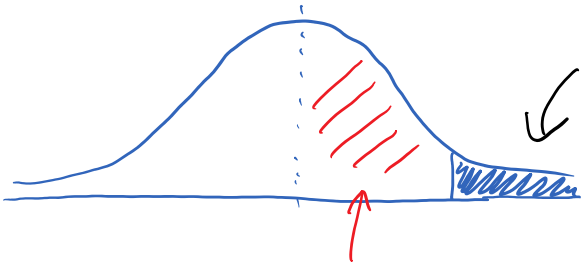
Section 5.4: The Standard Normal Distribution: Finding Values from Probabilities

Wednesday, November 20, 2019 10:32 AM

back to using the standard normal table

previously, I gave you z and asked you to find p

now, I'm giving you p and asking you to find z



cross-hatched area = 0.5 − 0.15
= 0.35

now you need to find this in the table

in table, look for the closest value to 0.35 in the middle of the table

z	0.03	0.04
1.0	0.3485 ↑	0.3508

value we want is between these two

for this course, I will accept any of:

$z = 1.03$
$z = 1.04$
$z = 1.035$

what about:

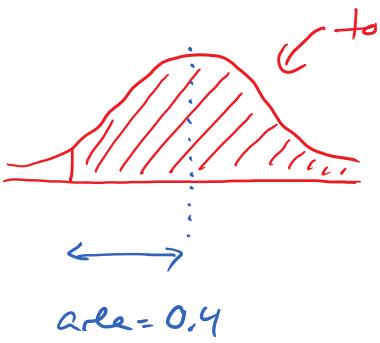
the closest z-score on the table is 0.88

but the z-score in the diagram is negative because it is to the left of zero

so $z = -0.88$

example: Back to our tomato plant example, where $\mu = 35$ mm and $\sigma = 3$ mm.

c) 90% of these tomato plants will have a diameter larger than a certain value. Calculate that value



closest z in table is 1.28

but z is negative:

$z = -1.28$

then $z = \frac{x - \mu}{\sigma}$

$\sigma(z) = \left(\frac{x-\mu}{\sigma}\right)\sigma$

$\sigma z = x - \mu$

$\mu + \sigma z = x \quad \Rightarrow \quad x = \mu + \sigma z$

$= 35 + 3(-1.28)$

$= 31.16$ mm

$=$ 31 mm or 31.2 mm

example: The time it takes a student to write the Stat 157 final is normally distributed with a mean of 2 hours 35 minutes and a standard deviation of 10 minutes.

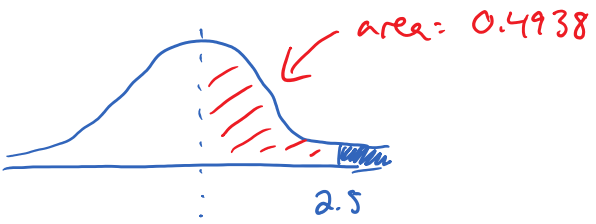
a) what is the probability that a random student will still be writing at the 3 hour mark?

μ = 2h 35 min = 155 min

x = 3h = 180 min

$$z = \frac{x - \mu}{\sigma} = \frac{180 - 155}{10}$$

$$= 2.5$$



$$P = 0.5 - 0.4938$$

$$= 0.0062$$

or 0.6%

b) In a class of 180 students, how many students on average will still be writing at the 3 hour mark?

$$n = 180\,(0.0062)$$

$$= 1.119$$

$$\approx 1 \text{ student}$$

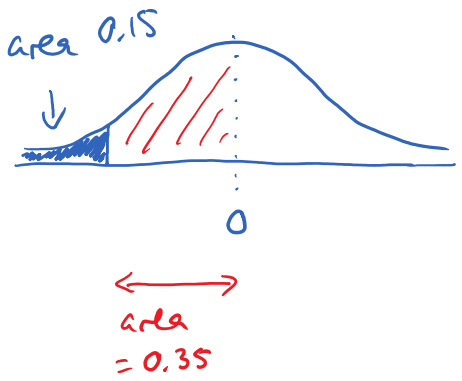
if you insist: $P(E) = \frac{n(E)}{n_{tot}}$

$0.0062 = \frac{n(E)}{180}$

2019/11/21

c) The fastest 15% of students will complete the final in a certain amount of time. Find that time.

μ = 2h 35 min
σ = 10 min



$z = -1.04$

↑ the z is negative because in the diagram, it is to the left of zero

$z = \frac{x - \mu}{\sigma}$

$\sigma(z) = \left(\frac{x - \mu}{\sigma}\right)\sigma$

$\sigma z = x - \mu$

$\mu + \sigma z = x$ $\Rightarrow$ $x = \mu + \sigma z$

$= 155 + 10(-1.04)$

$= 144.6$ min