The University Interscholastic League
Number Sense Test • HS State • 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) $421 + 2017 =$ _____

(2) $2017 - 421 =$ _____

(3) $7112 \div 4 =$ _____

(4) $21.17 \times 0.4 =$ _____ (decimal)

(5) $18.75\% =$ _____ (proper fraction)

(6) $1\frac{2}{3} - \frac{8}{9} =$ _____

(7) $(32 - 16) \div 8 + 4 \times 2 - 1 =$ _____

(8) 28 is _____% of 80

(9) 42117 ÷ 6 has a remainder of _____

***(10)** $7 + 71 + 711 + 7112 + 71124 =$ _____

(11) $1992 \times 12 + 96 =$ _____

(12) $75 \div 17 - 41 \div 17 =$ _____

(13) If 6 goobs cost $28.50 then 9 goobs cost $ _____

(14) $7.5 \times 5.2 =$ _____

(15) $\frac{11}{15} + \frac{15}{11} =$ _____ (mixed number)

(16) The LCM of 34 and 85 is _____

(17) 4 yards — 2 feet — 1 inch = _____ inches

(18) $34^2 =$ _____

(19) The sum of what number and 15 gives the same result as the positive difference between that number and 33? _____

***(20)** $421 \times 17 + 2017 =$ _____

(21) $5^2 - 4^3 + 3^4 =$ _____

(22) $\sqrt{3969} =$ _____

(23) Let F = {f,o,r,m,u,l,a} and S = {s,o,l,v,e,r}. The number of distinct elements of (F ∩ S) is _____

(24) $(421 \times 20 - 17) \div 8$ has a remainder of _____

(25) $6\frac{7}{8} - 4\frac{5}{6} =$ _____ (mixed number)

(26) 0.6888... = _____ (proper fraction)

(27) A right triangle with a base of 25 cm and an area of 150 cm^2 has a height of _____ cm

(28) How many positive integers less than or equal to 27 are relatively prime to 27? _____

(29) Given the set {8,3,11,14,p,39,q,...}. $p + q =$ _____

***(30)** $56 \times 28 \times 14 =$ _____

(31) A truck gets 14 miles per gallon. How many gallons will it take to travel 77 miles? _____ gal

(32) 79 base 10 is _____ in base 8

(33) 0.24666... = _____ (proper fraction)

(34) $3x - 2y = 4$ and $2x + y = 5$. $x =$ _____

(35) 6 is to 15 as 9 is to _____

(36) $b = 4$, $16a^2 - 8ab + b^2 = 64$, and $a > 0$. $a =$ _____

(37) $666\frac{2}{3}\%$ of $333\frac{1}{3} =$ _____

(38) $\frac{2}{5} + \frac{3}{10} - \frac{4}{15} =$ _____

(39) Let $P = -2$, $Q = 3$ and $R = 45$. Find $(Q^P)R$. _____

*(40) $42123 \div 532 =$ _____

(41) Round $(\sqrt{8} \times \sqrt{6})$ to a whole number. _____

(42) The circle $x^2 + y^2 - 4x - 14y + 4 = 0$ has (h, k) as its center and r as its radius. $h + k + r =$ _____

(43) $34^2 - 46^2 =$ _____

(44) Let P, Q, and R be the roots of $x^3 - 7x = 6$. Find $(P + Q + R) + (PQR)$. _____

(45) The 12^{th} triangular number is _____

(46) 65% of 60 − 55% of 50 is _____

(47) $7! \div 5! - 4! \div 2! =$ _____

(48) The sum of the integral values of x such that $|x - 1| + 3 < 5$ is _____

(49) $444_5 \times 11_5 =$ _____ 5

*(50) $12 \times 24 \times 36 \times 48 =$ _____

(51) $777 \times \frac{7}{37} =$ _____

(52) $2\log_4(8) \div 2\log_3(3) =$ _____

(53) $314 \times 262 =$ _____

(54) The length of the major axis of $5x^2 + 9y^2 = 45$ is _____

(55) Four pennies are flipped. The odds of getting all heads or all tails is _____ (proper fraction)

(56) The first four digits of the decimal for $\frac{5}{18}$ is 0._____

(57) Let $(a^4b^{-2}) \div (a^{-1}b^3) \div (a^5b^5) = a^mb^n$. Find $m + n$. _____

(58) $9\frac{2}{3} \times 6\frac{1}{3} =$ _____ (mixed number)

(59) ${}_6P_3 \div {}_6C_3 =$ _____

*(60) $7\frac{1}{9} \times 71916 \div 16 =$ _____

(61) If $3^{(2x-1)} = 243$ then $3^x =$ _____

(62) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[\sqrt{8} \times \sqrt{6}\right]$. _____

(63) The remainder of $(4x^2 + 2x - 1) \div (x - 3)$ is ____

(64) Change $0.3454545..._6$ to a base 10 fraction. _____

(65) $f(x) = 5 - 2x$ and $g(x) = 2 + 5x$. $f(g(-1)) =$ _____

(66) $11235_8 \div 7_8$ has a remainder of _____ 8

(67) Find k if $\begin{vmatrix} -4 & 2 \\ k & 1 \end{vmatrix} = 8 + 2k$. _____

(68) The total surface area of a cube with a lateral surface area of 64 sq. inches is _____ sq. inches

(69) $2\cos(\frac{2\pi}{3})\sin(\frac{3\pi}{2}) =$ _____

*(70) $24^4 \times 12^2 \div 12^4 =$ _____

(71) If $f(x) = \frac{7}{5x - 3} + 2$, then $f^{-1}(-1) =$ _____

(72) $53 \times 57 + 9 =$ _____

(73) Let $y = \frac{x + 3}{x - 5}$. The two asymptotes intersect at (x, y). Find $x + y$. _____

(74) $f(x) = x^4 - x^3 - 7x^2 + x + 6$. Find $f''(2) =$ _____

(75) $\int_{-1}^{2} (6x - 5)\,dx =$ _____

(76) $10^{12} \div 14$ has a remainder of _____

(77) Find the slope of the line tangent to the graph of $f(x) = 3x^2 - 5x + 1$ at $x = 2$. _____

(78) If $68 \pmod{14} \equiv x$, where $0 \leq x \leq 9$, then $x =$ ____

(79) $\lim_{x \to +\infty} \frac{x^2}{1 - x^2} =$ _____

*(80) $\sqrt[3]{1234567} =$ _____

University Interscholastic League - Number Sense Answer Key HS ● State ● 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) 2,438

(2) 1,596

(3) 1,778

(4) 8.468

(5) $\frac{3}{16}$

(6) $\frac{7}{9}$

(7) 9

(8) 35

(9) 3

***(10) 75,074 — 82,976**

(11) 24,000

(12) 2

(13) $42.75

(14) 39

(15) $2\frac{16}{165}$

(16) 170

(17) 119

(18) 1,156

(19) 9

***(20) 8,716 — 9,632**

(21) 42

(22) 63

(23) 3

(24) 3

(25) $2\frac{1}{24}$

(26) $\frac{31}{45}$

(27) 12

(28) 18

(29) 89

***(30) 20,855 — 23,049**

(31) 5.5, $\frac{11}{2}$, $5\frac{1}{2}$

(32) 117

(33) $\frac{37}{150}$

(34) 2

(35) 22.5, $\frac{45}{2}$, $22\frac{1}{2}$

(36) 3

(37) $2{,}222\frac{2}{9}$, $\frac{20000}{9}$

(38) $\frac{13}{30}$

(39) 5

***(40) 76 — 83**

(41) 7

(42) 16

(43) — 960

(44) 6

(45) 78

(46) 11.5, $\frac{23}{2}$, $11\frac{1}{2}$

(47) 30

(48) 3

(49) 10434

***(50) 472,781 — 522,547**

(51) 147

(52) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

(53) 82,268

(54) 6

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

(56) 2777

(57) — 10

(58) $61\frac{2}{9}$

(59) 6

***(60) 30,365 — 33,560**

(61) 27

(62) 6

(63) 41

(64) $\frac{67}{105}$

(65) 11

(66) 5

(67) — 3

(68) 96

(69) 1

***(70) 2,189 — 2,419**

(71) $\frac{2}{15}$

(72) 3,030

(73) 6

(74) 22

(75) — 6

(76) 8

(77) 7

(78) 12

(79) — 1

***(80) 102 — 112**