \frac{3}{n(n-5)} = \frac{4}{5-n} + \frac{3}{n(5-n)} \\ & \frac{4n}{n(5-n)} + \frac{3}{n(5-n)} = \boxed{\frac{4n+3}{n(5-n)}} \end{aligned}$$

$$\begin{aligned} (22) \quad & \frac{x+y}{a+b} = \frac{x+y}{a+b} = \frac{(x+y)}{(a+b)} \cdot \frac{(a+b)(a-b)}{(x+y)(x-y)} = \boxed{\frac{a+b}{x-y}} \\ & \frac{x^2-y^2}{a^2-b^2} = \frac{(x+y)(x-y)}{(a+b)(a-b)} \end{aligned}$$

$$\begin{aligned} (23) \quad & (y)(y+3) \left[\frac{-2}{y+3} - \frac{2}{y} = -1 \right] \\ & -2y - 2(y+3) = -(y+3)(y) \\ & -2y - 2y - 6 = -y^2 - 3y \\ & y^2 - y - 6 = 0 \\ & (y-3)(y+2) = 0 \\ & \boxed{y = 3, -2} \end{aligned}$$



"B"

Alg. Skills Review Part II (Units 9-12)

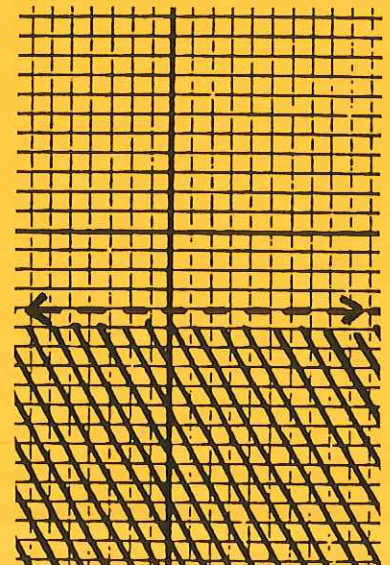
$$\begin{aligned} (1) \quad & y = 6x - 8 \quad m = 6 \\ & 12x - 3y = 16 \quad m = 4 \end{aligned}$$

independent
consistent
one solution

$$\begin{aligned} (2) \quad & 2x + 3y = 6 \cdot (-3) \\ & 3x + 4y = 7 \cdot (2) \\ & -6x - 9y = -18 \\ & 6x + 8y = 14 \\ & -y = -4 \end{aligned}$$

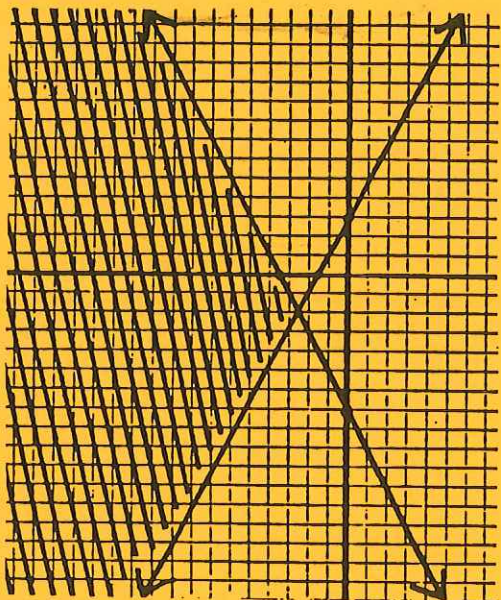
$$\begin{aligned} & y = 4 \quad x = -3 \\ & \boxed{(-3, 4)} \end{aligned}$$

$$(3) \quad y < -4$$



④ $|y+2|+5 \leq -2x$
 $|y+2| \leq -2x-5$
 $y+2 \leq -2x-5$ and $y+2 \geq 2x+5$

$y \leq -2x-7$ and $y \geq 2x+3$



⑦ $\frac{21.35}{\sqrt{456.0000}} \approx \boxed{21.4}$

$$\begin{array}{r} 4 \overline{) 56} \\ \underline{41} \\ 1500 \\ \underline{1269} \\ 23100 \end{array}$$



⑧ $\sqrt{5}(3\sqrt{10}+2\sqrt{15})-\sqrt{27}$
 $3\sqrt{50}+2\sqrt{75}-\sqrt{27}$
 $15\sqrt{2}+10\sqrt{3}-3\sqrt{3} = \boxed{15\sqrt{2}+7\sqrt{3}}$

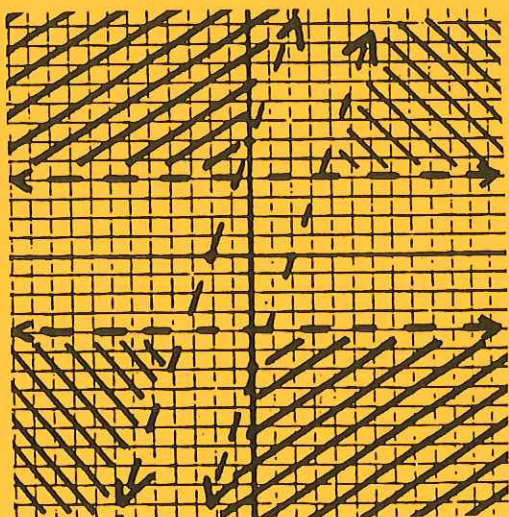
⑨ $\frac{3\sqrt{5}}{\sqrt{5+2\sqrt{2}}} \cdot \frac{\sqrt{5-2\sqrt{2}}}{\sqrt{5-2\sqrt{2}}} = \frac{15-6\sqrt{10}}{5-8}$

$\frac{15-6\sqrt{10}}{-3} = \boxed{-5+2\sqrt{10}}$

⑩ $38 = \sqrt{1444}$
 $39 = \sqrt{1521}$ } 77 } 44 } $38 \frac{44}{77}$
 $\boxed{38 \frac{44}{77}}$

⑤ $|y-3x| > 6$ and $|y| > 4$
 $(y-3x > 6$ or $y-3x < -6)$

$(y > 3x+6$ or $y < 3x-6)$ and
 $(y > 4$ or $y < -4)$



⑪ $\sqrt{4a+13}-3=2$

$\sqrt{4a+13}=5$
 $4a+13=25$
 $4a=12$

$\boxed{a=3}$

⑫ $a^2+b^2=c^2$

$2^2+8^2=c^2$
 $c^2=68$
 $c=\sqrt{68}$

$\boxed{2\sqrt{17} \text{ m}}$

⑬ $(6,-2)$ to $(-2,-4)$

$d = \sqrt{[(6)-(-2)]^2 + [(-2)-(-4)]^2}$

$d = \sqrt{(8)^2 + (2)^2} = \sqrt{68} = \boxed{2\sqrt{17}}$

⑭ $y = -x^2 + 8x - 12$

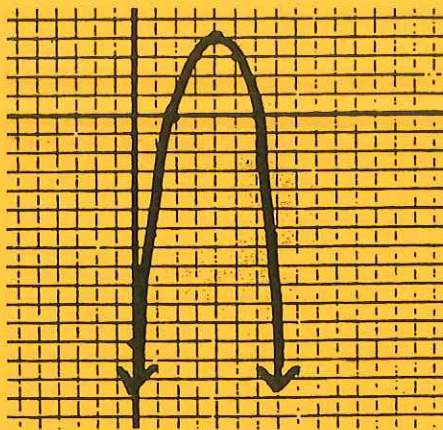
axis $x = -b/2a$ $\boxed{x=4}$ $\boxed{(4,4)}$

vertex $y = -(4)^2 + 8(4) - 12 = 4$

x	y		
3	3	$-(3)^2 + 8(3) - 12$	graph on
2	0	$-(2)^2 + 8(2) - 12$	next
0	-12	$-(0)^2 + 8(0) - 12$	Page

⑥ $\sqrt{72a^3b^4c^2} = \boxed{6ab^2|c|\sqrt{2a}}$





$$(20) \frac{n^2+2n+1}{n-1} \div \frac{n+1}{2n^2-8n+6}$$

$$\frac{(n+1)(n+1)}{(n-1)} \cdot \frac{2(n-1)(n-3)}{(n+1)} = \boxed{2(n+1)(n-3) \text{ or } 2n^2-4n-6}$$

$$(21) \frac{3}{2n-4} + \frac{2}{2n-n^2} = \frac{3}{2(n-2)} + \frac{2}{n(2-n)}$$

$$\frac{3}{2(n-2)} - \frac{2}{n(n-2)} = \frac{3}{2(n-2)} \left(\frac{n}{n}\right) - \frac{2}{n(n-2)} \left(\frac{2}{2}\right) = \boxed{\frac{3n-4}{2n(n-2)}}$$

$$(15) \begin{aligned} 3x^2+16x+16=0 \\ 3x^2+12x+4x+16=0 \\ 3x(x+4)+4(x+4)=0 \\ (x+4)(3x+4)=0 \end{aligned}$$

$$\boxed{x = -4, -4/3}$$

$$(22) \frac{x+y}{x^2-y^2} = \frac{(x+y)}{(x-y)(x+y)} = \frac{\cancel{(x+y)}}{(x-y)\cancel{(x+y)}}$$

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

$$\frac{1}{x-y} \cdot \frac{y+x}{-1} = \boxed{\frac{-(x+y)}{x-y}}$$

$$(23) (x-1)(x+1) \left[1 - \frac{1}{x-1} = \frac{2}{x+1}\right]$$

$$(x-1)(x+1) - (x+1) = 2(x-1)$$

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

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

$$x^2-3x=0 \quad x(x-3)=0 \quad \boxed{x=0, 3}$$

$$(16) \begin{aligned} 3n^2-24n=36 \\ n^2-8n=12 \\ + n^2-8n+16=12+16 \\ (n-4)=28 \\ n-4=\pm 2\sqrt{7} \end{aligned}$$

$$\boxed{n=4\pm 2\sqrt{7}}$$

$$(17) \begin{aligned} 4n^2+8n-1=0 \\ a=4 \quad b=8 \quad c=-1 \\ \frac{-8 \pm \sqrt{(8)^2 - 4(4)(-1)}}{2(4)} \end{aligned}$$

$$\frac{-8 \pm \sqrt{80}}{8} = \frac{-8 \pm 4\sqrt{5}}{8}$$

$$\boxed{\frac{-2 \pm \sqrt{5}}{2}}$$

$$(18) \begin{aligned} 3x^2+6x+3=0 \\ b^2-4ac \\ (6)^2-4(3)(3)=0 \\ \boxed{1 \text{ real root}} \text{ Rational} \end{aligned}$$

$$(19) \frac{n^2-16}{n^2-8n+16} \cdot \frac{n-4}{n^2+6n+8}$$

$$\frac{\cancel{(n-4)}\cancel{(n+4)}}{\cancel{(n-4)}\cancel{(n+4)}} \cdot \frac{\cancel{(n-4)}}{\cancel{(n+4)}(n+2)} = \boxed{\frac{1}{n+2}}$$

"C"

Alg. Skills Review Part II (Units 9-12)



$$(1) \begin{aligned} y=2x+6 \quad m=2 \quad y\text{-int } (0,6) \\ 8x-4y=10 \quad m=2 \quad y\text{-int } (0, -5/2) \end{aligned}$$

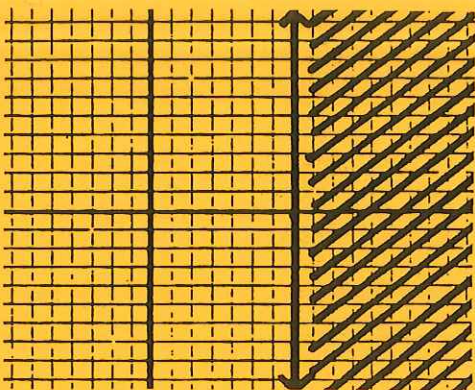
$\boxed{\text{independent, inconsistent, 0 solutions}}$

$$(2) \begin{aligned} 3x-2y=7 \quad \times(3) \\ 4x-3y=11 \quad \times(-2) \\ \hline 9x-6y=21 \\ -8x+6y=-22 \\ \hline x = -1 \end{aligned}$$

$$\begin{aligned} 3(-1)-2y=7 \\ -2y=10 \\ y=-5 \end{aligned}$$

$$\boxed{(-1, -5)}$$

③ $x \geq 7$



⑥ $\sqrt{125a^3b^3c^2} = 5abc\sqrt{5ab}$

⑦ $\sqrt[4]{642.0000} \approx 25.3$

$$\begin{array}{r} 4\overline{)242} \\ \underline{225} \\ 1700 \\ \underline{1509} \\ 19100 \end{array}$$

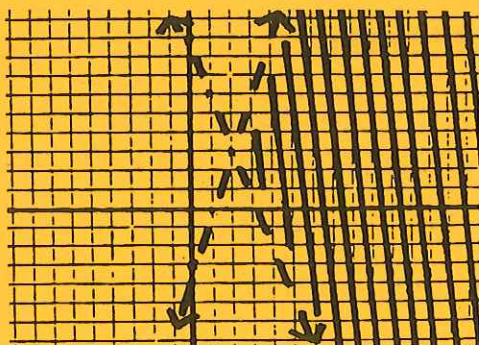


④ $|y-3|+6 < 3x$

$|y-3| < 3x-6$

$y-3 < 3x-6$ and $y-3 > -3x+6$

$y < 3x-3$ and $y > -3x+9$



⑧ $4\sqrt{3}(\sqrt{6}-2\sqrt{15})-2\sqrt{5}$

$4\sqrt{18}-8\sqrt{45}-2\sqrt{5}$

$12\sqrt{2}-24\sqrt{5}-2\sqrt{5} = 12\sqrt{2}-26\sqrt{5}$

⑨ $\frac{4\sqrt{3}}{2\sqrt{2}-\sqrt{3}} \cdot \frac{2\sqrt{2}+\sqrt{3}}{2\sqrt{2}+\sqrt{3}} = \frac{8\sqrt{6}+12}{8-3} = \frac{8\sqrt{6}+12}{5}$

⑩ $47 = \sqrt{2209}$
 $48 = \sqrt{2304}$
 $47 \frac{55}{95} \quad 47 \frac{11}{19}$

⑭ $y = x^2 - 6x - 16$

axis

$x = -b/2a \quad x = 3$

vertex

$y = (3)^2 - 6(3) - 16 = -25$

$(3, -25)$

⑪ $\sqrt{4x+13}+3=4$

$\sqrt{4x+13}=1$

$4x+13=1$

$4x=12$

$x = -3$

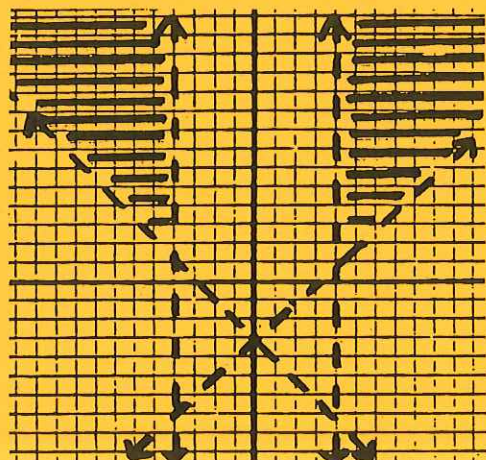
x	y
2	-24 $(2)^2 - 6(2) - 16$
0	-16 $(0)^2 - 6(0) - 16$
-2	0 $(-2)^2 - 6(-2) - 16$

⑮ $|x| < y+3$ and $|x| > 4$

$(x < y+3$ and $x > -y-3)$

and $(x > 4$ or $x < -4)$

$(y > x-3$ and $y > -x-3)$
 and $(x > 4$ or $x < -4)$



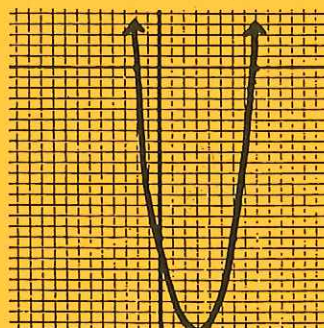
⑫ $a^2+b^2=c^2$

$4^2+10^2=c^2$

$16+100=c^2$

$c^2=116$

$c = 2\sqrt{29} \text{ m}$



⑬ $(4,5)$ to $(8,-1)$

$d = \sqrt{[(4)-(8)]^2 + [(5)-(-1)]^2}$

$d = \sqrt{(-4)^2 + (6)^2} = \sqrt{52}$

$d = 2\sqrt{13}$



$$\begin{aligned} (15) \quad & 4x^2 + 15x - 4 = 0 \\ & 4x^2 + 16x - x - 4 = 0 \\ & 4x(x+4) - 1(x+4) = 0 \\ & (x+4)(4x-1) = 0 \\ & \boxed{x = -4, \frac{1}{4}} \end{aligned}$$

$$\begin{aligned} (16) \quad & 3n^2 + 12 = 18n \\ & 3n^2 - 18n = -12 \\ \rightarrow & n^2 - 6n = -4 \\ & n^2 - 6n + 9 = -4 + 9 \\ & (n-3)^2 = 5 \\ & n-3 = \pm\sqrt{5} \\ & \boxed{n = 3 \pm \sqrt{5}} \end{aligned}$$

$$\begin{aligned} (17) \quad & n^2 - 6n + 1 = 0 \\ & a=1 \quad b=-6 \quad c=1 \\ & \frac{6 \pm \sqrt{(-6)^2 - 4(1)(1)}}{2(1)} \\ & \frac{6 \pm \sqrt{32}}{2} = \frac{6 \pm 4\sqrt{2}}{2} \end{aligned}$$

$$\boxed{3 \pm 2\sqrt{2}}$$

$$\begin{aligned} (18) \quad & 2x^2 + 4x + 3 = 0 \\ & b^2 - 4ac < 0 \\ & (4)^2 - 4(2)(3) = -8 \\ & \boxed{\text{no real roots}} \end{aligned}$$

$$\begin{aligned} (19) \quad & \frac{2n^2 - 13n + 15}{2n-3} \cdot \frac{n+1}{n^2 - 4n - 5} \\ & \frac{\cancel{(n-5)}(2n-3)}{(2n-3)} \cdot \frac{(n+1)}{\cancel{(n-5)}(n+1)} \\ & \boxed{1} \end{aligned}$$

$$\begin{aligned} (20) \quad & \frac{n^2 - 81}{n^2 - 36} \div \frac{n-9}{n+6} \\ & \frac{\cancel{(n+9)}(n-9)}{\cancel{(n+6)}(n-6)} \cdot \frac{\cancel{(n+6)}}{\cancel{(n-9)}} = \boxed{\frac{n+9}{n-6}} \end{aligned}$$

$$\begin{aligned} (21) \quad & \frac{-3}{5-a} - \frac{5}{a^2-25} = \frac{-3}{(5-a)} - \frac{5}{(a-5)(a+5)} \\ & \frac{3}{a-5} \left(\frac{a+5}{a+5} \right) - \frac{5}{(a-5)(a+5)} \\ & \frac{3(a+5) - 5}{(a-5)(a+5)} = \frac{3a+15-5}{(a-5)(a+5)} = \boxed{\frac{3a+10}{(a-5)(a+5)}} \end{aligned}$$

$$(22) \quad \frac{n+2 + \frac{2}{n+5}}{n+6 + \frac{6}{n+1}} = \frac{\frac{(n+2)(n+5) + 2}{(n+5)}}{\frac{(n+6)(n+1) + 6}{(n+1)}}$$

$$\frac{n^2 + 7n + 10 + 2}{(n+5)} = \frac{(n^2 + 7n + 12)}{(n+5)}$$

$$\frac{n^2 + 7n + 6 + 6}{(n+1)} = \frac{(n^2 + 7n + 12)}{(n+1)}$$

$$\frac{\cancel{(n^2 + 7n + 12)}}{(n+5)} \cdot \frac{(n+1)}{\cancel{(n^2 + 7n + 12)}} = \boxed{\frac{n+1}{n+5}}$$

$$(23) \quad (x-4)(x-1) \left[\frac{3x}{x^2 - 5x + 4} = \frac{2}{x-4} + \frac{3}{x-1} \right]$$

$$3x = 2(x-1) + 3(x-4)$$

$$3x = 2x - 2 + 3x - 12$$

$$3x = 5x - 14$$

$$-2x = -14$$

$$\boxed{x = 7}$$



Problem Solving Review

"A"

Prob. Solving Review Answer Key

①
$$\begin{array}{r} n & -1 \\ n+2 & \boxed{1} \\ n+4 & 3 \end{array}$$

$$3(n+4) - (2n+5) = 6$$

$$3n+12-2n-5=6$$

$$n=-1$$

② $-10 < 3n-4 < 17$

$$-10 < 3n-4 \text{ and } 3n-4 < 17$$

$$-6 < 3n \text{ and } 3n < 21$$

$$-2 < n \text{ and } n < 7$$

$$-2 < n < 7$$

positive, even

$n = 2, 4, 6$

③

	now	In 5	In 4
Ryan	$5n$	$5n+5$	
Sam	$8n$		$8n+4$

$$4(5n+5) = 3(8n+4)$$

$$20n+20 = 24n+12$$

$$-4n = -8$$

$$n = 2$$

Ryan now $5n = 10$

Last year $\boxed{9 \text{ yrs. old}}$

④
$$\begin{array}{r} n & \boxed{5} & \boxed{-6} \\ n+1 & \boxed{6} & \boxed{-5} \end{array}$$

$$n^2 + (n+1)^2 = 61$$

$$n^2 + (n^2 + 2n + 1) = 61$$

$$2n^2 + 2n - 60 = 0$$

$$n^2 + n - 30 = 0$$

$$(n-5)(n+6) = 0$$

$$n = 5, -6$$

⑤ $t+u$

$$t+u=7 \quad u=7-t$$

$$10u+t = 2(10t+u) - 25$$

$$10u+t = 20t+2u-25$$

$$8u-19t = -25$$

$$8(7-t)-19t = -25$$

$$56-8t-19t = -25$$

$$-27t = -81$$

$$t=3 \quad u=4 \quad \boxed{34}$$

⑥ $.085n + 3(210) = 1004$

$$.085n + 630 = 1004$$

$$.085n = 374$$

$$n = 4400 \quad \boxed{\$4400}$$

⑦ nickels $28-3n$

dimes n

quarters $2n$

$$5(28-3n) + 10n + 25(2n) = 365$$

$$140 - 15n + 10n + 50n = 365$$

$$45n = 225$$

$$n = 5$$

nickels $28-3n = \boxed{13 \text{ nickels}}$

⑧ $\frac{\text{after tax}}{\text{original price}} = \frac{15.37}{n} = \frac{106}{100}$

$$106n = 1537$$

$$n = 14.5 \quad \boxed{\$14.50}$$

⑨ $.06n = .08(18,000 - n) + 240$

$$.06n = 1440 - .08n + 240$$

$$.14n = 1680$$

$$n = 12,000 \quad \boxed{\$12,000 @ 6\%}$$

⑩ $4.25n + 1.75(50-n) = 120$

$$4.25n + 87.5 - 1.75n = 120$$

$$2.5n = 32.5$$

$$n = 13$$

$$50-n = 37$$

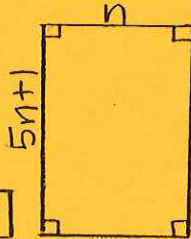
$\boxed{13 \text{ adult } \& 37 \text{ child tickets}}$

⑪ $40(30) - 6(n) = 60(30-n)$
 $12 = 18 - .6n$
 $.6n = 6$ 10L of water

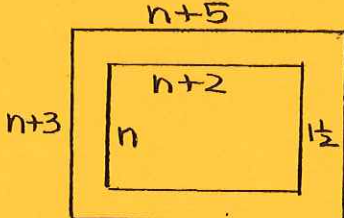
⑫ $\frac{r}{6} \cdot t = \frac{d}{6t}$
 Amy $\frac{r}{6} \cdot t = \frac{d}{6t}$
 Rick $8 \cdot (t - 3/4) = 8t - 6$
 $6t = 8t - 6$ Amy arrives
 $-2t = -6$ $1:30 + 3$
 $t = 3$ 4:30 PM
 Distance to beach $6t = \text{18 miles}$

⑬ downstream $\frac{r}{r+c} \cdot 3 = 42$
 upstream $\frac{r}{r-c} \cdot 7 = 42$
 $3r + 3c = 42 \div 3$ $r + c = 14$
 $7r - 7c = 42 \div 7$ $r - c = 6$
 $2r = 20$
 $r = 10$
 $c = 4$
current 4mph

⑭ $2n + 2(5n + 1) = 38$
 $2n + 10n + 2 = 38$
 $12n = 36$
 $n = 3$
 $5n + 1 = 16$
 area $3 \cdot 16 = \text{48 cm}^2$

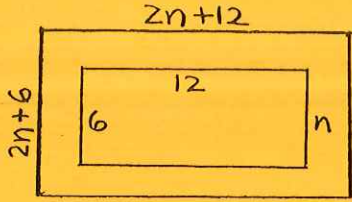


⑮ $(n+5)(n+3) - n(n+2) = 39$
 $(n^2 + 8n + 15) - (n^2 + 2n) = 39$
 $6n - 24 = 0$
 $6(n-4) = 0$
 $n = 4$
 $n+2 = 6$
4 by 6 in



⑯ $(2n+12)(2n+6) - (6)(12) = 63$
 $(4n^2 + 36n + 72) - 72 = 63$
 $4n^2 + 36n - 63 = 0$
 $a = 4$
 $b = 36$
 $c = -63$
 $\frac{-36 \pm \sqrt{(36)^2 - 4(4)(-63)}}{2(4)}$

$\frac{-36 \pm 48}{8}$
 $\frac{-84}{8}, \frac{12}{8}$
 $n = \text{1 1/2 ft}$



⑰ $(n-5)(2n+2) = 54$
 $2n^2 - 8n - 10 = 54$
 $2n^2 - 8n - 64 = 0$
 $n^2 - 4n - 32 = 0$
 $(n-8)(n+4) = 0$
 $n = \text{8, -4}$



⑱ Jim $\frac{r}{1/3} \cdot t = \frac{w}{t/3}$
 Russ $\frac{r}{1/6} \cdot t = \frac{w}{t/6}$
 $(6) \left[\frac{t}{3} + \frac{t}{6} = 1 \right]$
 $2t + t = 6$
 $3t = 6$ $t = \text{2 hours}$

⑲ Susan $\frac{r}{5} \cdot \frac{t}{2/15} = \frac{w}{2/3}$
 miwa $r \cdot \frac{t}{2/15} = \frac{2r}{1/5}$

(15) $\left[\frac{2}{3} + \frac{2r}{15} = 1 \right]$

$10 + 2r = 15$
 $2r = 5$
 $r = 5/2$
 reciprocal = $2/5$ $\frac{2}{5} \times 60 \text{ min}$
24 min

⑳ Fill Pipe 1 $\frac{r}{1/2} \cdot t = \frac{w}{t/2}$
 Fill Pipe 2 $\frac{r}{1/5} \cdot t = \frac{t}{5}$
 Drain $\frac{r}{1/4} \cdot t = \frac{t}{4}$

(20) $\left[\frac{t}{2} + \frac{t}{5} - \frac{t}{4} = 1 \right]$

$10t + 4t - 5t = 20$
 $9t = 20$
 $t = 20/9$
 $2 \frac{2}{9} \text{ hours} = \text{2 hrs 13 min}$

Quarterly Exam #4 - Skills 1-8

REMIEDIATION & EXTRA PRACTICE - Key

① $4ab^2 - 3(a-2b)$
 $4(-2)(-1)^2 - 3[(-2) - 2(-1)]$
 $4(-2)(1) - 3(0)$
 $-8 - 0 = -8$

$2a^2b^2 - 2(a+3b) - b^3$
 $2(-2)^2(1)^2 - 2[(-2) + 3(-1)] - (-1)^3$
 $2(4)(1) - 2(-5) - (-1)$
 $(8) - (-10) - (-1)$
 $(8) + (10) + (1) = 19$

② $2xy - 3x(y-4) - 8x$
 $2xy - 3xy + 12x - 8x$
 $-xy + 4x$

$12x^2 - 3x(x+2y) - 2xy$
 $12x^2 - 3x^2 - 6xy - 2xy$
 $9x^2 - 8xy$

③ $4 - \frac{2n}{3} = -2 - 5(n+4)$
 $3[4 - \frac{2n}{3} = -2 - 5n - 20]$
 $12 - 2n = -6 - 15n - 60$
 $12 - 2n = -15n - 66$
 $13n = -78$
 $n = -6$

$2(x-3) + \frac{x}{4} = 3x - 9$
 $4[2x - 6 + \frac{x}{4} = 3x - 9]$
 $8x - 24 + x = 12x - 36$
 $9x - 24 = 12x - 36$
 $-3x = -12$
 $x = 4$

④ $\frac{2a-1}{3} < \frac{2(3a+1)}{8}$
 $8(2a-1) < 6(3a+1)$
 $16a - 8 < 18a + 6$
 $-2a < 14$
 $a > -7$

$2x - 3(x-1) \geq \frac{x}{2} + 6$
 $2[2x - 3x + 3 \geq \frac{x}{2} + 6]$
 $4x - 6x + 6 \geq x + 12$
 $-3x \geq 6$
 $x \leq -2$

⑤ $(-\frac{1}{2}a^2bc^3)^2(-2a^{-1}b^2c^2)^3$
 $(\frac{1}{4}a^4b^2c^6)(-8a^3b^6c^6)$
 $-2ab^8c^{-12}$
 $\frac{-2ab^8}{c^{12}}$

$(-\frac{2}{3}x^{-1}y^{-2}z^2)^2(3xy^{-3}z^{-1})^2$
 $(\frac{4}{9}x^{-2}y^{-4}z^4)(9x^2y^{-6}z^{-2})$
 $4x^0y^{-10}z^2 = \frac{4z^2}{y^{10}}$

⑥ $\frac{-6xy^2z^3}{4x^2y^3z^{-5}} = \frac{-3z^2}{2xy^5}$
 $\frac{12a^2b^3cd^4}{-9a^3b^2c^4d^{-2}} = \frac{-4ad^6}{3b^5c^3}$

⑦ $\frac{.024 \times 10^{-7}}{2.5 \times 10^{-2}} = .0096 \times 10^{-5}$
 9.6×10^{-8}

$\frac{484 \times 10^{-5}}{2.5 \times 10^{-8}} = 193.6 \times 10^3$
 1.936×10^5

⑧ $(3n-5)(4n+3)$
 $12n^2 - 11n - 15$
 $(2x+3y)(x-4y)$
 $2x^2 - 5xy - 12y^2$

⑨
$$\begin{array}{r} 3n^2 + 6nm + 12m^2 + \frac{6m^3}{n-2m} \\ n-2m \overline{) 3n^3 - 6n^2m} \\ \underline{6n^2m} \\ 6n^2m - 12m^3 \\ \underline{12nm^2 - 18m^3} \\ 12nm^2 - 24m^3 \\ \underline{6m^3} \end{array}$$

$$\begin{array}{r} 4x^2 + 6xy + 9y^2 + \frac{19y^3}{2x-3y} \\ 2x-3y \overline{) 8x^3 - 12x^2y} \\ \underline{12x^2y} \\ 12x^2y - 18xy^2 \\ \underline{18xy^2 - 8y^3} \\ 18xy^2 - 27y^3 \\ \underline{19y^3} \end{array}$$

⑩ $25x^4y, 35xy^3, 45x^2y^2$

25	5 ²	GCF = 5xy
35	5 · 7	LCM = 1575x ⁴ y ³
45	3 ² · 5	

$18a^2b^3, 120abc, 150a^4bc^2$

18	2 · 3 ²	GCF = 6ab
120	2 ³ · 3 · 5	LCM = 1800a ⁴ b ³ c ²
150	2 · 3 · 5 ²	

⑪ $6x^2 + xy - 2y^2$ $\begin{matrix} -12 \\ \wedge \\ 4-3 \end{matrix}$
 $6x^2 + 4xy - 3xy - 2y^2$
 $2x(3x+2y) - y(3x+2y)$
 $(3x+2y)(2x-y)$

$12a^2 - 13ab + 3b^2$ $\begin{matrix} 36 \\ \wedge \\ -9-4 \end{matrix}$
 $12a^2 - 9ab - 4ab + 3b^2$
 $3a(4a-3b) - b(4a-3b)$
 $(4a-3b)(3a-b)$

$$\begin{aligned} (12) \quad & 4a^2x^2 - x^2b^2 + y^2b^2 - 4a^2y^2 \\ & x^2(4a^2 - b^2) + y^2(y^2 - 4a^2) \\ & x^2(4a^2 - b^2) - y^2(4a^2 - y^2) \\ & (4a^2 - b^2)(x^2 - y^2) \\ & (2a+b)(2a-b)(x+y)(x-y) \end{aligned}$$

$$\begin{aligned} & 6a^2x - 3a^2y - 6b^2x + 3b^2y \\ & 3(2a^2x - a^2y - 2b^2x + b^2y) \\ & 3[a^2(2x - y) - b^2(2x - y)] \\ & 3(2x - y)(a^2 - b^2) \\ & 3(2x - y)(a+b)(a-b) \end{aligned}$$

$$\begin{aligned} (13) \quad & x^3 - 10x = 3x^2 \\ & x^3 - 3x^2 - 10x = 0 \\ & x(x^2 - 3x - 10) = 0 \\ & x(x - 5)(x + 2) = 0 \\ & x = 0, 5, -2 \end{aligned}$$

$$\begin{aligned} & 5n^2 + 10 = 15n \\ & 5n^2 - 15n + 10 = 0 \\ & 5(n^2 - 3n + 2) = 0 \\ & 5(n - 2)(n - 1) = 0 \\ & n = 2, 1 \end{aligned}$$

$$(14) \quad \begin{matrix} (-2, 3) & \frac{3-1}{-2-5} = \frac{2}{-7} = \frac{A}{-B} & A=2 \\ (5, 1) & & B=7 \end{matrix}$$

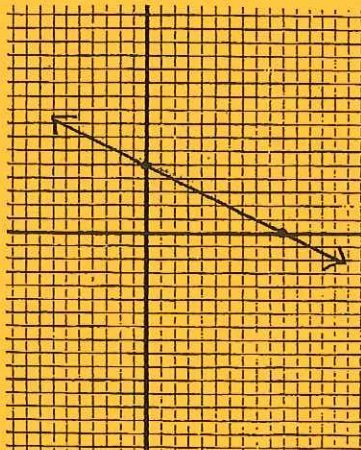
$$\begin{aligned} & 2x + 7y = c \\ & 2(-2) + 7(3) = 17 \\ & 2x + 7y = 17 \end{aligned}$$

I FINALLY GOT THE TOILET UNCLOGGED

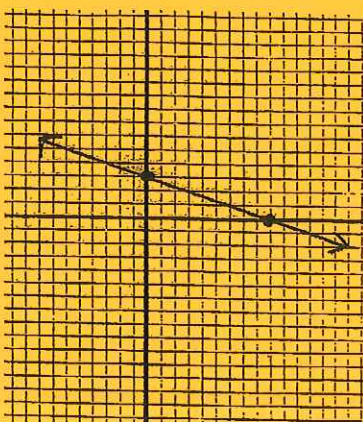


$$\begin{aligned} & (-4, 3) \quad \frac{3-7}{-4-(-6)} = \frac{-4}{2} = -2 \\ & (-6, 7) \\ & y = -2x + b \\ & (3) = -2(-4) + b \\ & 3 = 8 + b \\ & b = -5 \quad y = -2x - 5 \end{aligned}$$

$$\begin{aligned} (15) \quad & \text{Stan } \parallel y = \frac{1}{2}x + 2 \quad (2, 4) \\ & m = \frac{1}{2} = \frac{A}{B} \quad A=1 \\ & \quad \quad \quad \quad \quad \quad \quad B=2 \\ & x + 2y = c \\ & (2) + 2(4) = 10 \\ & x + 2y = 10 \end{aligned}$$



$$\begin{aligned} & \text{Si } \perp 3x - y = -5 \quad (-9, 6) \\ & m = 3 \quad \perp m = \frac{1}{3} \\ & y = \frac{1}{3}x + b \\ & (6) = \frac{1}{3}(-9) + b \\ & b = 3 \quad y = \frac{1}{3}x + 3 \end{aligned}$$



$$\begin{aligned} (16) \quad & f(n+4) \text{ for } f(x) = x^2 - 2x \\ & f(n+4) = (n+4)^2 - 2(n+4) \\ & \quad \quad \quad (n^2 + 8n + 16) - 2n - 8 \\ & \quad \quad \quad n^2 + 6n + 8 \end{aligned}$$

$$\begin{aligned} & f(2a+3) \text{ for } f(x) = x - x^2 \\ & f(2a+3) = (2a+3) - (2a+3)^2 \\ & \quad \quad \quad (2a+3) - (4a^2 + 12a + 9) \\ & \quad \quad \quad -4a^2 - 10a - 6 \end{aligned}$$



$$(17) \quad A(-5, 12) \quad B(9, -4) \\ P(-7, 4)$$

$$A(8, -9) \quad B(-2, 3) \\ P(3, -3)$$

$$\begin{aligned} (18) \quad & 2xy = 3x + 4y \\ & 2xy - 3x = 4y \\ & x(2y - 3) = 4y \\ & x = \frac{4y}{2y - 3} \text{ for } y \neq \frac{3}{2} \end{aligned}$$

$$-2y = 4x + xy - 1$$

$$4x + xy = -2y + 1$$

$$x(4 + y) = -2y + 1$$

$$x = \frac{-2y + 1}{4 + y} \text{ for } y \neq -4$$

$$\begin{aligned} (20) \quad & (2x^{a+b} - y^{2a+b})^2 \\ & 4x^{2a+2b} - 4x^{a+b}y^{2a+b} + y^{4a+2b} \end{aligned}$$

$$(3x^{n-2} + 2y^{3n+1})^2$$

$$9x^{2n-4} + 12x^{n-2}y^{3n+1} + 4y^{6n+2}$$

19) $|2x+4| < 8$ and $|x| \neq 1$

$(2x+4 < 8$ and $2x+4 > -8)$

$2x < 4$ and $2x > -12$

$x < 2$ and $x > -6$

$(-6 < x < 2)$ and $(x \neq 1$ and $x \neq -1)$



$|2n-4| > 10$ and $|n| \neq 10$

$(2n-4 > 10$ or $2n-4 < -10)$

$2n > 14$ and $2n < -6$

$(n > 7$ or $n < -3)$ and $(n \neq 10$ and $n \neq -10)$



Quarterly Exam #4 - Skills 9-12

REMEDICATION & EXTRA PRACTICE - Key

1) slope $-\frac{3}{2}$ $-\frac{3}{2}$
 y-int $(0,6)$ $(0,6)$
 dependent, consistent, inf

slope $\frac{2}{5}$ $\frac{2}{5}$
 y-int $(0,-2)$ $(0,4)$
 independent, inconsistent, 0

2) $3x - 4y = -5$
 $(x + 5y = -8) \times (-3)$
 $3x - 4y = -5$
 $-3x - 15y = 24$
 $-19y = 19$
 $y = -1$
 $x = -3$ $(-3, -1)$

$4x - 2y = -14$
 $(6x + y = 3) \times (2)$

$4x - 2y = -14$
 $12x + 2y = 6$
 $16x = -8$
 $x = -\frac{1}{2}$
 $y = 6$ $(-\frac{1}{2}, 6)$

3) $\sqrt{60a^2b^3c^3}$
 $2a\sqrt{bc}\sqrt{15bc}$

$\sqrt{75a^4bc^3d^2}$
 $5a^2cd\sqrt{3bc}$

4) $\sqrt{3}(2\sqrt{6} - \sqrt{15}) - 2\sqrt{2}$
 $2\sqrt{18} - \sqrt{45} - 2\sqrt{2}$
 $6\sqrt{2} - 3\sqrt{5} - 2\sqrt{2}$
 $4\sqrt{2} - 3\sqrt{5}$

$4\sqrt{3} - 3\sqrt{2}(3\sqrt{6} - 2\sqrt{10})$
 $4\sqrt{3} - 9\sqrt{12} + 6\sqrt{20}$
 $4\sqrt{3} - 18\sqrt{3} + 12\sqrt{5} = -14\sqrt{3} + 12\sqrt{5}$

5) $\frac{2\sqrt{3}}{3\sqrt{2}-4} \times \frac{3\sqrt{2}+4}{3\sqrt{2}+4} = \frac{6\sqrt{6}+8\sqrt{3}}{18-16}$
 $3\sqrt{6} + 4\sqrt{3}$

$\frac{3\sqrt{10}}{\sqrt{5}-2} \times \frac{\sqrt{5}+2}{\sqrt{5}+2} = \frac{3\sqrt{50}+6\sqrt{10}}{5-4}$
 $\frac{15\sqrt{2}+6\sqrt{10}}{1} = 15\sqrt{2}+6\sqrt{10}$

6) $\sqrt{1600} = 40$
 $\sqrt{1645}$
 $\sqrt{1681} = 41$
 $40 \frac{45}{81} = 40 \frac{5}{9}$

$$\left. \begin{aligned} \sqrt{4489} &= 67 \\ \sqrt{4534} & \\ \sqrt{4624} &= 68 \end{aligned} \right\} 45 \quad \left. \begin{aligned} & \\ & \\ & \end{aligned} \right\} 135$$

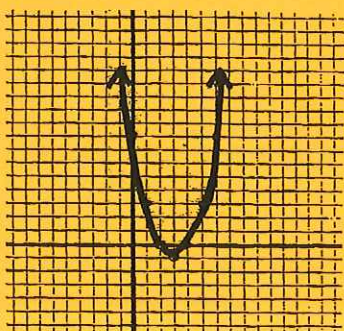
$$67 \frac{45}{135} = 67 \frac{1}{3}$$

$$\begin{aligned} \textcircled{7} \quad \sqrt{2n+10} - 6 &= -4 \\ \sqrt{2n+10} &= 2 \\ 2n+10 &= 4 \\ 2n &= -6 \\ n &= -3 \end{aligned}$$

$$\begin{aligned} 8 - \sqrt{5x+19} &= 5 \\ -\sqrt{5x+19} &= -3 \\ 5x+19 &= 9 \\ 5x &= -10 \\ x &= -2 \end{aligned}$$

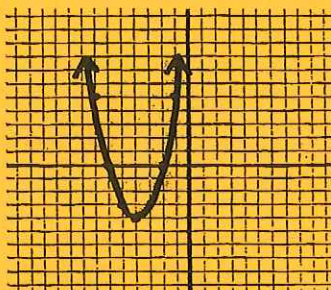
$$\begin{aligned} \textcircled{8} \quad (-3, 2) \text{ to } (-8, -3) \\ \sqrt{(-3-(-8))^2 + (2-(-3))^2} \\ \sqrt{25+25} = \sqrt{50} = 5\sqrt{2} \\ (5, -9) \text{ to } (9, -7) \\ \sqrt{(5-9)^2 + (-9-(-7))^2} \\ \sqrt{16+4} = \sqrt{20} = 2\sqrt{5} \end{aligned}$$

$$\begin{aligned} \textcircled{9} \quad y &= x^2 - 6x + 8 \\ x &= \frac{-b}{2a} \text{ axis } x=3 \\ \begin{array}{c|c} x & y \\ \hline 2 & 0 \\ 1 & 3 \\ 0 & 8 \end{array} & \text{vertex } (3, -1) \end{aligned}$$



$$y = x^2 + 8x + 12 \\ x = \frac{-b}{2a} \text{ axis } x = -4$$

$$\begin{array}{c|c} x & y \\ \hline -3 & -3 \\ -2 & 0 \\ -1 & 5 \end{array} \quad \begin{array}{l} \text{vertex} \\ (-4, -4) \end{array}$$



$$\begin{aligned} \textcircled{10} \quad n^2 - 6n + 6 &= 0 \\ n^2 - 6n + 9 &= -6 + 9 \\ (n-3)^2 &= 3 \\ n-3 &= \sqrt{3} \\ n &= 3 \pm \sqrt{3} \end{aligned}$$

$$\begin{aligned} 2x^2 + 8x - 2 &= 0 \\ x^2 + 4x - 1 &= 0 \\ x^2 + 4x + 4 &= 1 + 4 \\ (x+2)^2 &= 5 \\ x+2 &= \sqrt{5} \\ x &= -2 \pm \sqrt{5} \end{aligned}$$

$$\begin{aligned} \textcircled{11} \quad x^2 - 6x + 1 &= 0 \\ a=1 \quad \frac{6 \pm \sqrt{(-6)^2 - 4(1)(1)}}{2(1)} \\ b=6 \\ c=1 \\ \frac{6 \pm \sqrt{32}}{2} \\ \frac{6 \pm 4\sqrt{2}}{2} = 3 \pm 2\sqrt{2} \end{aligned}$$

$$\begin{aligned} 3x^2 + 12x - 9 &= 0 \\ 3(x^2 + 4x - 3) &= 0 \\ a=1 \quad \frac{-4 \pm \sqrt{(4)^2 - 4(1)(-3)}}{2(1)} \\ b=4 \\ c=-3 \\ \frac{-4 \pm \sqrt{28}}{2} \\ \frac{-4 \pm 2\sqrt{7}}{2} = -2 \pm \sqrt{7} \end{aligned}$$

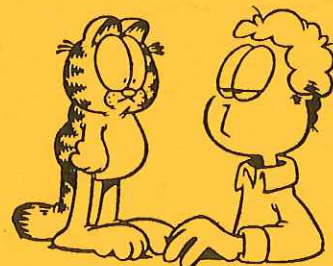
$$\textcircled{12} \quad \frac{(x-5)(x+1)}{(x-4)(x-3)} \times \frac{(x-3)}{(x+1)} \\ \frac{x-5}{x-4}$$

$$\frac{(n-3)(2n+1)}{(n+4)(n+2)} \times \frac{2(n+2)}{(2n+1)} \\ \frac{2(n-3)}{(n+4)}$$

$$\textcircled{13} \quad \frac{2}{n-1} - \frac{3}{n(n-1)} = \frac{2n-3}{n(n-1)}$$

$$\frac{3x}{x-2} - \frac{5}{x(2-x)}$$

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



$$\textcircled{14} \quad (n+1)(n-2) \left[\frac{n-5}{n+1} + \frac{n+8}{n-2} = 3 \right]$$

$$\begin{aligned} (n-2)(n-5) + (n+1)(n+8) &= 3(n+1)(n-2) \\ (n^2 - 7n + 10) + (n^2 + 9n + 8) &= 3n^2 - 3n - 6 \\ 2n^2 + 2n + 18 &= 3n^2 - 3n - 6 \\ n^2 - 5n - 24 &= 0 \end{aligned}$$

$$(n-8)(n+3) = 0 \quad n = 8, -3$$

$$(n)(n+3) \left[\frac{n+3}{n} + \frac{4n}{n+3} = -4 \right]$$

$$\begin{aligned} (n+3)(n+3) + (n)(4n) &= -4(n)(n+3) \\ (n^2 + 6n + 9) + (4n^2) &= -4n^2 - 12n \\ 9n^2 + 18n + 9 &= 0 \\ n^2 + 2n + 1 &= 0 \\ (n+1)^2 &= 0 \\ n &= -1 \end{aligned}$$

$$\textcircled{15} \frac{(n-3)(\cancel{n+1})}{(\cancel{n+2})(n-1)} \times \frac{(n-2)(\cancel{n+2})}{(n+1)}$$

$$\frac{(n-3)(n-2)}{(n-1)}$$

$$\frac{2(\cancel{x+1})(\cancel{x+1})}{(\cancel{x+2})(\cancel{x+1})} \times \frac{(x+2)}{3(x+1)} = \frac{2}{3}$$

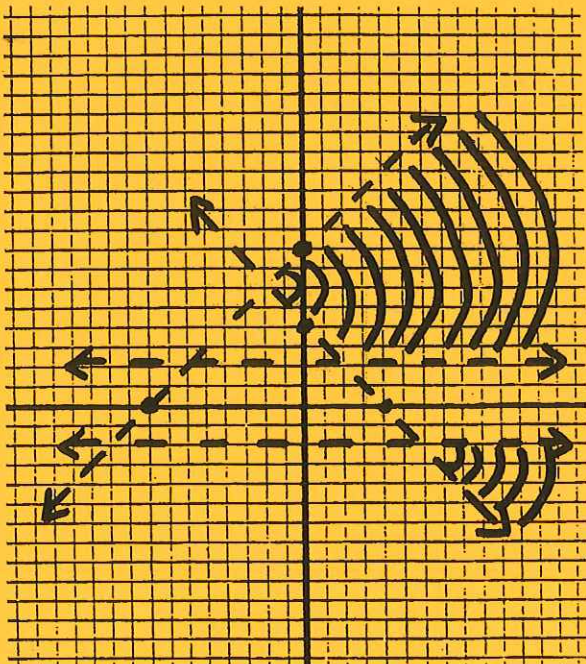
$$\textcircled{16} (y-6 < x+2) \text{ and } (y-6 > -x-2)$$

$$[y < x+8 \text{ and } y > -x+4] \text{ and } [y > 2 \text{ or } y < -2]$$

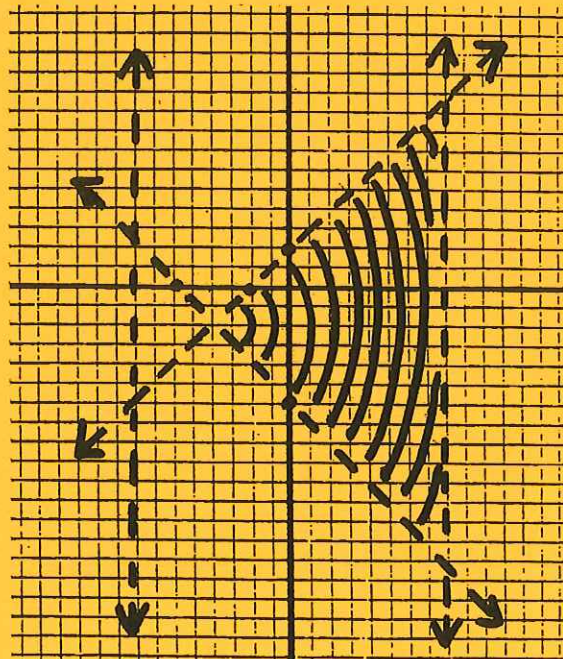
$$(y+2 < x+4) \text{ and } (y+2 > -x-4)$$

$$[y < x+2 \text{ and } y > -x-6] \text{ and } [x < 8 \text{ and } x > -8]$$

16A



16B



Quarterly Exam #4 - Problem Solving

REMEDICATION & EXTRA PRACTICE - Key

①

8	n	$2n - (n+4) = 2(n+2) - 16$
10	n+2	$2n - n - 4 = 2n + 4 - 16$
→	12	n+4
		$n - 4 = 2n - 12$
		$n = 8$

-9	n	$n - (n+4) = (n+2) + 3$
→	-7	n+2
		$n - n - 4 = n + 2 + 3$
		$-4 = n + 5$
		$n = -9$

②

	<u>now</u>	<u>6 ago</u>
Mark	n+6	n
Ramon	n	n-6

$4(n-6) = 3(n)$
 $4n - 24 = 3n$
 $n = 24$ $n+6 = 30$

30 yrs old

	<u>now</u>	<u>14 ago</u>
Ken	n+10	n-4
Steve	n	n-14

$5(n+10) = 4(n-4)$
 $5n - 70 = 4n - 16$
 $n = 54$ $n+10 = 64$

65 yrs old

next yr = 65

③

5	nickels	n
10	dimes	2n
→	20	quarters
		4n

10 dimes

$5n + 10(2n) + 25(4n) = 625$
 $125n = 625$ $n = 5$

2	nickels	n-2
8	dimes	2n
12	quarters	3n

12 quarters

$5(n-2) + 10(2n) + 25(3n) = 390$
 $5n - 10 + 20n + 75n = 390$
 $100n = 400$ $n = 4$

④

7	n	$n + (n+2)^2 = 88$
9	n+2	$n + (n^2 + 4n + 4) = 88$

$n^2 + 5n - 84 = 0$
 $(n+12)(n-7) = 0$
 -12 7

-7	6	n	$n^2 + (n+1)^2 = 85$
-6	7	n+1	$n^2 + (n^2 + 2n + 1) = 85$

$2n^2 + 2n - 84 = 0$
 $n^2 + n - 42 = 0$
 $(n+7)(n-6) = 0$
 -7 6

⑤

7%	22,800 - n
5%	n

$.05n = 2[.07(22,800 - n)]$
 $.05n = 2(1596 - .07n)$
 $.05n = 3192 - .14n$
 $.19n = 3192$
 $n = 16,800$

\$16,800 invested

\$840 interest

$$8\% \quad 13,300 - n$$

$$4\% \quad n$$

$$.04n = .08(13,300 - n) + 100$$

$$.04n = 1064 - .08n + 100$$

$$.12n = 1164$$

$$n = 9700$$

$$(.04)(9700) =$$

\$9700 invested

\$388 interest

$$\textcircled{6} \quad .5(30) - .0(n) = .6(30 - n)$$

$$15 = 18 - .6n$$

$$-3 = -.6n$$

$$n = 5$$

5l of water

$$.4(20) + 1(n) = .75(20 + n)$$

$$8 + n = 15 + .75n$$

$$.25n = 7$$

$$n = 28$$

28l of salt



$$\textcircled{7} \quad \begin{array}{c} R \cdot T = D \\ \hline \end{array}$$

Denny 6 t 6t

Alan 10 t-1 10t-10

$$6t = 10t - 10$$

$$-4t = -10$$

$$t = 5/2$$

2 1/2 hours

$$\begin{array}{c} R \cdot T = D \\ \hline \end{array}$$

michael 40 t 40t

Jermaine 30 t-1/2 30t-15

$$40t + 30t - 15 = 125$$

$$70t = 140$$

$$t = 2$$

4:00

$$2:00 + 2\text{hrs} = 4:00$$

$$\textcircled{8} \quad \begin{array}{c} R \cdot T = D \\ \hline \end{array}$$

with wind r+w 3 48

against r-w 6 48

$$3r + 3w = 48 \quad \div 3$$

$$6r - 6w = 48 \quad \div 6$$

$$r + w = 16$$

$$r - w = 8$$

$$\hline 2r = 24$$

$$r = 12$$

$$w = 4$$

wind:
4 mph

$$\begin{array}{l} \text{downstream} \quad \frac{R}{r+c} \cdot \frac{T}{3} = \frac{D}{48} \\ \text{upstream} \quad \frac{R}{r-c} \cdot \frac{T}{4} = \frac{D}{48} \end{array}$$

$$\begin{array}{l} 3r+3c = 48 \quad \div 3 \\ 4r-4c = 48 \quad \div 4 \end{array}$$

$$r+c = 16$$

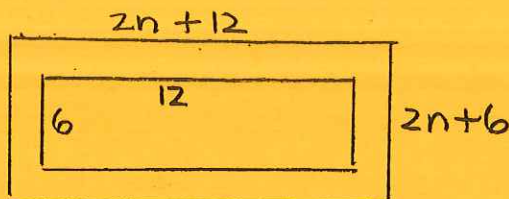
$$r-c = 12$$

$$\frac{2r}{\quad} = 28$$

$$r = 14$$

$$c = 2$$

Current:
2 mph



$$(2n+12)(2n+6) - (6)(12) = 88$$

$$4n^2+36n+72-72=88$$

$$4n^2+36n-88=0$$

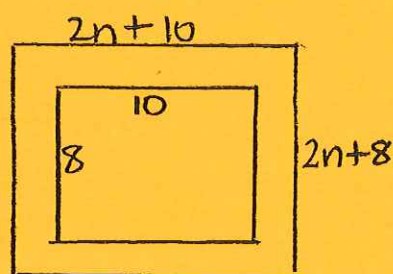
$$n^2+9n-22=0$$

$$(n+11)(n-2)=0$$

$$n = 2$$

2 ft.

9



$$(2n+10)(2n+8) - (8)(10) = 63$$

$$4n^2+36n+80-80=63$$

$$4n^2+36n-63=0$$

$$n = \frac{-36 \pm \sqrt{36^2 - 4(4)(-63)}}{2(4)}$$

$$\frac{-36 \pm 48}{8} = \frac{3}{2}, -\frac{21}{2} \quad \boxed{1\frac{1}{2} \text{ ft}}$$

10

$$\begin{array}{l} \frac{R}{\text{Joan}} \cdot \frac{T}{3} = \frac{W}{3t} \\ \frac{R}{\text{melissa}} \cdot \frac{T}{5} = \frac{W}{5t} \end{array}$$

$$3t+5t=1$$

$$8t=1$$

$$t = \frac{1}{8} \text{ hr}$$

$$60 \div 8 = 7\frac{1}{2}$$

7½ minutes

$$\begin{array}{l} \frac{R}{\text{John}} \cdot \frac{T}{3} = \frac{W}{3/5} \\ \frac{R}{\text{Sarah}} \cdot \frac{T}{r} = \frac{W}{r/5} \end{array}$$

$$\left[\frac{3}{5} + \frac{r}{5} = 1 \right] (5)$$

$$3+r=5$$

$$r=2$$

Sarah's rate is 2 jobs per hour.
Rate is reciprocal of time so it takes her ½ hr. to do one job.

½ hr

