NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Level 3 Mathematics and Statistics (Statistics), 2014

91585 Apply probability concepts in solving problems

9.30 am Thursday 20 November 2014
Credits: Four

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.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

Show ALL working.

Make sure that you have the Formulae and Tables Booklet L3–STATF.

If you need more space for any answer, use the page(s) provided at the back of this booklet and clearly number the question.

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 THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

ASSESSOR'S USE ONLY

QUESTION ONE

A study of 2000 pregnant women found:

- 1290 were over 30 years old

- 116 were pregnant with twins

- 32 were pregnant with twins and not over 30 years old.

(a) What proportion of women in the study were not pregnant with twins but were over 30 years old?

_____

_____

_____

_____

_____

_____

(b) Two different women from the study were randomly selected and both were found to be pregnant with twins.

Calculate the probability that both these women are also over 30 years old.

_____

_____

_____

(c) Consider the events 'a woman is pregnant with twins' and 'a pregnant woman is over 30 years old'.

Explain whether these events are independent.

_____

_____

_____

_____

_____

_____

(d) In-vitro fertilisation (I.V.F.) is a medical technique that is used to aid pregnancy.

For this study:

- 160 of the pregnant women used I.V.F.

- 24 of the pregnant women were over 30 years old, used I.V.F. and were pregnant with twins

- 20 of the pregnant women were not over 30 years old, used I.V.F. and were pregnant with twins

- 102 of the pregnant women were over 30 years old, used I.V.F. and were not pregnant with twins.

A woman is randomly selected from the study population.

Calculate the probability that this woman is not pregnant with twins, did not use I.V.F., and is not over 30 years old.

_____

_____

_____

QUESTION TWO

(a)   Gestational diabetes is a condition in which women with no previous history of diabetes show high blood glucose levels during pregnancy.

The table below shows the proportions in each category from an observational study of a group of 400 women.

	Over 30 years old	Not over 30 years old
Developed gestational diabetes	0.05	0.04
Did not develop gestational diabetes	0.415	0.495

(i)   Determine the number of women in this study who developed gestational diabetes or were over 30 years old.

(ii) Use the information provided to calculate the necessary probabilities to complete the probability tree shown below, rounding probabilities to 3 decimal places.
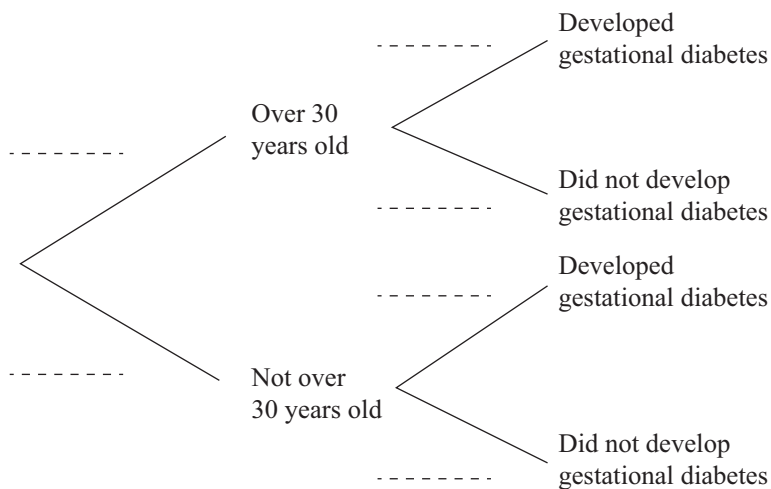
(iii) Compare the risk of developing gestational diabetes for a pregnant woman who is over 30 years old with the risk for a pregnant woman who is not over 30 years old.

(b) Hospital records show that 72.9% of the first-born of all twins are underweight. In instances where the first-born twin is underweight, 90.1% of second-born twins are also underweight. For 12.4% of twins, both the first-born and the second-born are not underweight.

A set of twins is selected at random from the hospital records. If the second-born twin is found to be not underweight, determine the probability that the first-born twin is underweight.

QUESTION THREE

At a childcare centre, there are six children aged two years and four children aged three years.

Each day for thirty days, three of these ten children were selected for a photograph.

A parent suspects that the three children for the daily photograph were not randomly selected.

The graph below shows the sum of the ages of the three children selected over the thirty days.
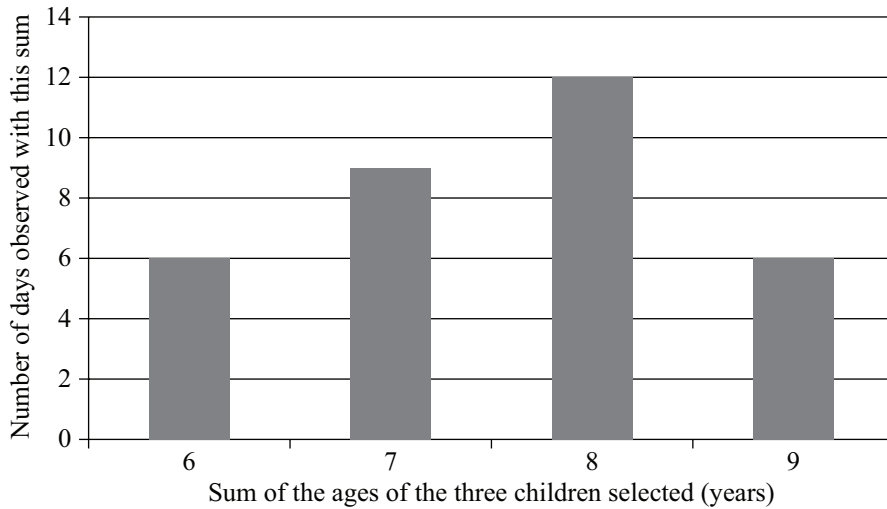
The parent correctly calculates that if the three children were randomly selected, then theoretically

P(sum of the ages of the three children is 8) = $\dfrac{3}{10}$.

The parent reasons that, as this probability is not the same as the proportion of days observed where the sum of the ages of the three children was 8, the selection process was not random.

(a) Is the parent correct in her reasoning about the selection process?

Explain why or why not.

(b)   Discuss why the parent would find it informative to carry out a simulation to investigate the variability in the experimental probability of the sum of the ages of the three children equalling 8 years.

(c)   Assume that the three children are randomly selected for the photo.

Complete the theoretical probability distribution table for T, the sum of the ages of the three children in years.

t	6	7	8	9
$P(T = t)$			$\dfrac{3}{10}$	

Extra paper if required.	
Write the question number(s) if applicable.	

QUESTION
NUMBER

91585

ASSESSOR'S
USE ONLY