**SOLUTIONS: BEGINNERS TEST**

1. The possibilities for the number are 18, 27, 36, 45 since reversal of the digits increases its value. The differences are

81 – 18 = 63, 45, 27 and 9. The answer is 45.

**Alternate method**: Let the tens digit be *a* and the units digit, *b*. The value of the number is  . When the digits are reversed, its value is  Hence



Add (1) and (2): . So the original number is 45.

2. Add all three equations: 

 Similarly  . Hence *abc =*  15

3. Suppose it takes *t* hours to reach the destination. Then the distance travelled is



So *t* = 5, and the distance that has to covered is 240km. The average speed is therefore 

4. A diagonal of a square bisects the opposite angles. Hence the shaded triangle is a right angled triangle. Its area is



5. If Andy chooses 10, then there are 9 numbers that are smaller. If Andy chooses 9, then there are 8 numbers that are smaller. Continuing this logic there will be 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 45 cases where Andy’s number is bigger than Betty’s.

6. Suppose *t* of the 30 throws showed tails. Then 30 – *t* showed heads. From the heads, Harry gained 2(30 - *t*) sweets and from the tails he lost 3*t* sweets. The net gain was zero. That is,



2(30 – *t*) = 3*t*

So *t* = 12 is the number of tails shown.

7. First note that each of the numbers contains 8 digits and the second is  of the first. Let

*x* = 33333333. Then our number is

.

This is a number which is the sum of two numbers, one which has 8 ones followed by 8 zeros, while the other has 8 ones. The answer is 16.

8. Divide the first of the three numbers by 6. It is one of 6n + 1, 6n + 3, 6n + 5. In each case one of the three numbers is a multiple of 3. But 3 is possible, as in 1 x 3 x 5. So HCF is 3.

9. Note that both triangles ABE and AEC are right angled isosceles triangles. So BEC is a right angle. So is BFC. Easily verified). Etc.

10.



So 31 is a factor. Since the sum of two (also four) odd numbers is even, 2 is also a factor.



Now *a* + *b* is a factor of whenever *n* is odd. So 5 + 31 = 36 is a factor of the second term. The right hand side is therefore divisible by 6. This gives us the prime factors 2 and 3.

**Alternate**: Mod 3, . Hence

proving 3 is also a factor. The answer is 2, 3 and 31.

We could have also taken mod 6 since 5 and 31 are equal to – 1 and 1 respectively in mod 6. In this case, 6 is shown to be a factor, so 2 and 3 are obtained at one stroke

11.

**Method** 1:

Extend YX and ZX to meet the opposite sides. By symmetry the four quadrilaterals so formed are congruent so area ABCD = 

**Method 2:**

Join XB and XC. The diagonals of a square meet at right angles, are equal, and bisect the opposite angles. So angle BXC = 90 . It follows that angles BXY and CYZ are equal and hence triangles BXY and CXZ are congruent.

area XYBZ = area BXY + area BXZ = = area CXZ + area BXZ = area BXC = 

12.



Since squares cannot be negative, we conclude that  So . Hence .

congruent. So

area XYBZ = area BXY + area BXZ = = area CYZ + area BXZ

area BXC = 

12.



Since squares cannot be negative, we conclude that  So . Hence .

So the triangle inequality is not satisfied. Such a triangle does not exist.

13.

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

11.