University of Ottawa Faculty of Administration

ADM 2303: STATISTICS FOR MANAGEMENT I SPECIAL FINAL EXAMINATION Jan 27 2005

NAME S.N. Section: A B C D E F G H

I have read the text on academic integrity at the top of the question sheet and I pledge not to have committed or attempted to commit academic fraud in this examination. Signed:

Q1 a)[2]

b)[3]

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c)[4]

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d)[5]

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e) [2]

Q2 a)[4]

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b)[5]

Q3 a)[2]

b)[2]

c) [4]

Q4 a)[2]

b)[2]

c)[3]

d)[3]

Q5 a)[2]

b)[2]

c)[3]

d)[3]

Q6 a)[2]

b)[2]

c)[2]

d)[2]

e)[2]

University of Ottawa Faculty of Administration

ADM 2303: STATISTICS FOR MANAGEMENT I FINAL EXAMINATION December 9, 2004

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Q1 a)[2]

1 z value for 90% (0.4 on table) is 1.28
1 1.28 = (x-47.8)/2.8 => x = 51.384 cm
***(0.5 no units)

TO PROFS: I've put asterisks on units.
Normally I'd deduct, but it appears that unit
issues not made clear in some classes.
I've kept ½ mark deduction on $ Q4a

b)[3]
To be normal (unfortunate wording!),
forearm length between 45.0 and 52.2 cm
P(45 < x < 52.2) =
1 P[(45-47.8)/2.8 <= z <= (52.2-47.8)/2.8]
1 = P(-1<=Z<=1.57) = 0.3413 + .4418=0.7831
P(Abnormal) = 1 - P(Normal) = 0.2169
(probability man has abnormal forearm len.)
P(Two Abnormals) = P(Abnormal)*P(Abnormal)
1 = 0.2169*0.2169 = 0.047

---

c)[4]
1 z-value for 90. percentile is z = 1.28
1 Sample size (144) is large enough to use CLT. Sample means are approximately Gaussian.

y_bar : observed forearm length of 144 students
2 1.28 = (y_bar – 47.8)/(2.8/sqrt(144)) => y = 48.1 cm
-0.5 no units ****

---

d)[5]
2 sample mean=48.02cm sample stdev = 2.49 cm n=9
population mean = 48 cm population stdev = ? we need to use t distribution.

1 t = (48.02-48)/(2.49/sqrt(9)) = 0.024 df = 9-1 = 8

1 P(t>=0.024) = more than 25%

1 This is a large probability so we would accept sample is drawn from the
stated population.

---

e) [2]

1 In this case we can use the GAUSSIAN, becaues we get an EXACT distribution.

z = (48.02-48)/(2.00/sqrt(9)) = 0.03 P(Z>=0.03) = 0.488

There is no change in our conclusion. This is a large probability so we accept
that the sample is drawn from stated population.

Q2 a)[4]

```
1 mark      N,S,n,x =   14    4     8     0          N,S,n,x =   14    4     8     1
            C(S,x)=1                                 C(S,x)=4
            C((N-S),(n-x))=   45                     C((N-S),(n-x))=120
            C(N,n)=3003                              C(N,n)=3003
1 mark      P(x=0)      0.014985         1 mark      P(x=1)      0.15984
1 mark      P(x<2)      0.17482
```

---

b)[5]

```
1 mark      Binomial large n
1 mark   n, p, x =   1000  0.32  400
         np =  320   >5
         nq =  680   >5
1 mark   Can use Normal approximation
         Mean =   320
         Variance =  217.6
1 mark   z =   1.999828       With Correction for continuity  else      2.033723
1 mark   P(x>=350)   0.022759                                 else      0.02099
-0.5 no correction for continuity (10% difference in probability!)
```

(Minitab binomial gives 0.0233842

Q3 a)[2]

```
2marks   47/(47+3)   = 0.94
         =P(T+ | menigitis)
```

b)[2]

```
2marks  47/(47+13)  = 0.783333
    = P(menigitis| T+)
```

c) [4]

```
1 mark   Bayes    (or showing 2-way table)
               Meningitis  WELL
   Test +ve       0.94     0.028889
   Test -ve       0.06     0.971111

1 mark   Prior    0.2   0.8
1 mark   Condit   0.94  0.028889
         Joint    0.188 0.023111
1 mark   Posterior   0.890526 0.109474
```

Q4 a)[2]

```
  E(a X + b Y) = a E(X) + b E(Y)
 = 100*10+200*15=$4,000
   1 point for the formula,
   1 point for the correct answer
  -0.5 no $ somewhere in answer
Let's keep this one – it's money!!!
```

b)[2]

```
 Cov(X,Y)= COR(X,Y)*SD(X)*SD(Y)=0.6*5*6=18
 Units are $^2
1 point for the formula,
1 point for the correct answer
***-0.5 for no units
```

c)[3]

```
   V(aX+bY)_indep = a^2 V(X)+b^2 V(Y)
=200*200*25+300*300*49=5,410,000 $^2
 -1 point for not squaring constants
 -1 for using s.d. instead of the variance
   ***units
```

d)[3]

```
V(aX+bY) = a^2 V(X)+ b^2 V(Y)+2ab COV(X,Y)
SD(aX + bY) = sqrt(100*100*25   +
    + 200*200*36 + 2*100*200*0.6*5*6) =
   = 1,552.42 $
1 for “formula”, 2 for OK answer
Deductions (down to 0) of 1 mark for each
no “2”, no “ab”, V() vs SD();***½ for units
```

Q5 a)[2]

```
Poisson model – constant RATE/time of hits
with mean NUMBER of successes for period
= time interval * rate
P(k hits | mu expected) = mu^k exp(-k)/k!

1 mark Poisson, 1 mark for a reason
```

b)[2]

```
For 30 mins = ½ hr expect 1/2*1/2 = ¼ hits

P(0 | .25) = exp(-0.25) = 0.778801

 1 mark setup, 1 answer (-.5 not evaluated)
```

c)[3]

```
 1 hour expect ½ hit.
P(>2 | 0.5) = 1 – P(0) – P(1)
= 1 – exp(-0.5)*(1 + .5)
= 1 – 0.606531*(1.5) = 1 – 0.909796
= 0.090204

1 mark mean, 1 mark setup, 1 mark answer
```

d)[3]

```
The condition is irrelevant – the prob
of a hit is constant per unit time.

P(2 | ½ expected) = .5^2 exp(-.5)/2!
 = .25 * .606531 / 2 = .07582
1 for justification, 1 for setup, 1 for #
```

Q6 a)[2]

```
  Use mu = mean = 0.5*(.46+.49) = .475g
  Range = 6 * sigmas so use
   sigma = (.49-.46)/6 = 0.005g


   -0.5 no units  ***
```

b)[2]

```
NNN has 2 “low” sachets, 8 “high”
SS has 2 “low” and 6 “high” <-- slightly
better quantitative performance

SS has tighter distribution but long tails
 |
1 mark counts some way, 1 mark for “shape”
comment
```

c)[2]

```
NNN appears to have a Gaussian dist of salt
(1 mark) but SS is highly non-gaussian
 -- many outliers, though symmetric.
```

d)[2]

```
 Need to use the bottom set – it uses
 the “specification” sigma (see S_bar)
 rather than the date-derived values,
 which are too generous in variability.

 1 mark each for mentioning spec/historical
 value AND data-generated value.
```

e)[2] Because there are several failures in keeping the VARIATION low enough (S chart) for the B (bottom) graphs, the process is UNCONTROLLABLE – need to revise the whole PROCESS. 1 mark UNCONTROLLABLE or equivalent (not OUT OF CONTROL unless applied to VARIABILITY), 1 mark change whole process.