1 Lesson 10 Example 2

Two fair, six-sided dice are rolled.

- Let S be the sum of the two numbers. Calculate and graph the p.m.f. of S
- Let D be the absolute difference between the two numbers. (That is, D is always a positive number). Calculate and graph the p.m.f. of D.

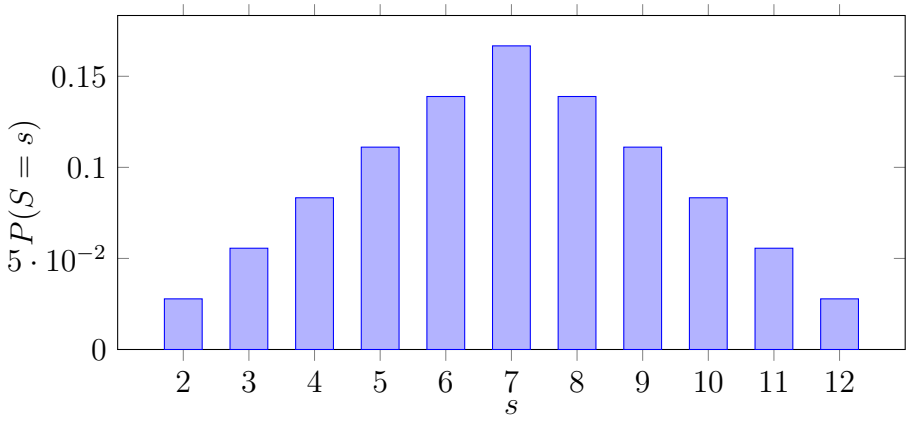
2 Answer

2.1 Part A

The p.m.f. of S, the sum of the numbers rolled on two dice, is as follows:

S	Number of Outcomes	$P(S = s)$
2	1	$\frac{1}{36} \approx 0.0278$
3	2	$\frac{2}{36} = \frac{1}{18} \approx 0.0556$
4	3	$\frac{3}{36} = \frac{1}{12} \approx 0.0833$
5	4	$\frac{4}{36} = \frac{1}{9} \approx 0.1111$
6	5	$\frac{5}{36} \approx 0.1389$
7	6	$\frac{6}{36} = \frac{1}{6} \approx 0.1667$
8	5	$\frac{5}{36} \approx 0.1389$
9	4	$\frac{4}{36} = \frac{1}{9} \approx 0.1111$
10	3	$\frac{3}{36} = \frac{1}{12} \approx 0.0833$
11	2	$\frac{2}{36} = \frac{1}{18} \approx 0.0556$
12	1	$\frac{1}{36} \approx 0.0278$

Graph of the p.m.f. of S



2.2 Part B

To find $P(D = d)$ for each possible value of D, we count the number of outcomes for each d:

- $P(D = 0) = \frac{6}{36} = \frac{1}{6} \approx 0.1667$
  Outcomes: (1,1), (2,2), (3,3), (4,4), (5,5), (6,6)
- $P(D = 1) = \frac{10}{36} \approx 0.2778$
  Outcomes: (1,2), (2,1), (2,3), (3,2), (3,4), (4,3), (4,5), (5,4), (5,6), (6,5)
- $P(D = 2) = \frac{8}{36} \approx 0.2222$
  Outcomes: (1,3), (3,1), (2,4), (4,2), (3,5), (5,3), (4,6), (6,4)
- $P(D = 3) = \frac{6}{36} = \frac{1}{6} \approx 0.1667$
  Outcomes: (1,4), (4,1), (2,5), (5,2), (3,6), (6,3)
- $P(D = 4) = \frac{4}{36} = \frac{1}{9} \approx 0.1111$
  Outcomes: (1,5), (5,1), (2,6), (6,2)
- $P(D = 5) = \frac{2}{36} = \frac{1}{18} \approx 0.0556$
  Outcomes: (1,6), (6,1)

The p.m.f. of D, the absolute difference between the numbers rolled on two dice, is as follows:

D	Number of Outcomes	$P(D = d)$
0	6	$\frac{6}{36} = \frac{1}{6} \approx 0.1667$
1	10	$\frac{10}{36} \approx 0.2778$
2	8	$\frac{8}{36} \approx 0.2222$
3	6	$\frac{6}{36} = \frac{1}{6} \approx 0.1667$
4	4	$\frac{4}{36} = \frac{1}{9} \approx 0.1111$
5	2	$\frac{2}{36} = \frac{1}{18} \approx 0.0556$

Graph of the p.m.f. of D