

## 1 Season 2, Episode 2

### Selected problems from 2016 AMC 12A

1. Each of the 100 students in a certain summer camp can either sing, dance, or act. Some students have more than one talent, but no student has all three talents. There are 42 students who cannot sing, 65 students who cannot dance, and 29 students who cannot act. How many students have two of these talents?

(A) 16    (B) 25    (C) 36    (D) 49    (E) 64

2016, AMC 12A, problem 11

2. Circles with centers  $P$ ,  $Q$  and  $R$ , having radii 1, 2 and 3, respectively, lie on the same side of line  $l$  and are tangent to  $l$  at  $P'$ ,  $Q'$  and  $R'$ , respectively, with  $Q'$  between  $P'$  and  $R'$ . The circle with center  $Q$  is externally tangent to each of the other two circles. What is the area of triangle  $PQR$ ?

(A) 0    (B)  $\sqrt{\frac{2}{3}}$     (C) 1    (D)  $\sqrt{6} - \sqrt{2}$     (E)  $\sqrt{\frac{3}{2}}$

2016, AMC 12A, problem 15

3. The graphs of  $y = \log_3 x$ ,  $y = \log_x 3$ ,  $y = \log_{\frac{1}{3}} x$ , and  $y = \log_x \frac{1}{3}$  are plotted on the same set of axes. How many points in the plane with positive  $x$ -coordinates lie on two or more of the graphs?

(A) 2    (B) 3    (C) 4    (D) 5    (E) 6

2016, AMC 12A, problem 16

4. Jerry starts at 0 on the real number line. He tosses a fair coin 8 times. When he gets heads, he moves 1 unit in the positive direction; when he gets tails, he moves 1 unit in the negative direction. The probability that he reaches 4 at some time during this process is  $a/b$ , where  $a$  and  $b$  are relatively prime positive integers. What is  $a + b$ ? (For example, he succeeds if his sequence of tosses is  $HTHHHHHH$ .)

(A) 69    (B) 151    (C) 257    (D) 293    (E) 313

2016, AMC 12A, problem 19

5. A binary operation  $\diamond$  has the properties that  $a \diamond (b \diamond c) = (a \diamond b) \cdot c$  and that  $a \diamond a = 1$  for all nonzero real numbers  $a, b$ , and  $c$ . (Here  $\cdot$  represents multiplication). The solution to the equation  $2016 \diamond (6 \diamond x) = 100$  can be written as  $\frac{p}{q}$ , where  $p$  and  $q$  are relatively prime positive integers. What is  $p + q$ ?

(A) 109    (B) 201    (C) 301    (D) 3049    (E) 33,601

2016, AMC 12A, problem 20