Answers

Page 15

1. a)

	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24
5	5	10	15	20	25	30
6	6	12	18	24	30	36

b) P(prod. = 6) = $\frac{4}{36}\left(\frac{1}{9}\right)$

c) P(prod. = 12) = $\frac{4}{36}\left(\frac{1}{9}\right)$

d) P(prod. is prime) = $\frac{6}{36}\left(\frac{1}{6}\right)$

e) P(prod. = 14) = 0

2. a) P(club) = $\frac{13}{54}$

b) P(6 of spades) = $\frac{1}{54}$

c) P(red ace) = $\frac{2}{54}\left(\frac{1}{27}\right)$

d) P(not joker) = $\frac{52}{54}\left(\frac{26}{27}\right)$

e) P(second ace) = $\frac{3}{53}$

3. a) P(2nd red) = $\frac{3}{9}\left(\frac{1}{3}\right)$

b) P(3rd blue) = $\frac{6}{8}\left(\frac{3}{4}\right)$

4. a) P(both) = 0.004 875
b) P(A and not B) = 0.070 125
c) P(neither) = 0.864 875

Page 16

5. a) P(both miss) = 0.15 x 0.20
= 0.03

b) P(one late) = 0.15 x 0.80 + 0.20 x 0.85
= 0.29

c) P(neither miss)
= 0.85 x 0.80
= 0.68

6. a) P(GGR) + P(GRG) + P(RGG)
= (0.6 x 0.6 x 0.4) x 3
= 0.432

b) P(GGR) + P(GRG) + P(RGG)
= (0.6 x 0.5555 x 0.5) x 3
= 0.5

Page 16 cont...

7. a) P(all red) = 0.05522
b) P(2B and 2R) = 0.3902

8. a) P(blue from 1st garden)
= 0.3333 x 0.25
= 0.08333

b) P(not blue from 3rd garden)
= 1 – (0.3333 x 0.5)
= 0.8333

c) P(blue flower) = $(0.\dot{3} \times 0.25)$
$+ (0.\dot{3} \times 0.\dot{3}) + (0.\dot{3} \times 0.5)$
= 0.3611

9. a) P(both chrome) = 0.06667

b) P(same) = 0.06667 + 0.02222 + 0.2222
= 0.3111

c) P(different) = 1 – 0.3111
= 0.6889

Page 17

10. a) P(solved) = 1 – P(not solved)
= 1 – (0.8 x 0.75 x 0.6)
= 0.64

b) Assumed the result of each student is independent and the performance of past problems give an accurate indication of performance on future problems. Neither assumption is likely to be valid. The problem could be easy and if one gets it the other is also likely to get it. Problems vary a lot so past performance is not likely to predict to 2 significant figures performance in the future.

11. a) P(> 1) = 1 – (P(0) + P(1))
= $1 - (0.9^{10} + 10 \times 0.9^{9} \times 0.1)$
= 0.264 (3 sf)

b) Independence is assumed and if the 10% of faults are random and not in clusters then the assumption is valid.

12. a) P(wins 0) = 0.04
b) P(wins 1) = 0.26
c) P(wins 2, 3) = 0.7
d) Independence is assumed. If winning or losing the first race changes the likelihood then it is not valid. Also past performance is not a valid predictor of future performance because competitors change, so it is not likely to be correct.

Page 17 cont...

13. a) P(green & 1st jar) = $0.\dot{3} \times 0.2$
= 0.06667

b) P(green lolly) = $(0.\dot{3} \times 0.2)$
$+ (0.\dot{3} \times 0.\dot{3}) + (0.\dot{3} \times 0.5)$
= 0.3444

c) P(green) = 0.3

d) Possibly not, as a child may be inclined to go for the jar with more lollies in it or the closest jar.

Page 18

14. a) P(one successful)
= (0.5 x 0.6666 x 0.75) + (0.3333 x 0.5 x 0.75) + (0.25 x 0.5 x 0.6666)
= 0.4583

b) P(both ring and work at B)
= 0.45 x 0.1
= 0.045

c) P(both ring and not work)
= 0.55 x 0.3 + 0.45 x 0.9
= 0.57

d) P(A) = 0.0305, P(B) = 0.35
P(A) x P(B) = 0.01068
$P(A \cap B)$ = 0.35 x 0.05
= 0.0175

Not independent.

15. a) Tossing will continue until someone tosses a head. If we let the probability that Cloris will win be p then the chance of Brian winning is twice as likely $2p$. Similarly the chance of Ana winning is twice as high as Brian so $4p$. As $p + 2p + 4p = 1$ we have

P(C) = p
= $\frac{1}{7}$

This gives the probability of Ana winning as

P(A) = $4p$
= $\frac{4}{7}$.

b) That the coin is not biased or asymmetrical which causes the true probability to vary from 0.5.

That the height it is tossed is random for each participant.

Each participant is honest in reporting the outcome.

Page 19

16. a) P(not W and not W)
= 0.65 x 0.65
= 0.4225

b) P(≥1 white) = 1 – 0.4225
= 0.5775

c) That the distribution of white Camrys is even across NZ.
That the proportion of white Camrys is the same each year as older cars are scrapped.
That seeing one white Camry is independent of seeing another white Camry.

17. a) P(≥1 fails) = 1 – 0.96 x 0.96
= 0.0784

b) P(both fail) = 0.0016

c) That the memory modules are correctly installed and not mistreated.
That the computer is used the same amount and not subject to a harsh environment.
That one module failing is independent of the another module failing (no power surges etc.).

18. a) P(all) = 0.133^4
= 0.0003 13

b) P(at least one) = 1 – 0.867^4
= 0.4350

c) That the researcher is calling mobile phones as many in this age group only have mobile phones.
That the time of day does not affect the likelihood of the phone being answered.
That members of this group have the same likelihood of answering calls when they do not know the caller.

19. a) P(2 no fault) = 0.88^2
= 0.7744

b) P(3 faults) = 0.12^3
= 0.0017

c) That the rate of fault does not depend upon the time of the year (e.g. winter).
That the probability of a fault does not depend upon how many days there are in a month.

Page 19 Q 19 c) cont...

19. c) That the rate of faults does not vary throughout the country. That faults are independent of one another.

Page 21

20. P(3 draws required) = 0.3333

Page 22

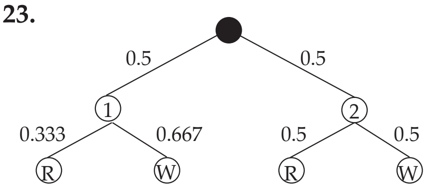
21. a) P(T and 2) = 0.08333

b) P(coin tossed twice) = 0.5

22. a) P(passes all) = 0.6 x 0.7 x 0.8
= 0.336

b) P(passes one) = 0.6 x 0.3 x 0.4
+ 0.4 x 0.5 x 0.4 + 0.4 x 0.5 x 0.4
= 0.232

23.



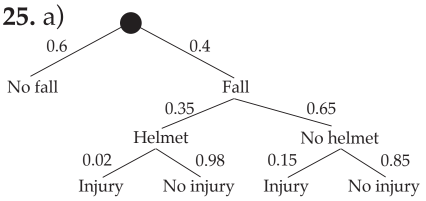
P(R) = (0.5 x 0.333) + (0.5 x 0.5)
= 0.4167

24. a) P(sum < 7) = 0.6

b) P(sum ≥ 5) = 0.8

Page 23

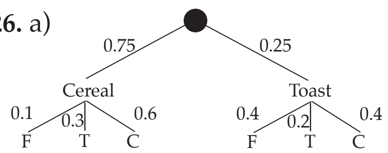
25. a)



b) P(uninjured)
= 0.6 + (0.4 x 0.35 x 0.98)
+ (0.4 x 0.65 x 0.85)
= 0.9582

c) P(injured) = 0.0418
P(inj. & no helm.) = 0.0390
P(No helm. of inj.) = 0.9330

26. a)



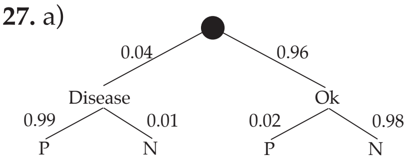
b) P(cereal and coffee)
= 0.75 x 0.6
= 0.45

c) P(fruit juice) = (0.75 x 0.1) +
(0.25 x 0.4)
= 0.175

d) Least popular is tea and toast with probability 0.05.

Page 24

27. a)

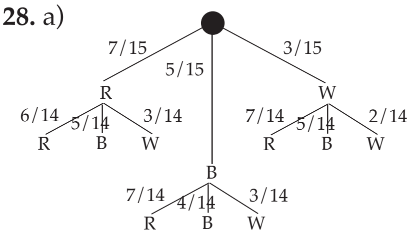


b) P(positive) = (0.04 x 0.99) +
(0.96 x 0.02)
= 0.0588

c) P(disease given positive)
$= \dfrac{0.0396}{0.0588}$
= 0.6735

d) P(not disease given negative)
$= \dfrac{0.9408}{0.9412}$
= 0.9996

28. a)



b) P(RW in any order) = 0.2

c) P(different colours)
= 1 – P(same)
= 0.6762

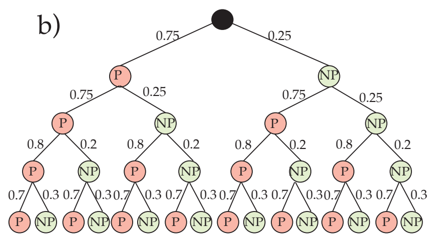
d) P(one white marble)
= P(WR, RW, WB, BW, WW)
= 0.3714

e) Two red marbles.

Page 25

29. a) P(4 aces) = 0.000 006 25

b)



c) P(one picture card)
= 0.046 25

d) If played 160 000 times (20^4) it would earn $320 000 and expect to return
= $100 000 + 240 x $500 +
7400 x $2
= $234 800
Profit for club per play
= $85 200 ÷ 160 000
= $0.5325 or 53.25¢

Page 26

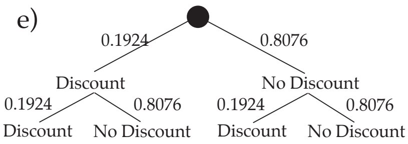
30. a) Small triangle
= 0.5 x 20 x 20 x sin 60°
= 173.2 cm^2
Large triangle
= 0.5 x 40 x 40 x sin 60°
= 692.8 cm^2

b) P(15% discount) = 0.1443

c) P(50%discount) = 0.0481

d) P(no discount) = 0.8076

e)



f) P(one discount) = 0.3108

g) P(at least 1 discount) = 0.3479

h) P(50% on at least one throw) = 0.0939

i) It may depend upon the experience of the customer at throwing darts. It could be that less experienced customers throw weakly so the dart tends to land in the bottom of the area. The results then would be worse then random.

Investigate by running an exercise with about 30 randomly selected blindfolded individuals each of which is limited to one throw in the square. Then compare the experimental results to the theoretical result.

Page 30

31. a) Sample space
BBB, BBG, BGB, BGG,
GBB, GBG, GGB, GGG,

b) P(same sex) $= \frac{2}{8}$
= 0.25

c) P(3B | ≥ 2B) $= \frac{1}{4}$
= 0.25

32. a) 0.05 + 0.03 + 0.105 = 0.185

b) P(N | F) = $\frac{0.105}{0.185}$
= 0.568 (3 sf)

Page 30 cont...

33. a) P(exercises regularly) = 0.375

b) P(50 or over) = 0.525

c) P(not exercise | < 50) = 0.4211

d) P(exercises | < 50) = 0.5789

e) P(< 50 or no exercise) = 0.9

f) P(≥ 50 | no exercise) = 0.68

Page 31

34. a) P(B) = 0.6

b) P(G) = 0.4

c) P(G ∩ S) = 0.1333

d) P(S | G) = 0.3333

e) P(B | S') = 0.4286

f) P(S ∪ B) = 0.7333

35. a) P(credit card) = 0.2364

b) P(credit card | Thu) = 0.3333

c) P(credit card and Thu) = 0.1455

d) P(it was on Friday) = 0.5636

e) P(Thu | credit card) = 0.6154

f) P(not purchased with EFT on Thursday) = 0.7091

36. a) P(roll | pie) = 0.6667

b) P(pie | roll) = 0.32

c) P(pie or roll) = 0.29

Page 32

37. a) P(2nd red given 1st black) = 0.5098

b) P(2nd ace given 1st not ace) = 0.0784

38. P(one putt | 1st on green) = 0.25

39. a) P(M | NCEA 2) = 0.4898

b) P(NCEA 3 | M) = 0.2512

c) P(F | NCEA 1) = 0.5514

40. P(buys lunch | bus) = 0.625

41. a) P(A ∩ B) = 0.27

b) P(C | B) = 0.35

c) P(A | B) = 0.3375

42. a) P(tails once | all same) = 0.5

b) P(tails once | 3rd heads) = 0.75

43. P(2nd red | first red) = 0.625

Page 33

44. a) P(same | at least one is 3) = 0.0909

b) P(prod > 20 | one number 5) = 0.2

45. a) P(first is chocolate)
$= \frac{x}{x+y}$

b) P(first two chocolate)
$= \frac{x}{x+y} \times \frac{x-1}{x+y-1}$

c) P(1st chocolate 2nd caramel)
$= \frac{x}{x+y} \times \frac{y}{x+y-1}$

d) P(2nd caramel | 1st chocolate)
$= \dfrac{\frac{x}{x+y} \times \frac{y}{x+y-1}}{\frac{x}{x+y}}$
$= \frac{y}{x+y-1}$

e) P(two or more caramel)
$= \frac{y(y-1)(y-2)+3xy(y-1)}{(x+y)(x+y-1)(x+y-2)}$

f) P(most caramel | first choc)
$= \dfrac{\frac{xy(y-1)}{(x+y)(x+y-1)(x+y-2)}}{\frac{x}{x+y}}$
$= \frac{y(y-1)}{(x+y-1)(x+y-2)}$

Page 38

46. a) P(absent and in Year 9) = 0.0276

b) P(not absent and in Year 9) = 0.2024

c) P(absent or in Year 9) = 0.2750

47. a) 15

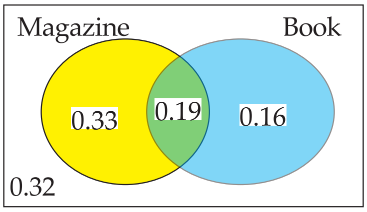
b) Soccer and netball

c) P(netball or baseball) = 0.56

d) P(soccer or netball) = 0.48

Page 38 cont...

48. a)



b) P(book and mag) = 0.19

c) P(mag and not book) = 0.33

d) P(lotto, book and mag)
= 0.1235

49. a) P(two successive tickets)
= 0.0132

b) P(1 prize on either 2 tickets)
= 0.2036

c) P(no prize on three tickets)
= 0.6932

Page 39

50. a) P(at least one subject) = 0.902

b) P(only 1 of the 2 subjects)
= 0.434

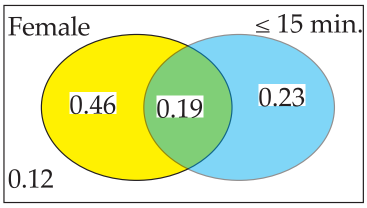
c) P(neither of the two subjects)
= 0.098

51. a) P(away and win) = 0.13

b) P(lose a home game) = 0.18

c) P(away and lose) = 0.27

52. a)



b) P(male and ≤ 15 min) = 0.23

c) P(male and requires ≥ 15 min)
= 0.12

d) P(female or requires ≤ 15 min)
= 0.88

53. a) 120 students

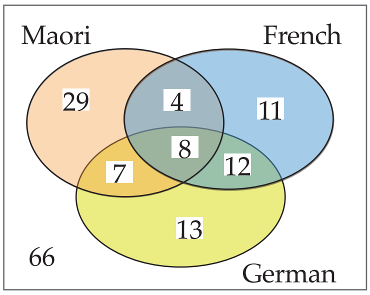
b) P(statistics and English)
= 0.075

c) P(all three subjects) = 0.0417

d) P(English but not biology)
= 0.2417

Page 40

54. a)

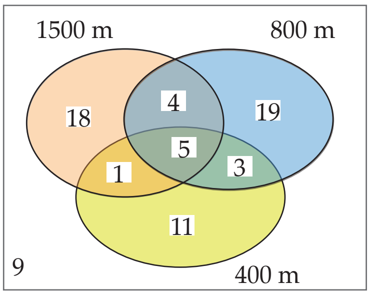


b) P(not study a language)
= 0.44

c) P(at least two languages)
= 0.2067

d) % study language, study French = 41.7%

55. a)



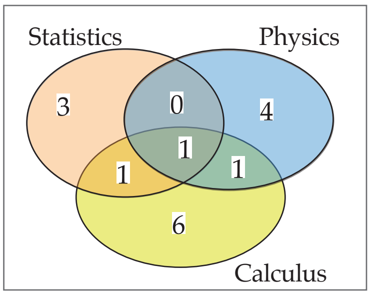
b) 9 athletes

c) P(runs in only one event)
= 0.6857

d) P(runs in two events)
= 0.1143

Page 41

56. a)



b) P(calc and / or stat, not phy)
= 0.625

c) P(more than one subject)
= 0.1875

d) 81.25% teach only one subject

e) P(teach another subject given they teach calculus) = 0.3333

Page 41 cont...

57. a) 0.72

b) 0.56

c) 0.24

d) 0.27

e) 0.4231

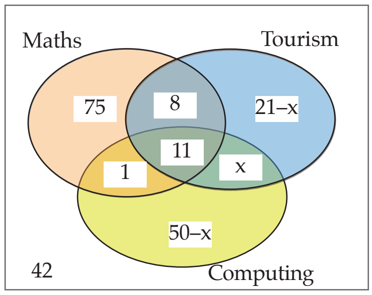
f) 0.08

g) 0.4681

h) 0.61

Page 42

58.



a) $95 + (21 - x) + x + (50 - x) = 158$
$x = 8$

b) $P(T \text{ or } C) = \frac{83}{200}(0.415)$

c) $P(M \text{ and } T) = \frac{19}{200}(0.095)$

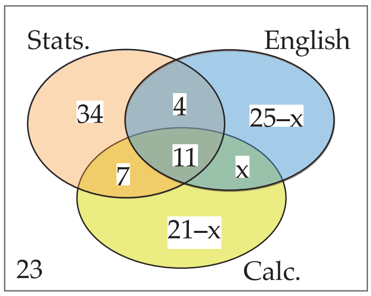
$P(M) \times P(T) = \frac{95}{200} \times \frac{40}{200}$

$= \frac{19}{200}(0.095)$

$= P(M \text{ and } T)$

Therefore independent.

59. a)



$56 + (21 - x) + x + (25 - x) = 102$
$x = 0$
$P(C \text{ and } E) = 0$

b) $P(\text{another} \mid S) = \frac{22}{56}(0.3929)$

c) That students in these three classes all come from Year 13. That Year 12 students are excluded from these figures.

Page 44

60. $4 \times 3 \times 4 = 48$

61. $8 \times 7 \times 6 = 336$

62. a) $5 \times 5 \times 5 = 125$

b) $5 \times 4 \times 3 = 60$

63. a) $4 \times 4 \times 4 = 64$

b) $3 \times 4 \times 4 = 48$

64. $9 \times 10 \times 10 \times 10 \times 10 = 90\ 000$

65. $9 \times 9 \times 8 \times 7 \times 6 = 27\ 216$

Page 45

66. $2 \times 5 \times 4 \times 3 \times 2 \times 1 = 240$

67. $1 \times 2 \times 10 = 20$

68. $6 \times 5 \times 4 \times 3 \times 2 = 720$

69. 120 x 0.6 = 72. Only 0.6 of all the numbers will end in 3, 5 or 7 and hence be odd.

70. $4 \times 3 = 12$

71. $15 \times 6 \times 8 = 720$

72. $2 \times 2 \times 4 = 16$

73. $\dfrac{2 \times 3 \times 2}{3 \times 5 \times 4} = 0.2$

74. $6 \times 5 \times 4 \times 3 \times 2 \times 1 = 720$

75. $3 \times 2 \times 1 = 6$

76. 8 000 000

77. $8 \times 10 \times 10 \times 5 \times 5 \times 5 \times 5$
$= 500\ 000$

78. $5 \times 5 \times 5 \times 5 \times 5 = 3125$

79. $3 \times 6 \times 6 \times 6 \times 6 = 3888$

Page 47

80. a) P(Spectator)
$= \frac{20}{48}(0.4167)$

b) P(Male) $= \frac{29}{48}(0.6042)$

c) P(Spect. | F) $= \frac{12}{19}(0.6316)$

81. a) P(Junior) $= \frac{34}{66}(0.5152)$

b) P(J | Ab) = 1

c) No intersection.

Page 48

82. a) No. P(Fossil) ≠ 1 – P(Elect.)

b) No. P(Fossil) = 0.489
P(Rented) = 0.468
P(Fossil) x P(Rented) = 0.229
P(Rent AND Fossil) = 0.266
Not equal so NOT independent.

c) The figures are for primary source. They may use electricity as their primary source and also use fossil fuel.

83. a) The figures are percentages of the 52% that use Facebook.

b) 52.5% of the sample of Facebook users are under 25. Not of all employees.

c) P(F. at W) = 0.419
P(< 25) = 0.525
P(F. at W and < 25) = 0.233
P(F. at W) x P(< 25) = 0.220
Not equal so NOT independent.

84. a) NOT independent.
There is the same number in the samples from each city so number prepared should be the same to be in the same proportion.
Alternatively
P(W) = 0.5
P(Prep.) = 0.1845
P(W) x P(Prep.) = 0.0923
P(W and Prep.) = 0.1235
As P(W) x P(Prep.) is NOT equal to P(W and Prep.)
NOT independent.

b) P(W | Prep.) = 0.6694

c) P(Prepared) $= \dfrac{269\ 600}{1\ 800\ 000}$
$= 0.1498$

Page 49

85. a) P(wk. unemp.)
$= \dfrac{141\ 800}{2\ 371\ 000} = 0.060$

b) P(wk. 15-24 unemp.)
$= \dfrac{59\ 500}{407\ 200} = 0.146$

P(wk. 25-64 unemp.)
$= \dfrac{82\ 300}{1\ 963\ 800} = 0.042$

c) Likelihood Ratio = 3.48.
A younger worker (15 – 24 years old) is 3.5 times as likely to be unemployed.

Page 50

86. a) Likely ratio = 0.811

b) Likely ratio = 2.654

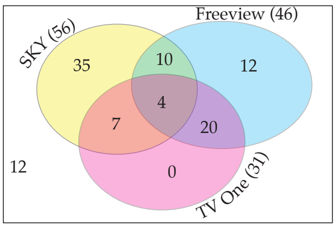
c) Younger people generally feel safe using the internet for transactions (73.5%) whereas older people are 0.811 times as likely to feel safe.

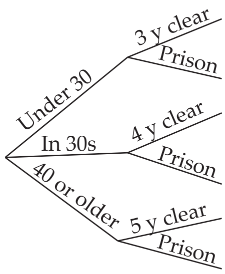
Younger people feel they experience discrimination at 2.65 times the rate of older people.

It is possible that younger people use the internet a lot more for online transactions and hence have gained confidence while many older people lack this experience and hence feel less safe.

It is likely that younger people are more socially mobile and therefore likely to come across situations where they experience discrimination. Also the proportion of minority groups in the younger population is likely to be higher. Older people are more likely to stay in their own social groups and are therefore less likely to suffer from discrimination.

Pages 50 – 55 Practice External Assessment Task – Probability

<table>
<tr><th>Q</th><th>Evidence</th><th>Achievement</th><th>Merit</th><th>Excellence</th></tr>
<tr><td>1 a)</td><td>i) P(not sport) $= 1 - \frac{6}{11} \times \frac{5}{10} = \frac{8}{11} (0.7\dot{2}\dot{7})$</td><td>Correct probability.</td><td></td><td></td></tr>
<tr><td>a)</td><td>ii) P(Sport 1) = 1st selection OR 2nd selection
$= \left(\frac{1}{11} \times \frac{10}{10}\right) + \left(\frac{10}{11} \times \frac{1}{10}\right) = \frac{2}{11}$</td><td>Correct probability.</td><td></td><td></td></tr>
<tr><td>b)</td><td>i)<table><tr><th></th><th>Female</th><th>Male</th><th>Totals</th></tr><tr><td>Entert.</td><td>330</td><td>240</td><td>570</td></tr><tr><td>Non-Ent.</td><td>260</td><td>210</td><td>470</td></tr><tr><td>Totals</td><td>590</td><td>450</td><td>1040</td></tr></table></td><td>At least one correct probability.
P(E | M) = 0.5333
P(E | F) = 0.5593</td><td>Calculates all probabilities and states conclusion that females more likely.</td><td></td></tr>
<tr><td>b)</td><td colspan="2">ii) Conclusion not wise because:
• It was only ONE survey and there will be a variation of results from each survey. • The time of the survey as one gender may be more likely to not be watching TV from 7 to 9 pm.• The day of the survey will likely affect the result as on Wednesday there is very little sport so the probability is likely to be different on other days. • The survey was conducted at one time of the year and in different seasons so there could be a different proportion watching other channels. • etc.</td><td>Gives a plausible explanation why the true probability is likely to be different from this survey.</td><td>Gives at least two plausible explanations why the true probability is likely to be different from this survey.</td></tr>
<tr><td>c)</td><td>P(different) = P(e, d, s) + P(e, s, d) + P(d, e, s)
+ P(d, s, e) + P(s, e, d) + P(s, d, e)
$= \frac{35}{136} (0.2574)$</td><td>P(e, d, s)
= 0.0429</td><td>Correct probability.</td><td></td></tr>
<tr><td>2 a)</td><td>i) P(Everynight | at least weekly) $= \frac{200}{371} (0.539)$</td><td>Correct probability.</td><td></td><td></td></tr>
<tr><td>a)</td><td>ii) P(TV and 1 to 3.5 h) = 0.539 x 0.21 = 0.113
Assuming that the events of watching TV each night (frequency and length) are independent of each other. The frequency of watching television is likely to be related to how long a person watches television for, so unlikely to be independent.</td><td>Correct probability.</td><td>Correct probability and recognises that independence must be assumed.</td><td>Correct probability and correct statement as to why independence may not be valid.</td></tr>
<tr><td>a)</td><td>iii)<table><tr><th>%</th><th>Female</th><th>Male</th><th>Totals</th></tr><tr><td>< 1 h.</td><td>8</td><td>3</td><td>11</td></tr><tr><td>≥ 1 h.</td><td>49</td><td>40</td><td>89</td></tr><tr><td>Totals</td><td>57</td><td>43</td><td>100</td></tr></table></td><td>Table correct
OR
Uses 417 instead of 400.</td><td>Correct Number
= 0.03 x 400
= 12</td><td></td></tr>
<tr><td>b)</td><td>i) </td><td>Correctly draws Venn diagram with at most one error. 10 viewers are both Sky and Freeview and not TV One.</td><td>Correctly draws Venn diagram and calculates probability.
P(Sky and Free NOT TV One)
= 0.1</td><td></td></tr>
<tr><td>b)</td><td>ii) Both 12% but based on • One survey only. •Timing of survey will affect how many watch TV One. • Over time the number streaming will change. • Some people will stream to a digital device not TV.</td><td></td><td>Gives a plausible explanation why the conclusion is likely invalid.</td><td>Gives at least two plausible explanations why conclusion likely invalid.</td></tr>
</table>

Q	Evidence	Achievement	Merit	Excellence
3 a)	i) P(parole and prison) = 0.3576 x 0.49 = 0.175	Correct probability.		
a)	ii) P(Violation) = 0.19 x 0.3576 + 0.01 x 0.6424 = 0.07437 P(Early | Violation) = 0.06795 ÷ 0.07437 = 0.9137	At least one correct probability.	Conditional probability correct.	
a)	iii) Likely be different types of inmates or different offence committed to be considered for early release / parole etc.		One plausible explanation.	
b)	i) P(No prison ≤ 36) = 1 – 0.678 = 0.322	Correct probability.		
b)	ii)  0.61 x 0.264 = 0.1610 0.22 x 0.266 = 0.0585 0.17 x 0.308 = 0.0524 P(> 3 years original sentence) = 0.2719	At least one correct probability. ≤ 29 years need 3 years free. 30 - 39 years need 4 years free. 40+ years need 5 years free.	Tree diagram substantially correct.	Tree diagram and model correct. Probability correct.
b)	iii) Model is unlikely to lead to a change in behaviour as it is based on the inmates age only. You are likely to still have the same offences but spread over a different period. You could reduce prison population by reducing all sentences by 1 year but this is unlikely to reduce re-offending rates.		One plausible explanation.	

Practice Assessment – Probability

In the external examinations NZQA uses a different approach to marking based on understanding (u), relational thinking (r) and abstract thinking (t). They then allocate marks to these concepts and add them up to decide upon the overall grade. This approach is not as easy for students to self mark as the NuLake approach, but the results should be broadly similar.

Sufficiency. For each question award yourself a score out of 8 using this table. Add the three scores for a score out of 24 and compare to the cut scores. All answers must include evidence / justification where appropriate.

Quest.	N0	N1	N2	A3	A4	M5	M6	E7	E8
ONE	No correct Prob.	1 correct Prob.	1 A	2A or equiv.	3A or equiv.	1M + 1M minor error.	2M	1E Minor error.	1E all correct.
TWO	No correct Prob.	1 correct Prob.	1 A	2A or equiv.	3A or equiv.	1M + 1M minor error.	2M	1E correct.	2E Minor error.
THREE	No correct Prob.	1 correct Prob.	1 A	2A or equiv.	3A or equiv.	1M + 1M minor error.	2M	1E Minor error.	1E all correct.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence	
0 – 6	7 – 13	14 – 20	21 – 24	