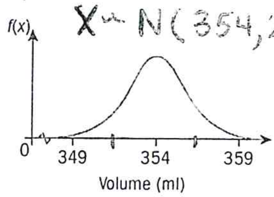
Book Review

Paper 1

1) (a) $X \sim N(354, 2.5^2)$



(b) normalcdf $(-10000, 350, 354, 2.5)$
0.0548

(c) $(100)(0.0548) = 5.48 \Rightarrow$ 5 cans

2) (a) normalcdf $(2, 4, 4.5, 1.5)$
$.322 = 32.2\%$

(b) normalcdf $(-10000, 1, 4.5, 1.5)$
$.00982$
$(6000)(0.00982) = 58.9 \Rightarrow$ 59 people

3) (a) normalcdf $(1, 10000, 1.03, 0.02)$
$.933 = 93.3\%$

(b) invNorm $(.15, 1.03, 0.02)$
1.01

9) (a) H_0: The number of pins knocked down is independent of which hand is used

(b) # of rows: 2 # of columns: 3 $\Rightarrow (2-1)(3-1) = (1)(2) = 2$

(c) $120 \cdot \frac{20}{120} \cdot \frac{60}{120}$ or $\frac{(20 \cdot 60)}{120} = 10$

(d) p-value from calc = 0.786 $\alpha = 0.1$ (10%)
$.786 > 0.1$ so do not reject H_0
There is enough evidence to conclude that the number of pins knocked down is independent of hand used.

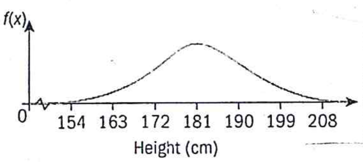
10) a) H_0 = The outcome is independent of the time spent preparing for the test.

b) rows: short time, medium time, long time = 3 (or vice versa)
Columns: pass, does not pass = 2
$(3-1)(2-1) = (2)(1) = \boxed{2}$

c) pvalue = 0.069 $\alpha = 0.05$ (5% sign. level)
$0.069 > 0.05$ fail to reject H_0
$\chi^2_{calc} = 4.21$ cv = 5.99 (from table in 12.4 notes)
$4.21 < 5.99$ fail to reject H_0
So using both criteria there is enough evidence to conclude that the outcome of the test is independent of the time spent preparing for the test.

Paper 2

1) a)



b) normalcdf(-10000, 175, 181, 9)
0.252

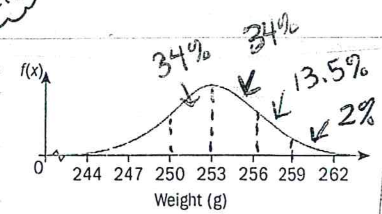
c) normalcdf(172, 192, 181, 9)
0.731

d) normalcdf(195, 10000, 181, 9)
0.0599
(60)(0.0599) = 3.59 ⇒ 4 men

e) invNorm(0.05, 181, 9) = 166

(non-calc)

2) a)



b) 50% − 34% = 16%
(since it is 1 standard deviation below)

34 + 13.5 + 2 = 49.5%
(or) $1 - \frac{(100-99)}{2} = 49.5\%$

c) (300)(.16) = 48 sweets

8) H_0: Choice of game and gender are independent
H_1: Choice of game and gender are not independent

	Badminton	table tennis	Darts	Total
male	$(69 \cdot 81)/142$ 39.4	$(26 \cdot 81)/142$ 14.8	$(47 \cdot 81)/142$ 26.8	81
female	$(69 \cdot 61)/142$ 29.6	$(26 \cdot 61)/142$ 11.2	$(47 \cdot 61)/142$ 20.2	61
total	69	26	47	$\boxed{142}$

degrees of freedom: $(2-1)(3-1) = (1)(2) = 2$

p-value $= 0.717$ sig level $= 5\%$ $\alpha = 0.05$ $0.717 > 0.05$
fail to reject H_0

$\chi^2_{calc} = 0.667$ CV (from table) $= 5.99$ $0.667 < 5.99$
fail to reject H_0

There is enough evidence to conclude that choice of game and gender are independent.

9) ⓐ $p = (36 \cdot 60)/100 = 21.6$ $q = (36 \cdot 40)/100 = 14.4$ $r = (34 \cdot 40)/100 = 13.6$

ⓑ (i) H_0 = The extra-curricular activity is independent of gender.
(ii) rows: 2 columns: 3 $(2-1)(3-1) = (1)(2) = 2$

ⓒ $\chi^2_{calc} = 4.613$

ⓓ $4.613 > 4.605 \rightarrow$ reject H_0
There is enough evidence to conclude extra-curricular activity is not independent of gender.

10) (a) (i) $a = (300 \cdot 180)/500 = 108$

(ii) $b = (180 \cdot 200)/500 = 72$ $c = (220 \cdot 300)/500 = 132$ $d = (220 \cdot 200)/500 = 88$

(b) H_0 = position in upper management is independent of gender.
H_1 = Position in upper management is not independent of gender.

(c) (i) $\chi^2_{calc} = 59.7$

(ii) $(2-1)(3-1) = (1)(2) = 2$

(iii) $CV = 5.991$ $59.7 > 5.991$ Reject H_0

There is enough evidence to conclude position in upper management is not independent of gender.

11) (a) H_1 = The choice of candidate is not independent of where the voter lives.

(b) total rural voters: 3720
total candidate A: 3680
total : 8000

$$\frac{(3720 \cdot 3680)}{8000} = 1711$$

(c) (i) $\chi^2_{calc} = 58.4$

(ii) $(3-1)(2-1) = (2)(1) = 2$

(d) (i) $CV = 9.21$ $58.4 > 9.2$ Reject H_0

+(ii) There is enough evidence to conclude that the choice of candidate is not independent of where the voter lives.

12) (a) $(90 \cdot 110)/200 = 49.5$

(b) (i) H_0 = Grade is independent of gender

(ii) $(2-1)(3-1) = (1)(2) = 2$

(iii) $\chi^2_{calc} = 0.400$

(c) $CV = 5.991$ $\quad 0.400 < 5.991$ fail to reject H_0

There is enough evidence to conclude that gender and grade are independent.

Additional Review

non calc

6. Oral tests are conducted by three examiners A, B and C separately. The results of the examination are classified as Credit, Pass or Fail. A χ^2 test is applied to the data collected in order to test whether or not the examiners differ in their standard of awards.

(a) State the null hypothesis, H_0, for this data.

H_0: results and the examiners are independent.

(b) Write down the number of degrees of freedom.

	Credit	Pass	Fail	total
A				45
B				
C				
total	30			135

$(3-1)(3-1) = 4$

$df = 4$

Of the 135 students who sit the exam, 30 get Credit and 45 are tested by examiner A.

(c) Calculate the expected number of students who get a Credit and are tested by examiner A.

$$\frac{(30)(45)}{135} = 10$$

see above

Using a 5% level of significance, the p-value is found to be 0.0327 correct to 3 s.f.

(d) State whether H_0 should be accepted. Justify your answer.

(Total 6 marks)

$.0327 < .05$

Since p is less than the significance level, we reject H_0.

Therefore, results and the examiners are not independent.

Non-Calc Book Review Solutions ch15

(1) $0.3 + 1/k + 2/k + 0.1 + 0.1 = 1$

(a) $0.5 + 3/k = 1$

$3/k = 0.5$

$3 = 0.5k$

$\boxed{6 = k}$

(b)

-2	-1	0	1	2
$3/10$	$1/6$	$2/6$	$1/10$	$1/10$

$-2(3/10) + -1(1/6) + 0(2/6) + 1(1/10) + 2(1/10)$

$-6/10 - 1/6 + 0 + 1/10 + 2/10$

$-3/10 - 1/6$

$-9/30 - 5/30 = -14/30 = \boxed{-7/15}$

(4) (a)

	2	2	4	4
1	2	2	4	4
2	4	4	8	8
3	6	6	12	12
4	8	8	16	16

(b)

x	2	4	6	8	12	16
$P(X=x)$	$1/8$	$2/8$	$1/8$	$2/8$	$1/8$	$1/8$

(c) $2(1/8) + 4(2/8) + 6(1/8) + 8(2/8) + 12(1/8) + 16(1/8)$

$2/8 + 8/8 + 6/8 + 16/8 + 12/8 + 16/8$

$8/8 + 8/8 + 32/8 + 12/8$

$1 + 1 + 4 + 1\,4/8 = \boxed{7\,1/2}$

(d)

x	£10	£5
$P(X=x)$	$2/8$	$6/8$

$10(2/8) + 5(6/8)$

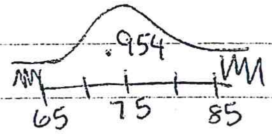
$20/8 + 30/8 = 50/8 = 25/4 = 6\,1/4 = 6.25$

10 weeks $= 10 \cdot 6.25 = \boxed{\$62.50}$

~~(5)~~ $X \sim B(5, 1/3)$

$P(X=3) = \binom{5}{3}\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2$ or ${}_5C_3\left(\frac{1}{3}\right)^3\left(\frac{2}{3}\right)^2$

~~(6)~~ $2(0.1) = \boxed{0.2}$

(7) 

(a) $a = 85$

(b) $x + .954 + x = 1$

$2x = .046$

$x = .023$

$P(X > 85)$

$\boxed{.023}$