Problem 1

The height of a plant is normally distributed and typically is 50 inches with a standard deviation of 2 inches:

PLEASE WRITE DOWN WORK RELATED TO HOW ANSWER OCCURRED

1. State the normal CDF function macro associated with randomly selecting a plant of over a height 52 inches

What is the associated probability with this problem? ________________________________

Mean = 50   st dev = 2

Model P(low<x<high) $=\text{normcdf}(low,high,50,2)$

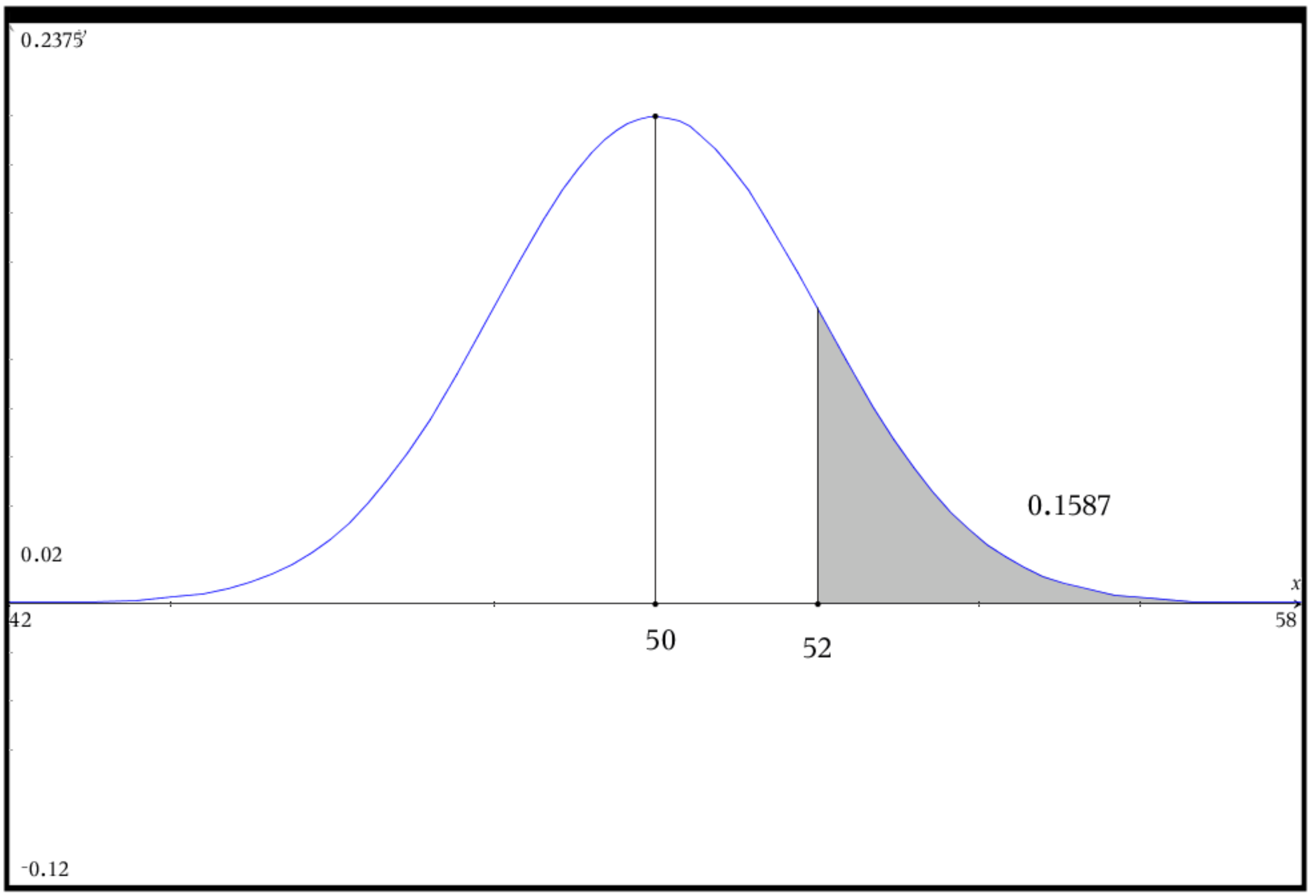
Specific example

Given scenario: randomly selecting a plant of over a height 52 inches implies P(x>52)

P(52<x<large number at least as big as 50+2*3)

P(52<x<100000)=$\text{normCdf}(52,100000,50,2) = 0.158655$

Approximately 15.8655 %



Problem 2

The height of a plant is normally distributed and typically is 50 inches with a standard deviation of 2 inches:

PLEASE WRITE DOWN WORK RELATED TO HOW ANSWER OCCURRED

2. State the normal CDF function macro associated with randomly selecting a plant of under a height 52 inches

What is the associated probability with this problem? ______________________________

Mean = 50   st dev = 2

Model P(low<x<high) $=\text{normcdf}(low,high,50,2)$

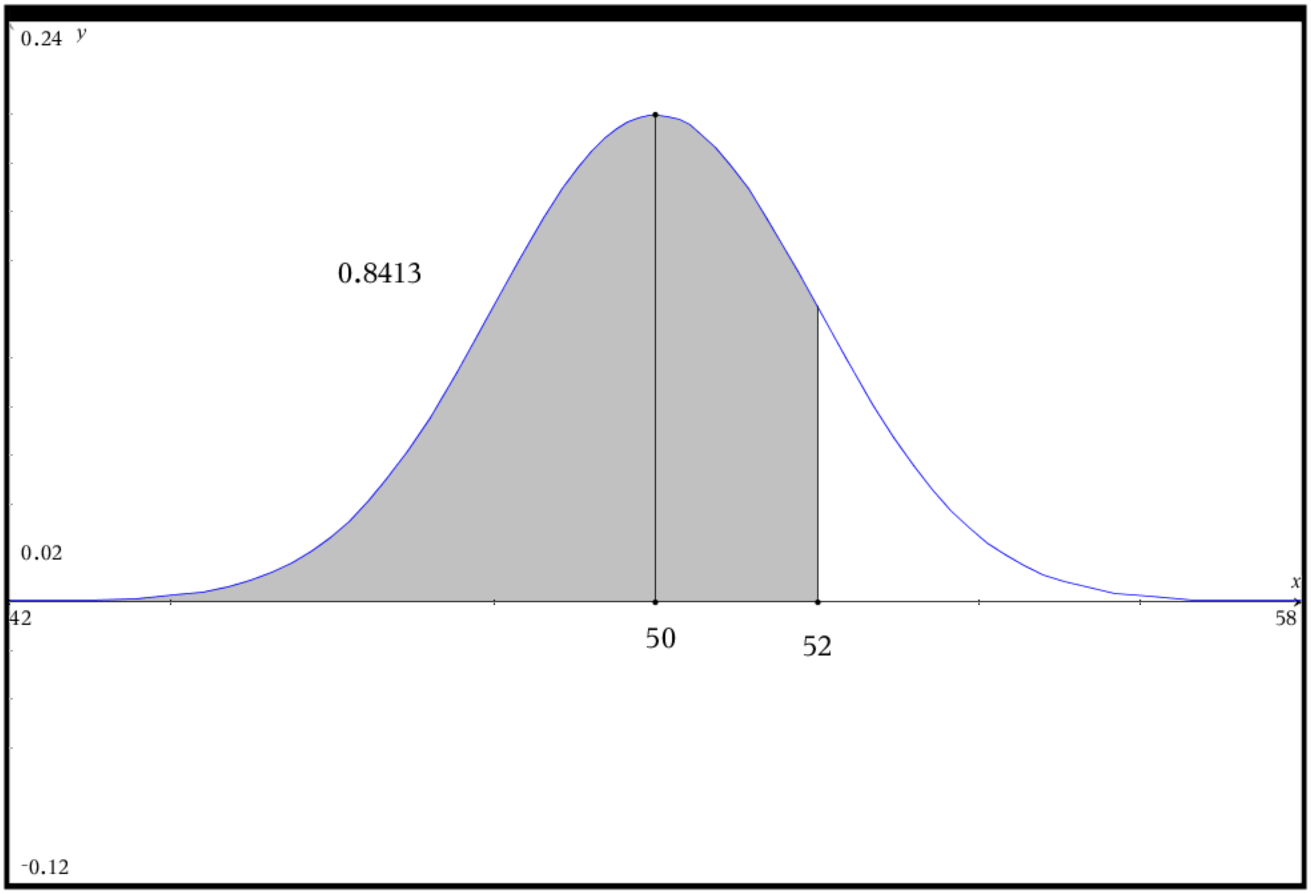
Specific example

Given scenario: randomly selecting a plant at or under a height 52 inches implies P(x<52)

P(small number at least as small as 50−2*3<x<52)

P(−1000<x<52)$=\text{normCdf}(^{-}1000,52,50,2) = 0.841345$

Approximately 84.1345 %



Problem 3

The height of a plant is normally distributed and typically is 50 inches with a standard deviation of 2 inches:

PLEASE WRITE DOWN WORK RELATED TO HOW ANSWER OCCURRED

3. Determine the normal distribution model that can be used to predict the height of a plant of this type

Mean = 50   st dev = 2

Model P(low<x<high) $= \text{normcdf}(low,high,50,2)$

Problem 4

The height of a plant is normally distributed and typically is 50 inches with a standard deviation of 2 inches:

PLEASE WRITE DOWN WORK RELATED TO HOW ANSWER OCCURRED

4. If the “usual range of acceptable plant heights” is within one standard deviation of the mean, then state the “usual” range of heights of this plant

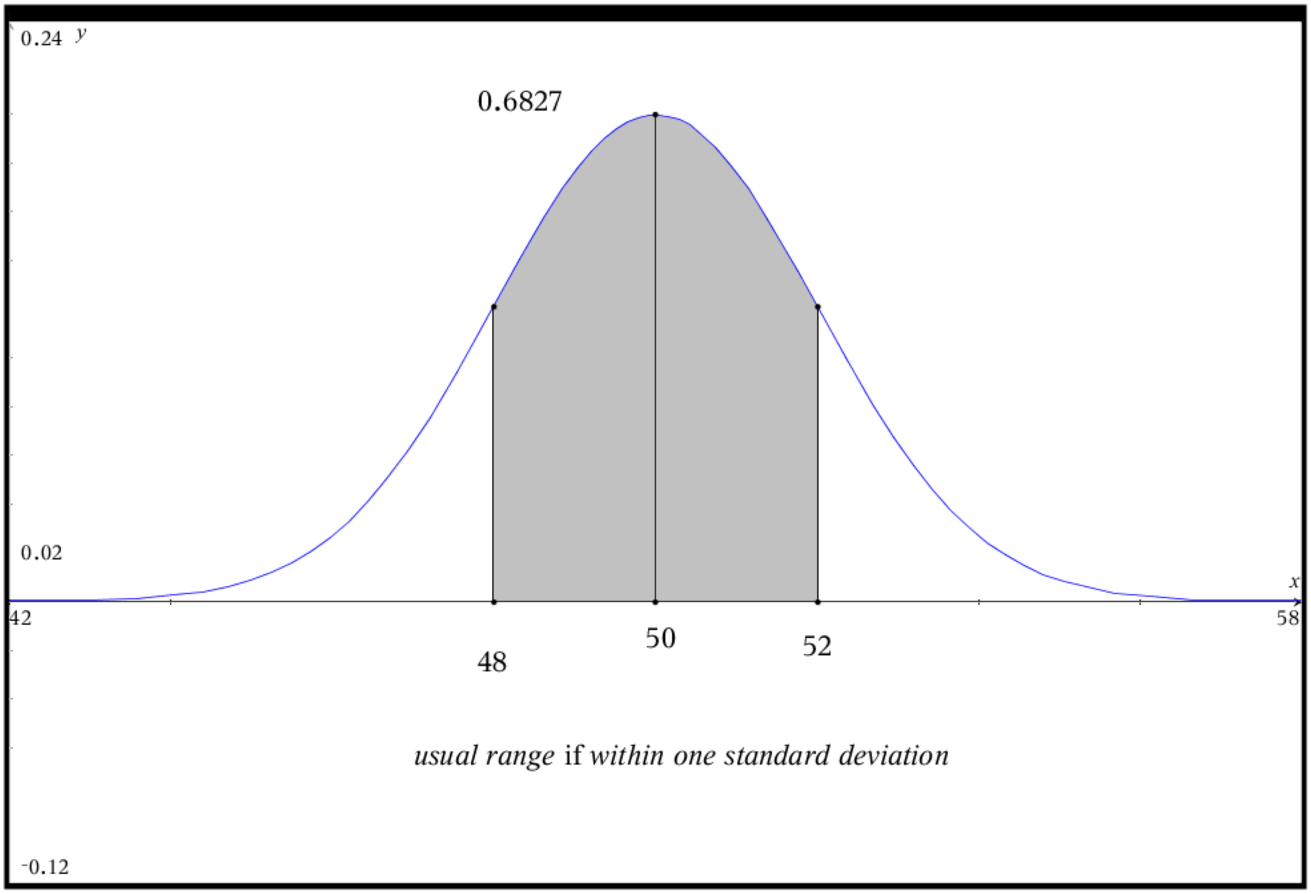
Mean = 50   st dev = 2

Model P(low<x<high) $= \text{normcdf}(low,high,50,2)$

"usual range" in this case means within one standard deviation of mean

50−2 to 50+2

48 to 52



Problem 5

The height of a plant is normally distributed and typically is 50 inches with a standard deviation of 2 inches:

PLEASE WRITE DOWN WORK RELATED TO HOW ANSWER OCCURRED

5. Determine the probability that a plant randomly selected is no more than 53 inches in height

What is the associated probability with this problem? ________________________________

Mean = 50 st dev = 2

Model P(low<x<high) =normcdf$(low,high,50,2)$

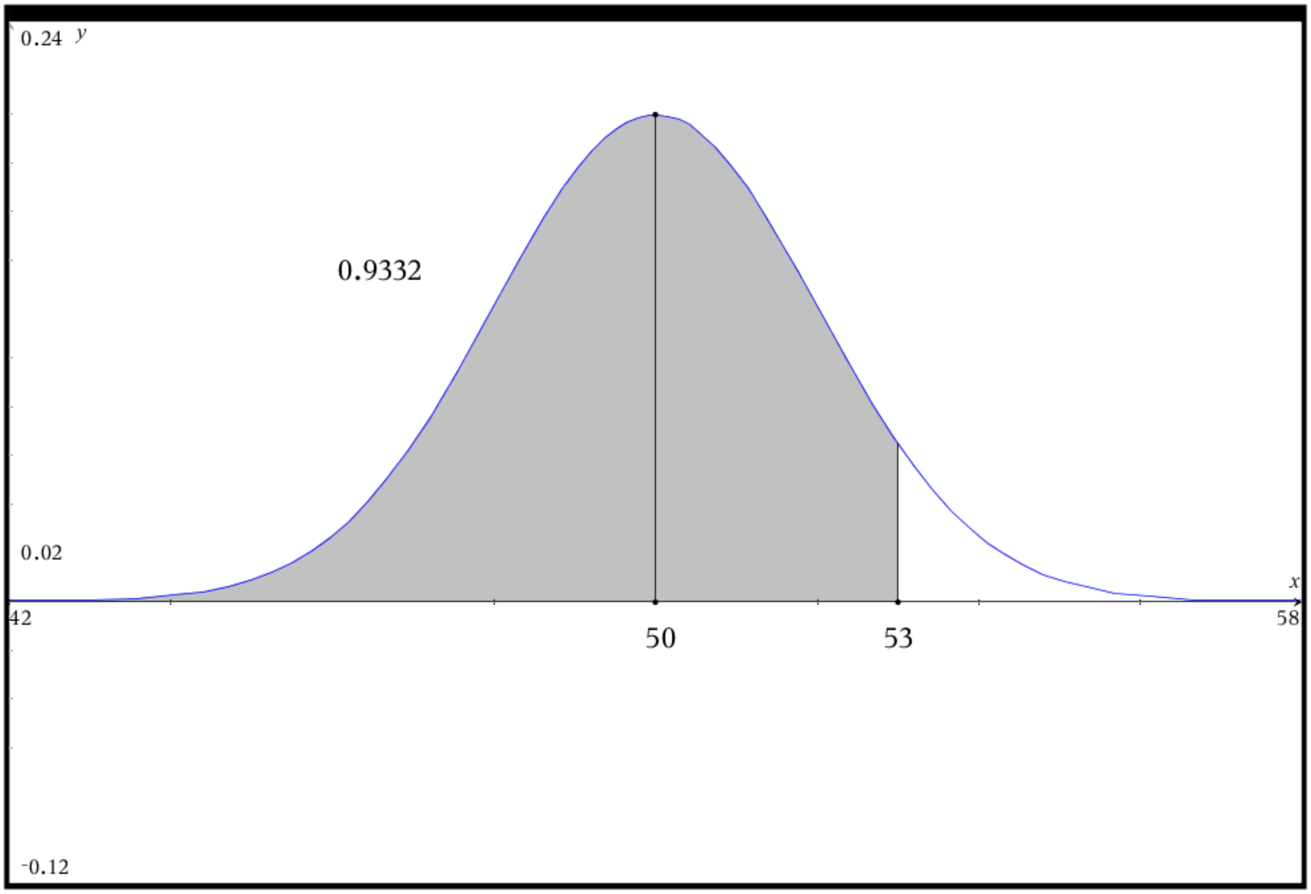
Specific example

Given scenario: randomly selecting a plant of over a height 53 inches implies P(x>52)

P(small number at least as small as 50−2*3<x<53)

P(−1000<x<53)=normCdf$(^{-}1000,53,50,2)$ = 0.933193

Approximately 93.3193 %



Problem 6

The height of a plant is normally distributed and typically is 50 inches with a standard deviation of 2 inches:

PLEASE WRITE DOWN WORK RELATED TO HOW ANSWER OCCURRED

6. Determine the probability that a plant randomly selected is exactly 51 inches in height

SINCE NORMPDF DOES NOT REALLY EXIST we must make a contiuity adjustment by adding 0.5 and subtracting 0.5 from 51 (this could be adjusted differently based on standard deviation)

so low boundary is $51-0.5=50.5$

and high boundary $51+0.5=51.5$

What is the associated probability with this problem? ________________________________

Mean = 50 st dev = 2

Model P(low<x<high) $=\text{normcdf}(low,high,50,2)$

Specific example

Given scenario: randomly selected is exactly 51 inches in height

P(50.5<x<51.5)=$\text{normCdf}(50.5,51.5,50,2)=0.174666$

Approximately 17.4666 %

Problem 7

The height of a plant is normally distributed and typically is 50 inches with a standard deviation of 2 inches:

PLEASE WRITE DOWN WORK RELATED TO HOW ANSWER OCCURRED

7. The company that sells these plants offers a discount for plants in the lowest 8% of "crop" each year, what is the maximum height of a plant that will be offered to its customers at a discount

Mean = 50 st dev = 2

Model P(low<x<high) $=\text{normcdf}(low,high,50,2)$

Inverse Model invnorm(area to left of desired x value,mean, st dev)

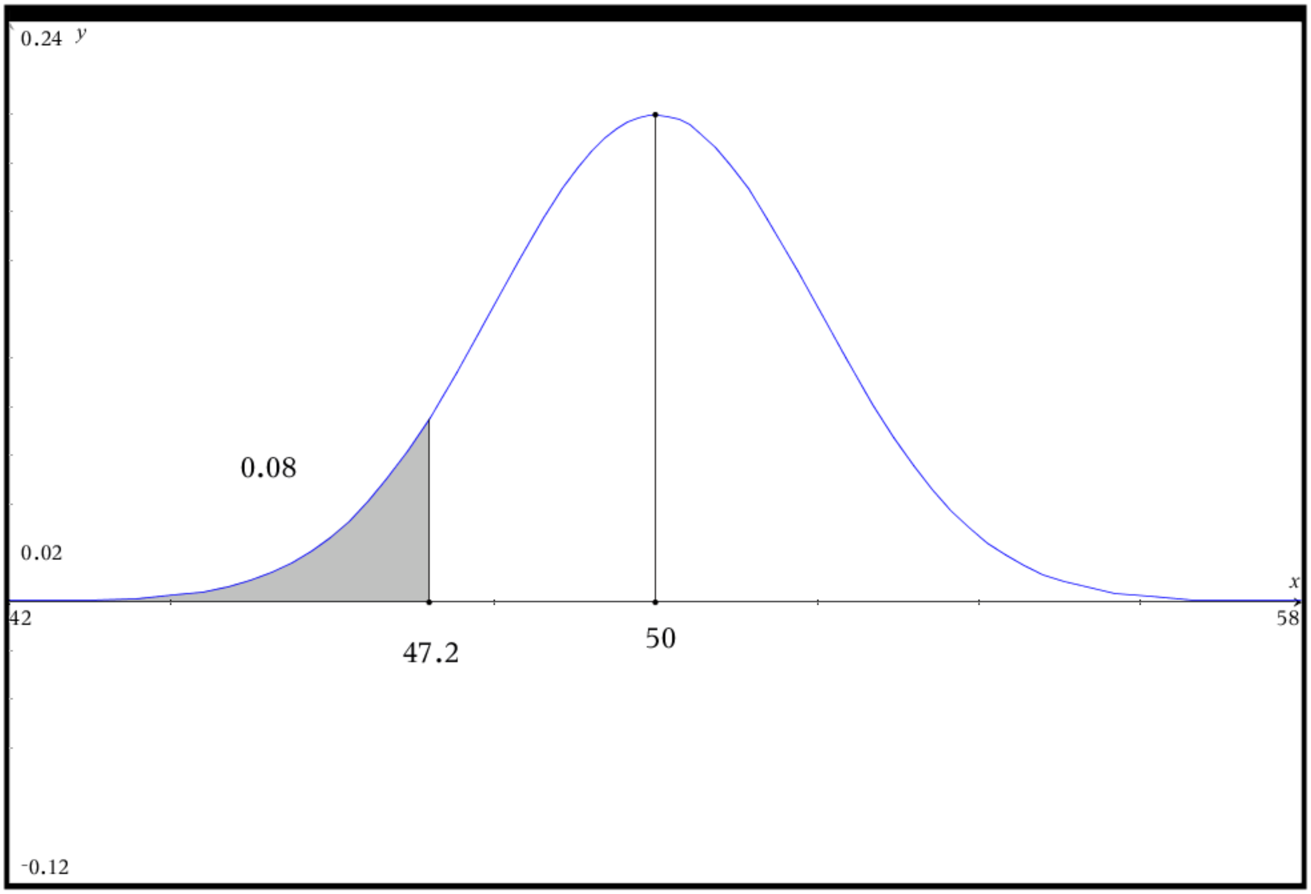
Specific example:

lowest 8% of "crop" each year, what is the maximum height of a plant that will be offered to its customers at a discount

area to left = 0.08

x = $\text{invNorm}(0.08,50,2) \blacktriangleright 47.1899$

So the company would sell all plants that are 47.190 and less at a discount.



Problem 8

The height of a plant is normally distributed and typically is 50 inches with a standard deviation of 2 inches:

PLEASE WRITE DOWN WORK RELATED TO HOW ANSWER OCCURRED

8. The company that sells these plants keeps all plants in the highest 15% of “crop” each year, what is the minimum height of a plant that will be kept by the company

Mean = 50 st dev = 2

Model P(low<x<high) $=\text{normcdf}(low,high,50,2)$

Inverse Model invnorm(area to left of desired x value,mean, st dev)

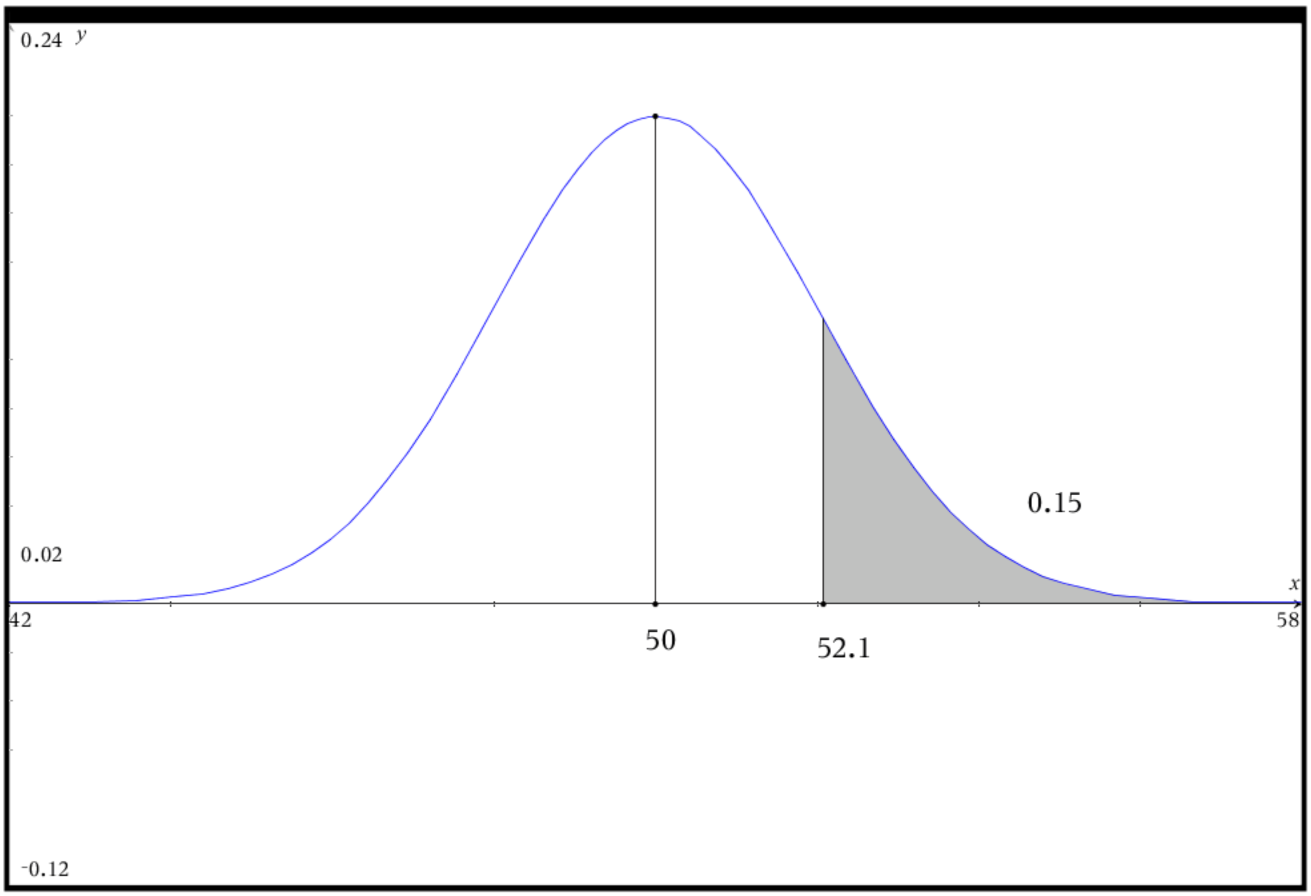
Specific example:

highest 15% of “crop” each year, what is the minimum height of a plant that will be kept by the company

area to right = 0.15 area to the left = $1-0.15 \blacktriangleright 0.85$

x = $\text{invNorm}(0.85,50,2) \blacktriangleright 52.0729$

So the company would keep all plants that are 52.073 and higher



Problem 9

9. If there are 1000 one pound bags of sugar being studied that have a 6% chance of weight exceeding one pound, then answer the following:

We are trying to build a binomial and normal distribution model

binomial will work as normal P(low≤x≤high) =binomcdf(n,p,low, high)

P(x = value) = binompdf(n,p,only value)

NormCdf will need to make an adjustment to accomodate for the conversion from discrete to continuous distribution

P(low−0.5≤x≤high+0.5) =normcdf(low−0.5, high+0.5, np, $\sqrt{npq}$)

Since NO normPDF exists we need to adjust single values as well

P(x=value) =P(value−0.5≤x≤value+0.5) =normcdf(value−0.5, value+0.5, np, $\sqrt{npq}$)

Models P(low≤x≤high) =binomcdf(1000,0.06,low, high)

P(x = value) = binompdf(100,0.06,only value)

P(low−0.5≤x≤high+0.5) =normcdf(low−0.5, high+0.5, 60. ,7.50999)

Note: p = 0.06 implies q = $1-0.06$ ▸ 0.94 n = 1000

mean $=1000\cdot 0.06$ ▸ $60.$ standard deviation $=\sqrt{1000\cdot 0.06\cdot 0.94}$ ▸ 7.50999

9a) Mean of number bags of sugar that exceed a weight of one pound (use np)

mean $=1000\cdot 0.06$ ▸ $60.$

9b) standard deviation $=\sqrt{1000\cdot 0.06\cdot 0.94}$ ▸ 7.50999

9c) usual range (within one standard deviation of mean)

$60-7.51$ ▸ 52.49 to $60+7.51$ ▸ 67.51

So since we are talking about bags of sugar it makes sense that we use
52 to 68 bags

Models P(low≤x≤high) =binomcdf(1000,0.06,low, high)

P(x = value) = binompdf(100,0.06,only value)

P(low−0.5≤x≤high+0.5) =normcdf(low−0.5, high+0.5, 60. ,7.50999)

Note: p = 0.06 implies q = $1-0.06 = 0.94$ $n = 1000$

mean $= 1000 \cdot 0.06 = 60.$ standard deviation $= \sqrt{1000 \cdot 0.06 \cdot 0.94} = 7.50999$

9di) Determine the probability of drawing at most 3 bags of sugar that exceed one pound

P(x≤3)

1. Binomial P(low≤x≤high) =binomCdf(1000,0.06,0,3) = 6.08242E-23

2. Normal P(low−0.5≤x≤high+0.5) =normCdf(-0.5,3.5,60,7.51) = 2.6E-14

Models P(low≤x≤high) =binomcdf(1000,0.06,low, high)

P(x = value) = binompdf(100,0.06,only value)

P(low−0.5≤x≤high+0.5) =normcdf(low−0.5, high+0.5, $1000 \cdot 0.06$, $\sqrt{1000 \cdot 0.06 \cdot 0.94}$)

Note: p = 0.06 implies q = $1-0.06$ $n = 1000$

mean $= 1000 \cdot 0.06$ standard deviation $= \sqrt{1000 \cdot 0.06 \cdot 0.94}$

9dii) Determine the probability of drawing at no less than 4 bags of sugar that exceed one pound

P(x≤3)

1. Binomial P(low≤x≤high) =binomCdf(1000,0.06,4,1000) ≈ 1.

2. Normal P(low−0.5≤x≤high+0.5) =normCdf(3.5,1000.5,60,7.51) ≈ 1.

Models P(low≤x≤high) =binomcdf(1000,0.06,low, high)

P(x = value) = binompdf(100,0.06,only value)

P(low−0.5≤x≤high+0.5) =normcdf(low−0.5, high+0.5, 60. ,7.50999)

Note: p = 0.06 implies q = $1-0.06 = 0.94$ n = 1000

mean $=1000\cdot 0.06 = 60.$ standard deviation $=\sqrt{1000\cdot 0.06\cdot 0.94} = 7.50999$

9diii) Determine the probability of drawing exactly 2 bags of sugar that exceed one pound

P(x≤3)

1. Binomial P(x=value) =binomPdf(1000,0.06,2) ≈ 2.73172E-24

2. Normal P(low−0.5≤x≤high+0.5) =normCdf(1.5,2.5,60,7.51) ≈ 6.E-15

Problem 10

10. What is the Continuity Correction Factor for normal CDF to approximate binomial PDF?

We need to adjust lower boundaries by subtracting 0.5 from lower boundary

We need to adjust higher boundaries by adding 0.5 to the upper boundary