The University Interscholastic League
Number Sense Test • HS Regional • 2015

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) $2015 - 425 =$ _____

(2) $5.24 + 510.2 =$ _____ **(decimal)**

(3) $248 \times 15 =$ _____

(4) $154 \div 25 =$ _____ **(decimal)**

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

(6) $42515 \div 11$ **has a remainder of** _____

(7) $5\frac{1}{2} - 4\frac{2}{5} =$ _____ **(mixed number)**

(8) $[4 \times (2 - 5) + 2^0 - 1] \div 15 =$ _____

(9) $23^2 =$ _____

***(10)** $5102 + 524 + 425 + 2015 =$ _____

(11) $9.090909...\% =$ _____

(12) **2 gallons — 2 quarts — 2 pints = ____ fluid ounces**

(13) $47 \times 74 =$ _____

(14) $4 + 8 + 12 + 16 + ... + 44 + 48 =$ _____

(15) **MMDCCCXV =** _____ **(Arabic Numeral)**

(16) $4\frac{2}{5} + 4\frac{1}{4} =$ _____ **(mixed number)**

(17) $428 \times 12 =$ _____

(18) **If 20 YURs cost $24.48 then 15 YURs cost $_____**

(19) $14^3 =$ _____

***(20)** $4.23 \times 42.8 \times 2015 =$ _____

(21) $(23 \times 28 + 15) \div 4$ **has a remainder of** _____

(22) $23^2 + 69^2 =$ _____

(23) $5\frac{1}{2} \div 4\frac{2}{5} =$ _____ **(mixed number)**

(24) $5102_6 =$ _____ **10**

(25) **Set A has 8 elements and set B has 11 elements. If $A \cap B$ has 5 elements, then $A \cup B$ has ___ elements**

(26) **If** $4x + 2 = 8$ **then** $2x - 15 =$ _____

(27) **If** $x = 15$ **and** $y = 28$ **then** $x^2 - 2xy + y^2 =$ _____

(28) **Find the ratio of the perimeter of a 3.5" x 6" rectangle to its area.** _____

(29) **0.2888...** _____ **(proper fraction)**

***(30)** $\sqrt{627} \times \sqrt{959} =$ _____

(31) **30% of 60 less 90 is** _____

(32) $20_9 + 15_9 + 428_9 =$ _____ **9**

(33) **How many subsets containing only 4 elements does the set {f,r,a,c,t,i,o,n} have?** _____

(34) $3\frac{1}{8} \times 3\frac{3}{5} =$ _____ **(mixed number)**

(35) 28 is divisible by how many natural numbers? ___

(36) $23 \times \frac{26}{29}$ = _____ (mixed number)

(37) Truncate $\sqrt{7}$ to the tenth place. _____

(38) $(0.111...)^{-2} + (0.125)^{-1} - (1.5)^{0}$ = _____

(39) If $x + (x + 3) + (x + 6) + ... + (x + 15) + (x + 18)$ equals 91, then $(x + 9)$ = _____

*(40) $\sqrt{5102824}$ = _____

(41) The sum of the roots of $4x^3 - 8x^2 + x + 3 = 0$ is S and the product of the roots is P. S + P = _____

(42) $(2 - i)(5 - 3i) = a + bi$. Find a + b. _____

(43) 25×0.3125 = _____

(44) $266\frac{2}{3}\%$ of 36 = _____

(45) The arithmetic mean of 23, 37, 19, & 29 is _____

(46) How many positive integers less than 45 are relatively prime to 45? _____

(47) The first 4 digits of the decimal of $\frac{419}{990}$ is 0._____

(48) A 20 element set has _____ improper subsets

(49) The point (— 3, — 5) is reflected across the line y = x to the point (h, k). Find h + k. _____

*(50) 2015423 ÷ 428 = _____

(51) ${}_6P_2$ = _____

(52) The odds of randomly selecting a composite number from $\{x \mid 0 < x < 20\}$ is _____

(53) $43^2 + 26^2$ = _____

(54) $3 + 7 + 10 + 17 + ... + 71 + 115 + 186$ = _____

(55) Let $\frac{9!}{8!} = \frac{(x - 1)!}{x!}$. Find x. _____

(56) $202_7 \div 5_7$ = _____ 7

(57) $10^2 \div 5^2 \times (2.5)^2$ = _____

(58) The probability of randomly selecting a Fibonacci number from the set of odd digits is _____%

(59) 323×325 = _____

*(60) $33^3 \div 22^2 \times 11$ = _____

(61) If $\csc \theta = 1.4$ then $\sin \theta$ = _____

(62) f(x) = 2x + 3 and g(x) = 2 — 5x. g(f(— 1)) = _____

(63) $\left| \begin{bmatrix} -2 & 5 \\ 1 & 5 \end{bmatrix} \right|$ = _____

(64) The amplitude of $y = 1 - 2\sin 3\pi(4\theta - 5)$ is _____

(65) Change $0.7444..._8$ to a base 8 fraction. _____ 8

(66) The simplified coefficient of the x^3y term in the expansion of $(2x + 5y)^4$ is _____

(67) If $f(x) = 4 - \frac{3 + 2x}{5}$, then $f^{-1}(-1)$ = _____

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

(69) The harmonic mean of the roots of $x^3 - 7x^2 + 12x - 6 = 0$ is _____

*(70) 5714.28×63 = _____

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

(72) The base of a triangle is 18 cm. If the altitude is increased from 9 cm to 12 cm, the corresponding increase in the area is _____ sq. cm.

(73) $143 \times 77 = 1001 \times$ _____

(74) If ln(10) = ln(80) — kln(2), then k = _____

(75) $\int_{-1}^{1} (2x - 3)\, dx$ = _____

(76) GCD(40, k) = 8. LCM(40, k) = 280. k = _____

(77) $12^3 + 13^3$ = _____

(78) $\sum_{k=1}^{3} (-k)^3$ = _____

(79) $110101_2 + 10111011_2$ = _____ 8

*(80) 96 rods is equivalent to _____ yards

University Interscholastic League - Number Sense Answer Key HS ● Regional ● 2015

***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) 1,590

(2) 515.44

(3) 3,720

(4) 6.16

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

(6) 0

(7) $1\frac{1}{10}$

(8) $-.8, -\frac{4}{5}$

(9) 529

***(10) 7,663 — 8,469**

(11) $\frac{1}{11}$

(12) 160

(13) 3,478

(14) 312

(15) 2,815

(16) $8\frac{13}{20}$

(17) 5,136

(18) $18.36

(19) 2,744

***(20) 346,564 — 383,043**

(21) 3

(22) 5,290

(23) $1\frac{1}{4}$

(24) 1,118

(25) 14

(26) — 12

(27) 169

(28) $\frac{19}{21}$

(29) $\frac{13}{45}$

***(30) 737 — 814**

(31) — 72

(32) 464

(33) 70

(34) $11\frac{1}{4}$

(35) 6

(36) $20\frac{18}{19}$

(37) 2.6

(38) 88

(39) 13

***(40) 2,146 — 2,371**

(41) 1.25, $\frac{5}{4}$, $1\frac{1}{4}$

(42) — 4

(43) 7.8125, $\frac{125}{16}$, $7\frac{13}{16}$

(44) 96

(45) 27

(46) 24

(47) 4232

(48) 1

(49) — 8

***(50) 4,474 — 4,944**

(51) 30

(52) $\frac{10}{9}$, $1\frac{1}{9}$

(53) 2,525

(54) 480

(55) $\frac{1}{9}$

(56) 26

(57) 25

(58) 60

(59) 104,975

***(60) 776 — 857**

(61) $\frac{5}{7}$

(62) — 3

(63) — 15

(64) 2

(65) $\frac{65}{70}$

(66) 160

(67) 11

(68) 3

(69) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

***(70) 342,000 — 377,999**

(71) 225

(72) 27

(73) 11

(74) 3

(75) — 6

(76) 56

(77) 3,925

(78) — 36

(79) 360

***(80) 502 — 554**