

Ch 3 HW Worked Probs

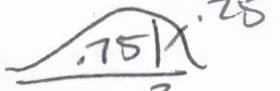
6. (3.14) The total scores on the Medical College Admission Test (MCAT) follow a Normal distribution with mean 24.7 and standard deviation 6.5.

invnorm
 → asking for scores, x-axis values
 What are the median and the first and third quartiles of the MCAT scores? Median=Mean

$Q_1(\pm 0.001) = 20.3158$



$Q_3(\pm 0.001) = 29.0843$

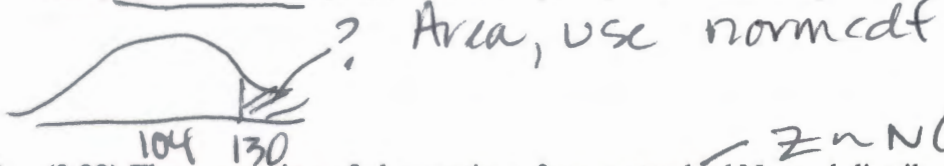


invnorm(.25, 24.7, 6.5)

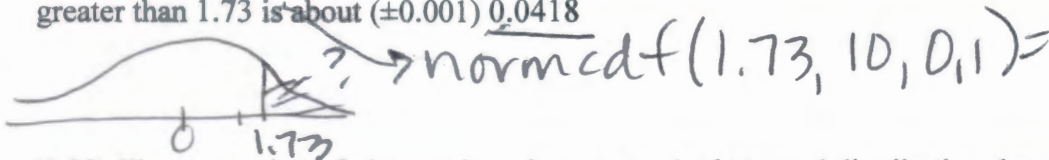
invnorm(.75, 24.7, 6.5)

9. (3.20) According to a study, the scale of scores on an IQ test of adults is approximately Normal with mean 104 and standard deviation 13. The organization MENSAs, which calls itself "the high-IQ society," requires an IQ score of 130 or higher for membership.

What percent of adults ($\pm 0.1\%$) would qualify for membership? 2.3%

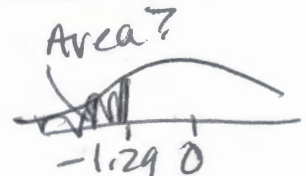


10. (3.22) The proportion of observations from a standard Normal distribution that take values greater than 1.73 is about (± 0.001) 0.0418



11. (3.22) The proportion of observations from a standard Normal distribution that take values less than -1.29 is about (± 0.0001) 0.0985

normcdf(-10, -1.29, 0, 1) =

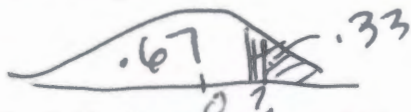


12. (3.29) (a) Use your calculator to find the number z such that the proportion of observations that are less than z in a standard Normal distribution is 0.33. z (± 0.01) = -0.44



invnorm(.33, 0, 1) = -0.44

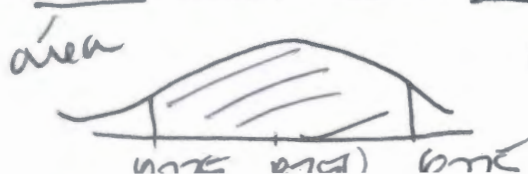
- (b) Find the number z such that 33% of all observations from a standard Normal distribution are greater than z . z (± 0.01) = 0.44



invnorm(.67, 0, 1) = .44
 or use symmetry + ans. to a.

13. (3.33) Automated manufacturing operations are quite precise but still vary, often with distributions that are close to Normal. The width in inches of slots cut by a milling machine follows approximately the $N(0.8750, 0.0013)$ distribution. The specifications allow slot widths between 0.8725 and 0.8775 inch.

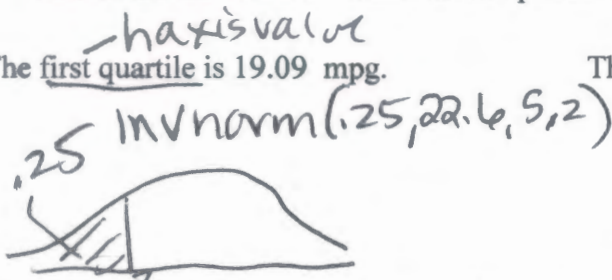
What proportion (± 0.001) of slots meet these specifications (use software)? 0.9456



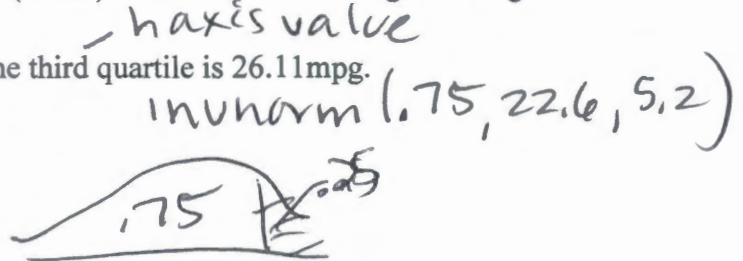
normcdf(.8725, .8775, .8750, .0013) =

14. (3.37) NOTE: The numerical values in this problem have been modified for testing purposes. In its Fuel Economy Guide for 2014 model vehicles, the Environmental Protection Agency gives data on 1160 vehicles. There are a number of high outliers, mainly hybrid gas-electric vehicles. If we ignore the vehicles identified as outliers, however, the combined city and highway gas mileage of the other 1134 vehicles is approximately Normal with mean 22.6 miles per gallon (mpg) and standard deviation 5.2 mpg. The quartiles of any distribution are the values with cumulative proportions 0.25 and 0.75. They span the middle half of the distribution. What are the quartiles (± 0.01) of the distribution of gas mileage?

The first quartile is 19.09 mpg.



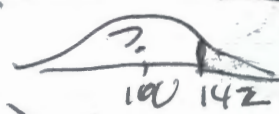
The third quartile is 26.11 mpg.



16. (3.24) The scores of adults on an IQ test are approximately Normal with mean 100 and standard deviation 15. Clara scores 142 on such a test. She scores higher than what percent (± 0.01) of all adults? *Area, % , proportion*
- $normcdf(-1000, 142, 100, 15) =$
- She scores higher than 99.74% of all adults.

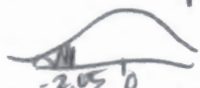
tricky

$1 - normcdf(142, 100, 100, 15) = 1 - 0.00256 = .9974$



17. (3.28) Find the proportion of observations (± 0.0001) from a standard Normal distribution that falls in each of the following regions. In each sketch a standard Normal curve and shade the area representing the region.

(a) $z < -2.05$: 0.0202



$normcdf(-10, -2.05, 0, 1)$

(b) $z > -2.05$: 0.9798



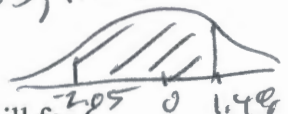
(c) $z > 1.48$: 0.0694



$normcdf(1.48, 10, 0, 1)$

(d) $-2.05 < z < 1.48$: 0.9104

$normcdf(-2.05, 1.48, 0, 1)$



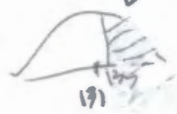
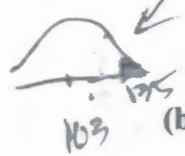
18. (3.32) In a study of exercise, a large group of male runners walk on a treadmill for 6 minutes. Their heart rates in beats per minute at the end vary from runner to runner according to the $N(103, 13)$ distribution. The heart rates for male nonrunners after the same exercise have the $N(131, 17.3)$ distribution.

- (a) What percent (± 0.1) of the runners have heart rates above 135 (use software)? 0.69%

$normcdf(135, 1000, 103, 13) = .0069 = .69\%$

- (b) What percent (± 0.1) of the nonrunners have heart rates above 135 (use software)? 40.86%

$normcdf(135, 1000, 131, 17.3) = .4086 = 40.86\%$



19. (3.36) NOTE: The numerical values in this problem have been modified for testing purposes. In its Fuel Economy Guide for 2014 model vehicles, the Environmental Protection Agency gives data on 1160 vehicles. There are a number of high outliers, mainly hybrid gas-electric vehicles. If we ignore the vehicles identified as outliers, however, the combined city and highway gas mileage of the other 1134 vehicles is approximately Normal with mean 23 miles per gallon (mpg) and standard deviation 5.2 mpg. How high must a 2014 vehicle's gas mileage (± 0.01) be to fall in the top 10% of all vehicles? *maxis value*

Gas mileage = 29.66mpg

$$\text{INVNORM}(.9, 23, 5.2) =$$



20. (3.38) NOTE: The numerical values in this problem have been modified for testing purposes.

In its Fuel Economy Guide for 2014 model vehicles, the Environmental Protection Agency gives data on 1160 vehicles. There are a number of high outliers, mainly hybrid gas-electric vehicles. If we ignore the vehicles identified as outliers, however, the combined city and highway gas mileage of the other 1134 vehicles is approximately Normal with mean 22.9 miles per gallon (mpg) and standard deviation 5.2 mpg.

The quintiles of any distribution are the values with cumulative proportions 0.20, 0.40, 0.60, and 0.80. What are the quintiles of the distribution of gas mileage?

The first quintile is (± 0.01 mpg) 18.5237 mpg. $\text{INVNORM}(.2, 22.9, 5.2)$

The second quintile is (± 0.01 mpg) 21.5828mpg. $\text{INVNORM}(.4, 22.9, 5.2)$

The third quintile is (± 0.01 mpg) 24.2172mpg. $\text{INVNORM}(.6, 22.9, 5.2)$

The fourth quintile is (± 0.01 mpg) 27.2763mpg. $\text{INVNORM}(.8, 22.9, 5.2)$

