Discrete random variables and binomial models

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A sample from this topic. The complete topic collection contains three different resources and worked solutions.

Read the worked example, then show each step in the practice questions. Show the mathematical steps. A calculator, graphing tool or CAS may be used to check results where useful.

What you will practise

• Discrete random variables and binomial distributions

Useful starting skills: Mathematical Methods Units 1–2 functions, algebra, probability and introductory calculus.

A probability mass function lists the chance of each possible value. Probabilities must be non-negative and sum to 1.

For X~Bin(n, p), there are n independent trials with the same success probability p. $P(X=k)=C(n,k)\ p^{k}(1-p)^{(n-k)}$, E(X)=np and Var(X)=np(1-p).

Worked example

X has values 0, 1, 2 with probabilities 0.2, 0.5, 0.3. Find E(X).

Weighted mean 0×0.2+1×0.5+2×0.3=1.1.

Answer: 1.1.

Try it yourself

Name: _____ Date: _____

1. X takes values 0, 1 and 2 with probabilities 0.2, 0.5 and 0.3 respectively. Find Var(X).

2. X~Bin(4, 0.5). Find P(X=2).

Answers and explanations

Check the method as well as the final answer. An alternative correct method is also valid.

1. 0.49.

$E(X^2)=0.5+1.2=1.7$; subtract 1.1^2.

2. 3/8.

$C(4,2)(1/2)^4=6/16$.

Curriculum reference: Mathematical Methods Units 3–4 — Discrete random variables and binomial distributions

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