Algebra I January Regional — Team Solutions

① $2(5-x)+6x = x+22$

$10-2x+6x = x+22$

$3x = 12$

$x = 4$

$6(y+4)-(y+3) = y-1$

$6y+24-y-3 = y-1$

$5y+21 = y-1$

$4y = -22$

$y = -\frac{11}{2}$ or $-5\frac{1}{2}$

$x+y = \boxed{-1\frac{1}{2}}$

② Let x = # of each coin

$41x = 1517$

$x = 37$

total number of coins is $4 \cdot 37 = \boxed{148}$

③ $x = 2+3+5+7+11+13 = 41$

$y = 1+2+3+5+6+10+15+30 = 72$

$z = 1+3+5+7+9+11+13 = 49$

$\frac{x-z}{y} = \frac{41-49}{72} = \frac{-8}{72} = \boxed{\frac{-1}{9}}$

④ $80{,}000 = 8 \cdot 10{,}000 = 2^3 \cdot 10^4 = 2^3 \cdot 2^4 \cdot 5^4 = 2^7 \cdot 5^4 = \boxed{128 \cdot 625}$

⑤ $6x^2-x-12 = 0$

$(3x+4)(2x-3) = 0$

$x = \frac{-4}{3}$ $x = \frac{3}{2}$

$3x^2+14x-24 = 0$

$(3x-4)(x+6) = 0$

$x = \frac{4}{3}$ $x = -6$

$\frac{-4}{3}+\frac{3}{2}+\frac{4}{3}+-6 = \boxed{-4\frac{1}{2}}$

⑥ $\frac{n}{n+10}$ = original fraction

$\frac{n-2}{n+10} = \frac{3}{5}$

$5n-10 = 3n+30$

$2n = 40$

$n = 20$

$\boxed{\frac{20}{30}}$

⑦ $\dfrac{x+3+\frac{5}{x-3}}{x+2+\frac{4}{x-3}} = \dfrac{\frac{x^2-9+5}{x-3}}{\frac{x^2-x-6+4}{x-3}} = \dfrac{x^2-4}{x-3} \cdot \dfrac{x-3}{x^2-x-2} = \dfrac{(x+2)(x-2)}{x-3} \cdot \dfrac{x-3}{(x-2)(x+1)} = \boxed{\dfrac{x+2}{x+1}}$

⑧ $3x+2y = -1$

$y = -\frac{3}{2}x - \frac{1}{2}$

$m = -\frac{3}{2}$

$\perp m = \frac{2}{3}$

$y = mx+b$

$4 = \frac{2}{3}(-3)+b$

$4 = -2+b$

$6 = b$

$\boxed{y = \frac{2}{3}x+6}$

(9) $A * B = (2A - 3B)^2$

$5 * 3 = (10 - 9)^2 = 1$

$4 * 2 = (8 - 6)^2 = 4$

$(1 * 4) = (2 - 12)^2 = \boxed{100}$

(10) Just work with powers of x:

$$\frac{x^{-6}}{x^{-10}} \cdot \frac{x^{14}}{x^{-3}} \cdot \frac{x^{18}}{x^{0}} = x^4 \cdot x^{17} \cdot x^{18} = x^{39}$$

$\boxed{39 \text{ or } x^{39}}$

(11) Find LCM of 2, 3, 4, 5, 6, 7, 8

which is LCM of 5, 6, 7, 8 $= 5 \cdot 2 \cdot 3 \cdot 7 \cdot 2 \cdot 2 = 840$

plus remainder of 3 $= \boxed{\cancel{8}\ \cancel{3}}$ $\emptyset$

(12) $7A + 5 = 15$

$7A = 10$

$A = \frac{10}{7}$

$\frac{B-7}{3} = -4$

$B - 7 = -12$

$B = -5$

$3C + 15 = 8 - 4C$

$7C = -7$

$C = -1$

$\frac{7}{8} D = \frac{5}{4}$

$D = \frac{5}{4} \cdot \frac{8}{7}$

$D = \frac{10}{7}$

$2A - B + C - 2D$

$= \frac{20}{7} + 5 - 1 - \frac{20}{7}$

$= \boxed{4}$

(13) $S^2 = (x + 14)^2$

$S = x + 14 \Rightarrow P = \boxed{4(x+14)}$ or $\boxed{4x + 56}$

(14)

$$2x - 1 \overline{)\ 4x^5 - 6x^4 + 0x^3 - 3x^2 \ldots}$$

$2x^4 - 2x^3 - 1x^2$

$4x^5 - 2x^4$

$-4x^4 + 0x^3$

$-4x^4 + 2x^3$

$-2x^3 - 3x^2$

$-2x^3 + x^2$

...

Coefficient of x^2 is $\boxed{-1}$

(15)

x, $x+1$, $x+2$: $2x = 51 + x + 2$, $x = 53$

x, $x+2$: $4(x+2) = 85 + 5x$, $-77 = x$

$53, 54, 55$ + $-77, -75$ Sum = $\boxed{10}$