

A2.S.15: Binomial Probability 9: Know and apply the binomial probability formula to events involving the terms exactly, at least, and at most

- 1 The junior class is planning a two-day fair in April. The weather forecast indicates a 60% chance of rain for each of the two days.
 - (1) Find the probability that it will rain on at least one of the two days.
 - (2) Find the probability that it will rain on both days.
- 2 When Joe bowls, he can get a strike (knock down all the pins) 60% of the time. How many times more likely is it for Joe to bowl *at least* three strikes out of four tries as it is for him to bowl zero strikes out of four tries? Round your answer to the *nearest whole number*.
- 3 Dr. Glendon, the school physician in charge of giving sports physicals, has compiled his information and has determined that the probability a student will be on a team is 0.39. Yesterday, Dr. Glendon examined five students chosen at random. Find, to the *nearest hundredth*, the probability that *at least* four of the five students will be on a team. Find, to the *nearest hundredth*, the probability that *exactly* one of the five students will not be on a team.
- 4 In each basketball game played, the Raiders have a probability of winning of $\frac{2}{3}$ and a probability of losing of $\frac{1}{3}$. Find the probability of the Raiders winning:
 - (1) exactly 4 out of five games
 - (2) at most 4 out of five games
 - (3) exactly 4 out of five games if they have already won the first two games
- 5 The probability of Chris getting a hit is $\frac{1}{3}$. If Chris comes to bat four times, what is the probability that he gets
 - (1) *exactly* 2 hits
 - (2) *at least* 3 hits
 - (3) *at most* 1 hitIf, in his first two times at bat, Chris does not get a hit, what is the probability that he gets 2 hits in his next two times at bat?
- 6 In a contest, the probability of the Alphas beating the Betas is $\frac{3}{5}$. The teams compete four times a season and each contest has a winner. Find the probability that
 - (1) the Betas win all four contests
 - (2) each team wins two contests during the season
 - (3) the Alphas win *at least* two contests during the season
 - (4) the Betas win *at most* one contest during the season
- 7 Only red and black cards are in a box. The probability of drawing a black card is $\frac{3}{5}$. A card is randomly drawn and replaced in the box after each draw. Five such draws are made. Find the probability that
 - (1) *exactly* two black cards will be drawn
 - (2) *at least* four black cards will be drawn
- 8 Five marbles are in a jar. Two are red and three are white. Four marbles are selected at random with replacement. Find the probability that *at most* two red marbles are selected. Find the probability that *at least* three red marbles are selected.

- 9 Assume that in the United States $\frac{1}{5}$ of all cars are red. Suppose you are driving down the highway and you pass 6 cars. What is the probability that *at most* one of the cars you pass is red? What is the probability that *at least* four of the cars you pass are red?

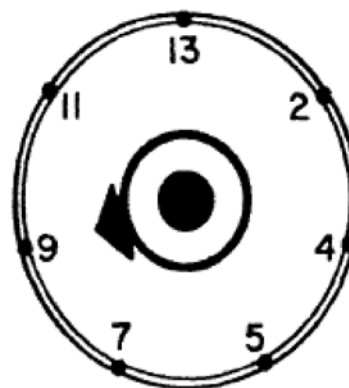
- 10 In the month of February at a ski resort, the probability of snow on any day is $\frac{3}{4}$. What is the probability that snow will fall on every day of a 5-day trip to that resort in February? What is the probability that snow will fall on *at least* 3 days of that 5-day trip in February?

- 11 A varsity basketball player makes $\frac{3}{4}$ of the foul shots she attempts. Find the probability that in four attempts she will make:
(1) *exactly* three foul shots
(2) *at least* three foul shots

- 12 The probability that bus *A* will arrive on time is $\frac{5}{6}$. Yolanda takes this bus on 4 consecutive days. Find the probability that this bus will arrive on time:
(1) all 4 days
(2) *at least* 3 days

- 13 A factory that produces light bulbs determined that $\frac{1}{10}$ of all light bulbs it produces are defective. If four light bulbs are selected at random, what is the probability that
(1) no bulb selected is defective
(2) *at least* three bulbs selected are defective

- 14 The receivable channels on a TV are indicated on the channel selector shown. The probability of selecting each channel is the same.



- a Find: (1) $P(2)$
(2) $P(\text{even channel})$
(3) $P(\text{odd channel})$
b Find the probability of:
(1) choosing *exactly* two even channels on three random selections
(2) choosing *at least* two odd channels on three random selections

- 15 Five cards are in a box. Two are red and three are black. Four cards are selected at random and replaced in the box after each selection.
(1) Find the probability that *exactly* three of the cards selected are black.
(2) Find the probability of selecting *at most* one red card.
- 16 If a letter is selected at random from the name MARILYN in five separate trials, what is the probability that the M is chosen *exactly* three times? If a letter is selected at random from the name DAPHNE in seven separate trials, what is the probability that a vowel is chosen *at least* six times? If a letter is selected at random from the name NORMA in six separate trials, what is the probability that a consonant is chosen *at most* once?

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Answer Section

1 ANS:

84%, 36%

PTS: 4

REF: 088441siii

2 ANS:

19

PTS: 6

REF: 080334b

3 ANS:

0.08, 0.07

PTS: 4

REF: 010731b

4 ANS:

$\frac{80}{243}, \frac{211}{243}, \frac{4}{9}$

PTS: 10

REF: 088739siii

5 ANS:

$\frac{24}{81}, \frac{9}{81}, \frac{48}{81}, \frac{1}{9}$

PTS: 5

REF: 068940siii

6 ANS:

$\frac{16}{625}, \frac{216}{625}, \frac{513}{625}, \frac{297}{625}$

PTS: 10

REF: 069639siii

7 ANS:

$\frac{720}{3125}, \frac{1053}{3125}$

PTS: 6

REF: 069839siii

8 ANS:

$\frac{513}{625}, \frac{112}{625}$

PTS: 6

REF: 080039siii

9 ANS:

$\frac{10240}{15625}, \frac{265}{15625}$

PTS: 6

REF: 060038siii

10 ANS:

$$\frac{243}{1024}, \frac{918}{1024}$$

PTS: 6

REF: 010037siii

11 ANS:

$$\frac{108}{256}, \frac{189}{256}$$

PTS: 5

REF: 010341siii

12 ANS:

$$\frac{625}{1,296}, \frac{1,125}{1,296}$$

PTS: 5

REF: 010241siii

13 ANS:

$$\frac{6,561}{10,000}, \frac{37}{10,000}$$

PTS: 5

REF: 080240siii

14 ANS:

$$\frac{1}{7}, \frac{2}{7}, \frac{5}{7}, \frac{60}{343}, \frac{275}{343}$$

PTS: 10

REF: 068143siii

15 ANS:

$$\frac{216}{625}, \frac{297}{625}$$

PTS: 4

REF: 060340siii

16 ANS:

$$\frac{360}{16807}, \frac{15}{2187}, \frac{640}{15625}$$

PTS: 10

REF: 089741siii