

The University Interscholastic League

Number Sense Test • HS B • 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!

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|--|---|
| <p>(1) $1492 + 1865 =$ _____</p> <p>(2) $23.5 \times 0.7 =$ _____ (decimal)</p> <p>(3) $2824 \div 4 =$ _____ (mixed number)</p> <p>(4) $112 - 35 - 8 =$ _____</p> <p>(5) $1\frac{3}{5} =$ _____ %</p> <p>(6) $21^2 =$ _____</p> <p>(7) $1.333... \times 36 =$ _____</p> <p>(8) $45 \times 54 - 24 \times 45 =$ _____</p> <p>(9) 108 is _____ % of 27</p> <p>*(10) $213 + 4711 + 18294 - 7 =$ _____</p> <p>(11) $1996 \times 5 + 20 =$ _____</p> <p>(12) $(11 - 7) \times 5 \div (3 + 2) =$ _____</p> <p>(13) $275 \times 11 =$ _____</p> <p>(14) $22017 \div 9$ has a remainder of _____</p> <p>(15) The sum of the positive divisors of 50 is _____</p> <p>(16) The GCD of 18, 24, and 36 is _____</p> <p>(17) $\frac{3}{5} - \frac{1}{10} + \frac{2}{15} =$ _____</p> <p>(18) $12 \text{ ft} \times 6 \text{ ft} \times 4 \text{ ft} =$ _____ cubic yards</p> | <p>(19) $DLXV + CCXIX =$ _____ (Arabic Numeral)</p> <p>*(20) $275 \times 31 - 2017 =$ _____</p> <p>(21) $1\frac{1}{5} + 1\frac{3}{7} =$ _____ (mixed number)</p> <p>(22) $4^4 =$ _____</p> <p>(23) If $x^{-1} = 2^{-2} + 3^0$ then $x =$ _____</p> <p>(24) 131 base 5 is _____ in base 10</p> <p>(25) $1\frac{1}{7} - 1\frac{3}{5} =$ _____</p> <p>(26) The sum of the solutions of $x + 2 = 3$ is _____</p> <p>(27) $8\frac{1}{3}\%$ of 72 = _____</p> <p>(28) $(20 \times 17 - 19) \div 8$ has a remainder of _____</p> <p>(29) $(\{p,l,u,s\} \cap \{m,i,n,u,s\}) \cup \{t,i,m,e,s\}$ has _____ distinct elements.</p> <p>*(30) $7102111 \div 1967 =$ _____</p> <p>(31) Let $\frac{6}{x} = \frac{4}{5}$. Find $x =$ _____</p> <p>(32) $0.2444... =$ _____ (proper fraction)</p> <p>(33) Given: $\{1,8,27,64,...,2197,k,3375,...\}$. Find k. _____</p> <p>(34) How long would it take to travel 450 miles at 75 miles per hour? _____ hours</p> |
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- (35) Let $2x + y = 1$ and $x + 2y = 3$. $y =$ _____
- (36) 48 base 10 is _____ in base 6
- (37) If $a = 3$ and $4a^2 + 4ab + b^2 = 25$, then $b =$ _____
- (38) How many positive natural numbers less than 12 are relatively prime to 12? _____
- (39) The length of the diagonals of a square is $16\sqrt{2}$ cm. The perimeter of the square is _____ cm
- *(40) $28 \times 25 \times 14 =$ _____
- (41) $36^2 - 24^2 =$ _____
- (42) The sides of a triangle are 6", 3", and $3\sqrt{3}$ ". The smallest angle of the triangle is _____ degrees.
- (43) Let P, Q, & R be the roots of $x^3 - 6x^2 + 11x = 6$. Find $PQ + PR + QR$. _____
- (44) If $i^{(11)} = a\sqrt{b}$. Find $a + b$. _____
- (45) $1 + 3 + 5 + 7 + \dots + 21 + 23 =$ _____
- (46) The sum of the integral values of x such that $|x + 1| - 2 \leq 3$ is _____
- (47) The area of the ellipse $9x^2 + 4y^2 = 36$ is $k\pi$. Find k . _____
- (48) The sum of the reciprocals of all of the positive integral divisors of 9 is _____
- (49) If $\log_5(x) = \log_5(15) - \log_5(10)$ then $x =$ _____
- *(50) $\sqrt{2017102} =$ _____
- (51) The coefficient of the x^2y term of $(x - y)^3$ is _____
- (52) ${}_4P_2 \div {}_4C_2 =$ _____
- (53) Y varies directly with X and $Y = 6$ when $X = 9$. Find X when $Y = 10$. _____
- (54) $215 \times 213 =$ _____
- (55) Round $\sqrt{3} + \sqrt{6}$ to the tenths place. _____
- (56) The number of distinct diagonals of a regular pentagon is _____
- (57) $235_7 \times 6_7 =$ _____ ₇
- (58) The first four digits of the decimal for $\frac{4}{111}$ is 0.____
- (59) The probability of selecting a factor of 12 from the set of digits is _____%
- *(60) $55 \times 45 \times 35 \div 25 =$ _____
- (61) If $3^{(x+1)} = 81$ then $9^{(x-1)} =$ _____
- (62) $75^2 - 50^2 =$ _____
- (63) Change $0.232323\dots_5$ to a base 10 fraction. _____
- (64) Vector $a = (-4, -9)$ and vector $b = (-1, 2)$. Find the dot product ab . _____
- (65) $F(x) = 4x - 1$. $G(x) = x + 4$. $G(F(2)) =$ _____
- (66) $2\cos^2(30^\circ) - 1 =$ _____
- (67) $\begin{bmatrix} 3 & 1 \\ 0 & 2 \end{bmatrix} \times \begin{bmatrix} 2 & 1 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$. $ab + cd =$ _____
- (68) The volume of a cube with a face area of 16 cm^2 is _____ cm^3
- (69) $12^6 \div 5$ has a remainder of _____
- *(70) $4^4 \times 16^4 \div 16^2 =$ _____
- (71) $12 + 67 \pmod{36} \equiv x$, where $0 \leq x \leq 9$. $x =$ _____
- (72) $22 \times 26 + 4 =$ _____
- (73) The sum of the radii of the circumscribed circle and inscribed circle of a 9, 40, 41, right triangle is _____ units.
- (74) $\int_0^1 (2x - 1)^2 dx =$ _____
- (75) $0.141414\dots$ base 6 = _____ ₆ (proper fraction)
- (76) $\lim_{x \rightarrow \infty} \frac{2x-3}{1-x} =$ _____
- (77) The range of $y = \sqrt{3x - 1}$ is $y \geq$ _____
- (78) How many triangles can be formed using any three vertices of a regular octagon? _____
- (79) $444 \times \frac{4}{37} =$ _____
- *(80) $4\frac{2}{3} \times 32016 \div 21 =$ _____

University Interscholastic League - Number Sense Answer Key HS • Invitation B • 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

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|------------------------------------|--|--|--|
| (1) 3,357 | (19) 784 | (35) $\frac{5}{3}, 1\frac{2}{3}$ | (58) 0360 |
| (2) 16.45 | *(20) 6,183 — 6,833 | (36) 120 | (59) 50 |
| (3) 706 | (21) $2\frac{22}{35}$ | (37) — 1 | *(60) 3,292 — 3,638 |
| (4) 69 | (22) 256 | (38) 4 | (61) 81 |
| (5) 160 | (23) $.8, \frac{4}{5}$ | (39) 64 | (62) 3,125 |
| (6) 441 | (24) 41 | *(40) 9,310 — 10,290 | (63) $\frac{13}{24}$ |
| (7) 48 | (25) $-\frac{16}{35}$ | (41) 720 | (64) — 14 |
| (8) 1,350 | (26) — 4 | (42) 30 | (65) 11 |
| (9) 400 | (27) 6 | (43) 11 | (66) $.5, \frac{1}{2}$ |
| *(10) 22,051 — 24,371 | (28) 1 | (44) — 2 | (67) 40 |
| (11) 10,000 | (29) 6 | (45) 144 | (68) 64 |
| (12) 4 | *(30) 3,431 — 3,791 | (46) — 11 | (69) 4 |
| (13) 3,025 | (31) $7.5, \frac{15}{2}, 7\frac{1}{2}$ | (47) 6 | *(70) 62,260 — 68,812 |
| (14) 3 | (32) $\frac{11}{45}$ | (48) $\frac{13}{9}, 1\frac{4}{9}$ | (71) 7 |
| (15) 93 | (33) 2,744 | (49) $1.5, \frac{3}{2}, 1\frac{1}{2}$ | (72) 576 |
| (16) 6 | (34) 6 | *(50) 1,350 — 1,491 | (73) $24.5, \frac{49}{2}, 24\frac{1}{2}$ |
| (17) $\frac{19}{30}$ | | (51) — 3 | (74) $\frac{1}{3}$ |
| (18) $\frac{32}{3}, 10\frac{2}{3}$ | | (52) 2 | (75) $\frac{2}{11}$ |
| | | (53) 15 | (76) — 2 |
| | | (54) 45,795 | (77) 0 |
| | | (55) $4.2, \frac{21}{5}, 4\frac{1}{5}$ | (78) 56 |
| | | (56) 5 | (79) 48 |
| | | (57) 2112 | *(80) 6,759 — 7,470 |