The University Interscholastic League
Number Sense Test • HS State • 2018

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) $5418 + 8145 =$ _____

(2) $504 \times 8 =$ _____

(3) $5042018 \div 9$ has a remainder of _____

(4) $5 \times 4 \div 2^0 + 1 - 8 =$ _____

(5) $29^2 =$ _____

(6) $5420 \div 18 =$ _____ (mixed number)

(7) $5\frac{1}{4} - 1\frac{4}{5} =$ _____ (mixed number)

(8) $5.4 \div 2.5 =$ _____ (decimal)

(9) The negative reciprocal of 3.5 is _____

***(10)** $20 + 18 \times 504 =$ _____

(11) $24 \times 38 - 24 \times 14 =$ _____

(12) The GCD of 85 and 102 is _____

(13) $4 \times 8 - 12 + 16 \div 20 =$ _____

(14) The LCM of 102 and 85 is _____

(15) Simplify to lowest terms: $\frac{144}{234}$. _____

(16) The arithmetic mean of 5, 4, 20, and 18 = _____

(17) 20% of 60 less 40 is _____

(18) The largest prime number less than 95 is _____

(19) $11 \times 504 =$ _____

***(20)** $81547 \div 347 =$ _____

(21) $1797 \times 3 + 9 =$ _____

(22) $39 \times 31 - 33 \times 13 =$ _____

(23) $83 \times 87 =$ _____

(24) $(50 \times 34 - 18) \div 7$ has a remainder of _____

(25) Find the slope of the line $5x + 4y = 18$. _____

(26) $\sqrt{8836} =$ _____

(27) $405 \times 16 =$ _____

(28) $3600 = [3(12 + k)]^2$. Find $k \geq 0$. _____

(29) The largest root of $15x^2 + 7x - 4 = 0$ is _____

***(30)** $\sqrt{6} \times 597 =$ _____

(31) A pickup gets 17 miles per gallon of gas. How far can it travel on 23 gallons of gas? _____ miles

(32) 504 base 10 is written as _____ in base 7

(33) 0.0545454... _____ (proper fraction)

(34) How many positive integers less than or equal to 27 are relatively prime to 27? _____

(35) 6.5 is _____ % more than 4

(36) A regular hendecagon has how many sides? _____

(37) Find the simple interest on $500.00 at a rate of 4% for 18 months. $ _____

(38) Given: 8145B is divisible by 6. Find $B > 0$. _____

(39) Find y if $5x - y = 1$ and $4x + y = 8$. y = _____

*(40) $(248 \times 53)^2 \div (47 \times 289)$ = _____

(41) $48^2 - 58^2$ = _____

(42) $504_7 + 305_7 + 534_7$ = _____ 7

(43) Find k, given 5, 4, 9, 13, 22, ..., 57, k, 149, ... _____

(44) $5^{(-3)}$ = _____ (decimal)

(45) The vertex of $y = 4x^2 - 5x - 3$ is (h, k). h = _____

(46) The midpoint between the points (— 5,4) and (3,— 5) is (h, k). Find h + k. _____

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

(48) If 6 apps cost $12.24, then 9 apps cost $ _____

(49) 991^2 = _____

*(50) $\sqrt[3]{542018}$ = _____

(51) Let $(1 + 2i) \times (3 - 4i) = a + bi$. Find a + b. _____

(52) $i \times i \times i \times i \times i \times i$ = _____

(53) If 4, 18, and x are the sides of a triangle, then x + 5 > _____

(54) $4\log 10^5$ = _____

(55) $\frac{3}{4} + \frac{1}{2} + \frac{1}{3} + ... + \frac{8}{81} + ...$ = _____

(56) 1 + 3 + 6 + 10 + 15 + ... + 78 + 91. _____

(57) $74^2 + 33^2$ = _____

(58) $(504_6 - 405_6)(2_6)$ = _____ 6

(59) Find the sum of all positive integers x such that $3x - 6 \leq 10$. _____

*(60) $7 \times 14 \times 21 \times 28$ = _____

(61) 0.454545... base 8 = _____ base 10 (fraction)

(62) $(6x^2 + x - 7) \div (x + 1)$ has a remainder of _____

(63) X varies inversely as Y. If X = 16 when Y = 4. find Y when X = 12. Y = _____

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

(65) $f(x) = 3 - 5\cos(\pi x + 1)$. The amplitude is _____

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

(67) $\sec^2(\frac{7\pi}{6})$ = _____

(68) $f(x) = 5x^2 - 4$. $g(x) = 5 + 4x + x^2$. f(g(—1)) = ____

(69) $10^{11} \div 12$ has a remainder of _____

*(70) $\pi^5 \times e^4$ = _____

(71) If $3.2^{(x+1)} = 64$ then $3.2^{(x)}$ = _____

(72) $\lim_{x \to \infty} \frac{3\cos(x)}{x}$ = _____

(73) Let $f(x) = x^3 - 3x^2 - 2x + 1$. Find $f'(1)$. _____

(74) If $x < 0$ and $|5x + 4| = 18$ then x = _____

(75) A pair of dice is rolled. The probability of rolling a four on one die but not on both is _____

(76) If $14^4 \div 4 = (4^x)(49^y)$, then x + y = _____

(77) If $f(x) = 5 - \frac{4x - 5}{4}$ then $f^{-1}(8)$ = _____

(78) (0.571428571428571428...) ÷ (0.222...) = _____

(79) 12.5% of a mile = _____ yards

*(80) $(504.2018)^3$ = _____

DO NOT DISTRIBUTE TO STUDENTS BEFORE OR DURING THE CONTEST

University Interscholastic League - Number Sense Answer Key HS • State • 2018

***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) 13,563

(2) 4,032

(3) 2

(4) 13

(5) 841

(6) $301\frac{1}{9}$

(7) $3\frac{9}{20}$

(8) 2.16

(9) $-\frac{2}{7}$

***(10) 8,638 — 9,546**

(11) 576

(12) 17

(13) 20.8, $\frac{104}{5}$, $20\frac{4}{5}$

(14) 510

(15) $\frac{8}{13}$

(16) 11.75, $\frac{47}{4}$, $11\frac{3}{4}$

(17) — 28

(18) 89

(19) 5,544

***(20) 224 — 246**

(21) 5,400

(22) 780

(23) 7,221

(24) 2

(25) $-1.25, -\frac{5}{4}, -1\frac{1}{4}$

(26) 94

(27) 6,480

(28) 8

(29) $\frac{1}{3}$

***(30) 1,390 — 1,535**

(31) 391

(32) 1320

(33) $\frac{3}{55}$

(34) 18

(35) 62.5, $\frac{125}{2}$, $62\frac{1}{2}$

(36) 11

(37) $30.00

(38) 6

(39) 4

***(40) 12,084 — 13,355**

(41) — 1,060

(42) 1646

(43) 92

(44) .008

(45) .625, $\frac{5}{8}$

(46) $-1.5, -\frac{3}{2}, -1\frac{1}{2}$

(47) $-3.5, -\frac{7}{2}, -3\frac{1}{2}$

(48) $18.36

(49) 982,081

***(50) 78 — 85**

(51) 13

(52) — 1

(53) 19

(54) 20

(55) 2.25, $\frac{9}{4}$, $2\frac{1}{4}$

(56) 455

(57) 6,565

(58) 154

(59) 15

***(60) 54,743 — 60,505**

(61) $\frac{37}{63}$

(62) — 2

(63) $\frac{16}{3}$, $5\frac{1}{3}$

(64) 135

(65) 5

(66) .75, $\frac{3}{4}$

(67) $\frac{4}{3}$, $1\frac{1}{3}$

(68) 16

(69) 4

***(70) 15,873 — 17,543**

(71) 20

(72) 0

(73) — 5

(74) $-4.4, -\frac{22}{5}, -4\frac{2}{5}$

(75) $\frac{5}{18}$

(76) 3

(77) $-1.75, -\frac{7}{4}, -1\frac{3}{4}$

(78) $\frac{18}{7}$, $2\frac{4}{7}$

(79) 220

***(80) 121,769,012 — 134,586,802**