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 MATH 101
 Fall 2021
 HW 1: Due 09/24

"I wasn't a failed DJ. I was pre-successful."
 —Jason Mendoza, *The Good Place*

Problem 1. (5pt) Give the definition of a real number.

A real number is 'any' number expressible as a decimal.

Problem 2. (15pt) For each of the following, determine if the associative property, commutative property, distributive property, additive identity property, multiplicative identity property, additive inverse property, or multiplicative inverse property is being used.

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|------------------------------------|---|
| (a) <u>Associative (+)</u> | $2^2 + (6 \cdot 4 + 1) - 3/6^3 = (2^2 + 6 \cdot 4) + 1 - 3/6^3$ |
| (b) <u>Distributive</u> | $5 - x^2(2a - 3b) = 5 - 2ax^2 + 3bx^2$ |
| (c) <u>Commutative (·)</u> | $19 - 4^2 + 3 \cdot (-5) - 16 = 19 - 4^2 - 5(3) - 16$ |
| (d) <u>Additive Identity</u> | $3 - 16 + 0 - 1/7 = 3 - 16 - 1/7$ |
| (e) <u>Multiplicative Inverse</u> | $-17 + 2(5 \cdot 6 + 8^3)/2 = -17 + (5 \cdot 6 + 8^3)$ |
| (f) <u>Associative (·)</u> | $45 - 4(5 \cdot 3) - 25/5^2 = 45 - (4 \cdot 5)3 - 25/5^2$ |
| (g) <u>Multiplicative Identity</u> | $1/3 - 6 \cdot 5^2 - (5 + \pi^2 \cdot 1) = 1/3 - 6 \cdot 5^2 - (5 + \pi^2)$ |
| (h) <u>Additive Inverse</u> | $4 \cdot 7/5 + (1 - 41^2) - 6^2 + 36 = 4 \cdot 7/5 + (1 - 41^2)$ |
| (i) <u>Commutative (·)</u> | $(5 - 1)^2 + 4(-3)6 \cdot 1/4 = (5 - 1)^2 + (-3)6 \cdot 4/4$ |
| (j) <u>Commutative (+)</u> | $-4 - (15 - 3^2)/2 + 1^3 + 4 = -(15 - 3^2)/2 + 1^3 - 4 + 4$ |
| (k) <u>Additive Inverse</u> | $61 - 19(1(5) + 6) + 8^5 - 8^5 = 61 - 19(1(5) + 6)$ |
| (l) <u>Distributive</u> | $6^6 + 7(2 - 6) = 6^6 + 14 - 42$ |
| (m) <u>Associative (·)</u> | $19^2((1 - 3)4) + 0^3 = (19^2(1 - 3))4 + 0^3$ |
| (n) <u>Multiplicative Inverse</u> | $15 - 2\pi/\pi = 15 - 2$ |
| (o) <u>Distributive</u> | $(5/3)^2 + 12 - (6 - 2) = (5/3)^2 + 12 - 2(3 - 1)$ |

Problem 3. (10pt) Translate the following sentences into arithmetic:

- (a) $\underline{\hspace{2cm} x + 20 \hspace{2cm}} :$ The sum of a number and 20.
- (b) $\underline{\hspace{2cm} 105/6 \hspace{2cm}} :$ The quotient of one-hundred and five and six.
- (c) $\underline{\hspace{2cm} x - 9 \hspace{2cm}} :$ A number is decreased by nine.
- (d) $\underline{\hspace{2cm} 19 \cdot (-8) \hspace{2cm}} :$ The product of nineteen and negative eight.
- (e) $\underline{\hspace{2cm} 7 + 15 \hspace{2cm}} :$ Fifteen more than seven.
- (f) $\underline{\hspace{2cm} \frac{1}{3}x \hspace{2cm}} :$ One-third times a number.
- (g) $\underline{\hspace{2cm} x - y = 1 \hspace{2cm}} :$ The difference of x and y is one.
- (h) $\underline{\hspace{2cm} x/16 \hspace{2cm}} :$ A number is divided by sixteen.
- (i) $\underline{\hspace{2cm} 2(x - 5) \hspace{2cm}} :$ Twice the difference of a number and 5.
- (j) $\underline{\hspace{2cm} 5x + 6 = 27 \hspace{2cm}} :$ Six more than five times a number is 27.

Problem 4. (20pt) Compute the following:

- (a) $\underline{\hspace{2cm} 104 \hspace{2cm}} :$ $50 + 50 - (25 \cdot 0) + 2 + 2$
- (b) $\underline{\hspace{2cm} 25 \hspace{2cm}} :$ $3 + 6(9) - 5(8) + 48/6$
- (c) $\underline{\hspace{2cm} 42 \hspace{2cm}} :$ $3 \cdot 8 - 4/2 + 5 \cdot 2^2$
- (d) $\underline{\hspace{2cm} 4 \hspace{2cm}} :$ $2(1 - 1)^2 + 6/3 \cdot 2$
- (e) $\underline{\hspace{2cm} 1 \hspace{2cm}} :$ $2(1 - 1)^2 + 6/(3 \cdot 2)$
- (f) $\underline{\hspace{2cm} 4 \hspace{2cm}} :$ $6 - \frac{3}{4} \cdot 8 + 2^2$
- (g) $\underline{\hspace{2cm} 0 \hspace{2cm}} :$ $\frac{1 - 1}{4 + 3^2}$
- (h) $\underline{\hspace{2cm} 134 \hspace{2cm}} :$ $7 - (4 - 6) + 5^3$
- (i) $\underline{\hspace{2cm} 10 \hspace{2cm}} :$ $4(1) + 28/2^2 - (4 - 1)/3$
- (j) $\underline{\hspace{2cm} 3 \hspace{2cm}} :$ $4 \cdot 2^{1-2} - (5 - 6)$

Problem 5. (20pt) Compute the following:

(a) 16: $3(4 - (3 - 5)) - 4/2$

(b) 192: $3(2^2(1 - 5(3(4 - 5))))$

(c) -2: $-3^2 - 9 + 2^4$

(d) -1: $((2 - 10)/2)/4)^3$

(e) 13: $(3 \cdot 4^2)/4 - (15/(-3 \cdot 5))^3$

(f) -32: $(6^2 - (-10)^2)/2$

(g) 4: $1 - ((-1)^3 - 2(3 - (1 + 1))^2)$

(h) $\frac{5}{2}$: $\frac{x^2 + y}{y - x}$; where $x = -3$ and $y = 1$

(i) 19: $y - x^3$; where $x = -1$ and $y = 18$

(j) -1: $\frac{3x - 4}{y - 7}$; where $x = 2$ and $y = 5$

Problem 6. (10pt) Compute the following:

(a) 64: $8^2 - 8^0$

(b) 49: $(-7)^2$

(c) $-\frac{3}{8}$: $2^{-3} - 2^{-1}$

(d) 25: $\frac{5^3}{5}$

(e) 48: $\frac{2^2 \cdot 3^3}{2^{-2} \cdot 3^2}$

Problem 7. (10pt) ‘Simplify’ the following as much as possible, being sure to not use any negative powers:

(a) $\frac{1}{x^3} : x^5 \cdot x^{-8}$

(b) $x^6 : \frac{x^9}{x^3}$

(c) $\frac{x^5}{y^4} : (x^2y)(x^3/y^5)$

(d) $8x^5 : \frac{(2x^2)^3}{x^{-2}}$

(e) $\frac{1}{xy} : (x^5/y^4)(x^2y^{-1})^{-3}$

Problem 8. (5pt) Express the following numbers in scientific notation:

(a) $1.3 \cdot 10^{-3} : 0.0013$

(b) $2.21 \cdot 10^4 : 22100$

(c) $4.435 \cdot 10^1 : 44.35$

(d) $4.531453210 \cdot 10^9 : 4531453210$

(e) $5.8 \cdot 10^0 : 5.8$

Problem 9. (5pt) Convert the following numbers from their scientific notation to their decimal notation:

(a) $187100 : 1.871 \times 10^5$

(b) $0.016 : 1.6 \times 10^{-2}$

(c) $50 : 5.0 \times 10^0$

(d) $0.00000009 : 9 \times 10^{-8}$

(e) $26.6 : 2.66 \times 10^1$