 Discovering binomial probability

Student activity

1. Complete the probability tree diagram to represent the number of sixes when a die is rolled 4 times.



1. Use the tree diagram to complete the first 4 rows of the following table with expressions to represent the probability of rolling r sixes.

One expression has been done for you.

There are 3 ways (branches) of obtaining 2 sixes from 3 throws. This is multiplied by the probability of each branch in the tree diagram.

| Number of Rolls |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1 |  |  | N/A | N/A | N/A | N/A |
| 2 |  |  |  | N/A | N/A | N/A |
| 3 |  |  |  |  | N/A | N/A |
| 4 |  |  |  |  |  | N/A |
| 5 |  |  |  |  |  |  |

1. Examine the first 4 rows. By observing a pattern, complete the last two rows of the table.
2. Examine the coefficients of the expressions. What pattern do you observe?
3. Relate the pattern to your knowledge of combinations.
4. Use your observations to write an expression for the following:

A die is rolled 12 times, what is the probability that you will obtain 5 sixes?

1. Can you generalise your result? Write an expression for: What is the probability of successes in trials if the probability of success in each trial is p?
* With teacher guidance as necessary, students link the expressions for the probabilities with the terms of the expansion of . This result is then generalised to.

Worked solutions (questions 2-7)

1. Use the tree diagram to complete the first 4 rows of following table with expressions to represent each probability:

One expression has been done for you.

There are 3 ways (branches) of obtaining 2 sixes from 3 throws. This is multiplied by the probability of each branch in the tree diagram.

| Number of Rolls |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1 |  |  | N/A | N/A | N/A | N/A |
| 2 |  |  |  | N/A | N/A | N/A |
| 3 |  |  |  |  | N/A | N/A |
| 4 |  |  |  |  |  | N/A |
| 5 |  |  |  |  |  |  |

1. Examine the first 4 rows. By observing a pattern, complete the last two rows of the table.
2. Examine the coefficients of the expressions. What pattern do you observe?

Hint: Rewrite the coefficient aligning each term in between coefficients from the row above.

They follow the rows of Pascal’s triangle.

1. Relate the pattern to your knowledge of combinations.

Example: The coefficient to obtain 2 sixes from 5 rolls is

1. Use your observations to write an expression for the following:

A die is rolled 12 times, write an expression for the probability that you will obtain 5 sixes?

1. Can you generalise your result? Write an expression for: What is the probability of successes in trials if the probability of success in each trial is p?