Day 9

Checkpoint 7

Problem 7-115

Solving Equations with Fractions (Fraction Busters)

Answers to problem 7-115: a: $x = \frac{15}{4} = 3\frac{3}{4}$, b: $x \approx \$1.74$, c: $x = -5$, d: $(12, 16)$

Equations are often easier to solve if there are no fractions. To eliminate fractions from an equation, multiply both sides of the equation by the common denominator.

Example 1: Solve $\frac{1}{2}x + \frac{2}{3} = \frac{3}{4}$

Solution: Start by multiplying both sides of the equation by 12 (the common denominator.) Simplify and then solve as usual.

$$12\left(\tfrac{1}{2}x + \tfrac{2}{3}\right) = 12\left(\tfrac{3}{4}\right)$$
$$6x + 8 = 9$$
$$6x = 1$$
$$x = \tfrac{1}{6}$$

Example 2: Solve $1.1x + 0.35x = 29$

Solution: Two decimal places means that the common denominator is 100. Multiply both sides by 100 and solve as usual.

$$100(1.1x + 0.35x) = 100(29)$$
$$110x + 35x = 2900$$
$$145x = 2900$$
$$x = 20$$

Now we can go back and solve the original problems.

a.
$$\tfrac{1}{5}x + \tfrac{1}{3}x = 2$$
$$15\left(\tfrac{1}{5}x + \tfrac{1}{3}x\right) = 15(2)$$
$$3x + 5x = 30$$
$$8x = 30$$
$$x = \tfrac{30}{8} = \tfrac{15}{4} = 3\tfrac{3}{4}$$

b.
$$x + 0.15x = \$2$$
$$100(x + 0.15x) = 100(\$2)$$
$$100x + 15x = \$200$$
$$115x = \$200$$
$$x \approx \$1.74$$

c.
$$\tfrac{x+2}{3} = \tfrac{x-2}{7}$$
$$21\left(\tfrac{x+2}{3}\right) = 21\left(\tfrac{x-2}{7}\right)$$
$$7(x+2) = 3(x-2)$$
$$7x + 14 = 3x - 6$$
$$4x = -20$$
$$x = -5$$

d.
$$y = \tfrac{2}{3}x + 8$$
$$y = \tfrac{1}{2}x + 10$$
$$\tfrac{2}{3}x + 8 = \tfrac{1}{2}x + 10$$
$$6\left(\tfrac{2}{3}x + 8\right) = 6\left(\tfrac{1}{2}x + 10\right)$$
$$4x + 48 = 3x + 60$$
$$x = 12$$
$$y = \tfrac{2}{3}(12) + 8 = 16$$
$$(12, 16)$$

Day 9

Here are some more to try. Solve each equation or system of equations.

Solve these

Justify! Show work!

1. $\frac{1}{6}x + \frac{2}{3}x = 5$

2. $y = 32x + 16$
   $y = 80x + 4$

3. $\frac{6}{15} = \frac{x-2}{40}$

4. $y = \frac{x}{3}$
   $y = \frac{4}{3}x - 9$

5. $\frac{x}{2} - 4 = \frac{x}{3}$

6. $\frac{x}{4} - 3 = \frac{x+4}{6} - 2$

7. $\frac{x}{10} + \frac{5}{12} = 3x - 1$

8. $\frac{2x-2}{6} - \frac{1}{2} = \frac{x}{2} - 2$

9. $0.2x + x = 30$

10. $y = \frac{x}{6} + \frac{1}{4}$
    $y = x - \frac{9}{4}$

11. $y = -3x + 2$
    $y = -\frac{15}{4}x + 3$

12. $x + 3\frac{2}{3} = 2x + \frac{1}{3}$

13. $\frac{x}{2} + \frac{4x}{3} = 2x - 1.5$

14. $\frac{x+1}{4x} = \frac{5}{16}$

15. $y = \frac{1}{3}x + 8$
    $y = -\frac{1}{2}x - 2$

16. $y = 7x + 2$
    $y = 2x - 10\frac{1}{2}$

17. $y = \frac{x}{2} - 1$
    $y = \frac{x+3}{12}$

18. $y = \frac{3}{2}x - 10$
    $y = \frac{x}{3} - \frac{x}{2}$

19. $\frac{x-1}{4} = \frac{7}{8}$

20. $\frac{2}{3}x = x - \frac{10}{3}$

Answers

1. $x = 6$
2. $x = \frac{1}{4}$, $y = 24$
3. $x = 18$
4. $x = 9$, $y = 3$
5. $x = 24$
6. $x = 20$
7. $x = \frac{60}{149}$
8. $x = 7$
9. $x = 25$
10. $x = 3$, $y = \frac{3}{4}$
11. $x = \frac{4}{3}$, $y = -2$
12. $x = 3\frac{1}{3}$
13. $x = 9$
14. $x = 4$
15. $x = -12$, $y = 4$
16. $x = -2\frac{1}{2}$, $y = -15\frac{1}{2}$
17. $x = 3$, $y = \frac{1}{2}$
18. $x = 6$, $y = -1$
19. $x = 4.5$
20. $x = 10$