



Eighty Twenty Consulting Pty, Reg.no. 2012/019879/07  
Upper East Side, 31 Pickwick Road Woodstock  
Roof Parking Level, Cape Town 7925  
T: 021 461 8020 | F: 087 625 0649 | E: [info@eighty20.co.za](mailto:info@eighty20.co.za)

## THE EIGHTY20 CHALLENGE

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Here at Eighty20 we want to see how well you think. So try some of these puzzles. To apply, select four puzzles (not just the easy ones please), and send your answers to...see the grey box below.

### SEND YOUR ANSWERS

TO:

Inoo pqyn, aqc rbtrunp hd. Dwtd itky'd dqq wtpb itk hd? Sontkn knyp aqcb kqocdhqyk dq dwn scllonk dq rbtrunp td nhmwdadinyda pqd rq pqd lt. He aqc'vn rwqkny kqzn qe dwn wtpbnb rwtoonymnk, typ ztpn kqzn dwqcmwdeco tddnzsdk td dwn tykinbk, in'oo mnd xtru dq aqc typ tku aqc eqb aqcb rv. He aqc wtvn ty njrnoonyd ztdbhr typ t ehbkd rotkk cyhvnbkhda pnmbnn, in'oo xn kcbn dq rpydtrd aqc eqb ty hydnbvni. Dwtyuk eqb snbkvnbhym!

### THE FIRST CHALLENGE

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Have a good look at our logo. It fits in with the analytical and quantitative emphasis of our approach. What do the blocks in the logo represent?

Difficulty rating: pretty easy



### EIGHTY20 DIVISIONS

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EIGHTY is a six digit number with no repeating digits and no zeros. When divided by 19, 17, 13, 11, or H, the remainders are, respectively, 17, 13, 11, 7 and G.

TWENTY is (another) six digit number with no repeating digits and no zeros (and uses a different key to EIGHTY above). When divided by T, perfect square WE or cube NTY, the remainder is zero.

Find EIGHTY TWENTY

Difficulty rating: Brute force will do it, but can you be clever?

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## **THE PRISONER AND THE GUARDS**

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You are a prisoner with two guards, each guarding one door to your cell. One guard always lies and one is always truthful, but you do not know which is which. You may leave your cell by one of the two doors. One leads to the execution block and death. The other to freedom. You may ask only one question, which you may address to either of the guards but not to both. What do you do?

Difficulty rating: simple

## **PRIME SUMS**

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Prove that every even integer greater than 2 can be expressed as the sum of two primes

Difficulty rating: You're a genius if you can do it

## **BUYING CHERRIES**

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Cherries are very popular in South Africa. In one warehouse 1,000kg of fresh cherries are stored. The cherries contain 99% water when fresh, but a few days later, a test showed that there was now only 98% water, due to the drying out of the cherries. What do the cherries weigh now?

Difficulty rating: basic

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### **CRAZY DOG**

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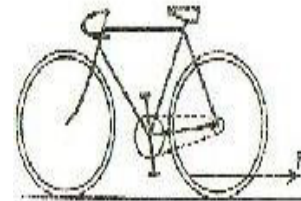
John and Paul are on their bicycles, distance  $L$  apart. They begin at the same time to move towards each other, each pedalling as fast as they can intending to collide. At the instant they begin, their dog who loves them both leaves John and runs as fast as he can to Paul, who pats him on the head, at which point he turns and runs back to John. All this is repeated until the bicyclists collide. How much distance is covered by the dog? Assume that John and Paul move with constant velocity  $v_1$  and  $v_2$ , and the dog moves with speed  $u$  and is able to turn around instantly.

Difficulty rating: challenging

### **A BICYCLE PROBLEM**

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A bicycle as shown in the picture is a perfectly good bicycle except that it has a piece of string caught up in the rear wheel. If we pull the string in the direction  $P$ , will the bicycle move forward, move backward or 'stay put'? Assume that the wheel does not slip on the ground.



Difficulty rating: just try it

### **HAPPY BIRTHDAY**

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The year is 2007. Two days ago I was ten years old; Next year I shall be thirteen. What is the date today and when is my birthday?

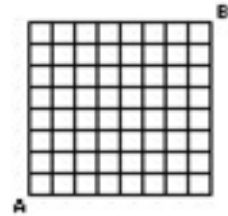
Difficulty rating: trivial

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## ROAD MAP

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This is a map of the Roads from A to B. Every line is a road. If I start to walk from A to B and you start to walk from B to A at the same speed, what is the probability that we shall meet? You can take any route you like except that it mustn't go back along a path or away from your destination. For instance, if you come from B to A you must always move from East to West or North to South. What is the probability of us meeting if I cycle and hence travel three times as fast as you?



Difficulty rating: really difficult

## DEATH CIRCLE

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N prisoners are to be put to death, except for one, who will be set free. The method to determine who will be set free is as follows: All prisoners stand in a circle. A gun is given to a prisoner 1, and he has to shoot dead the prisoner to his left. He then passes the gun to the next (alive) prisoner on his left, who, in turn will shoot the prisoner on his left, and pass the gun to the next person on his left, and so on. For example if N=5 prisoners are standing in a circle (call them prisoner 1, 2,3, etc).

- 1 shoots 2, and passes the gun to 3.
- 3 shoots 4, and passes the gun to 5.
- 5 shoots 1, and passes the gun to 3 (2 is already dead)
- 3 shoots 5, and 3 is the last one left. He is set free

Who is set free for N=100. Any arbitrary N?

Difficulty rating: hard

## THROWING DICE

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In a pub the owner is throwing a number of dice simultaneously. "I am trying to get one of each of the six faces", he says, "But it hasn't happened yet". "No", I said "You need at least four more dice to make the odds in favour of such a thing" How many dice does the owner have?

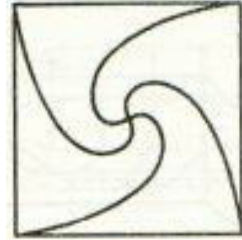
Difficulty rating: tricky

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## SQUARE FIELD

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Consider a square field with a man standing at each of its four corners. If each man walks directly towards the man on his right they will all eventually reach the middle of the field together. Assuming they walk at the same speed, how far will each man have to walk?



Difficulty rating: a challenge to explain

## BOTTLE OF WINE

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Three men order a bottle of wine at R30 to drink with their meal. They each pay R10 for it. The waitress asks the manager who only has a bottle at R25, so he gives the waitress the wine and R5 change. She returns to the table but gives only R3 back keeping R2 for herself. Since each man paid R10 and received R1 change he has paid R9. But  $3 \times 9 = R27$  which with the R2 kept by the waitress makes R29. Where did the R1 go?

Difficulty rating: really easy

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