YEAR 2

APPLIED

- STATISTICS

January 2019

mock paper

worked solutions

(1)

a) $\text{mean} = \frac{798}{30} = 26.6$

$$SD = \sqrt{\frac{21357.5}{30} - \left(\frac{798}{30}\right)^2} = 2.09$$

b) mean = 14.8
SD = 2.37

upper limit $14.8 + (3 \times 2.37) = 21.91$

lower limit $14.8 - (3 \times 2.37) = 7.69$

∴ so no outliers

c) i) higher mean air temp in northern hemisphere

SD are similar which suggest similar variations in mean air temp

ii) Data from one location and therefore not valid

as temp can vary accross each hemisphere

(1)

(d) $P(x > 29)$ $(27, 2.1^2)$

Normal CD

lower : 29

upper : large number (100)

σ : 2.1

μ : 27

$P(x > 29) = 0.17045$

$= 5.11$ days

(2)

a) i) making predictions outside data range

ii) trend may not continue
so prediction will be un reliable

b) PMCC cant be greater than 1

c) classwiz menu 6: statistics
2: $y = a + bx$ (linear correlation)

Enter data

OPTN

4: regression calc

$r = 0.76279$

d) $H_0: p = 0$ (no correlation) $H_1: p > 0$ (positive correlation)

use PMCC table Sample level = 10
Sig level = 0.01

∴ critical value = 0.7155

Reject Ho
Evidence PMCC is greater than 0

e) longer tails longer wings

(3)

a) $P(\text{new with repair contract}) = \frac{82}{65+82+231+262} = \frac{82}{640} = 0.128125$

13 people for sample

b) i) $P(\text{Faulty after testing positive}) = P(F|P)$ (Faulty positive)

How many tested positive $P(P)$:

Test positive + Faulty $= 0.70 \times 0.02 = 0.014$

Test positive + Not Faulty $= 0.10 \times 0.98 = 0.098$

(0.98: NOT Faulty, 100% − 2%)

Total Tested positive $= 0.014 + 0.098$

$= 0.112$

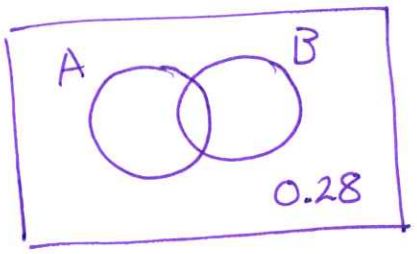
$$P(F|P) = \frac{P(P \cap F)}{P(P)} = \frac{0.014}{0.112}$$

$$= 0.125$$

ii) most machines that test positive do not have a fault so not a very useful test

(3)

c)



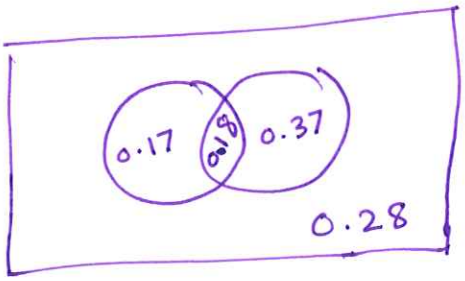
$P(A) = 0.35$

$P(B) = 0.55$

$P(\bar{A} \text{ and } \bar{B}) = 0.28$

$0.28 + 0.35 + 0.55 = 1.18$

$\therefore \quad P(A \text{ and } B) = 0.18$



$P(A) \times P(B) = 0.35 \times 0.55$

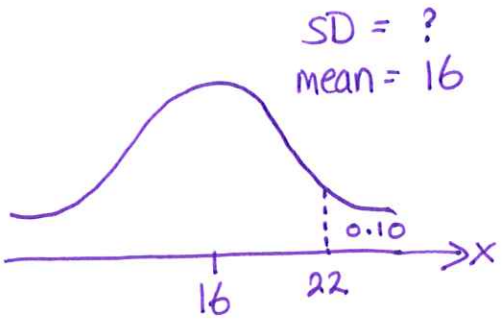
$= 0.1925$

$0.1925 \neq 0.18 \therefore$ NOT INPEDENDENT

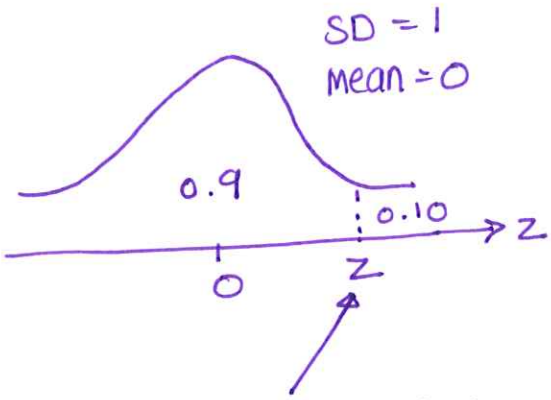
d) $0.17 + 0.37 = 0.54$

4

a)



Standard ND



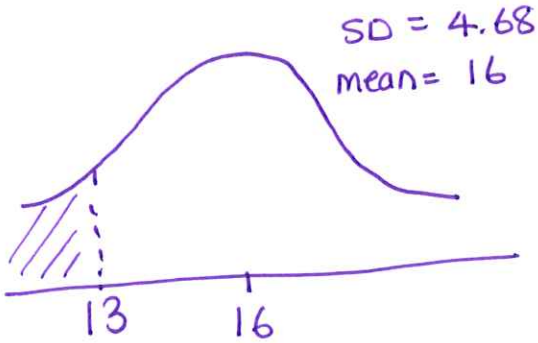
Classwiz. menu 7: INVERSE NORMAL
Area = 0.9
$\sigma = 1$
$\mu = 0$
$Z = 1.28155$

$$Z = \frac{X - \mu}{\sigma}$$

$$1.28155 = \frac{22 - 16}{\sigma}$$

$$SD = \sigma = 4.68$$

b)

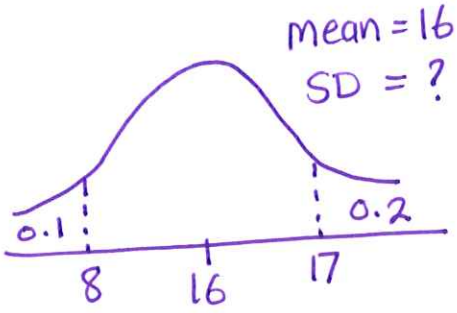


Classwiz menu 7:
2: Normal CD
lower : 0
upper : 13
σ : 4.68
μ : 16

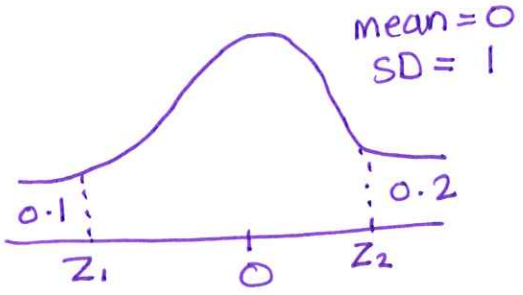
$$P(T < 13) = 0.2604$$
$$= 26.1\%$$

(4)

c)



Standard ND



use classwize to find z_1 and z_2

menu 7
Inverse normal
mean = 0
SD = 1
Area = 0.1 and 0.8

$z_1 = \frac{8-\mu}{\sigma}$ $\quad z_2 = \frac{17-\mu}{\sigma}$

$-1.2816 = \frac{8-\mu}{\sigma}$ $\quad 0.8416 = \frac{17-\mu}{\sigma}$

$-1.2816\sigma = 8 - \mu$ $\quad 0.8416\sigma = 17 - \mu$

solve simultaneously

$\sigma = 4.238...$

$\mu = 13.432...$

d) $13.4 < 16$

yes supports supervisors belief

5

a) winning scratch card (W) Stores (S)

(20, 0.45) (8, P)

$P(W \geq 12)$

$= 1 - P(W \leq 11)$

↓

menu 7
Binomial CD
2:variable
x = 11
N = 20
p = 0.45

$= 1 - 0.869235029$

$P(W \geq 12) = 0.130765$

(8, 0.130765)

$P(S \geq 2)$

$= 1 - P(S \leq 1)$

↓ x = 1, N = 8, P = 0.130765

$= 1 - 0.71814$

$= 0.282$

(5)

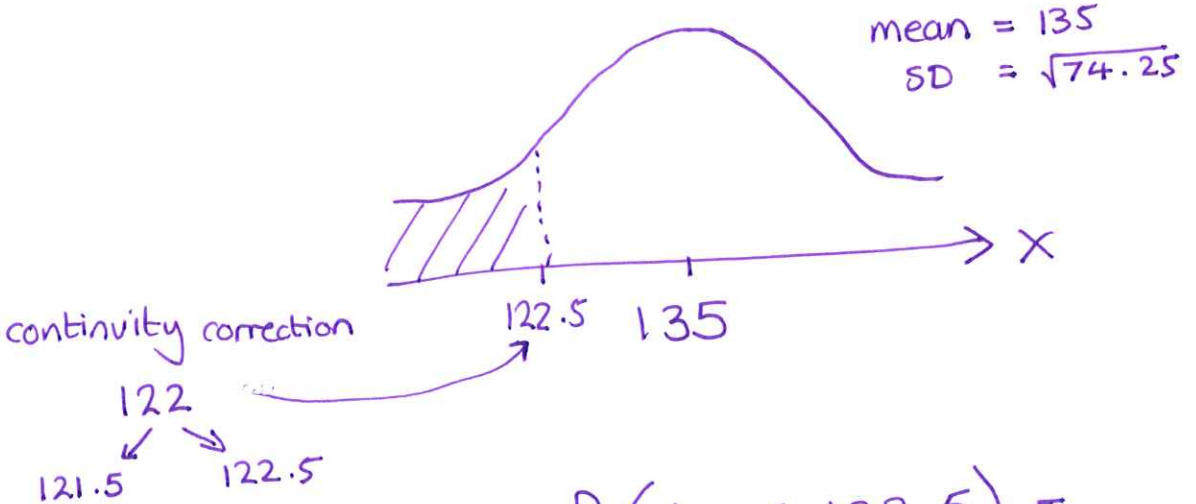
b) Number of trials is large
probability of success is close to zero

c) $p = 0.45$
$n = 300$

ND for a sample:

$$X \sim N\left(\underbrace{np}_{\text{mean}}, \underbrace{\sqrt{np(1-p)}}_{SD}\right)$$

$$\left(135, \sqrt{74.25}\right)$$



$P(X < 122.5) =$

class wize: menu 7
2: normal CD
lower: 0
upper: 122.5
σ : $\sqrt{74.25}$
μ : 135

$= 0.0734$

(5)

d) $0.0734 < 0.025$

$\therefore$ insufficient evidence at 5% sign level (2 tail)

to suggest the proportion is different from 45%.