# The University Interscholastic League
# Number Sense Test • HS A • 2017

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)** $5017 - 1167 =$ _____

**(2)** $8.15 + 194.7 =$ _____ **(decimal)**

**(3)** $804 \times 5 =$ _____

**(4)** $4422 \div 6 =$ _____

**(5)** $\frac{5}{8} =$ _____ **% (mixed number)**

**(6)** $64 \times 15 =$ _____

**(7)** $24 \div 12 + 8 \times 4 - 1 =$ _____

**(8)** 1112017 ÷ 3 has a remainder of _____

**(9)** 25% of 22 is _____

***(10)** $17 + 717 + 1717 + 71717 =$ _____

**(11)** $1996 \times 3 + 12 =$ _____

**(12)** $14 \times 18 + 14 \times 32 =$ _____

**(13)** $15^2 =$ _____

**(14)** Which is greater, $\frac{7}{9}$ or $\frac{11}{13}$? _____

**(15)** The arithmetic mean of 23, 31, 18, and 36 is _____

**(16)** The LCM of 32 and 40 is _____

**(17)** $(7) + (^-5) - (3) - (^-1) =$ _____

**(18)** DLXIV = _____ **(Arabic Numeral)**

**(19)** The number of prime divisors of 80 is _____

***(20)** $18 \times 19 + 1918 =$ _____

**(21)** $1\frac{2}{3} + 3\frac{1}{2} =$ _____ **(mixed number)**

**(22)** If 8 QT's cost $12.60 then 6 QT's cost $ _____

**(23)** $1 - |1 + 2| - 3 + |5 - 8| - 13 =$ _____

**(24)** $(15 \times 29 + 43) \div 7$ has a remainder of _____

**(25)** $5^4 =$ _____

**(26)** Let P = 5, Q = 3, and R = 2. Find $PQ^R$. _____

**(27)** Let E = {e,i,n}, Z = {z,w,e,i}, and D = {d,r,e,i}. The number of distinct elements of $(D \cup E \cup Z)$ is ____.

**(28)** $112\frac{1}{2}\%$ of 24 = _____

**(29)** $\sqrt[3]{3375} =$ _____

***(30)** $2017 \times 2016 =$ _____

**(31)** A belt costs $12.00. The total cost if the tax rate is 8.5% is $ _____

**(32)** $4\frac{3}{5} - 1\frac{7}{10} =$ _____ **(mixed number)**

**(33)** 35 base 10 is _____ **in base 5**

**(34)** Given the set {1,9,25,49, ... ,k,361,... }. k = _____

**(35)** 6 is to 10 as x is to 15. Find x. _____

(36) A right triangle with an height of 12 cm and an area of 30 $cm^2$ has a base of _____ cm

(37) If $a = -5$ and $b = 4$, then $a^2 - 2ab + b^2 =$ _____

(38) The multiplicative inverse of 2.8 is _____

(39) $3x + 4y = 5$ and $x + 2y = -3$. $x =$ _____

*(40) $116117 \div 348 =$ _____

(41) The product of the roots of $5x^2 - 2x - 5 = 0$ is ___

(42) The sum of the integral values of x such that $1 + |x - 2| \leq 3$ is _____

(43) $33^2 + 27^2 =$ _____

(44) Let $(2i)^2(i^3) = a\sqrt{b}$. Find $a + b$. _____

(45) Let $(a^2b^2) \times (a^3b^{-3}) \div (a^{-1}b) = a^mb^n$. Find $m + n$. _____

(46) The fifth pentagonal number is _____

(47) The number of triangles from a given vertex in a regular hexagon is _____

(48) $5! \div 4! \times 3! =$ _____

(49) 25% of 32 — 75% of 64 is _____

*(50) $\sqrt{1062017} =$ _____

(51) The coefficient of the $xy^2$ term of $(2x + y)^3$ is ____

(52) $\log_9(27) \div \log_9(3) =$ _____

(53) 0.2434343... = _____ (proper fraction)

(54) ${}_7C_3 =$ _____

(55) Three coins are flipped. The odds of getting one tail and two heads is _____ (proper fraction)

(56) $234_7 - 56_7 =$ _____ 7

(57) The sum of the reciprocals of all of the positive integral divisors of 10 is _____

(58) $18^2 - 12^2 =$ _____

(59) The length of the major axis of $9x^2 + 4y^2 = 36$ is _____

*(60) $28 \times 29 \times 30 \times 31 =$ _____

(61) If $4^{(x-1)} = 2^{(x+3)}$ then $x =$ _____

(62) Let $\begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix} + \begin{bmatrix} -4 & 2 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$. Find abcd. _____

(63) The remainder of $(2x^2 - 5x - 1) \div (x + 3)$ is ____

(64) The Cartesian coordinate $(1, \sqrt{3})$ written in polar coordinate form is $(r, \theta)$. Find r. _____

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

(66) $2\sin(\frac{3\pi}{4})\cos(\frac{3\pi}{4}) =$ _____

(67) Find k if $\begin{vmatrix} -2 & 1 \\ -1 & 1 \end{vmatrix} = k - 1$. _____

(68) The lateral surface area of a cube with edge length 3 inches is _____ sq. inches

(69) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[5\sqrt{5}\right]$. _____

*(70) $34^4 \times 17^2 \div 17^4 =$ _____

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

(72) $32 \times 35 + 9 =$ _____

(73) $f(x) = x^3 - 3x^2 - 5x + 7$. Find $f''(-1) =$ _____

(74) Change 0.123 base 4 to a base 10 fraction. _____

(75) The first four digits of the decimal for $\frac{23}{33}$ base 4 is 0._____ in base 4.

(76) The graph of $y = \frac{5x-1}{25x^2+1}$ has _____ asymptote(s)

(77) $14^7 \div 6$ has a remaider of _____

(78) $\int_0^3 (x-1)^2\,dx =$ _____

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

*(80) $4\frac{2}{3} \times 1423 \div 14 =$ _____

**University Interscholastic League - Number Sense Answer Key HS ● Invitation A ● 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) 3,850**

**(2) 202.85**

**(3) 4,020**

**(4) 737**

**(5) $62\frac{1}{2}$**

**(6) 960**

**(7) 33**

**(8) 1**

**(9) 5.5, $\frac{11}{2}$, $5\frac{1}{2}$**

***(10) 70,460 — 77,876**

**(11) 6,000**

**(12) 700**

**(13) 225**

**(14) $\frac{11}{13}$**

**(15) 27**

**(16) 160**

**(17) 0**

**(18) 564**

**(19) 2**

***(20) 2,147 — 2,373**

**(21) $5\frac{1}{6}$**

**(22) $9.45**

**(23) — 15**

**(24) 2**

**(25) 625**

**(26) 45**

**(27) 7**

**(28) 27**

**(29) 15**

***(30) 3,862,959 — 4,269,585**

**(31) $13.02**

**(32) $2\frac{9}{10}$**

**(33) 120**

**(34) 289**

**(35) 9**

**(36) 5**

**(37) 81**

**(38) $\frac{5}{14}$**

**(39) 11**

***(40) 317 — 350**

**(41) — 1**

**(42) 10**

**(43) 1,818**

**(44) 3**

**(45) 4**

**(46) 35**

**(47) 10**

**(48) 30**

**(49) — 40**

***(50) 980 — 1,082**

**(51) 6**

**(52) 3**

**(53) $\frac{241}{990}$**

**(54) 35**

**(55) $\frac{3}{5}$**

**(56) 145**

**(57) 1.8, $\frac{9}{5}$, $1\frac{4}{5}$**

**(58) 180**

**(59) 6**

***(60) 717,402 — 792,918**

**(61) 5**

**(62) 2**

**(63) 32**

**(64) 2**

**(65) 2**

**(66) — 1**

**(67) 0**

**(68) 36**

**(69) 11**

***(70) 4,393 — 4,855**

**(71) — 6**

**(72) 1,129**

**(73) — 12**

**(74) $\frac{27}{64}$**

**(75) 2323**

**(76) 1**

**(77) 2**

**(78) 3**

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

***(80) 451 — 498**