

91585



NEW ZEALAND QUALIFICATIONS AUTHORITY  
MANA TOHU MĀTAURANGA O AOTEAROA

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SUPERVISOR'S USE ONLY

## 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?

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- (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.

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- (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.

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- (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.

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**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.

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

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

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- (ii) Use the information provided to calculate the necessary probabilities to complete the probability tree shown below, rounding probabilities to 3 decimal places.

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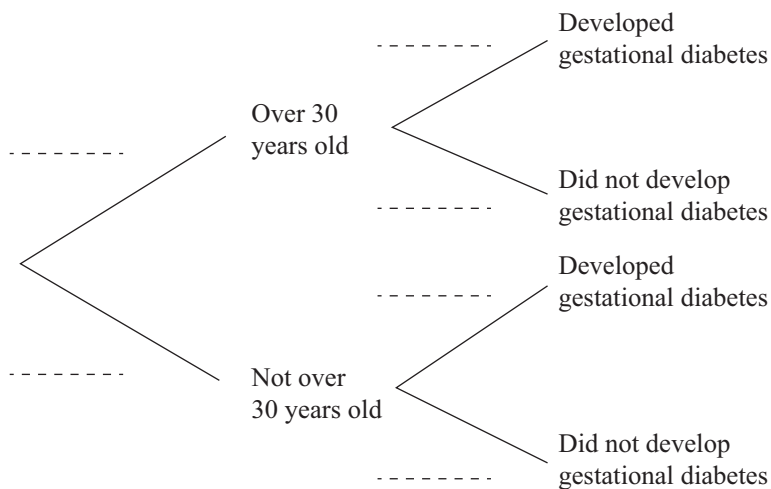
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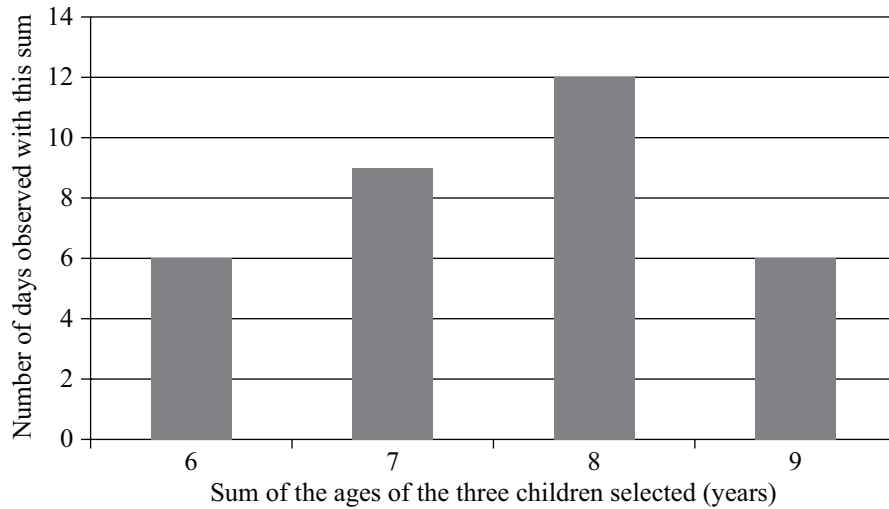
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**QUESTION THREE**

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

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

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.

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