6.2 solving equations with variables on both sides

Wednesday, October 7, 2020   11:09 AM

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Date: _Oct. 20. 2020_

Math 9 HW Chapter 6.2: Solving Equations with Variables on Both Sides:

1. Solve each of the following equations:

a) $3x+10=5x-20$
$10+20=5x-3x$
$30=2x$
$\boxed{x=15}$

b) $6x-14=2x+18$
$6x-2x=18+14$
$4x=32$
$\boxed{x=8}$

c) $22-7x=14x-20$
$42=21x$
$\boxed{x=2}$

d) $51-8x=2x+11$
$40=10x$
$\boxed{x=4}$

e) $4(x-3)+9=7x+15$
$4x-12+9=7x+15$
$15-3=3x$
$12=3x$
$\boxed{x=4}$

f) $24-5(2x-8)=6x$
$24-10x+40=6x$
$24-40=16x$
$-16=16x$
$\boxed{x=-1}$

g) $22-8x=5(10-3x)$
$22-8x=50-15x$
$7x=28$
$\boxed{x=4}$

h) $3(4x-1)+13=5(x+4)$
$12x-3+13=5x+20$
$7x=20-10$
$7x=10$
$\boxed{x=\frac{10}{7}}$

i) $2(3x+4)+5x=10(6-x)+1$
$6x+8+5x=60-10x+1$
$11x+8=60-10x+1$
$11x+10x=61-8$
$21x=53$
$\boxed{x=53/21}$

j) $4+3x-29=13-5x$
$4+3x-29=13-5x$
$3x-25=13-5x$
$8x=38$
$x=\frac{19}{4}$

k) $2x+4(2x+3)=5(2x+9)-33$
$2x+8x+12=10x+45-33$
$10x+12=10x+12$
$12=12$
$x\in\mathbb{R}$

L) $6x+13=2(3x-5)+11$
$6x+13=6x-10+11$
$13\neq1$

$x\in\varnothing$

2. Find the Lowest Common Denominator for each of the following fractions:

a) $\frac{1}{6}$ and $\frac{1}{14}$

$\frac{1}{2\times3}$ $\frac{1}{2\times7}$

$LCD = \frac{1}{2\times3\times7} = \frac{1}{42}$

b) $\frac{1}{5}$ and $\frac{1}{15}$

$5\lfloor\underline{5\quad 15}$ $LCD:\frac{1}{15}$
$\quad\; 1\quad 3$

c) $\frac{1}{15}$ and $\frac{1}{12}$

$3\lfloor\underline{15\quad 12}$ $LCD:\frac{1}{60}$
$2\lfloor\underline{5\quad 4}$
$\quad\; 5\quad 2$

d) $\frac{1}{3}$, $\frac{1}{5}$ and $\frac{1}{7}$

$LCD: \frac{1}{105}$

e) $\frac{1}{10}$, $\frac{1}{15}$ and $\frac{1}{6}$

$5\lfloor\underline{10\quad 15\quad 6}$ $LCD:\frac{1}{60}$
$3\lfloor\underline{2\quad 3\quad 6}$
$\quad\; 2\quad 1\quad 2$

f) $\frac{1}{6}$, $\frac{1}{10}$ and $\frac{1}{16}$

2 3 2 5   2 2 2
$LCD: \frac{1}{240}$

3. When solving an equation with fractions, why are we finding the LCD? Explain using your own words

we're finding the LCD so that we can simplify the equation so it will be easier to solve!

4. Solve each of the following equations. Show all your work and steps

a) $\frac{x}{2}+13=x+7$

$x+26=2x+14$
$26-14=2x-x$
$12=x$

b) $\frac{-2}{5}=2x-\frac{17}{5}$

$-2=10x-17$
$15=10x$
$x=\frac{15}{10}=\frac{3}{2}$

c) $\frac{-7x}{2}-1=\frac{-11}{4}$

$-14x-4=-11$
$-4+11=14x$
$7=14x$
$x=\frac{7}{14}=\frac{1}{2}$

d) $48=18\left(\frac{2x}{3}-1\right)$

$48=\frac{36x}{3}-18$
$66=12x$
$\boxed{x=11/2}$

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

$12x+40=45x-12$
$40+12=45x-12x$
$52=33x$
$\boxed{x=\frac{52}{33}}$

f) $\frac{2x}{3}+\frac{5}{2}=\frac{3x}{4}-\frac{11}{3}$

$8x+30=9x-44$
$30+44=9x-8x$
$x=74$

g) $\dfrac{10x}{3} - \dfrac{24}{5} = \dfrac{6x}{5} + \dfrac{8}{3}$

$50x - 72 = 18x + 40$

$50x - 18x = 40 + 72$

$32x = 112$

$x = \dfrac{112}{32} \boxed{\dfrac{7}{2}}$

h) $\dfrac{18x}{7} - \dfrac{48}{4} = \dfrac{15x}{4} - \dfrac{14}{7}$

$72x - 336 = 105x - 56$

$72x - 105x = 280$

$-33x = 280$

$\boxed{x = \dfrac{280}{-33}}$

i) $\dfrac{-1}{2}(4x+6) = \dfrac{1}{2}(9-3x)$

$-\dfrac{1}{2}(4x+6) = \dfrac{9}{2} - \dfrac{3}{2}x$

$-\dfrac{1}{2} \times 2(2x+3) = \dfrac{9}{2} - \dfrac{3}{2}x$

$-2x - 3 = \dfrac{9}{2} - \dfrac{3}{2}x$

$-4x - 6 = 9 - 3x$

$\boxed{-15 = x}$

j) $\dfrac{5}{2}(2x+16) = \dfrac{1}{5}(30x+20)$

$25(2x+16) = 2(30x+20)$

$50x + 400 = 60x + 40$

$400 - 40 = 60x - 50x$

$360 = 10x$

$x = \dfrac{360}{10} \boxed{36}$

k) $\dfrac{8}{3}(6x+7) - 8x = \dfrac{1}{2}(4-x)+11$

$16(6x+7) - 48x = 3(4-x) + 66$

$96x + 112 - 48x = 12 - 3x + 66$

$48x + 3x = 78 - 112$

$51x = -34$

$x = \dfrac{-34}{51} \boxed{-\dfrac{2}{3}}$

l) $\dfrac{3}{4}(2x+3) + \dfrac{3}{5}(8x-2) = 9x$

$15(2x+3) + 12(8x-2) = 180x$

$30x + 45 + 96x - 24 = 180x$

$126x + 21 = 180x$

$21 = 54x$

$x = \dfrac{21}{54} \boxed{\dfrac{7}{18}}$

5. A student answered the following two questions with their work shown below. Is there a mistake in their work? What conclusion can you make from their work?

Student A

$3(2x-8)=6x-12$

$6x-24=6x+12$

$-6x \quad -6x$

$24=12$

↑ changed sign with no reason

Student B

$5x(2x-8)+10=10x^2-40x+10$

$10x^2-40x+10=10x^2-40x+10$

$-10x^2 \qquad -10x^2$

$-40x+10=-40x+10$

$+40x \qquad +40x$

$10=10$

no mistake!

Student C

$2x+4x+10=3(2x+3)+2$

$6x+10=6x+9+2$

$-6x \qquad -6x$

$10=11$

no solution!

6. Jason worked 3 years and saved some money. His brother has half of what he saved and his sister has 2/3 of what he saved. Together they have $25,000. How much money does each person have? Write an equation to solve this question and then show all your work and steps.

$x+\frac{1}{2}x+\frac{2}{3}x=25\,000$

$6x+3x+4x=150\,000$

$13x=150\,000$

Jason has $\frac{(50\,000)}{3}=50\,000$ dollars.

brother has 25 000 dollars

sister has 33 333.33 dollars.

7. Tom bought three burgers and three drinks. He also bought two hotdogs that cost $3.50 each. If a drink costs $2.75 and everything costs $32.50, how much is a burger? Write an equation to solve this question and then show all your work and steps.

$3x+3(2.75)+2(3.5)=32.5$

$3x+8.25+7=32.5$

$3x+15.25=32.5$

$3x=17.25$

$x=5.75$

$5.75/burger

8. Tom is twice as his younger brother Dave. In eight years from now, Tom will be six years older than Dave. How old is each person now?

$2x=x+6$

$\boxed{x=6}$

Dave is 6, Tom is 12.