

# The University Interscholastic League

## Number Sense Test • HS District • 2017

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

Read directions carefully  
before beginning test

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

Final	_____
2nd	_____
1st	_____
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!**

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|--|--|
| <p>(1) <math>320 + 2017 =</math> _____</p> <p>(2) <math>20.17 - 3.25 =</math> _____ (decimal)</p> <p>(3) <math>235 \times 8 =</math> _____</p> <p>(4) <math>2517 \div 9 =</math> _____ (mixed number)</p> <p>(5) <math>32\% =</math> _____ (proper fraction)</p> <p>(6) <math>2\frac{3}{5} + 1\frac{1}{2} =</math> _____ (mixed number)</p> <p>(7) <math>16^2 =</math> _____</p> <p>(8) <math>1 + 2 \times (3 - 4) \div (5 - 6) =</math> _____</p> <p>(9) <math>3202517 \div 3</math> has a remainder of _____</p> <p>*(10) <math>1347 + 1118 + 294 + 776 =</math> _____</p> <p>(11) <math>1996 \times 7 + 28 =</math> _____</p> <p>(12) <math>94 \div 22 - 28 \div 22 =</math> _____</p> <p>(13) If 8 pens cost \$17.60 then 10 pens cost \$ _____</p> <p>(14) Which is greater, <math>\frac{11}{15}</math> or <math>\frac{14}{17}</math>? _____</p> <p>(15) If 1 cm = 0.39" then 10 meters = _____ "</p> <p>(16) The GCD of 48, 32, and 24 is _____</p> <p>(17) <math>26 + 54 + 72 + 18 + 36 + 64 =</math> _____</p> <p>(18) <math>\frac{11}{15} + \frac{15}{11} =</math> _____ (mixed number)</p> | <p>(19) CXLV — DL = _____ (Arabic Numeral)</p> <p>*(20) <math>17 \times 25 + 2517 =</math> _____</p> <p>(21) <math>4^2 + 3^3 + 2^4 =</math> _____</p> <p>(22) Let P = 3, Q = — 2, and R = 4. Find <math>(RQ)^P</math>. _____</p> <p>(23) Let M = {m,i,x,e,d} and N = {n,u,m,b,e,r}. The number of distinct elements of <math>(M \cup N)</math> is _____</p> <p>(24) <math>(20 \times 25 + 20) \div 17</math> has a remainder of _____</p> <p>(25) The multiplicative inverse of 3.2 is _____</p> <p>(26) <math>3\frac{2}{5} - \frac{1}{8} =</math> _____</p> <p>(27) <math>4\frac{2}{3}\%</math> of 2400 = _____</p> <p>(28) How many positive integers less than or equal to 20 are relatively prime to 20? _____</p> <p>(29) Given the set {3,7,10,17,p,q,71,115,...}. <math>p + q =</math> _____</p> <p>*(30) <math>325 \times 2017 =</math> _____</p> <p>(31) If <math>a = 4</math> and <math>a^2 + 4ab + 4b^2 = 576</math>, then <math>b =</math> _____</p> <p>(32) <math>0.3777... =</math> _____ (proper fraction)</p> <p>(33) A car running at an average speed of 60 mph for 3 hours and 20 minutes would travel _____ miles</p> <p>(34) 320 base 5 is _____ in base 10</p> |
|--|--|

- (35) Let  $\frac{5}{6} = \frac{7}{x}$ . Find  $x =$  \_\_\_\_\_
- (36)  $2\frac{2}{5} - 1.8 =$  \_\_\_\_\_
- (37) If  $x + y = 2$  and  $2x - y = 4$ , then  $xy =$  \_\_\_\_\_
- (38)  $\frac{1}{3} - \frac{5}{6} + \frac{7}{9} =$  \_\_\_\_\_
- (39)  $2 - |1 - 3| - 4 + |7 - 11| - 18 =$  \_\_\_\_\_
- \*(40)  $\sqrt{7152023} =$  \_\_\_\_\_
- (41) The roots of  $x^3 - 4x^2 + x + 6 = 0$  are 2, -1, and k. Find k. \_\_\_\_\_
- (42) The sides of a triangle are 8", 4", and  $4\sqrt{3}$ ". The smallest angle of the triangle is \_\_\_\_\_ degrees
- (43)  $46^2 - 54^2 =$  \_\_\_\_\_
- (44) Let  $(3i)^2(i) = a\sqrt{b}$ . Find  $a + b$ . \_\_\_\_\_
- (45) The sum of the integral values of  $x$  such that  $|x - 3| - 2 \leq 5$  is \_\_\_\_\_
- (46) The fifth pentagonal number is \_\_\_\_\_
- (47) The number of triangles from a given vertex in a regular nonagon \_\_\_\_\_
- (48)  $523_6 \times 11_6 =$  \_\_\_\_\_ <sub>6</sub>
- (49)  $\frac{6!}{3!} = \frac{4!}{x}$ .  $x =$  \_\_\_\_\_
- \*(50)  $21 \times 33 \times 45 =$  \_\_\_\_\_
- (51)  $888 \times \frac{4}{37} =$  \_\_\_\_\_
- (52) If  $(x, y)$  is the midpoint of the segment with endpoints  $(-2, 5)$  to  $(1, -7)$ , then  $x + y =$  \_\_\_\_\_
- (53)  $320 \times 325 =$  \_\_\_\_\_
- (54)  $7\frac{3}{7} \times 7\frac{4}{7} =$  \_\_\_\_\_
- (55) The sum of the lengths of the minor axis and the major axis of  $4x^2 + 9y^2 = 36$  is \_\_\_\_\_
- (56) Round  $5\sqrt{6}$  to the nearest tenth. \_\_\_\_\_
- (57) Let  $a^5 \times b^{-2} \div a^{-7} \times b \times a^0 \div b^2 = a^m b^n$ . Find  $m + n$ . \_\_\_\_\_
- (58) The first four digits of the decimal for  $\frac{113}{333}$  is 0.\_\_\_\_
- (59)  ${}_5C_2 \div {}_5C_4 =$  \_\_\_\_\_
- \*(60)  $[(\sqrt{5} + 1) \div 2] \times 621 =$  \_\_\_\_\_
- (61) If  $9(2x - 1) = 3(x + 2)$  then  $x =$  \_\_\_\_\_
- (62) Change  $0.343434..._7$  to a base 10 fraction. \_\_\_\_\_
- (63) The remainder of  $(x^3 - 4x^2 + 6) \div (x + 5)$  is \_\_\_\_\_
- (64)  $\sin(\frac{\pi}{3}) \times \cos(\frac{\pi}{6}) + \tan(\frac{3\pi}{4}) =$  \_\_\_\_\_
- (65) Let  $f(x) = x^3 - 4x^2 + x + 6$ . Find  $f(f(3))$ . \_\_\_\_\_
- (66) Vector  $a = (-2, 5)$  and vector  $b = (1, -7)$ . Find the dot product  $ab$ . \_\_\_\_\_
- (67) Find  $k$  if  $\begin{vmatrix} -7 & 1 \\ -0 & 2 \end{vmatrix} = 2k + 5$ . \_\_\_\_\_
- (68) The Greatest Integer Function is written as  $f(x) = [x]$ . Find  $[(\sqrt{5} + 1) \div 2 \times \sqrt{3}]$ . \_\_\_\_\_
- (69)  $32017_8 \div 7_8$  has a remainder of \_\_\_\_\_ <sub>8</sub>
- \*(70)  $64^2 \times 32^3 \div 16^4 =$  \_\_\_\_\_
- (71) If  $3x \equiv 17 \pmod{5}$ , where  $0 \leq x \leq 5$ , then  $x =$  \_\_\_\_\_
- (72)  $43 \times 47 + 4 =$  \_\_\_\_\_
- (73) The sum of the critical values of  $f(x) = x^3 - 3x + 1$  is \_\_\_\_\_
- (74)  $f(x) = x^3 - 4x^2 + x + 6$ . Find  $f''(-2) =$  \_\_\_\_\_
- (75)  $\int_{-1}^1 (8x + 1) dx =$  \_\_\_\_\_
- (76)  $\lim_{x \rightarrow \infty} \frac{3x^2 - 2x + 1}{x^2 + 4} =$  \_\_\_\_\_
- (77)  $34^5 \div 6$  has a remainder of \_\_\_\_\_
- (78)  $84^2 + 32^2 =$  \_\_\_\_\_
- (79) The sum of the radii of the circumscribed circle and inscribed circle of a right triangle with side lengths of 250 cm, 88 cm, and 234 cm is \_\_\_\_\_ cm
- \*(80)  $3\frac{1}{4} \times 2017 \div 26 =$  \_\_\_\_\_

# University Interscholastic League - Number Sense Answer Key HS • District • 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) 2,337              | (19) — 405                                   | (35) $8.4, \frac{42}{5}, 8\frac{2}{5}$         | (58) 3393  |
| (2) 16.92              | *(20) 2,795 — 3,089                          | (36) $.6, \frac{3}{5}$                         | (59) 2   |
| (3) 1,880              | (21) 59                                      | (37) 0   | *(60) 955 — 1,055                                  |
| (4) $279\frac{2}{3}$   | (22) — 512                                   | (38) $\frac{5}{18}$                            | (61) $\frac{4}{3}, 1\frac{1}{3}$                   |
| (5) $\frac{8}{25}$     | (23) 9                                       | (39) — 18                                      | (62) $\frac{25}{48}$                               |
| (6) $4\frac{1}{10}$    | (24) 10                                      | *(40) 2,541 — 2,808                            | (63) — 219   |
| (7) 256                | (25) $.3125, \frac{5}{16}$                   | (41) 3   | (64) — .25, — $\frac{1}{4}$                        |
| (8) 3                  | (26) $3.275, \frac{131}{40}, 3\frac{11}{40}$ | (42) 30  | (65) 6   |
| (9) 2                  | (27) 112                                     | (43) — 800                                     | (66) — 37  |
| *(10) 3,359 — 3,711    | (28) 8                                       | (44) — 10                                      | (67) — 9.5, — $\frac{19}{2}$ ,<br>— $9\frac{1}{2}$ |
| (11) 14,000            | (29) 71                                      | (45) 45  | (68) 2   |
| (12) 3                 | *(30) 622,749 —<br>688,301                   | (46) 35  | (69) 6   |
| (13) \$22.00           | (31) 10                                      | (47) 28  | *(70) 1,946 — 2,150                                |
| (14) $\frac{14}{17}$   | (32) $\frac{17}{45}$                         | (48) 10153                                     | (71) 4   |
| (15) 390               | (33) 200                                     | (49) $.2, \frac{1}{5}$                         | (72) 2,025   |
| (16) 8                 | (34) 85                                      | *(50) 29,626 — 32,744                          | (73) 0   |
| (17) 270               |  | (51) 96  | (74) — 20  |
| (18) $2\frac{16}{165}$ |  | (52) — 1.5, — $\frac{3}{2}$ , — $1\frac{1}{2}$ | (75) 2   |
|                        |  | (53) 104,000                                   | (76) 3   |
|                        |  | (54) $56\frac{12}{49}$                         | (77) 4   |
|                        |  | (55) 10  | (78) 8,080   |
|                        |  | (56) $12.2, \frac{61}{5}, 12\frac{1}{5}$       | (79) 161   |
|                        |  | (57) 9   | *(80) 240 — 264                                    |