3.13

DARFIELD

DISCE UT INTELLEGAS

Name:

Level 3 Mathematics and Statistics

91585 Apply probability concepts in solving problems

Credits: Four

Check that you have completed ALL parts of the box at the top of this page.

You should answer ALL parts of ALL questions in this booklet.

Check that this booklet has pages 2 – 8 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO YOUR TEACHER AT THE END OF THE ALLOTTED TIME.

For Assessor's use only		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Apply probability concepts in solving problems.	Apply probability concepts, using relational thinking, in solving problems.	Apply probability concepts, using extended abstract thinking, in solving problems.
Total	**Overall Level of Performance**	

You are advised to spend 60 minutes answering the questions in this booklet.

QUESTION ONE

(a) A survey of pedestrians in the City Mall classified pedestrians as being local or tourists, and under 25, or 25 years and over. It was found that:

- the probability of a pedestrian being local was $\frac{23}{29}$.
- the probability of a pedestrian being local or under 25 was $\frac{24}{29}$.
- the probability of a pedestrian being local and under 25 was $\frac{14}{29}$.

(i) Calculate the probability that a randomly selected pedestrian from this group is over 25. You should explain your reasoning in calculating your answer.

Space for diagram

	L	L'	
U25	14	1	15
25+	9	5	14
	23	6	29

14/29

(ii) Calculate the probability that a randomly selected local from this group is over 25. You should explain your reasoning in calculating your answer.

$\frac{9}{23}$

(iii) 50% of tourists to the **entire** city are aged 25 or over. The City Mall manager wants to attract more tourists to the mall. Should he target older tourists or younger tourists? Justify your answer using the data given.

Mall 25+ 5/6 Tourists

only 1/6 <25

∴ Should target younger

Assessor's use only

bold

b) A different survey was undertaken. In this survey all pedestrians were classified as either local or tourists. It was found that:

- 22 pedestrians were male
- 8 pedestrians were tourists
- 10 pedestrians were aged under 25
- 1 pedestrian was a male tourist aged under 25
- 3 pedestrians were male tourists who were over 25
- there were no female tourists who were over 25
- 2 pedestrians were males who were under 25, but were not tourists
- 30 pedestrians were surveyed altogether

Find the **probability** that a randomly selected pedestrian for that day was a female local aged over 25.

		M.	F.	
T	U25	1	4	8
	25+	3	0	
T'	U25	2	3	22
	25+	16	1	
		22	8	30

1/30

Assessor's use only

QUESTION TWO

ODDS and EVENS is a simple probability game.
To play, you place a counter on the start square and roll a die.
If you get an EVEN number move your counter one square *upwards*.
If you get an ODD number move your counter one square *left*.

If your counter moves off the board, you lose.

If you reach the finish square, you win!

FINISH		
		START

a) What is the probability of winning the game? Justify your answer.

UULL $0.5^4 = 0.625$

ULUL

ULLU 0.0625×6

LLUU ~~[illegible]~~

LUUL $= 0.375$

LULL

b) Caleb thinks he can improve his chance of winning.
He invents a new game called LOW and HIGH, played on the same board. In this game, dice rolls of 1, 2, 3 or 4 move upwards and rolls of 5 or 6 move left.
What is Caleb's chance of winning this new game? Is Caleb right? Why/ Why not?

$4/6 \times 4/6 \times 2/6 \times 2/6 \times 6$

$= 8/27 = 0.2963$

$\therefore$ Wrong harder.

Assessor's use only

c) Caleb plays the original game (that in (a)) 40 times and wins 17 of these.
Using this game, **explain** what is meant by the terms true probability, theoretical probability and experimental probability.

bold

Exp $\frac{17}{40} = 0.425$

Theoretical $= 0.375$

True = don't know.

Assessor's use only

QUESTION THREE

The table below gives the number of attempts and passes of the new drivers license tests in NZ up to March 2013, by age group.

	Age:	17	18	19	20 - 24	25 - 34	35 -
Restricted test	attempts	1411	876	569	1450	1089	593
	Passes on first attempt	790	438	250	624	482	197
Full test	attempts	85	748	466	2047	2648	1832
	Passes on first attempt	74	546	322	1310	1584	1008

(a) What is the probability that someone 20 or older passes their Full test on the first attempt?

$\frac{1310+1584+1008}{2047+2648+1832} = \frac{3902}{6527}$

$= 0.5978$

(b) What is the probability that a 19 year old passes both their Restricted and Full test on the first attempt? Assuming they stay 19

$\frac{250}{569} \times \frac{322}{466} = \frac{80500}{265154}$

$= 0.3036$

Assessor's use only

(c) 2860 females sat the Restricted test and 1344 of them passed. 1470 of 3128 males passed the Restricted test. Is passing the Restricted test independent of gender? Justify your answer.

♀ $\frac{1344}{2860} = 0.4699$

♂ $\frac{1470}{3128} = 0.4699$

∴ Independent.

(d) Some people take many attempts to pass a test. Based on the table above, estimate the relative risk of having to sit the Restricted test more than twice for 17 year olds compared to people 20 to 24 years old. Discuss the validity of any assumptions you make. You may assume that the pass rate on retests is independent of the number of times the test is attempted.

bold

17

$1411 - 790 = 621$ fail

$\frac{621}{1411} = 0.4401$

$0.4401^2 = 0.1937$

20-24

$1450 - 624 = 826$

$\frac{826}{1450} = 0.5697$

$0.5697^2 = 0.3245$

$RR = \frac{0.3245}{0.1937} = 1.675$

or $UV = 0.5969$.

EXTRA SPACE IF NEEDED – please number questions clearly

Assessor's use only