Normal Distribution and Applications

(sample MathCad lecture by Marc.Artzrouni@univ-pau.fr; February 2011)

1.Normal distribution:

The random variable (r.v.)

is called a normal

Example below: $\mu \equiv 2$, $\sigma \equiv 0.5$

simul : $si1 := rnorm(1, \mu, \sigma) = (1.66)$

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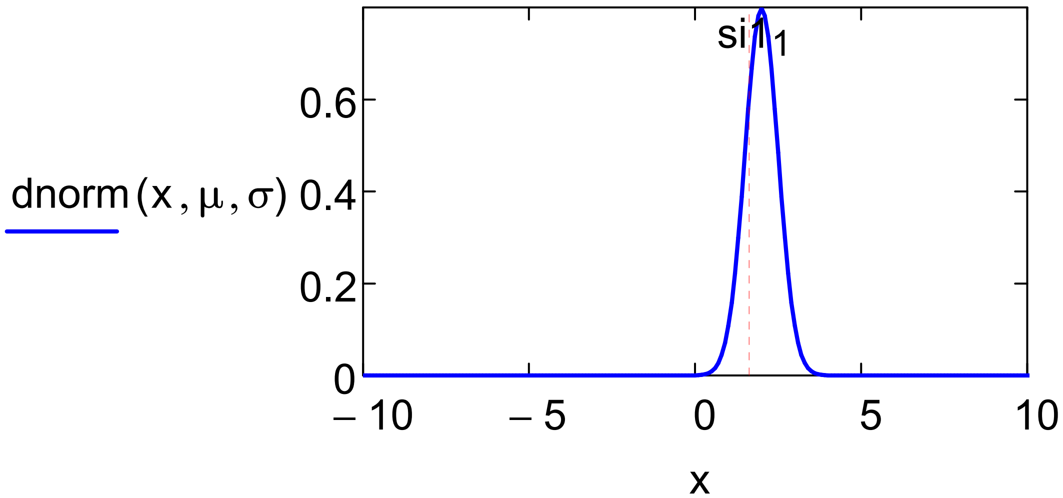
1. Density normal distribution



Calculations done in exercise sessions:

=

which shows that the parameter

Similarly the standard deviation

and therefore .

Remarks:

1. The density dnorm(x,μ,σ) is centered

2. The smaller σ is,

3. dnorm(x,μ,σ) does not

2. Normal distribution as a model for heigths of male and female students collected at first class *(make sure path is specificed correctly to EXCEL spreadsheet read below in collapsed area; male and female heights (random variables) are TF, TM)*

i. Histogram

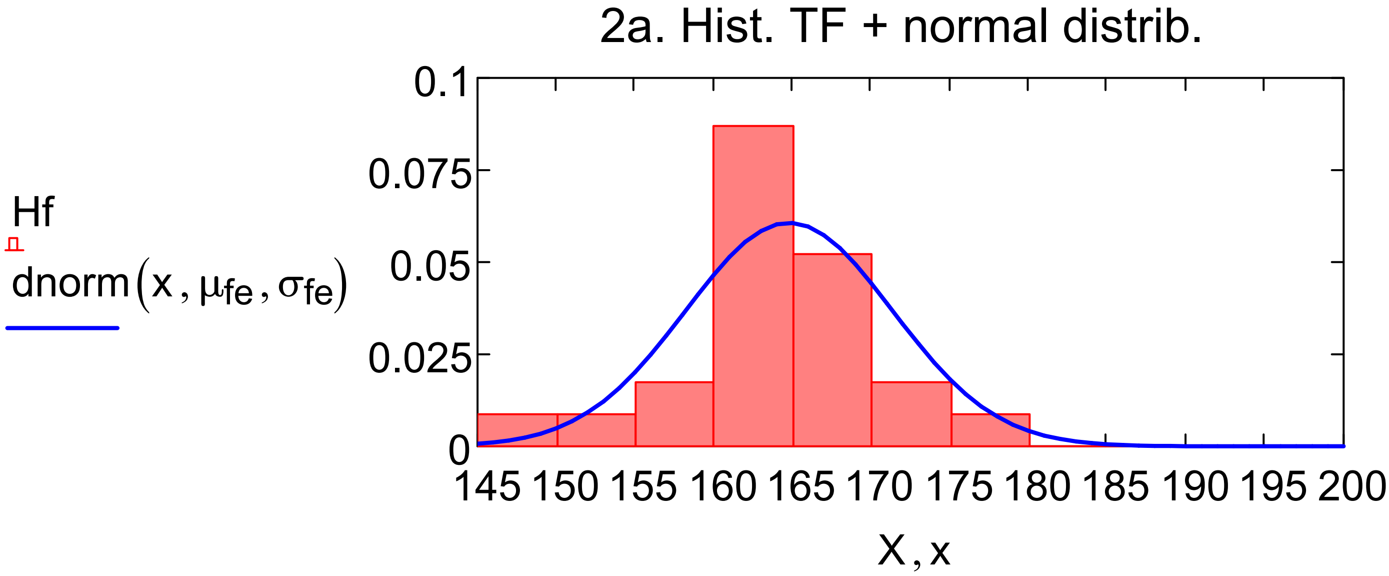
EXCEL spreadsheet (check path, etc)

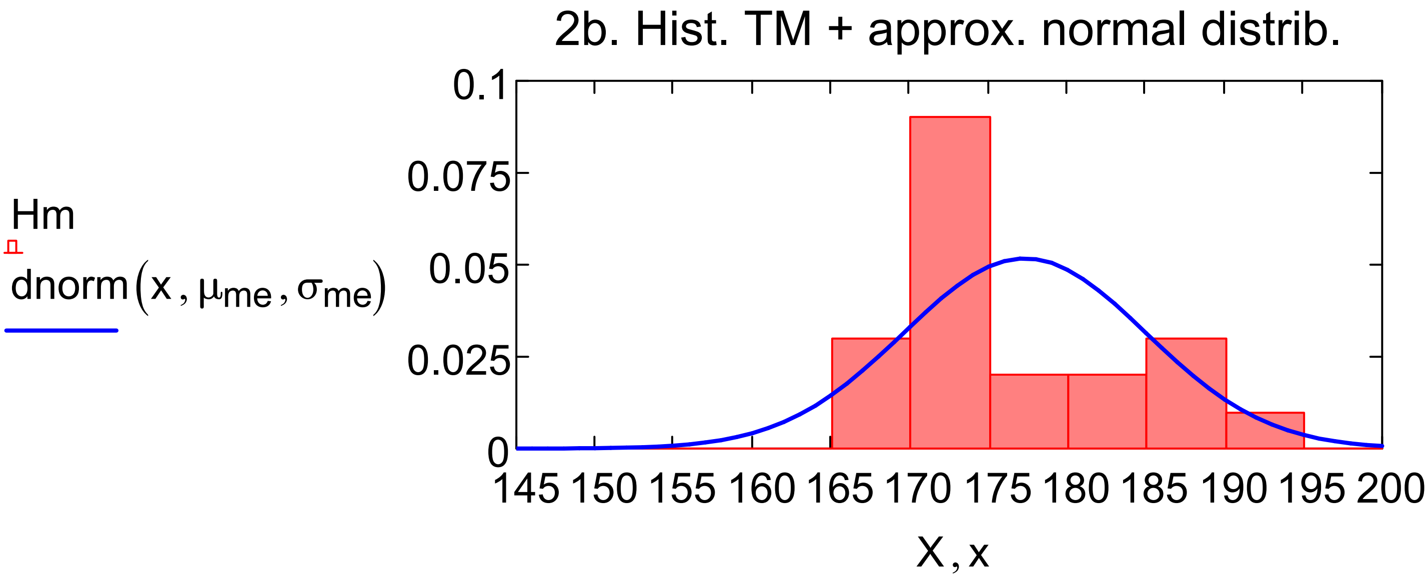
counts and heights, in cm:

$$Df = \begin{pmatrix} 1 & 1 & 2 & 10 & 6 & 2 & 1 & 0 \\ 147.5 & 152.5 & 157.5 & 162.5 & 167.5 & 172.5 & 177.5 & 182.5 \end{pmatrix}$$

$n_f = 23$ = number of females

In histogram





ii. Normal approximation

Male parameters

$\mu_{fe} = 164.783$; similarly : $\mu_{me} = 177.3$

These estimators are unbiased:

b. To estimate

For calculations we need:

i. $n_f = 23$ $n_m = 20$

ii. somTF = 3790 somTM = 3546

iii. Sums of squares = som2TF = 625478 ; som2TM = 629836

Exercise: ladies in lecture calculate μ_{fe} , σ_{fe} ;

gentlemen μ_{me} , σ_{me} ***(done here and now in class)***

Exercise 1: We have three sampled values $X_1=0$, $X_2=0$, $X_3=1$,of a binary rv (e.g. flipped coin). Use eq. (1) and (4) to calculate estimated values μ_e of μ and σ_e of σ.

$\mu_e =$