Warm Up

Pick up a half-index card. Then find your pulse.

Today:

Start Normal Distribution

Everyone find your pulse

Multiply by 3

Write down your pulse rate

(beats per minute)

Give your card to our statistician.

Questions
on the two
exam questions

(After test Assignment)

A The equation of line L_1 is $y = 2.5x + k$. Point A$(3, -2)$ lies on L_1.

(a) Find the value of k. [2]

The line L_2 is perpendicular to L_1 and intersects L_1 at point A.

(b) Write down the gradient of L_2. [1]

(c) Find the equation of L_2. Give your answer in the form $y = mx + c$. [2]

integers!

(d) Write your answer to part (c) in the form $ax + by + d = 0$ where a, b and $d \in \mathbb{Z}$. [1]

Working:

(a) $(3, -2)$

$y = 2.5x + k$

$-2 = 2.5(3) + k$

Solve

$k = -9.5$

(b) L_1 $y = 2.5x - 9.5$

gradient is 2.5

for L_2 gradient is $-\frac{1}{2.5} = -0.4$

Answers:

(a) $k = 9.5$

(b) -0.4

(c) $y = -.4x - .8$

(d) $4x + 10y + 8 = 0$

(c) L_2 $(3,-2)$

$y = -0.4x + b$

$-2 = -0.4(3) + b$

$-2 = -1.2 + b$

$b = -.8$

$y = -.4x - .8$

yx

(d) $y = -.4x - .8$

multiply by 10

$10y = -4x - 8$

set equal to 0

$4x + 10y + 8 = 0$

or $-4x - 10y - 8 = 0$

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13 A population of 200 rabbits was introduced to an island. One week later the number of rabbits was 210. The number of rabbits, N, can be modelled by the function

look to y

$$N(t) = 200 \times b^t, t \geq 0,$$

where t is the time, in weeks, since the rabbits were introduced to the island.

(a) Find the value of b. [2]

(b) Calculate the number of rabbits on the island after 10 weeks. [2]

An ecologist estimates that the island has enough food to support a maximum population of 1000 rabbits.

(c) Calculate the number of weeks it takes for the rabbit population to reach this maximum. [2]

Working:

(a) $N(t) = 200 \times b^t$

$(1, 210)$

$210 = 200 \cdot b^1$

$b = \frac{210}{200}$

$b = \frac{21}{20}$

or 1.05

(b) $N(10) = 200(1.05)^{10}$

$= 325.7789....$

$\doteq 326$ to 3 sig figs

Answers:

(a) 1.05 or $\frac{21}{20}$

(b) 326 rabbits

(c) 33.0 years

(c) $200(1.05)^t = 1000$

divide

$1.05^t = 5$

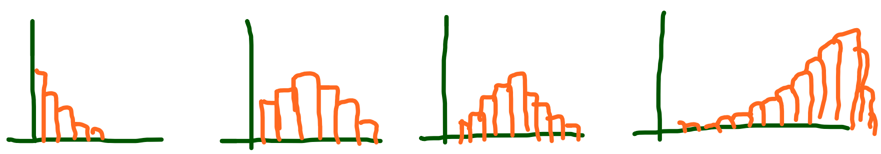
take log of both sides $\log(1.05^t) = \log(5)$

$t \cdot \log(1.05) = \log(5)$

$t = \frac{\log(5)}{\log(1.05)}$

$= 32.9869....$

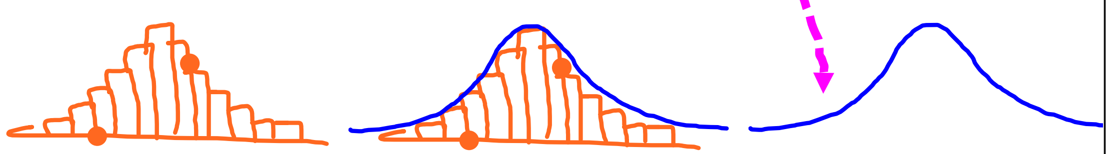
$\doteq 33.0$ to 3 signif. figures



There are many distributions that characterize natural phenomena in the world

One of the most common is called the
Normal Distribution

The graph of a normal distribution
is called a normal curve

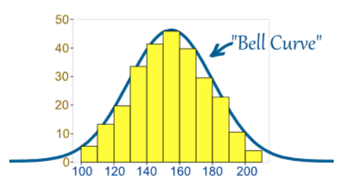


Things that closely follow a Normal Distribution:

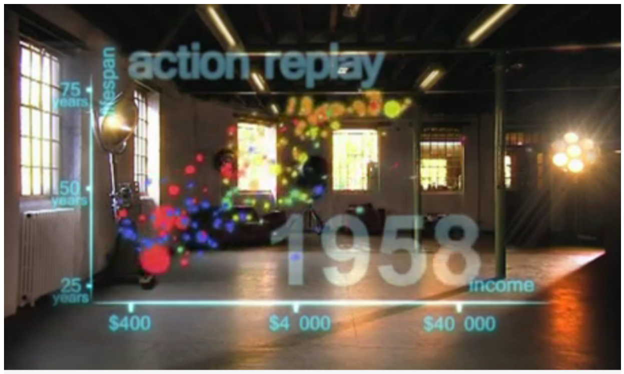
- heights of people
- size of things produced by machines
- errors in measurements
- blood pressure
- marks on a test

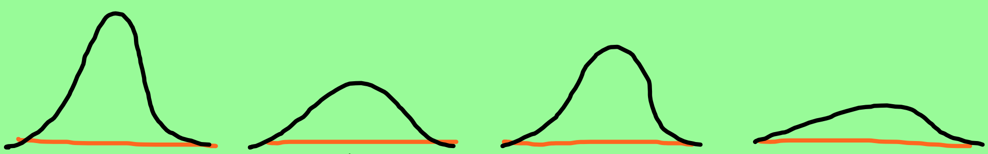
Today's Aim:

Be able to construct diagrams of Normal Distributions



But first a visit from Hans Rosling





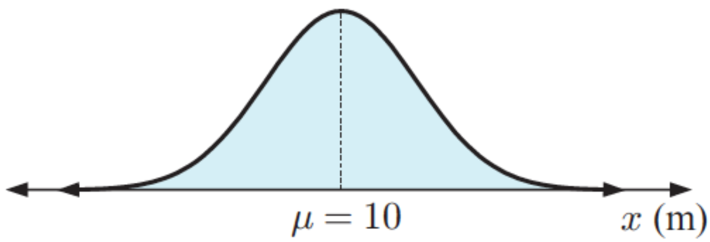
\# of traffic accidents

Heights of people at Sheldon

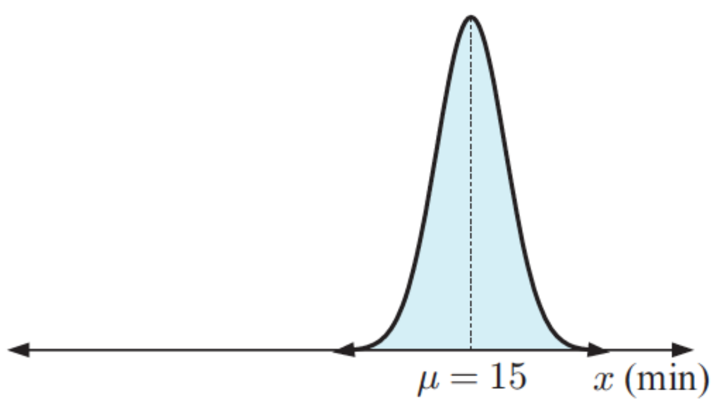
there are many normal curves

examples

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.



My favorite thing about

the Normal distribution

is its **proportions**

NOTES

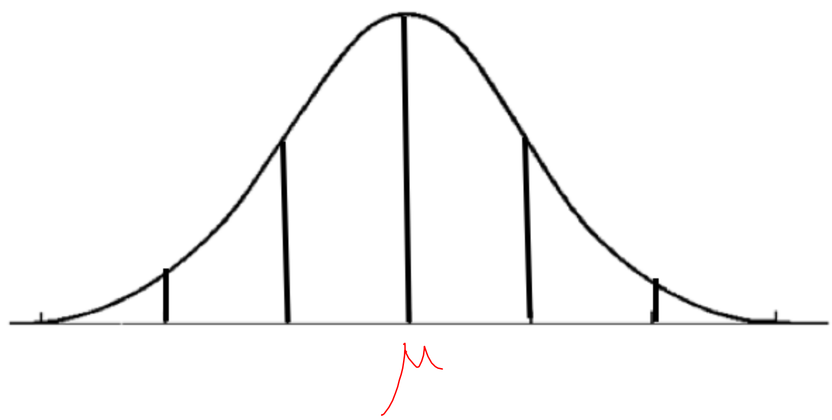
You'll need to recall two symbols

μ mean (population)

σ Stand deviation (pop)

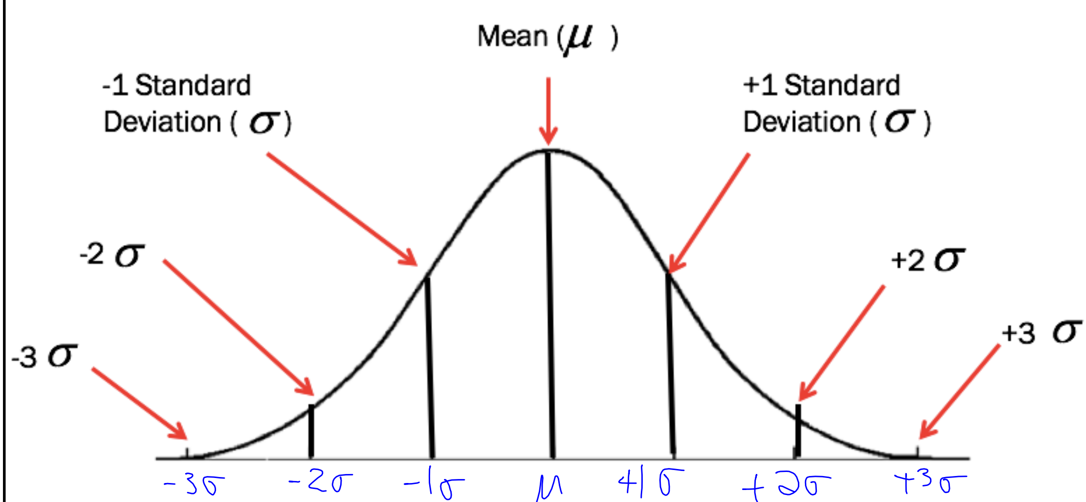
WHAT'S NORMAL?

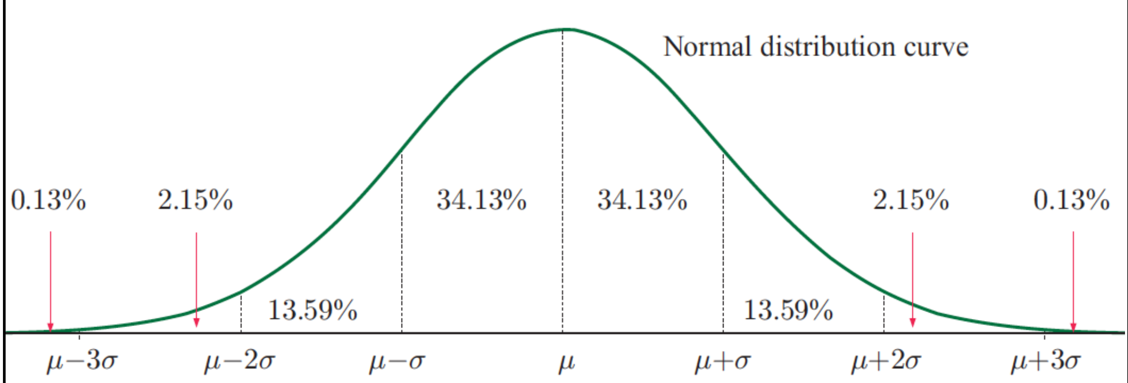
A normal curve is symmetric about the mean and has a bell shape.

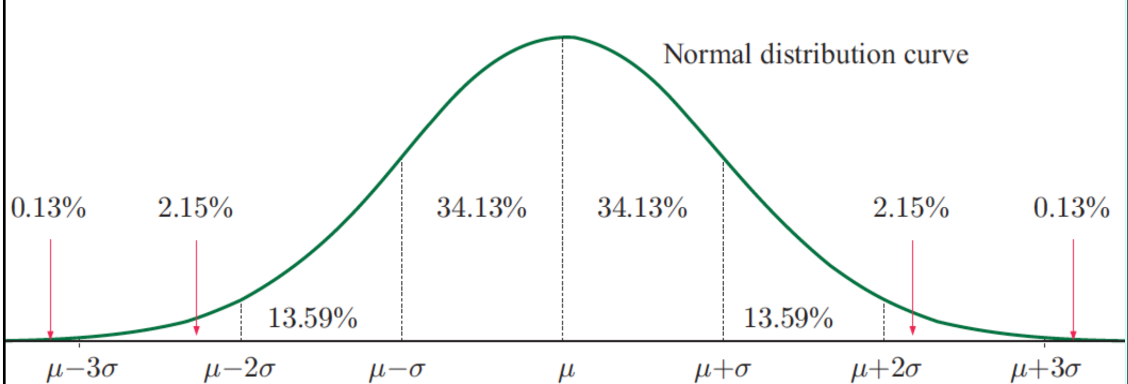


WHAT'S NORMAL?

Notes

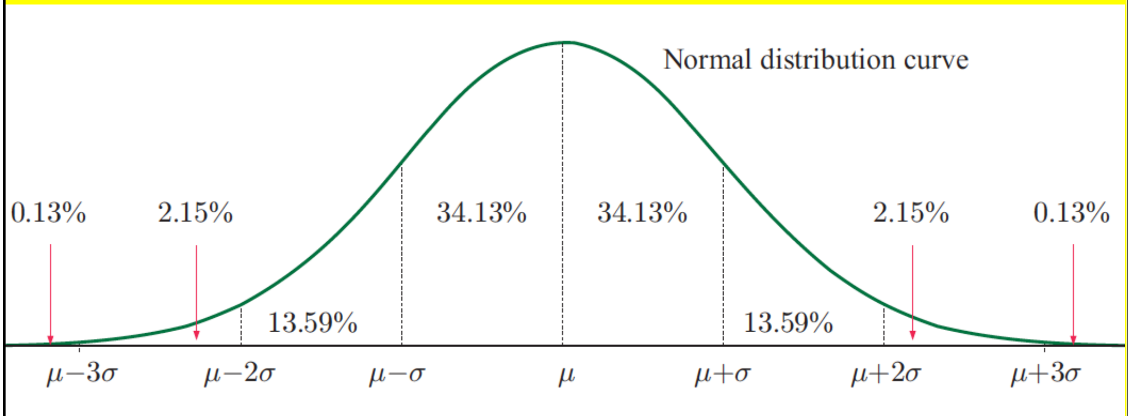






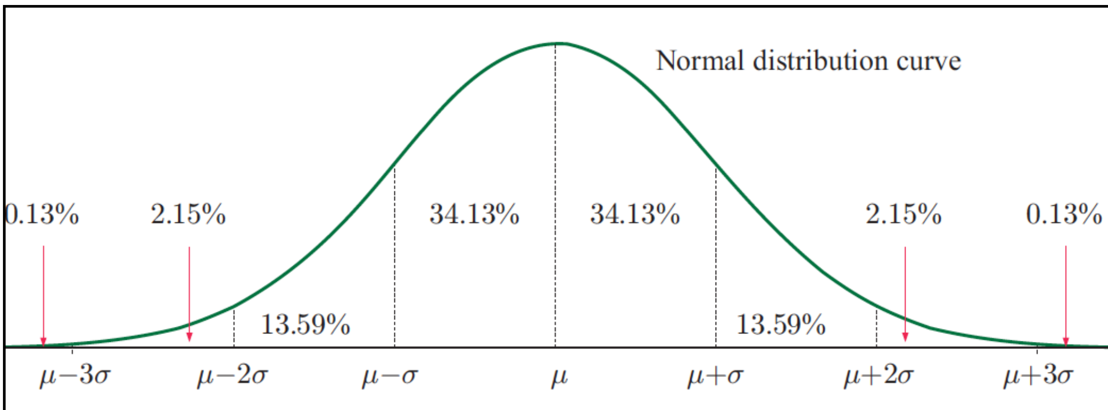
don't need to write

68.26% of the values lie w/in 1 σ from μ



68.26% of the values lie w/in **1** σ from μ

95.44% of the values lie w/in **2** σ from μ



68.26% of the values lie w/in **1** σ from μ

95.44% of the values lie w/in **2** σ from μ

99.74% of the values lie w/in **3** σ from μ

This relationship is know as the.....

Emperical Rule

68.26% - 95.44% - 99.74%

$\pm 1\sigma$ $\pm 2\sigma$ $\pm 3\sigma$

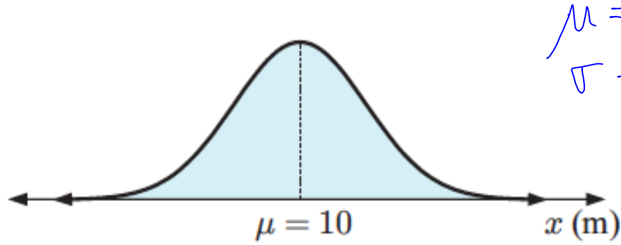
and in some places.....

68% - 95% - 99.7%

Notes

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

$\mu = 10$
$\sigma = 3$



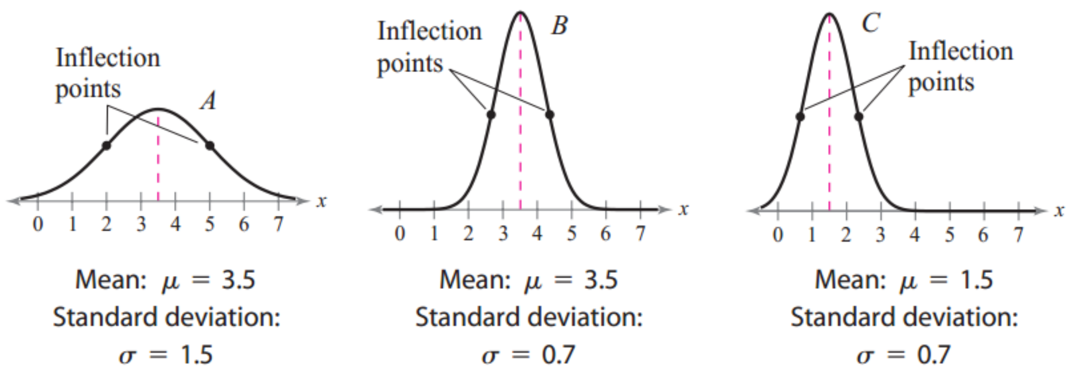
We use the notation $X \sim N(\mu, \sigma^2)$

In the tree case: $X \sim N(10, 3^2)$

mean

std dev 2 (Variance)

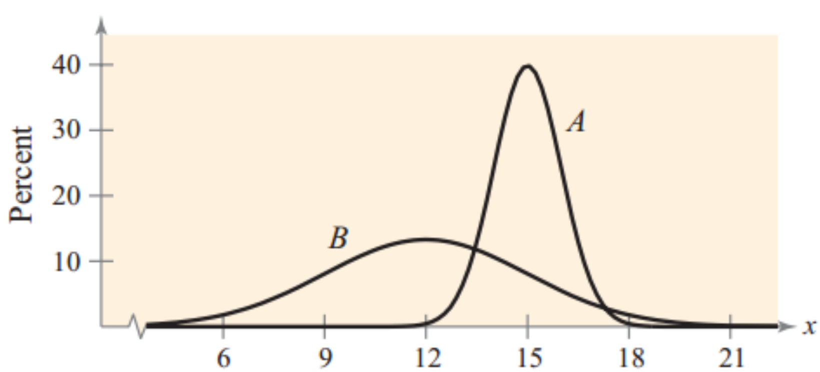
A normal distribution can have any mean and any positive standard deviation. These two parameters, μ and σ, completely determine the shape of the normal curve. The mean gives the location of the line of symmetry, and the standard deviation describes how much the data are spread out.



Notice that curve A and curve B above have the same mean, and curve B and curve C have the same standard deviation. The total area under each curve is 1.

Which normal curve has a greater mean?

Which normal curve has a greater standard deviation?

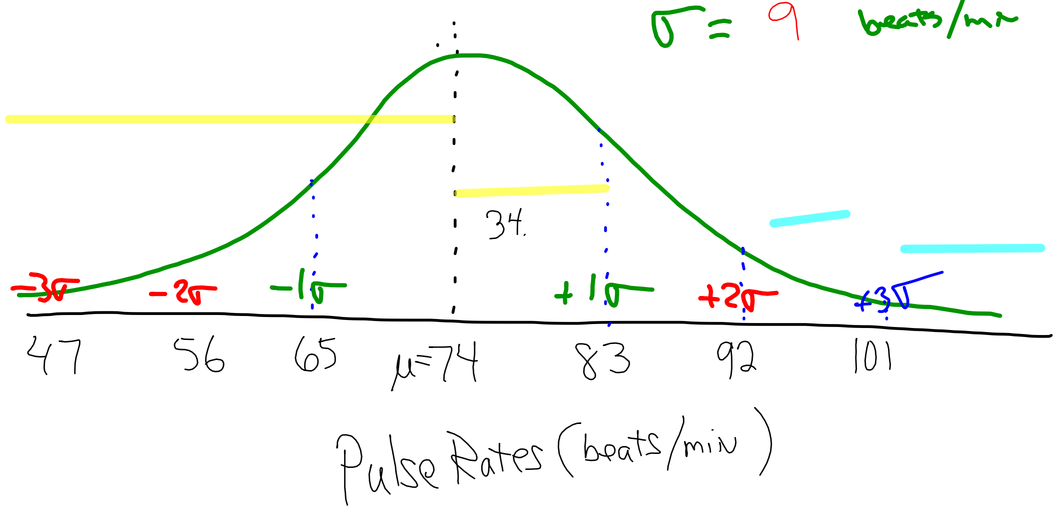


Our Pulse rates as a Normal Distribution

Per 4 Pulse Rates

$\mu = 74$ beats/min

$\sigma = 9$ beats/min



Pulse Rates

What are the chances that someone in the class has a pulse rate

greater than 74 ? $P(x>74) = 50\%$

less than 83 ? $P(x<83) = \cancel{63.59}\%$ 84.13%

more than 92 ? $P(x>92) = 2.28\%$

less than 92 ? $100\% - 2.28\% = 97.72\%$

What are the chances that someone in the class has a pulse rate

greater than ____

less than ____

more than ____

You will now be given a Normal Distribution Packet which we will use over the next three days

In your notes

On page 303....#3

Draw and Label a **Large**

Normal Distribution diagram

3 The mean height of players in a basketball competition is 184 cm. If the standard deviation is 5 cm, what percentage of them are likely to be:

- **a** taller than 189 cm
- **b** taller than 179 cm
- **c** between 174 cm and 199 cm
- **d** over 199 cm tall?

3 **a** 15.9% **b** 84.1% **c** 97.6% **d** 0.13%

Assignment

- **Worksheet on Review of Functions**
- **Complete all of it by tomorrow**

Read P2 by this weekend
on line

4 The mean average rainfall of Claudona for August is 48 mm with a standard deviation of 6 mm. Over a 20 year period, how many times would you expect there to be less than 42 mm of rainfall during August in Claudona?