

1. How many letters are in this question?
2. In a school in Japan, the school offers two languages, Japanese and English. James and Franklin are transferring to this school and are considering which language they want to take. Assuming each student can take only one language, how many different combinations are possible for the two students?
3. David has ten 20 lbs. bags of cat food, and eight 30 lbs. bags of cat food, how many pounds of cat food does he have in all?
4. Danny Kim is 5 ft 3 in tall. If he wants to grow until he is exactly 2 in taller than Jeremy Lin, who is 75 in tall, how many inches must he grow?
5. A bag contains 3 red marbles, 4 blue marbles, and 2 marbles that are both red and blue. What is the probability that a marble that has red is drawn out of the bag?
6. What is the sum $1 + 2 + 4 + 8 + 16 + 32 + 64 + 128$?
7. It is winter in BCA and naturally the students there hibernate for the winter. Each person in the 9th grade hibernates for 9 days, each person in the 10th grade hibernates for 10 days, each person in the 11th grade hibernates for 11 days, and each person in the 12th grade hibernates for 12 days. If there are 100 people in each grade, how many total cumulative days does the whole school hibernate?
8. The sum of two numbers is equal to 25, and their difference is 11. What is the smaller of the two numbers?
9. There is a rumor at BCA that if someone is watching paint dry on a newly painted wall, it will dry faster. Naturally, Betty wants to test this theory and starts watching a newly painted wall dry at 9 : 00 AM. If Betty's watchfulness causes the paint to dry 1.5 times faster and it would normally finish drying at 3 : 00 PM, what time will it finish drying if Betty is watching it?
10. Find the sum of the mean, median, and mode of the set $\{1, 1, 3, 4, 4, 5, 6, 6, 6\}$.
11. How many two-digit multiples of 3 are not multiples of 6?
12. If the answer to this problem is x , find $4x + 9$.
13. 17 consecutive integers sum to 0. What is the smallest of these integers?
14. A car and a train face each other. The car starts moving at a constant speed of 5 m/s, and 10 seconds later, the train starts moving towards the car at a constant speed of 10 m/s. One minute after the train started moving, the two vehicles meet. How far apart were they initially?
15. How many ways are there to arrange 2 identical red books and 3 identical blue books in a row?
16. Mr. Lemma initially arranged his marching band in a square formation, before realizing that he preferred arranging them in 6 equal rows. If Mr. Lemma has between 100 and 150 students, how many people are in marching band?
17. Find the area of a triangle with vertices at $(0,1)$, $(0,7)$ and $(6,8)$.

18. On the planet Robzha, each day is 8-hours. The Robzhanians use an 8-hour clock, with each hour being 75 minutes long. If, on both the planet Earth and the planet Robzha, the current time is 7:57, after how many minutes will it be 7:57 on both planets again?
19. How many lines of symmetry does a regular octagon have?

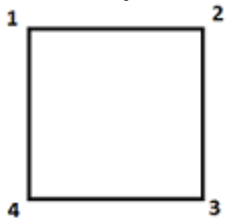
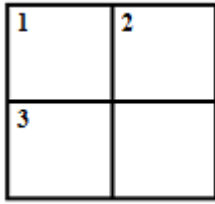


Figure for problem 20

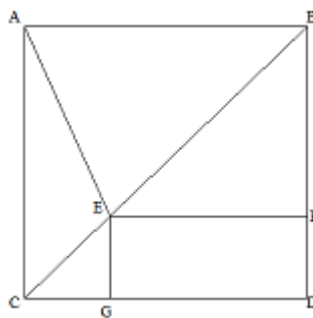
20. A group of students are running around a square racetrack and the first to visit the four corners wins the race. Robin is an inefficient cheater and decides to run from corner 1 to corner 2 to corner 4 and then to corner 3 while normal runners run the corners in order from 1 to 4. How much further does Robin have to run over the other runners to finish the race?
21. If the mean of the numbers 3, 7, 5, and $2x$ is x , find x .
22. $ABCD$ is a quadrilateral with right angles at B and D , $AB = 7$, $BC = 24$, $CD = 20$, and $DA = 15$. What is the area of this quadrilateral?
23. If n is an integer that evenly divides into $n + 4$, find the sum of all possible values of n .
24. Paula is trying to paint a house in 40 minutes, but it would take her one hour to complete this task. However, she has a helper, Abhiram, who, when working with her, paints just fast enough to finish painting the house in exactly 40 minutes. If both Paula and Abhiram work at constant speeds, how long would it take Abhiram to paint a house alone (in minutes)?
25. How many ways are there to arrange sedans, SUVs, and semitrucks in a parking lot of 10 side by side spaces if a sedan takes up 1 space, an SUV takes up 2 spaces, and a semitruck takes up 4 spaces? (The order in which they are arranged does not matter)
26. In a new game called Kopemon, a Kopemon called Kipachu uses an attack called Shocking Thunder, which does 100 damage. However, there is a 10% chance that it will be ultra-effective! and do double the damage. What is the average damage that can be done by a Kipachu's Shocking Thunder?
27. What is the probability of rolling a 2 or a 5, but not both, when rolling a pair of standard, six-sided dice?
28. If $0.108108108\dots$ can be written in simplest form as a fraction $\frac{a}{b}$, find $a + b$.

For problems 29 through 32, fill in the following crossword puzzle, putting a single digit in each box.



29. (1 across) A perfect cube
30. (1 down) A perfect square
31. (2 down) A multiple of 8
32. (3 across) A multiple of 13
33. How many positive integers less than 48 are relatively prime to 48? Note that two integers are relatively prime if their greatest common divisor is 1.
34. $\triangle ABC$ has area 171, and a \overline{DE} is parallel to \overline{AB} such that $\frac{DE}{AB} = \frac{1}{3}$. What is the area of quadrilateral $DEAB$?
35. A rectangle $ABCD$ has $AB = 6$ and $BC = 8$. Two points, E and F, are on \overline{AB} such that $AE = EF = FB = 2$, and one point, G, is on \overline{CD} such that $CG = GD = 3$. What is the ratio of the area of $ABCD$ to the sum of the areas of $\triangle DEG$ and $\triangle GFC$?
36. A happy pair of numbers is pair of two numbers such that each digit in one number is exactly one greater than the corresponding digit in the second number. For example, 1283 and 2394 are a happy pair. The sum of two numbers in a certain happy pair is 5823. What is the larger number?
37. Matt and Andrew start to have a game of catch on a perfectly linear path while separated by 20m. Andrew accidentally throws the ball too hard and it bounces off Matt, ricocheting back at double the speed. The moment the ball left his hand, Andrew started running in the opposite direction at a fixed speed of 6 m/s. If the ball hits Andrew after 8 seconds, how fast did Andrew initially throw the ball?
38. What is the surface area of a sphere with radius 10?
39. Izzy is thinking of a 3-digit number with all non-zero digits. When she squares each of its digits and adds them up, she gets exactly twice the sum of the digits. What is the number?
40. Andrew Cho needs to choose two new people for his band, the Chonas Brothers. He needs to choose these people from a group of 4 girls and 5 boys, where at least one person chosen is a boy. How many different pairs of people can he choose?

41. An ant is on its way home from the starting point of $(0, 0)$ on a coordinate plane. He needs to get to his nest at point $(7, 11)$, but he can only go up or right 1 unit at a time. However, along the way he needs to get food located at $(3, 3)$. How many possible ways are there to get from its starting point to its nest through the food spot?
42. What is the greatest integer that must always divide a product of five consecutive positive even integers?
43. An equilateral triangle of side length 6 is inscribed in a circle. Find the circumference of the circle.
44. A room has 20 teachers, 12 of which are male and 8 are female. Each male teacher shakes hands twice with every other male teacher, each female teacher shakes hands three times with every other female teacher, and each teacher shakes hands once with every teacher of the opposite gender. How many total handshakes happen in the room?
45. Alice and Bob are running for class president. But in this voting system, the votes are counted one at a time until either Bob receives three votes or Alice receives two. The remaining votes are thrown out, and whoever received the last vote becomes president. If there is always a $\frac{1}{2}$ chance that either Bob or Alice will receive a vote, what is the probability that Bob wins?
46. Find the solution, as an order pair (x, y, z) of the system of equations $x + 3y + 2z = 2$ and



$$6x + 3y + 2z = 3 \text{ and } 2x + 3y + 4z = 4.$$

47. In the diagram above, $ABCD$ is a square with side length 12, $EF = 2 \cdot EG$. What is the area of $\triangle AEC$?
48. Find the shortest distance from the point $(3, 4)$ to the line $y = x$.
49. How many ordered pairs of positive integers (a, b) satisfy $8a - 3b + 2ab = 36$?
50. Brian is mixing potassium hydroxide in a 100mL, 200mL, and a 500mL beaker. If he has 7 indistinguishable chunks of potassium hydroxide, and each beaker must have at least one chunk of potassium hydroxide, then how many ways can Brian distribute his potassium hydroxide among his 3 beakers?