LESSON MAKER PRO

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 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 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

A phone-repair club tests 24 used chargers. Each charger independently works with probability 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.

WORK SPACE AND ANSWER

ANSWER KEY

Success Count Forecast

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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

1. **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.
2. **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.