

The Virtual Challenge Meets

Number Sense Test • HS VCM #4 • 2024-2025

Name _____

School _____

Grade 9 10 11 12

Classification: A 2A 3A 4A 5A 6A

Final _____

2nd _____

1st _____

Score Initials

Read directions carefully
before beginning test

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

Directions: Do not turn this page until the proctor 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 without the help of paper, pencil, or calculator. Write only the answer in the space provided at the end of each problem. Problems marked with an (*) require approximate integral answers; any answer to a problem with an (*) *asterisk* that is within five percent of the exact answer will be scored correct; all other problems require exact answers.

STOP – WAIT FOR SIGNAL!

(1) $2025 + 137 - 53 =$ _____

(2) $\frac{3}{5} \div 0.9 =$ _____

(3) $\frac{7}{8} \times 168 =$ _____

(4) $2025 - 15^2 + 4^3 =$ _____

(5) $124865 \div 11$ has a remainder of _____

(6) $27^2 =$ _____

(7) $92 \times 12 =$ _____

(8) $115 \div 12 - 93 \div 12 =$ _____

(9) $(14 + 2 \times 9) \div 4 - 3 \times 11 =$ _____

*(10) $630 + 23124 - 8156 + 3149 =$ _____

(11) $28\frac{4}{7}\% =$ _____ (fraction)

(12) $85 + 70 + 55 + 40 + 25 =$ _____

(13) $1 + 3 + 5 + \dots + 33 =$ _____

(14) If 5 ounces of mixed nuts sell for \$2.25, then what will one pound of mixed nuts cost? _____

(15) $26^2 - 14^2 =$ _____

(16) $62^2 - 18^2 = 20 \times$ _____

(17) The number of positive integral divisors of $3^2 \times 5^3 \times 11$ is _____

(18) 18 % of $\frac{2}{3}$ of 75 is _____

(19) The sum of the mean and the median of the set of numbers {3, 5, 7, 10, 15} is _____

*(20) $25032 \div 42 =$ _____

(21) $\sqrt[3]{1331} =$ _____

(22) If $x + 5x + 9x + 13x + 17x = 210$, then $3x =$ _____

(23) $12\frac{4}{9} \times 12\frac{5}{9} =$ _____ (mixed number)

(24) 44% of 25% of 36 = _____ (decimal)

(25) $0.555... \times 108 =$ _____

(26) $(8^9 + 13^9 + 7) \div 21$ has a remainder of _____

(27) If $A^5 \times A^{-2} \div A^{-7} = A^K$ and $A > 1$, then $k =$ _____

(28) The number of proper positive integral divisors of 22 is _____

(29) The 7th term of 1, 5, 12, 22, ... is _____

*(30) $718324 \div 159 =$ _____

(31) $101110_2 =$ _____₄

(32) $101110_2 =$ _____₈

(33) Find k , so that the roots of $6x^2 - 24x + k = 0$ are equal. _____

(34) If $f(x) = 9x^2 - 6x + 1$, then $f(6) =$ _____

(35) $8\frac{1}{3} \times 9\frac{5}{8} =$ _____ (mixed number)

(36) $\frac{18}{23} \times 21 =$ _____ (mixed number)

(37) $34^2 + 35^2 =$ _____

(38) The reciprocal of $-4\frac{3}{8}$ is _____

(39) 24% of $137\frac{1}{2}$ is _____

*(40) $\sqrt[3]{620} \times \sqrt{620} \times 620 =$ _____

(41) If $f(x) = 2x^2 - 12x + 9$, and $f(7) = f(k)$, then $k =$ _____

(42) $(5x + 6)^3 = ax^3 + bx^2 + cx + d$. $a + b + c + d =$ _____

(43) The point (7, 3) is reflected over the y-axis to the point (h, k). $h + k =$ _____

(44) $32^2 + 38^2 =$ _____

(45) $64^2 + 44^2 =$ _____

(46) $(11^3 - 4^3) \div (11 - 4) =$ _____

(47) If $2^x \times 3^x = \frac{1}{216}$, then $x =$ _____

(48) A regular icosahedron has how many congruent equilateral triangular faces? _____

(49) The number of sides in a regular polygon with an exterior angle of 15 degrees is _____

*(50) 833 gallons = _____ cubic inches

(51) $45_8 \times 12_8 =$ _____₈

(52) $45_8 \times 22_8 =$ _____₈

(53) $\left(\frac{8}{125}\right)^{\frac{2}{3}} =$ _____ (fraction)

(54) Let R_1 and R_2 be the roots of $(2x - 5)^2 = 5$. Find $R_1 + R_2 - R_1R_2$. _____

(55) $\log_2 4 + \log_2 16 + \log_2 64 + \dots + \log_2 2^{20} =$ _____

(56) 66 feet per second = _____ miles per hour

(57) The sum of the two smallest positive perfect numbers is _____

(58) If $5^B + 4B1 = 556$, then $B^5 =$ _____

(59) $12^{15} \div 31$ has a remainder of _____

*(60) $[0.181818 \dots \times 879]^2 =$ _____

(61) The sum of the reciprocal of the first 10 triangular numbers is _____

(62) If ${}_7P_3 = {}_nP_2$, then $n =$ _____

(63) If $(\sqrt[7]{a^5})(\sqrt[5]{a^8}) = \sqrt[n]{a^k}$, where n and k are relatively prime, then $k =$ _____

(64) A single card is drawn from a standard deck of cards. Given that the card is a face card, find the probability that it is a red king. _____

(65) If $\sec A = \frac{3}{2}$, then $\tan^2 A =$ _____

(66) 4.5 fathoms = _____ inches

(67) Change $0.424242 \dots_7$ to a base 7 fraction. _____

(68) $3124 \times 14 =$ _____

(69) If $\frac{3x+2}{4x-2} + \frac{5x-3}{2x+1} = \frac{ax^2+bx+c}{dx^2+ex+f}$, then $(a + b + c) + (d + e + f) =$ _____

*(70) A pipe with a diameter of 6 feet is 48 feet long. The volume is _____ ft^3

(71) If $f(x) = 3x^2 - 4x - 1$, then $f(f(2)) =$ _____

(72) $f(x) = 3x^2 - 12x + 5$ has a horizontal tangent line at the point (p, q). Find the value of p. _____

(73) $(14 + 6i) \div (2i) = a + bi$. $a + b =$ _____

(74) $f(x) = \frac{5}{2}x - 8$. $f^{-1}(12) =$ _____

(75) $\int_1^2 \int_3^4 8xy \, dy \, dx =$ _____

(76) Find the sum of the squares of the diagonals of a parallelogram with sides of 7 and 13. _____

(77) $\lim_{x \rightarrow 3} \frac{2x^2 - 18}{x - 3} =$ _____

(78) $\frac{9 + 3 + 1 + \dots}{9 + 6 + 4 + \dots} =$ _____

(79) Let (p, q) be the focus of $8(y - 3) = (x + 4)^2$. $q =$ _____

*(80) 91.6666 ... % of 335812 = _____