

Worksheet 3.3 Solutions

(a) $\frac{x}{3} - 1 = \frac{x}{5} - \frac{14}{15}$

$$\frac{15(x)}{3} - \frac{15(1)}{1} = \frac{15(x)}{5} - \frac{15(14)}{15}$$

LCM
15

note: formal checks are optional.

check

$$5x - 15 = 3x - 14$$

$$5x - 15 - 3x = 3x - 14 - 3x$$

$$2x - 15 = -14$$

$$2x - 15 + 15 = -14 + 15$$

$$2x = 1$$

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

$$\boxed{x = \frac{1}{2}}$$

LS	RS
$(\frac{1}{2}) \div 3 - 1$	$\frac{1}{2} \div \frac{5}{1} - \frac{14}{15}$
$= \frac{1}{2} \times \frac{1}{3} - 1$	$= \frac{1}{2} \times \frac{1}{5} - \frac{14}{15}$
$= \frac{1}{6} - \frac{6}{6}$	$= \frac{1}{10} - \frac{14}{15}$
$= -\frac{5}{6}$	$= \frac{3}{30} - \frac{28}{30}$
	$= -\frac{25}{30}$
	$= -\frac{5}{6}$
	$\therefore x = \frac{1}{2}$

b) $\frac{3x-4}{5} = \frac{-x}{2} - \frac{3}{1}$ LCM 10

$$\frac{10}{5}(3x-4) = \frac{10}{2}(-x) - \frac{10}{1}(3)$$

$$2(3x-4) = 5x - 30$$

$$6x - 8 = 5x - 30$$

$$6x - 8 + 5x = 5x - 30 + 5x$$

$$11x - 8 + 8 = -30 + 8$$

$$11x = -22$$

$$\frac{11x}{11} = \frac{-22}{11}$$

$$\boxed{x = -2}$$

check

LS	RS
$\frac{3(-2)-4}{5}$	$\frac{-(-2)}{2} - \frac{3}{1}$
$= \frac{-6-4}{5}$	$= \frac{2}{2} - \frac{3}{1}$
$= \frac{-10}{5}$	$= 1 - 3$
$= -2$	$= -2$
	$\therefore x = -2$

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c) $\frac{5x-3}{4} + \frac{2}{1} = \frac{3x}{1} + \frac{1}{2}$

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

$5x-3+8 = 12x+2$

$5x+5-12x = 12x+2-12x$

$-7x+5-5 = 2-5$

$-7x = -3$

$\frac{-7x}{-7} = \frac{-3}{-7}$

$x = \frac{3}{7}$

check

<p>LS</p> $\left[\frac{5\left(\frac{3}{7}\right) - 3}{4} \right] + 2$ $= \left[\frac{15}{28} - \frac{21}{28} \right] + 2$ $= \frac{-6}{28} + 2$ $= \frac{-3}{14} + \frac{28}{14}$ $= \frac{25}{14}$	<p>RS</p> $3\left(\frac{3}{7}\right) + \frac{1}{2}$ $= \frac{9}{7} + \frac{1}{2}$ $= \frac{18}{14} + \frac{7}{14}$ $= \frac{25}{14}$
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$\therefore x = \frac{3}{7}$

d) $\frac{y+4}{3} = \frac{y+5}{2} + \frac{2}{1}$ LCM 6

$\frac{6}{3}(y+4) = \frac{6}{2}(y+5) + \frac{6}{1}(2)$

$2(y+4) = 3(y+5) + 12$

$2y+8 = 3y+15+12$

$2y+8 = 3y+27$

$2y+8-27 = 3y+27-27$

$2y-19-2y = 3y-2y$

$-19 = y$

$y = -19$

check:

<p>LS</p> $\frac{-19+4}{3}$ $= \frac{-15}{3}$ $= -5$	<p>RS</p> $\frac{-19+5}{2} + 2$ $= \frac{-14}{2} + 2$ $= -7+2$ $= -5$
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$\therefore y = -19$

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e)
$$\frac{2x}{3} - \frac{5x-3}{4} = \frac{x}{6} + \frac{1}{1}$$
 LCM 12.

$$\frac{12}{3}(2x) - \frac{12}{4}(5x-3) = \frac{12}{6}(x) + \frac{12}{1}(1)$$

$$4(2x) - 3(5x-3) = 2(x) + 12$$

$$8x - 15x + 9 = 2x + 12$$

$$-7x + 9 = 2x + 12$$

$$-7x + 9 - 9 = 2x + 12 - 9$$

$$-7x - 2x = 2x + 3 - 2x$$

$$-9x = 3$$

$$\frac{-9x}{-9} = \frac{3}{-9}$$

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

check

LS: $\frac{2(-\frac{1}{3})}{3} - \frac{5(-\frac{1}{3})-3}{4}$
 $= \frac{-2/3}{3} - \frac{[-\frac{5}{3}-3]+4}{4}$
 $= -\frac{2}{9} - \frac{[-\frac{5}{3}-\frac{12}{3}]+4}{4}$
 $= -\frac{2}{9} - \frac{-\frac{17}{3}+4}{4}$
 $= -\frac{2}{9} - \frac{-\frac{17}{3}+\frac{12}{3}}{4}$
 $= -\frac{2}{9} - \frac{-\frac{5}{3}}{4}$
 $= -\frac{2}{9} + \frac{5}{12}$
 $= -\frac{4}{18} + \frac{25}{36}$
 $= \frac{-4+25}{36} = \frac{21}{36} = \frac{7}{12}$

RS: $\frac{-\frac{1}{3}}{6} + 1$
 $= \frac{-1}{18} + \frac{18}{18}$
 $= \frac{-1+18}{18} = \frac{17}{18}$

$\therefore x = \frac{-1}{3}$

f)
$$\frac{x}{2} - \frac{2x-4}{7} = \frac{x}{7} + \frac{1}{1}$$
 LCM 14

$$\frac{14}{2}(x) - \frac{14}{7}(2x-4) = \frac{14}{7}(x) + \frac{14}{1}(1)$$

$$7x - 2(2x-4) = 2x + 14$$

$$7x - 4x + 8 = 2x + 14$$

$$3x + 8 - 8 = 2x + 14 - 8$$

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

$$x = 6$$

check

LS: $\frac{6}{2} - \frac{2(6)-4}{7}$
 $= \frac{6}{1} - \frac{12-4}{7}$
 $= \frac{6}{1} - \frac{8}{7}$
 $= \frac{42}{7} - \frac{8}{7} = \frac{34}{7}$

RS: $\frac{6}{7} + 1$
 $= \frac{6}{7} + \frac{7}{7}$
 $= \frac{13}{7}$

$\therefore x = 6$

g)
$$\frac{2(x-3)}{1} + \frac{x}{2} - \frac{1}{6} = \frac{2x}{3} - \frac{5}{2}$$
 LCM 6

$$\frac{6}{1}(2x-6) + \frac{6}{2}(x) - \frac{6}{6}(1) = \frac{6}{3}(2x) - \frac{6}{2}(5)$$

$$12x - 36 + 3x - 1 = 4x - 15$$

$$15x - 37 = 4x - 15$$

$$15x - 37 + 37 = 4x - 15 + 37$$

$$15x - 4x = 4x + 22 - 4x$$

$$11x = 22$$

$$\frac{11x}{11} = \frac{22}{11}$$

$$x = 2$$

check

LS: $2(x-3) + \frac{x}{2} - \frac{1}{6}$
 $= 2(-1) + \frac{-1}{2} - \frac{1}{6}$
 $= -2 + -\frac{1}{2} - \frac{1}{6}$
 $= -2 - \frac{3}{6} - \frac{1}{6}$
 $= -2 - \frac{4}{6} = -2 - \frac{2}{3} = -\frac{6}{3} - \frac{2}{3} = -\frac{8}{3}$

RS: $\frac{2x}{3} - \frac{5}{2}$
 $= \frac{2(-1)}{3} - \frac{5}{2}$
 $= -\frac{2}{3} - \frac{5}{2}$
 $= -\frac{4}{6} - \frac{15}{6} = -\frac{19}{6}$

$\therefore x = 2$