

# The University Interscholastic League

## Number Sense Test • HS Regional • 2016

Contestant's Number \_\_\_\_\_

Final \_\_\_\_\_

2nd \_\_\_\_\_

1st \_\_\_\_\_

Read directions carefully  
before beginning test

**DO NOT UNFOLD THIS SHEET  
UNTIL TOLD TO BEGIN**

Score \_\_\_\_\_

Initials \_\_\_\_\_

**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!**

- |  |   |
|--|---|
| <p>(1) <math>6102 - 524 - 423 =</math> _____</p> <p>(2) <math>234 \times 5 =</math> _____</p> <p>(3) <math>1947 \div 3 =</math> _____</p> <p>(4) <math>0.1875 =</math> _____ (proper fraction)</p> <p>(5) <math>55\% =</math> _____ (proper fraction)</p> <p>(6) <math>31^2 =</math> _____</p> <p>(7) <math>5 + 2 - 3 \times 5 \div (2 - 4) + 2^0 + 1 \times 6 =</math> _____</p> <p>(8) <math>13^3 =</math> _____</p> <p>(9) <math>1111967 \div 9</math> has a remainder of _____</p> <p>*(10) <math>246 - 1357 + 2134 - 711 =</math> _____</p> <p>(11) <math>4\frac{1}{4} + 3\frac{1}{3} =</math> _____ (mixed number)</p> <p>(12) <math>135 \times 12 =</math> _____</p> <p>(13) <math>42325 \div 8</math> has a remainder of _____</p> <p>(14) <math>125\%</math> of <math>88 =</math> _____</p> <p>(15) <math>5\frac{2}{5} - 3\frac{2}{3} =</math> _____ (mixed number)</p> <p>(16) If 8 <math>\square</math>'s cost \$6.40 then 5 <math>\square</math>'s cost \$ _____</p> <p>(17) <math>37 \times 14 + 14 \times 33 =</math> _____</p> <p>(18) <math>CXXV \times XLIV =</math> _____ (Arabic numeral)</p> | <p>(19) 4 gallons — 2 quarts — 2 pints = _____ cups</p> <p>*(20) <math>815 \times 1947 =</math> _____</p> <p>(21) <math>2^5 + 4^3 + 8^2 =</math> _____</p> <p>(22) What number divided by four gives the same result as that number minus twelve? _____</p> <p>(23) Let <math>x = -1</math>. Find <math>3x^2 + 6x - 9</math>. _____</p> <p>(24) The sum of three consecutive even integers is 144. The smallest of the three integers is _____</p> <p>(25) <math>4\frac{1}{2} \times 2\frac{1}{10} =</math> _____ (mixed number)</p> <p>(26) <math>23 \times \frac{26}{29} =</math> _____ (mixed number)</p> <p>(27) What is <math>27\%</math> of <math>444\frac{4}{9} =</math> _____</p> <p>(28) <math>0.02555\ldots =</math> _____ (proper fraction)</p> <p>(29) <math>F = \{f, o, r, t, y\}</math>, <math>S = \{s, i, x, t, y\}</math>, and <math>E = \{e, i, g, h, t, y\}</math>. <math>(F \cup S) \cap E</math> has how many distinct elements? _____</p> <p>*(30) <math>4\frac{2}{3} \times 1423 \div 14 =</math> _____</p> <p>(31) <math>15^2 + 45^2 =</math> _____</p> <p>(32) If <math>7x - 5 = 3</math>, then <math>7x + 1 =</math> _____</p> <p>(33) 213 base 4 in base 10 is _____</p> <p>(34) If <math>a = 22</math> and <math>b = 14</math>, then <math>4a^2 - 4ab + b^2 =</math> _____</p> |
|--|---|

- (35)  $\left(\frac{9}{16}\right)^{\frac{3}{2}} =$  \_\_\_\_\_
- (36) Given the set  $\{1, 5, 12, 22, m, 51, 70, n, 117, 145, \dots\}$ .  
Find  $m + n$ . \_\_\_\_\_
- (37)  $36 \times 53 =$  \_\_\_\_\_
- (38)  $4\frac{5}{8} \times 4\frac{3}{8} =$  \_\_\_\_\_ (mixed number)
- (39)  $(22 + 44 \times 66) \div 8$  has a remainder of \_\_\_\_\_
- \*(40)  $\sqrt{523524} =$  \_\_\_\_\_
- (41)  $31 \times 39 + 16 =$  \_\_\_\_\_
- (42) Let  $39^4 \times 39^{-2} \div 39^k = 39^3$ . Find  $k$ . \_\_\_\_\_
- (43) The sum of the roots of  $9x^2 - 6x = -1$  is \_\_\_\_\_
- (44) The area of a right triangle with a base of 40 cm and a hypotenuse of 41 cm is \_\_\_\_\_  $\text{cm}^2$
- (45) The midpoint of the segment with end points  $(-1, 3)$  and  $(6, -10)$  is  $(x, y)$ . Find  $x + y$ . \_\_\_\_\_
- (46) If  $3^{-2} + x^{-1} = 6^{-1}$  then  $x =$  \_\_\_\_\_
- (47) Which of the following is an odious number, 3, 5, or 7? \_\_\_\_\_
- (48) The sum of the integral values of  $x$  such that  $|x - 2| - 4 \leq 6$  is \_\_\_\_\_
- (49) The sum of the number of faces, the number of sides, and the number of vertices of a Platonic icosahedron is \_\_\_\_\_
- \*(50)  $4^2 \times 3^4 \times 2^5 =$  \_\_\_\_\_
- (51)  $(2 + 3i) \div 5i = (a + bi)$ . Find  $(a + b)$ . \_\_\_\_\_
- (52) Find the 5<sup>th</sup> term of the geometric sequence, 81,  $-27$ , 9,  $-3$ , ... . \_\_\_\_\_
- (53)  ${}_7C_5 \times {}_5P_3 =$  \_\_\_\_\_
- (54) If  $\frac{5!4!}{6!} = \frac{(x+1)!}{x!}$ , then  $x =$  \_\_\_\_\_
- (55)  $8 + 15 + 23 + 38 + 61 + \dots + 160 + 259 =$  \_\_\_\_\_
- (56) The sum of the coefficients of the  $x^3y^2$  term and the  $xy^4$  term of  $(x + y)^5$  is \_\_\_\_\_
- (57)  $423 \times 425 =$  \_\_\_\_\_
- (58) Find the units digit of  $18^7$ . \_\_\_\_\_
- (59) The odds of selecting a pentagonal number from the set of digits is \_\_\_\_\_ (proper fraction)
- \*(60)  $4232016 \div 425 =$  \_\_\_\_\_
- (61) The sum of the reciprocals of all of the positive divisors of 35 is \_\_\_\_\_
- (62)  $7^{10} \div 13$  has a remainder of \_\_\_\_\_
- (63) The Greatest Integer Function is written as  $f(x) = [x]$ . Find  $\left[\frac{\sqrt{5}+1}{2} - 3.14\right]$ . \_\_\_\_\_
- (64) If  $\log_8(4x + 3) = 2$  then  $x =$  \_\_\_\_\_
- (65)  $524_6 + 423_6 + 201_6 =$  \_\_\_\_\_  $_6$
- (66) Change  $0.4232323\dots_5$  to a base 10 fraction. \_\_\_\_\_
- (67) How many positive integers less than 20 are relatively prime to 20? \_\_\_\_\_
- (68)  $1 - \cos^2\left(\frac{5\pi}{3}\right) =$  \_\_\_\_\_
- (69) The first four digits of the decimal for  $\frac{7}{11}$  is 0. \_\_\_\_\_
- \*(70)  $2^2 + 4^2 + 6^2 + 8^2 + \dots + 14^2 + 16^2 =$  \_\_\_\_\_
- (71) Truncate  $5\sqrt{6}$  to the nearest tenth. \_\_\_\_\_
- (72) The largest element of the range of  $y^2 = 16 - x^2$  is \_\_\_\_\_
- (73) If  $f(x) = \frac{2}{x+3} - 1$ , then  $f^{-1}(-4) =$  \_\_\_\_\_
- (74)  $\int_{-1}^1 (3x - 4) dx =$  \_\_\_\_\_
- (75) If  $3x - 2 \equiv 4 \pmod{8}$ ,  $0 \leq x \leq 7$ , then  $x =$  \_\_\_\_\_
- (76) The 1<sup>st</sup> triangular number times the 2<sup>nd</sup> hexagonal number times the 3<sup>rd</sup> pentagonal number is \_\_\_\_\_
- (77) The domain of the function  $\sqrt{\ln(e^x)}$  is  $x \geq$  \_\_\_\_\_
- (78) How many subsets containing only 4 elements does the set  $\{r, e, g, i, o, n\}$  have? \_\_\_\_\_
- (79)  $44^2 \div 22^2 \times 11^2 =$  \_\_\_\_\_
- \*(80) The interest on \$5000 for 2.5 years at a simple interest rate of 1.5% is \_\_\_\_\_ dollars (integer)

University Interscholastic League - Number Sense Answer Key HS • Regional • 2016

\*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) 5,155                               | (19) 52                        | (35) $\frac{27}{64}$   | (58) 2                                    |
| (2) 1,170                               | *(20) 1,507,465 —<br>1,666,145 | (36) 127               | (59) $\frac{1}{4}$                        |
| (3) 649                                 | (21) 160                       | (37) 1,908             | *(60) 9,460 — 10,455                      |
| (4) $\frac{3}{16}$                      | (22) 16                        | (38) $20\frac{15}{64}$ | (61) $\frac{48}{35}, 1\frac{13}{35}$      |
| (5) $\frac{11}{20}$                     | (23) — 12                      | (39) 6                 | (62) 4                                    |
| (6) 961                                 | (24) 46                        | *(40) 688 — 759        | (63) — 2                                  |
| (7) 21.5, $\frac{43}{2}, 21\frac{1}{2}$ | (25) $9\frac{9}{20}$           | (41) 1,225             | (64) 15.25, $\frac{61}{4}, 15\frac{1}{4}$ |
| (8) 2,197                               | (26) $20\frac{18}{29}$         | (42) — 1               | (65) 1552                                 |
| (9) 8                                   | (27) 120                       | (43) $\frac{2}{3}$     | (66) $\frac{109}{120}$                    |
| *(10) 297 — 327                         | (28) $\frac{23}{900}$          | (44) 180               | (67) 8                                    |
| (11) $7\frac{7}{12}$                    | (29) 3                         | (45) — 1               | (68) .75, $\frac{3}{4}$                   |
| (12) 1,620                              | *(30) 451 — 498                | (46) 18                | (69) 6363                                 |
| (13) 5                                  | (31) 2,250                     | (47) 7                 | *(70) 776 — 856                           |
| (14) 110                                | (32) 9                         | (48) 42                | (71) 12.2, $\frac{61}{5}, 12\frac{1}{5}$  |
| (15) $1\frac{11}{15}$                   | (33) 39                        | (49) 62                | (72) 4                                    |
| (16) \$4.00                             | (34) 900                       | *(50) 39,399 — 43,545  | (73) — $\frac{11}{3}, -3\frac{2}{3}$      |
| (17) 980                                |                                | (51) .2, $\frac{1}{5}$ | (74) — 8                                  |
| (18) 5,500                              |                                | (52) 1                 | (75) 2                                    |
|   |                                | (53) 1,260             | (76) 72                                   |
|   |                                | (54) 3                 | (77) 0                                    |
|   |                                | (55) 663               | (78) 15                                   |
|   |                                | (56) 15                | (79) 484                                  |
|   |                                | (57) 179,775           | *(80) 179 — 196                           |