Mathematics 52
Study Guide 1
Fall 2016
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Course ID: (27488) and (27501)

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Note: This study guide contains practice questions that are very useful for your preparation for the first exam in *Elementary Algebra*.

Problem 1: Determine whether the following is **TRUE** or **FALSE** and if it is false **EXPLAIN** why:

a. $5\frac{1}{6} = \frac{5}{6}$ <u>False</u> because $5\frac{1}{6} = \frac{(5\cdot 6)+1}{6} = \frac{30+1}{6} = \frac{31}{6}$

b. $2^{-1} + 2^0 + 2^{1--2} \ll 100^0 + e^0 + 22^{-1+2} + 1000^3$ <u>True</u>
   $\frac{1}{2} \quad 1 \quad 2^3 \qquad\quad 1 \quad 1 \quad 22^1 \quad$ Big number

c. $-500.34 - -200.34 \geq -200.87 \to -300 \geq -200.87$
   $|-10| = 10$
   False because $-300 < -200.87$

d. $\left|-\frac{20}{2}\right| < (-2)^5 \to -32$
   False because $10 > -32$

e. $\frac{2x^4+x^3+x^2+2}{1\,x^0+x\sqrt{64}\cdot x^8} \geq \frac{0x^5+x^2+x^7+2}{x^0+(x-\sqrt{4})}$ if given $x = -1$
   $\frac{2(-1)^4+(-1)^3+(-1)^2+2}{1+(-1)^8} = \frac{2-1+1+2}{2} = \frac{4}{2} = \boxed{2}$
   $\frac{0+(-1)^2+(-1)^7+2}{1+(-1)^{-2}} = \frac{1-1+2}{1+1} = \frac{2}{2} = \boxed{1}$
   True

f. $\pm 1.23 \leq \pm 1.23$ True

g. $25^{-2} \geq 2.56$ False because $\frac{1}{25^2} < 2.56$

h. $0.\bar{3} - \frac{1}{3} > 0.012 - 0.091$
   True $0 > -0.079$

i. $\frac{2^{-3+2+4-2}+\sqrt[3]{27}+\left(\frac{15}{5}\right)}{\left(\frac{40}{2}\right)--|-20--10|} \geq \frac{\sqrt{121}-|--23-+20|+64^{\left(\frac{1}{4}\right)^{\frac{1}{2}}}}{2\sqrt{100}-\sqrt{100}}$ False $\frac{4}{15} < \frac{8}{5}$

j. $2^0 + 2^{(25)^{\frac{1}{2}}} \gg 2^{0.5-1} \to 2^{-0.5} = 2^{-1/2} = \frac{1}{2^{1/2}} = \frac{1}{\sqrt{2}}$
   $2^0 + (2^{25})^{\frac{1}{2}}$
   $2^0 + 3^2 \quad 3^2$
   $\qquad = 2$
   $(2^{25})^{1/2} \Rightarrow \sqrt{25} = 5$ True
   $2^5 = 32$

Problem 2: Add the following using the **NUMBER LINE:**

a. $-4 - -2$

b. $-10 + -8$

c. $-5 - 1 + 3 - 2$

d. $-3.5 - -0.5$
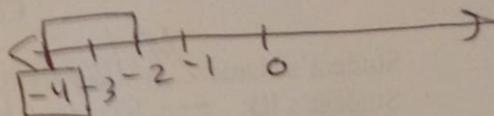
e. $+(-2) \cdot -(-1)^3 + -(-2 \cdot (-1)^{11})$

e. $+(-2) \cdot -(-1)^3 + -(-2 \cdot (-1)^{11})$
$(-2) \cdot (+1)) + -(-2 \cdot -1)$
$-2 + (-2) = \boxed{-4}$

a. $-4 - -2 = -4 + 2$
$= \boxed{-2}$
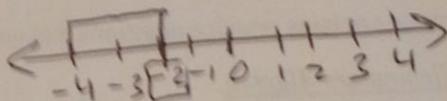
b. $-10 + -8 = \boxed{-18}$
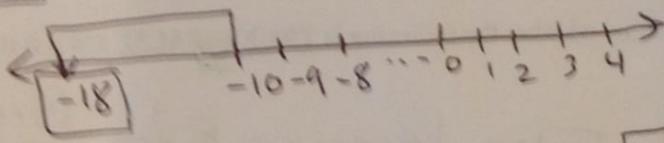
c. $(-5 - 1) + (3 - 2) = (-6) + (1)$
$= \boxed{-5}$
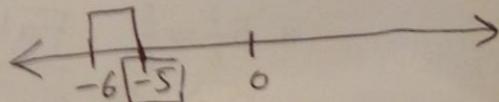
d. $-3.5 - -0.5 = -3.5 + 0.5 = \boxed{-3}$
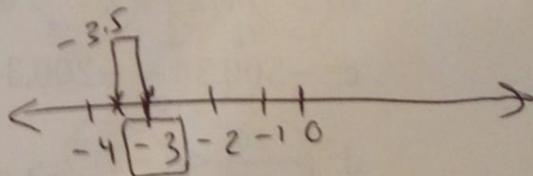
Problem 3: Determine which of the following is **INCORRECT** and **EXPLAIN** why:

a. $\frac{1}{9} > 0.\overline{1}$ <u>False</u> because $\frac{1}{9} = 0.\overline{1} \approx 0.11111111$

b. $0.\overline{1}$ is irrational number <u>False</u> because $0.\overline{1}$ is rational number.

c. $\mathbb{R} < \mathbb{Z}_{\geq 0}$ <u>False</u> because the set of real number $(\mathbb{R})$ is greater than the set of whole number $(\mathbb{Z}_{\geq 0})$.

d. $\frac{0}{1}$ is undefined

e. $\frac{(\sqrt{x} - \sqrt{x})(x-2)}{(\sqrt{x} - \sqrt{x})} = 0$ False
$(x - 2) \neq 0$

↳ False because $\frac{0}{1} = \underline{0}$, while $\frac{0}{0}$ is <u>undetermined</u> and $\frac{1}{0}$ is <u>undefined</u>.

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c.) For any real number x, y, z, then we have

$$x + y = y + x$$

d.) For any real number x, y, z, then $\overrightarrow{x(y+z) = xy + xz}$

Problem 4: Write the general form for each of the following:

a. Linear Equation
b. Absolute Value
c. Commutative Law of Addition
d. Associative Law of Multiplication (Distribution Law)
e. Additive Identity

e.) For any real number x, y, z, then we have: $x + 0 = x$

ⓐ For any $a, b, c,$ and d constant, we have:

$$ax + b = cx + d$$

ⓑ For any real number, say x, then we have:

$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

Problem 5: Simplify (evaluate) the following mathematical expression:

a. $\dfrac{\sqrt{81} - |-23 - +20| + 121^{\left(\frac{1}{4}\right)^{\frac{1}{2}}}}{6\sqrt{25} - \sqrt{25}}$

b. $\dfrac{2^{-3+2+5-2} + 2\cdot(3--1+2)\cdot\sqrt[3]{27} + \left(\frac{15}{5}\right)}{\left(\frac{40}{2}\right) - -|-20+10|}$

$\left((121)^{\left(\frac{1}{4}\right)^{\frac{1}{2}}}\right) = 121^{\frac{1}{\sqrt{4}}} = 121^{\frac{1}{2}}$
$= \sqrt{121}$
$= 11$

ⓐ $\dfrac{\sqrt{81} - |-23-20| + 121^{\left(\frac{1}{4}\right)^{\frac{1}{2}}}}{6\sqrt{25} - \sqrt{25}} = \dfrac{9 - 43 + 11}{6\cdot5 - 5} = \boxed{\dfrac{-23}{25}}$

ⓑ $\dfrac{2^2 + 2\cdot(\overset{6}{3+1+2})\cdot 3 + 3}{20 + |-20|} = \dfrac{4 + (2)(6)(3) + 3}{20 + 10} = \boxed{\dfrac{43}{30}}$

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Problem 6: Solve the following:

a. $\alpha^2 - (\alpha - 2)(\alpha - 5) - 18 = -6(4\alpha + 7)$

b. $-\frac{7}{2}\mu + \frac{3}{2}(\mu - 6) = -3$

c. $3\varphi + 7 > 7\varphi - 5$

(a.) $x^2 - (x^2 - 5x - 2x + 10) - 18 = -24\alpha - 42$

$\boxed{x^2} \; \cancel{x^2} + \boxed{5x} + \boxed{2x} \underline{-10} \; \underline{-18} = \boxed{-24\alpha} \underline{-42}$

$5\alpha + 2\alpha + 24\alpha = -42 + 10 + 18$

$31\alpha = -14 \Rightarrow \boxed{\therefore \alpha = \dfrac{-14}{31}}$

(b.) $-\frac{7}{2}\mu + \frac{3}{2}\mu - \frac{3}{2}\overset{3}{\cancel{(6)}} = -3$

$\boxed{-\frac{7}{2}\mu} + \boxed{\frac{3}{2}\mu} \underline{-9} = -3$

$-\frac{7}{2}\mu + \frac{3}{2}\mu = -3 + 9 \Rightarrow \left(\dfrac{-7+3}{2}\right)\mu = 6$

$\Rightarrow \left(\dfrac{-\overset{2}{\cancel{4}}}{\cancel{2}}\right)\mu = 6 \Rightarrow -2\mu = 6 \Rightarrow \mu = \dfrac{6}{-2} = \boxed{-3}$

(c.) $3\varphi + 7 > 7\varphi - 5$

$3\varphi - 7\varphi > -5 - 7$

$\dfrac{-4\varphi}{-4} \; \textcircled{>} \; \dfrac{-12}{-4} \quad <$

$\boxed{\varphi < 3}$

The solution on the interval notation is

$(-\infty, 3)$

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Problem 7: Solve the following real life application problems:

Problem 7.1

Laura rented a <u>rectangular</u> office space of length 90 ft and the width of the office space is one-third its length. Find the area of Laura's office space.

$$w = \frac{1}{3}l = \frac{1}{3}(90) = 30\,ft$$

$$Area = l \cdot w = (90)(30) = \boxed{2,700\,ft^2}$$

(diagram: rectangle with width w and length $l = 90\,ft$)
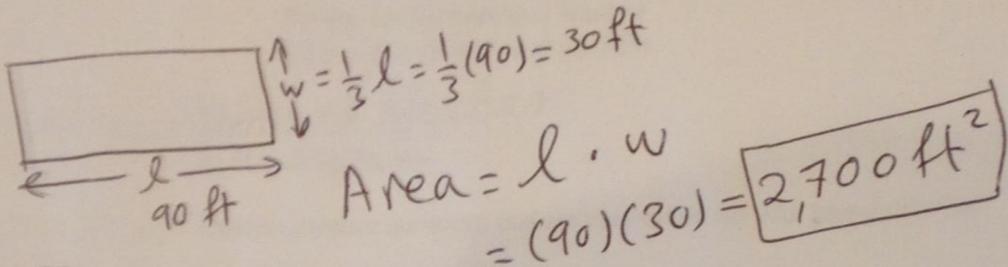
Problem 7.2

In Labor Day, Elias went to one of the Honda dealerships in California to buy a 2016 Honda Civic Coupe. The price of this car was listed as $20,000. Elias is currently working in marketing in one of companies in California. A Labor Day discount of 10% on the price of this car, followed by another discount of 5% because he is working in a partner company of the Honda dealership, is equivalent to a single discount of what percent of the original price?

<u>Solution:</u>

Original price = $20,000 , Discount 1 = 10% , Discount 2 = 5% , % = ?!

The deductible value for the price after discount 1 is

$$(20,000) \cdot \left(\frac{10}{100}\right) = \boxed{2,000}$$

So, the price after discount 1 becomes: $20,000 - $2,000 = $\boxed{18,000}$.

The deductible value for the price after discount 2 is

$$(18,000) \cdot \left(\frac{5}{100}\right) = \boxed{900}$$

So, the price after discount 2 becomes: $18,000 - $900 = $\boxed{17,100}$

So, the final price is $\boxed{2,900}$ less than the original price
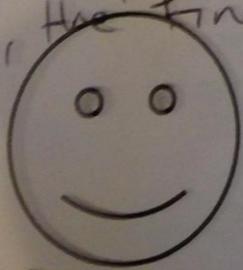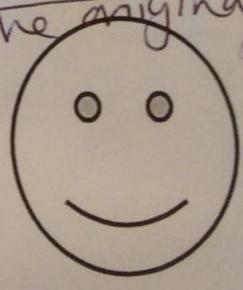
Hence,

$$\frac{2,900}{20,000} = \frac{29}{200} = 0.145 = \boxed{14.5\%}$$