Solutions for the twelfth week's homework
Math 131

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Also available as PDF.

1 Exercises for 7.1

Problem 1 **A** and **C** are linear.

Problem 2 For **B**, there is an exponent of two (x^2). And for **D**, there is an exponent of negative one ($\frac{1}{x}$).

Problem 3 Substituting, $3(6+4) = 3 \cdot 10 = 30$ on the left, and $5 \cdot 6 = 30$ on the right. Hence 6 **is a solution**.

Problem 4 Without evaluating the expressions, we can see that substituting -2 on the left yields an *even* number and that substituting -2 on the right yields an *odd* number. **Thus -2 cannot be a solution.**

But if we want to evaluate the expressions anyways, we have $5(-2+4) - 3(-2+6) = 5{\cdot}2 - 3{\cdot}3 = 10 - 12 = -2$ on the left, and $9(-2+1) = 9{\cdot}-1 = -9$. Because $-2 \neq -9$, -2 is not a solution.

Problem 9 $7k + 8 = 1 \Rightarrow 7k = -7 \Rightarrow k = -1$.

Problem 10 $5m - 4 = 21 \Rightarrow 5m = 25 \Rightarrow m = 5$.

Problem 17 $2(x+3) = -4(x+1) \Rightarrow 2x + 6 = -4x - 4 \Rightarrow 6x = -10 \rightarrow x = \frac{-10}{6} = \frac{-5}{3}$.

Problem 18 $4(x-9) = 8(x+3) \Rightarrow 4x - 36 = 8x + 24 \Rightarrow -60 = 4x \Rightarrow x = -15$.

Problem 25 $-[2z - (5z+2)] = 2 + (2z+7) \Rightarrow -2z + 5z + 2 = 9 + 2z \Rightarrow 3z + 2 = 9 + 2z \Rightarrow z = 7$.

Problem 26 $-[6x - (4x+8)] = 9 + (6x+3) \Rightarrow -6x + 4x + 8 = 12 + 6x \Rightarrow -2x + 8 = 12 + 6x \Rightarrow -8x = 4 \Rightarrow x = \frac{-1}{2}$.

Problem 36 $\frac{3x}{4} + \frac{5x}{2} = 13 \Rightarrow \frac{3x+10x}{4} = 13 \Rightarrow \frac{13}{4}x = 13 \Rightarrow x = 4$.

Problem 37 $\frac{8x}{3} - \frac{2x}{4} = -13 \Rightarrow \frac{32x-6x}{12} = -13 \Rightarrow \frac{26}{12}x = -13 \Rightarrow x = \frac{-13{\cdot}12}{13{\cdot}2} = -6$.

Problem 61 $t = \frac{d}{r}$

Problem 62 $r = \frac{I}{pt}$

Problem 68 $r = \frac{C}{2\pi}$

Problem 69 $h = \frac{S-2\pi r^2}{2\pi r} = \frac{S}{2\pi r} - r$ (either is fine, the latter is better for calculators)

Problem 76

- In part a, $x = 93$. Then $y = .1 \cdot 93 - 8.5 = 9.3 - 8.5 = .8$, or **800 000 tickets**.
- For part b, solve $.75 = .1x - 8.5$ for x. Then $x = (.75 + 8.5)/.1 = 9.25/.1 = 92.5$. **So the model predicts that the season spanning the latter half of 1992 through the first half of 1993 sold 750 000 tickets**. But reading into a model like this is tricky. I expect the authors intend the answer to be the 1992–1993 season.

2 Exercises for 7.2

Problem 21

1. Let x be the number of big-store shoppers, poor people.
2. Then $x-70 = y$, where y is the number of happy small-store shoppers[1].
3. $x + y = 442$, or $x + (x - 70) = 442$.
4. From the above, $2x - 70 = 442 \Rightarrow 2x = 512 \Rightarrow x = 256$.
5. So there are $x = 256$ big-store shoppers and $y = 256 - 70 = 186$ small-store shoppers.
6. The number of **big-store shoppers** was **70** more than the number of **small-store shoppers**, and the total number of these two bookstore types was $\mathbf{256 + 186 = 442}$.

Problem 24 Let W be the number of wins and L be the number of losses. Then $W = 3L - 2$ and $W + L = 82$. So $3L - 2 + L = 82 \Rightarrow 4L = 84 \Rightarrow \mathbf{L = 21}$ is the number of losses, and $\mathbf{W = 82 - 21 = 61}$ is the number of wins. This solution makes sense; both numbers are non-negative integers.

Problem 26 Let D be the number of votes for G.W. Bush, and S be the number of votes for A. Gore. Then $D + S = 537$ and $D = S + 5$. Then $2S + 5 = 537$, so $\mathbf{S = 266}$ and $\mathbf{D = 271}$. Again, this makes sense because the numbers are non-negative integers.

[1] One source of local book stores is `http://www.librarything.com/local/`. Another is `http://www.indiebound.org/`.

Problem 43

Percent	Investment	Interest
0.03	x	$0.03 \cdot x$
0.04	$12\,000 - x$	$0.04 \cdot (12\,000 - x)$
	$12\,000$	440

So $0.03 \cdot x + 0.04 \cdot (12\,000 - x) = 440$. Solving for x, $\mathbf{x = 4000}$.

He invested \$4 000 at 3% interest and \$8 000 at 4% interest. Checking, this totals to $0.03 \cdot 4000 + 0.04 \cdot 8000 = 120 + 320 = 440$.