MONTH 6

Numerical Reasoning & Challenge Problems

Monthly Learning Goals

Month 6 strengthens numerical reasoning through estimation, algebraic thinking, and varied competition-style challenges. Students practice moving efficiently among calculations, fractions, percentages, statistics, geometry, probability, and patterns.

Students are encouraged to look for structure before calculating. They estimate, simplify, test cases, eliminate choices, and verify that each final answer fits the information in the problem.

By the End of This Month, Students Should Be Able To:

- Estimate powers, percentages, products, and other calculations.
- Recognize when an exact answer or an estimate is appropriate.
- Simplify multi-step numerical expressions strategically.
- Use patterns and properties to reduce unnecessary work.
- Apply statistics, probability, geometry, and algebra in context.
- Eliminate unreasonable choices in multiple-choice problems.
- Verify solutions using a second method or quick check.

Skills We Will Practice

Numerical Estimation
Approximating calculations while preserving useful accuracy.

Algebraic Thinking
Representing relationships and simplifying expressions.

Pattern Recognition
Using repeated structure to predict or shorten a calculation.

Multi-Topic Reasoning
Connecting ideas from several areas of mathematics.

Solution Verification
Checking magnitude, conditions, and alternative approaches.

This Month's Activities

- Computational estimation practice
- Powers and percentage estimates
- MATHCOUNTS-style problems
- AMC 8 multiple-choice problems
- Pattern and algebra challenges
- Solution checks and discussion

Connection to the Rest of the Year

Month 6 deepens the flexible reasoning developed throughout the program. Students practice combining several mathematical ideas within one problem, preparing them for later investigations, advanced competition problems, and independent problem solving.

Racing Cars Mental Addition and Subtraction

I can add and subtract mentally ones, tens and hundreds from a three-digit number.

Play this game with a partner. You need a die and two small counters.

- Take turns to roll the die and move your counter.
- Work out the answer to the question and find the corresponding answer further along the track.
- Move your counter to this square and wait until your next turn to roll the die again.
- The first player to land on a WIN square is the winner.



twinkl visit twinkl.com

START	245 + 1	389 − 60	548 + 6	246 − 10	397 − 100	582 + 10	204 + 9
505 − 10	221 + 30	383 − 50	548 + 60	329 + 300	267 − 6	407 + 4
241 + 40	261 − 20	421 − 200	656 − 48	554 − 400	347 + 60	592 − 100
495 + 3	572 − 24	629 − 7	336 + 1	236 + 100	622 − 40	411 − 30
251 + 100	313 + 70	297 − 30	154 + 50	337 + 10	336 + 3	339 + 9
333 + 100	372 + 200	412 + 9	348 + 200	381 − 9	492 − 80	213 + 100
608 − 10	498 + 100	351 − 70	433 + 20	453 win!	598 win!	281 win!

1. _____ When $(x^6y^5z^3)^2$ is simplified, what is the sum of the exponents?

2. _____ (sides) Each exterior angle of a regular polygon measures 24°. How many sides does the polygon have?

3. ($) _____ The total amount Edgar paid for a slice of pizza and a tip of exactly 24% was between $2.50 and $3.00. What was the price of the pizza slice?

4. _____ What is the probability that flipping a fair coin 15 times will yield equal numbers of heads and tails?

5. _____ What prime number is a factor of every four-digit palindrome?

6. _____ (integers) How many positive integers that contain each of the four digits 3, 4, 5 and 7 exactly once are multiples of 4?

7. _____ What is the value of $\frac{1}{2^2-1}+\frac{1}{3^2-1}+\frac{1}{4^2-1}+\frac{1}{5^2-1}+\frac{1}{6^2-1}$? Express your answer as a common fraction.

8. _____ What is the median of the data in the stem-and-leaf plot, shown here, where 3|9 represents 39?

3	9 9
4	0 3 5 6
5	0 3 7 7 7
6	8 8 9 9
7	4 5

9. _____ (pounds) A wholesaler mixes cashews, almonds and filberts in the ratio 2:3:4, respectively, by weight. How many pounds of almonds will be needed to make 540 pounds of this mixture?

10. _____ What is the sum of the odd numbers between 100 and 200?

11. _____ (codes) How many unique, six-character codes can be made using each of the characters A, B, C, 1, 2 and 3 exactly once?

12. _____ (percent) This weekend, there is a 30% chance it will rain Saturday and a 40% chance it will rain Sunday. If these are independent events, what is the percent chance it will rain at least one day during this weekend?

Copyright MATHCOUNTS, Inc. 2014. All rights reserved. 2015 Chapter Countdown Round

13. _____ (pounds) Sweet Delights Candy Company has fixed costs of $300. Each pound of candy costs $1 to produce and is sold for $3. How many pounds of candy must be sold so that the company has no profit and no loss?

14. _____ (ft/s) Bob ran the first 1000 feet of a race in 250 seconds and the other 4000 feet in 750 seconds. What was his average speed, in feet per second, for the entire race?

15. _____ If $n*$ is defined as the product of all even factors of $2n$, for all integers n, where $n > 0$, what is the value of $11*$?

16. _____ (points) During the first third of the basketball season, Katrina scored an average of 12 points per game. What is the average number of points she must score per game for the remaining two thirds of the season so that her average points scored per game for the entire season is 14 points?

17. _____ If the positive integers 15, 9, 5, 7 and x have a mean and median that are identical, what is the value of x?

18. _____ If a and b both are whole numbers greater than 1, and $\frac{1}{a}+\frac{1}{2a}=\frac{1}{b}$, what is the smallest possible value for b?

19. _____ What is the value of $\sqrt{10}\left(\sqrt{3}+\sqrt{10}\right)$? Express your answer to the nearest whole number.

20. _____ What is the units digit of the product $1 \times 3 \times 5 \times \cdots \times 2015$?

21. _____ What is the greatest possible product of three distinct positive integers that have a sum of 15?

22. _____ (people) On average, Diane makes 20 deliveries for a restaurant in a six-hour shift. What is the minimum number of people, each making deliveries at the same rate as Diane, needed to make 20 deliveries for the restaurant per hour?

23. _____ If $x + y = 5$ and $x^2 + y^2 = 20$, what is the value of xy? Express your answer as a common fraction.

Copyright MATHCOUNTS, Inc. 2014. All rights reserved. 2015 Chapter Countdown Round