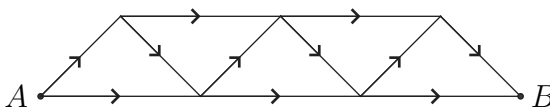


## From Stage 1

1. Alphonse and Beth play the following game. Gamal, a neutral third party, flips one fair coin repeatedly. He continues until sometime or other during the tossing either (i) the sequence “HH” (two heads in a row) appears, in which case Alphonse wins or (ii) the sequence “TH” (tail followed by a head) appears, in which case Beth wins. What is the probability that Beth wins? Express your answer as a common fraction.
2. There are three balls in a box, numbered 1, 2, and 3. You remove a ball from the box at random, record its number, and put it back in the box. You do this a total of three times. What is the probability that the sum of the three numbers you recorded is 6? Express your answer as a common fraction.
3. The diagram shows a network of one-way streets. How many ways are there to get from  $A$  to  $B$  if you can only travel in the direction of the arrows?

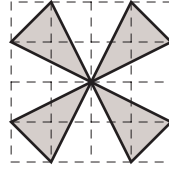


4. Alpha has four white socks and four black socks. She randomly divides these eight socks into four pairs, paying no attention to colour. What is the probability that each pair consists of 2 socks that match in colour? Express your answer as a common fraction.

## From Stage 2

1. Today it is Saturday. What day of the week will it be 1000 days from now? Your answer should be one of Sunday, Monday, . . . , Saturday.
2. A piggy bank contains only dimes and quarters. There are three times as many dimes as there are quarters, and the total amount in the piggy bank is \$8.25. How many coins are in the piggy bank?
3. What is the sum of the integers between  $-100$  to  $103$ , including  $-100$  and  $103$ ?
4. The first act of a three act play began at 7:30 pm. The third act ended at 10:35 pm. All three acts were of the same length, and there were two 10 minute intermissions, one between Act I and Act II, and one between Act II and Act III. At what time did the first intermission begin?

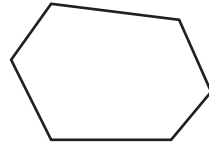
5. In the diagram, grid lines (dashed) are 1 unit apart. How many square units are in the shaded area?



6. A grocer buys oranges at 6 for a dollar, and sells them at 5 for two dollars. How many oranges must she sell in order to make a profit of 70 dollars?
7. Beth has a total of \$6.80 in nickels, dimes, and quarters. She has the same number of coins of each kind. How many coins does Beth have?

### From Stage 3

1. Alan went to the casino. On his first bet, he doubled the money he had. On the second, he lost 32 dollars. On the third bet, he doubled the money he had. On the fourth, he lost 32 dollars. He made a total of 10 bets, alternately doubling the money he had and losing 32 dollars. After the 10 bets, Alan was left without money. How many dollars did Alan start out with?
2. We want to divide the hexagon of the diagram below into triangles by drawing 3 diagonals that do not meet inside the hexagon. How many ways are there to do this?



3. The first two terms of the *Fibonacci sequence* are 1 and 1. After that, each term is the sum of the previous two. So the Fibonacci sequence goes

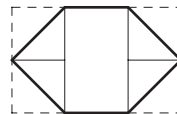
$$1, 1, 2, 3, 5, 8, 13, 21, 34,$$

and so on. How many of the first 100 terms of the Fibonacci sequence are multiples of 4?

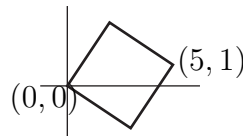
### From Stage 4

1. Solve for  $x$ :  $\frac{x}{2} - \frac{x}{3} + \frac{x}{4} = 10$ .
2. What is the sum of the roots of the equation  $(x - 10)^2 = 16$ ?
3. If Alan gets paid \$8 per hour, he needs to work 24 days to earn enough for a month's food and rent. How many days does it take if he gets paid \$6 per hour?
4. The surface area of a cube is 24 square cm. What is the sum, in cm, of the edge lengths of the cube?

5. The four corners of a 16 by 10 rectangle are folded inward as in the diagram. What is the perimeter of the resulting hexagon? Give the answer in simplest radical form.

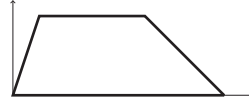


6. Express  $\frac{8! - 7!}{8! + 7!}$  as a fraction in lowest terms.
7. Given that 5 is a solution of the equation  $x^2 + ax + 5a = 2005$ , what is the value of  $a$ ?
8. How many integers are there between  $\sqrt{11}$  and  $\sqrt{111}$ ?
9. Fifty gold coins are divided among pirates A, B, and C. Pirate A gets more coins than B, who gets more than C. What is the largest number of coins C can get?
10. The title MATH CHALLENGERS must be centered on a line that contains 80 spaces. If each letter takes up one space, and the space between the two words takes up one space, how many spaces must be put before the M?
11. Two diagonally opposite vertices of a square are at  $(0, 0)$  and  $(5, 1)$ . How many square units are in the area of the square?



12. What is the value of  $\frac{x + y}{x - y}$  if  $x = \frac{5}{6}$  and  $y = \frac{4}{5}$ ?
13. What is the value of  $\frac{8!}{4!4!}$ ?
14. When  $N$  is divided by 40, the quotient is 39 and the remainder is 39. What is  $N$ ?
15. One-sixth of the hospital salary budget goes to the manager, and the remaining five-sixths goes to the 100 workers. If each worker earns \$240 a week, how many dollars a week does the manager earn?
16. What is the smallest positive integer that is a solution of  $32x - 16 > 1600$ ?
17. Duper Store sells evaporated milk for \$1 a can for the first 3 cans, and for the regular price of \$1.50 a can for every can over 3 cans. If you buy 10 cans of milk, how many percent do you save over the regular price?

18. How many square units are in the area of the trapezoid with vertices at  $(0, 0)$ ,  $(8, 0)$ ,  $(5, 3)$ , and  $(1, 3)$ ?



19. What is the smallest prime number that leaves a remainder of 24 when it is divided by 25?
20. The speed of light is 300 000 km per second, and the Sun is 150 million km from the Earth. How many seconds does it take for light to travel from the Sun to the Earth?