ANSWER KEYS

1. (3)	**2.** (2)	**3.** (3)	**4.** (4)	**5.** (3)	**6.** (3)	**7.** (1)	**8.** (2)
9. (4)	**10.** (4)						

1. **(3)** All the 5 digit numbers and 6 digit numbers are greater than 3000. Therefore, number of 5 digit numbers $= {}^6P_5 - {}^5P_5 = 600$.
{Since the case that 0 will be at ten thousand place should be subtracted}.
Similarly, number of 6 digit numbers $6! - 5! = 600$.
Now, the numbers of 4 digit numbers which are greater than 3000, having 3, 4 or 5 at first place, this can be done in 3 ways and remaining 3 digit may be filled from remaining 5 digits i.e. required number of 4 digit numbers are ${}^5P_3 \times 3 = 180$.
Hence, total numbers $= 600 + 600 + 180 = 1380$

2. **(2)**
Number of ways of choosing 1 candidate $= {}^{10}C_1$
Number of ways of choosing 2 candidates $= {}^{10}C_2$
Number of ways of choosing 3 candidates $= {}^{10}C_3$
Number of ways of choosing 4 candidates $= {}^{10}C_4$
Total number of ways
$= {}^{10}C_1 + {}^{10}C_2 + {}^{10}C_3 + {}^{10}C_4$
$= 10 + 45 + 120 + 210$
$= 385$

3. **(3)** Out of 6 novels, 4 novels can be selected in ${}^6C_4$ ways.
Also out of 3 dictionaries, 1 dictionary can be selected in ${}^3C_1$
ways.
Since the dictionary is fixed in the middle, we only have to arrange 4 novels which can be done in 4! ways. Then the number of ways ${}^6C_4 \cdot {}^3C_1 \cdot 4!$
$= \frac{6 \cdot 5}{2} \cdot 3 \cdot 24 = 1080$

4. **(4)** Odd numbers are $1, 3, 5, 7$
We have to fill up four places like - - - -
Units place can be occupied in 4 ways by $1, 3, 5, 7$. Thousands place can be occupied is 5 ways (i.e. $1, 2, 3, 5, 7$) remaining two positions can be filled in 6 ways each
$\therefore$ By fundamental principle of counting.
Required no. of ways are $= 5 \times 6^2 \times 4$
$= 720$

5. **(3)**
In word MATHEMATICS
H, E, C, I and S - without repetition
M, A, T - occurs twice 5 letters can be placed on 3 places in ${}^5C_3$ ways.
Again even places 2^{nd} & 4^{th} position can be filled by the three letter M, A & T
Even places can be filled in two ways
(1) Choose 1 letter from 3 given letters M, A & T
${}^3C_1$ ways
(2) Choose 2 letter from 3 given letters M, A & T and arrange them in 2! ways
${}^3C_1 \times 2!$ ways
Total ways ${}^3C_1 + {}^3C_1 \times 2! = 9$ ways
Required number of ways $= {}^5C_3 \times 9 = 540$ ways.

6. **(3)** 6 particular players are always to be included and 4 are always excluded so total no. of selection, now, 4 players out of 12, hence number of ways $= {}^{12}C_4$.

7. **(1)**

Consider triangle without vertex A.

We can choose 2 vertices from line AB and one vertex from A, the possibilities are ${}^{m}C_{2} \times n$.

We can choose 2 vertices from line AC and one vertex from AB, the possibilities are ${}^{n}C_{2} \times m$

As anyone of the above can be done, so number of possibilities is ${}^{m}C_{2} \times n + {}^{n}C_{2} \times m$.

$= \frac{m(m-1)}{2} n + \frac{n(n-1)}{2} m$

$= \frac{mn(m+n-2)}{2}$.

Consider triangles with vertex A

As one vertex is A, we can choose one vertex from AC and one from AB the possibilities are $1 \times m \times n = mn$.

Number of triangles when A may be included is $= mn + \frac{mn(m+n-2)}{2} = \frac{mn(m+n)}{2}$

Therefore, ratio is $\frac{m+n-2}{m+n}$.

8. **(2)** Given word is $HAVANA$ $(3A,\ 1H,\ 1N,\ 1V)$.

Total number of ways arranging the given word

$= \frac{6!}{3!} = 120$

Total number of words in which N & V are together

$= \frac{5!}{3!} \times 2! = 40$

$\therefore$ Required number of ways$= 120 - 40 = 80$

9. **(4)** Total number of ways in which boys and girls can seat alternatively $= 4! \times 4! \times 2 = 1152$.

When particular boy and particular girl are always together, then number of ways $= 3! \times 3! \times 7 \times 2 = 504$.

$\therefore$ Required number of ways $= 1152 - 504 = 648$.

10. **(4)**

Given word is MISSISSIPPI.

Here, $I = 4$ times, $S = 4$ times, $P = 2$ times, $M = 1$ time

_M_I_I_I_I_P_P_

So, MIIIIPP can be arranged in $\frac{7!}{4! \times 2!}$.

So there are 8 gaps among the letters of the words MIIIIPP, in which 4S can be filled.

$\therefore$Required number of words $= {}^{8}C_{4} \times \frac{7!}{4!2!}$

$= {}^{8}C_{4} \times \frac{7 \times 6!}{4!2!}$

$= 7 \cdot {}^{8}C_{4} \cdot {}^{6}C_{4}$