MATH 140 Check-Up

January 12, 2023

Question 1

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Answer

The first value has standardized value $Z = (12 - 10)/0.5 = 4$, while the second has standardized value $Z = (20 - 10)/5 = 2$, so the first value is more extreme in its distribution.

Question 2

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Answer

$X =$ how many 4s you get when you roll a single die ten times. $Y =$ the weight (in grams) of newborn chicks.

Question 3

Assume 60% of all ripe watermelons at a particular farm weigh more than 20 pounds. We randomly select 10 to sample and find 40% of them weigh more than 20 pounds. (a) Is 60% a parameter or a statistic? (b) Is 40% a parameter or a statistic?

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Answer

(a) parameter; (b) statistic

Question 4

Suppose the diameters of ball-bearing produced at a plant vary normally with mean 1.2 cm and standard deviation 0.05 cm. If you pick a ball-bearing at random, what is the probability that it will have diameter between 1.18 and 1.22 cm?

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Answer

If X = the diameter of a randomly chosen ball-bearing, we want $P(1.18 < X < 1.22)$.
This probability equals $P(z_{low} < Z < z_{high})$ where
$z_{low} = (1.18 - 1.2)/0.05 = -0.4$, and
$z_{high} = (1.22 - 1.2)/0.05 = 0.4$.

Finally, $P(-0.4 < Z < 0.4) =$ `pnorm(0.4)-pnorm(-0.4) = .3108`

Question 5

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Answer

To use CLT, convert everything to proportions.
p = proportion of blue marbles in the box $= 1800/5000 = 0.36$.
We gather a sample of size $n = 200$ and ask for this probability: $P(\hat{p} > 90/200)$
By the CLT, $\hat{p}$ lives in a normal distribution with mean $= p = .36$, and standard deviation $\sqrt{p(1-p)/n} = .03394$.
Now, $90/200 = 0.45$ and the Z-score for 0.45 is $Z = (0.45-0.36)/.03394 = 2.65$.
So we want $P(Z > 2.65) = 1-\texttt{pnorm(2.65)} = .0040$.