

Name _____ Score _____ Teacher _____ Date _____

Bernoulli and Normal Model Selection

Identify the random variable and parameters before calculating. Distinguish a normal variance from its standard deviation.

- 1. X is Bernoulli with $P(X=1)=0.2$. Find its PMF, $F(-1)$, mean, and variance.**

Reference: For Bernoulli(p), $P(X=1)=p$, $P(X=0)=1-p$, $E(X)=p$, and $\text{Var}(X)=p(1-p)$.

- 2. A model is written $X \sim N(6, 2^2)$, where the second slot is the variance. State the support, mean, variance, standard deviation, and PDF.**

Reference: For $N(\mu, \sigma^2)$, support is all real numbers and $f(x) = \frac{1}{(\sigma \sqrt{2\pi})} \exp\left[-\frac{(x-\mu)^2}{2\sigma^2}\right]$.

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Bernoulli and Normal Model Selection

Identify the random variable and parameters before calculating. Distinguish a normal variance from its standard deviation.

- 3. A measurement is continuous, roughly symmetric and bell-shaped with center 7 and standard deviation 3; let X be one measurement. Is a normal model suitable? If so, standardize $x=7$.**

Reference: A normal model is plausible for an unbounded-looking continuous bell-shaped measurement without strong skew or discrete counts. Standardize $z=(x-\mu)/\sigma$.

- 4. In inspection batch 4, 12 independent components each pass with probability 0.65. Let X count passes. Choose Bernoulli or binomial and state its parameters.**

Reference: Bernoulli records one binary trial. Binomial counts successes in a fixed number n of independent trials with common p .

Bernoulli and Normal Model Selection

Identify the random variable and parameters before calculating. Distinguish a normal variance from its standard deviation.

5. In inspection batch 5, a randomly selected component either passes or fails, with pass probability 0.8. Define $X=1$ for pass and 0 for fail. Choose Bernoulli or binomial and state its parameter.

Reference: Bernoulli records one binary trial. Binomial counts successes in a fixed number n of independent trials with common p .

6. X is Bernoulli with $P(X=1)=0.2$. Find its PMF, $F(1)$, mean, and variance.

Reference: For $\text{Bernoulli}(p)$, $P(X=1)=p$, $P(X=0)=1-p$, $E(X)=p$, and $\text{Var}(X)=p(1-p)$.

Bernoulli and Normal Model Selection

Identify the random variable and parameters before calculating. Distinguish a normal variance from its standard deviation.

- 7. A measurement is continuous, roughly symmetric and bell-shaped with center 0 and standard deviation 2; let X be one measurement. Is a normal model suitable? If so, standardize $x=-2$.**

Reference: A normal model is plausible for an unbounded-looking continuous bell-shaped measurement without strong skew or discrete counts. Standardize $z=(x-\mu)/\sigma$.

- 8. A model is written $X \sim N(1, 3^2)$, where the second slot is the variance. State the support, mean, variance, standard deviation, and PDF.**

Reference: For $N(\mu, \sigma^2)$, support is all real numbers and $f(x)=[1/(\sigma \sqrt{2\pi})] \exp[-(x-\mu)^2/(2\sigma^2)]$.

Math Sheet

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Bernoulli and Normal Model Selection

Worked Answer Key

Identify the random variable and parameters before calculating. Distinguish a normal variance from its standard deviation.

1. X is Bernoulli with $P(X=1)=0.2$. Find its PMF, $F(-1)$, mean, and variance.

Reference: For Bernoulli(p), $P(X=1)=p$, $P(X=0)=1-p$, $E(X)=p$, and $\text{Var}(X)=p(1-p)$.

Answer: PMF: $P(0)=0.8$, $P(1)=0.2$; $F(-1)=0$; mean 0.2; variance 0.16

1. The support is $\{0,1\}$.
2. $F(-1)=0$. $E(X)=0.2$; $\text{Var}(X)=0.2(1-0.2)=0.16$.

2. A model is written $X \sim N(6, 2^2)$, where the second slot is the variance. State the support, mean, variance, standard deviation, and PDF.

Reference: For $N(\mu, \sigma^2)$, support is all real numbers and $f(x) = \frac{1}{(\sigma \sqrt{2\pi})} \exp\left[-\frac{(x-\mu)^2}{2\sigma^2}\right]$.

Answer: support all real x; mean 6; variance 4; SD 2

1. The second parameter is variance, so $\sigma=2$.
2. $f(x) = \frac{1}{(2 \sqrt{2\pi})} \exp\left[-\frac{(x-6)^2}{2(4)}\right]$, for all real x ; $f(x)=0$ nowhere on the real support.

Bernoulli and Normal Model Selection

Worked Answer Key

Identify the random variable and parameters before calculating. Distinguish a normal variance from its standard deviation.

3. A measurement is continuous, roughly symmetric and bell-shaped with center 7 and standard deviation 3; let X be one measurement. Is a normal model suitable? If so, standardize $x=7$.

Reference: A normal model is plausible for an unbounded-looking continuous bell-shaped measurement without strong skew or discrete counts. Standardize $z=(x-\mu)/\sigma$.

Answer: suitable; $z=0$

1. The described shape and continuous scale make a normal model reasonable.
2. $z=(7-7)/3=0$.

4. In inspection batch 4, 12 independent components each pass with probability 0.65. Let X count passes. Choose Bernoulli or binomial and state its parameters.

Reference: Bernoulli records one binary trial. Binomial counts successes in a fixed number n of independent trials with common p .

Answer: Binomial($n=12$, $p=0.65$)

1. X counts successes across 12 fixed independent trials, so X is binomial.

Bernoulli and Normal Model Selection

Worked Answer Key

Identify the random variable and parameters before calculating. Distinguish a normal variance from its standard deviation.

5. In inspection batch 5, a randomly selected component either passes or fails, with pass probability 0.8. Define $X=1$ for pass and 0 for fail. Choose Bernoulli or binomial and state its parameter.

Reference: Bernoulli records one binary trial. Binomial counts successes in a fixed number n of independent trials with common p .

Answer: Bernoulli(0.8)

1. There is one binary trial, so X is Bernoulli.

6. X is Bernoulli with $P(X=1)=0.2$. Find its PMF, $F(1)$, mean, and variance.

Reference: For Bernoulli(p), $P(X=1)=p$, $P(X=0)=1-p$, $E(X)=p$, and $\text{Var}(X)=p(1-p)$.

Answer: PMF: $P(0)=0.8$, $P(1)=0.2$; $F(1)=1$; mean 0.2; variance 0.16

1. The support is $\{0,1\}$.
2. $F(1)=1$. $E(X)=0.2$; $\text{Var}(X)=0.2(1-0.2)=0.16$.

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Bernoulli and Normal Model Selection

Worked Answer Key

Identify the random variable and parameters before calculating. Distinguish a normal variance from its standard deviation.

7. A measurement is continuous, roughly symmetric and bell-shaped with center 0 and standard deviation 2; let X be one measurement. Is a normal model suitable? If so, standardize $x=-2$.

Reference: A normal model is plausible for an unbounded-looking continuous bell-shaped measurement without strong skew or discrete counts. Standardize $z=(x-\mu)/\sigma$.

Answer: suitable; $z=-1$

1. The described shape and continuous scale make a normal model reasonable.
2. $z=(-2-0)/2=-1$.

8. A model is written $X \sim N(1, 3^2)$, where the second slot is the variance. State the support, mean, variance, standard deviation, and PDF.

Reference: For $N(\mu, \sigma^2)$, support is all real numbers and $f(x)=[1/(\sigma \sqrt{2\pi})] \exp[-(x-\mu)^2/(2\sigma^2)]$.

Answer: support all real x ; mean 1; variance 9; SD 3

1. The second parameter is variance, so $\sigma=3$.
2. $f(x)=1/(3 \sqrt{2\pi}) \exp[-(x-1)^2/(2(9))]$, for all real x ; $f(x)=0$ nowhere on the real support.