**Question 5** **(30 marks)**
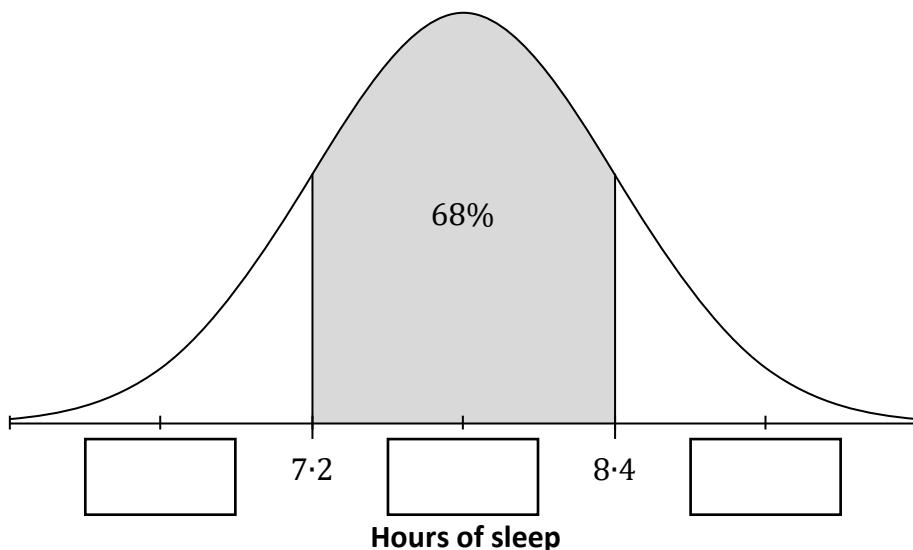
**(a)** A large group of 17-year-olds were asked how many hours of sleep they got on the previous night. The results were normally distributed.
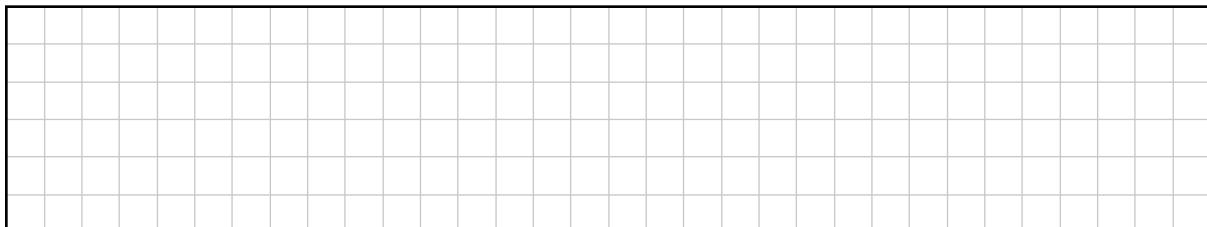
The **middle 68%** slept between 7·2 and 8·4 hours, as shown on the diagram below.
Use the empirical rule to answer **parts (a)(i)** and **(a)(ii)**.

**(i)** Fill in the three missing numbers on the horizontal axis.
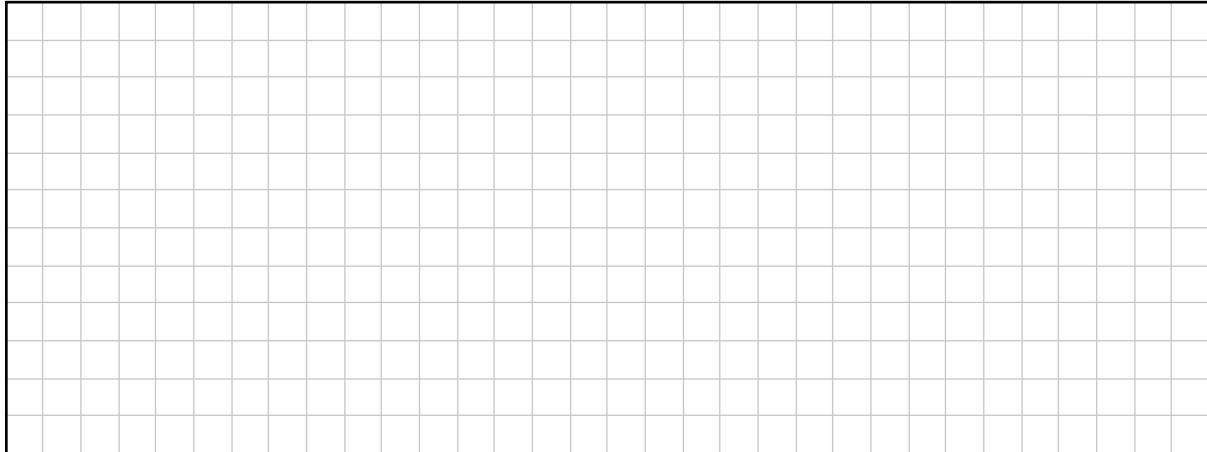


**Hours of sleep**

**(ii)** Research says that a 17-year-old should get at least 9 hours of sleep each night.
What percentage of this sample got **at least 9 hours** of sleep on the previous night?

**(b)** Owen records the number of hours of sleep that he gets each night for several weeks. Based on this, he calculates that he gets the recommended amount of sleep 10% of the time.

**(i)** What is the probability that he does **not** get the recommended amount of sleep on a particular night?

**(ii)** Beginning on a Sunday night, Owen records his sleep each night for a week. Find the probability that Owen gets the recommended amount of sleep for the **first time** on Tuesday night (the third night).

Assume that the number of hours of sleep Owen gets on different nights are independent.