

Grade 9: Exercise 9.1 Pg. 77

(No. 1a, 2abc, 3, 4ac, 5bcd)

$$\begin{aligned} 1a) \quad x \div 12 &= 72 \quad \times 12 \\ x &= 72 \times 12 \\ x &= 864 \end{aligned}$$

$$\begin{aligned} 2a) \quad x + 7 &= 15 \quad -7 \\ x &= 15 - 7 \\ x &= 8 \end{aligned}$$

$$\begin{aligned} 2b) \quad m - 2 &= 17 \quad +2 \\ m &= 17 + 2 \\ m &= 19 \end{aligned}$$

$$\begin{aligned} 2c) \quad 5y &= 3y + 12 \quad -3y \\ 5y - 3y &= 12 \\ \frac{2y}{2} &= \frac{12}{2} \\ y &= 6 \end{aligned}$$

$$\begin{aligned} 3a) \quad \frac{x}{2} &= 25 \quad \times 2 \\ x &= 25 \times 2 \\ x &= 50 \end{aligned}$$

$$\begin{aligned} 3b) \quad \frac{x}{-3} &= 12 \quad \times -3 \\ x &= 12 \times -3 \\ x &= -36 \end{aligned}$$

$$\begin{aligned} 3c) \quad \frac{x}{7} + 2 &= -5 \quad -2 \\ \frac{x}{7} &= -5 - 2 \\ \frac{x}{7} &= -7 \quad \times 7 \\ x &= -7 \times 7 \\ x &= -49 \end{aligned}$$

$$\begin{aligned} 3d) \quad \frac{x-6}{2} &= -1 \quad \times 2 \\ x-6 &= -1 \times 2 \\ x-6 &= -2 \quad +6 \\ x &= -2 + 6 \\ x &= 4 \end{aligned}$$

$$3e) \frac{2x-3}{2 \times 2} - \frac{3x+1}{4 \times 1} = \frac{1}{1 \times 4} \quad \text{LCD: } 4$$

$$\frac{2(2x-3)}{4} - \frac{1(3x+1)}{4} = \frac{4(1)}{4} \quad \text{DROP LCD}$$

$$4x - 6 - 3x - 1 = 4$$

$$4x - 3x = 4 + 6 + 1$$

$$x = 11 \rightarrow$$

$$3f) \frac{2(x-1)}{3} - \frac{3}{4} = \frac{3(2x+3)}{2} - \frac{3}{1}$$

$$\frac{2x-2}{3 \times 4} - \frac{3}{4 \times 3} = \frac{6x+9}{2 \times 6} - \frac{3}{1 \times 12} \quad \text{LCD} = 12$$

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

$$8x - 8 - 9 = 36x + 54 - 36$$

$$8x - 36x = 54 - 36 + 8 + 9$$

$$\frac{-28x}{-28} = \frac{35}{-28}$$

$$x = -\frac{5}{4} \rightarrow$$



$$4a) \quad 3(x-2) = 2(x-4)$$

$$3x - 6 = 2x - 8$$

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

$$x = -2$$

$$4c) \quad 6 - 2(x-1) = 4x - 16$$

$$6 - 2x + 2 = 4x - 16$$

$$6 + 2 + 16 = 4x + 2x$$

$$\frac{24}{6} = \frac{6x}{6}$$

$$x = 4$$

$$5b) \quad \frac{x}{6} + \frac{x}{1} + \frac{2}{1} = \frac{x}{1} + \frac{5}{2} \quad \text{LCD} = 6$$

$$\frac{x}{6} + \frac{6x}{6} + \frac{12}{6} = \frac{6x}{6} + \frac{15}{6}$$

$$x + 6x + 12 = 6x + 15 \quad (\text{DROP LCD})$$

$$x + 6x - 6x = 15 - 12 \quad (\text{LIKE TERMS})$$

$$x = 3$$

$$c) \quad \frac{x+3}{4} - \frac{x}{2} = \frac{x+2}{8} - \frac{1}{1} \quad \text{LCD} = 8$$

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

$$2x + 6 - 4x = x + 2 - 8$$

$$2x - 4x - x = 2 - 8 - 6$$

$$\frac{-3x}{-3} = \frac{-12}{-3}$$

$$x = 4$$

$$5d) \frac{3 \times (3x-5)}{4 \times 1} - \frac{9}{4} = \frac{1 \times (2x+4)}{2 \times 1}$$

$$\frac{9x-15}{4} - \frac{9}{4} = \frac{2x+4}{2} \quad \text{LCD} = 4$$

$$\frac{9x-15}{4} - \frac{9}{4} = \frac{4x+8}{4}$$

$$9x-15-9=4x+8$$

$$9x-4x=8+15+9$$

$$\frac{5x}{5} = \frac{32}{5}$$

$$x = \frac{32}{5}$$



Grade 9: Ex. 9.2 Pg. 78  
(No. 1, 2, 5)

1a)  $2^{x+1} = 16$  change to base of 2  
 $2^{x+1} = 2^4$   
 $x+1 = 4$  (DROP BASES)  
 $x = 4-1$   
 $x = 3$

1b)  $3^x = \frac{1}{27}$  change Base  
 $3^x = \frac{1}{3^3}$   
 $3^x = 3^{-3}$  DROP BASES  
 $x = -3$

1c)  $2^{-x} = 32$   
 $2^{-x} = 2^5$   
 $-x = 5$   
 $x = -5$

d)  $8^x = 16$  change Bases  
 $2^{3x} = 2^4$   $8 = 2^3$   $16 = 2^4$   
 $\frac{3x}{3} = \frac{4}{3}$   
 $x = \frac{4}{3}$

e)  $5^{2x-1} = 0,008$  change decimal to fraction  
 $5^{2x-1} = \frac{8}{1000}$

$5^{2x-1} = \frac{1}{125}$

$5^{2x-1} = \frac{1}{5^3}$  Exponent becomes negative

$5^{2x-1} = 5^{-3}$

$5^{2x-1} = 5^{-3}$  Drop bases of 5  
 $2x-1 = -3$   
 $2x = -3+1$   
 $2x = -2$   
 $x = -1$

1f)  $10^x = 0,0001$  Change Decimal to fraction

$$10^x = \frac{1}{10000}$$

$$10^x = \frac{1}{10^4} \quad \leftarrow \text{Move base over fraction line (Exponent becomes negative)}$$

$$10^x = 10^{-4} \quad \text{Drop bases}$$

$$x = -4 \rightarrow$$

2a)

$$x^{\frac{3}{4}} = 8$$

$$x^{\frac{3}{4}} = 2^3$$

$$\left(x^{\frac{3}{4}}\right)^{\frac{4}{3}} = \left(2^3\right)^{\frac{4}{3}} \quad \text{Multiply Exponents}$$

$$x^{\frac{12}{12}} = 2^{\frac{12}{3}}$$

$$x^1 = 2^4$$

$$x = 16 \rightarrow$$

2b)

$$2x^{-\frac{2}{3}} = 32 \quad (\text{Same as in slides})$$

$$x^{-\frac{2}{3}} = 16$$

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

$$x^{\frac{6}{6}} = 2^{-\frac{12}{2}}$$

$$x = \frac{2^{-6}}{1} \rightarrow$$

$$x = \frac{1}{2^6}$$

$$x = \frac{1}{64} \rightarrow$$



$$2c) \frac{1}{3} x^5 = 81 \times 3$$

$$x^5 = 243$$
$$\sqrt[5]{x^5} = \sqrt[5]{243}$$

$$x = 3$$

$$d) 2x^3 - 4 = 246 \xrightarrow{+4}$$

$$2x^3 = 246 + 4$$

$$\frac{2x^3}{2} = \frac{250}{2}$$

$$x^3 = 125$$

$$\sqrt[3]{x^3} = \sqrt[3]{125}$$

$$x = 5$$

$$5) \frac{a^1 \times a^3}{\sqrt{a^2}} = a^x$$

→ Square root cancels square.

$$\frac{a^4}{a^1} = a^x$$

$$a^3 = a^x \quad \text{DROP BASES}$$

$$3 = x$$

Grade 9: Rev Ex. Pg. 81  
(No 1, 2, 3, 4, 5)

$$1) \quad x + 4x = 35$$

$$\frac{5x}{5} = \frac{35}{5}$$

$$x = 7$$

$$2a) \quad 6a + 2 = 74$$

$$6a = 74 - 2$$

$$\frac{6a}{6} = \frac{72}{6}$$

$$a = 12$$

$$2b) \quad 9n - 3 = -66$$

$$9n = -66 + 3$$

$$\frac{9n}{9} = \frac{-63}{9}$$

$$n = -7$$

$$2c) \quad \frac{b}{4} = 5$$

$$b = 5 \times 4$$

$$b = 20$$

$$2d) \quad \frac{2x - 1}{3} = -5$$

$$2x - 1 = -5 \times 3$$

$$2x - 1 = -15$$

$$2x = -15 + 1$$

$$\frac{2x}{2} = \frac{-14}{2}$$

$$x = -7$$

$$2e) \quad \frac{y+1}{2 \times 5} = \frac{2y+1}{5 \times 2} - \frac{1}{1 \times 10}$$

LCD = 10

$$\frac{5(y+1)}{10} = \frac{2(2y+1)}{10} - \frac{10}{10}$$

$$5y + 5 = 4y + 2 - 10$$

$$5y - 4y = 2 - 10 - 5$$

$$y = -13$$

$$3a) \quad 5(x - 2) = 3x - 4$$

$$5x - 10 = 3x - 4$$

$$5x - 3x = -4 + 10$$

$$2x = 6$$

$$x = 3$$

$$3b) \quad 3(2x - 7) = 2(x - 3)$$

$$6x - 21 = 2x - 6$$

$$6x - 2x = -6 + 21$$

$$\frac{4x}{4} = \frac{15}{4}$$

$$x = \frac{15}{4}$$



$$\begin{aligned}
 3c) \quad & 4(2x-1) = 2(2x+3) + 2 \\
 & 8x - 4 = 4x + 6 + 2 \\
 & 8x - 4x = 6 + 2 + 4 \\
 & \frac{4x}{4} = \frac{12}{4} \\
 & \underline{x = 3} \rightarrow
 \end{aligned}$$

$$\begin{aligned}
 4a) \quad & 3^{x-1} = \underline{81} \\
 & 3^{x-1} = 3^4 \\
 & x-1 = 4 \\
 & x = 4+1 \\
 & \underline{x = 5} \rightarrow
 \end{aligned}$$

$$\begin{aligned}
 4b) \quad & \underline{4^{-x}} = \underline{32} \\
 & 2^{2(-x)} = 2^5 \\
 & 2^{-2x} = 2^5 \\
 & \frac{-2x}{-2} = \frac{5}{-2} \\
 & x = \frac{5}{-2} \\
 & \underline{\hspace{1.5cm}} \rightarrow
 \end{aligned}$$

$$\begin{aligned}
 4c) \quad & 2^x = 0,125 \\
 & 2^x = \frac{125}{1000} \\
 & 2^x = \frac{1}{8} \\
 & 2^x = \frac{1}{2^3} \\
 & 2^x = 2^{-3} \\
 & \underline{x = -3} \rightarrow
 \end{aligned}$$

$$\begin{aligned}
 5) \quad & x^2 \times x^3 = 243 \\
 & x^5 = 243 \\
 & \sqrt[5]{x^5} = \sqrt[5]{243} \\
 & \underline{x = 3} \rightarrow
 \end{aligned}$$