EJ Academy

Lesson 1: Problem-solving strategies and word problems

Includes logic problems, unit digits, question tips, word problems, and arithmetic translations

Credits: Lesson written and edited by Justin Liu

Warmup (10 minutes)

1. What is the units digit of 5x5x5x5x5x5x5x5? (1)

2. What is the units digit of 9x9x9x9x9x9x9x9x9? (2)

3. What is the units digit of 89x89x89? (2)

4. What is the units digit of 9x8x7x6x5x4x3x2x1? (2)

5. What is the units digit of 12345x12344x12343? (3)

6. What is the units digit of ((3492+5)x6)+5? (3)

Class problems

Avoiding silly mistakes

In math, it's almost guaranteed that you will make mistakes from time to time. However, it's important to not get frustrated and understand its part of the process. Practice will reduce your mistakes, but because math questions vary so much and are always different, you can't fully memorize every case for every question.

Tips:
- Read the question CAREFULLY
- Make sure you are SURE which number you start with
- Plug any answers you are unsure about
- NEVER half-solve a question then guess, always finish it or skip

15. Justin can solve a Rubik's cube in 25 seconds. Allison can solve a Rubik's cube in 14 seconds. Justin solves a cube twice, and Allison uses the same cube right after, solving it six times. How many seconds did it take them? (4)
   A. 39   B. 103   C. 110   D. 134   E. 162

16. Lucius is counting backward by 7s. His first three numbers are 100, 93, and 86. What is his 10th number? (4) (Source: AMC)
   A. 61   B. 63   C. 64   D. 66
        E. 67

17. Sekou writes the numbers 15, 16, 17, 18, 19. After erasing one of the numbers, the rest of the numbers are divisible by 4. What number did he erase? (6) (Source: AMC)

    A. 15   B. 16   C. 17   D. 18   E. 19

🔥 BOSS PROBLEM 🔥

18. Howard sat on the car at the end of his street, counting 21 light poles in total. He knows that the street is 440 feet long and his friend's house is closest to the 14th pole from him. How far must he walk to reach his friend's house? (7)

    A. 308   B. 264   C. 286   D. 294   E. None of
                                 the above

Practice Problems

Estimated time: 60 minutes

Check on chick1n.github.io/EJAcademy.

(case sensitive, work in progress)

Guessing and Checking + Brute Forcing

A lot of the time Mathcounts and AMC questions are worded weirdly. Especially on the easier end, it's important to just TRUST yourself and continue solving. Don't second guess the question or overestimate it. They are ALL solvable. For instance, for question 5 below, there is NOT a fancy trick. It's simply an addition problem in a word problem. In conclusion, many questions sound harder than they are. Below is a set of problems that sound mathematical but are all solvable with basic logic and arithmetic. Give it a try!

Easy Difficulty

1. Clark has 5 marbles. Every day, his mom gives him a box of marbles, either containing 3 or 6 marbles. After a few days, what amount of marbles could Clark have? [1 coin]

   A. 9   B. 12   C. 13   D. 14   E. 16

2. What is the unit digit of 13^3+17^3? [1 coin]

   A. 1   B. 3   C. 8   D. 9   E. 0

3. If I choose 3 elements from the set {1, 2, 3, 4, 5, 6, 7}, what's the difference between the largest possible sum and the smallest possible sum? [1 coin]
    A. 9   B. 10   C. 11   D. 12   E. 13

Medium Difficulty

4. Bobby is locked in playing geometry dash on his phone while charging it. His phone can charge 1.5% battery a minute, but the game consumes 1% battery per minute. How many minutes will it take for him to fully charge his phone, starting from a dead battery? [2 coins]
    A. 200   B. 100   C. 60   D. 90   E. 66

5. Sofia buys a shiny new mechanical keyboard, which comes with bags of switches. The first bag has 1 switch, the second bag has 2 switches, and so on. She received 9 bags and 2 extra individual switches. How many switches does she have now? [2 coins]
    A. 38   B. 49   C. 50   D. 47   E. 48

6. Aaliyah rolls two standard 6-sided dice. She notices that the product of the two numbers rolled is a multiple of 6. Which of the following integers cannot be the sum of the two numbers? (Source: AMC) [2 coins]

    A. 5   B. 7   C. 8   D. 9   E. 13

7. I have 9 dollars on Monday. For the week (5 times), if I have an even amount of money, my friend Bob steals half of the money. If I have an odd amount of money, I multiply my money by 3 and gain 1 dollar. How much money do I have at the end of the week? [2 coins]

    A. 7   B. 11   C. 14   D. 28   E. 22

8. In Rizzyland, sodas cost $3, and burgers cost $5. Assuming no tax, which combo price is NOT possible? [2 coins]

    A. $7   B. $8   C. $9   D. $15   E. $16

9. I am thinking of a two-digit number. When the digits of my number are reversed, the value of my number is 72 larger than my original number. What is my original number? [2 coins]

    A. 12   B. 23   C. 89   D. 70

        E. 19

10. Brian's soccer team has 800 packs of gummies that they must eat. Ryan can eat 20 bags of gummies a minute, William can eat three times as fast as Ryan, and Brian can eat twice as fast as William. How many minutes will it take for them to finish all the gummies? [2 coins]

    A. 2   B. 4   C. 6   D. 8   E.
      10

Hard Difficulty

11. A drawer has 6 red socks, 5 blue socks, and 4 green socks. It's dark, so you pick socks randomly.
What is the minimum number of socks you must pull to guarantee you have at least one matching pair? [3 coins]

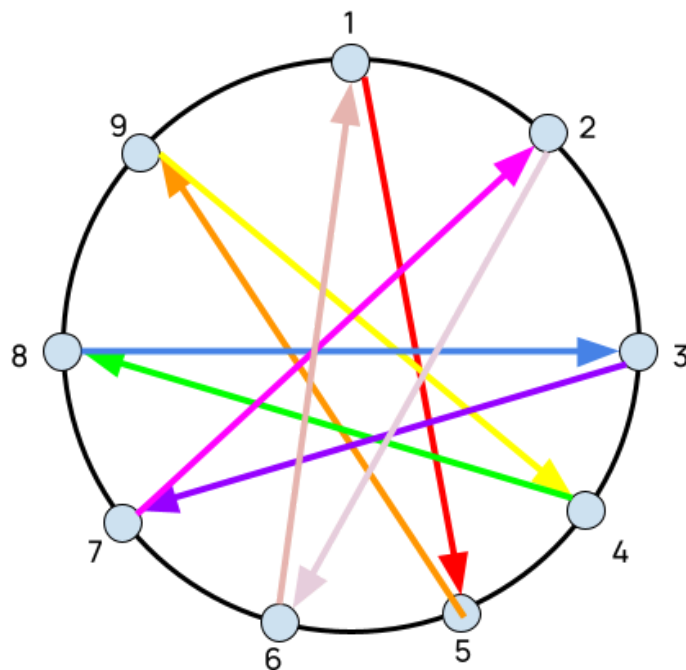   A. 2   B. 3   C. 4   D. 5   E.
      10

12. A ball is thrown around in a circle of 9 students, numbered 1 through 9. Each time, the ball is thrown clockwise around the circle, landing on the fourth person clockwise. This continues as the ball goes around the circle. After 91 tosses with the ball starting with the student numbered 1, which student has the ball? [3 coins]

A. 1   B. 2   C. 3   D. 4   E. 5

Bonus Questions

13. n! equals the product of all positive integers less than n. (5! = 5*4*3*2*1). What is the units digit of

$$\frac{1!}{1} + \frac{2!}{2} + \frac{3!}{3} + \frac{4!}{4} + \frac{5!}{5} + \cdots + \frac{2025!}{2025}$$

? [3 coins]

A. 1   B. 5   C. 0   D. 4   E. 9

14. I have 7 dollars on Monday. For two days, I can either double my money or quadruple my money each day. How many possible values of money can I have on Friday (At the end of the five days)? [3 coins]

A. 1   B. 2   C. 3   D. 4   E. 5

15. Grandpa Barry is on his hospital bed typing, and plans to type until he passes away. At the beginning of his session, he types at 128 words per minute. However, every minute that passes, his typing speed halves. Which word will he never finish? [3 coins]

A. 128   B. 80   C. 255   D. 256   E. 512