2024 UH Mathematics Contest
Number Sense Exam

Directions: Read the instructions carefully before you begin this exam. You will have 30 minutes to complete this exam. Solve accurately as many problems as you can in the order in which they appear and enter your answers using the panel on your screen. ALL PROBLEMS ARE TO BE SOLVED MENTALLY. Make NO calculations on paper. Enter the answer correctly for each question. You cannot erase anything once the numbers are entered. Five points will be awarded for correct answers and four points will be deducted for each problem not solved correctly and for each problem skipped. No deduction is taken for problems after the last problem attempted. All answers should be either (simplified) fractions, or decimals, or just integers. Mixed numbers are NOT allowed. Answers should be written in the most efficient form possible. Problems marked with a $(*)$ require approximate integral answers; any answer to a starred problem that is within five percent of the exact answer will be scored correct; all other problems require exact answers.

(1) $7002 - 2007 =$ _____

(2) $2 + 3 \times 5 - 7 =$ _____

(3) The negative reciprocal of .6 is _____ (fraction)

(4) $15 + 10 \div 5 \times 10 - 15 =$ _____

(5) $17 \times 13 =$ _____

(6) $602 - 2006 =$ _____

(7) $64 \div 25 =$ _____ (decimal)

(8) $25 \times 20 - 15 + 10 \div 5 =$ _____

(9) DCXX = _____ (Arabic Numeral)

(10) 12 is _____ % of 250

(11) $34^2 =$ _____

(12) $3815 \div 8 =$ _____ (decimal)

(13) The LCM of 84 and 63 is _____

*(14) $136 + 1015 - 2128 + 3645 =$ _____

(15) XXVII $\times$ CXI = _____ (Arabic Numeral)

(16) $(23 \times 19 - 15) \div 4$ has a remainder of _____

(17) If 8 ounces of candy costs \$1.47, then 2 pounds of candy will cost \$ _____

(18) $\frac{5}{8} - \frac{5}{16} - \frac{5}{24} =$ _____

(19) If $1,111,111 = 123456 \times 9 + k$, then $k =$ _____

(20) Which is larger: $1\frac{5}{12}$ or 1.45? _____ (fraction)

(21) $96 \times 97 =$ _____

(22) The multiplicative inverse of 2.125 is _____ (fraction)

(23) The number of prime numbered calendar days in the month of January is _____

(24) 34 is 85% of what? _____

(25) The arithmetic mean of $24, 21,$ and _____ is 18.

(26) 4 gallons $-$ 2 quarts $-$ 1 pint = _____ pints

(27) $6\frac{3}{5} \div 11 =$ _____ (decimal)

*(28) $\sqrt{224} \times \sqrt{325} =$ _____

(29) If $A = 1$, $B = 2A$, and $C = -3A$, then $(A + B) \div C =$ _____

(30) $f(x) = 4x^2 + 12x + 9$. $f(-8) =$ _____

(31) The 10th term in the sequence $3, 8, 13, 18, \ldots$ is _____

(32) $21^2 + 63^2 =$ _____

(33) If one dozen eggs cost \$2.40, then 2.5 dozen eggs cost \$ _____

(34) The simple interest earned on \$800.00 at 9% for 8 months is \$ _____

(35) Find the smallest prime number p, where $p > 7$ and $4p + 7$ is a prime number. _____

(36) $22 + 20 + 18 + \ldots + 2 =$ _____

(37) $\{p, l, u, s\} \cap \{m, i, n, u, s\}$ has _____ distinct elements

(38) If $|4x - 13| = 2x$ and $0 < x < 6$, then $x =$ _____ (fraction)

(39) Convert 61 base 10 to base 8. _____ $_8$

(40) $\left|-9 + |-6 + 3| + 1\right|$ _____

(41) The area of a square is $12\frac{1}{4}$ sq. inches. The perimeter of this square is _____ in.

*(42) $4\frac{2}{3} \times 1423 \div 14 =$ _____

(43) If $\frac{a}{7}$ has a remainder of 5 and $\frac{b}{7}$ has a remainder of 2, then $\frac{ab}{7}$ has a remainder of _____

(44) Given the set: $\{1, 9, 25, 49, \ldots, k, 361, \ldots\}$, $k =$ _____

(45) Let $(4x + 3)^2 = ax^2 + bx + c$. Find $b - c$. _____

(46) The largest palindrome smaller than 503 is _____

(47) 24 inches per second = _____ feet per min

(48) If x and y are positive integers and $x^2 - y^2 = 53$, then $y =$ _____

(49) The slope of the line perpendicular to the line $4x - y = 9$ is _____, (fraction)

(50) $.14114114\ldots =$ _____ (fraction)

(51) The sum of the roots of $2x^3 + 5x^2 - x + 7 = 0$ is _____

(52) 2541 cubic inches = _____ gallons

(53) The units digit of 27^{37} is _____

(54) The area of a rhombus is 135 in^2 and one diagonal is 18in. The other diagonal is _____ in

(55) If $5^x = 625$, then $x^3 =$ _____

*(56) 20 hours + 30 minutes + 40 seconds = _____ seconds

(57) $2016_8 \times 7_8 =$ _____ $_8$

(58) If P is 30% of Q and Q is $\frac{1}{4}$ of R, then P is what percent of R? _____ % (decimal)

(59) If $x < 0$ and $|2x - 5| = 9$ then $x =$ _____

(60) The simplified coefficient of the x^2y^3 term in the expansion of $(3x + 2y)^5$ is _____

(61) If $3^{2x} = 121$, then $3^{3x} =$ _____

(62) The point $(3, 2)$ is reflected across the x-axis to the point (h, k). Find $h + k$. _____

(63) If $6^{(x-1)} = 123$, then $6^x =$ _____

(64) If ..., 4.5, 1.5, x, y, ... is a geometric sequence, then the value of y is _____ (fraction)

(65) Find k, so that $3k8$ is the largest 3-digit number divisble by 6 _____

(66) $2.3 + 0.23 + 0.023 + 0.0023 =$ _____

(67) 66 feet per second = _____ miles per hour

(68) If $3x + 5 = 15$, then $3x - 5 =$ _____

(69) The smallest root of $(x + 3)^2 = \frac{1}{4}$ is _____ (decimal)

*(70) $85.7142 \times 1492 =$ _____

(71) $(259)(39)(k) = 121212$. $k =$ _____

(72) $(3 + 2\mathrm{i})(4 + 5\mathrm{i}) = a + b\mathrm{i}$. Find $a + b$. _____

(73) The largest number of regions created by five intersecting lines is _____

(74) Two numbers are in the ratio of 3 : 11. If their sum is 84, find the smaller number. _____

(75) If $9! = 2^a \times 3^b \times 5^c \times 7^d$, then $a =$ _____

(76) The line of symmetry of the parabola $y = x^2 + 2x - 3$ is $x =$ _____

(77) The probability of drawing a Queen or a King from a standard 52 card deck is _____

(78) The odds of losing is $\frac{7}{11}$. The probability of winning is _____

(79) The vertex of $y = 3x^2 - 2x - 5$ is (h, k). $h =$ _____

(80) How many ways can you arrange 6 books on a shelf taking 3 books at a time? _____

(81) If $\log 2 = .3$ and $\log 3 = .48$, then $\log 6 =$ _____

(82) $\frac{7!}{5!} = \frac{(x-1)!}{(x-2)!}$. Find x. _____

(83) How many subsets containing only 2 or 3 elements does the set $\{s, q, u, a, r, e\}$ have? _____

*(84) The area of $25x^2 + 9y^2 = 225$ is _____

(85) If $A \in$ Quadrant I and $\sin A = \frac{5}{13}$, then $\tan A =$ _____

(86) If $\log_4 2x + \log_4 3 = 2$, then $x =$ _____ (fraction)

(87) The volume of a rectangular pyramid with a base width of 2.4 in., a base length of 2.5 in., and a height 7 in. is _____ cu in.

(88) $\sin\left(-\frac{\pi}{6}\right) \times \cos\left(\frac{\pi}{3}\right) =$ _____ (fraction)

(89) How many triangles can be formed using any three vertices of a regular dodecagon? _____

(90) The minimum of $f(x) = 4 - 3\sin\left(\frac{1}{2}x\right)$ is _____

(91) The ratio of x to y is 7 to 4.
If $x - y = 24$, then $x + y =$ _____

(92) $\det\left(\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix} \times \begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}\right) =$ _____

(93) Change .202 base 5 to a base 10 fraction. _____

(94) $g(x) = x^2 + 1$ and $h(x) = 1 - x^2$, then
$g(h(2)) =$ _____

(95) $f(x) = 5x^3 + 4x^2 + 3x - 2$ divided by $x + 1$ has a remainder of _____

(96) Let $18^8 \div 36 = (2^x)(9^y)$. Find $x + y$. _____

(97) The sum of the first nine terms of the Fibonacci sequence 3, 5, 8, 13, 21, ... is _____

*(98) $(3.14)^e \times (2.718)^\pi =$ _____

(99) Find the slope of the line tangent to $y = 2x^2 + 2x - 3$ at $(2, 9)$. _____

(100) Two dice are rolled. What is the probability that the sum is divisible by 5? _____

(101) If $f'(x) = 2$ and $f(3) = 11$, find $f(18)$. _____

(102) Find x if $\det\begin{vmatrix} 3 & 9 \\ 4 & x \end{vmatrix} = 6$. $x =$ _____

(103) The roots of $x^3 + 5x^2 + 4x - 2 = 0$ are d, e, and f. Find $(d + e)(e + f)(f + d)$. _____

(104) If $f(x) = x^2 - 8x + 15$, then $f'(-1) =$ _____

(105) The domain of $y = \sqrt[4]{3 - 2x}$ is $x \leq$ _____ (decimal)

(106) How many positive 3-digit numbers divisible by 5 exist? _____

(107) How many lines are determined by four points, no three of which are collinear? _____

(108) Find $x, 6 \leq x \leq 15$, if $2x + 5 \equiv 8 (\text{mod } 7)$. _____

(109) $\lim_{x \to \infty}\left(\frac{(2x+1)(x-4)}{(x+3)(3x+1)}\right) =$ _____

(110) $\int_{-1}^{2} (6x - 5)\, dx =$ _____

(111) Let $f(x) = \frac{5x-4}{3} - 2$. Find $f^{-1}(-1)$. ____ (decimal)

*(112) $438 \div 9\frac{1}{11}\% \times 11.1 =$ _____