

PUZZLES

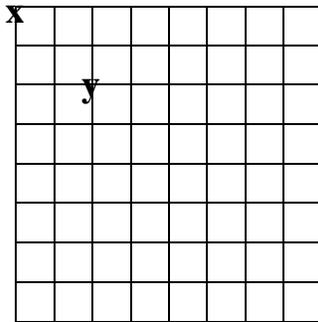
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1. Exactly 333 UTA engineering students, each armed with a water gun, are spread around the field of Cowboys Stadium for the annual Engineering Week Water Dual. For every student, each of the other 332 students is a different distance from him/her. At Jerry Jones' signal, each student squirts, hitting his/ her nearest neighbor. Select the correct statement from the choices below. As your answer, state only the corresponding letter.
 - (a) All 333 students get wet.
 - (b) At least two students stay dry.
 - (c) Exactly one student stays dry.
 - (d) There is not enough information to select (a) – (c) with certainty.
2. IMSE professor Marie Savant, ME professor Li Yin, and BE professor Elisa Hart each have two children, and the six children attend the same elementary school. The three faculty members decide to carpool. However, Drs. Savant and Yin have cars that can carry all six children, while Dr. Hart's car can carry only four children. Is there a driving schedule so that each professor takes children to school exactly half the days during the 20 school days of April? Obviously more than one car will be needed when Dr. Hart drives. Select the correct statement from the choices below. As your answer, state only the corresponding letter.
 - (a) Yes, there is such a carpooling schedule.
 - (b) No, there is no such carpooling schedule.
 - (c) There is not enough information to select (a) or (b) with certainty.
3. In the ME supply room, there are three closed boxes labeled NAILS, SCREWS, and NAILS & SCREWS. The actual box of nails contains 100 nails, the actual box of screws contains 80 screws, and the other box contains 40 nails and 30 screws. Each box is labeled incorrectly, however. An ME work-study student named Brad chooses a box, and another work-study student named Angelina hands him a single randomly chosen object from that box. Brad keeps the object without returning it to its box. What is the minimum number of objects that Brad can request in this way and correctly label the boxes?
4. Two environmental engineering students Diana and Nadia took a drive to Forest Hills National Park in Diana's car one Saturday this past October to see the fall foliage. Diana drove the first forty miles of the trip to the park, and Nadia drove the rest of the way. After a picnic, Diana drove the first part of the trip back on the same route, and then Nadia drove the last fifty miles. To two decimal places, who drove the most total miles on the trip and by how many miles? State your answer in the form: (name of driver, number of miles more than other driver).

5. A material scientist graduate student named Hsia Tseng has four pieces of the metal unobtainium, each weighing an integer number of pounds. With these four pieces, he can weigh on a balance scale any object weighing an integer number of pounds from 1 to 40. Determine how much the four individual pieces of unobtainium must weigh. State your answer in the form (a,b,c,d) , where $a < b < c < d$ and a,b,c,d represent the four individual weights.

6. Two CSE students named Subrat and Prabhu play the following game with a standard die. Subrat rolls the die first, Prabhu rolls next, and they continue alternating turns until someone loses. The loser of the game is the first student who does not roll a higher value than obtained on the previous roll. To the nearest three decimal places, what is the probability that Subrat wins the game?

7. The nation of Griddonesia consists of eighty-one equally-spaced islands represented by intersections of the lines in the following grid, where north is up and east is right as on a standard map. Each island is connected to all its adjacent islands by horizontal and vertical bridges exactly one-mile long. There are no diagonal bridges. A Griddonesian UTA CE graduate named $\mathbb{M}\mathbb{D}\mathbb{H}\mathbb{K}$ needs to drive from island x below to island y over the bridges in an autonomous vehicle that steers itself. $\mathbb{M}\mathbb{D}\mathbb{H}\mathbb{K}$ knows the vehicle is defective and always drives south from any island with probability $1/3$ and east from any island with probability $2/3$. To the nearest three decimal places, what is the probability that $\mathbb{M}\mathbb{D}\mathbb{H}\mathbb{K}$ will reach island y from island x in this defective autonomous vehicle?



8. An ME student named Siri traveled around England between the fall and spring semesters. At one point she stopped her car en route to Dunwich and determined with an iPhone GPS app that she was exactly 5 miles from Alton, 5 miles from Bingham, and 13 miles from Coleford. For each of these four towns the app also gave their relative map coordinates in miles, centered at Bingham, as Alton $(0,8)$, Bingham $(0,0)$, Coleford $(15,9)$, and Dunwich $(5,2)$. To the nearest two decimal places, how far in miles on the map is Siri from Dunwich?

9. An AE named Carlos is reviewing analytic geometry before taking a course in statics. In his review, Carlos encounters the following example, which you are to solve. Suppose that A, B, and C are noncollinear points in the plane with integer

coordinates. Also suppose that the lines AB, AC, and BC have integer lengths. What is the smallest possible value of AB?

10. An ME student named Zach purchased a 2012 Honda Accord in October and immediately drove to a large empty parking. Starting from rest, Zach accelerated uniformly for 5.21 seconds over a distance of 110 meters. To the nearest two decimal places, determine the car's required constant acceleration in meters per second².
11. The Shorthorn polled n engineering students in December about whether they had learned from the internet, newspapers, or television about the CERN announcement that some neutrinos had possibly exceeded the speed of light (see <http://www.guardian.co.uk/science/2011/nov/18/neutrinos-still-faster-than-light>). The Shorthorn article published the following results of the poll. Exactly 50 students had heard the story on either the internet alone or the internet together with at least one of the other two sources. Exactly 61 students did not read it in a newspaper. Exactly 13 students did not see the news on television. Exactly 74 students learned the news from at least two of the sources. Find the maximum value of n for which the results of the poll are consistent.
12. In the capstone course IE 4350, a student project team models the amount $A(t)$ of money that Luxxar Inc. accumulates in a fund for future corporate expansion, where t is the time in years from the creation of the fund. Starting with $A(0) = 0$, Luxxar continuously invests part of its revenue in the fund at a rate of \$50,000 dollars per year and earns an interest rate of 5% per year compounded continuously. To the nearest dollar, find the amount in this fund after 20 years of investing.
13. EE professor Dr. Nick Tesla is studying electrical power usage. In his lab in the new Engineering Research Building, he has 1000 lights attached to the ceiling. Each light is turned on or off by its own pull-cord, and the lights are numbered 1 to 1000 for experimental purposes. Suppose all the lights are initially off. First Dr. Tesla pulls each cord in numerical order to turn them on. Second, he pulls every second cord in order and turns off lights 2, 4, 6, 8, Third, he pulls every third cord, i.e., lights 3, 6, 9, 12, Fourth, he pulls every fourth cord, i.e., lights 4, 8, 12, 16, Dr. Tesla continues pulling cords in this manner, turning some lights on and others off. Finally he pulls every 1000th cord (i.e., light 1000) and stops. Determine how many lights will be on after he stops. Select the correct statement from the choices below. As your answer, state only the corresponding letter.
 - (a) 31
 - (b) 121
 - (c) 500
 - (d) 1000

ANSWERS

1. d
2. a
3. 1 Choose an object from the N & S box first to determine the correct labels.
4. (Nadia, 20.00)
5. (1,3,9,27)
6. 0.665
7. 0.296
8. 2.83
9. 3
10. 8.10 meters per second²
11. 148
12. \$1,718,282 Luxxar continuously invests at the rate of \$50,000 per year. Since the interest is continuously compounded also, $A(t)$ must satisfy the differential equation $dA/dt = 0.05 A(t) + 50,000$ with $A(0) = 0$.
13. a