

MATHCOUNTS®

2023-2024

SCHOOL HANDBOOK



*CHECK OUT THIS YEAR'S MATH
PROBLEMS INSIDE, ON **pg. 4!***



Get a **FREE** copy of the School Handbook by registering for the Competition Series at: mathcounts.org/register
or
purchase the complete School Handbook at: mathcountsstore.com.

A HANDBOOK PREVIEW



The following three pages provide a preview of the problems in the complete School Handbook. Answers are at the bottom of this page.



Refer to the last page of this preview for an explanation of all resources (including step-by-step solutions) in the complete School Handbook.

STRETCHES

Each covers a particular math topic.



Prepare students for all rounds: Sprint, Target, Team & Countdown.

WARM-UPS

10 problems
no calculators



Prepare students for the Sprint Round.

WORKOUTS

10 problems
calculators encouraged



Prepare students for the Target Round.

EXPONENTS STRETCH

1. 4
2. 15
3. 512
4. $2\frac{1}{6}$
5. 1
6. $\frac{5}{2}$
7. $\frac{7}{2}$
8. 11
9. $\frac{4}{9}$
10. -3

WARM-UP 1

31. 12
32. 50
33. 47.25
34. 15
35. 1.40
36. 81
37. 56
38. 152
39. 11
40. 32

WORKOUT 1

141. 810
142. 994
143. 24
144. 17 or 17.00
145. 45
146. $\frac{35}{27}$
147. 70
148. 13
149. 108
150. 90



Exponents Stretch

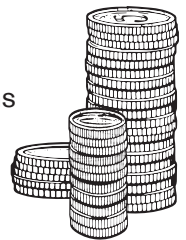
Properties of Exponents				
$a^m a^n = a^{m+n}$	$(a^m)^n = a^{mn}$	$(ab)^m = a^m b^m$	$a^{m^n} = a^{(m^n)}$	$a^{\frac{1}{n}} = \sqrt[n]{a}$
$\frac{a^m}{a^n} = a^{m-n}$ $a \neq 0$	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ $b \neq 0$	$a^{-m} = \frac{1}{a^m}$ $a \neq 0$	$a^m = \frac{1}{a^{-m}}$ $a \neq 0$	$a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$

- _____ What is the value of $256^{\frac{1}{4}}$?
- _____ When $\frac{(x^2 y^3)^3}{x^2 y^{-2}}$ is expressed in the form $x^a y^b$, what is the value of $a + b$?
- _____ What is the value of 2^{3^2} ?
- _____ What is the value of $\left(2\frac{1}{4}\right)^{\frac{1}{2}} + \left(2\frac{1}{4}\right)^{-\frac{1}{2}}$? Express your answer as a common mixed number.
- _____ When $(\sqrt{w})^3$ is written in the form $w^{\frac{m}{n}}$ for common fraction $\frac{m}{n}$, what is the value of $m - n$?
- _____ Given that $9^{x-1} = 27$, what is the value of x ? Express your answer as a common fraction.
- _____ What is the value of $\frac{2^{32} - 2^{29}}{2^{31} - 2^{30}}$? Express your answer as a common fraction.
- _____ Given that $\frac{32^7}{16^6} = 2^d$, what is the value of d ?
- _____ Given that $(\sqrt{3})^t = \sqrt[3]{9}$, what is the value of t ? Express your answer as a common fraction.
- _____ What is the sum of the values of x that satisfy the equation $(x-2)^{x^2+7x+12} = 1$?



Warm-Up 1

31. _____ The scores for the Math Competition Team at Artemis Middle School were 14, 19, 22, 9, 17, 15, 22, 30, 2 and 8. What is the absolute difference between the median and range of these scores?
32. _____ If $4g + 12 = 28g$, what is the value of $100g$?
33. \$ _____ Theo had \$75 when he started shopping. After paying \$3.50 for an ice cream cone, \$8.00 each for two bouquets of roses, and \$8.25 for a bag of gumballs, how much money does Theo have left?
34. _____ minutes Lisha is mowing lawns. She takes a break between each lawn she mows and the next, and the lengths of all breaks are the same. She starts mowing the first lawn at 10:00 a.m. and finishes her fourth lawn at 2:00 p.m. The first lawn takes 75 minutes to mow, the second lawn takes 30 minutes to mow, and the third and fourth lawns each take 45 minutes to mow. How many minutes long is each break?
35. \$ _____ Seven quarters are worth how much more than seven nickels?
36. _____ % Esra is playing an online multiplayer puzzle game. He has a 90% chance of winning any given match, independent of his results on previous matches. If he plays two matches, what is the percent probability that he wins them both?
37. _____ degrees In isosceles triangle LMN, only angle L measures 68 degrees. What is the degree measure of angle M?
38. _____ feet & wings There are 15 goats and 23 ducks in a barnyard. If each goat has four feet and each duck has two feet and two wings, what is the total number of feet and wings?
39. _____ coins Using only quarters, dimes and nickels, what is the least number of coins you can use to make \$2.40?
40. _____ % What percent of 25 is 8?





Workout 1

141. _____ inches How many inches are in 22.5 yards?

142. _____ What is the greatest three-digit number whose digits have a sum of 22?

143. _____ flamingos



Jackie spotted 128 birds through her binoculars at Lake Kenya, of which 18.75% were flamingos. How many flamingos did Jackie spot?

144. \$ _____ The yearbook staff will order 285 yearbooks. Each yearbook costs \$14.73 to print. The 38 staff members will each receive a free yearbook. What is the least amount they can charge for each yearbook to have enough money to cover the printing costs?

145. _____ ordered pairs How many ordered pairs (a, b) of positive integers with $a + b = 110$ satisfy $ab \geq 2500$?

146. _____ Let r and s be real numbers for which $\frac{r+s}{s} = \frac{5}{3}$. What is the value of $\frac{r^3 + s^3}{s^3}$? Express your answer as a common fraction.

147. _____ pieces The table shows how many pieces of cheese Timsy the Mouse eats each day of every week. If January 1 is a Monday, how many pieces of cheese will Timsy eat in the entire month of January?

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Pieces	3	2	1	1	1	7	1

148. _____ The arithmetic mean of four consecutive odd integers is 16. What is the least of the four integers?

149. _____ products Sapati is making a 12×12 multiplication table of positive integers for his younger brother. How many of the products in the table will be even numbers?

x	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												

150. _____ pumpkins



At a barter's market, 3 pumpkins can be traded for 2 watermelons, and 3 watermelons can be traded for 5 cantaloupes. How many pumpkins are needed to trade for 100 cantaloupes?

IN THIS YEAR'S HANDBOOK

Problems

200 MATH PROBLEMS TO BOOST PROBLEM-SOLVING SKILLS

11 WARM-UPS

10 questions per Warm-Up
no calculators used



6 WORKOUTS

10 questions per Workout
calculators used



3 STRETCHES

of questions and calculator use of vary by Stretch

Answers

INCLUDING DIFFICULTY RATINGS

Toolkit INCLUDING VOCABULARY + FORMS OF ANSWERS

Solutions

200 STEP-BY-STEP EXPLANATIONS

Problem Index + CCSS Mapping

ALL 200 PROBLEMS CATEGORIZED

+ MAPPED TO THE CCSS

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