

section 1.3

1.3 1

$$144) -\frac{104}{48} = -\frac{52}{24} = -\frac{26}{12} = \underline{\underline{-\frac{13}{6}}}$$

$$146) \frac{182}{294} = \frac{91}{147} = \underline{\underline{\frac{13}{21}}}$$

$$148) \frac{24a}{32b^2} = \frac{12a}{16b^2} = \frac{6a}{8b^2} = \underline{\underline{\frac{3a}{4b^2}}}$$

$$150) -\frac{30x^2}{105y^2} = -\frac{6x^2}{21y^2} = \underline{\underline{-\frac{2x^2}{7y^2}}}$$

$$152) -\frac{3}{8} \cdot \frac{4}{15} = \frac{-\overset{1}{\cancel{3}}\overset{1}{\cancel{4}}}{\underset{2}{\cancel{8}}\underset{5}{\cancel{15}}} = \underline{\underline{-\frac{1}{10}}}$$

$$154) \left(-\frac{9}{10}\right)\left(\frac{25}{33}\right) = \frac{-\overset{3}{\cancel{9}}\overset{5}{\cancel{25}}}{\underset{2}{\cancel{10}}\underset{11}{\cancel{33}}} = \underline{\underline{-\frac{15}{22}}}$$

$$156) \left(-\frac{33}{60}\right)\left(-\frac{40}{88}\right) = \frac{\overset{3}{\cancel{33}}\overset{4}{\cancel{40}}}{\underset{2}{\cancel{60}}\underset{2}{\cancel{88}}} = \underline{\underline{\frac{1}{4}}}$$

1.3 | 2

$$158) \frac{5}{6} \cdot 30m = \left(\frac{5}{6}\right)\left(\frac{30m}{1}\right) = \frac{(5)(\cancel{30}^5)m}{(\cancel{6}_1)} = \frac{25m}{1} = \underline{\underline{25m}}$$

$$160) \frac{2}{5} \div \frac{y}{9} = \left(\frac{2}{5}\right)\left(\frac{9}{y}\right) = \frac{(2)(9)}{(5)(y)} = \frac{18}{5y}$$

$$162) \frac{7}{18} \div \left(-\frac{14}{27}\right) = \left(\frac{7}{18}\right)\left(\frac{-27}{14}\right) = \frac{(\cancel{7}^1)(\cancel{-27}^{-3})}{(\cancel{18}_2)(\cancel{14}_2)} = \frac{-3}{4}$$

$$164) \frac{12\Omega}{25} \div \frac{18\Omega}{35} = \left(\frac{12\Omega}{25}\right)\left(\frac{35}{18\Omega}\right) = \frac{(\cancel{12}^2)(\cancel{35}^7)\Omega}{(\cancel{25}_5)(\cancel{18}_3)\Omega} = \frac{14\Omega}{15\Omega}$$

$$166) -15 \div \left(-\frac{5}{3}\right) = \left(\frac{-15}{1}\right) \div \left(\frac{-5}{3}\right) = \left(\frac{-15}{1}\right)\left(\frac{-3}{5}\right) = \frac{(\cancel{-15}^3)(3)}{(\cancel{5}_1)} = \frac{9}{1} = \underline{\underline{9}}$$

$$168) \frac{-\frac{9}{16}}{\frac{33}{40}} = \left(\frac{-9}{16}\right) \div \left(\frac{33}{40}\right) = \left(\frac{-9}{16}\right)\left(\frac{40}{33}\right) = \frac{-\cancel{(9)}^3(\cancel{40}^5)}{(\cancel{16}_2)(\cancel{33}_{11})} = \frac{-15}{22}$$

$$170) \frac{\frac{5}{3}}{10} = \frac{\frac{5}{3}}{\frac{10}{1}} = \left(\frac{5}{3}\right) \div \left(\frac{10}{1}\right) = \left(\frac{5}{3}\right)\left(\frac{1}{10}\right) = \frac{(\cancel{5}^1)(1)}{(3)(\cancel{10}_2)} = \frac{1}{6}$$

$$172) \quad \frac{-\frac{3}{8}}{-\frac{y}{12}} = \left(\frac{-3}{8}\right) \div \left(\frac{-y}{12}\right) = \left(\frac{-3}{8}\right) \left(\frac{-12}{y}\right) = \frac{(3)(\cancel{12}^3)}{(\cancel{8}_2)(y)} = \frac{9}{2y}$$

$$174) \quad 12 = (2)^2(3)^1 \quad 8 = (2)^3 \quad LCD = (2)^3(3)^1 = 24$$

$$\frac{5}{12} + \frac{3}{8} = \left(\frac{5}{(2)^2(3)^1}\right) \left(\frac{(2)^1}{(2)^1}\right) + \left(\frac{3}{(2)^3}\right) \left(\frac{(3)^1}{(3)^1}\right) = \frac{5(2) + 3(3)}{(2)^3(3)^1} = \frac{10 + 9}{24} = \frac{19}{24}$$

$$176) \quad 16 = (2)^4 \quad 12 = (2)^2(3)^1 \quad LCD = (2)^4(3)^1 = 48$$

$$\begin{aligned} \frac{7}{16} - \frac{5}{12} &= \left(\frac{7}{(2)^4}\right) \left(\frac{(3)^1}{(3)^1}\right) - \left(\frac{5}{(2)^2(3)^1}\right) \left(\frac{(2)^2}{(2)^2}\right) = \frac{7(3) - 5(4)}{(2)^4(3)^1} \\ &= \frac{21 - 20}{48} = \frac{1}{48} \end{aligned}$$

$$178) \quad 30 = (2)^1(3)^1(5)^1 \quad 48 = (2)^4(3)^1 \quad LCD = (2)^4(3)^1(5)^1 = 240$$

$$\begin{aligned} -\frac{23}{30} + \frac{5}{48} &= \left(\frac{-23}{(2)^1(3)^1(5)^1}\right) \left(\frac{(2)^3}{(2)^3}\right) + \left(\frac{5}{(2)^4(3)^1}\right) \left(\frac{(5)^1}{(5)^1}\right) \\ &= \frac{-23(8) + 5(5)}{(2)^4(3)^1(5)^1} = \frac{-184 + 25}{240} = \frac{-159}{240} \end{aligned}$$

$$180) \quad 49 = (7)^2 \quad 35 = (5)'(7)' \quad LCD = (5)'(7)^2 = 245 \quad 1.3 \quad \underline{4}$$

$$-\frac{33}{49} - \frac{18}{35} = \left(\frac{-33}{(7)^2} \right) \left(\frac{(5)'}{(5)'} \right) - \left(\frac{18}{(5)'(7)'} \right) \left(\frac{(7)'}{(7)'} \right) = \frac{(-33)(5) - (18)(7)}{(5)'(7)^2}$$

$$= \frac{-165 - 126}{245} = \underline{\underline{\frac{291}{245}}}$$

$$182) \quad 4 = (2)^2 \quad 5 = (5)' \quad LCD = (2)^2(5)' = 20$$

$$-\frac{3}{4} - \left(-\frac{4}{5} \right) = \frac{-3}{4} + \frac{4}{5} = \left(\frac{-3}{(2)^2} \right) \left(\frac{(5)'}{(5)'} \right) + \left(\frac{4}{(5)'} \right) \left(\frac{(2)^2}{(2)^2} \right)$$

$$= \frac{(-3)(5) + (4)(4)}{(2)^2(5)'} = \frac{-15 + 16}{20} = \underline{\underline{\frac{1}{20}}}$$

$$184) \quad 5 = (5)' \quad 4 = (2)^2 \quad LCD = (2)^2(5)' = 20$$

$$\frac{x}{5} - \frac{1}{4} = \left(\frac{x}{(5)'} \right) \left(\frac{(2)^2}{(2)^2} \right) - \left(\frac{1}{(2)^2} \right) \left(\frac{(5)'}{(5)'} \right) = \frac{(x)(4) - (1)(5)}{(2)^2(5)'}$$

$$= \underline{\underline{\frac{4x - 5}{20}}}$$

$$186-a) \quad 5 = (5)' \quad 8 = (2)^3 \quad LCD = (2)^3(5)' = 40 \quad | \quad 186-b)$$

$$-\frac{2}{5} - \frac{1}{8} = \left(\frac{-2}{(5)'} \right) \left(\frac{(2)^3}{(2)^3} \right) - \left(\frac{1}{(2)^3} \right) \left(\frac{(5)'}{(5)'} \right) = \frac{(-2)(8) - (1)(5)}{(2)^3(5)'}$$

$$= \frac{-16 - 5}{40} = \underline{\underline{\frac{-21}{40}}}$$

$$-\frac{2}{5} \cdot \frac{1}{8} = \frac{(-2)(1)}{(5)(8)} = \frac{-1}{40}$$

$$188-a) \quad \frac{3a}{8} \div \frac{7}{12} = \left(\frac{3a}{8}\right) \left(\frac{12}{7}\right) = \frac{(3a)(\cancel{12}^3)}{(\cancel{8}_2)(7)} = \frac{9a}{14}$$

$$188-b) \quad 8 = (2)^3 \quad 12 = (2)^2(3)' \quad LCD = (2)^3(3)' = 24$$

$$\frac{3a}{8} - \frac{7}{12} = \left(\frac{3a}{(2)^3}\right) \left(\frac{(3)'}{(3)'}\right) - \left(\frac{7}{(2)^2(3)'}\right) \left(\frac{(2)'}{(2)'}\right) = \frac{(3a)(3) - (7)(2)}{(2)^3(3)'} = \frac{9a-14}{24}$$

$$190-a) \quad 9 = (3)^2 \quad 6 = (2)'(3)' \quad LCD = (2)'(3)^2 = 18$$

$$-\frac{3y}{9} - \frac{5}{6} = \left(\frac{-3y}{(3)^2}\right) \left(\frac{(2)'}{(2)'}\right) - \left(\frac{5}{(2)'(3)'}\right) \left(\frac{(3)'}{(3)'}\right) = \frac{(-3y)(2) - (5)(3)}{(2)'(3)^2} = \frac{-6y-15}{18}$$

$$190-b) \quad -\frac{3y}{8} \cdot \frac{4}{3} = \left(\frac{-3y}{8}\right) \left(\frac{4}{3}\right) = \frac{(\cancel{-3}^1)y(\cancel{4}^1)}{(\cancel{8}_2)(\cancel{3}_1)} = \frac{-y}{2}$$

$$192-a) \quad 5 = (5)' \quad 15 = (3)'(5)' \quad LCD = (3)'(5)' = 15$$

$$\frac{2b}{5} + \frac{8}{15} = \left(\frac{2b}{(5)'}\right) \left(\frac{(3)'}{(3)'}\right) + \left(\frac{8}{(3)'(5)'}\right) = \frac{(2b)(3) + 8}{(3)'(5)'} = \frac{6b+8}{15}$$

$$192-b) \quad \frac{2b}{5} \div \frac{8}{15} = \left(\frac{2b}{5}\right) \left(\frac{15}{8}\right) = \frac{(\cancel{2}^1)b(\cancel{15}^3)}{(\cancel{5}_1)(\cancel{8}_4)} = \frac{3b}{4}$$

$$194) \quad \frac{8 \cdot 9 - 7 \cdot 6}{5 \cdot 6 - 9 \cdot 2} = \frac{72 - 42}{30 - 18} = \frac{30}{12} = \frac{15}{6} = \frac{5}{2}$$

$$196) \frac{6^2 - 4^2}{4 - 6} = \frac{36 - 16}{-2} = \frac{20}{-2} = \underline{\underline{-10}}$$

$$198) \frac{9 \cdot 7 - 3(12 - 8)}{8 \cdot 7 - 6 \cdot 6} = \frac{63 - 3(4)}{56 - 36} = \frac{63 - 12}{20} = \frac{49}{20}$$

$$200) \frac{8(9 - 2) - 4(14 - 9)}{7(8 - 3) - 3(16 - 9)} = \frac{8(7) - 4(5)}{7(5) - 3(7)} = \frac{56 - 20}{35 - 21} = \frac{36}{14} = \frac{18}{7}$$

$$202) \frac{3^3 - 3^2}{\left(\frac{3}{4}\right)^2} = \frac{27 - 9}{\frac{9}{4}} = \frac{18}{\frac{9}{4}} = \frac{18}{1} \cdot \frac{4}{9} = \left(\frac{18}{1}\right)\left(\frac{4}{9}\right) = \frac{8}{1} = \underline{\underline{8}}$$

$$204) \frac{\left(\frac{3}{4}\right)^2}{\left(\frac{5}{8}\right)^2} = \left(\frac{3}{4}\right)^2 \div \left(\frac{5}{8}\right)^2 = \left(\frac{3}{4}\right)^2 \left(\frac{8}{5}\right)^2 = \left(\frac{3}{4}\right)\left(\frac{3}{4}\right)\left(\frac{8}{5}\right)\left(\frac{8}{5}\right) = \frac{36}{25}$$

$$206) \frac{5}{\frac{1}{4} + \frac{1}{3}} = \frac{\frac{5}{1}}{\frac{1}{4} + \frac{1}{3}} = \left(\frac{\frac{5}{1}}{\frac{1}{(2)^2} + \frac{1}{(3)^1}} \right) \left(\frac{\frac{(2)^2(3)^1}{1}}{\frac{(2)^2(3)^1}{1}} \right) \quad \text{GLCD} = (2)^2(3)^1 = 12$$

$$= \frac{5(4)(3)}{1(3) + 1(4)} = \frac{60}{7}$$

$$208) \frac{\frac{3}{4} - \frac{3}{5}}{\frac{1}{4} + \frac{2}{5}} = \left(\frac{\frac{3}{(2)^2} - \frac{3}{(5)^1}}{\frac{1}{(2)^2} + \frac{2}{(5)^1}} \right) \left(\frac{\frac{(2)^2(5)^1}{1}}{\frac{(2)^2(5)^1}{1}} \right) = \frac{3(5) - 3(4)}{1(5) + 2(4)} = \frac{15 - 12}{5 + 8} = \frac{3}{13}$$

$$\text{GLCD} = (2)^2(5)^1 = 20$$

$$210) -\frac{3}{12} \div \left(-\frac{5}{9}\right) = \left(\frac{-3}{12}\right)\left(\frac{-9}{5}\right) = \frac{\cancel{(3)}^1(\cancel{9})^1}{\cancel{(12)}^4(5)} = \frac{9}{20}$$

$$212) \quad 8 = (2)^3 \quad 12 = (2)^2(3)^1 \quad LCD = (2)^3(3)^1 = 24$$

$$-\frac{1}{8} + \frac{7}{12} = \left(\frac{-1}{(2)^3}\right)\left(\frac{(3)^1}{(3)^1}\right) + \left(\frac{7}{(2)^2(3)^1}\right)\left(\frac{(2)^1}{(2)^1}\right) = \frac{-1(3) + 7(2)}{(2)^3(3)^1} = \frac{-3 + 14}{24} = \frac{11}{24}$$

$$214) \quad 8 = (2)^3 \quad 11 = (11)^1 \quad LCD = (2)^3(11)^1 = 88$$

$$-\frac{3}{8} - \frac{x}{11} = \left(\frac{-3}{(2)^3}\right)\left(\frac{(11)^1}{(11)^1}\right) - \left(\frac{x}{(11)^1}\right)\left(\frac{(2)^3}{(2)^3}\right) = \frac{(-3)(11) - x(8)}{(2)^3(11)^1} = \frac{-33 - 8x}{88}$$

$$216) \quad \frac{10y}{13} \cdot \frac{8}{15y} = \frac{\cancel{(10)}^2 \cancel{(8)}^1}{(13)(\cancel{15})^3} = \frac{16}{39}$$

$$218) \quad \frac{1}{3} + \frac{2}{5} + \frac{3}{4} = \frac{1}{3} + \frac{\cancel{(2)}^1(3)}{(5)(\cancel{4})^2} = \frac{1}{3} + \frac{3}{10}$$

$3 = (3)^1 \quad 10 = (2)^1(5)^1$
 $LCD = (2)^1(3)^1(5)^1 = 30$

$$= \left(\frac{1}{(3)^1}\right)\left(\frac{(2)^1(5)^1}{(2)^1(5)^1}\right) + \left(\frac{3}{(2)^1(5)^1}\right)\left(\frac{(3)^1}{(3)^1}\right) = \frac{1(10) + 3(3)}{(2)^1(3)^1(5)^1} = \frac{10 + 9}{30} = \frac{19}{30}$$

$$220) \quad 1 - \frac{5}{6} \div \frac{1}{12} = 1 - \left(\frac{5}{6}\right)\left(\frac{12}{1}\right) = 1 - \frac{(\cancel{5})^2(\cancel{12})^1}{\cancel{(6)}^1(1)} = 1 - \frac{10}{1} = 1 - 10 = \underline{\underline{-9}}$$

$$222) \quad 5 = (5)^1 \quad 8 = (2)^3 \quad 4 = (2)^2 \quad LCD = (2)^3(5)^1 = 40$$

$$\begin{aligned} \frac{2}{5} + \frac{5}{8} - \frac{3}{4} &= \left(\frac{2}{(5)^1}\right)\left(\frac{(2)^3}{(2)^3}\right) + \left(\frac{5}{(2)^3}\right)\left(\frac{(5)^1}{(5)^1}\right) - \left(\frac{3}{(2)^2}\right)\left(\frac{(2)^1(5)^1}{(2)^1(5)^1}\right) = \frac{2(8) + 5(5) - 3(10)}{(2)^3(5)^1} \\ &= \frac{16 + 25 - 30}{40} = \frac{41 - 30}{40} = \underline{\underline{\frac{11}{40}}} \end{aligned}$$

224)

1.3 8

$$8 \left(\frac{15}{16} - \frac{5}{6} \right) = \frac{8}{1} \left(\frac{15}{16} - \frac{5}{6} \right)$$

$$= \left(\frac{8}{1} \right) \left(\frac{15}{16} \right) - \left(\frac{8}{1} \right) \left(\frac{5}{6} \right)$$

$$= \frac{\cancel{8}^1 (15)}{\cancel{16}_2} - \frac{\cancel{8}^4 (5)}{\cancel{6}_3}$$

$$2 = (2)' \quad 3 = (3)'$$

$$LCD = (2)'(3)' = 6$$

$$= \frac{15}{2} - \frac{20}{3}$$

$$= \left(\frac{15}{(2)'} \right) \left(\frac{(3)'}{(3)'} \right) - \left(\frac{20}{(3)'} \right) \left(\frac{(2)'}{(2)'} \right) = \frac{15(3) - 20(2)}{(2)'(3)'} = \frac{45 - 40}{6} = \frac{5}{6}$$

226)

$$6 = (2)'(3)'$$

$$10 = (2)'(5)'$$

$$30 = (2)'(3)'(5)'$$

$$GLCD = (2)'(3)'(5)' = 30$$

$$\frac{\frac{1}{6} + \frac{3}{10}}{\frac{14}{30}} = \left(\frac{\frac{1}{(2)'(3)'} + \frac{3}{(2)'(5)'}}{\frac{14}{(2)'(3)'(5)'}} \right) \left(\frac{\frac{(2)'(3)'(5)'}{1}}{\frac{(2)'(3)'(5)'}{1}} \right) = \frac{1(5) + 3(3)}{14}$$

$$= \frac{5+9}{14} = \frac{14}{14} = 1$$

228)

$$\left(\frac{3}{4} + \frac{1}{6} \right) \div \left(\frac{5}{8} - \frac{1}{3} \right) = \frac{\frac{3}{4} + \frac{1}{6}}{\frac{5}{8} - \frac{1}{3}} = \left(\frac{\frac{3}{(2)^2} + \frac{1}{(2)'(3)'}}{\frac{5}{(2)^3} - \frac{1}{(3)'}} \right) \left(\frac{\frac{(2)^3(3)'}{1}}{\frac{(2)^3(3)'}{1}} \right)$$

$$4 = (2)^2$$

$$6 = (2)'(3)'$$

$$8 = (2)^3$$

$$3 = (3)'$$

$$GLCD = (2)^3(3)' = 24$$

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

$$= \frac{18+4}{15-8} = \frac{22}{7}$$

$$230) \frac{5}{12} - w$$

$$a) w = \frac{1}{4} : \frac{5}{12} - \left(\frac{1}{4}\right) = \frac{5}{(2)^2(3)^1} - \left(\frac{1}{(2)^2}\right) \left(\frac{(3)^1}{(3)^1}\right) = \frac{5-1(3)}{(2)^2(3)^1}$$

$$12 = (2)^2(3)^1$$

$$4 = (2)^2$$

$$LCD = (2)^2(3)^1 = 12$$

$$= \frac{5-3}{12} = \frac{2}{12} = \underline{\underline{\frac{1}{6}}}$$

$$b) w = -\frac{1}{4} : \frac{5}{12} - \left(-\frac{1}{4}\right) = \frac{5}{12} + \frac{1}{4} = \frac{5}{(2)^2(3)^1} + \left(\frac{1}{(2)^2}\right) \left(\frac{(3)^1}{(3)^1}\right) = \frac{5+1(3)}{(2)^2(3)^1}$$

$$= \frac{5+3}{12} = \frac{8}{12} = \underline{\underline{\frac{2}{3}}}$$

$$232) u = \frac{-3}{4}, v = \frac{-1}{2}$$

$$8u^2v^3 = 8\left(\frac{-3}{4}\right)^2\left(\frac{-1}{2}\right)^3 = 8\left(\frac{-3}{4}\right)\left(\frac{-3}{4}\right)\left(\frac{-1}{2}\right)\left(\frac{-1}{2}\right)\left(\frac{-1}{2}\right)$$

$$= 8\left(\frac{9}{16}\right)\left(\frac{-1}{8}\right) = \frac{\cancel{8}(9)(-1)}{(16)(\cancel{8})} = \underline{\underline{\frac{-9}{16}}}$$

$$234) n=10, A=-5$$

$$\frac{n-A}{n+A} = \frac{(10)-(-5)}{(10)+(-5)} = \frac{10+5}{5} = \frac{15}{5} = \underline{\underline{3}}$$