

9.9

$$1) \frac{xy}{y} = \frac{72}{y} \quad x = \frac{72}{y}$$

$$\frac{(x+2)(y-4)}{y-4} = \frac{128}{y-4}$$

$$x + 2 = \frac{128}{y-4}$$

$$y(y-4) \frac{72}{y} + 2y(y-4) = \frac{128}{y-4} y(y-4)$$

$$LCD: y(y-4)$$

$$72(y-4) + 2y(y-4) = 128y$$

$$72y - 288 + 2y^2 - 8y = 128y$$

$$2y^2 + 64y - 288 = 128y$$

$$\frac{-128y}{-128y} \quad \frac{-128y}{-128y}$$

$$\frac{2y^2}{2} - \frac{64y}{2} - \frac{288}{2} = 0$$

$$y^2 - 32y - 144 = 0$$

$$\frac{+144}{+144} \quad \frac{+144}{+144}$$

$$y^2 - 32y \quad = 144$$

$$\left(32 \cdot \frac{1}{2}\right)^2 = 16^2 = 256$$

$$y^2 - 32y + 256 = 144 + 256$$

$$\sqrt{(y-16)^2} = \sqrt{400}$$

$$y - 16 = \pm 20$$

$$\frac{+16}{+16} \quad \frac{+16}{+16}$$

$$y = 36, -4$$

$$x = \frac{72}{36} = 2 \quad x = \frac{72}{-4} = -18$$

$$(2, 36), (48, -4)$$

$$3) \frac{xy}{y} = \frac{150}{y} \quad x = \frac{150}{y}$$

$$\frac{(x-6)(y+1)}{y+1} = \frac{64}{y+1}$$

$$x - 6 = \frac{64}{y+1}$$

$$\frac{150y}{y} (y(y+1)) - 6(y(y+1)) = \frac{64}{y+1} (y(y+1))$$

$$LCD: (y(y+1))$$

$$150(y+1) - 6y(y+1) = 64y$$

$$150y + 150 - 6y^2 + 6y = 64y$$

$$-6y^2 + 156y + 150 = 64y$$

$$+6y^2 - 156y - 150 \quad +6y^2 - 156y - 150$$

$$\frac{0}{2} = \frac{6y^2}{2} - \frac{80y}{2} - \frac{150}{2}$$

$$0 = 3y^2 - 40y - 75$$

$$0 = (3y+5)(y-15)$$

$$3y+5=0 \quad y-15=0$$

$$\frac{-5}{-5} \quad \frac{+15}{+15}$$

$$\frac{3y}{3} = \frac{-5}{-3} \quad y = 15$$

$$y = -\frac{5}{3} \quad x = \frac{150}{15} = 10$$

$$x = \frac{150}{-\frac{5}{3}} = 150 \left(-\frac{3}{5}\right) = -90$$

$$\left(-90, -\frac{5}{3}\right), (10, 15)$$

$$\begin{aligned}
 5) \quad \frac{xy}{y} &= \frac{45}{y} & x &= \frac{45}{y} \\
 \frac{(x+2)(y+1)}{y+1} &= \frac{70}{y+1} \\
 x+2 &= \frac{70}{y+1} \\
 \frac{45}{y}(y(y+1)) + 2(y(y+1)) &= \frac{70}{y+1}(y(y+1)) \\
 LCD: (y(y+1)) \\
 45(y+1) + 2y(y+1) &= 70y \\
 45y + 45 + 2y^2 + 2y &= 70y \\
 2y^2 + 47y + 2y &= 70y \\
 \underline{-70y} \quad \underline{-70y} \\
 2y^2 - 23y + 45 &= 0 \\
 (2y-5)(y-9) &= 0 \\
 2y-5=0 & \quad y-9=0 \\
 \underline{+5} \quad \underline{+5} \quad \underline{+9} \quad \underline{+9} \\
 \frac{2y}{2} = \frac{5}{2} & \quad y=9 \\
 y = \frac{5}{2} & \quad x = \frac{45}{9} = 5 \\
 x = \frac{45}{\frac{5}{2}} = 45 \cdot \frac{2}{5} &= 18 \\
 (18, \frac{5}{2}), (5, 9)
 \end{aligned}$$

$$\begin{aligned}
 7) \quad \frac{xy}{y} &= \frac{90}{y} & x &= \frac{90}{y} \\
 \frac{(x-5)(y+1)}{y+1} &= \frac{120}{y+1} \\
 x-5 &= \frac{120}{y+1} \\
 \frac{90}{y}(y(y+1)) - 5(y(y+1)) &= \frac{120}{y+1}(y(y+1)) \\
 LCD: (y(y+1)) \\
 90(y+1) - 5y(y+1) &= 120y \\
 90y + 90 - 5y^2 - 5y &= 120y \\
 -5y^2 + 85y + 90 &= 120y \\
 \underline{+5y^2 - 85y - 90} \quad \underline{+5y^2 - 85y - 90} \\
 0 &= \frac{5y^2}{5} + \frac{35y}{5} - \frac{90}{5} \\
 0 &= y^2 + 7y - 18 \\
 0 &= (y+9)(y-2) \\
 y+9=0 & \quad y-2=0 \\
 \underline{-9} \quad \underline{-9} \quad \underline{+2} \quad \underline{+2} \\
 y &= -9 \quad y=2 \\
 x = \frac{90}{-9} &= -10 \quad x = \frac{90}{2} = 45
 \end{aligned}$$

$$\begin{aligned}
 9) \quad \frac{xy}{y} &= \frac{12}{y} & x &= \frac{12}{y} \\
 \frac{(x+1)(y-4)}{y-4} &= \frac{16}{y-4} \\
 x+1 &= \frac{16}{y-4} \\
 \frac{12}{y}(y(y-4)) + 1(y(y-4)) &= \frac{16}{y-4}(y(y-4)) \\
 LCD: (y(y-4)) \\
 12(y-4) + (y(y-4)) &= 16y \\
 12y - 48 + y^2 - 4y &= 16y \\
 y^2 + 8y - 48 &= 16y \\
 \underline{-16y} \quad \underline{-16y} \\
 y^2 - 8y - 48 &= 0 \\
 (y-12)(y+4) &= 0 \\
 y-12=0 & \quad y+4=0 \\
 \underline{+12} \quad \underline{+12} \quad \underline{-4} \quad \underline{-4} \\
 y &= 12 \quad y = -4 \\
 x = \frac{12}{12} &= 1 \quad x = \frac{12}{-4} = -3 \\
 (1, 12), (-3, -4)
 \end{aligned}$$

$$\begin{aligned}
 11) \quad \frac{xy}{y} &= \frac{45}{y} & x &= \frac{45}{y} \\
 \frac{(x-5)(y+3)}{y+3} &= \frac{160}{y+3} \\
 x-5 &= \frac{160}{y+3} \\
 \frac{45}{y}(y(y+3)) - 5(y(y+3)) &= \frac{160}{y+3}(y(y+3)) \\
 45(y+3) - 5y(y+3) &= 160y \\
 45y + 135 - 5y^2 - 15y &= 160y \\
 -5y^2 + 30y + 135 &= 160y \\
 \underline{+5y^2 - 30y - 135} \quad \underline{+5y^2 - 30y - 135} \\
 0 &= \frac{5y^2}{5} + \frac{130y}{5} - \frac{135}{5} \\
 0 &= y^2 + 26y - 27 \\
 0 &= (y+27)(y-1) \\
 y+27=0 & \quad y-1=0 \\
 \underline{-27} \quad \underline{-27} \quad \underline{+1} \quad \underline{+1} \\
 y &= -27 \quad y=1 \\
 x = \frac{45}{-27} &= -\frac{5}{3} \quad x = \frac{45}{1} \\
 (-\frac{5}{3}, -27), (45, 1)
 \end{aligned}$$