

Lecture 1 · In-class quiz

Introduction and random variables

2026-10-05 · 8 minutes · Student copy

Name: _____

1. Concept check

Is a count of job offers discrete or continuous? Choose one: A. Discrete; B. Continuous; C. Neither.

2. Application

A PMF assigns probabilities 0.2, 0.5 and 0.3 to $X = 0, 1$ and 2. Find $P(X \geq 1)$.

3. Exam-style

In the football model, the probabilities for 0, 1, 2, 3, 4 and 5 goals are 0.1, 0.2, 0.3, 0.2, 0.1 and 0.1. Calculate $P(X \leq 3)$ and $P(X > 2)$.

4. Concept check

True or false: a continuous density of 1.4 at a point is impossible. Explain.

5. Exam-style

For observations 1, 2, 2, 5, what is the empirical CDF at 2? Does it estimate a population CDF or establish it exactly?

Lecture 2 · In-class quiz

Distribution parameters and discrete models

2026-10-05 · 10 minutes · Student copy

Name: _____

1. Concept check

Can $E(X)$ be a value that X never takes? Give an example.

2. Application

For an illustrative employment indicator with $p = 0.6$, find $E(X)$ and $\text{Var}(X)$.

3. Exam-style

Five independent applicants each receive an offer with probability 0.6. Find the probability of exactly four offers.

4. Concept check

Four out of ten applicants have vocational qualifications. You randomly select three distinct applicants. Which model describes the number with vocational qualifications? A. Binomial; B. Hypergeometric; C. Geometric. Explain.

5. Exam-style

A homogeneous Poisson helpdesk receives an average of two calls per hour. What is the probability of zero calls in half an hour?

Lecture 3 · In-class quiz

Continuous distribution models

2026-10-12 · 8 minutes · Student copy

Name: _____

1. Exam-style

A uniform bus wait on $[0,30]$ minutes: find $P(\text{wait} \leq 20)$.

2. Exam-style

A job-offer waiting time is exponential with rate 0.25 per month. What is its mean in months?

3. Exam-style

Commute duration is normal with mean 40 and SD 2 minutes. What is the z score for 36 minutes?

4. Concept check

For a continuous normal variable, $P(X=a)$ equals... A. The density at a; B. Zero; C. One

5. Concept check

Which distribution describes $(\text{mean} - \mu) / (S / \sqrt{n})$ for iid normal observations? A. Standard normal for every n; B. t with $n-1$ degrees of freedom; C. Chi-square with n degrees of freedom

Lecture 4 · In-class quiz

Samples and sample functions

2026-10-12 · 8 minutes · Student copy

Name: _____

1. Concept check

In a survey, the population employment rate is a... A. Statistic; B. Parameter; C. Realisation of the sample mean

2. Exam-style

The population is 168,172,176,180. Find its mean.

3. Concept check

A very large voluntary survey necessarily removes selection bias. A. True; B. False

4. Concept check

Sample separately from education groups and combine using population shares. This is... A. Cluster sampling; B. Stratified sampling; C. A census

5. Exam-style

Standard error describes... A. Dispersion of individuals; B. Sampling dispersion of an estimator; C. A data entry mistake

Lecture 5 · In-class quiz

Sampling distributions and the sample mean

2026-11-02 · 8 minutes · Student copy

Name: _____

1. Exam-style

Population SD is 12 and $n=36$ independent observations. Find $SE(\text{mean})$.

2. Exam-style

Multiply n by 4 with unchanged population SD. By what factor is SE multiplied?

3. Concept check

The CLT says the raw observations become normally distributed as n grows. A. True; B. False

4. Exam-style

For 10 independent fair tosses, find $P(0.4 < \text{proportion of heads} < 0.6)$.

5. Exam-style

For a normal approximation to an integer count, $P(X \leq 40)$ uses boundary... A. 39.5; B. 40; C. 40.5

Lecture 6 · In-class quiz

Estimation and confidence intervals

2026-11-02 · 8 minutes · Student copy

Name: _____

1. Exam-style

60 of 100 participants are employed. Find the Bernoulli maximum likelihood estimate.

2. Concept check

Normal variance MLE divides squared deviations by... A. n ; B. $n-1$; C. $\sqrt{n}$

3. Exam-style

Known $\sigma=400$ euros, $n=100$. Find the 95% margin of error using $z=1.96$.

4. Exam-style

A 95% confidence procedure means... A. The fixed parameter is random with probability 0.95 inside this observed interval; B. 95% of repeated intervals cover the fixed parameter under the model; C. 95% of people lie in the interval

5. Concept check

A likelihood of 0.6 establishes a 60% posterior probability for a model. A. True; B. False

Lecture 7 · In-class quiz

Confidence, prediction and tolerance intervals

2026-11-09 · 8 minutes · Student copy

Name: _____

1. Exam-style

A t interval based on 8 iid normal observations uses how many degrees of freedom?

2. Exam-style

A 95% interval for one future commuting cost is a... A. Confidence interval for the mean; B. Prediction interval; C. Tolerance interval

3. Exam-style

A target interval has total width 0.02. What is the margin of error?

4. Concept check

A Wald proportion interval is most problematic when... A. n is large and p is near 0.5; B. n is small or p is near 0 or 1; C. The units are percentage points

5. Exam-style

Holding n and s fixed, increasing confidence from 95% to 99% makes a t interval... A. Narrower; B. Wider; C. Unchanged

Lecture 8 · In-class quiz

Principles of statistical testing

2026-11-09 · 8 minutes · Student copy

Name: _____

1. Exam-style

Reject a fair-coin null after 5 tosses only for all heads or all tails. Find the null rejection probability.

2. Exam-style

A p-value of 0.03 means... A. $P(H_0 \text{ is true})=0.03$; B. Under H_0 , outcomes at least as incompatible occur with probability 0.03; C. The estimated effect is large

3. Concept check

A Type I error is... A. Failing to reject a false null; B. Rejecting a true null; C. An inaccurate sample mean

4. Exam-style

At a specified alternative, Type II error probability is 0.2. What is power?

5. Exam-style

After $p=0.20$, a sound conclusion is... A. The null is proved; B. Fail to reject at 5%; consider effect estimate and uncertainty; C. There is a 20% chance of no effect

Lecture 9 · In-class quiz

One-sample inference

2026-11-16 · 8 minutes · Student copy

Name: _____

1. Exam-style

$n=25$, $\text{mean}=5.4$, $\text{sample SD}=2$, $\text{null mean}=6$. Find the one-sample t statistic.

2. Concept check

A sign test against a continuous-population median uses... A. Distances from the median; B. Signs relative to the benchmark; C. Squared deviations

3. Exam-style

6 of 9 auction prices exceed 50. The prespecified alternative is $\text{median} > 50$. Find $P(\text{Bin}(9, 0.5) \geq 6)$.

4. Exam-style

Jewellery mean test has $p=0.05394$. At $\alpha=0.05$... A. Reject; B. Fail to reject; 0.618 remains in the matching 95% CI; C. Prove the mean is 0.618

5. Exam-style

A simple regression with intercept and slope has $n=20$ observations. What df does the classical slope t test use?

Lecture 11 · In-class quiz

Two-sample inference

2026-11-30 · 8 minutes · Student copy

Name: _____

1. Exam-style

Scores before and after training for the same people should usually use... A. A paired comparison; B. An independent-groups test; C. An F test of means

2. Exam-style

Programme employment is 58%, comparison employment is 49%. What is the gap in percentage points?

3. Concept check

Welch's independent-means test... A. Requires equal population variances; B. Allows unequal variances; C. Makes any observational difference causal

4. Concept check

For an F ratio with fixed numerator group and a two-sided level- α test, the upper quantile is... A. $1-\alpha$; B. $1-\alpha/2$; C. $\alpha/2$

5. Concept check

Random assignment guarantees identical observed baseline group means. A. True; B. False

Lecture 13 · In-class quiz

Independence, homogeneity and goodness of fit

2026-12-07 · 8 minutes · Student copy

Name: _____

1. Exam-style

A table has row total 92, column total 152, grand total 351. Find the expected count under independence.

2. Exam-style

A 3-by-2 independence table has how many degrees of freedom?

3. Concept check

The Pearson approximation should be assessed using... A. Expected counts; B. Only observed percentages; C. The p-value alone

4. Exam-style

Fair-die counts are 6,2,4,6,8,4 out of 30. Find the Pearson statistic.

5. Exam-style

Failing to reject an independence null proves no association. A. True; B. False