5. According to a 2017 national survey in Country B, the mean number of bedrooms in newly built houses was 2.9. Rodney, a researcher, believes the mean number of bedrooms in newly built houses in the country was different in 2024 than it was in 2017. To investigate his belief, he took a large random sample of newly built houses in Country B in 2024 and recorded the number of bedrooms in each house. The distribution of the number of bedrooms for the sampled houses is summarized in the table.

Distribution of the Number of Bedrooms for the Houses Sampled in 2024

Number of Bedrooms	1	2	3	4	5	6
Proportion of Houses	0.12	0.22	0.28	0.22	0.14	0.02

A.

   i. A house from the sample will be selected at random. What is the probability that the house had fewer than 3 bedrooms? Show your work.

   ii. What is the mean number of bedrooms for the sample of newly built houses in 2024? Show your work.

B. Rodney will use a one-sample t-test for a population mean to test his belief.

   i. In the context of Rodney's investigation, state the hypotheses for the test.

   ii. Explain, in context, what a Type I error would be for Rodney's hypothesis test.

C. A different researcher, Keisha, suggests using a confidence interval to investigate whether the mean number of bedrooms in newly built houses in 2024 in Country B was different from 2.9.

Assume the conditions for inference have been met. Using Rodney's data, Keisha calculated a one-sample 97 percent confidence interval to estimate the population mean as $(3.01, 3.19)$. Based on the confidence interval, what conclusion can be made for Rodney's hypothesis test in part B at $\alpha = 0.03$? Justify your answer.

6. Stefan, a psychologist, conducted a study to investigate the effect of time of day on reading comprehension in children. One hundred children volunteered, with their parents' consent, to participate in the study. Fifty of the children were randomly assigned to read a story at 9 a.m. and then answer 25 questions about it. The remaining 50 children were assigned to read the same story at 3 p.m. and answer the same 25 questions. The reading comprehension for each child was measured by a reading score, which was determined by the number of questions that were answered correctly about the story. Stefan is interested in comparing the mean reading scores for the two times of day. Table 1 shows the results of Stefan's study.

Table 1: Summary Statistics of Reading Scores

	n	Mean	Standard Deviation
9 a.m.	50	15.2	4.12
3 p.m.	50	17.9	4.43

Stefan found the conditions for inference were met and conducted a two-sample t-test for the difference in two population means. Let μ_{AM} represent the mean reading score for all children, similar to those in the study, who would read the story at 9 a.m. Let μ_{PM} represent the mean reading score for all children, similar to those in the study, who would read the story at 3 p.m. Stefan's hypotheses are as shown.

$$H_0: \mu_{AM} = \mu_{PM}$$
$$H_a: \mu_{AM} \neq \mu_{PM}$$

A. The p-value for Stefan's hypothesis test was 0.002. State an appropriate conclusion, at the 5 percent significance level, for Stefan's test in the context of the investigation. Justify your answer.

B. Explain why it was appropriate for Stefan to conduct a two-sample t-test for the difference in two population means instead of a paired t-test for the population mean difference.

Scoring for Question 5	Score
Complete Response Three parts essentially correct	**4**
Substantial Response Two parts essentially correct and one part partially correct	**3**

Developing Response
Two parts essentially correct and no part partially correct
    OR
One part essentially correct and one or two parts partially correct
    OR
Three parts partially correct
	2

Minimal Response One part essentially correct and no parts partially correct *OR* No part essentially correct and two parts partially correct	**1**