

*At the top of your write-up, you must also write a statement attesting that you have at least thought about all assigned problems. Points will be deducted if you do not write this statement. This does not mean that you solved all of the problems — just that you gave some thought about how to solve every problem. For the sake of preparing for the state certification exam, as well as for your own integrity, I'd prefer that you are honest when writing this statement.*

**Problem 15.1**

- Ten people in a room have an average height of 5 feet 6 inches. Another person, who is 6 feet 5 inches tall, enters the room. Find the average height of all 11 people.
- Repeat the previous problem if there were initially 20 people in the room with an average height of 5 feet 6 inches.

**Problem 15.2** For registered students at universities in the U.S., which is larger: average age or median age? Explain your answer, but no computations are required to answer this question.

**Problem 15.3** In a public health study, 11-year-old boys were found to have an average height of 146 cm with a SD of 8 cm. About what percentage of these boys had heights between 138 cm and 154 cm? Between 130 and 162 cm?

**Problem 15.4** Each of the following lists has an average of 50. Without doing any calculations, guess whether the SD is around 1, 2, or 10. Then check your guess by computing the SDs.

- 48, 51, 49, 52, 47, 52, 46, 51, 53, 51
- 51, 49, 50, 49, 51, 50, 48, 50, 49, 49
- 60, 36, 31, 50, 48, 50, 54, 56, 62, 53

**Problem 15.5**

- The governor of California proposes to give all state employees a flat raise of \$250 per month. What would this do to the average monthly salary of state employees? to the SD?
- Repeat the previous problem if the state employees are instead given a 5% increase in salary.

**Problem 15.6** Can a SD ever be negative? Explain your answer.

**Problem 15.7** An investigator has a computer file show family incomes for 1,000 subjects in a certain study. These range from \$15,800 a year to \$198,600 a year. By accident, the highest income gets changed to \$1,986,000.

- Does this affect the median? If so, by how much?
- Does this affect the average? If so, by how much?

**Problem 15.8** On the Math SAT, men have a distinct edge. In 2005, for instance, the men averaged about 538, and the women averaged about 504. You may assume that the histogram approximated followed the normal curve, and the both SDs are about 120.

- Estimate the percentage of men getting over 700 on this test in 2005.
- Estimate the percentage of women getting over 700 on this test in 2005.

**Problem 15.9** A deck of cards is shuffled and the top two cards are placed face down on a table. True or false, and explain:

- The chance that the first card is the ace of clubs is  $1/52$ .
- The chance that the second card is the ace of hearts is  $1/52$ .
- The chance that the first card is the ace of clubs and the second card is the ace of hearts is  $1/52 \times 1/52$ .

**Problem 15.10** A die is rolled four times. What is the chance that:

- All the rolls show 3 or more spots?
- None of the rolls show 3 or more spots?
- At least one roll has 3 or more spots?
- Not all of the rolls show 3 or more spots?
- The four rolls are the same?
- The four rolls are all different?

**Problem 15.11** Three cards are dealt from a well-shuffled deck.

- Find the chance that all of the cards are diamonds.
- Find the chance that none of the cards are diamonds.
- Find the chance that the cards are not all diamonds.
- Find the chance that the cards are of different suits.

**Problem 15.12** Suppose  $E$  and  $F$  are disjoint events with  $P(E) = 0.2$  and  $P(F) = 0.5$ .

- Find the probability that both  $E$  and  $F$  occur.
- Find the probability that either  $E$  or  $F$  occur.
- Find the probability that  $F$  occurs and  $E$  does not occur.
- Find the probability that neither occurs.

**Problem 15.13** Repeat the previous problem if  $E$  and  $F$  are independent instead of disjoint.

**Problem 15.14** A survey of students at a certain college showed that 60% of them read a daily newspaper and 40% read of weekly news magazine. Also, if a student reads a daily newspaper, then the chance of reading a weekly news magazine rose to 50%.

- What percentage of students read both?
- What percentage of students read at least one?
- What percentage of students read neither?

**Problem 15.15** Sketch a Venn diagram if  $P(E) = 0.35$ ,  $P(F) = 0.55$ , and  $P(E \cup F) = 0.75$ . Then find the following:

- $P(E \cap F)$
- $P(E \cap F')$
- $P(E' \cap F)$
- $P((E \cup F)')$