

NAME: _____ SCHOOL: _____

2019 UH MATHEMATICS CONTEST NUMBER SENSE EXAM

Directions: Do not unfold this sheet until you are told to begin. You will have 30 minutes to complete this exam and you must use PEN. Solve accurately as many problems as you can in the order in which they appear. ALL PROBLEMS ARE TO BE SOLVED MENTALLY. Make NO calculations on paper. Write only the answer in the space provided at the end of each question. Five points will be awarded for correct answers and four points will be deducted for each problem not solved correctly and for each problem skipped. No deduction is taken for problems after the last problem attempted. An illegible answer constitutes an incorrect answer. All fractions in test papers must be reduced to lowest terms and improper fractions are allowed unless otherwise stated. Answers should be written in the most efficient form possible (extraneous zeroes are not to be used).

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| (1) $35 \times 70 =$ _____ | (21) $15^3 =$ _____ |
| (2) $512 \div 4(9 - 1) =$ _____ | (22) $\sqrt[3]{4096} =$ _____ |
| (3) $67^2 =$ _____ | (23) $2 \text{ ft.} \times 3 \text{ ft.} \times 5 \text{ ft.} =$ _____ cubic yards |
| (4) $31751 + 25929 - 16298 =$ _____ | (24) $(3)^{-2} + (2)^{-3} =$ _____ |
| (5) $462 \times 11 =$ _____ | (25) $52 \times 5\frac{3}{4} =$ _____ |
| (6) $2^{10} - 5^2 + 3^3 =$ _____ | (26) $560824 \div 8 =$ _____ |
| (7) $167 \times 173 =$ _____ | (27) $23 \times 46 =$ _____ |
| (8) $13 \div 3.25 =$ _____ | (28) How many unique whole numbers will divide evenly into 48? _____ |
| (9) $14 \times 42 + 14 =$ _____ | (29) $DCCCXLV - LXXIX =$ _____ (Arabic numeral) |
| (10) $2^2 + 3^2 + 4^2 + 5^2 =$ _____ | (30) $3^4 \times 12^2 \div 6^2 =$ _____ |
| (11) $2\frac{5}{7} + 3\frac{3}{4} =$ _____ (mixed number) | (31) 16% of 32 is 20% of _____ |
| (12) $75 \div 13 + 120 \div 13 =$ _____ | (32) $2 + 7 + 12 + 17 + \dots + 37 =$ _____ |
| (13) $238^2 =$ _____ | (33) $1331^{2/3} =$ _____ |
| (14) $8.75\% =$ _____ (proper fraction) | (34) Which is larger, $-\frac{5}{18}$ or $-\frac{7}{23}$? _____ |
| (15) $(27 + 36 + 47) \div 6$ has a remainder of _____ | (35) $543_7 - 246_7 =$ _____ ₇ |
| (16) $4\frac{2}{3} \div 2\frac{3}{5} =$ _____ (improper fraction) | (36) The largest prime factor of 489 is _____ |
| (17) $50 \times 130.2 =$ _____ | (37) The GCD of 52, 39 and 42 is _____ |
| (18) $\sqrt{4096} =$ _____ | (38) $7! \div 3! - 8! \div 6! =$ _____ |
| (19) $0.311111\dots =$ _____ (proper fraction) | (39) $1101_2 + 1011_2 =$ _____ ₂ |
| (20) $ 4 - 3 - 9 =$ _____ | (40) The geometric mean between 7 and 28 is _____ |

- (41) $55 \div 0.625 =$ _____
- (42) $CLXVI + CXIX =$ _____ (Roman numeral)
- (43) The largest root of $x^3 + 3x^2 - 10x - 24$ is _____
- (44) $114^2 - 14^2 =$ _____
- (45) ${}_9C_7 =$ _____
- (46) $\sqrt[3]{4 \times 29 + 9} =$ _____
- (47) If $(2 - 3i)(4 + i) = a + bi$, then $a + b =$ _____
- (48) The largest triangular number less than 100 which is prime is _____
- (49) $345_6 =$ _____₁₀
- (50) $2 \sin\left(\frac{\pi}{12}\right) \cos\left(\frac{\pi}{12}\right) =$ _____
- (51) $10! \div 6! - 11! \div 9! =$ _____
- (52) The multiplicative inverse of -2.7 is _____
- (53) The arithmetic mean of 37, 71 and _____ is 58.
- (54) Give the tens digit of 4^6 _____
- (55) $23^2 + 17^2 - 782 =$ _____
- (56) $2 \cos(\arctan(1) + \operatorname{arcsec}(\sqrt{2})) =$ _____
- (57) How many proper subsets does a set with 10 elements have? _____
- (58) $(1 - 2i)(4 + 3i)(2 - 3i)(1 + 8i) =$ _____
- (59) $256 \times 144 =$ _____
- (60) Give the value of $\sqrt{1499}$ rounded to the nearest whole number. _____
- (61) The harmonic mean of 1, 4 and 4 is _____
- (62) Find the slope of the line perpendicular to the line which contains the points $(-1, 5)$ and $(-3, -9)$. _____
- (63) Find $4x$ if $\log_x 9 = 0.5$. _____
- (64) $17^2 \div 13.5^2 \times 27^2 =$ _____
- (65) $5\frac{3}{8} \div 3\frac{5}{8} =$ _____ (mixed number)
- (66) Give the maximum value of the function $f(x) = 5 - 2x - 3x^2$ _____
- (67) The largest value of x which satisfies $\frac{x^2 + 5x - 6}{x + 1} \leq 0$ is _____
- (68) 24% of $21\frac{1}{8}$ is _____
- (69) Solve for x : $\sqrt{x} + \sqrt{28} = \sqrt{63}$ _____
- (70) $|35 - 12i| =$ _____
- (71) $56_7 =$ _____₉
- (72) The surface area of a cube with edge of 5 is _____
- (73) $\langle -2, 3 \rangle \cdot \langle 3, -5 \rangle =$ _____
- (74) $\begin{vmatrix} -11 & 7 \\ 13 & 8 \end{vmatrix} =$ _____
- (75) Find $f^{-1}(\pi)$ if $f(x) = \sin(x) + 2x - 1$ _____
- (76) $1 - \frac{1}{3} + \frac{1}{9} - \frac{1}{27} + \cdots + \frac{1}{729} =$ _____
- (77) ${}_4P_2 \times {}_6P_3 =$ _____
- (78) Find $f(f(-2))$ for $f(x) = \frac{x + 1}{x^2 - x + 1}$ _____
- (79) $6 \times 18 - 14 \div 21 \times 12 =$ _____
- (80) $8^{10} \div 5$ has a remainder of _____
- (81) $|(3 + 7i)(5 - 4i)|^2 =$ _____
- (82) The product of the solutions to $|x^2 - 9| = 6$ is _____
- (83) $\cot\left(\frac{5\pi}{6}\right) =$ _____ (round to tenths place)
- (84) The sum of the prime factors of 2730 is _____
- (85) $\lim_{x \rightarrow -3} \frac{2x + 6}{x^2 - 9} =$ _____
- (86) The sum of the first 4 hexagonal numbers is _____
- (87) $237_9 + 152_7 =$ _____₁₀
- (88) If $11x + 2 \equiv 5 \pmod{6}$, the smallest positive integer value of x is _____
- (89) $\cos(\arctan(\frac{25}{7})) =$ _____
- (90) The Greatest Integer Function is written as $f(x) = [x]$. Find $[\cos(\frac{5\pi}{6})]$ _____
- (91) $\sqrt{74529} =$ _____
- (92) The x -value of the rectangular coordinates for $(2, -\frac{\pi}{3})$ is _____
- (93) If $xy = 12$ and $x + y = 3$, then $x^2 + y^2 =$ _____
- (94) Solve for x : $\log_x 375 - \log_x 3 = 3$ _____
- (95) If $f(x) = x^3 - 3x^2 + 2x - 1$, then $f''(-1) =$ _____
- (96) $\cos^2\left(\frac{5\pi}{12}\right) + \sin^2\left(\frac{5\pi}{12}\right) =$ _____
- (97) If $g(x) = \sqrt{x} - 2x^3$, $g'(4) =$ _____
- (98) The graph of $y = \frac{x^2 - 5x + 6}{x^2 - 4}$ has how many vertical asymptotes? _____
- (99) $\lim_{x \rightarrow \infty} \arctan\left(\frac{x}{2}\right) =$ _____
- (100) $\int_{-2}^1 x^3 dx =$ _____