Algebra I Problem Set 1

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0 Preface

I wrote this collection of problems in order to help student's master their ability to solve Algebra I Problems creatively. All problems should be solved without a calculator unless otherwise specified.

Notes about new notation. In algebra, we will start using new notation for multiplication: Where we used to see things like *3 times 7* be written like

$$3 \times 7 = 21$$

may now be written like

$$3 \cdot 7 = 21$$

or

$$3(7) = 21$$

Additionally, if we have a variable x and want to write 3 *times* x we won't write

$$3 \times x$$

but instead write

$$3x$$

1 Algebra Foundations

Problem 1.1

i) If $a = 7$ what number does $a + 7$ equal?

ii) If $x = -1$ what number does $2x + 1$ equal?

iii) If $z = 3$ what number does $-1 + \frac{6}{z}$ equal?

Problem 1.2

If $a = 3$ and $b = -1$ what does $\frac{a}{b} - \frac{b}{a}$ equal?

Problem 1.3

Which of the following expressions are equivalent to $3x + y + x + 1$

i) $4x + y + 1$

ii) $3(\frac{4}{3}x + \frac{1}{3}) + y$

iii) $2(x + y) + 2x + 1 - y$

Problem 1.4

Evaluate of the following expressions when $a = 2$. If it is undefined, that is ok. Just write "UND" if it is undefined!

i) $3(\frac{1}{2}) - 2a$

ii) $\frac{1}{a-2}$

iii) $\frac{7}{2-a}$

iv) $\frac{1}{\frac{1}{a}}$

v) $\frac{2-a}{1}$

vi) $\frac{a+2}{a}$

Problem 1.5

Solve for α. Once you find α, check your answer by plugging backing into the initial expression, evaluate each side, and show they are the same.

i) $\alpha - 1 = 0$

ii) $1 - \alpha = 0$

iii) $1 + \alpha = 0$

Problem 1.6

Solve for β. Once you find β, check your answer by plugging backing into the initial expression, evaluate each side, and show they are the same.

i) $\frac{1}{\beta} = \frac{3}{2}$

ii) $\frac{\beta-1}{\beta} = 2$

iii) $2\beta = \beta$

iv) $2\beta + 1 = \beta$

Problem 1.7

Solve for e. Once you find e, check your answer by plugging backing into the initial expression, evaluate each side, and show they are the same. If you want a challenge, try to find another value of e which is also a solution. There are two solutions to this equation.

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

Problem 1.8

How many solutions do each of the following equations have?

i) $\frac{2(x+1)-2}{2x} = 1$

ii) $\frac{1}{x} - 1 = -1$

iii) $\frac{x}{2} - 1 = 1$

iv) $2x - x = 1 + x$

Problem 1.9

Solve for x in terms of the other variables.

$$\frac{x+a}{3} + bx - 3 = 0$$

Problem 1.10

i) Solve for y in terms of the other variables.

$$\frac{3a+1}{y} - \frac{2y}{7b} = 0$$

ii) If $y = 2$ and $a = -5$ what does b equal?