

Success Count Forecast

Find the average number of successes in binomial situations.

HIGH SCHOOL • MA.912.DP.6.4

MA.912.DP.6.4 "Given a binomial distribution, calculate and interpret the expected value. Solve real-world problems involving binomial distributions."

NAME _____

DATE _____

EXPECTED SUCCESSES

For a binomial variable X with n independent trials and probability p of success on each trial, use $E(X) = np$. The expected value is the long-run average number of successes, so it does not have to be the exact result of one experiment.

WORKED EXAMPLE

A binomial experiment has 11 trials, and the probability of success on each trial is $4/11$. Find the expected number of successes.

1. Use $E(X) = np$.
2. Substitute: $E(X) = 11(4/11)$.
3. Simplify: $E(X) = 4$.

Answer: The expected value is 4 successes.

PRACTICE 6 problems

- 1** A binomial experiment has 8 trials and $p = 5/8$. Find $E(X)$.

ANSWER _____

- 2** A binomial experiment has 7 trials and $p = 1/7$. Find the expected number of successes.

ANSWER _____

- 3** A binomial experiment has 12 trials and $p = 1/3$. Find $E(X)$.

ANSWER _____

- 4** A shooter makes a free throw with probability $1/2$ on each of 18 independent attempts. Find the expected number of made free throws.

ANSWER _____

- 5** A binomial variable has $n = 20$ and $E(X) = 10$. Find p .

ANSWER _____

- 6** A school club sends 25 independent event invitations. Each invitation has a probability of $2/5$ of receiving a positive response. How many positive responses should the club expect?

ANSWER _____

APPLY IT Show your work

- 1** A student sends 16 independent fundraiser messages. Based on past data, each message has a probability of $\frac{3}{4}$ of leading to a donation. Find and interpret the expected number of donations.

WORK SPACE

ANSWER _____

- 2** In a gaming tournament, a player has a probability of $\frac{2}{5}$ of winning each of 15 independent rounds. Find and interpret the expected number of round wins.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A phone-repair club tests 24 used chargers. Each charger independently works with probability $\frac{3}{8}$. The club needs 10 working chargers. Find the expected number of working chargers. Then explain whether the club can be certain it will have at least 10 working chargers.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A binomial experiment has 8 trials and $p = 5/8$. Find $E(X)$.	$E(X) = 5$.
2	A binomial experiment has 7 trials and $p = 1/7$. Find the expected number of successes.	1 success
3	A binomial experiment has 12 trials and $p = 1/3$. Find $E(X)$.	$E(X) = 4$.
4	A shooter makes a free throw with probability $1/2$ on each of 18 independent attempts. Find the expected number of made free throws.	9 made free throws
5	A binomial variable has $n = 20$ and $E(X) = 10$. Find p .	$p = 1/2$
6	A school club sends 25 independent event invitations. Each invitation has a probability of $2/5$ of receiving a positive response. How many positive responses should the club expect?	10 positive responses

PART 2 • APPLY IT

- 12 donations. In the long run, sets of 16 messages would average 12 donations.** Use $E(X) = np = 16(3/4) = 12$. Interpret 12 as a long-run average, not a guaranteed result from this one set of messages.
- 6 wins. Over many groups of 15 rounds, the player would average 6 wins.** Use $E(X) = np = 15(2/5) = 6$. The expected value describes the average number of wins over many similar tournaments.

CHALLENGE

$E(X) = 24(3/8) = 9$ working chargers. No, the club cannot be certain, because 9 is a long-run average and the actual number of working chargers could be more or fewer than 9.

Accept equivalent calculations such as $8(5/8) = 5$. For interpretation answers, accept wording that identifies expected value as a long-run average rather than a guaranteed outcome.