The University Interscholastic League
Number Sense Test • HS State • 2019

Final _____ _____

Contestant's Number _____ 2nd _____ _____

1st _____ _____

Score **Initials**

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) $503 + 350 + 530 =$ _____

(2) $504 + 450 - 45 =$ _____

(3) $15 \times 24 \div 10 =$ _____

(4) $25 \times 7.2 =$ _____

(5) $103 \div 7 - 54 \div 7 =$ _____

(6) 18 is what percent of 12? _____%

(7) $12 + 34 + 56 + 78 =$ _____

(8) $(48 - 24) \times 12 \div 6 =$ _____

(9) $5.03 \times 10^2 - 53 =$ _____

***(10)** $503 + 201 + 930 + 504 =$ _____

(11) If 1 gram = .04 oz., then 400 grams = _____ oz.

(12) The median of 5,0,3,2,0,1,9,5,0, and 4 is _____

(13) $29^2 =$ _____

(14) $53 \times 47 =$ _____

(15) The multiplicative inverse of 5.4 is _____

(16) $4\frac{2}{3} \times 9\frac{3}{4} =$ _____ (mixed number)

(17) $\sqrt[3]{2744} =$ _____

(18) The number of prime numbers greater than 50 and less than 70 is _____

(19) $3.00 is 7.5% tax on $ _____

***(20)** $503 \times 305 + 2019 =$ _____

(21) $1881 \times 19 + 361 =$ _____

(22) $54^2 - 45^2 =$ _____

(23) 503 base 10 is _____ base 7

(24) 48 inches × 6 feet × 2 yards = _____ cubic feet

(25) If A = — 4, B = — 3, and C = 2, then $AB^C =$ _____

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

(27) How many elements are in a set that has 63 proper subsets? _____

(28) $(2^4 + 6 \times 8) \div 5$ has a remainder of _____

(29) $\frac{3}{4}$ is what percent more than $\frac{3}{5}$? _____%

***(30)** $\sqrt{503} \times 1920 =$ _____

(31) Let $(27x - 23)^2 = ax^2 + bx + c$.
Find $a + b + c$. _____

(32) Let $(17x - 15)(17x + 15) = ax^2 + bx + c$.
Find $a + b + c$. _____

(33) Given: 1, 5, 12, 22, p, 51, q, 92... . $p + q =$ _____

(34) If $f(x) = 25x^2 + 30x + 9$, then f(4) is _____

(35) The slope of the line $5x - 3y = 2$ is _____

(36) How many positive integers less than 60 are relatively prime to 60? _____

(37) 1001011_2 = _____ 4

(38) Given: 2, 7, 9, 16, 25, 41, k, 107, 173, ... k = _____

(39) The smallest root of $(5x + 1)^2 = \frac{1}{16}$ is _____

*(40) $16^5 \div 8^3 \times 4^2$ = _____

(41) If $7^{(x-1)} = 50$, then $7^{(x+1)}$ = _____

(42) The sum of the roots minus the product of the roots of $15x^2 - 13x + 10 = 0$ is _____

(43) The area of a circle is 45π in^2. The radius of this circle is $a\sqrt{b}$ in., where $a > 1$. Find $a + b$. _____

(44) $(503_6)(4_6)$ = _____ 6

(45) The coefficient of the x^4y^2 term in the expansion of $(2x + 3y)^6$ is _____

(46) 503×1111 = _____

(47) $(i)^{53} = a\sqrt{b}$, where $a,b \in \{-1,1\}$. Find $a + b$. ___

(48) If $5x + y = 3$ and $2x - 3y = 5$, then x = _____

(49) A container has 2 gallons 2 quarts 2 pints of water in it. How many pints are left in the container if 5 quarts 7 pints are poured out? _____ pints

*(50) $17 \times 34 \times 51 \times 68$ = _____

(51) The integral sides of a right triangle are x, y & 13, where $x < y < 13$ and GCF(x,y) = 1. Find xy. ___

(52) The roots of $x^3 + 2x^2 - 15x = 0$ are d, e, and f. Find $(d + e)(e + f)(f + d)$. _____

(53) $(89)^2 - (55)(144)$ = _____

(54) The vertex of the parabola $x^2 - 8x + 15$ is (h, k) and $h + k$ = _____

(55) The sum of the 5th triangular number and the third pentagonal number is _____

(56) Given: 1,0,2,3,6,10,17,k,46,... . k = _____

(57) The probability of winning is 76%. The odds of winning is _____ (improper fraction)

(58) Find the sum of the reciprocals of the first nine triangular numbers. _____

(59) 534×219 = _____

*(60) $\left(\pi \times e \times \frac{\sqrt{5}+1}{2}\right)^3$ = _____

(61) In how many ways can 3 boys and 2 girls be seated in a row if a boy has to be in the first seat? _____

(62) ${}_5P_3 - {}_5C_3$ = _____

(63) $\sin(\frac{\pi}{4})\cos(\frac{3\pi}{4})\tan(\frac{5\pi}{4})$ = _____

(64) Y varies inversely as X, and X = 5 when Y = 3. Find Y when X = 7. Y = _____

(65) The first four digits of the decimal for $\frac{27}{34}$ base 8 is 0._____ base 8

(66) 140° F = _____ ° C

(67) $\begin{bmatrix} 5 & 0 \\ 3 & 4 \end{bmatrix} \times \begin{bmatrix} 2 & 1 \\ 0 & 9 \end{bmatrix} = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$. ad = _____

(68) Change $\frac{11}{216}$ to a base 6 decimal. _____ base 6

(69) The harmonic mean of the roots of $x^5 - 11x^4 + 47x^3 - 97x^2 + 96x - 36 = 0$ is _____

*(70) The volume of a cone with a radius of 9" and a height of 21" is _____ cu. in.

(71) Let $f(x) = 3x^2 - 5x - 2$. Find $f(-f(1))$. _____

(72) How many positive 2-digit numbers divisible by 3 exist? _____

(73) If $113_b = 75$, then 34_b = _____

(74) The remainder of $(3x^2 - 5x - 2) \div (x - 4)$ is ____

(75) $\lim_{x \to 0} \frac{x^2 + 3x}{x}$ = _____

(76) $\int_1^2 (3 - 4x)$ = _____

(77) $\frac{5! \times 0! - 4! \times 1!}{3! \times 2!}$ = _____

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

(79) 724×17 = _____

*(80) $3333 \times 222 \div 66$ = _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS • State • 2019

***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) 1,383

(2) 909

(3) 36

(4) 180

(5) 7

(6) 150

(7) 180

(8) 48

(9) 450

***(10) 2,032 — 2,244**

(11) 16

(12) 2.5, $\frac{5}{2}$, $2\frac{1}{2}$

(13) 841

(14) 2,491

(15) $\frac{5}{27}$

(16) $45\frac{1}{2}$

(17) 14

(18) 4

(19) $40.00

***(20) 147,663 — 163,205**

(21) 36,100

(22) 891

(23) 1316

(24) 144

(25) — 36

(26) 13

(27) 6

(28) 4

(29) 25

***(30) 40,909 — 45,214**

(31) 16

(32) 64

(33) 105

(34) 529

(35) $\frac{5}{3}$, $1\frac{2}{3}$

(36) 16

(37) 1023

(38) 66

(39) — .25, $-\frac{1}{4}$

***(40) 31,130 — 34,406**

(41) 2,450

(42) .2, $\frac{1}{5}$

(43) 8

(44) 3220

(45) 2,160

(46) 558,833

(47) 0

(48) $\frac{14}{17}$

(49) 5

***(50) 1,904,279 — 2,104,729**

(51) 60

(52) 30

(53) 1

(54) 3

(55) 27

(56) 28

(57) $\frac{19}{6}$

(58) 1.8, $\frac{9}{5}$, $1\frac{4}{5}$

(59) 116,946

***(60) 2,507 — 2,770**

(61) 72

(62) 50

(63) — .5, $-\frac{1}{2}$

(64) $\frac{15}{7}$, $2\frac{1}{7}$

(65) 6444

(66) 60

(67) 390

(68) .015

(69) 1.875, $\frac{15}{8}$, $1\frac{7}{8}$

***(70) 1,693 — 1,870**

(71) 26

(72) 30

(73) 28

(74) 26

(75) 3

(76) — 3

(77) 8

(78) 1.4, $\frac{7}{5}$, $1\frac{2}{5}$

(79) 12,308

***(80) 10,651 — 11,771**