

A2.S.15: Binomial Probability 5: Know and apply the binomial probability formula to events involving the terms exactly, at least, and at most

- 1 If the probability that it will rain on any given day this week is 60%, find the probability it will rain *exactly* 3 out of 7 days this week.
- 2 Jim can drive a golf ball over 220 yards 40% of the time. He regularly plays on a golf course where drives of that distance are needed on 12 holes. Determine the probability that exactly 7 of his drives will be over 220 yards.
- 3 Mr. and Mrs. Doran have a genetic history such that the probability that a child being born to them with a certain trait is $\frac{1}{8}$. If they have four children, what is the probability that *exactly* three of their four children will have that trait?
- 4 The probability of Ashley being the catcher in a softball game is $\frac{2}{5}$. Calculate the exact probability that she will be the catcher in *exactly* five of the next six games.
- 5 The probability of winning a game is $\frac{2}{3}$. Determine the probability, expressed as a fraction, of winning *exactly* four games if seven games are played.
- 6 After studying a couple's family history, a doctor determines that the probability of any child born to this couple having a gene for disease X is 1 out of 4. If the couple has three children, what is the probability that *exactly* two of the children have the gene for disease X?
- 7 During a recent survey, students at Franconia College were asked if they drink coffee in the morning. The results showed that two-thirds of the students drink coffee in the morning and the remainder do not. What is the probability that of six students selected at random, *exactly* two of them drink coffee in the morning? Express your answer as a fraction or as a decimal rounded to *four decimal places*.
- 8 At a certain intersection, the light for eastbound traffic is red for 15 seconds, yellow for 5 seconds, and green for 30 seconds. Find, to the *nearest tenth*, the probability that out of the next eight eastbound cars that arrive randomly at the light, exactly three will be stopped by a red light.
- 9 The Coolidge family's favorite television channels are 3, 6, 7, 10, 11, and 13. If the Coolidge family selects a favorite channel at random to view each night, what is the probability that they choose exactly three even-numbered channels in five nights? Express your answer as a fraction or as a decimal rounded to four decimal places.
- 10 On a multiple-choice test, Abby randomly guesses on all seven questions. Each question has four choices. Find the probability, to the *nearest thousandth*, that Abby gets *exactly* three questions correct.
- 11 Ginger and Mary Anne are planning a vacation trip to the island of Capri, where the probability of rain on any day is 0.3. What is the probability that during their five days on the island, they have *no* rain on *exactly* three of the five days?
- 12 The probability that Kay and Joseph Dowling will have a redheaded child is 1 out of 4. If the Dowlings plan to have three children, what is the *exact* probability that only one child will have red hair?

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Answer Section

- 1 ANS:
19.35%

REF: 010524b

- 2 ANS:
0.101

REF: fall9922b

- 3 ANS:
 $\frac{28}{4096}$

REF: 080723b

- 4 ANS:
 ${}_6C_5 \left(\frac{2}{5}\right)^5 \left(\frac{3}{5}\right) = 6 \left(\frac{32}{3125}\right) \left(\frac{3}{5}\right) = \frac{576}{15,625}$

REF: 011532a2

- 5 ANS:
 ${}_7C_4 \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^3 = 35 \left(\frac{16}{81}\right) \left(\frac{1}{27}\right) = \frac{560}{2187}$

REF: 081531a2

- 6 ANS:
 $\frac{9}{64}$

REF: 060223b

- 7 ANS:
0.0823

REF: 010625b

- 8 ANS:
0.3

REF: 060122b

- 9 ANS:
0.1646

REF: 080522b

10 ANS:

$${}_7C_3 \left(\frac{1}{4}\right)^3 \left(\frac{3}{4}\right)^4 = 35 \left(\frac{1}{64}\right) \left(\frac{81}{256}\right) = \frac{2835}{16384} \approx 0.173$$

REF: 061335a2

11 ANS:

0.3087

REF: 060625b

12 ANS:

$${}_3C_1 \left(\frac{1}{4}\right)^1 \left(\frac{3}{4}\right)^2 = 3 \cdot \frac{1}{4} \cdot \frac{9}{16} = \frac{27}{64}$$

REF: 061530a2