**Quiz #2 Prep Answers**

**Solutions:**

**Answer #1)** Given:

Normal distribution

µ (mean) = 1000

σ (standard deviation) =100

x1 & x2 (salary range) = 840,1200

A) Find: **P(840< X < 1200)** = P(X< 1200) – P(X< 840)

B) Need to first convert to standardized values



Z formula =

(for the low end of the salary range)

Z formula =

(for the high end of the salary range)

C) Using the *Standard Normal Probabilities* in the back of the book (**Table C**)

**For the low end of the salary range:**

Looking for P(Z < -1.6 ) so look for z at -1.60 on Table C. The probability (area under the curve) is

= **0.0548** Resulting in: P(X< 840) = **0.0548**

or using Excel function =NORMSDIST(-1.6) (for Excel 2010 use =NORM.S.DIST(-1.6,TRUE))

or you can use =NORMDIST(840, 1000, 100, True) (for Excel 2010 use NORM.DIST)

**For the high end of the salary range:**

Looking for P(X< 1200) = P(Z < 2 ) = **0.9772** (using Table C at z=2.0)

or using Excel function =NORMDIST(1200, 1000, 100, True)

D) **P(840< X < 1200)** = P(X< 1200) – P(X< 840) = 0.9772 – 0.0548 = **0.9224**

This is a probability that can be stated as a percent.

Answer: **92.24%**

**Answer #2)** Given:

20% of employees use direct deposit so the probability someone uses direct deposit = 0.2

p = 0.2

sample size n = 5

Employees either use direct deposit or they don’t (Binomial)

Using direct deposit = success = x = 5

A) Find: **P(X = 5)**

B) Using the *Binomial Probabilities* in the back of the book (**Table B**)

Look-up: p= 0.2 (along the top of the page) and n=5 (on the left side of the table) and x=5

Or use Excel function = BINOMDIST(5, 5, 0.2, False) (for 2010 users BINOM.DIST)

Note: “Probability” is always a number between 0 and 1.

Answer: P(X = 5) = **0.0003**

How would you answer this question… What is the probability that 2 or more employees use direct deposit?

**Answer #3)**

**1st Shift 2nd Shift 3rd Shift Totals**

**Perfect product** 185 175 170 530

**Acceptable product** 55 60 65 180

**Defective product** 15 15 15 45

**Reworked product** 10 15 15 40

265 265 265 795

Ho: product quality and shift **are** independent (or stated as product and shift are not dependent, In other words, the product’s quality doesn’t depend on a particular shift producing it.)

Ha: product quality and shift are not independent (or stated as product and shift **are** dependent)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | F=(fi \* fj)/N |  |  |  |
|  |  | The first F = (530 x 265)/795 |  |  |  |
| **Category** | **f** | **F** | **(f-F)2 /F** |  |  |
| perfect 1 | 185 | 176.7 | 0.39 |  |  |
| perfect 2 | 175 | 176.7 | 0.02 |  |  |
| perfect 3 | 170 | 176.7 | 0.25 |  |  |
| accept 1 | 55 | 60.0 | 0.42 |  |  |
| accept 2 | 60 | 60.0 | 0.00 |  |  |
| accept 3 | 65 | 60.0 | 0.42 |  |  |
| defect 1 | 15 | 15.0 | 0.00 |  |  |
| defect 2 | 15 | 15.0 | 0.00 |  |  |
| defect 3 | 15 | 15.0 | 0.00 |  |  |
| rework 1 | 10 | 13.3 | 0.83 |  |  |
| rework 2 | 15 | 13.3 | 0.21 |  |  |
| rework 3 | 15 | 13.3 | 0.21 |  |  |
| Totals | 795 |  | **2.74** | = chi-squared | |

i = row

j = column

df = degrees of freedom = (i -1) x (j – 1) = (4-1) x (3-1)= 6

Use **Table E** (with df = 6) and chi-square = 2.744

along row at df = 6 the chi-square = 2.744 is closest to **p-value = 0.90**

or **use Excel function** to get the exact p-value = CHIDIST(2.744, 6)

(for Excel 2010 users =CHISQ.DIST.RT(2.744, 6))

**p-value = 0.84**

Or set up both **actual**

185 175 170

55 60 65

15 15 15

10 15 15

and **expected** tables

176.7 176.7 176.7

60 60 60

15 15 15

13.3 13.3 13.3

And use **Excel function** =CHITEST(actual table range, expected table range)

(for 2010 users =CHISQ.TEST(actual table range, expected table range))

(“if p is low Ho must go”)

If p < α then reject Ho

If p > α then fail to reject Ho

**0.90 (or 0.84) > alpha 0.05 then fail to reject Ho**

**product quality and shift are independent (not dependent)**

**The product’s quality does not depend on the shift that produced it.**

**Answer #4)**

His claim was… mean > 3000

Ho: µ < = 3000

Ha: µ > 3000

**One-sample, one-sided, upper-tail hypothesis test**

n=60 (large sample size)

sample mean, x-bar = 3012

s = 112

alpha α = ? (what is the level of significance?)

Z = (x-bar – µ) / (s/ √¯n ) = (3012 – 3000) / (112 / sqrt 60) = 12 / (112 / 7.7459)

Z = 0.8299 (rounded = 0.83)

Use Table C…Look down the Z column for 0.8 and then across to 0.03

to get a probability of 0.7967 (this is the area to the left – according to the normal curve at top of page)

This is an upper-tail test so we want the area to the **right** of the Z

1 - 0.7967 = **0.2033 = p**

Or use Excel function =NORMDIST(3012, 3000,14.459,TRUE) (2010 users =NORM.DIST)

**The decision rule is:**

If p > = alpha, then fail to reject Ho

If p < alpha, then reject Ho

But alpha wasn’t given in this problem.

If 0.2033 > = alpha, then fail to reject Ho

If 0.2033 < alpha, then reject Ho So….

If alpha > 0.2033 then reject Ho

This seems like you need a really high alpha to reject Ho…since they are typically around 5% . We wouldn’t necessarily say that the data supports the claim, unless we had a pretty large alpha > 0.2033.