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$$\begin{aligned} \text{a) } 3 + 2(4x + 2) &= 23 \\ 3 + 8x + 4 &= 23 \\ 8x + \cancel{7} &= \cancel{23} \quad \parallel -7 \\ \frac{8x}{8} &= \frac{16}{8} \quad \parallel :8 \\ x &= 2 \end{aligned}$$

$$\begin{aligned} \text{b) } 2(x-3) + 3(x+9) &= 0 \\ \boxed{2x} - \boxed{6} + \boxed{3x} + \boxed{27} &= 0 \\ \cancel{5x} + \cancel{21} &= \cancel{0} \quad \parallel -21 \\ \frac{5x}{5} &= \frac{-21}{5} \quad \parallel :5 \\ x &= -\frac{21}{5} = -4\frac{1}{5} \quad (-4,2) \end{aligned}$$

$$\begin{aligned} \text{c) } 4(2x + 1) + 3(4x + 3) &= 93 \\ 8x + 4 + 12x + 9 &= 93 \\ 20x + \cancel{13} &= \cancel{93} \quad \parallel -13 \\ \frac{20x}{20} &= \frac{80}{20} \quad \parallel :20 \\ x &= 4 \end{aligned}$$

$$\begin{aligned} \text{d) } 4(2x + 1) + 3(2x + 1) &= 28 \\ 8x + 4 + 6x + 3 &= 28 \\ 14x + \cancel{7} &= \cancel{28} \quad \parallel -7 \\ \frac{14x}{14} &= \frac{21}{14} \quad \parallel :14 \\ x &= \frac{21}{14} = \frac{3}{2} = 1\frac{1}{2} \end{aligned}$$

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a) $\frac{x}{4} = \frac{x+3}{2}$ $\parallel \cdot 4$

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

$x = 2(x+3)$

~~$x = 2x + 6$~~ $\parallel -2x$

$\frac{-x}{-1} = \frac{6}{-1}$ $\parallel : (-1)$

$x = -6$

b) $\frac{3y-2}{6} = \frac{y+1}{3}$ $\parallel \cdot 6$

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

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

~~$3y-2 = 2y+2$~~ $\parallel -2y$

~~$y-2 = 2$~~ $\parallel +2$

$y = 4$

c) $\frac{x+5}{2} = \frac{3x}{6}$ $\parallel \cdot 6$

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

$3(x+5) = 3x$

~~$3x + 15 = 3x$~~ $\parallel -3x$

$15 = 0$ ei ratkaisua

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s. 107

$$\begin{aligned} \text{a)} \quad 2(x + 4) &= 12 \\ 2x + 8 &= 12 && \parallel - 8 \\ \frac{2x}{2} &= \frac{4}{2} && \parallel : 2 \\ x &= 2 \end{aligned}$$

$$\begin{aligned} \text{b)} \quad 5(x + 3) &= 15 \\ 5x + 15 &= 15 && \parallel - 15 \\ \frac{5x}{5} &= \frac{0}{5} && \parallel : 5 \\ x &= 0 \end{aligned}$$

$$\begin{aligned} \text{c)} \quad 2(3x + 6) &= 24 \\ 6x + 12 &= 24 && \parallel - 12 \\ \frac{6x}{6} &= \frac{12}{6} && \parallel : 6 \\ x &= 2 \end{aligned}$$

$$\begin{aligned} \text{d)} \quad 7(2x + 1) &= 21 \\ 14x + 7 &= 21 && \parallel - 7 \\ \frac{14x}{14} &= \frac{14}{14} && \parallel : 14 \\ x &= 1 \end{aligned}$$

$$d) \quad \frac{3x - 2}{5} = \frac{6 + x}{10} \quad || \cdot 10$$

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

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

$$\cancel{6x} - 4 = \cancel{6} + x \quad || -x$$

$$5x - 4 = \cancel{6} \quad || +4$$

$$\frac{5x}{5} = \frac{10}{5} \quad || :5$$

$$x = 2$$

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$$a) \quad 3x - \overset{0}{5} = \overset{21}{16} \quad || +5$$

$$\frac{3x}{3} = \frac{21}{3} \quad || :3$$

$$x = 7$$

$$b) \quad 5(x - 2) = 3x$$

$$5x - 10 = 3x \quad || -3x$$

$$2x - 10 = 0 \quad || +10$$

$$\frac{2x}{2} = \frac{10}{2} \quad || :2$$

$$x = 5$$

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Timo $x - 5$ vuotta

Kimmo x vuotta

Heli $2(x - 5)$ vuotta

$$(x - 5) + x + 2(x - 5) = 113$$

$$x - 5 + x + 2x - 10 = 113$$

$$4x - 15 = 113 \quad || +15$$

$$\frac{4x}{4} = \frac{128}{4} \quad || :4$$

$$x = 32$$

Kimmo 32 vuotta

Timo $32 - 5 = 27$ vuotta

Heli $2(32 - 5)$
 $= 2 \cdot 27 = 54$ vuotta

S. 107 - 108

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