

PRINTABLE VERSION

Quiz 4

You scored 100 out of 100

Question 1

Your answer is CORRECT.

Suppose you have a distribution, X , with mean = 5 and standard deviation = 4. Define a new random variable $Y = 8X - 5$. Find the mean and standard deviation of Y .

a) ☒ $E[Y] = 35; \sigma_Y = 32$

b) ☐ $E[Y] = 40; \sigma_Y = 27$

c) ☐ $E[Y] = 35; \sigma_Y = 256$

d) ☐ $E[Y] = 40; \sigma_Y = 256$

e) ☐ $E[Y] = 35; \sigma_Y = 27$

f) ☐ None of the above

$$E[X] = 5 \quad \sigma_X = 4 \quad \text{Var}[X] = 16$$

$$\begin{aligned} E[Y] &= E[8X - 5] = 8E[X] - 5 \\ &= 8(5) - 5 \\ &= 35 \end{aligned}$$

$$\text{Var}[Y] = 8^2 \text{Var}[X] = 64 \cdot 16 = 1024$$

$$\sigma_Y = \sqrt{1024} = 32$$

Question 2

Your answer is CORRECT.

Which statement is not true for a binomial distribution with $n = 10$ and $p = 1/20$?

a) ☐ The number of trials is equal to 10 ✓

b) ☐ The standard deviation is 0.6892 ✓

c) ☐ The mean equals 0.5000 ✓

d) ☐ The probability that x equals 1 is 0.3151 ✓

e) ☒ The highest probability occurs when x equals 0.5000

f) ☐ None of the above

$$\mu = E[X] = n \cdot p = 10 \cdot \frac{1}{20} = \frac{1}{2}$$

$$\begin{aligned} \sigma^2 &= np(1-p) \\ &= 10 \left(\frac{1}{20} \right) \left(\frac{19}{20} \right) \end{aligned}$$

$$= \frac{19}{40} = 0.475$$

$$\sigma = \sqrt{0.475} = 0.6892$$

Question 3

Your answer is CORRECT.

In testing a new drug, researchers found that 3% of all patients using it will have a mild side effect. A random sample of 9 patients using the drug is selected. Find the probability that none will have this mild side effect.

$$p = .03$$

$$n = 9$$

a) ☐ 0.6992

b) ☐ 0.9884

c) ☐ 0.0300

d) ☐ 0.9700

e) ☒ 0.7602

f) ☐ None of the above

$$P(X=0) = \text{dbinom}(0, 9, .03)$$

$$= \text{binompdf}(9, .03, 0)$$

$$=$$

```
> dbinom(0,9,.03)
[1] 0.7602311
```

Question 4

Your answer is CORRECT.

$$p = .06$$

In testing a new drug, researchers found that 6% of all patients using it will have a mild side effect. A random sample of 12 patients using the drug is selected. Find the probability that at least one will have this mild side effect.

$$n = 12$$

$$X \geq 1$$

a) ☐ 0.9400

b) ☐ 0.0600

c) ☐ 0.3292

☒ d) 0.5241

e) ☐ 0.6605

f) ☐ None of the above

$$P(X \geq 1) = 1 - P(X \leq 0)$$

$$= 1 - \text{pbinom}(0, 12, .06)$$

$$= 1 - \text{binomcdf}(12, .06, 0)$$

$$=$$

```
> 1-pbinom(0,12,.06)
[1] 0.5240797
```

Question 5

Your answer is CORRECT.

$$p = .01$$

In testing a new drug, researchers found that 1% of all patients using it will have a mild side effect. A random sample of 15 patients using the drug is selected. Find the probability that exactly two will have this mild side effect.

$$n = 15$$

☒ a) 0.009214

b) ☐ 0.05921

$$P(X=2) = \text{dbinom}(2, 15, .01)$$

$$= \text{binompdf}(15, .01, 2)$$

$$=$$

```
> dbinom(2,15,.01)
[1] 0.009213971
```

- c) ☐ 0.03921
- d) ☐ 0.04921
- e) ☐ 0.01921
- f) ☐ None of the above

Question 6

Your answer is CORRECT.

A manufacturer of matches randomly and independently puts 17 matches in each box of matches produced. The company knows that one-tenth of 4 percent of the matches are flawed. What is the probability that a matchbox will have one or fewer matches with a flaw?

- a) ☒ 0.9979
- b) ☐ 0.06378
- c) ☐ 0.003752
- d) ☐ 0.08273
- e) ☐ 0.9341
- f) ☐ None of the above

$$p = \frac{1}{10} \cdot (.04) = .004$$

$$P(X \leq 1) = \text{pbinom}(1, 17, .004) \\ = \text{binomcdf}(17, .004, 1)$$

$$= > \text{pbinom}(1, 17, .004) \\ [1] 0.9979092$$

Question 7

Your answer is CORRECT.

Suppose you have a binomial distribution with $n = 41$ and $p = 0.4$. Find $P(8 \leq X \leq 12)$.

- a) ☐ 0.1480
- b) ☐ 0.0551
- c) ☐ 0.1551
- d) ☐ 0.3040
- e) ☒ 0.1040**
- f) ☐ None of the above

$$P(X \leq 12) - P(X \leq 7) = \text{pbinom}(12, 41, 0.4) - \text{pbinom}(7, 41, 0.4) \\ = \text{binomcdf}(41, .4, 12) - \text{binomcdf}(41, .4, 7)$$

$$= > \text{pbinom}(12, 41, .4) - \text{pbinom}(7, 41, .4) \\ [1] 0.1040156$$

Question 8

Your answer is CORRECT.

Each year a company selects a number of employees for a management training program. On average, 40 percent of those sent complete the program. Out of the 20 people sent, what is the probability that exactly 9 complete the program?

$$n = 20 \quad p = 40\% \\ p = .4$$

a) ☐ 0.3597

b) ☐ 0.7553

c) ☐ 0.8553

☒ d) 0.1597

e) ☐ 0.2037

f) ☐ None of the above

$$P(X=9) = \text{binompdf}(20, .4, 9)$$

$$= \text{dbinom}(9, 20, .4)$$

$$= \begin{array}{l} > \text{dbinom}(9, 20, .4) \\ [1] 0.1597385 \end{array}$$

Question 9

Your answer is CORRECT.

Each year a company selects a number of employees for a management training program. On average, 40 percent of those sent complete the program. Out of the 29 people sent, what is the probability that 7 or more complete the program?

$$p = .4 \quad n = 29$$

a) ☐ 0.1569

b) ☐ 0.0233

c) ☐ 0.0569

☒ d) 0.9766

e) ☐ 0.9430

f) ☐ None of the above

$$P(X \geq 7) = 1 - P(X \leq 6)$$

$$= 1 - \text{pbinom}(6, 29, .4)$$

$$= 1 - \text{binomcdf}(29, .4, 6)$$

$$= \begin{array}{l} > 1 - \text{pbinom}(6, 29, .4) \\ [1] 0.9766707 \end{array}$$

Question 10

Your answer is CORRECT.

A fish tank in a pet store has 19 fish in it. 6 are orange and 13 are white. Determine the probability that if we select 3 fish from the tank, at least 2 will be white.

a) ☐ 0.6842

b) ☐ 0.2218

$$19 \text{ fish} \quad 13 \text{ white} \quad 6 \text{ orange}$$

$$P(\text{at least 2 out of 3 are white}) = \frac{19C2}{19C3}$$

c) ☐ 0.9981d) ☒ 0.7781e) ☐ 0.2438f) ☐ None of the above

$$P(X \geq 2) = 1 - P(X \leq 1) = 1 - 0.2219 = 0.7781$$

$$P(X=1) = \frac{{}^{13}C_1 \cdot {}^6C_2}{{}^{19}C_3} = \frac{195}{969}$$

$$+ = 0.2219$$

$$P(X=0) = \frac{{}^6C_3}{{}^{19}C_3} = \frac{20}{969}$$

Question 11

Your answer is CORRECT.

Identify the following distribution as binomial, geometric or neither.

In a large population of college students, 20% of the students have experienced feelings of math anxiety. If you take a random sample of 10 students from this population. You are interested in how many students have experienced math anxiety.

$$p = .20$$

$$n = 10$$

↑
Know # of trials

a) ☒ Binomialb) ☐ Geometricc) ☐ Neither

Question 12

Your answer is CORRECT.

A quarter back completes 55% of his passes. We want to observe this quarterback during one game to see how many pass attempts he makes before completing one pass. What is the probability that the quarterback throws 7 incomplete passes before he has a completion?

Geometric

$$p = .55$$

$$P(X=8) = dgeom(7, .55)$$

$$= geompdf(.55, 11)$$

$$= > dgeom(7, .55)$$

$$[1] 0.002055182$$

a) ☐ 0.0229b) ☐ 0.9979c) ☒ 0.0020d) ☐ 0.9990e) ☐ 0.0009f) ☐ None of the above

Question 13

Your answer is CORRECT.

A quarter back completes 26% of his passes. We want to observe this quarterback during one game to see how many pass attempts he makes before completing one pass. Determine the probability that it

takes more than 15 attempts before he completes a pass.

a) ☐ 0.9890

b) ☐ 0.0028

c) ☐ 0.9971

☒ d) 0.0109

e) ☐ 0.0248

f) ☐ None of the above

$$P(X > 15) = 1 - P(X \leq 15)$$

$$= 1 - \text{geomcdf}(.26, 15)$$

$$= 1 - \text{pgeom}(14, .26)$$

$$= > 1 - \text{pgeom}(14, .26)$$

```
[1] 0.01092637
```

Question 14

Your answer is CORRECT.

Joe has an 32% probability of passing his statistics quiz 4 each time he takes it. What is the probability he will take no more than 4 tries to pass it?

Geometric

☒ a) 0.7861

b) ☐ 0.9315

c) ☐ 0.0684

d) ☐ 0.0904

e) ☐ 0.2138

f) ☐ None of the above

$$P(X \leq 4) = \text{geomcdf}(.32, 4)$$

$$= \text{pgeom}(3, .32)$$

$$= > \text{pgeom}(3, .32)$$

```
[1] 0.7861862
```

Question 15

Your answer is CORRECT.

Joe has an 17% probability of passing his statistics quiz 4 each time he takes it. How many times should Joe expect to take his quiz before passing it?

Geometric

a) ☐ 119

$$p = .17$$

$$E[X] = \frac{1}{p}$$

☒ b) 6

c) ☐ 5

d) ☐ 9

$$E[X] = \frac{1}{.17} = 5.88$$

round up

6

e) ☐ 22

f) ☐ None of the above