SUPERVISOR'S USE ONLY

2

91267

912670

Draw a cross through the box (☒) if you have NOT written in this booklet

+

NZQA | Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 2 Mathematics and Statistics 2026

91267 Apply probability methods in solving problems

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Apply probability methods in solving problems.	Apply probability methods, using relational thinking, in solving problems.	Apply probability methods, 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.

Make sure that you have the Formulae Sheet L2–MATHF.

Show ALL working.

If you need more room for any answer, use the extra space provided at the back of this booklet.

Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

Do not write in the margins (////). This area will be cut off when the booklet is marked.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

© New Zealand Qualifications Authority, 2026. All rights reserved.
No part of this publication may be reproduced by any means without the prior permission of the New Zealand Qualifications Authority.

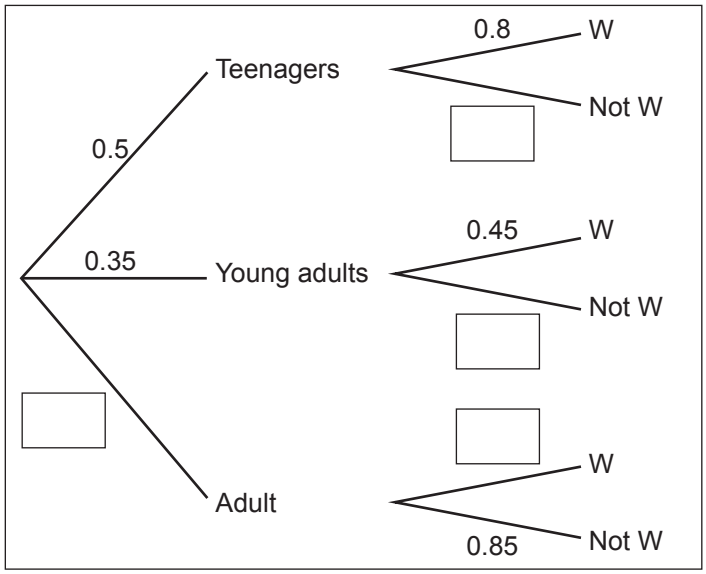
QUESTION ONE

Research has shown that TikTok is fast becoming the most popular social media platform that allows users to create, watch, and share short videos by teenagers, as well as adults.

(a) A social media marketer for a New Zealand company is running an advertisement on TikTok. The company wants to know how effective the advertisement is with different age groups. They have gathered the following information:

- 50% of the TikTok users were teenagers (13–19 years old).
- The probability that a user was a young adult (20–30 years old) is 0.35 and the rest were classified as adults (30+).
- For teenagers, the probability of them watching the company's advertisement is $\frac{4}{5}$.
- 45% of the young adults watched (W) the advertisement.
- The probability that an adult did not watch (Not W) the advertisement was 0.85.

Use this information to complete the probability tree below, and then answer the questions that follow.



(i) What is the probability that a user is a young adult and does not watch the advertisement?

(ii) What is the probability that a randomly selected TikTok user watches the company's advertisement?

(iii) Out of a randomly selected group of 410 TikTok users, how many would you expect to be teenagers or to watch the advertisement?

(b) The company wants to redesign its advertising strategy.

The company considers targeting only teenagers and young adults with future advertisements.

Using evidence from the probability tree, determine whether this strategy would reach at least 96% of all users who watch the advertisement.

Justify your answer mathematically.

(c) Another social media analyst is studying how users interact with TikTok videos. A user can interact with a video in three ways: Like (L), Comment (C), or Share (S).

After the first interaction, the user may interact with a second video. The probabilities of the second interaction depend on what they did first.

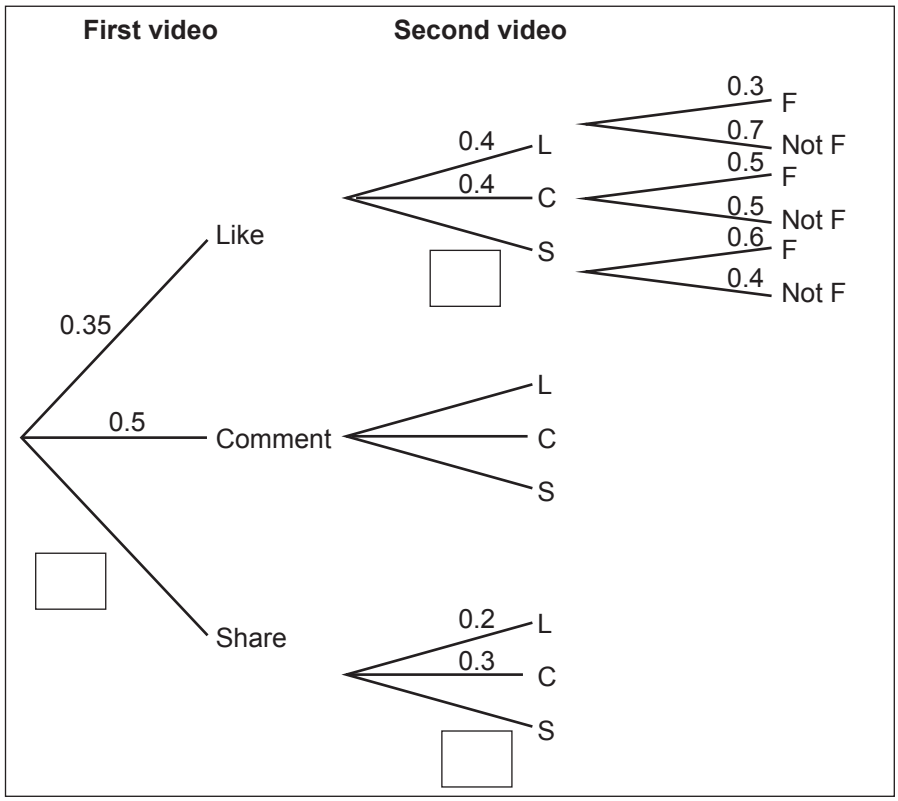
For the first video:

- The probability of Like is 0.35 and Comment is 0.5 .
- If the first video was liked, then the probability of the second being liked is 0.4 and commented on is also 0.4.
- Of the users that commented on the first video, three times as many users comment on the second video than share it.
- If the first video was shared, P(L) = 0.2 and P(C) = 0.3.

Finally, after the second video, the user may Follow (F) or Not Follow (Not F) the creator. The probabilities depend on the second interaction:

- If the second video was Like: P(F) = 0.3.
- If the second video was Comment: P(F) = 0.5.
- If the second video was Share: P(F) = 0.6.

Complete the probability tree:



(i) Calculate the probability that a user shares the first video, comments on the second video, and then follows the creator.

(ii) Overall, if 48% of all users comment on the videos, what is the probability that a randomly selected user likes the video?

QUESTION TWO

(a) Recent data shows that the amount of time in minutes that a New Zealand teenager spends on TikTok each day is normally distributed, with a mean of 85 minutes and a standard deviation of 20 minutes.

(i) What is the probability that a randomly selected teenager spends between 50 and 120 minutes on TikTok in a day?

(ii) What percentage of teenagers spend more than 2 hours on TikTok in a particular day.

(iii) What is the maximum time, in minutes, that the lower 15% of teenagers spend on TikTok per day?

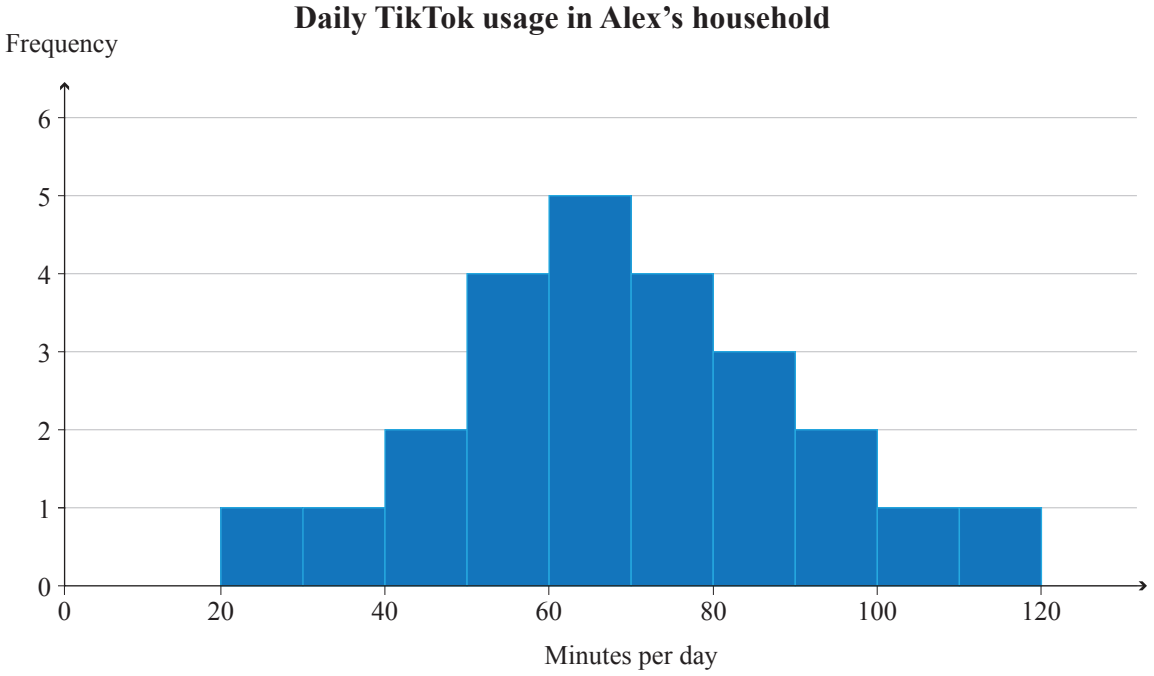
(b) A social media analyst suspects that the time users spend watching a specific viral TikTok trend could be modelled by a normal distribution with a standard deviation of 15 seconds. Collected data shows that 90% of users watch the trend for more than 57 seconds.

If it was a normal distribution, calculate the mean time that a user will spend watching a trend.

(c) Alex is concerned about the amount of time his family spends on TikTok each day. He reads that the average daily TikTok usage for New Zealanders is 95 minutes, with a standard deviation of 20 minutes.

To monitor his own household, Alex records the daily TikTok usage (in minutes) of his 3 children and partner over 2 weeks.

The results are displayed in the graph below:



Compare Alex's household TikTok usage to a normal distribution model with $\sigma = 20$ minutes.

In your answer, discuss at least two of centre, shape, and spread.

QUESTION THREE

(a) Recent studies suggest that teenagers whose screentimes are more than 3 hours per day (social media, gaming) may experience higher levels of sleep disruption (self-reported frequent difficulty falling asleep, or waking up) compared to those who have lower screentimes.

A health survey of 480 teenagers collected the following data.

Daily screentime	Sleep disrupted	Sleep not disrupted	Total
Less than 1 hour	30	90	120
1–3 hours	96	144	240
More than 3 hours	96	24	120
Total	**222**	**258**	**480**

(i) What percentage of teenagers have screentimes of more than 3 hours per day?

(ii) Given that a randomly selected teenager has a screentime of 1–3 hours, what is the probability that their sleep is not disrupted?

(iii) What is the probability that a randomly selected teenager has a screentime of less than 1 hour or has their sleep disrupted?

(b) A health advocate reviews the data and suggests that ‘the risk of sleep disruption for users with heavy screentimes (more than 3 hours) is more than twice that for all other users.’

(i) Evaluate this claim, using calculations from the data above to interpret the relative risk.

(ii) Considering that the studies cited “the risk of sleep disruption for users with heavy screentimes (more than 3 hours) is more than twice that for all other users”, discuss TWO limitations of this study.

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

QUESTION NUMBER