S1 JAN 08

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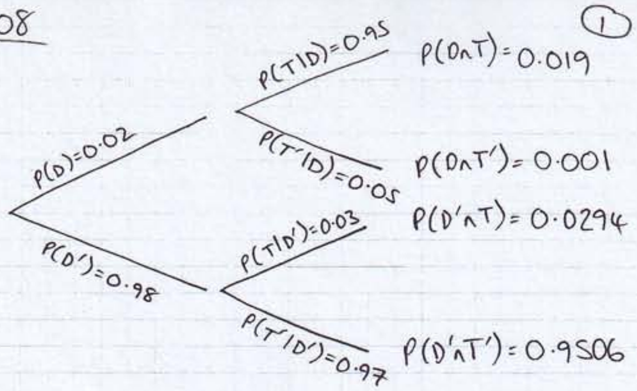
1)



b) $P(T) = P(D\cap T) + P(D'\cap T) = 0.019 + 0.0294 = 0.0484$

c) $P(D'|T) = \dfrac{P(D'\cap T)}{P(T)} = \dfrac{0.0294}{0.0484} = 0.607$

d) Test isn't that useful since there is a high probability someone doesn't have the disease even though the test is positive.

2) Mode = 50

b) $Q_1 \Rightarrow \frac{1}{4}n = \frac{1}{4}(28) = 7 \quad x_7/x_8 = \underline{45}$

$Q_3 \Rightarrow \frac{3}{4}n = \frac{3}{4}(28) = 21 \quad x_{21}/x_{22} = \underline{63}$ $\Rightarrow IQR = 18$

$Q_2 \Rightarrow \frac{1}{2}n = \frac{1}{2}(28) = 14 \quad x_{14}/x_{15} = \frac{50+51}{2} = \underline{50.5}$

c) i) $\bar{x} = \dfrac{\Sigma x}{n} = \dfrac{1469}{28} = \underline{52.46}$

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c) ii) $Var = \dfrac{\Sigma x^2}{n} - \bar{x}^2 = \dfrac{81213}{28} - 52.46^2 = 147.963$

$s.d. = \sqrt{Var} = \underline{12.16}$

d) $Skew = \dfrac{52.46 - 50}{12.16} = \underline{0.2}$

e) • Age at Abbey is smaller on average

• Similar standard deviation but Abbey's is slightly larger

• Abbey is negative skew, Balmoral positive

3)

x	-1	0	1	2	3
P	p	q	0.2	0.15	0.15

$E(x) = -p + 0 + 0.2 + 0.3 + 0.45 = 0.55$

$\Rightarrow -p + 0.95 = 0.55 \quad \underline{p = 0.4}$

$q = 1 - 0.4 - 0.2 - 0.15 - 0.15 = \underline{0.1}$

b)

x^2	1	0	1	4	9
P	0.4	0.1	0.2	0.15	0.15

$E(x^2) = 0.4 + 0 + 0.2 + 0.6 + 1.35 = \underline{2.55}$

$V(X) = E(x^2) - E(x)^2 = 2.55 - 0.55^2 = 2.2475$

c) $E(2x - 4) = 2E(x) - 4 = 2 \times 0.55 - 4 = \underline{-2.9}$

3

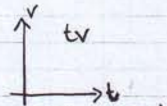
4) $S_{tt} = 10922.81 - \dfrac{401.3^2}{15} = 186.6973$

$S_{vv} = 42.3356 - \dfrac{25.08^2}{15} = 0.40184$

$S_{tv} = 677.971 - \dfrac{(401.3)(25.08)}{15} = 6.9974$

b) $r = \dfrac{S_{tv}}{\sqrt{S_{tt} \times S_{vv}}} = \dfrac{6.9974}{\sqrt{186.6973 \times 0.40184}} = \underline{0.808}$

c)



t is the explanatory variable since temperature affects the noise. We can control the temperature

d) $r = 0.808$ which is reasonable evidence to suggest correlation exists.

e) $b = \dfrac{S_{tv}}{S_{tt}} = \dfrac{6.9974}{186.6973} = 0.0375$

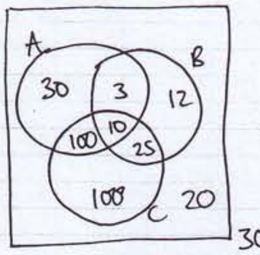
$a = \bar{v} - b\bar{t} = \dfrac{25.08}{15} - 0.0375\left(\dfrac{401.3}{15}\right) = 0.669$

$v = 0.669 + 0.0375t$

f) $t = 19 \quad v = 0.669 + 0.0375(19) =$

4

5)



b) $P(C) = \dfrac{100+100+10+25}{300} = \underline{\dfrac{47}{60}}$

c) $P(All\ 3|A) = \dfrac{10}{143}$

d) $P(None) = \dfrac{20}{300} = \dfrac{1}{15}$

6)

x	2	3	4
F	$\frac{(2+k)^2}{25}$	$\frac{(3+k)^2}{25}$	$\frac{(4+k)^2}{25}$

$\dfrac{(4+k)^2}{25} = 1$

$\Rightarrow (k+4)^2 = 25 \Rightarrow k = 1$

x	2	3	4
F	$\frac{9}{25}$	$\frac{16}{25}$	$\frac{25}{25}$

x	2	3	4
P	$\frac{9}{25}$	$\frac{7}{25}$	$\frac{9}{25}$

7) $\mu = 50 \quad \sigma = 2 \quad P(X > 53) = P(Z > \frac{53-50}{2}) = P(Z > 1.5)$

$= 1 - \Phi(1.5) = 0.0668$

b) $P(X > w) = 0.99 \Rightarrow P(X < w) = 0.01$

$\Rightarrow P(Z < \frac{w-50}{2}) = 0.01 \Rightarrow P(Z > \frac{50-w}{2}) = 0.01$

$\Rightarrow P(Z < \frac{50-w}{2}) = 0.99 \quad \Phi(\frac{50-w}{2}) = 0.99 = \Phi(2.32$

$50 - w = 4.64 \quad \underline{w = 45.36}$

c) $P(2\ more / 1\ less) = 3 \times 0.0668^2(0.9332) = \underline{0.0125}$