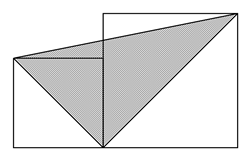
**STELLENBOSCH CAMP 2017**

**BEGINNERS’ TEST**

1. The sum of the digits of a 2-digit number is 9. If the digits are written down in the reverse order, the new number is 9 more than the original number. What is the original number?

2. Let *a , b* and *c* be positive integers. If  What is the value of *abc*?

3. Travelling at an average speed of 40 km/h, we will be 1 hour late to our destination. Travelling at an average speed of 60 km/h, we will be 1 hour early. At what average speed, in km/h, should we travel in order to arrive on time?

4. Two squares are adjacent to each other as shown. The smaller square has length *a* cm, while the larger has length *b* cm. Determine the shaded area in terms of *a* and *b*.

5. Andy and Betty both choose a whole number from 1 to 10. In how many ways can Andy's number be bigger than Betty's?

6. Simon and Harry spin a coin 30 times. Whenever the coin showed heads, Simon gave two sweets to Harry. When the coin showed tails, Harry gave three sweets to Simon. After 30 spins, both Simon and Harry had the same number of sweets as they started with. How many times did the coin show tails?

7. When 333333332 +22222222 is written out in full what is the sum of its digits?

8. Let *P* be the product of three consecutive odd integers. What is the HCF of all such numbers *P*?

9.



ABDE is a square and ACF is an equilateral triangle. Further BA = AC.

Prove that BEFC is a cyclic quadrilateral.

10. Find three prime factors of 

11.

X is the centre of square ABCD. Determine the area of XYBZ if ABCD has area *a*.

12. If *a, b* and *c* are three positive real numbers such that .

Show that *a, b* and *c* cannot be the sides of a triangle.

13. In a certain city, all the skyscrapers are arranged in a square grid and each has either one, two, three or four storeys. Jonathan is surveying 4 x 4 sections of the city and noting how many skyscrapers he can see from a certain position in a certain direction. For example, Jonathan came across the following section of the city, viewed from the top. See diagram below.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 2 | 2 | 1 | 3 |  |  |
|  |  |  |  |  |  |  |  |
| 3 |  | 1 | 3 | 4 | 2 |  | 2 |
| 1 |  | 4 | 2 | 1 | 3 |  | 2 |
| 3 |  | 2 | 1 | 3 | 4 |  | 1 |
| 2 |  | 3 | 4 | 2 | 1 |  | 3 |
|  |  |  |  |  |  |  |  |
|  |  | 2 | 1 | 3 | 2 |  |  |

Each number in the 4 x4 square represents the number of storeys in the building located there. He jots down the numbers alongside. The top 3 on the left says that from that position looking in the direction of the arrow, he can see three buildings. Check: he sees the 1, 3 and 4 storey buildings, but he cannot see the 2 storey building.

Suppose Jonathan jots down the following information for a different city.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 4 | 1 | 2 | 2 | 3 |  |  |
|  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  | 3 |
| 2 |  |  |  |  |  |  |  | 2 |
| 2 |  |  |  |  |  |  |  | 3 |
| 1 |  |  |  |  |  |  |  | 4 |
| 5 |  |  |  |  |  |  |  | 1 |
|  |  |  |  |  |  |  |  |  |
|  |  | 2 | 3 | 2 | 2 | 1 |  |  |

Fill in the missing numbers.

14. Find all pairs of positive integers which satisfy the equation

15. Points and are chosen on the sides and of a square , respectively, so that . Points and are the intersections of the diagonal with and , respectively. Prove that and lie on the circle with diameter .