

# Chess board

Chess is a two players strategy game that consist of 64 square boxes arranged into 8x8 square grid. The ultimate aim in the chess game is delivering a checkmate – trapping your opponent’s king. The term checkmate is an alteration of the Persian phrase “Shah Mat”, meaning literally, “the King is ambushed”. Each player of the chess game has 16 pieces consist of: A king, A queen, 2 bishops, 2 rocks, 2 knights (a.k.a. horses), and 8 pawns. Each piece has a different move whereas we are focusing on the move of king, queen, rock, bishop and knight. However, you can find online chess board to know about all other’s moves.

## The king

King is the focal point of chess game and all planning of chess player is to save the king form getting trapped. King has limited moves on the board. It can only move to the square boxes that are adjacent to it. For instance, following figures describes the moves of the kind on 8x8 chess board. If king is placed at [3,3] square then the possible moves of the king are its adjacent square boxes i.e. [2,2], [2,3], [2,4], [3,2], [3,4], [4,2], [4,3], [4,4]. If you move the king to the right adjacent square i.e. [3,4] as shown in figure 1 (b), then new possible moves can be [2,3], [2,4], [2,5], [3,3], [3,5], [4,3], [4,4], [4,5].

	0	1	2	3	4	5	6	7
0								
1								
2			●	●	●			
3			●	♔	●			
4			●	●	●			
5								
6								
7								

Fig 1 (a). King’s moves

	0	1	2	3	4	5	6	7
0								
1								
2				●	●	●		
3				●	♔	●		
4				●	●	●		
5								
6								
7								

Fig 1 (b). King’s moves

## The Bishop

Chess board has two bishops with each player. Bishops can move in a diagonal and thus has wide moves as compare to king. In following, we describe the moves of bishop on chess board.

	0	1	2	3	4	5	6	7
0	●						●	
1		●				●		
2			●		●			
3				♔				
4			●		●			
5		●				●		
6	●						●	
7								●

Fig 2 (a). Bishop’s moves

	0	1	2	3	4	5	6	7
0	●							
1		●						
2			●					
3				●				
4					●			
5						●		●
6							♔	
7						●		●

Fig 2 (b). Bishop’s moves



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Green dots in figure 2(a) and 2(b) demonstrates possible moves and range of moves of a bishop on 8x8 chess board. For example, you can move a bishop from square [3,3] to square [6,6] because the direction and range allows you to do so. Similarly, you cannot move from location [3,3] to location [3,2]!!! Because the (diagonal) direction and range doesn't allows making this move.

### The rock

Similar to bishop, each player has two rocks on a chess board. The rock has same wide range as bishop, but, unlike bishop, it moves in straight line. following figures demonstrates moves of the rock.

	0	1	2	3	4	5	6	7
0				●				
1				●				
2				●				
3	●	●	●	♖	●	●	●	●
4				●				
5				●				
6				●				
7				●				

Fig 3 (a). Rock's moves

	0	1	2	3	4	5	6	7
0				●				
1				●				
2				●				
3				●				
4				●				
5				●				
6				●				
7	●	●	●	♖	●	●	●	●

Fig 3 (b). Rock's moves

From location [3,3] you can move to any other location by keeping in view the range and description. For example, we decided to move to location [7,3] (figure 3(b)) from location [3,3] (figure 3(a)) which is valid move. After changing location, the next possible moves and directions are demonstrated in figure 3(b).

### The knight

Knight is famous for its two and half moves which make it strong, deceptive and challenging. Two and half moves means, you can move two points straight and then direct toward left or right square. It can be better understood from following figure.

	0	1	2	3	4	5	6	7
0								
1			●	↻	●			
2		●	↻	♠	↻	●		
3		↻	↻	♠	↻	↻		
4		●	↻	↻	●			
5			●	↻	●			
6								
7								

Fig 4 (a). Knight's moves

	0	1	2	3	4	5	6	7
0								
1								
2				●	↻	●		
3				●	↻	↻	●	
4				↻	♠	↻	↻	
5				↻	↻	●		
6				●	↻	●		
7								

Fig 4 (b). Knight's moves



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Figure 4(a) shows that, from square [3,3] you can move into square [4,1], [2,1], [1,2], [1,4], [2,5], [4,5], [5,2], [5,4].

Once moved to any of above-mentioned squares, the knight can make further two and half moves as described in figure 4 (b).

### The queen

Strongest in its moves, the queen is hoping to win the game as it threatens all opponents by its strong moves. It can move like a bishop in diagonals and rock like straight. Hence queen has combination of both moves and it makes a star like position in chess board. Following figure demonstrates moves of the queen.

	0	1	2	3	4	5	6	7
0	●			●			●	
1		●		●		●		
2			●	●	●			
3	●	●	●	♙	●	●	●	●
4			●	●	●			
5		●		●		●		
6	●			●			●	
7				●				●

Fig 5 (a). Queen's moves

	0	1	2	3	4	5	6	7
0		●			●			●
1			●		●		●	
2				●	●	●		
3	●	●	●	●	♙	●	●	●
4				●	●	●		
5			●		●		●	
6		●			●			●
7	●				●			

Fig 5 (b). Queen's moves

Once you have moved from position [3,3] to [3,4] the directions and range changes accordingly as described in figure 5 (b).

Based on knowledge provided in this document, you are required to solve the question mentioned in following section.



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### Your Next Move

Based on rules mentioned above, write a program that shall describe next moves according to following mentioned steps

1. User starts program
2. Program asks to choose any of: king, queen, bishop, rock or knight
3. User chooses among existing options
4. Program asks for some initial position of the selected piece
5. User provides initial position (both row and column)
6. Program displays existing position and all next positions of the selected piece  
Steps 2-6 can be repeated until user choose to finish
7. Program terminates after user choose finish option

### Save the King (2 players game)

This will be a two-player game where your task is to save the king and your opponent will attack the king either through 2 bishops, 2 knights, 2 rocks or queen (whatever assigned by instructor). The program works as following

1. The program shall assign some random position to the king and opponent pieces. Make sure that the king is outside the range of opponents (2 bishops OR 2 knights OR 2 rocks OR queen assigned by instructor)
2. Opponent's turn
  - a. Change position of any of your piece in such a way that the king comes under attack
3. Your turn
  - a. Change position of your king in order to mitigate the attack
4. The program shall repeat step 2 and 3 until user choose to finish or the king has no way to escape

### DELIVERABLE:

1. Implement complete project for Grid size 8X8.
2. main function will only start the game

```
int main()
{
    start();
    return 0;
}
```

3. Divide your code in functions (your project will not be accepted without functions):  
Functions are used because of following reasons
  - a. To improve the readability of code.
  - b. Improves the reusability of the code.
  - c. Debugging of the code would be easier if you use functions, as errors are easy to be traced.



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- d. Reduces the size of the code, duplicate set of statements are replaced by function calls.
4. Your Project must contain arrays and pointers as well.

**Note: Above instructions are must to be followed in project.**

**Task Assignment:**

The whole project is divided among the class students in the following manner. Project is supposed to be performed individually, i.e. 19-1955 is supposed to submit the menu driven program having functionality for King and Bishop. There will be one king and 2 bishops. Plagiarism will result in cancellation of your project so please avoid it.

Module Name	Assigned Student
King and 2 Bishops	19-1955 20I-0403 20I-0527 20I-0541 20I-0602 20I-0604 20I-0651 20I-0694
King and 2 Rocks	20I-0714 20I-0715 20I-0731 20I-0806 20I-0837 20I-0872 20I-0941 20I-0955
King and 2 Knights	20I-0957 20I-0971 20I-1789 20I-1794 20I-1797 20I-1827 20I-1845 20I-1851
King and 1 Queen	20I-1873 20I-2353 20I-2392 20I-2441 20I-2456 20I-2458 20I-2702 20I-2703



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