CHAPTER – 6
GAMES AND TOURNAMENTS

Worked out Examples:

These questions are based on the following information.

64 players are scheduled to take part in a tennis tournament. The players are seeded from 1 to 64 with seed 1 being the top seed and seed 64 being the last seeded player. The tournament takes place in a knockout format with different rounds. In each round the winner of a match between two players advance to the next round while the loser is eliminated. This process is repeated till the finals. In the first round player seeded 1 plays the player seeded 64, the player seeded 2 plays the player seeded 63 and so on. An upset is said to happen if a lower seeded player beats a higher seeded player. The matches are scheduled such that, in case of no upsets, in each round, the highest seeded player plays the lowest seeded player left in the tournament, the second highest seeded player beats the second lowest seeded player left and so on.

6.01. What is the total number of rounds in the tournament?
(A) 5 (B) 6 (C) 7 (D) 8

Sol: As there are a total of 64 players, in the first round 32 players would be eliminated and 32 players would be left. In the next round half of 32, i.e., 16 players would be eliminated. In this way after 6 rounds there will be only one player left who is the winner of the tournament.

Note: Number of rounds is a factor of the power of 2. For 2 players, the number of rounds required is 1 as $2^1 = 2$, for 3 or 4 players the number of rounds required is 2 as $2^2 = 4$, for 5, 6, 7 or 8 players the number of rounds is 3 as $2^3 = 8$ and so on. Choice (B)

6.02. How many matches are played in the tournament?
(A) 52 (B) 60 (C) 63 (D) 64

Sol: As the tournament stated with 64 players and in the end only one player was undefeated, a total of 63 matches are played as one player is eliminated per match. Choice (C)

6.03. Which player faces the player seeded 3 in the quarter finals (round of 8) if the tournament had no upset?
(A) 6 (B) 9 (C) 11 (D) 5

Sol: In any round, in case of no upsets, the sum of the seedings of the players is one more than the number of players left in the tournament.

As the match happens in the quarterfinals, the number of players left = 8.

$\therefore$ Sum of seedings of players - 8 + 1 = 9.
9 – 3 = 6
Players seed 3 faced the player seeded 6 in the quarterfinals. Choice (A)

6.04. If the tournament had no upsets, in which round was the player seeded 15 eliminated?
(A) 6 (B) 5 (C) 4 (D) 3

Sol: In case of no upsets, the player seeded 15 would be in the pre quarterfinals (round of 16). In the next round as 8 players are left he will be eliminated. $\therefore$ The player seeded 15 was eliminated in the 3rd round. Choice (D)

6.05. How many matches did the player who lost in the semifinals, win in the tournament?
(A) 2 (B) 3 (C) 4 (D) 5

Sol: As the player reached the semifinals, he was among the last 4 players. $\therefore$ he won four matches and reached the fifth round. Choice (C)

Exercise – 6(a)

Directions for questions 1 to 4: These questions are based on the following information.

The following are the details of a chess tournament in which the top ten players of the world participated. Each player had to play exactly once with each of the other players and the points were awarded as following.

Win = 1 point; Draw = 1/2 point; Loss = 0 points

Each player was seeded, before the tournament, based on his rating. The player with the highest rating was seeded first, the player with second highest rating seeded second and so on.

The following table in which some of the details are missing, was obtained at the end of the tournament.

		Points scored against									
Name	**Rating**	**Kasparov**	**Anand**	**Kramnik**	**Adams**	**Topalov**	**Svidler**	**Leko**	**Polgar**	**Grischuk**	**Ivanchuk**
Kasparov	2812	X	$\frac{1}{2}$	0	1	$\frac{1}{2}$		1	$\frac{1}{2}$	0	
Anand	2788		X	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$			1	1	
Kramnik	2774	1	$\frac{1}{2}$	X	0	0		$\frac{1}{2}$		$\frac{1}{2}$	0
Adams	2719		$\frac{1}{2}$		X				$\frac{1}{2}$	1	0
Topalov	2786				1	X		$\frac{1}{2}$	1	1	
Svidler	2735	$\frac{1}{2}$	0	$\frac{1}{2}$	0	0	X		0	$\frac{1}{2}$	0
Leko	2763		$\frac{1}{2}$	$\frac{1}{2}$	1		$\frac{1}{2}$	X	$\frac{1}{2}$		
Polgar		$\frac{1}{2}$	0	1	$\frac{1}{2}$		1		X	1	
Grischuk			0	$\frac{1}{2}$	0			$\frac{1}{2}$		X	$\frac{1}{2}$
Ivanchuk	2751	$\frac{1}{2}$	$\frac{1}{2}$	1	1	1		0	0	$\frac{1}{2}$	X

The above table gives the points scored by different players against the other player. For example Kasparov scored 1/2 point against Anand, 0 points against Kramnik and 1 point against Adams.

Further, it was known that all players except Polgar were male and the average rating of all the male players was nine more than the average rating of all the players in the tournament which was 2751.

At the end of the tournament all the players are given places depending on their respective total points scored in the tournament.

In case of two or more players, finishing with the same number of points, the player with the highest rating is given the top place among them, the player who is rated the second highest, is given the second place among them and so on.

1. Who scored the highest points in the tournament?
(A) Kasparov (B) Anand
(C) Topalov (D) Ivanchuk

2. In which position did Polgar finish the tournament?
(A) 6 (B) 7 (C) 9 (D) 4

3. How many points did Adams score in the tournament?
(A) 3 (B) $3\frac{1}{2}$ (C) 4 (D) $4\frac{1}{2}$

4. Among the following, the player who had the maximum number of decisive (win or loss) games was
(A) Ivanchuk
(B) Anand
(C) Karmnik
(D) Adams

Directions for questions 5 to 8: These questions are based on the following information.

The following is the table of points in the twenty club English premier league, which is played on a double round-robin basis. The points given below are after the clubs played around thirty games.

Club	**Played**	**Won**	**Draw**	**Loss**	**Points**
Chelsea	32	28	4	0	88
Arsenal	32	22	8	2	74
Manchester United	31	23	5	3	74
Liverpool	31	20	6	5	66
Newcastle United	32	18	8	6	62

Note: Only the top five clubs are shown in the table of points given
Win $\rightarrow$ 3 points, Draw $\rightarrow$ 1 point, Loss $\rightarrow$ 0 points
In a double round-robin tournament, every team plays exactly two games with every other team.

5. What is the maximum points Arsenal can end up with?
(A) 88 (B) 92
(C) 93 (D) 95

6. If in the remaining matches Arsenal had at least three wins and at least two draws, Manchester United should win at least how many of the remaining games to guarantee itself at least the second place?
(A) 3 (B) 5 (C) 6 (D) 4

7. A minimum of how many more points should Chelsea score in the remaining matches, to guarantee itself the top most position?
(A) 6 (B) 8 (C) 10 (D) 12

8. Of the top five teams, if each team had to play the other four teams once more before the season is over and in the remaining matches between these teams, Newcastle wins four, Liverpool wins three, Manchester United wins two and Arsenal drew with Chelsea, which team finished fourth at the end of the season?
(Assume none of the other teams can catch up with these five teams)
(A) Arsenal
(B) Manchester United
(C) Newcastle United
(D) Cannot be determined

Directions for questions 9 to 11: These questions are based on the following information.

43	44	45	46	47	48	HOME 49
42	41	40	39	38	37	36
29	30	31	32	33	34	35
28	27	26	25	24	23	22
15	16	17	18	19	20	21
14	13	12	11	10	9	8
START 1	2	3	4	5	6	7

You are playing a board game in which, you start at 1 (START) and you have to reach 49 (HOME) in the least number of rounds.

In each round you throw a die exactly once and advance as many places as the number on the face of the die.

The following conditions apply in the game:

(a) If in three successive rounds, you throw three 6's consecutively, you should advance 5 more places at the end of that third round. i.e., say you are at 10, and in the next 3 rounds you get all 6's, so you reach 10 + (6 + 6 + 6) + 5 = 33 at the end of the third round.
(b) If you reach 4 after any round, advance 13 places.
(c) If you reach 40 after any round, go back 12 places.
(d) If you reach 27 after any round, you can go to any number whose sum of digits is same as that of 27.
(e) If you reach 23, after any round, go to either the highest or the lowest number in that column.
(f) You can't reach home with a 1, 4 or 6 as the last try.

9. What is the least possible number of rounds required to reach 'HOME' from the start?
(A) 4 (B) 5
(C) 6 (D) 7

10. If your first try is 6, what is the least number of rounds in which you can hope to reach 'HOME'?
(A) 6 (B) 7
(C) 8 (D) 9

11. If condition (d) is removed the minimum number of rounds required to reach 'HOME' from start is
(A) 4
(B) 5
(C) 6
(D) 7

Directions for questions 12 to 15: These questions are based on the information given below.

The table given in the next page gives the listing of players, ranked from the highest (1) to the lowest (32), who are due to play in a Tennis Tournament. This tournament has four knockout rounds before the final i.e., first round, second round, quarterfinals and semifinals. In the first round, the highest ranked player plays with the lowest ranked player, which is designated as match no.1 of first round; the 2nd ranked player plays the 31st ranked player which is designated match no.2 of first round and so on. Thus, for instance, match no.10 of first round is to be played between 10th ranked player and the 23rd ranked player.

In the second round, the winner of match no.1 of first round, plays the winner of match no.16 of the first round, and is designated as match no.1 of the second round. Similarly, the winner of match no.2 of first round plays the winner of match no.15 of the first round, and is designated match no.2 of the second round. Thus, for instance match no 5 of the second round is to be played between the winner of match no.5 of the first round and the winner of match no.12 of the first round. The same pattern is allowed for the next rounds as well. There is exactly one upset (a lower ranked player beating a higher ranked player) in each of the rounds, including the finals. No match ended as a draw.

Rank	Player	Rank	Player	Rank	Player	Rank	Player
1	Somdev	9	Anju	17	Peltsin	25	Nisha
2	Vijay	10	George	18	Peter	26	Murthy
3	Ramesh	11	Spassky	19	Sam	27	Swati
4	Prakash	12	Ramiz	20	Ramesh	28	Meenakshi
5	Anand	13	Sachin	21	Rajesh	29	Kapil
6	Mahesh	14	Amit	22	Rakesh	30	Arvind
7	Paes	15	Dibyendu	23	Roopesh	31	Niranjan
8	Sania	16	Stalin	24	Vidya	32	Sunil

12. If Kapil reaches the final, then who will play with him in the finals. if the number of upsets in the tournament is the minimum?
(A) Vijay
(B) Ramesh
(C) Somadev
(D) Anand

13. If Peter won the second round match, then who won the finals?
(A) Peter
(B) Dibyendu
(C) Kapil
(D) Cannot be determined

14. If Anand played the quarterfinals, then who amongst the following must not have played against him in quarterfinals?
(A) Ramesh
(B) Prakesh
(C) Sachin
(D) Kapil

15. If Ramiz played the semifinals, then who amongst the following could have played him in the semifinals?
(A) Ramesh
(B) Sania
(C) Meenakshi
(D) Prakesh

Directions for questions 16 to 20: These questions are based on the following information.

Eight players – A through H qualified for the final round of the World Snooker Championship which is a round robin competition, i.e., each player plays with every other player exactly once. At the start of the tournament, these eight players were seeded from 1 to 8, with seed 1 being considered as the top seed. No match ended as a tie and after each match, the winner was awarded one point and the loser was not awarded any points. At the end of the tournament, it was found that each player scored exactly one point less than his seeding. The following table gives the results of some of the matches played.

Player	A	B	C	D	E	F	G	H
A	×			W	W			
B		×				W		
C			×					W
D		W		×				
E			W		×			
F						×		
G	W				W		×	
H						W		×

W – Won

For example, in the match between A and D, A won over D. It was also known that C was seeded 3 and E was not among the top five seeds.

Directions for questions 16 to 20: Type in your answer in the input box provided below the question.
For questions that follow, if your answer for any question is player A, enter 1 as your answer. For player B, enter 2; for player C enter 3 and so on till player H when you have to enter 8 as your answer.

16. Which player was seeded 1 at the start of the tournament?

17. How many matches did B win?

18. How many points did A score?

19. At the end of the tournament, the eight players were ranked based on the number of points scored such that the person with the highest number of points is ranked 1, the one with the second highest number of points is ranked 2 and so on. For which player was his rank the same as the number of points he scored?

20. Who scored the maximum number of points in the tournament?

Exercise – 6(b)

Directions for questions 1 to 4: These questions are based on the following information.

The Indian premier League (IPL) has a total of ten teams taking part. In the league phase, each team would play two matches with six other teams and one match each with the remaining three teams. The matches are scheduled such that each team plays every other team at least once and play the same number of matches in the league phase. Two points are awarded for a win, one point for a tie and zero points for a loss. At the end of the league matches, the top two teams, in terms of the points scored, play a match termed P_1, with the winner advancing to the finals. The team that finished third and fourth in the league phase play against each other, in a match termed P_2, with the winner of that match playing with the loser of match P_1 to decide the second finalist. The loser of P_2 is eliminated. The winner of the finals is crowned the IPL champion. If two or more teams end up with the same number of points at the end of the league phase, the team with better net run rate is placed higher.

1. What is the total number of matches in the tournament?
(A) 73 (B) 74
(C) 79 (D) None of these

2. What is the least number of points required for a team to finish in the top four at the end of the league phase?
(A) 16 (B) 14 (C) 12 (D) 10

3. What could be the maximum number of matches won by a team that failed to be in the top four positions in the league phase?
(A) 12 (B) 11 (C) 10 (D) 9

4. At least what percentage of its matches did the team that was crowed the IPL champion, win?
(A) 25% (B) 16.67%
(C) 11.11% (D) None of these

Directions for questions 5 to 7: These questions are based on the following information.

A and B are about to start playing a game where there will be *n* coins on the table at the beginning of the game and each of them has to remove a minimum of one and a maximum of *x* coins in his turn. They take turns alternatively and always play intelligently so as to win the game, as far as possible. They select one of the following two formats of the games.

(i) *Last out:* The format in which the player who clears the table is considered to be the loser of the game.
(ii) *Last win:* The format in which the player who clears the table is considered to be the winner of the game.

5. They started playing the *Last win* format of the game with the value of *x* as 4 and the value of *n* as 73. If A is the first person to play, then how many coins should he remove?
(A) 1 (B) 2 (C) 3 (D) 4

6. They started playing the *Last win* format of the game with the value of *x* as 6. If A, who played first, removed five coins, which of the following can be the value of *n*?
(A) 65 (B) 125
(C) 157 (D) None of these

7. They started playing the *Last out* format of the game with the value of *x* as 5 and the value of *n* as 135. If B is the first person to play, then how many coins should he remove?
(A) 2 (B) 3 (C) 1 (D) 5

Directions for questions 8 to 11: These questions are based on the following information.

For the first time in the history of the U.S. Open Men's Tennis Tournament, the organisers of the tournament decided to do away with the process of drawing lots for finalising the fixtures. Instead, they seeded all the 128 players in the tournament, as per their present world ranking, given by the Association of Tennis Professionals (ATP), with seed 1 being the highest seed and seed 128 being the lowest seed. This tournament has six knockout rounds, i.e., first round, second round, third round, fourth round, quarter finals and semi finals, before the finals.

In the first round, the highest seeded player (i.e., seed 1) plays the lowest seeded player (i.e., seed 128) and this match is designated as match no.1 of the first round; the 2nd highest seeded player (i.e., seed 2) plays the 2nd lowest seeded player (i.e., seed 127) and this match is designated as match no. 2 of the first round, and so on. Thus, for instance, match no. 64 of the first round is played between the 64th seeded player and the 65th seeded player. In the second round, the winner of match no. 1 of the first round plays the winner of match no. 64 of the first round and this match is designated as match no. 1 of the second round. Similarly, the winner of match no. 2 of the first round plays with the winner of match no. 63 of the first round and this match is designated as match no. 2 of the second round. Thus, for instance, match no. 32 of the second round is played between the winner of match no. 32 of the first round and the winner of match no. 33 of the first round. The same pattern is followed for all the subsequent rounds as well.

A match in which a lower seeded player beats a higher seeded player is termed as an *upset*.

8. If it was known that the player seeded third was *upset* in the third round, which of the following is definitely not the seeding of the player who *upset* him?
(A) 35 (B) 94 (C) 99 (D) 29

9. If there were no *upsets* in the first two rounds, the lowest seeded player who could have won the tournament, by himself causing exactly one *upset*, is
(A) seed 27 (B) seed 32
(C) seed 24 (D) seed 17

10. If the tournament was won by a player who was not among the first 50 seeds, the minimum number of *upsets* in the tournament was
(A) 5 (B) 6 (C) 11 (D) 17

11. If there were no *upsets* in the first two rounds and only match nos. 5, 8, 12 and 14 of the third round resulted in *upsets*, then who among the following definitely reached the quarterfinals, given that there were no *upsets* in the fourth round?
(A) seed 9 (B) seed 28
(C) seed 12 (D) seed 20

Directions for questions 12 to 15: These questions are based on the following information.

64 players, seeded from 1 to 64, took part in the world match play golf tournament. The tournament was to be played in a knockout format where in the first round, the top seed (seed 1) was to face the last seed (seed 64), the second seed (seed 2) was to face the second last seed (seed 63) and so on. An upset is said to happen when a lower seeded player beats a higher seeded player. The matches in each round were scheduled such that, in any round after the first, in case of no upset, the highest seeded player would play the lowest seeded player left, the second highest seeded player plays the second lowest seeded player left and so on. In case of an upset, the player who caused the upset (the lower seeded player) would take the designated place of the player he upset (the higher seeded player) in the next round.

12. If it is known that the player seeded 1 reached the finals, then which of the following could be the seeding of the player he could have faced in the quarter finals (round of eight)?
(A) 13 (B) 25 (C) 27 (D) 42

13. If the player seeded 4 won the tournament, then which of the following seeded players definitely did not reach the finals?
(A) seed 2 (B) seed 3 (C) seed 31 (D) seed 29

14. If the player seeded 21 reached the semi finals, then which of the following is definitely not the seeding of one of the players he defeated in any of the previous rounds?
(A) 53 (B) 3 (C) 60 (D) 5

15. If it is known that the winner of the tournament himself caused only a single upset, then the lowest seeded player who could have won the tournament is
(A) seed 17 (B) seed 29
(C) seed 33 (D) None of these

Directions for questions 16 to 20: These questions are based on the following information.

The International Rugby Union (IRU) World Cup tournament has 16 teams seeded from 1 to 16, taking part in the first stage called the pool stage. They are divided into four pools such that seeds 1, 2, 3 and 4 are in pools 1, 2, 3, 4 respectively; seeds 5, 6, 7, 8 in pools 4, 3, 2, 1 respectively; seeds 9, 10, 11, 12 in pools 1, 2, 3, 4 respectively and seeds 13, 14, 15, 16 in pools 4, 3, 2 and 1 respectively. Each team in a pool plays all the other teams in the pool exactly once.

For the next stage called the Super Eight stage, the top two teams from each pool, based on their number of points, would qualify from each of the four pools. If at any stage, two or more teams end up with the same number of points, complex rules are applied to determine their placing. In the Super Eight stage, each team plays every other team except the team that qualified from its own pool. A team qualifying for the Super Eight stage carries forward only those points that it gained in its pool stage match against the other team that qualified from its pool. The top four teams in terms of points at the end of the Super Eight stage, would qualify for the semi-finals, with the losers of the semi-finals playing for the third place and the winners of the semi-finals playing the final.

For any team, the manner in which the points are awarded for a match, in the pool stage or the Super Eight stage, is: two points for a win and zero points for a loss. An *upset* is caused when, in any match, a lower seeded team beats a higher seeded team. In any match, in case the scores are equal at the end of the normal duration of play, the teams play extra time till the winner is decided.

Directions for questions 16 to 20: Type in your answer in the input box provided below the question.

16. What is the number of matches in the Super Eight stage?

17. If the pool stage had only a single *upset*, then which is the lowest seeded team which can win the tournament?

18. What is the minimum number of points required for a team to reach the semi-finals?

19. For a team that has reached the Super Eight stage, what is the minimum total number of points required (including the points that it carried forward from the pool stage) such that it can guarantee itself a place in the semi-finals?

20. What is the total number of matches in the tournament?

Key

Exercise – 6(a)

1. C	5. B	9. B	13. D	17. 3
2. D	6. D	10. B	14. A	18. 6
3. C	7. B	11. D	15. B	19. 4
4. D	8. D	12. A	16. 6	20. 7

Exercise – 6(b)

1. C	5. C	9. C	13. D	17. 16
2. D	6. D	10. B	14. D	18. 4
3. A	7. A	11. A	15. D	19. 12
4. C	8. D	12. B	16. 24	20. 52