The University Interscholastic League
Number Sense Test • HS State • 2016

Final _____ _____
2nd _____ _____
1st _____ _____
Score Initials

Contestant's Number _____

Read directions carefully before beginning test

DO NOT UNFOLD THIS SHEET UNTIL TOLD TO BEGIN

Directions: Do not turn this page until the person conducting this test gives the signal to begin. This is a ten-minute test. There are 80 problems. Solve accurately and quickly as many as you can in the order in which they appear. ALL PROBLEMS ARE TO BE SOLVED MENTALLY. Make no calculations with paper and pencil. Write only the answer in the space provided at the end of each problem. 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.

The person conducting this contest should explain these directions to the contestants.

STOP -- WAIT FOR SIGNAL!

(1) $5232 + 425 + 2016 =$ _____

(2) $525 - 201 - 6 =$ _____

(3) $345 \times 6 =$ _____

(4) $6102 \div 4 =$ _____

(5) $3\frac{5}{8} =$ _____ (decimal)

(6) $4\frac{2}{3} + 2\frac{3}{4} =$ _____ (mixed number)

(7) $29^2 =$ _____

(8) $(5 + 2) \times 5 - 20 \div 16 =$ _____

(9) $1.0625 - \frac{9}{16} =$ _____

*(10) $1492 - 1776 + 1963 - 1044 =$ _____

(11) The arithmetic mean of 17, 23, and _____ is 26.

(12) $5\frac{3}{4} - 2\frac{1}{6} =$ _____ (mixed number)

(13) $523525 \div 9$ has a remainder of _____

(14) 20 inches + 1 foot + 6 yards = _____ inches

(15) $41\frac{2}{3}\%$ of 36 is _____

(16) If 6 TDs cost \$7.00 then 21 TDs cost \$ _____

(17) $44 \times 22 + 26 \times 22 =$ _____

(18) $14^3 =$ _____

(19) $1 + 3 + 5 + 7 + 9 + ... + 31 + 33 =$ _____

*(20) $620 \times 1975 =$ _____

(21) The multiplicative inverse of -2.2 is _____

(22) $0.23444... =$ _____ (proper fraction)

(23) Let G = {g,e,r,m,a,i,n}, P = {p,r,i,m,e} and N = {n,u,m,b,e,r}. The number of distinct elements of $(G \cap P) \cap N$ is _____.

(24) $(20 \times 16 + 52) \div 5$ has a remainder of _____

(25) $6\frac{1}{6} \times 6\frac{5}{6} =$ _____ (mixed number)

(26) $5 + |2 - 3| - 5 + |2 - 5| =$ _____

(27) $54 \times 56 =$ _____

(28) 67 base 8 in base 9 is _____ 9

(29) Given the set {1,6,15,28,45,m,91,n,153,... }. Find m + n. _____

*(30) $3\frac{5}{16} \times 1875 \div 43.75 =$ _____

(31) Round $2\sqrt{5}$ to the tenths place. _____

(32) If a = 14 and b = 6, then $a^2 + 6ab + 9b^2 =$ _____

(33) $1833\frac{1}{3}\%$ of 36 = _____

(34) The perimeter of a square is 60 cm. The area of the square is _____ cm^2

(35) The sum of the first 4 hexagonal numbers is _____

(36) How many natural numbers less than 10 are considered to be evil numbers? _____

(37) $523_6 + 525_6 =$ _____ 6

(38) $4\frac{5}{8} \div 4\frac{3}{8} =$ _____ (mixed number)

(39) The sum of the prime factors of 210 is _____

*(40) $6102325 \div 525 =$ _____

(41) 25% of 60 — 60% of 25 is _____

(42) If $(9^{-1})(x^{-1}) = 10^{-1}$ then $x =$ _____

(43) $37^2 + 67^2 =$ _____

(44) $(1 - 3i)(6 + 10i) = (a + bi)$. Find $a + b$. _____

(45) The sum of the solutions of $|x + 2| - 4 = 0$ is _____

(46) Find the units digit of 8^8. _____

(47) The sum of the number of faces, vertices, and edges of a Platonic octahedron is _____

(48) $32 \times 35 + 9 =$ _____

(49) The least value of x such that $|x + 4| \leq 2$ is _____

*(50) $75^2 + 54^2 + 33^2 =$ _____

(51) The product of the coefficient of the x^2y term of $(x + y)^3$ and the xy^3 term of $(x + y)^4$ is _____

(52) $\frac{8!}{5!} - \frac{7!}{4!} =$ _____

(53) $361 \times 215 =$ _____

(54) ${}_5C_4 - {}_5C_3 + {}_5C_2 - {}_5C_1 =$ _____

(55) The probability of selecting a perfect number from the set of natural numbers less than 101 is _____%

(56) Let $a^5b^3 \times a^{-1}b^2 \div \left(\frac{a}{b}\right)^3 = a^m b^n$. Find $m + n$. _____

(57) The sum of the reciprocals of all of the positive integral divisors of 21 is _____

(58) The first 4 digits of the decimal for $\frac{39}{110}$ is 0._____

(59) $6 + 10 + 16 + 26 + \ldots + 288 + 466 =$ _____

*(60) $\sqrt{523524525} =$ _____

(61) 120 has how many positive integral divisors? _____

(62) If $\log_4(4x + 4) = 4$ then $x =$ _____

(63) Change 0.6444... base 8 to a base 10 fraction. _____

(64) $46^2 \div 23^2 \times 11.5^2 =$ _____

(65) Let $f(x) = 5x^2 - 2x - 5$. Find $f(f(-1))$. _____

(66) $\cos^2(\frac{5\pi}{6}) \div \sin^2(\frac{5\pi}{6}) =$ _____

(67) Find k if $\begin{vmatrix} -1 & -5 \\ 12 & 22 \end{vmatrix} = 35 - k$. _____

(68) The total surface area of a rectangular prism with a base width of 5", a base length of 12", and a height of 13" is _____ in^2

(69) $19^{12} \div 5$ has a remainder of _____

*(70) $1^2 + 3^2 + 5^2 + 7^2 + 9^2 + \ldots 17^2 + 19^2 =$ _____

(71) If $6 + 9x \equiv 5 \pmod 7$, $0 \leq x \leq 6$, then $x =$ _____

(72) $y = \frac{x^3 - 2x^2 + 5}{x^2}$ has how many asymptotes? _____

(73) $(523_8)(25_8) \div 7$ has a remainder of _____

(74) If $f(x) = \frac{3x - 5}{4 - 2x}$, then $f^{-1}(-1) =$ _____

(75) Find k given the geometric sequence $\{k, 3k, 20 - k, \ldots\}$. _____

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

(77) The range of the function $y = (x + 2)^{-\frac{1}{2}}$ is $y >$ ___

(78) $\lim_{x \to 2} \frac{x^2 - 4}{x - 2} =$ _____

(79) The 3rd hexagonal number plus the 4th pentagonal number plus the 5th triangular number is _____

*(80) $4000 compounded quarterly at an annual rate of 4% for 4 years is _____ dollars (integer)

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*number) x — y means an integer between x and y inclusive

NOTE: If an answer is of the type like $\frac{2}{3}$ it cannot be written as a repeating decimal

(1) 7,673

(2) 318

(3) 2,070

(4) 1525.5, $\frac{3051}{2}$, $1525\frac{1}{2}$

(5) 3.625

(6) $7\frac{5}{12}$

(7) 841

(8) 33.75, $\frac{135}{4}$, $33\frac{3}{4}$

(9) .5, $\frac{1}{2}$

*(10) 604 — 666

(11) 38

(12) $3\frac{7}{12}$

(13) 4

(14) 248

(15) 15

(16) $24.50

(17) 1,540

(18) 2,744

(19) 289

*(20) 1,163,275 — 1,285,725

(21) $-\frac{5}{11}$

(22) $\frac{211}{900}$

(23) 3

(24) 2

(25) $42\frac{5}{36}$

(26) 4

(27) 3,024

(28) 61

(29) 186

*(30) 135 — 149

(31) 4.5, $\frac{9}{2}$, $4\frac{1}{2}$

(32) 1,024

(33) 660

(34) 225

(35) 50

(36) 4

(37) 1452

(38) $1\frac{2}{35}$

(39) 17

*(40) 11,043 — 12,204

(41) 0

(42) $\frac{10}{9}$, $1\frac{1}{9}$

(43) 5,858

(44) 28

(45) — 4

(46) 6

(47) 26

(48) 1,129

(49) — 6

*(50) 9,149 — 10,111

(51) 12

(52) 126

(53) 77,615

(54) 0

(55) 2

(56) 9

(57) $\frac{32}{21}$, $1\frac{11}{21}$

(58) 3545

(59) 1,210

*(60) 21,737 — 24,024

(61) 16

(62) 63

(63) $\frac{23}{28}$

(64) 529

(65) 11

(66) 3

(67) — 3

(68) 562

(69) 1

*(70) 1,264 — 1,396

(71) 3

(72) 2

(73) 0

(74) 1

(75) 2

(76) 10

(77) 0

(78) 4

(79) 52

*(80) 4,456 — 4,924