The University Interscholastic League
Number Sense Test • HS A • 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) $1927 + 2015 =$ _____

(2) $109 - 207 - 2015 =$ _____

(3) $214 \times 15 =$ _____

(4) $2015 \div 9 =$ _____ **(mixed number)**

(5) $14^2 =$ _____

(6) $0.1666... =$ _____ **(proper fraction)**

(7) $20\frac{1}{9} + 15\frac{2}{7} =$ _____ **(mixed number)**

(8) 64 is _____% of 1600

(9) $10 \times (9 - 20) \div (7 + 15) =$ _____

***(10)** $20720 + 10915 =$ _____

(11) $83.333...\% =$ _____ **(proper fraction)**

(12) $9 \times 20 + 9 \times 15 =$ _____

(13) $235 \times 14 =$ _____

(14) $2\frac{1}{6} - 4\frac{3}{5} =$ _____ **(mixed number)**

(15) $1 + 2 + 3 + 4 + ... + 28 =$ _____

(16) MDXXIX = _____ **(Arabic Numeral)**

(17) $2197 \div 13 =$ _____

(18) 1 yard + 2 feet + 3 inches = _____ inches

(19) $109207 \div 11$ has a remainder of _____

***(20)** $5102702 \div 109 =$ _____

(21) $1 - |3 - 6| + |10 - 15| + 21 =$ _____

(22) If 4 CDs cost $25.00 then 10 CDs cost $_____

(23) $1\frac{3}{4} \times 2\frac{2}{3} =$ _____ **(mixed number)**

(24) $14^2 + 42^2 =$ _____

(25) If $1.111... \times k = 1$, then $k =$ _____

(26) If $x - 3 = 5$ then $3x + 5 =$ _____

(27) $(19 \times 27 + 15) \div 6$ has a remainder of _____

(28) If $x + (x + 3) + (x + 6) + (x + 9) + (x + 12) = 40$ then $(x + 6) =$ _____

(29) $432_5 =$ _____ 10

***(30)** $\sqrt{109} \times \sqrt{207} =$ _____

(31) $5\frac{1}{4} \div 2\frac{1}{3} =$ _____ **(mixed number)**

(32) Let M = {m,i,x,e,d} and N = {n,u,m,b,e,r}. How many unique elements are in $M \cap N$? _____

(33) 78 is divisible by how many natural numbers?____

(34) Round $\sqrt{2}$ to the thousandth place. _____

(35) The length of a rectangle is 1 more than the width. Find the perimeter if the area is 20 cm^2. _____ cm.

(36) How many subsets containing only 2 elements does the set {p,o,i,n,t} have? _____

(37) If x = 5 and y = 9 then $x^2 + 2xy + y^2$ = _____

(38) If $4^x = 64$ then x^4 = _____

(39) How long does it take to drive 210 miles at a rate of 60 mph? _____ hours

*(40) $98 \times \frac{1}{4} \times 728 \times \frac{1}{7}$ = _____

(41) $\frac{11}{25} - \frac{43}{101}$ = _____

(42) $2 + 7 + 9 + 16 + 25 + 41 + 66 + 107$ = _____

(43) If $x - y = -2$ and $xy = 2$ then $x^3 - y^3$ = _____

(44) $13 \times \frac{14}{15}$ = _____

(45) P,Q, and R are the roots of $2x^3 - 9x^2 - 2x + 8 = 0$. Find PQR + P + Q + R. _____

(46) Find k if $21^2 - 29^2 = -16k$. k = _____

(47) The arithmetic mean of 18, 31, and 53 is _____

(48) 12% of $266\frac{2}{3}$ = _____

(49) $344_5 + 43_5$ = _____ 5

*(50) The volume of a right cylinder with a radius of 6" and a height of 9" is _____ cu. in

(51) $(4 - 13i)(4 + 13i) = (a + bi)$. Find b. _____

(52) Let $\frac{7!}{6!} = \frac{x!}{(x-1)!}$. Find x. _____

(53) 126×261 = _____

(54) $145_6 \div 5_6$ = _____ 6

(55) The legs of a right △ are 5" and 12". The length of the altitude to the hypotenuse is _____ inches

(56) If $2\log_3(3x) = 4$ then x = _____

(57) The point (— 1, 5) is reflected across the line y = 2 to the point (h, k). Find k. _____

(58) The probability of drawing a 2, 3, or 4 from a standard 52 card deck is _____

(59) The first 4 digits of the decimal of $\frac{253}{999}$ is 0._____

*(60) $8^4 \div 4^4 \times 2^4$ = _____

(61) Change 0.4777..._8 to a base 8 fraction. _____ 8

(62) The greatest integer function $f(x) = [x + 2]$ has a value of _____ for $f(\sqrt{2})$

(63) $2\sin 15° \cos 15°$ = _____

(64) If $\ln(60) = \ln(15) + 2\ln(k)$, then k = _____

(65) The simplified coefficient of the xy^2 term in the expansion of $(2x + y)^3$ is _____

(66) 27×37 = _____

(67) How many positive integers less than 32 are relatively prime to 32? _____

(68) The larger root of $3x^2 + 8x + 5 = 0$ is _____

(69) The seventh term of 3, 8, 11, 19, 30, ... is _____

*(70) 1092015 ÷ 207 = _____

(71) The perimeter of a square is increased from 17.5" to 18.5". Find the corresponding increase in the area of the square. _____ sq. in.

(72) Find k if $\det\begin{bmatrix} k & -5 \\ 4 & -6 \end{bmatrix} = 3$. k = _____

(73) 2 bushels + 2 pecks = _____ quarts

(74) $\lim_{x \to \infty} \frac{2x}{4x - 1}$ = _____

(75) The polar coordinates of the rectangular coordinate $(1, \sqrt{3})$ are (r , θ). θ = _____°

(76) If $f(x) = 2x^3 - 3x^2 + 4x$, then $f'(-1)$ = _____

(77) The graph of $y = \frac{x + 4}{x^2 + 16}$ has _____ asymptote(s)

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

(79) $\frac{1}{80} + \frac{1}{48} + \frac{1}{24} + \frac{1}{8}$ = _____

*(80) $55\frac{5}{9}$% of 555 ÷ 0.55 = _____

University Interscholastic League - Number Sense Answer Key HS ● Invitation A ● 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) 3,942

(2) — 2,113

(3) 3,210

(4) $223\frac{8}{9}$

(5) 196

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

(7) $35\frac{25}{63}$

(8) 4

(9) — 5

***(10) 30,054 — 33,216**

(11) $\frac{5}{6}$

(12) 315

(13) 3,290

(14) $-2\frac{13}{30}$

(15) 406

(16) 1,529

(17) 169

(18) 63

(19) 10

***(20) 44,474 — 49,154**

(21) 24

(22) $62.50

(23) $4\frac{2}{3}$

(24) 1,960

(25) .9, $\frac{9}{10}$

(26) 29

(27) 0

(28) 8

(29) 117

***(30) 143 — 157**

(31) $2\frac{1}{4}$

(32) 2

(33) 8

(34) 1.414

(35) 18

(36) 10

(37) 196

(38) 81

(39) 3.5, $\frac{7}{2}$, $3\frac{1}{2}$

***(40) 2,421 — 2,675**

(41) $\frac{36}{2525}$

(42) 273

(43) — 20

(44) $12\frac{2}{15}$

(45) .5, $\frac{1}{2}$

(46) 25

(47) 34

(48) 32

(49) 442

***(50) 967 — 1,068**

(51) 0

(52) 7

(53) 32,886

(54) 21

(55) $\frac{60}{13}$, $4\frac{8}{13}$

(56) 3

(57) — 1

(58) $\frac{3}{13}$

(59) 2532

***(60) 244 — 268**

(61) $\frac{5}{10}$

(62) 3

(63) .5, $\frac{1}{2}$

(64) 2

(65) 6

(66) 999

(67) 16

(68) — 1

(69) 79

***(70) 5,012 — 5,539**

(71) 2.25, $\frac{9}{4}$, $2\frac{1}{4}$

(72) $\frac{17}{6}$, $2\frac{5}{6}$

(73) 80

(74) .5, $\frac{1}{2}$

(75) 60

(76) 16

(77) 1

(78) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

(79) .2, $\frac{1}{5}$

***(80) 533 — 588**