IB Math Studies 2

Were there any questions on the Ch 6 Review Set?

Chapter 10

The normal distribution

Today we will evaluate the normal distribution of continuous data and what can be learned from its graph.

Topic 2: Descriptive Statistics

There's no such thing as exact:

For a **continuous random value**, such as height or weight, we can never say that something weighs *exactly* a specific measure, we simply refer to the probability that its weight falls within a certain interval.

32.4 kg

32.35 – 32.44

27.346 cm

27.3455 - 27.3464

For example, the probability that an egg will weigh *exactly* 72.9 g is zero.

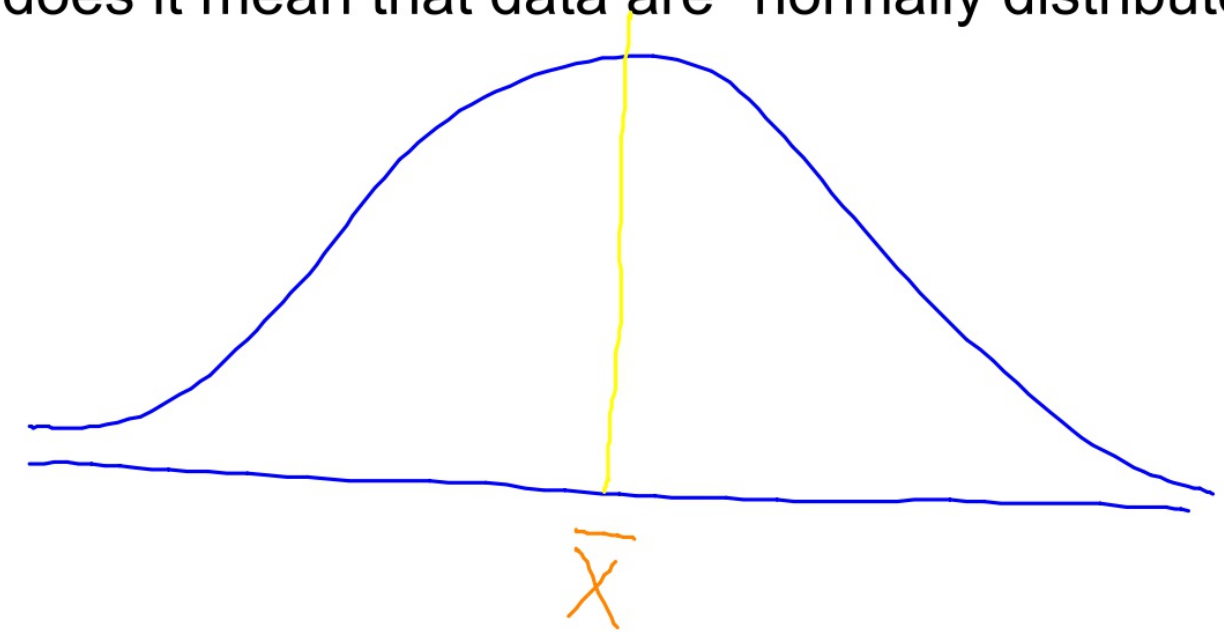
If you were to weigh an egg on scales that weigh to the nearest 0.1 g, a reading of 72.9 g means the weight lies somewhere between 72.85 g and 72.95 g. No matter how accurate your scales are, you can only ever know the weight of an egg within a range.

So, for a continuous variable we can only talk about the probability that an event lies in an **interval**, and:

$$\mathrm{P}(a \leqslant X \leqslant b) = \mathrm{P}(a < X \leqslant b) = \mathrm{P}(a \leqslant X < b) = \mathrm{P}(a < X < b).$$

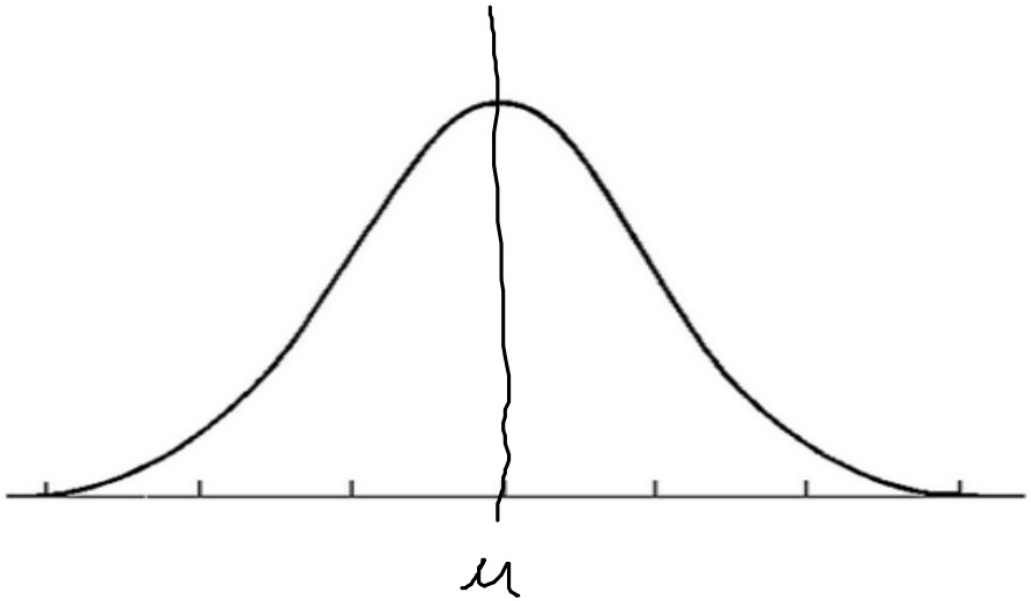
THE NORMAL DISTRIBUTION

What does it mean that data are "normally distributed?"



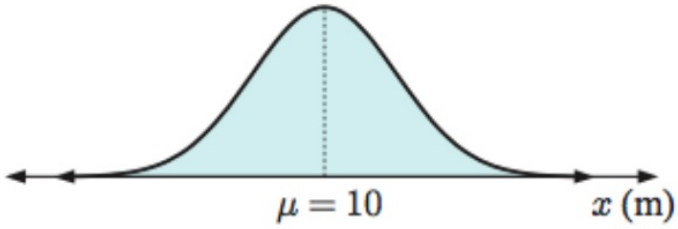
Explain why the weights of a specific breed of purebred dogs is likely to be normally distributed.

The Bell Curve

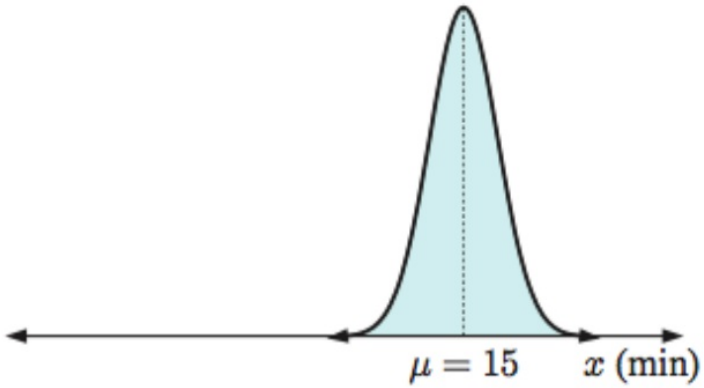


Although all normal distributions have the same general bell-shaped curve, the exact location and shape of the curve is determined by the **mean** μ and **standard deviation** σ of the variable.

- The height of trees in a park is normally distributed with mean 10 metres and standard deviation 3 metres.

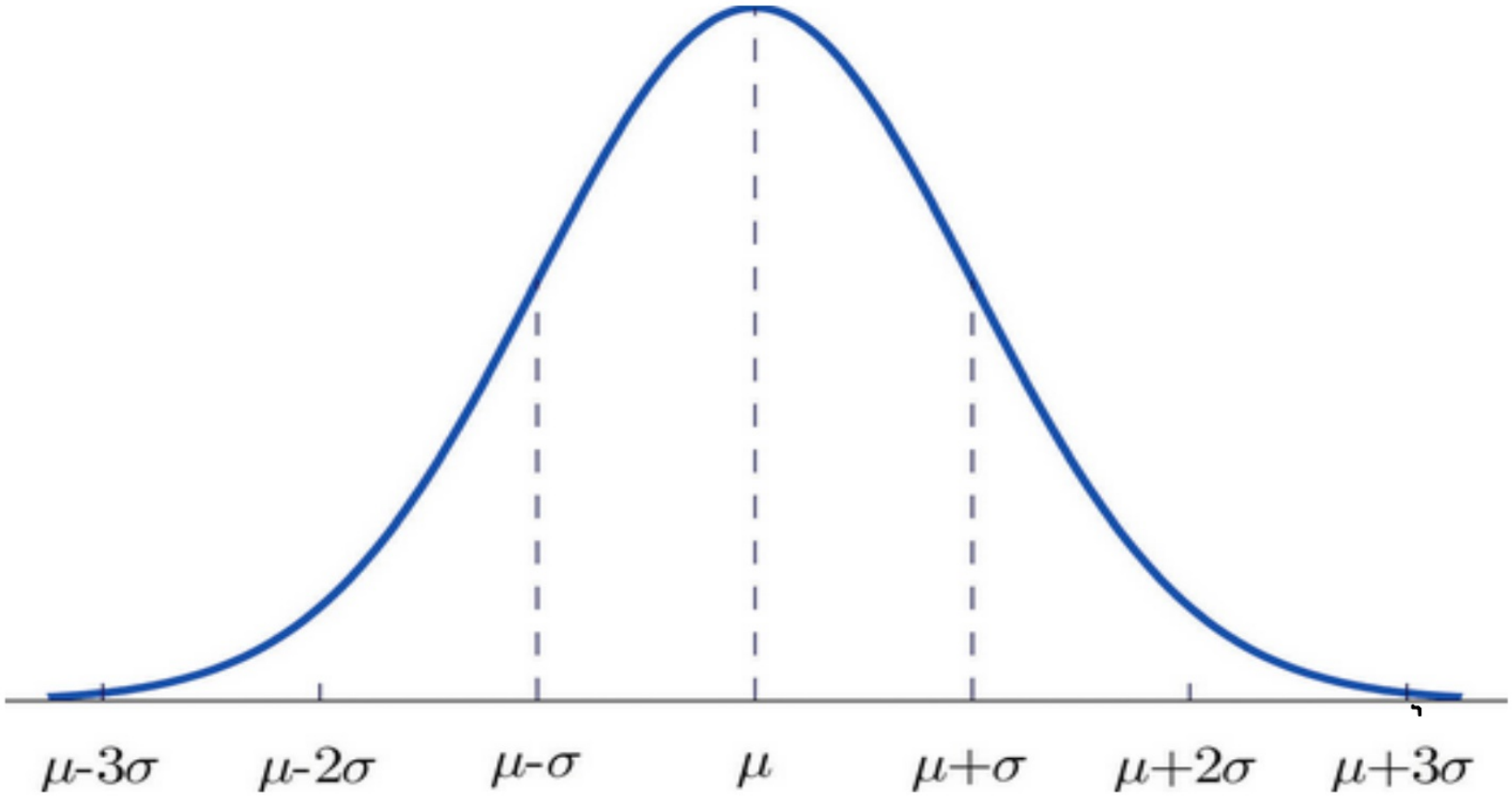


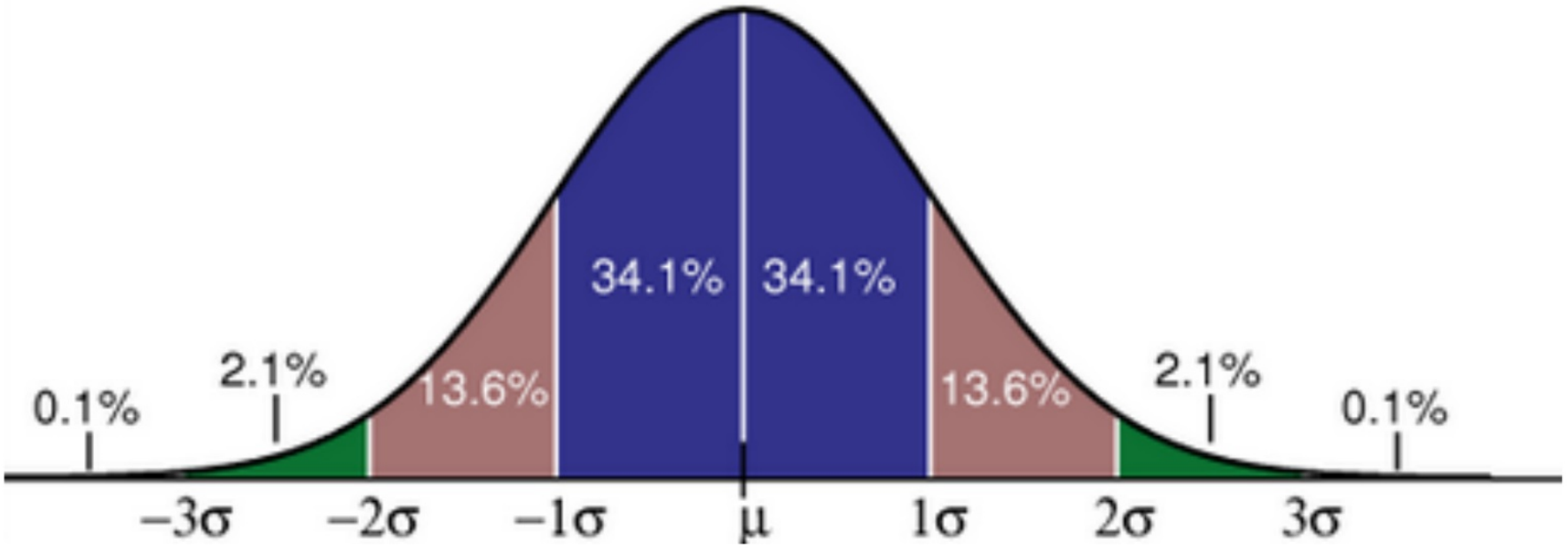
- The time it takes Sean to get to school is normally distributed with mean 15 minutes and standard deviation 1 minute.



So what does the standard deviation actually tell us?

How far the majority of points are from the mean


μ-3σ
μ-2σ
μ-σ
μ
μ+σ
μ+2σ
μ+3σ
1
4
7
10
13
16
19
+ve



We can use these proportions to find the probability that the value of a normally distributed variable will lie within a particular range.

68.2% of data falls within 1 sd of mean

Notation Notation Notation

If a continuous variable X is normally distributed with mean μ and standard deviation σ, we write $X \sim \mathrm{N}(\mu, \sigma^2)$.

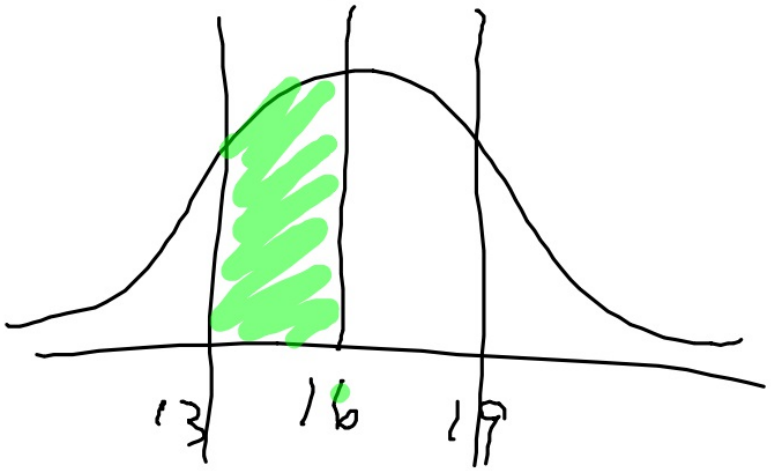
Suppose $X \sim \mathrm{N}(16, 3^2)$. Find:

a $\mathrm{P}(13 \leqslant X \leqslant 16)$

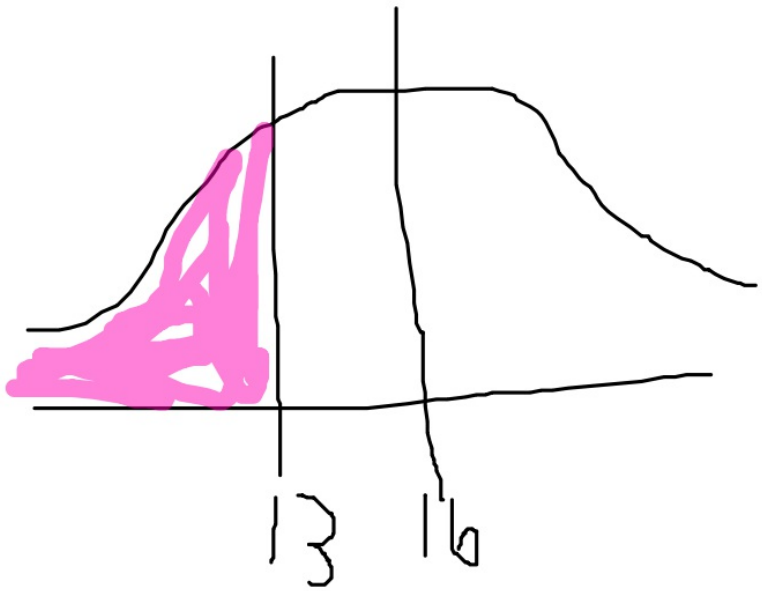
$\mu = 16$

$s.d. = 3$

34.1%



b $\mathrm{P}(X \leqslant 13)$



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Homework:

Exercise 10 A # 2, 5, 7, 9