SN _____ ID _____ NAME _____

Show all necessary steps for full marks.

Question 1: (9 points): Let U be the universal set, where

$U = \{\text{all whole numbers less than } 11\}$

$A = \{\text{all even natural numbers less than or equal to } 8\}$, and let

$B = \{y \mid y = x^2 + 2x \text{ where } x \text{ is an integer such that } 0 \le x < 3\}$,

Answer the following statements as TRUE or FALSE.

(a): $U = ?$

(b): $A = ?$

(c): $A' = ?$

(d): $U' = ?$

(e): $\varnothing' = ?$

(f): $B = ?$

(g): $B' = ?$

(h): $A' \cap B' = ?$

(i): $\varnothing \cap B = \varnothing$

Solution:

(a): $U = \{0,\ 1,\ 2,\ 3,\ 4,\ 5,\ 6,\ 7,\ 8,\ 9,\ 10\}$

(b): $A = \{2,\ 4,\ 6,\ 8\}$

(c): $A' = \{0,\ 1,\ 3,\ 5,\ 7,\ 9,\ 10\}$

(d): $U' = \varnothing$

(e): $\varnothing' = U$

(f): $B = \{0,\ 3,\ 8\}$

(g): $B' = \{1,2,4,5,6,7,9,10\}$

(h): $A' \cap B' = \{1,5,7,9,10\}$

(i): $\varnothing \cap B = \varnothing$

Question 2: (8 points): Answer the following:

A. Which is smaller $\frac{8}{11}$ or $\frac{7}{9}$? Why?

Answer: $\frac{8}{11}$ because $\frac{8}{11} = \frac{8(9)}{11(9)} = \frac{72}{99}$ and $\frac{7}{9} = \frac{7(11)}{9(11)} = \frac{77}{99}$

B. Express $\frac{1205}{40}$ as a decimal number.

$$
\begin{array}{r}
30.125 \\
40\overline{)\,1205} \\
\underline{120} \\
50 \\
\underline{40} \\
100 \\
\underline{80} \\
200 \\
\underline{200} \\
0
\end{array}
$$

Answer: $\frac{1205}{40} = 30.125$

C. Express 0.62 as a fraction in its lowest terms.

Answer: $0.62 = \frac{31}{50}$ because $0.62 = \frac{0.62}{1} = \frac{62}{100} = \frac{2(31)}{2(50)} = \frac{31}{50}$

D. Find reciprocal of the mixed number $-2\frac{3}{5}$

Answer: $-\frac{5}{13}$ because $-2\frac{3}{5} = -\left(2\frac{3}{5}\right) = -\left(2+\frac{3}{5}\right) = -\frac{13}{5}$

Question 3: (4 points):

If $x < -1$, then write expression $|2x|+|-4x|+\|6x\|$ without absolute value notation.

Solution:

$$|2x|+|-4x|+\|6x\| = |2x|+|4x|+|6x|$$
$$= -2x - 4x - 6x$$
$$= -12x$$

If $x < -1$, then the expression $|2x| + |-4x| + \|6x\|$ is equal to

(a) $-12x$

(b) $12x$ (d) $8x$

(c) $-4x$ (e) $4x$

Question 4: (4 points):

If $x = -\frac{3}{4}$ then find the value of the expression $-17 + 3\left[8x - 4(3x - 2)\right] = ?$

Solution:

$$-17+3\left[8x-4(3x-2)\right] = -17+3\left[8x-12x+8\right]$$
$$= -17+3\left[-4x+8\right]$$
$$= -17+3\left[(-4)\left(-\frac{3}{4}\right)+8\right]$$
$$= -17+3\left[3+8\right]$$
$$= -17+33$$
$$= 16$$

Another Method:

$$-17+3\left[8\left(-\frac{3}{4}\right)-4\left(3\left(-\frac{3}{4}\right)-2\right)\right] = -17+3\left[-6-4\left(-\frac{9}{4}-2\right)\right]$$
$$= -17+3\left[-6+9+8\right] = -17+3(11) = 33-17 = 16$$