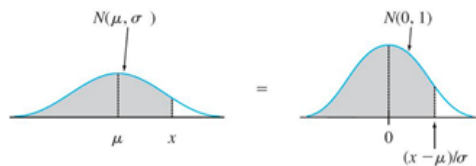


Ch 6.2 Application of Normal Distribution

Ch 6.2 Using the Normal distribution

When X is normally distributed with mean μ and standard deviation σ , $N(\mu, \sigma)$ probability of range of X can be represented by the area under normal density curve $y = \frac{e^{-\frac{1}{2} \cdot (\frac{x-\mu}{\sigma})^2}}{\sigma\sqrt{2\pi}}$ (no need to memorize.)



The same properties of bell shape density curve apply:

Probability = area = relative frequency (percentage)

- a) $P(X > \mu) = 0.5$, $P(X < \mu) = 0.5$
- b) $P(a < X < b)$ = area between a and b under the density bell curve.

A) Find Probability of X in Normal distribution

Use online Normal distribution calculator to find prob.

http://onlinestatbook.com/2/calculators/normal_dist.html

Specify mean = μ , SD = σ

- For left area or $P(x < a)$ click below
- For right area or $P(x > a)$ click above
- For area between two values a and b $P(a < x < b)$, click between
- For area outside of a and b , $P(x < a \text{ or } x > b)$, click outside
- Click "Recalculate"

B) Find X given probability in Normal Distribution

Use Inverse Normal Calculator to find the cut-off given a left area, right area, between area or outside area of two tails.

http://onlinestatbook.com/2/calculators/inverse_normal_dist.html

Specify area, mean = μ , SD = σ

select if area is below, above, between or outside.

Click "Recalculate"

Note: left area = bottom percentage = percentile. Right area = top percent

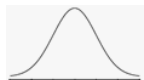
- a) Find cutoff X for Top k percentage:

Use Inverse online calculator, above

- b) Find cutoff X for Bottom k percentage or k percentile: Use Inverse online calculator, below

Ex1. Final exam of a standardized test is normally distributed with mean 63 and standard deviation 5.

- a) Find the probability that a randomly selected student scored more than 65 on the exam.



Use Online Normal calculator.

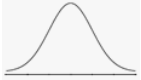
Mean = 63, SD =5,

Click above, enter 65.

Recalculate

$P(X > 65) = 0.3446$.

b) Find the probability that a score less than 85



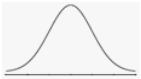
Use Online Normal calculator. Mean = 63, SD =5,

Click below, enter 85.

Recalculate

$P(X < 85) = 1$

c) Find the 90th percentile score. (top 10%)



Use Inverse Normal Calculator, mean = 63, SD = 5

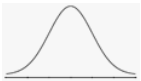
Enter Area = 0.9, Click below

The cut-off X is at the below box.

$P(X < \underline{69.4}) = 0.9$. The 90th percentile is 69.4.

Ex2: Heights of men are normally distributed with mean of 68.6 in. and a standard deviation of 2.8 in.

Find the probability that a randomly selected man has a height greater than 72 in.



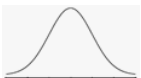
Use Online Normal calculator.

Mean = 68.6, sd =2.8, Click above, enter 72.

Recalculate

$P(X > 72) = 0.1123$

Ex3. Given pulse rate of women is normally distributed with a mean of 74 bpm and a standard deviation of 12.5 bpm. Find the pulse rates of lowest 5% and highest 5% of women.



Total area = 5% + 5% =0.1

Find cutoff pulse rate for lowest 5% and highest 5%. Use Inverse Normal calculator.

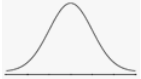
Area = 0.10, Mean = 74, SD=12.5. Click Outside.

Recalculate.

lowest 5% cutoff = 53.4 bpm highest 5%=94.6 bpm

Ex4. A circus farmer grows mandarin oranges finds that the diameters of mandarin oranges harvested on his farm follow a normal distribution with a mean diameter of 5.85 cm and standard deviation of 0.24cm.

a) Find the probability that a normally selected mandarin orange from his farm has a diameter larger than 6 cm.



Use Online Normal calculator.

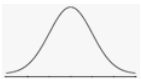
Mean = 5.85, sd =0.24,

Click above, enter 6.

Recalculate

$P(X > 6) = 0.266$

b) Find the middle 20% diameter of mandarin oranges from his farm.



Use Inverse Normal Calculator

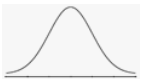
Area = 0.2, Mean = 5.85, sd=0.24

Click Between.

$P(5.79 < X < 5.91) = 0.2$

Ex5. A TV has a life that is normally distributed with a mean of 6.5 years and a standard deviation of 2.3 years. If the company offers a warranty to replace any TV within 3 years. What percent of TV will need to be replaced?

To find percent, use Normal online calculator.



Mean = 6.5 , sd =2.3,

Click below, enter 3.

Recalculate

$P(X < 3) = 0.064 = 6.4\%$

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