SENIOR CHALLENGE '05

Sponsored by Mercer Human Resource Consulting Ltd

1. EINSTEIN'S PROBLEM

Albert Einstein was standing on a station platform thinking about relativity when he noticed that he could see two station clocks. Each clock was digital (in his day?), showing only hours and minutes. He observed that the display on one changed to the next minute 10 seconds before the correct time, whereas the other one changed to the next minute 10 seconds after the correct time. For what fraction of the day did the clocks show the same time?

Solution: $\frac{2}{3}$.

2. HOPPING MAD

Starting at A, a fixed point on a circle with centre O, I move anticlockwise one quarter of the way round the circle to a point W, then hop across to X, the opposite end of the diameter through W, then travel one fifth of the way round the circle clockwise to the point Y, before hopping across to Z, the point at the opposite end of the diameter through Y. How big is the angle $\angle AOZ$?

Solution: 18^o.

3. LOW MARK

In four tests, each marked out of 100, my average was 85. What is the lowest mark that I could have scored on any one test?

Solution: 40%.

4. BURNING OUT

One night two candles, one of which was 3cm taller than the other, were lit. The taller one was lit at 5:30 pm and the shorter one at 7 pm. At 9:30 pm they were both the same height. The taller one burned out at 11:30 pm and the shorter one at 11 pm. How tall was each candle originally?

Solution: 24cm and 27cm.

5. TWO DIGITS

A 2-digit number is squared. When this 2-digit number is reversed and squared the difference between the squares is also a square. What is the 2-digit number?

Solution: 65 or 56.

6. ESCALATORS

At an underground station there are two very long escalators side by side. Two people are in a hurry, and each climbs one of the escalators as it is moving upwards, thus adding their speed to that of the moving steps. The taller of the two people climbs three times as quickly as the smaller person. He has counted the steps that he has taken in getting to the top and has taken 75 steps. The smaller person takes 50 steps on the escalator before getting to the top. Each escalator moves at the same speed. If they had been stationary how many steps would there have been for people to climb?

Solution: 100 steps.

7. PENNY-FARTHING

Two touching circular wheels stand, as shown, on a horizontal surface. The diameter of the smaller wheel is one quarter that of the larger wheel which is, say, d. In terms of d, how far apart are the wheels' points of contact with the horizontal surface?

Solution: $d/2$.