INKMATHS FLASHCARDS

Further Statistics 1 distributions and tests

14 cards · fronts and backs

Print double-sided, flipping on the long edge, and each answer lands behind its question. Cut along the card borders.

Definitions in precise wording, the standard results the formulae booklet does not print, a check-yourself question per topic, and the slips that lose marks. The same cards run on the website with spaced-repetition scheduling, at inkphysics.co.uk/maths/flashcards.

STANDARD RESULT

Discrete variance:

Var(X) = ?

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

Linear transformation:

Var(aX + b) = ?

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STANDARD RESULT

Poisson:

X is Po(λ): P(X = x) = ?

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STANDARD RESULT

Geometric:

X is Geo(p), x = 1, 2, 3, ...: P(X = x) = ?, μ = ?, σ^2 = ?

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STANDARD RESULT

Negative binomial:

rth success on trial x: P = ?

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RECALL

State what the Central Limit Theorem buys you.

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

RECALL

State how a Poisson hypothesis test differs from a binomial one.

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STANDARD RESULT

Goodness of fit:

χ^2 = ?

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STANDARD RESULT

a^2 Var(X). The shift b contributes nothing

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

$\Sigma x^2 P(X = x) - \mu^2$

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STANDARD RESULT

$p(1 - p)^{x-1}$, $(1)/(p)$, $(1-p)/(p^2)$

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

$e^{-\lambda}(\lambda^x)/(x!)$, with $E(X) = Var(X) = \lambda$

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

RECALL

For a large enough sample of independent observations from one distribution of finite variance, the mean is approximately normal whatever that population looks like, with mean μ and variance σ^2/n. The mean and variance hold for any n. Normal is the theorem's whole contribution, so quote the sample size when you lean on it.

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

$^{x-1}C_{r-1}\, p^r(1 - p)^{x-r}$, $\mu = (r)/(p)$

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

$\Sigma ((O_i - E_i)^2)/(E_i)$

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

RECALL

The machinery is identical, only the distribution under the null changes. Test λ rather than p, and scale λ to the interval the question actually observes before you touch the tables. For a geometric model the tail is easy, since $P(X \geq x)$ is just $(1 - p)$ to the power $x - 1$.

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

Contingency table:

E_{ij} = ?, degrees of freedom?

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

Generating function:

G(t) = ?, mean = ?

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

Variance from a PGF:

Var(X) = ?

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DEFINITION

Define: Power of a test.

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

SPOT THE ERROR

Say what is wrong with this claim:

A test at the 5% level is wrong 5% of the time.

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

CHECK YOURSELF

A goodness-of-fit test has 6 classes after pooling, with one parameter estimated from the data. State the degrees of freedom.

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

$E(t^X)$, mean = $G'(1)$

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

(row × column)/(total), $(r-1)(c-1)$

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

DEFINITION

The probability of correctly rejecting the null hypothesis at a stated alternative, equal to one minus the probability of a Type II error there.

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

STANDARD RESULT

$G''(1) + G'(1) - [G'(1)]^2$

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

CHECK YOURSELF

6 - 1 - 1 = 4. One degree of freedom goes to the fixed total and one to the estimated parameter.

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS

SPOT THE ERROR

The 5% is the level the test is set to. The chance of rejecting a true null is the test's size, the probability of the critical region given H_0, and a discrete test lands at or below the nominal 5%. It says nothing about Type II errors, which are often far more likely, and it is a conditional probability rather than an overall error rate.

FURTHER STATISTICS 1: DISTRIBUTIONS AND TESTS