

MC15A

Pre-MathCounts Algebra

Chapter 1: Integers & Arithmetic

- Order of Operations with Integers and four basic operations
- Word problems only using arithmetic with integers without the need of unknowns

Sample Problem:

(AMC8-2014-5) Margie's car can go 32 miles on a gallon of gas, and gas currently costs \$4 per gallon. How many miles can Margie drive on \$20 worth of gas?

- (A) 64 (B) 128 (C) 160 (D) 320 (E) 640

Chapter 2: Rate & Proportion

- Definition of rate and proportion
- Given the ratio of two numbers and one of the numbers, finding the other one
- Given the ratio of two numbers and their sum (or difference), finding the numbers

Sample Problem:

(AMC10-2006-A3) The ratio of Mary's age to Alice's age is 3 : 5. Alice is 30 years old. How many years old is Mary?

- (A) 15 (B) 18 (C) 20 (D) 24 (E) 50

Chapter 3: Fractions

- Different types of fractions (proper, improper, mixed, common)
- Basic arithmetic with fractions and related word problems

Sample Problem:

(PiMC-2016-Individual-5) Simplify

$$8 \times \left(\frac{2}{6} + \frac{3}{24} + \frac{1}{24} \right).$$

Chapter 4: Decimals

- Arithmetic and applications of decimals and related word problems
- Conversions between fractions and decimals

Sample Problem:

(Jocelyn Zhu) One ping is 0.4 of a pong. One pong is 0.6 of a pang. How many pangs is a ping? Express your answer as a decimal to the nearest hundredth.

Chapter 5: Percent

- Conversions between percent and fractions/decimals
- Word problems involving percent (tax, tip, interest, etc.)

Sample Problem:

(AMC8-2004-6) After Sally takes 20 shots, she has made 55% of her shots. After she takes 5 more shots, she raises her percentage to 56%. How many of the last 5 shots did she make?

- (A) 1 (B) 2 (C) 3 (D) 4 (E) 5

Chapter 6: Exponents

- Basic properties of exponents (multiplying, dividing, raising an exponent to another exponent)
- Perfect powers (squares and cubes) and square roots (of perfect squares)

Sample Problem:

(Hope Chen) If A and B are integers, $A^B = 27$, and $B \geq A$, What is A^5 ?

Chapter 7: Word Problems

- Converting word problems into mathematical equations
- Solving one-unknown linear equations

Sample Problem:

(PiMC-2016-Individual-13) Danielle and Rachel have an equal number of berries. After Danielle eats two of her own berries, Celine comes and takes two-thirds of Danielle's remaining berries, and Rachel eats 80% of her own berries. At the end, Danielle and Rachel have the same number of berries again. How many berries did Danielle have at the beginning?

Chapter 8: Time & Travel

- Unit conversions (ounces to pounds, square feet to square yards, etc.)
- Distance = Rate \times Time
- Average speed, relative speed

Sample Problem:

(AMC10-2008-A1) A bakery owner turns on his doughnut machine at 8:30 AM. At 11:10 AM the machine has completed one third of the day's job. At what time will the doughnut machine complete the job?

- (A) 1:50 PM (B) 3:00 PM (C) 3:30 PM (D) 4:30 PM (E) 5:50 PM

Chapter 9: Sequences-1

- Definition of a sequence
- Mean, median, mode, range

Sample Problem:

(AMC8-2004-9) The average of the five numbers in a list is 54. The average of the first two numbers is 48. What is the average of the last three numbers?

- (A) 55 (B) 56 (C) 57 (D) 58 (E) 59

Chapter 10: Sequences-2

- Arithmetic sequences
- Geometric sequences
- Recursive sequences

Sample Problem:

(CEMC-2016-Gauss7-15) Sophia did push-ups every day for 7 days. Each day after the first day, she did 5 more push-ups than the day before. In total she did 175 push-ups. How many push-ups did Sophia do on the last day?

- (A) 55 (B) 35 (C) 50 (D) 45 (E) 40

Chapter 11: Work

- Word problems involving rates of work/output
- Similarity between work and $D = R \times T$

Sample Problem:

(PiMC-2016-Team-10) Christie is making paper cranes while Katrina unfolds them. It takes Christie 2 minutes to make one paper crane and it takes Katrina 15 seconds to unfold one. Christie starts with 21 cranes and makes more while Katrina unfolds them. How many seconds will pass before Christie has no cranes left?

Chapter 12: Functions & Operations

- Informal treatment, definition of a function, examples
- Absolute value, floor/ceiling value
- Operators

Sample Problem:

(Richard Spence) If $a \spadesuit b = |a+b|$, then what are all possible values of x , if $x \spadesuit 20 = 19$?

