The University Interscholastic League
Number Sense Test • HS SAC • 2017

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) $2018 + 1802 = $ _____

(2) $852 - 258 = $ _____

(3) $10 \times 22 \times 300 = $ _____

(4) $\frac{1}{5} + \frac{1}{6} = $ _____

(5) $45\% = $ _____ **(proper fraction)**

(6) $542 \div 9 = $ _____ **(mixed number)**

(7) $16^2 = $ _____

(8) Which is larger, $\frac{2}{5}$ or $.49 = $ _____

(9) $3 \times 6 \div 9 - 12 = $ _____

*(10) $394 + 868 + 2582 = $ _____

(11) $14 \times 13 + 14 \times 27 = $ _____

(12) The GCD of 14 and 56 is _____

(13) $3\frac{1}{4} - 1\frac{5}{8} = $ _____ **(mixed number)**

(14) XLIX = _____ **(Arabic Numeral)**

(15) $3 + 6 + 9 + 12 + 15 + 18 + 21 = $ _____

(16) The arithmetic mean of 15 and 29 = _____

(17) The LCM of 12, 15, and 24 = _____

(18) $2\frac{1}{4} \times 2\frac{2}{3} = $ _____

(19) The largest prime number less than 89 is _____

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

(21) $1998 \times 2 + 4 = $ _____

(22) The number 36 has _____ positive prime divisors

(23) If 7 pens cost 84¢ then one dozen pens cost $ _____

(24) $312_4 = $ _____ **10**

(25) $F(x) = x^4 + 4x^2 + 4.$ $F(4) = $ _____

(26) $\sqrt{5776} = $ _____

(27) If $x + y = 8$ and $x - y = 3$, then $2x = $ _____

(28) $0.151515... = $ _____ **(fraction)**

(29) Given the set {2,1,3,4,7,p,q,29,47,... }. $p + q = $ _____

*(30) $248 \times 598 = $ _____

(31) A compact car needs 18 gallons of gas to travel 400 miles. The car gets _____ miles per gallon

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

(33) The sum of the positive integral divisors of 20 is __

(34) $5423 \div 4$ has a remainder of _____

(35) $\sqrt[3]{2197} = $ _____

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

(37) Find the simple interest on $300.00 at a rate of 4% for 2 years. $_____

(38) 2030 ÷ 5 = _____

(39) $4\frac{1}{5}$ is _____ % less than 7

*(40) 9092330 ÷ 2018 = _____

(41) Let $(ab^2) \times (a^{-2}b) \div (a^3b^{-3}) = a^m b^n$. mn = _____

(42) The legs of a right triangle are 7" and 24". The length of the hypotenuse is _____ "

(43) $991^2 =$ _____

(44) The sixth triangular number is _____

(45) $41^2 - 51^2 =$ _____

(46) The distance between the points (4,5) and (7,2) is k. Find k^2. _____

(47) If $2^{(x+y)} = 16$ then $(x + y)^2 =$ _____

(48) The sum of the reciprocals of all of the positive integral divisors of 8 is _____

(49) $4^{-2} =$ _____ (decimal)

*(50) $\sqrt{64000} =$ _____

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

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

(53) If 3, 8, and x are the sides of a triangle, then x + 3 > _____

(54) 3! × 4! = _____

(55) How many ways can 5 distinct books be placed on a bookshelf? _____

(56) $112_5 - 34_5 =$ _____ 5

(57) $\log_9(3) =$ _____

(58) 213 × 232 = _____

(59) If $x^2 + y^2 = 29$, x > y and both x and y are positive integers, then x = _____

*(60) 12 × 24 × 36 × 48 = _____

(61) Find the sum of all positive integers x such that 2x + 3 ≤ 9. _____

(62) $1 + \frac{1}{2} + \frac{2}{3} + \frac{3}{4} + \frac{5}{6} =$ _____

(63) 0.121212... base 4 = _____ base 10 (fraction)

(64) The volume of a cylinder is 27π dm^3. Find the height if the radius equals the height. _____ dm

(65) Let $f(x) = x^2 - 9$. Find f(f(− 3)). _____

(66) cos(120°) = _____

(67) $\sec(\frac{2\pi}{3}) =$ _____

(68) $(x^3 + 2x^2 + x + 4) \div (x - 2)$ has a remainder of _____

(69) If $12^5 \div 4 = (3^x)(4^y)$, then x + y = _____

*(70) $\pi^5 =$ _____

(71) Find x, 0 ≤ x ≤ 6, if 2x + 3 ≡ 2(mod 7). x = _____

(72) The first four digits of the decimal for $\frac{21}{33}$ base 4 is 0._____ base 4

(73) Let $f(x) = x^3 - 2x^2 - 3x + 4$. Find f '(1). _____

(74) $y = \log_2(x + 3)$ has a vertical asymptote at x = ____

(75) $\lim\limits_{x \to 3} \frac{x^2 - 9}{x - 3} =$ _____

(76) $\int_1^2 (x)\, dx =$ _____

(77) If the probability of losing is 35%, then the odds of winning is _____ (fraction)

(78) $14^2 + 39^2 =$ _____

(79) The sum of the radii of the circumscribed circle and inscribed circle of a 5, 12, 13, right triangle is _____ units.

*(80) $(1 + 2 + 3 + 4 + ... + 23 + 24)^2 =$ _____

University Interscholastic League - Number Sense Answer Key HS ● SAC ● Fall 2017

*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) 3,820

(2) 594

(3) 66,000

(4) $\frac{11}{30}$

(5) $\frac{9}{20}$

(6) $60\frac{2}{9}$

(7) 256

(8) .49, $\frac{49}{100}$

(9) — 10

*(10) 3,652 — 4,036

(11) 560

(12) 14

(13) $1\frac{5}{8}$

(14) 49

(15) 84

(16) 22

(17) 120

(18) 6

(19) 83

*(20) 257 — 283

(21) 4,000

(22) 2

(23) $1.44

(24) 54

(25) 324

(26) 76

(27) 11

(28) $\frac{5}{33}$

(29) 29

*(30) 140,889 — 155,719

(31) $\frac{200}{9}$, $22\frac{2}{9}$

(32) 12

(33) 42

(34) 3

(35) 13

(36) 9

(37) $24.00

(38) 406

(39) 40

*(40) 4,281 — 4,730

(41) — 24

(42) 25

(43) 982,081

(44) 21

(45) — 920

(46) 18

(47) 16

(48) 1.875, $\frac{15}{8}$, $1\frac{7}{8}$

(49) .0625

*(50) 241 — 265

(51) 1

(52) — 1

(53) 8

(54) 144

(55) 120

(56) 23

(57) .5, $\frac{1}{2}$

(58) 49,416

(59) 5

*(60) 472,781 — 522,547

(61) 6

(62) 3.75, $\frac{15}{4}$, $3\frac{3}{4}$

(63) $\frac{2}{5}$

(64) 3

(65) — 9

(66) — .5, — $\frac{1}{2}$

(67) — 2

(68) 22

(69) 9

*(70) 291 — 321

(71) 3

(72) 2121

(73) — 4

(74) — 3

(75) 6

(76) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

(77) $\frac{13}{7}$, $1\frac{6}{7}$

(78) 1,717

(79) 8.5, $\frac{17}{2}$, $8\frac{1}{2}$

*(80) 85,500 — 94,500