

2026 UIL / TMSCA JUNIOR HIGH CALCULATOR CONTEST – GRADE 7 CHAMPIONSHIP – OFFICIAL S

CANONICAL ANSWERS (3 SIGNIFICANT DIGITS) • SCIENTIFIC NOTATION • GRADING TOLERANCES [PAGE 1 OF 5]

#	OFFICIAL CONTEST ANSWER (3 SIG FIGS)	SCIENTIFIC NOTATION	ACCEPTANCE INTERVAL (±2 UNITS)
1	35.3	3.53×10^1	[35.1, 35.5]
2	-121	-1.21×10^2	[-123, -119]
3	30 [INT]	3.00×10^1	[30]
4	201	2.01×10^2	[199, 203]
5	4.00	4.00×10^0	[3.98, 4.02]
6	40.7	4.07×10^1	[40.5, 40.9]
7	-29.4	-2.94×10^1	[-29.6, -29.2]
8	-11.6	-1.16×10^1	[-11.8, -11.4]
9	-2.90 °C	-2.90×10^0	[-2.92, -2.88]
10	-214 m	-2.13×10^2	[-216, -212]
11	1.88	1.88×10^0	[1.85, 1.90]
12	0.667	6.67×10^{-1}	[0.665, 0.669]
13	23 [INT]	2.30×10^1	[23]
14	12 [INT]	1.20×10^1	[12]
15	36 [INT]	3.60×10^1	[36]
16	65 [INT] mph	6.50×10^1	[65]
17	\$5.00	5.00×10^0	[4.98, 5.02]
18	4 [INT]	4.00×10^0	[4]
19	1050 [INT]	1.05×10^3	[1050]
20	36.0 ft	3.60×10^1	[35.8, 36.2]
21	\$472.50	4.72×10^2	[470, 474]
22	\$1271.00	1.27×10^3	[1.25, 1.29] $\times 10^3$
23	\$6000.00	6.00×10^3	[5.98, 6.02] $\times 10^3$
24	\$98.00	9.80×10^1	[97.8, 98.2]
25	\$92.01	9.20×10^1	[91.8, 92.2]

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CANONICAL ANSWERS (3 SIGNIFICANT DIGITS) • SCIENTIFIC NOTATION • GRADING TOLERANCES [PAGE 2 OF 5]

#	OFFICIAL CONTEST ANSWER (3 SIG FIGS)	SCIENTIFIC NOTATION	ACCEPTANCE INTERVAL (±2 UNITS)
26	\$103.92	1.04 x 10^2	[102, 106]
27	5.07 %	5.07 x 10^0	[5.05, 5.09]
28	\$3120.00	3.12 x 10^3	[3.10, 3.14] x 10^3
29	\$1512.00	1.51 x 10^3	[1.49, 1.53] x 10^3
30	\$106.47	1.06 x 10^2	[104, 108]
31	116 cm	1.16 x 10^2	[114, 118]
32	134 m	1.34 x 10^2	[132, 136]
33	491 m²	4.91 x 10^2	[489, 493]
34	633 cm²	6.33 x 10^2	[631, 635]
35	139 m²	1.39 x 10^2	[137, 141]
36	350 [INT] m²	3.50 x 10^2	[350]
37	467 cm²	4.67 x 10^2	[465, 469]
38	448 m²	4.48 x 10^2	[446, 450]
39	226 m	2.26 x 10^2	[224, 228]
40	178 ft²	1.78 x 10^2	[176, 180]
41	15 [INT]	1.50 x 10^1	[15]
42	24 [INT]	2.40 x 10^1	[24]
43	491 cm³	4.91 x 10^2	[489, 493]
44	528 [INT] cm³	5.28 x 10^2	[528]
45	23.5	2.35 x 10^1	[23.3, 23.7]
46	8.40	8.40 x 10^0	[8.38, 8.42]
47	478	4.78 x 10^2	[476, 480]
48	180 [INT] min	1.80 x 10^2	[180]
49	4.67 ft³	4.67 x 10^0	[4.65, 4.69]
50	2.50 hrs	2.50 x 10^0	[2.48, 2.52]

STACKCALC32 RPM BENCHMARK: 342 KEYSTROKES vs. 516 ALGEBRAIC (SAVING 174 KEYS, 33.7% FASTER)

GRADER 1 INITIALS: _____ GRADER 2 INITIALS: _____ CONTEST DIRECTOR: _____

SCORING RULE: +5 points for each correct answer; -4 points for each error or skipped question up to last attempted.

PART II: DETAILED WORD PROBLEM & GEOMETRY WORKED SOLUTIONS

Formal Mathematical Modeling, Formula Setups & StackCalc RPN Keystroke Workflows

PROBLEM 9 • RECTANGULAR ELECTRONICS ENCLOSURE VOLUME**ANSWER: -2.90 °C**

A 3D printer thermal environmental chamber tests an electronics enclosure at an initial sub-zero temperature of -14.5°C. During active printing, the chamber temperature rises by 22.8°C, and then cools by 11.2°C during post-print curing. What is the final chamber temperature in °C?

GOVERNING MODEL: Volume = Length × Width × Height

NUMERICAL SETUP: $V = L \times W \times H$

STEP-BY-STEP MATHEMATICAL REASONING:

Internal volume of the rectangular electronics enclosure equals length times width times height: $V = L \cdot W \cdot H$. Multiply dimensions sequentially.

CALCULATOR FLOW: [14.5] [+/-] [ENTER] [22.8] [+] [11.2] [-] -> -2.90 °C

PROBLEM 10 • SIGNED CNC Z-AXIS & THERMAL NET CHANGE**ANSWER: -214 m**

A CNC milling machine vertical spindle is zeroed at -185.0 meters below a high reference. It ascends 64.0 meters for clearance, then descends 92.5 meters. What is the spindle's final depth in meters relative to the reference?

GOVERNING MODEL: Final Position = Initial Position + Displacement

NUMERICAL SETUP: Final = Position_0 + Delta_Position

STEP-BY-STEP MATHEMATICAL REASONING:

Apply signed rational addition. Starting below reference baseline (or negative datum), add upward clearance ascents and subtract plunge depth changes.

CALCULATOR FLOW: [185] [+/-] [ENTER] [64] [+] [92.5] [-] -> -214 m

PROBLEM 19 • SMD PLACEMENT MACHINE PRODUCTION RATE & PROPORTION**ANSWER: 1050 [INT]**

An automated pick-and-place surface mount machine places 420 SMD capacitors onto PCB boards in 14.0 minutes. At this steady rate, how many components can the machine place in 35.0 minutes?

GOVERNING MODEL: Placed Components = (Rate per Minute) × Total Time

NUMERICAL SETUP: Count = $(N_1 / t_1) \times t_2$

STEP-BY-STEP MATHEMATICAL REASONING:

Compute component placement rate per minute (N_1 / t_1) , then multiply by total operating duration t_2 to determine parts placed.

CALCULATOR FLOW: [420] [ENTER] [14] [÷] [35] [×] -> 1050 [INT]

PROBLEM 20 • CAD LAYOUT PROPORTIONAL SCALE & DISPLAY CONVERSION**ANSWER: 36.0 ft**

An electronics CAD layout of a modular calculator chassis uses a zoom scale of 0.500 inches = 8.00 feet. If an internal battery pocket measures 2.25 inches long on screen, what is the actual battery pocket length in feet?

GOVERNING MODEL: Actual Dimension = Display Dimension × Scale Ratio

NUMERICAL SETUP: Actual = CAD_Measure × (Actual Units / Screen Unit)

STEP-BY-STEP MATHEMATICAL REASONING:

Determine scaling ratio between actual units and drawing units, then multiply by measured drawing dimension.

CALCULATOR FLOW: [2.25] [ENTER] [0.5] [÷] [8] [×] -> 36.0 ft

PROBLEM 29 • ROBOTICS LAB EQUIPMENT FUND & SIMPLE INTEREST**ANSWER: \$1512.00**

An educational robotics lab equipment fund deposits \$6,400 at an annual simple interest rate of 5.25%. How much total interest in dollars is earned after 4.50 years?

GOVERNING MODEL: $I = P \times r \times t$

NUMERICAL SETUP: Interest = Principal $\times$ Annual Rate (dec) $\times$ Time (yrs)

STEP-BY-STEP MATHEMATICAL REASONING:

Simple interest accrues linearly: multiply lab endowment principal P by annual rate r (decimal) and time t in years. Round currency to the nearest cent [\$].

CALCULATOR FLOW: [6400] [ENTER] [0.0525] [$\times$] [4.5] [$\times$] -> \$1512.00

PROBLEM 30 • ELECTRONICS ORDER TAX & HANDLING SURCHARGES**ANSWER: \$106.47**

An electronics component supplier order totals \$84.50 before tax. An 8.00% local tax is added, and the buyer selects an 18.0% priority handling fee on the pre-tax order. What is the total dollar expenditure?

GOVERNING MODEL: Total = Subtotal $\times$ (1 + Tax Rate + Handling Rate)

NUMERICAL SETUP: Total = $P_0 \times (1 + r_{\text{tax}} + r_{\text{handling}})$

STEP-BY-STEP MATHEMATICAL REASONING:

Apply combined surcharges to pre-tax electronics subtotal: multiply base order by (1 + tax rate + handling rate). Express final result in currency notation [\$].

CALCULATOR FLOW: [84.5] [ENTER] [1.26] [$\times$] -> \$106.47

PROBLEM 39 • 3D PRINTER PULLEY & ENCODER CIRCUMFERENCE**ANSWER: 226 m**

A circular stepper motor encoder ring on a 3D printer has an inside radius of 36.0 meters. What is the total perimeter in meters of one complete lap around the inside edge?

GOVERNING MODEL: Circumference = $\pi \times d$ [or $C = 2 \times \pi \times r$]

NUMERICAL SETUP: $C = \pi \times \text{Diameter}$ or $2 \times \pi \times \text{Radius}$

STEP-BY-STEP MATHEMATICAL REASONING:

One complete rotation or belt travel step equals circular circumference $C = \pi \cdot d$ (or $2 \cdot \pi \cdot r$). Multiply diameter or radius by π (and 2 if radius).

CALCULATOR FLOW: [36] [ENTER] [2] [$\times$] [π] [$\times$] -> 226 m

PROBLEM 40 • CHASSIS FACEPLATE WITH CIRCULAR CUTOUT AREA**ANSWER: 178 ft²**

A 3D printed calculator faceplate measures 18.0 feet long and 12.0 feet high. A circular cutout for a rotary dial encoder with a radius of 3.50 feet is excised from the center. Calculate the remaining faceplate area in square feet.

GOVERNING MODEL: Remaining Area = (Length $\times$ Width) - ($\pi \times r^2$)

NUMERICAL SETUP: Area = ($L \times W$) - ($\pi \times \text{Radius}^2$)

STEP-BY-STEP MATHEMATICAL REASONING:

Compute rectangular faceplate area ($L \cdot W$), compute circular cutout area ($\pi \cdot r^2$), and subtract cutout area from total faceplate area on the stack.

CALCULATOR FLOW: [18] [ENTER] [12] [$\times$] [3.5] [ENTER] [3.5] [$\times$] [π] [$\times$] [-] -> 178 ft²

PROBLEM 49 • BUILD CHAMBER VOLUME & CUBIC FOOT CONVERSION**ANSWER: 4.67 ft³**

A 3D printer heated build volume chamber measures 32.0 inches long, 14.0 inches wide, and 18.0 inches deep. If 1.00 cubic foot equals 1,728 cubic inches, what is the chamber's volume in cubic feet?

GOVERNING MODEL: Volume (cu ft) = (Length × Width × Depth) / 1,728 cu in/cu ft

NUMERICAL SETUP: $V = (L \times W \times D) / 1728$

STEP-BY-STEP MATHEMATICAL REASONING:

Compute rectangular build chamber volume in cubic inches by multiplying length × width × depth. Convert cubic inches to cubic feet by dividing by constant 1,728.

CALCULATOR FLOW: [32] [ENTER] [14] [×] [18] [×] [1728] [÷] -> 4.67 ft³

PROBLEM 50 • SMD PLACEMENT MACHINE PRODUCTION RATE & PROPORTION**ANSWER: 2.50 hrs**

Two stepper motors drive pick-and-place gantry heads outward from center in opposite directions at constant speeds of 52.0 mph and 46.0 mph. In how many hours will they be 245 miles apart?

GOVERNING MODEL: Placed Components = (Rate per Minute) × Total Time

NUMERICAL SETUP: Count = $(N_1 / t_1) \times t_2$

STEP-BY-STEP MATHEMATICAL REASONING:

Compute component placement rate per minute (N_1 / t_1) , then multiply by total operating duration t_2 to determine parts placed.

CALCULATOR FLOW: [245] [ENTER] [52] [ENTER] [46] [÷] [÷] -> 2.50 hrs