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

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) $116 + 611 =$ _____

(2) $345 - 612 =$ _____

(3) $116 \times 5 =$ _____

(4) $0.444... =$ _____ (proper fraction)

(5) $36\% =$ _____(proper fraction)

(6) $14^2 =$ _____

(7) $1616 \div 4 =$ _____

(8) $9 - 12 \times 6 \div 3 =$ _____

(9) $2\frac{1}{8} =$ _____ (decimal)

***(10)** $1601 + 1610 + 1160 + 1061 =$ _____

(11) $1\frac{1}{6} + 2\frac{3}{4} =$ _____ (mixed number)

(12) $65 \times 25 =$ _____

(13) $345 \div 9 =$ _____ (mixed number)

(14) 15% of $44 =$ _____

(15) Which is larger, 0.63 or $\frac{5}{8}$? _____

(16) MDCVI = _____ (Arabic numeral)

(17) The GCD of 35, 56, and 70 is _____

(18) 2 yards — 1 foot — 6 inches = _____ inches

(19) $3\frac{4}{7} - 1\frac{3}{5} =$ _____ (mixed number)

***(20)** $373 \times 464 =$ _____

(21) 12% of $166\frac{2}{3} =$ _____

(22) The additive inverse of 0.444... is _____

(23) $12^2 + 4^2 =$ _____

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

(25) $41 \times 39 =$ _____

(26) $|1 + 4 - 7| - |7 + 1 - 4| =$ _____

(27) If 12 pens cost \$1.60 then 9 pens cost \$ _____

(28) $0.3111... =$ _____ (proper fraction)

(29) Set T = {t,i,m,e,s} and M = {s,q,u,a,r,e}. $T \cap M$ contains how many distinct elements? _____

***(30)** $3\frac{1}{5} \times 12515 \div 16 =$ _____

(31) $(21 \times 7 - 14) \div 6$ has a remainder of _____

(32) If $5x - 1 = 9$, then $x - 5 =$ _____

(33) $1\frac{2}{5} \times 1\frac{1}{14} =$ _____ (mixed number)

(34) $1 + 3 + 5 + 7 + ... + 17 + 19 =$ _____

(35) If $x = 11$ and $y = 8$ then $x^2 - 2xy + y^2 =$ _____

(36) 67 base 8 in base 10 is _____

(37) $14 \times \frac{15}{16} =$ _____ (mixed number)

(38) The area of a rectangle with a length of 1.25 ft and a width of 3.2 ft is _____sq. ft

(39) The product of the first 3 prime numbers is _____

*(40) $\sqrt{12515} =$ _____

(41) 35% of 40 + 45% of 50 is _____

(42) The leg opposite the 60° angle in a right triangle is $12\sqrt{3}$ cm. The hypotenuse is _____ cm

(43) If $x^{-1} - 2^{-1} = 3^{-1}$ then x = _____

(44) The midpoint of the segment with endpoints (— 1, — 2) and (3, 4) is (x, y). Find x + y. _____

(45) The sum of the roots of $(2x + 3)^2 = 0$ is _____

(46) Let $16^{-2} \times 16^3 \div 16^5 = 16^k$. Find k. _____

(47) $18 \times 22 + 4 =$ _____

(48) $123_6 - 45_6 =$ _____$_6$

(49) The sum of the solutions of $|x - 1| = 3$ is _____

*(50) $12^3 \times 6^2 =$ _____

(51) The middle term of the 5th row of Pascal's triangle is _____

(52) Each face of a Platonic octahedron has _____ sides

(53) Find the 7th term of the Fibonacci sequence, 1, 1, 2, 3, ... _____

(54) If $\frac{4!}{6!} = \frac{1}{x}$, then x = _____

(55) ${}_6C_4 - {}_6C_2 =$ _____

(56) $12^2 \div 6^2 \times 3^2 =$ _____

(57) (2 + 3i) (4 — 5i) = (a + bi). Find ab. _____

(58) $221 \times 133 =$ _____

(59) The probability of selecting an even integer between 1 and 11 is _____ (proper fraction)

*(60) $322.3 \times 37.73 =$ _____

(61) The number of positive integral divisors of 48 is __

(62) $11^{13} \div 15$ has a remainder of _____

(63) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[1 - \frac{\sqrt{5}+1}{2}\right]$. _____

(64) If $f(x) = (x - 3)(x^2 - 6x + 9)$, then f(18) = _____

(65) The volume of a rectangular prism with base width 5", base length 12", and height 13" is _____ in^3

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

(67) Find k if $\begin{vmatrix} -1 & -3 \\ 6 & 10 \end{vmatrix} = 15k$. _____

(68) $2\sin(\frac{\pi}{4})\cos(\frac{\pi}{4}) =$ _____

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

*(70) $(28 + 24 + 20 + 16 + 12 + 8 + 4)^2 =$ _____

(71) The product of the 2nd triangular number and the 2nd pentagonal number is _____

(72) $0.242424..._5 =$ _____ $_5$ (proper fraction)

(73) Truncate $(2\sqrt{3} + 3\sqrt{2})$ to the nearest whole. ___

(74) The first four digits of the decimal for $\frac{14}{33}$ is 0. ___

(75) If $f(x) = \sqrt{x + 2}$, then $f^{-1}(4) =$ _____

(76) $f(x) = 2x^3 + 6x^2 + 6x + 2$. Find $f'(-1) =$ _____

(77) $\int_1^2 (3x - 4)\,dx =$ _____

(78) The largest number in the domain of $y^2 = 4 - x^2$ is _____

(79) The minimum value of $f(x) = 5(x - 3)^2 + 2$ is ____

*(80) The interest on $6000 for 6 years at 6% compounded semiannually is _____ dollars (integer)

University Interscholastic League - Number Sense Answer Key HS ● Invitation A ● 2016

***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) 727

(2) — 267

(3) 580

(4) $\frac{4}{9}$

(5) $\frac{9}{25}$

(6) 196

(7) 404

(8) — 15

(9) 2.125

***(10) 5,161 — 5,703**

(11) $3\frac{11}{12}$

(12) 1,625

(13) $38\frac{1}{3}$

(14) 6.6, $\frac{33}{5}$, $6\frac{3}{5}$

(15) .63, $\frac{63}{100}$

(16) 1,606

(17) 7

(18) 54

(19) $1\frac{34}{35}$

***(20) 164,419 — 181,725**

(21) 20

(22) — $\frac{4}{9}$

(23) 160

(24) 13

(25) 1,599

(26) — 2

(27) $1.20

(28) $\frac{14}{45}$

(29) 2

***(30) 2,378 — 2,628**

(31) 1

(32) — 3

(33) $1\frac{1}{2}$

(34) 100

(35) 9

(36) 55

(37) $13\frac{1}{8}$

(38) 4

(39) 30

***(40) 107 — 117**

(41) 36.5, $\frac{73}{2}$, $36\frac{1}{2}$

(42) 24

(43) 1.2, $\frac{6}{5}$, $1\frac{1}{5}$

(44) 2

(45) — 3

(46) — 4

(47) 400

(48) 34

(49) 2

***(50) 59,098 — 65,318**

(51) 6

(52) 3

(53) 13

(54) 30

(55) 0

(56) 36

(57) 46

(58) 29,393

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

***(60) 11,553 — 12,768**

(61) 10

(62) 11

(63) — 1

(64) 3,375

(65) 780

(66) 1

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

(68) 1

(69) $\frac{27}{64}$

***(70) 11,917 — 13,171**

(71) 15

(72) $\frac{12}{22}$ (not reducible)

(73) 7

(74) 4242

(75) 14

(76) 0

(77) .5, $\frac{1}{2}$

(78) 2

(79) 2

***(80) 2,427 — 2,682**