Choice (e) on all questions is "NOTA" which means "None Of The Above answers is correct."

1. Simplify the following numerical expression: $2+16\div 3-5+6\div \frac{2}{3}$.

   a) 10 b) 6⅓ c) 11⅓ d) -7⅓ e) NOTA

2. Which of the following is an example of the Commutative Property of Multiplication?

   a) $a(b+c)=(c+b)\cdot a$ b) $a(b+c)=a(b+c)$
   c) $a(b+c)=(b+c)\cdot a$ d) $a(b+c)=a(b+c)+0$ e) NOTA

3. Solve the equation $3(3x+1)-(x-1)=6(x+10)$. What is the sum of the digits of the value of x?

   a) 13 b) 11 c) 10 d) 3 e) NOTA

4. Solve for y in terms of m: $16(y-m)=4(2m-y)$.

   a) $y=3m$ b) $y=\frac{6}{5}m$ c) $y=\frac{3}{4}m$ d) $y=\frac{9}{10}m$ e) NOTA

5. The larger of two consecutive odd integers is four less than one-third of the smaller. Find the product of these two integers.

   a) 99 b) 63 c) 35 d) no solution e) NOTA

6. What is the sum of the integral solutions of the conjunction $-6<5x-4<10$?

   a) 0 b) 3 c) 6 d) 10 e) NOTA

7. Simplify the expression: $(-2x)(-3xy)^3+(3x)^2(xy)^2(-6y)$.

   a) $-108x^4y^3$ b) $-36x^4y^3$ c) $-18x^4y^3$ d) $108x^4y^3$ e) NOTA

8. Factor the trinomial $6x^2-47x-63$ into the form $(Ax+B)(Cx+D)$; what is the value of $A+B+C+D$?

   a) 5 b) 8 c) 13 d) -11 e) NOTA

9. Which of the following is a factor of the polynomial $ax-6xy-5a+30y$?

a) $(y+5)$ b) $(a-6y)$ c) $(a+6x)$ d) (y-5) e) NOTA

10. Factor completely: x^4-81.

a) $(x^2-9)(x^2+9)$ b) $(x^2+9)(x+3)(x-3)$
c) $(x-3)^4$ d) $(x+3)^2(x-3)^2$ e) NOTA

11. The binomial $3x-5$ is multiplied by its conjugate. That product is then subtracted from the square of the original binomial. Find the value of the resulting expression, given that $x = 5$.

a) 100 b) 0 c) -50 d) -100 e) NOTA

12. The units digit of a two-digit number is 2 more than the tens digit. If the digits are reversed, the new number is 39 less than twice the original number. What is the product of the digits of the original number?

a) 8 b) 12 c) 35 d) 57 e) NOTA

13. The ratio of cats to dogs to turtles in a pet store is 4:7:1. There is a total of 84 of these three animals. How many are dogs?

a) 12 b) 21 c) 35 d) 49 e) NOTA

14. Given $\frac{2x-3}{5}=\frac{3x-1}{4}$, find the value of the expression $-2x^5-7x^4+3x^3+x-5$.

a) -10 b) -1 c) 0 d) 1 e) NOTA

15. Simplify the expression $\left\{\left[-\frac{1}{2}+\frac{3}{5}+\frac{2}{3}\left(1-\frac{7}{10}\right)\right]\div\frac{1}{3}-\frac{1}{9}\right\}$. What is the absolute value of the difference of the numerator and denominator of the value of the given expression?

a) 19 b) 21 c) 89 d) 91 e) NOTA

16. A new game called Ultimate Mu has started to get popular!! Teams earn either 4 or 7 points, depending on where they score from. What is the largest number of points which could not possibly be earned by a team playing Ultimate Mu?

a) 9 b) 17 c) 31 d) 111 e) NOTA

17. How many digits were used in numbering the pages of *Harry Potter and the Deathly Hallows*, which has a total of 759 pages?

a) 2,164 b) 2,165 c) 2,168 d) 2,169 e) NOTA

18. If $32^x = 16$, then $x = ?$

a) -2 b) ½ c) ⅔ d) $4/5$ e) NOTA

19. For what value of x does the line with slope $-3/2$ pass through the points $(x, -1)$ and $(-2, 4)$?

a) 0 b) $4/3$ c) $11/4$ d) $3/4$ e) NOTA

20. What is the y-coordinate of the point of intersection of the graphs of $2x-3y=8$ and $2x+4y=2$?

a) $-6/7$ b) 2 c) 6 d) 10 e) NOTA

21. The point (6, -5) lies on line **L** which is perpendicular to the line whose equation is $3x - 1/5\, y = 3$. What is the x-intercept of line **L**?

a) (1, 0) b) (23,0) c) (-69, 0) d) $\left(-23/5, 0\right)$ e) NOTA

22. If $\frac{x}{y} = \frac{3}{5}$, what is the value of the expression $\frac{x-5y}{y}$?

a) $-\frac{22}{5}$ b) $-\frac{2}{5}$ c) 0 d) $\frac{5}{3}$ e) NOTA

23. What is the lowest common multiple of $72a^5b^6c^3$, $48a^6b^{10}c^7$, and $60a^3c^9d$?

a) $12a^3c^3$ b) $360a^6b^{10}c^9$ c) $720a^6b^{10}c^9$ d) $1440a^6b^{10}c^9d$ e) NOTA

24. Jimmy has $16.40 in pennies, nickels, dimes, and quarters. He has an equal number of each coin. How many total coins does he have?

a) 5 b) 12 c) 8 d) 16 e) NOTA

25. Simplify: $\dfrac{1000^2}{\left(254^2 - 246^2\right)}$.

a) 250 b) 125 c) 25 d) 2 e) NOTA

26. How many integers lie on the x-axis between the x-intercepts of the graph of $y = 2x^2 - 5x - 3$?

a) 4 b) 3 c) 2 d) 1 e) NOTA

27. Rob Frost has an average of 87 on his first six Algebra tests. What must he average on the next three tests to bring his overall average up to 92?

a) 94.5 b) 97 c) 98 d) 102 e) NOTA

28. A gourmet snack shop sells almonds for \$10.80 per pound, walnuts for \$7.80 per pound, and peanuts for \$3.90 per pound. The shopkeeper makes a blend of these three nuts and plans to sell the blend for \$6.00 per pound. He uses twice as many peanuts as walnuts. He wants to have a total of 21 pounds of the mixture. How many pounds of almonds should he use?

a) 3 b) 4 c) 6 d) 9 e) NOTA

29. If $f(x) = 5 - 2x^2$, $g(x) = \dfrac{x-5}{2}$, and $h(x) = |2x - 3|$, find the value of $g(h(f(-3)))$.

a) -17 b) -5 c) 0 d) 12 e) NOTA

30. Which list of quadrants contains all the solutions to the system $y > 2, x \leq -3$?

a) II, III, & IV b) III only c) II only d) II and IV e) NOTA

Question #1

Find the value of the expression $a^b\left(b^a \cdot a^a \cdot 7 - 1\right)$, given $a=2$ *and* $b=3$.

Question #2

What is the power of x in the simplified form of: $\dfrac{\left(-3x^5y^{10}z^7\right)^4 \cdot \left(25x^8y^6z^3\right)^6}{\left(9x^2y^6z^8\right)^3 \cdot \left(-5x^9y^3z^{11}\right)^5}$

Question #3

What is the sum of the solutions of the three equations below?

$5x-(12x-8)+3=2x+29$ $\quad\quad$ $\dfrac{2x+7}{2}=\dfrac{-5x-2}{4}$ $\quad\quad$ $9x^2-16x+7=0$

Question #4

Let $\boldsymbol{A}$ = the value of a such that the line containing $(a, 3)$ and $(-2, 7)$ has slope $^5/_3$.
Let $\boldsymbol{B}$ = the y-intercept of the line containing $(-3, 3)$ and parallel to $2x-3y=10$.
Let $\boldsymbol{C}$ = the x-intercept of the line containing $(10, 1)$ and perpendicular to $2x-y=-4$.
What is the value of $\boldsymbol{A \cdot B + C}$?

Question #5

A: A fraction has a value of ¾. When the numerator is increased by 7, the resulting fraction equals the reciprocal of the original fraction.
What is the denominator of the original fraction?

B: The numerator of a certain fraction is a 2-digit number. The denominator is that number with the digits reversed. The value of the fraction is $^4/_7$. What is the numerator of the largest fraction that fits this description?

Find the value of $\dfrac{\mathbf{A}}{\mathbf{B}}$.

Question #6

Find the sum of the integral solutions of each of the following:

i) $|3x+2|=7$

ii) $-5x+3\geq 10$ *and* $4x-9<5x-4$

iii) $(3x+8)(x-5)(x+1)(x-10)=0$

Question #7 Simplify: $\sqrt{7{,}840{,}800}$

Question #8 Solve each of the following equations, and find the value of $r \cdot w - n + k$.

$\frac{n+5}{12} - \frac{n+3}{8} = 1$

$\frac{3}{4}(2r+5) - \frac{5}{8}(3r-1) = 1$

$\frac{3w+5}{3} = 3w + 2 - \frac{3w-4}{6}$

$.03k + .05(1{,}000 - k) = 34$

Question #9

Use long division to find the indicated quotients ***A*** and ***B***. Find the sum ***A*** + ***B***.

$A = \frac{m^3 - 3m - 2}{m^2 + 2m + 1}$

$B = \frac{8m^3 - 27}{2m - 3}$

Question #10

Andy counted up some m&m's. He noticed that whether he sorts them in groups of 4's, 5's, or 7's, there are always 3 m&m's left over. What is the least number of m&m's that are possible for Andy to have?

Question #11

Find the sum of the abscissa and ordinates of the intersection points of each of the following pairs of lines:

$4x - 7y = 8$	$5x - 4y = 2$	The horizontal line containing (4, -5).
$5x + 9y = 81$	$2x + 4y = 40$	The vertical line containing (-8, 2).

Question #12 If $(x+y) = 4$ and $(x^2 - y^2) = 12$, find the value of xy.

Question #13

Find the y-intercept of the line which contains the point (-6, 8) and which is also parallel to the line with equation $5x + 2y = 7$.

Question #14

Using x = the smallest even prime number, and y = the smallest odd prime number,

find the value of the expression $xy^y\left[(xy)^x + 1\right] + x^{xy} - xy^y$

January Regional *Algebra I Individual Test* *Solutions*

1. **C** Using order of operations: $2+\frac{16}{3}-5+9 \Rightarrow 6+\frac{16}{3}=\mathbf{11\frac{1}{3}}$
2. **C**
3. **C** $9x+3-x+1=6x+60 \Rightarrow 8x+4=6x+60 \Rightarrow 2x=56 \Rightarrow x=28$ Sum of digits is **10.**
4. **B** $16y-16m=8m-4y \Rightarrow 20y=24m \Rightarrow \mathrm{y}=\mathbf{\frac{6}{5}}$
5. **B** $x+2=\frac{1}{3}x-4 \Rightarrow \frac{2}{3}x=-6 \Rightarrow x=-9$. So the integers are -9 and -7; their product is **63.**
6. **B** $-6<5x-4<10 \Rightarrow -2<5x<14 \Rightarrow -\frac{2}{5}<x<\frac{14}{5}$. The integral solutions are **0,1,2**; the sum is **3.**
7. **E** $-2x(-27x^3y^3)+9x^2\cdot x^2\cdot y^2\cdot -6y = 54x^4y^3-54x^4y^3 = \mathbf{0}$
8. **A** factors are $(6x+7)(x-9)$ so the sum is 6 + 7 + 1 – 9 = **5**
9. **B** Factor by grouping: $x(a-6y)-5(a-6y) \Rightarrow (x-5)(a-6y)$
10. **B** Factor as the difference of squares: $(x^2-9)(x^2+9) \rightarrow \boldsymbol{(x+3)(x-3)(x^2+9)}$
11. **D** Conjugates: $(3x+5)(3x-5) \rightarrow 9x^2-25$; $(3x-5)^2=9x^2-30x+25$. Subtracting gives us $-30x+50$, with x = 5, we get **-100**
12. **C** Let u = units digit, and t = tens digit, then: $u=2+t$ *and* $10u+t=2(10t+u)-39$. By solving this system, we get t = 5 and u = 7. The original number was 57. The product of the digits is **35.**
13. **D** Let $4x$ = # of cats, $7x$ = # of dogs, x = # of turtles. Then $4x+7x+x=84$; → x = 7 and dogs = **49.**
14. **E** Cross multiply → $8x-12=15x-5 \rightarrow x=-1$. Sub for x: $-2(-1)^5-7(-1)^4+3(-1)^3+(-1)-5=\mathbf{-14}$
15. **A** $\left[-\frac{1}{2}+\frac{3}{5}+\frac{2}{3}\left(\frac{3}{10}\right)\right]\div\frac{1}{3}-\frac{1}{9} \rightarrow \left[\frac{1}{10}+\frac{1}{5}\right]\div\frac{1}{3}-\frac{1}{9} \rightarrow \left[\frac{3}{10}\right]\div\frac{1}{3}-\frac{1}{9}=\frac{9}{10}-\frac{1}{9}=\frac{71}{90}$. Difference is **19.**
16. **B** Possibilities are: 4, 7, 8, 11, 12, 14, 15, 16, 18, 19, 20, 21. We have 4 consecutive integers, so all other whole numbers are possible by simply adding on 4 to prior values. Last impossible score is **17.**
17. **D** One digit pages: 1 – 9 = 9 digits. Two digit pages: 10 – 99 = 90 pgs x 2 = 180 digits. Three digit pages: 100 – 759 = 660 pages x 3 = 1980 digits. Total digits = **2,169.**
18. **D** $(2^5)^x=2^4 \rightarrow 2^{5x}=2^4 \rightarrow 5x=4 \rightarrow \boldsymbol{x=\frac{4}{5}}$
19. **B** $\frac{-1-4}{x+2}=-\frac{3}{2}$. Cross multiplying, $-10=-3x-6 \Rightarrow \boldsymbol{x=\frac{4}{3}}$
20. **A** Eliminate x by subtracting the equations, so $-7y=6 \Rightarrow y=-\boldsymbol{6/7}$
21. **C** Given equation has slope of 15. $\perp slope=-1/15$. In point slope form, line L is: $y+5=-1/15(x-6)$. The x- intercept is found by replacing y with 0, giving us $\boldsymbol{x}$ **= -69**
22. **A** $\frac{x-5y}{y}=\frac{x}{y}-\frac{5y}{y} \rightarrow \frac{3}{5}-5=-\mathbf{\frac{22}{5}}$
23. **E** $72=2^3\cdot 3^2$; $48=2^4\cdot 3$; $60=2^2\cdot 3\cdot 5$. LCM = $2^4\cdot 3^2\cdot 5=720$. Including variables: $\boldsymbol{720a^6b^{10}c^9d}$
24. **E** A set of one of each coin = 41¢. \$16.40 ÷ 0.41 = 40 sets of coins. Multiply by 4 coins = **160 total.**
25. **A** Factor difference of two squares: $\frac{1,000\cdot 1,000}{(254-246)(254+246)} \rightarrow \frac{1,000\cdot 1,000}{(8)(500)} \rightarrow \frac{125\cdot 2}{1\cdot 1}=\mathbf{250}$
26. **B** $0=2x^2-5x-3 \rightarrow 0=(2x+1)(x-3)$. x intercepts are – ½ and 3. The integers between are 0, 1, 2. **3**

27. **D** $\frac{87 \cdot 6 + 3x}{9} = 92 \rightarrow$ $\boldsymbol{x = 102}$

28. **A** Set up a system of equations and solve by substitution:
$10.8a + 7.8w + 3.9p = 6(21) \qquad a + w + p = 21 \qquad p = 2w$.
First substitute and get $a + 3w = 21$, then use $a = 21 - 3w$ and substitute into long equation: $10.8(21 - 3w) + 7.8w + 3.9(2w) = 126$. This solves and gives us $w = 6$, so $a =$ **3.**

29. **D**
$f(-3) = 5 - 2 \cdot 9 = -13$
$h(-13) = |-26 - 3| = 29$
$g(29) = 24/2 = \mathbf{12}$

30. **C** The solution lies above the horizontal line $y = 2$ and to the left of the vertical line $x = -3$. This intersection would be only in quadrant **II.**

1. $2^3\left(3^2 \cdot 2^2 \cdot 7 - 1\right) = 8(36 \cdot 7 - 1) = 8 \cdot 252 - 8 = \mathbf{2008}$

2. Simplify only the factors of x: $\dfrac{x^{20} \cdot x^{48}}{x^6 \cdot x^{45}} = x^{14} \cdot x^3 = x^{17} \Rightarrow \mathbf{17}$

3. First equation:

$5x - (12x - 8) + 3 = 2x + 29$
$-7x + 8 + 3 = 2x + 29$
$-18 = 9x$
$x = -2$

Second equation:
(cross multiply first)

$8x + 28 = -10x - 4$
$18x = -32$
$x = -\dfrac{16}{9}$

Third equation:
(factor first)

$(9x - 7)(x - 1) = 0$
$9x - 7 = 0 \quad x - 1 = 0$
$x = \dfrac{7}{9} \qquad x = 1$

The sum of all these solutions is **-2.**

4. **A:** $\dfrac{7-3}{-2-a} = \dfrac{5}{3} \to 12 = -10 - 5a \Rightarrow a = -22/5$ **B:** $m = 2/3$; $3 = 2/3(-3) + b$, so $b = \mathbf{5}$

C: $m = 2$, so $\perp m = -1/2$. Using point-slope form and $y = 0$; $-1 = -1/2(x - 10)$, so $x = 12$. A+B+C = **-10**

5. **A:** Set up with $\dfrac{n}{d} = \dfrac{3}{4}$ *and* $\dfrac{n+7}{d} = \dfrac{4}{3}$. Cross multiply; solve the resulting system: $\begin{matrix} 3d - 4n = 0 \\ 4d - 3n = 21 \end{matrix} \Rightarrow d = 12$

B: $\dfrac{10t + u}{10u + t} = \dfrac{4}{7}$ Cross multiply and simply to: $u = 2t$. Solutions are 12, 24, 36, and 48; largest is 48. $\dfrac{\mathbf{A}}{\mathbf{B}} = \dfrac{\mathbf{1}}{\mathbf{4}}$

6. *i*) Solve $3x + 2 = \pm 7$ The integral solution is $\{-3\}$. *ii)* $x \le -7/5$ and $x > -5$, so integers are -4, -3, and -2.
iii) Solutions are $-8/3$, 5, -1, and 10. The sum requested is -3 + -4 + -3 + -2 + -1 + 5+ 10 = **2.**

7. Factor, using perfect squares wherever possible:
$7{,}840{,}800 = 100 \cdot 78{,}408 = 100 \cdot 8 \cdot 9801 = 100 \cdot 8 \cdot 9 \cdot 1089 = 100 \cdot 8 \cdot 9 \cdot 9 \cdot 121$. Taking the square root of these factors, we get $10 \cdot 2 \cdot 9 \cdot 11\sqrt{2} \Rightarrow \mathbf{1980\sqrt{2}}$

8. n: Multiply equation by 24, getting 2n+10 -3n – 9 = 24, so $n = -23$
r: multiply equation by 8, getting 12r + 30-15r + 5 = 8, so $r = 9$
w: multiply by 6, getting 6w + 10 = 18w +12 – 3w + 4, so $w = -2/3$
k: multiply by 100, getting 3k + 5(1,000 – k) = 3,400. This solves to $k = 800$. So: $9 \cdot -2/3 - {}^{-}23 + 800 = \mathbf{817}$.

9. By long division: $A = m - 2$ and $B = 4m^2 + 6m + 9$, so $\boldsymbol{A + B = 4m^2 + 7m + 7}$

10. The lowest common multiple of 4, 5, and 7 is 140. Andy has 3 more than that, or **143** *m&m's.*

11.

$$\begin{array}{l} 4x-7y=8 \\ 5x+9y=81 \end{array} \Rightarrow \begin{array}{l} -20x+35y=-40 \\ 20x+36y=324 \end{array} \Rightarrow y=4,\ x=9 \rightarrow \textit{sum of these}=13$$

$$\begin{array}{l} 5x-4y=2 \\ 2x+4y=40 \end{array} \Rightarrow x=6, y=7 \rightarrow \textit{sum of these}=13$$

The horizontal and vertical lines intersect at (-8, -5); *their sum* = -13.

The sum of all these coordinates is **13.**

12. Factoring and substituting, we get:

$$\begin{array}{l} x^2-y^2=12 \\ (x+y)(x-y)=12 \\ 4(x-y)=12 \\ x-y=3 \end{array}$$

Using the two equations $\begin{array}{l} x-y=3 \\ x+y=4 \end{array}$ we obtain $x=\frac{7}{2}, y=\frac{1}{2}$. The product xy = $\mathbf{\frac{7}{4}}$

13. The line we want has the same slope as that of the given line, which is m = -5/2.Using point slope form, we can substitute in the slope, the point (-6, 8) and a value of 0 for x, since we want the y-intercept.

$$y-8=-5/2(x+6) \rightarrow y-8=-5/2(6) \Rightarrow y=\mathbf{-7}$$

14. Substituting, with x = 2, and y = 3, we have

$$\begin{aligned} & 2\cdot 3^3\left[(6)^2+1\right]+2^6-2\cdot 3^3 \\ & =54(37)+64-54 \\ & =1998+10 \\ & =\mathbf{2008} \quad \textit{deja vu!!!} \end{aligned}$$