Group Test Answers

1) Each 'fracture' splits a single segment into 5.

Each 'fracture' decreases segment size by $\frac{1}{3}$.

Step 0: 1 segment 6 inches each

Step 1: 5 segments $\frac{6}{3} = 2$ in each

Step 2: 25 segments $\frac{2}{3}$ in each

Step 3: 125 segments $\frac{\frac{2}{3}}{3} = \frac{2}{9}$ inches each

Thus total length is $125 \times \frac{2}{9} = \frac{250}{9}$ inches

2) Because the table is round, there is no starting point, just 'fix' someone, say a man. There are then 5 options for his right-hand neighbor, 4 for the next, etc... So, we have

$5 \times 4 \times 4 \times 3 \times 3 \times 2 \times 2 \times 1 \times 1 = 2{,}880$ ways.

3) The size 4 intersection contains 10 students total. The size 3 intersections each contain 15 total, and 10 of these are accounted for, so there are 5 students with exactly 3 A-s, in each set of 3 subjects.

Similarly, there are 6 students with exactly 2 A-s in each set of 2 subjects $(26 - 2(5) - 10 = 6)$.

There are 7 students with exactly one A in each set of 1 subject. Thus there are $7 + 3(6) + 3(5) + 10 = 50$ students with A-s in mathematics. There are a total of $4(7) + 6(6) + 4(5) + 1(10) = 94$ with A-s, so 6 with none.

④ Notice that there are

$$9! = 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 362{,}880$$

possible 9 digit numbers w/ 1 through 9. But who cares!! The sum of the digits of all of these is

$$1+2+3+4+5+6+7+8+9 = \frac{9(10)}{2} = 45$$

Since 3 divides 45, all of these numbers have 3 as a factor.

So the answer is <u>zero</u>, none of them are prime.

5) Notice the area is given by finding the area of the larger circle and subtracting the area of the smaller. Say R is the larger radius and r the smaller.

So $A = \pi R^2 - \pi r^2 = \pi(R^2 - r^2)$.

By Pythagorean we have

$$r^2 + 5^2 = R^2$$

so $R^2 - r^2 = 5^2$.

Therefore area $= \pi(5^2) = 25\pi$. in^2