

1. (10 pts) The stem-and-leaf plot below shows the number of years in the U.S. Senate for each of the current senators. The diagram is a bit too long and narrow. Improve upon it by redrawing it as a histogram using *more than 5* classes.

Stem	Leaf
0	0000000000012222222224444444445566666667888888
1	00000000000112234444445556888
2	00000022224666889
3	002449
4	458

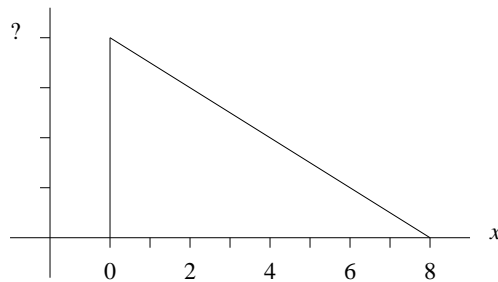
Note: 1|2 represents 12 years.

2. (18 pts) Using the data and graphs of the previous problem, do the following.
- (6 pts) Find a five-number summary of the data.
 - (6 pts) Draw a modified boxplot of the data.
 - (3 pts) Describe the shape of the distribution, using statistical terminology.
 - (3 pts) If Senator Robert Byrd (48 years in the Senate) were to suddenly retire and be replaced by a new senator, would the resulting distribution have a greater or a smaller standard deviation? Explain.
3. (16 pts) A sample of 12 used-car ads in the newspaper had the following asking prices:

6400, 5000, 8000, 5000, 32500, 26900,
36400, 22900, 1500, 5750, 28900, 19000

- (4 pts) Find the mean of the sample.
 - (4 pts) Find the standard deviation of the sample.
 - (4 pts) Find the standard score (z -score) of 8000.
 - (4 pts) Suppose we consider an outlier to be any value whose z -score is greater than 2.5 or less than -2.5 . Does this set have any outliers? Justify your answer.
4. (8 pts) For the standard normal random variable Z , find the following.
- (4 pts) $P(-2.45 < Z < 1.32)$.
 - (4 pts) The 45th percentile.

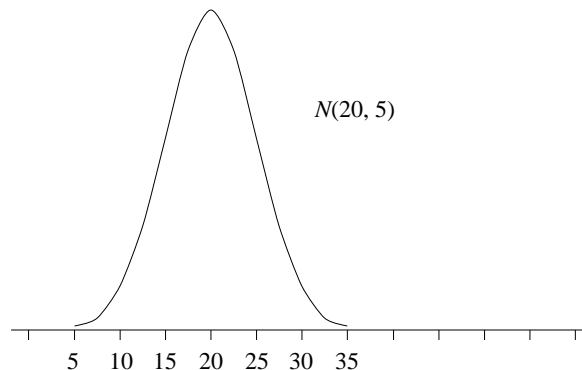
5. (16 pts) Suppose that the population of all IQ scores has a normal distribution with a mean of 100 and a standard deviation of 15.
- (4 pts) What proportion of the population has an IQ score between 90 and 120?
 - (4 pts) What proportion of the population has an IQ score greater than 120?
 - (4 pts) Find the first quartile of IQ scores.
 - (4 pts) To attract the best and the brightest, a certain college decides to give a full scholarship to anyone whose IQ score is in the top 5% of the population. What is the lowest IQ score that will win a full scholarship from this college?
6. (8 pts) Let X be a random variable whose probability distribution function is shown in the graph below.
- (2 pts) What is the height of the graph (at the peak)?
 - (6 pts) Find the probability that X is between 2 and 4.

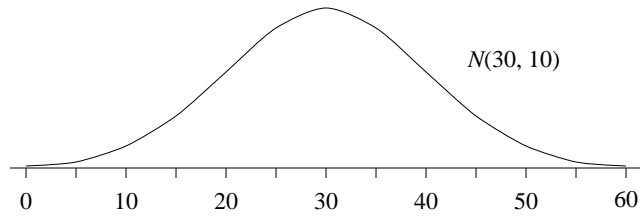


7. (12 pts) The distribution of a random variable X is either $N(20, 5)$ or $N(30, 10)$. The graphs of the two distributions are shown below. A researcher must decide which is the correct distribution. Let the two hypotheses be

$$H_0: X \text{ is } N(20, 5).$$

$$H_1: X \text{ is } N(30, 10).$$





Sampling from this population is extremely expensive, so the researcher will base his decision on a single observation. By selecting one value of X , he will decide which distribution he believes is correct. If the selected value is less than 25, he will accept H_0 . Otherwise, he will reject H_0 .

- (a) (4 pts) Find the value of α .
 - (b) (4 pts) Find the value of β .
 - (c) (4 pts) Find the p -value of 30.
8. (12 pts) Suppose that the proportion of males in a population is $p = 0.60$.
- (a) (9 pts) Find the sampling distribution of \hat{p} for samples of size $n = 2$. Use a table to describe the distribution.
 - (b) (3 pts) If one random sample of size 2 is taken, what is the probability that $\hat{p} = 1/2$?