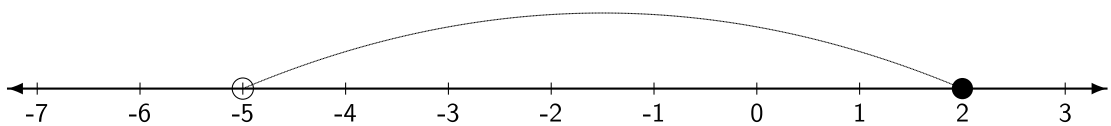
Math 1040 Basic Mathematics **Practice Problems 2 SOLUTIONS**

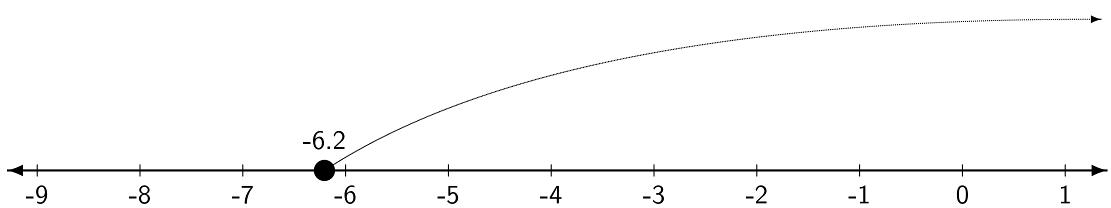
1. (**1**) $\sqrt{60} = \sqrt{2 \times 30} = \sqrt{2 \times 2 \times 15} = \sqrt{2 \times 2 \times 3 \times 5}$.
Then $\sqrt{60} = 2 \times \sqrt{3 \times 5}$.
Hence the solution is $2\sqrt{15}$

(**2**) $\sqrt{245} = y\sqrt{5}$. Now $\sqrt{245} = \sqrt{49 \times 5} = \sqrt{7 \times 7 \times 5} = 7\sqrt{5}$. Hence $y = 7$

(**3**) In interval form the answer is $(-5, 2]$ and on a real line the answer is:



(**4**) In inequality form the answer is $x \geq -6.2$ and on a real line the answer is:



(**5**) $\sqrt{8y} = 12\sqrt{3}$, so $\sqrt{8y} = \sqrt{12 \times 12 \times 3} = \sqrt{432}$, so $8y = 432$. Hence $y = 54$

(**6**) $3 = -3y$, so $\dfrac{3}{-3} = \dfrac{-3y}{-3}$

Hence $y = -1$

(**7**) $6z + 5 = 1$, so $6z = 1 - 5$, so $6z = -4$, so $\dfrac{6z}{6} = \dfrac{-4}{6}$

Hence $z = -\dfrac{2}{3}$

(**8**) $(-7 - 3y)(-3y) = -7 \times (-3y) - 3y \times (-3y) = 21y + 9y^2$

(**9**) $|-3y - 2| = 2$, so

$-3y - 2 = 2$	*or*	$-3y - 2 = -2$
$-3y = 2 + 2$		$-3y = -2 + 2$
$-3y = 4$		$-3y = 0$
$\dfrac{-3y}{-3} = \dfrac{4}{-3}$		$y = 0$

Hence the solutions are: $y = -\dfrac{4}{3}$ and $y = 0$

(10)

$$\left(\sqrt{9}+\sqrt{3}\right)\left(\sqrt{8}+\sqrt{9}\right) = \sqrt{9}\times\sqrt{8}+\sqrt{9}\times\sqrt{9}+\sqrt{3}\times\sqrt{8}+\sqrt{3}\times\sqrt{9}$$
$$= \sqrt{9\times 8}+\sqrt{9\times 9}+\sqrt{3\times 8}+\sqrt{3\times 9}$$
$$= \sqrt{72}+9+\sqrt{24}+\sqrt{27}$$
$$= 6\sqrt{2}+9+2\sqrt{6}+3\sqrt{3}$$
$$= 9+6\sqrt{2}+3\sqrt{3}+2\sqrt{6}$$

(11) Substituting for z into the equation gives $5 = 3y+5$, so $3y = 5-5$, so $3y = 0$

Hence $y = 0$

(12)

$$\left(\sqrt{3}+\sqrt{6}\right)\sqrt{5} = \sqrt{5}\times\sqrt{3}+\sqrt{5}\times\sqrt{6}$$
$$= \sqrt{5\times 3}+\sqrt{5\times 6}$$
$$= \sqrt{15}+\sqrt{30}$$

(13) $(3-3z)(6+z) = 3\times 6+3\times z-3z\times 6-3z\times z = 18+3z-18z-3z^2 = -3z^2-15z+18$

(14) $-5 = \dfrac{2y}{-4}+5$, so $\dfrac{-y}{2} = -5-5$, so $\dfrac{-y}{2} = -10$, so $-y = -10\times 2$, so $-y = -20$

Hence solution is: $y = 20$

(15) $\dfrac{-3}{2x}+4 = 5$, so $\dfrac{-3}{2x} = -4+5$, so $\dfrac{-3}{2x} = 1$, so $-3 = 2x$, so $x = \dfrac{-3}{2}$

Hence solution is: $x = -\dfrac{3}{2}$

(16)

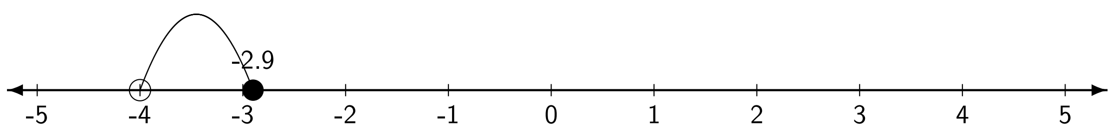
$$\frac{-4}{10}+\frac{-13}{10} = \frac{-4-13}{10}$$
$$= \frac{-17}{10}$$
$$= -\frac{17}{10}$$
$$= -1\frac{7}{10}$$

Hence solution is: $x{=}-1\dfrac{7}{10}$

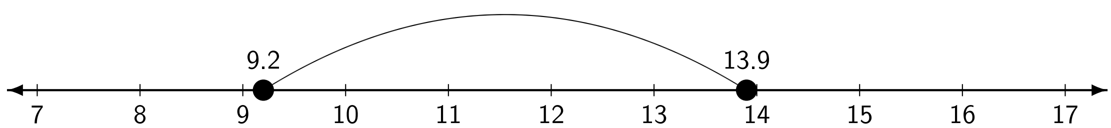
2. **(1)** $\sqrt{420} = \sqrt{2\times 210} = \sqrt{2\times 2\times 105} = \sqrt{2\times 2\times 3\times 35}$
$= \sqrt{2\times 2\times 3\times 5\times 7}$.
Then $\sqrt{420} = 2\times\sqrt{3\times 5\times 7}$.
Hence the solution is $2\sqrt{105}$

(2) $\sqrt{12} = x\sqrt{3}$. Now $\sqrt{12} = \sqrt{4\times 3} = \sqrt{2\times 2\times 3} = 2\sqrt{3}$. Hence $x = 2$

(**3**) In interval form the answer is $(-4, -2.9]$ and on a real line the answer is:



(**4**) In inequality form the answer is $9.2 \le x \le 13.9$ and on a real line the answer is:



(**5**) $\sqrt{80x} = 10\sqrt{4}$, so $\sqrt{80x} = \sqrt{10 \times 10 \times 4} = \sqrt{400}$, so $80x = 400$. Hence $x = 5$

(**6**) $6 = -2x - 5$, so $6 + 5 = -2x$, so $11 = -2x$, so $\dfrac{11}{-2} = \dfrac{-2x}{-2}$

Hence $x = -\dfrac{11}{2}$

(**7**) $3y = 4$, so $\dfrac{3y}{3} = \dfrac{4}{3}$

Hence $y = \dfrac{4}{3}$

(**8**) $-4z\,(-7 + 5z) = -7 \times (-4z) + 5z \times (-4z) = 28z - 20z^2$

(**9**) $|5y + 3| = 4$, so

$$\begin{aligned} 5y + 3 &= 4 \\ 5y &= 4 - 3 \\ 5y &= 1 \\ \frac{5y}{5} &= \frac{1}{5} \end{aligned} \qquad \textit{or} \qquad \begin{aligned} 5y + 3 &= -4 \\ 5y &= -4 - 3 \\ 5y &= -7 \\ \frac{5y}{5} &= \frac{-7}{5} \end{aligned}$$

Hence the solutions are: $y = \dfrac{1}{5}$ and $y = -\dfrac{7}{5}$

(**10**)

$$\begin{aligned} \left(\sqrt{6} + \sqrt{6}\right)\left(\sqrt{6} - \sqrt{6}\right) &= \left(\sqrt{6} + \sqrt{6}\right) \times 0 \\ &= 0 \end{aligned}$$

(**11**) Substituting for y into the equation gives $2 = -5z - 6$, so $-5z = 2 + 6$, so $-5z = 8$, so $\dfrac{-5z}{-5} = \dfrac{8}{-5}$

Hence $z = -\dfrac{8}{5}$

(**12**)

$$\begin{aligned}\sqrt{7}\left(\sqrt{2}+\sqrt{3}\right) &= \sqrt{7}\times\sqrt{2}+\sqrt{7}\times\sqrt{3}\\ &= \sqrt{7\times 2}+\sqrt{7\times 3}\\ &= \sqrt{14}+\sqrt{21}\end{aligned}$$

(**13**) $(1-6y)(3+5y) = 1\times 3 + 1\times 5y - 6y\times 3 - 6y\times 5y = 3+5y-18y-30y^2 = -30y^2-13y+3$

(**14**) $\frac{5y}{-2}+5=6$, so $\frac{-5y}{2}=6-5$, so $\frac{-5y}{2}=1$, so $-5y=1\times 2$, so $-5y=2$, so $\frac{-5y}{-5}=\frac{2}{-5}$

Hence solution is: $y=-\frac{2}{5}$

(**15**) $\frac{-6}{-4x}-4=-5$, so $\frac{3}{2x}=4-5$, so $\frac{3}{2x}=-1$, so $3=-1\times 2x$, so $3=-2x$, so $x=\frac{3}{-2}$

Hence solution is: $x=-\frac{3}{2}$

(**16**)

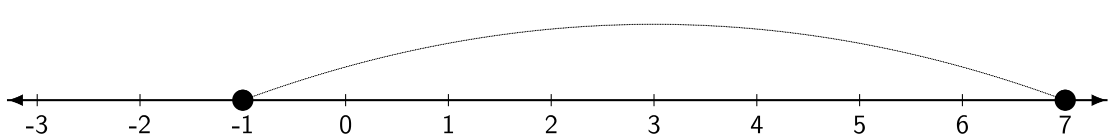
$$\begin{aligned}\frac{7}{13}+\frac{-5}{-10} &= \frac{7\times 10}{13\times 10}+\frac{5\times 13}{10\times 13}\\ &= \frac{70+65}{130}\\ &= \frac{135}{130}\\ &= \frac{\cancel{5}\times 27}{\cancel{5}\times 26}\\ &= \frac{27}{26}\\ &= 1\frac{1}{26}\end{aligned}$$

Hence solution is: $y{=}1\frac{1}{26}$

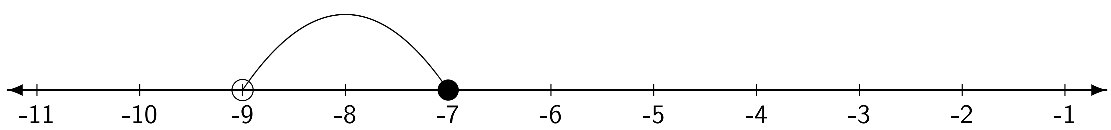
3. (**1**) $\sqrt{245}=\sqrt{5\times 49}=\sqrt{5\times 7\times 7}$.
Then $\sqrt{245}=7\times\sqrt{5}$.
Hence the solution is $7\sqrt{5}$

(**2**) $\sqrt{50}=y\sqrt{2}$. Now $\sqrt{50}=\sqrt{25\times 2}=\sqrt{5\times 5\times 2}=5\sqrt{2}$. Hence $y=5$

(**3**) In interval form the answer is $[-1,7]$ and on a real line the answer is:



(**4**) In inequality form the answer is $-9 < x \leq -7$ and on a real line the answer is:



(**5**) $\sqrt{192x} = 8\sqrt{15}$, so $\sqrt{192x} = \sqrt{8 \times 8 \times 15} = \sqrt{960}$, so $192x = 960$. Hence $x = 5$

(**6**) $6 = 6x$, so $\dfrac{6}{6} = \dfrac{6x}{6}$

Hence $x = 1$

(**7**) $4x + 5 = 6$, so $4x = 6 - 5$, so $4x = 1$, so $\dfrac{4x}{4} = \dfrac{1}{4}$

Hence $x = \dfrac{1}{4}$

(**8**) $3y\,(2 - 2y) = 2 \times 3y - 2y \times 3y = 6y - 6y^2$

(**9**) $|-5x - 1| = 0$, so

$$
\begin{aligned}
-5x - 1 &= 0 \\
-5x &= 1 \\
\frac{-5x}{-5} &= \frac{1}{-5}
\end{aligned}
$$

Hence the solution is: $x = -\dfrac{1}{5}$

(**10**)

$$
\begin{aligned}
\left(\sqrt{4} - \sqrt{8}\right)\left(\sqrt{6} - \sqrt{4}\right) &= \sqrt{4} \times \sqrt{6} - \sqrt{4} \times \sqrt{4} - \sqrt{8} \times \sqrt{6} + \sqrt{8} \times \sqrt{4} \\
&= \sqrt{4 \times 6} - \sqrt{4 \times 4} - \sqrt{8 \times 6} + \sqrt{8 \times 4} \\
&= \sqrt{24} - 4 - \sqrt{48} + \sqrt{32} \\
&= 2\sqrt{6} - 4 - 4\sqrt{3} + 4\sqrt{2} \\
&= -4 + 4\sqrt{2} - 4\sqrt{3} + 2\sqrt{6}
\end{aligned}
$$

(**11**) Substituting for z into the equation gives $3 = 2y - 2$, so $2y = 3 + 2$, so $2y = 5$, so $\dfrac{2y}{2} = \dfrac{5}{2}$

Hence $y = \dfrac{5}{2}$

(**12**)

$$
\begin{aligned}
\left(\sqrt{2} - \sqrt{2}\right)\sqrt{7} &= 0 \times \sqrt{7} \\
&= 0
\end{aligned}
$$

(**13**) $(4z - 7)\,(-4z - 3) = 4z \times (-4z) + 4z \times (-3) - 7 \times (-4z) - 7 \times (-3) = -16z^2 - 12z + 28z + 21 = -16z^2 + 16z + 21$

(**14**) $\dfrac{5z}{-2} + 6 = 4$, so $\dfrac{-5z}{2} = 4 - 6$, so $\dfrac{-5z}{2} = -2$, so $-5z = -2 \times 2$, so $-5z = -4$, so $\dfrac{-5z}{-5} = \dfrac{-4}{-5}$

Hence solution is: $z = \dfrac{4}{5}$

(**15**) $-3+\dfrac{-2}{-4y}=-4$, so $\dfrac{1}{2y}=3-4$, so $\dfrac{1}{2y}=-1$, so $1=-1\times 2y$, so $1=-2y$, so $y=\dfrac{1}{-2}$

Hence solution is: $y=-\dfrac{1}{2}$

(**16**)

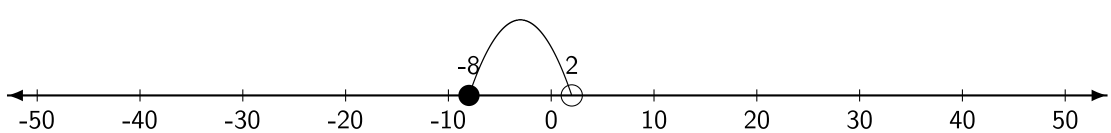
$$\begin{aligned}\frac{12}{8}\div\frac{-10}{14}&=\frac{12}{8}\times\frac{-14}{10}\\&=\frac{\not{4}\times 3}{\not{4}\times 2}\times\frac{\not{2}\times(-7)}{\not{2}\times 5}\\&=\frac{3}{2}\times\frac{-7}{5}\\&=\frac{3\times(-7)}{2\times 5}\\&=\frac{-21}{10}\\&=-2\frac{1}{10}\end{aligned}$$

Hence solution is: $x{=}-2\dfrac{1}{10}$

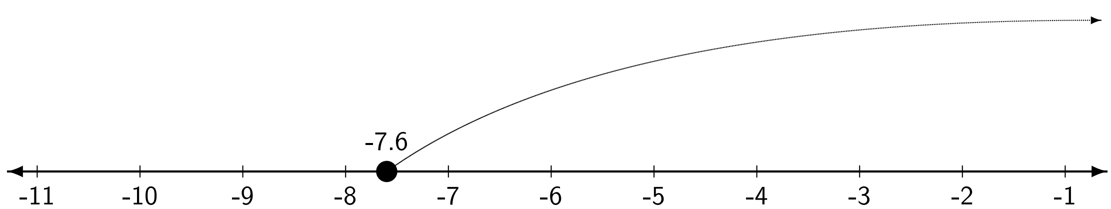
4. (**1**) $\sqrt{245}=\sqrt{5\times 49}=\sqrt{5\times 7\times 7}$.
Then $\sqrt{245}=7\times\sqrt{5}$.
Hence the solution is $7\sqrt{5}$

(**2**) $\sqrt{8}=x\sqrt{2}$. Now $\sqrt{8}=\sqrt{4\times 2}=\sqrt{2\times 2\times 2}=2\sqrt{2}$. Hence $x=2$

(**3**) In interval form the answer is $[-8,2.0)$ and on a real line the answer is:



(**4**) In inequality form the answer is $x\geq -7.6$ and on a real line the answer is:



(**5**) $\sqrt{32x}=8\sqrt{12}$, so $\sqrt{32x}=\sqrt{8\times 8\times 12}=\sqrt{768}$, so $32x=768$. Hence $x=24$

(**6**) $0=4y+2$, so $-2=4y$, so $\dfrac{-2}{4}=\dfrac{4y}{4}$

Hence $y = -\frac{1}{2}$

(7) $-2x + 3 = 6$, so $-2x = 6 - 3$, so $-2x = 3$, so $\frac{-2x}{-2} = \frac{3}{-2}$

Hence $x = -\frac{3}{2}$

(8) $4y\left(-5 - 5y\right) = -5 \times 4y - 5y \times 4y = -20y - 20y^2$

(9) $|5y - 4| = 5$, so

$$\begin{aligned} 5y - 4 &= 5 \\ 5y &= 5 + 4 \\ 5y &= 9 \\ \frac{5y}{5} &= \frac{9}{5} \end{aligned} \qquad \textit{or} \qquad \begin{aligned} 5y - 4 &= -5 \\ 5y &= -5 + 4 \\ 5y &= -1 \\ \frac{5y}{5} &= \frac{-1}{5} \end{aligned}$$

Hence the solutions are: $y = \frac{9}{5}$ and $y = -\frac{1}{5}$

(10)

$$\begin{aligned} \left(\sqrt{8} + \sqrt{3}\right)\left(\sqrt{4} + \sqrt{9}\right) &= \sqrt{8} \times \sqrt{4} + \sqrt{8} \times \sqrt{9} + \sqrt{3} \times \sqrt{4} + \sqrt{3} \times \sqrt{9} \\ &= \sqrt{8 \times 4} + \sqrt{8 \times 9} + \sqrt{3 \times 4} + \sqrt{3 \times 9} \\ &= \sqrt{32} + \sqrt{72} + \sqrt{12} + \sqrt{27} \\ &= 4\sqrt{2} + 6\sqrt{2} + 2\sqrt{3} + 3\sqrt{3} \\ &= 10\sqrt{2} + 5\sqrt{3} \end{aligned}$$

(11) Substituting for z into the equation gives $2 = 6y + 1$, so $6y = 2 - 1$, so $6y = 1$, so $\frac{6y}{6} = \frac{1}{6}$

Hence $y = \frac{1}{6}$

(12)

$$\begin{aligned} \sqrt{4}\left(\sqrt{7} - \sqrt{8}\right) &= \sqrt{4} \times \sqrt{7} - \sqrt{4} \times \sqrt{8} \\ &= \sqrt{4 \times 7} - \sqrt{4 \times 8} \\ &= \sqrt{28} - \sqrt{32} \\ &= 2\sqrt{7} - 4\sqrt{2} \end{aligned}$$

(13) $\left(-3 + 5x\right)\left(3x - 1\right) = -3 \times 3x - 3 \times (-1) + 5x \times 3x + 5x \times (-1) = -9x + 3 + 15x^2 - 5x = 15x^2 - 14x + 3$

(14) $-x = 1$

Hence solution is: $x = -1$

(15) $\frac{4}{-4y} - 1 = 6$, so $\frac{-1}{y} = 1 + 6$, so $\frac{-1}{y} = 7$, so $-1 = 7y$, so $y = \frac{-1}{7}$

Hence solution is: $y = -\frac{1}{7}$

(**16**)

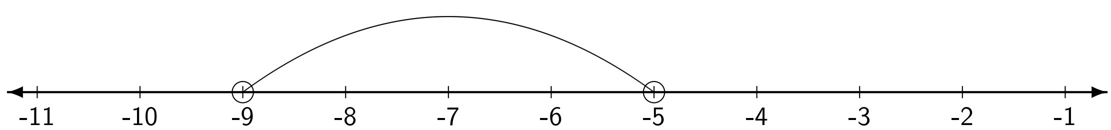
$$\begin{aligned}\frac{10}{15} \div \frac{18}{12} &= \frac{10}{15} \times \frac{12}{18}\\ &= \frac{\cancel{5} \times 2}{\cancel{5} \times 3} \times \frac{\cancel{6} \times 2}{\cancel{6} \times 3}\\ &= \frac{2}{3} \times \frac{2}{3}\\ &= \frac{2 \times 2}{3 \times 3}\\ &= \frac{4}{9}\end{aligned}$$

Hence solution is: $x = \frac{4}{9}$

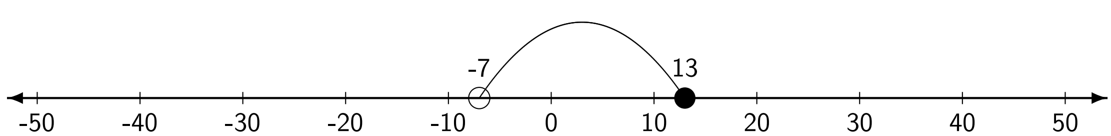
5. (**1**) $\sqrt{200} = \sqrt{2 \times 100} = \sqrt{2 \times 2 \times 50} = \sqrt{2 \times 2 \times 2 \times 25}$
$= \sqrt{2 \times 2 \times 2 \times 5 \times 5}$.
Then $\sqrt{200} = 2 \times 5 \times \sqrt{2}$.
Hence the solution is $10\sqrt{2}$

(**2**) $\sqrt{192} = x\sqrt{3}$. Now $\sqrt{192} = \sqrt{64 \times 3} = \sqrt{8 \times 8 \times 3} = 8\sqrt{3}$. Hence $x = 8$

(**3**) In interval form the answer is $(-9, -5)$ and on a real line the answer is:



(**4**) In inequality form the answer is $-7 < x \leq 13$ and on a real line the answer is:



(**5**) $\sqrt{4x} = 6\sqrt{13}$, so $\sqrt{4x} = \sqrt{6 \times 6 \times 13} = \sqrt{468}$, so $4x = 468$. Hence $x = 117$

(**6**) $2 = -3x + 3$, so $2 - 3 = -3x$, so $-1 = -3x$, so $\frac{-1}{-3} = \frac{-3x}{-3}$

Hence $x = \frac{1}{3}$

(**7**) $2x - 3 = -1$, so $2x = -1 + 3$, so $2x = 2$, so $\frac{2x}{2} = \frac{2}{2}$

Hence $x = 1$

(8) $6z\left(-5-z\right) = -5\times 6z - z\times 6z = -30z - 6z^2$

(9) $|-5z-5| = 5$, so

$$\begin{aligned} -5z-5 &= 5 \\ -5z &= 5+5 \\ -5z &= 10 \\ \frac{-5z}{-5} &= \frac{10}{-5} \end{aligned} \qquad \textit{or} \qquad \begin{aligned} -5z-5 &= -5 \\ -5z &= -5+5 \\ -5z &= 0 \\ z &= 0 \end{aligned}$$

Hence the solutions are: $z = -2$ and $z = 0$

(10)

$$\begin{aligned} \left(\sqrt{9}+\sqrt{4}\right)\left(\sqrt{6}+\sqrt{9}\right) &= \sqrt{9}\times\sqrt{6}+\sqrt{9}\times\sqrt{9}+\sqrt{4}\times\sqrt{6}+\sqrt{4}\times\sqrt{9} \\ &= \sqrt{9\times 6}+\sqrt{9\times 9}+\sqrt{4\times 6}+\sqrt{4\times 9} \\ &= \sqrt{54}+9+\sqrt{24}+\sqrt{36} \\ &= 3\sqrt{6}+9+2\sqrt{6}+6 \\ &= 9+6+2\sqrt{6}+3\sqrt{6} \\ &= 15+5\sqrt{6} \end{aligned}$$

(11) Substituting for x into the equation gives $5z+3=-1$, so $5z=-1-3$, so $5z=-4$, so $\frac{5z}{5}=\frac{-4}{5}$

Hence $z = -\frac{4}{5}$

(12)

$$\begin{aligned} \left(\sqrt{2}+\sqrt{5}\right)\sqrt{7} &= \sqrt{7}\times\sqrt{2}+\sqrt{7}\times\sqrt{5} \\ &= \sqrt{7\times 2}+\sqrt{7\times 5} \\ &= \sqrt{14}+\sqrt{35} \end{aligned}$$

(13) $(5-2x)(6+6x) = 5\times 6+5\times 6x-2x\times 6-2x\times 6x = 30+30x-12x-12x^2 = -12x^2+18x+30$

(14) $\frac{-y}{-4}+5=2$, so $\frac{y}{4}=2-5$, so $\frac{y}{4}=-3$, so $y=-3\times 4$, so $y=-12$

Hence solution is: $y=-12$

(15) $\frac{-6}{-3y}+1=-2$, so $\frac{2}{y}=-1-2$, so $\frac{2}{y}=-3$, so $2=-3y$, so $y=\frac{2}{-3}$

Hence solution is: $y=-\frac{2}{3}$

(16)

$$\begin{aligned} \frac{-10}{8}\times\frac{-15}{-18} &= \frac{\cancel{2}\times(-5)}{\cancel{2}\times 4}\times\frac{\cancel{3}\times 5}{\cancel{3}\times 6} \\ &= \frac{-5}{4}\times\frac{5}{6} \\ &= \frac{-5\times 5}{4\times 6} \\ &= \frac{-25}{24} \\ &= -1\frac{1}{24} \end{aligned}$$

Hence solution is: $x=-1\frac{1}{24}$