The University Interscholastic League
Number Sense Test • HS Regional • 2017

Final _____ _____
2nd _____ _____
1st _____ _____
Score Initials

Contestant's Number _____

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) $2017 - 910 =$ _____

(2) $1997 + 1408 =$ _____

(3) $910 \div 8 =$ _____ (mixed number)

(4) $13.6 \times 0.5 =$ _____

(5) $\frac{7}{25} =$ _____%

(6) $\frac{3}{5} - 1\frac{1}{2} =$ _____

(7) 15% of 48 is _____

(8) $2 + 5 \times 9 - 14 \div (20 - 27) =$ _____

(9) $132 \times 14 =$ _____

*(10) $7102 + 910 + 109 + 2017 =$ _____

(11) $1991 \times 8 + 72 =$ _____

(12) $27^2 =$ _____

(13) $15^3 =$ _____

(14) If 32 Ems cost $43.84 then 4 Ems cost $ _____

(15) The arithmetic mean of 27, 16, 9, and 40 is _____

(16) If 1 cm = 0.39" then 20 decimeters = _____"

(17) $\frac{4}{7} - \frac{3}{14} + \frac{5}{28} =$ _____

(18) The sum of the positive prime divisors of 70 is _____

(19) CMXVII — MXX = _____ (Arabic Numeral)

*(20) $17 \times 23 + 1723 =$ _____

(21) $1 - |5 - 12| - 22 - |3 - 5| =$ _____

(22) $\sqrt{1936} =$ _____

(23) 4 yards — 5 feet + 9 inches = _____ inches

(24) $(9 \times 10 + 20) \div 17$ has a remainder of _____

(25) $3\frac{1}{4} \times 2\frac{3}{5} =$ _____ (mixed number)

(26) The sum of the solutions of $|2x + 3| = 5$ is _____

(27) $(\{p,l,u,s\} \cup \{m,i,n,u,s\}) \cap \{t,i,m,e,s\}$ has _____ distinct elements

(28) $(3^4) + (2^4) - 1 =$ _____

(29) 8 is to 12 as 12 is to x. Find x. _____

*(30) $23 \times 27 \times 58 =$ _____

(31) Find the simple interest on $600 at 12% for 24 months. $ _____

(32) $11\frac{2}{9}\%$ of 81 = _____ (decimal)

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

(34) $a = 4$, $a^2 + 10ab + 25b^2 = 81$, and $b > 0$. b = _____

(35) 123 base 10 is _____ in base 4

(36) The perimeter of a rectangle with a width of 4 yds and an area of 18 yds^2 is _____ yds

(37) $22 \times 16 + 56 \times 32 =$ _____

(38) How many positive natural numbers less than or equal to 30 are relatively prime to 30? _____

(39) If $5x - 3y = 2$ and $x - y = 1$ then $x =$ _____

*(40) $\sqrt{9201017} =$ _____

(41) $27^2 - 18^2 =$ _____

(42) The sides of a triangle are 10", 5", and $5\sqrt{3}$ ". The smallest angle of the triangle is _____ degrees

(43) Let $3(i)^4(i)^5 = a\sqrt{b}$. Find $a + b$. _____

(44) Let P, Q, & R be the roots of $x^3 + 3x^2 - 11x = 18$. Find $(P + Q + R)(PQR)$. _____

(45) Find the measure of a central angle of a regular decagon. _____ degrees

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

(47) $217_8 + 721_8 - 172_8 =$ _____ 8

(48) The sum of the reciprocals of all of the positive integral divisors of 26 is _____

(49) If $\frac{5!4!}{6!} = \frac{(x-1)!}{(x-2)!}$, then $x =$ _____

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

(51) The number of distinct diagonals of a regular nonagon is _____

(52) $\log_3(81) \div \log_3(27) =$ _____

(53) $579 \times 123 =$ _____

(54) If (x, y) is the midpoint of the segment with endpoints of (2, 8) and (6, 1), then $x + y =$ _____

(55) Four pennies are flipped. The odds of three heads and one tail being face up is ____ (proper fraction)

(56) Truncate $3\sqrt{5}$ to the nearest tenth. _____

(57) Y varies indirectly with X and Y = 10 when X = 2. Find Y when X = 6. _____

(58) The length of the minor axis of $16x^2 + 25y^2 = 400$ is _____

(59) The first four digits of the decimal for $\frac{15}{330}$ is 0. ____

*(60) $6\frac{3}{4} \times 60006 \div 18 =$ _____

(61) If $7^{(x)} = 16{,}807$ then $7^{(x+1)} =$ _____

(62) $\begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} 4 & 2 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$. $a + b + c + d =$ ____

(63) Change $0.4212121..._6$ to a base 10 fraction. _____

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

(65) $F(x) = 9x - 10$. $G(x) = 20x + 17$. $G(-F(1)) =$ _____

(66) $\cos^2(\frac{5\pi}{6}) - \sin^2(\frac{5\pi}{6}) =$ _____

(67) Let vector a = (11, 60). Find $\|a\|$. _____

(68) The edge of a cube with a lateral surface area of 9 sq. inches is _____ inches

(69) $2357_8 \div 7_8$ has a remainder of _____ 8

*(70) $8^4 \times 32^3 \div 16^2 =$ _____

(71) The domain of $y = \sqrt[4]{3 - 2x}$ is $x \leq$ _____

(72) $112 \times 118 + 9 =$ _____

(73) Let $f(x) = \frac{x^2}{6} + \frac{x}{3} + 1$. Find $f'(-2)$. _____

(74) The first four digits of the decimal for $\frac{3}{4}$ base 7 is 0._____ in base 7.

(75) If $f(x) = 9 - \frac{10 + 20x}{17}$, then $f^{-1}(5) =$ _____

(76) The range of $y = \sqrt[4]{3 - 2x}$ is $y \geq$ _____

(77) $11^{12} \div 13$ has a remainder of _____

(78) The Greatest Integer Function is written as $f(x) = [x]$. Find $\left[3\pi \times \frac{\sqrt{5} - 1}{2}\right]$. _____

(79) How many triangles can be formed using any three vertices of a regular dodecagon? _____

*(80) $\sqrt[3]{2222222} =$ _____

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*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) 1,107

(2) 3,405

(3) $113\frac{3}{4}$

(4) 6.8, $\frac{34}{5}$, $6\frac{4}{5}$

(5) 28

(6) —.9, $-\frac{9}{10}$

(7) 7.2, $\frac{36}{5}$, $7\frac{1}{5}$

(8) 49

(9) 1,848

*(10) 9,632 — 10,644

(11) 16,000

(12) 729

(13) 3,375

(14) $5.48

(15) 23

(16) 78

(17) $\frac{15}{28}$

(18) 14

(19) —103

*(20) 2,009 — 2,219

(21) —30

(22) 44

(23) 93

(24) 8

(25) $8\frac{9}{20}$

(26) —3

(27) 3

(28) 96

(29) 18

*(30) 34,218 — 37,818

(31) $144.00

(32) 9.09

(33) $\frac{16}{3}$, $5\frac{1}{3}$

(34) 1

(35) 1323

(36) 17

(37) 2,144

(38) 8

(39) —.5, $-\frac{1}{2}$

*(40) 2,882 — 3,184

(41) 405

(42) 30

(43) 2

(44) —54

(45) 36

(46) 2

(47) 746

(48) $\frac{21}{13}$, $1\frac{8}{13}$

(49) 5

*(50) 472,781 — 522,547

(51) 27

(52) $\frac{4}{3}$, $1\frac{1}{3}$

(53) 71,217

(54) 8.5, $\frac{17}{2}$, $8\frac{1}{2}$

(55) $\frac{1}{3}$

(56) 6.7, $\frac{67}{10}$, $6\frac{7}{10}$

(57) $\frac{10}{3}$, $3\frac{1}{3}$

(58) 8

(59) 0454

*(60) 21,378 — 23,627

(61) 117,649

(62) 21

(63) $\frac{51}{70}$

(64) 120

(65) 37

(66) .5, $\frac{1}{2}$

(67) 61

(68) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

(69) 3

*(70) 498,074 — 550,502

(71) 1.5, $\frac{3}{2}$, $1\frac{1}{2}$

(72) 13,225

(73) $-\frac{1}{3}$

(74) 5151

(75) 2.9, $\frac{29}{10}$, $2\frac{9}{10}$

(76) 0

(77) 1

(78) 5

(79) 220

*(80) 124 — 137