Answer: No, because

$$\sum P_i = 1.2.$$

4. In a standard normal distribution, what is $P(z > 0.5)$?

   Answer: From the table, we see that $P(z < 0.5) = 0.6915$. Hence, $P(z > 0.5) = 1 - 0.6915 = 0.3085$. By calculator, `normalcdf (0.5,100)` = 0.3085375322.

5. A random variable X has $N(13,0.45)$. Describe the distribution of $2 - 4X$ (that is, each datapoint in the distribution is multiplied by 4, and that value is subtracted from 2).

   Answer: We are given that the distribution of X is normal with $\mu_X = 13$ and $\sigma_X = 0.45$. Because $\mu_{a \pm bX} = a \pm b\mu_X$, $\mu_{2-4X} = 2 - 4\mu_X = 2 - 4(13) = -50$. Also, because $\sigma_{a \pm bX} = b\sigma_X$, $\sigma_{2-4X} = 4\sigma_X = 4(0.45) = 1.8$.

Practice Problems

Multiple Choice

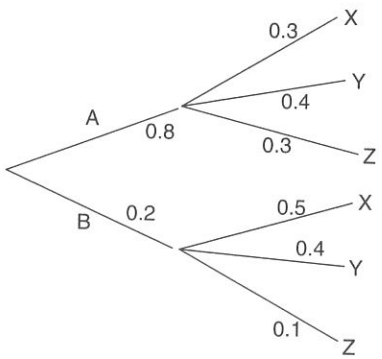
1.

	D	E	Total
A	15	12	27
B	15	23	38
C	32	28	60
Total	62	63	125

In the table above what are $P(\text{A and E})$ and $P(C \mid E)$?

(a) 12/125, 28/125
(b) 12/63, 28/60
(c) 12/125, 28/63
(d) 12/125, 28/60
(e) 12/63, 28/63

2.



For the tree diagram pictured above, what is $P(\text{B} \mid \text{X})$?

(a) 1/4
(b) 5/17
(c) 2/5
(d) 1/3
(e) 4/5

3. It turns out that 25 seniors at Fashionable High School took both the AP Statistics exam and the AP Spanish Language exam. The mean score on the Statistics exam for the 25 seniors was 2.4 with a standard deviation of 0.6 and the mean score on the Spanish Language exam was 2.65 with a standard deviation of 0.55. We want to combine the scores into a single score. What are the correct mean and standard deviation of the combined scores?

   (a) 5.05; 1.15
   (b) 5.05; 1.07
   (c) 5.05; 0.66
   (d) 5.05; 0.81
   (e) 5.05; you cannot determine the standard deviation from this information.

4. The GPA (grade point average) of students who take the AP Statistics exam are approximately normally distributed with a mean of 3.4 with a standard deviation of 0.3. Using Table A, what is the probability that a student selected at random from this group has a GPA lower than 3.0?

   (a) 0.0918
   (b) 0.4082
   (c) 0.9082
   (d) −0.0918
   (e) 0

5. The 2000 Census identified the ethnic breakdown of the state of California to be approximately as follows: White: 46%, Latino: 32%, Asian: 11%, Black: 7%, and Other: 4%. Assuming that these are mutually exclusive categories (this is not a realistic assumption, especially in California), what is the probability that a random selected person from the state of California is of Asian or Latino descent?

   (a) 46%
   (b) 32%
   (c) 11%
   (d) 43%
   (e) 3.5%

6. The students in problem #4 above were normally distributed with a mean GPA of 3.4 and a standard deviation of 0.3. In order to qualify for the school honor society, a student must have a GPA in the top 5% of all GPAs. Accurate to two decimal places, what is the minimum GPA Norma must have in order to qualify for the honor society?

   (a) 3.95
   (b) 3.92
   (c) 3.75
   (d) 3.85
   (e) 3.89

7. The following are the probability distributions for two random variables, X and Y:

X	$P(X = x)$
3	$\frac{1}{3}$
5	$\frac{1}{2}$
7	$\frac{1}{6}$

Y	$P(Y = y)$
1	$\frac{1}{8}$
3	$\frac{3}{8}$
4	?
5	$\frac{3}{16}$

If X and Y are independent, what is $P(X = 5 \text{ and } Y = 4)$?

(a) $\frac{5}{16}$

(b) $\frac{13}{16}$

(c) $\frac{5}{32}$

(d) $\frac{3}{32}$

(e) $\frac{3}{16}$

8. The following table gives the probabilities of various outcomes for a gambling game.

Outcome	Lose \$1	Win \$1	Win \$2
Probability	0.6	0.25	0.15

What is the player's expected return on a bet of \$1?

(a) \$0.05

(b) –\$0.60

(c) –\$0.05

(d) –\$0.10

(e) You can't answer this question since this is not a complete probability distribution.

9. You own an unusual die. Three faces are marked with the letter "X," two faces with the letter "Y," and one face with the letter "Z." What is the probability that at least one of the first two rolls is a "Y"?

(a) $\frac{1}{6}$

(b) $\frac{2}{3}$

(c) $\frac{1}{3}$

(d) $\frac{5}{9}$

(e) $\frac{2}{9}$

10. You roll two dice. What is the probability that the sum is 6 given that one die shows a 4?

(a) $\frac{2}{12}$

(b) $\frac{2}{11}$

(c) $\frac{11}{36}$

(d) $\frac{2}{36}$

(e) $\frac{12}{36}$

Free Response

1. Find μ_X and σ_X for the following discrete probability distribution:

X	2	3	4

3. Consider a set of 9000 scores on a national test that is known to be approximately normally distributed with a mean of 500 and a standard deviation of 90.
   (a) What is the probability that a randomly selected student has a score greater than 600?
   (b) How many scores are there between 450 and 600?
   (c) Rachel needs to be in the top 1% of the scores on this test to qualify for a scholarship. What is the minimum score Rachel needs?

4. Consider a random variable X with $\mu_X = 3$, $\sigma_X^2 = 0.25$. Find
   (a) μ_{3+6X}
   (b) σ_{3+6X}

5. Harvey, Laura, and Gina take turns throwing spit-wads at a target. Harvey hits the target 1/2 the time, Laura hits it 1/3 of the time, and Gina hits the target 1/4 of the time. Given that somebody hit the target, what is the probability that it was Laura?

6. Consider two discrete, independent, random variables X and Y with $\mu_X = 3$, $\sigma_X^2 = 1$, $\mu_Y = 5$, and $\sigma_Y^2 = 1.3$. Find μ_{X-Y} and σ_{X-Y}.

7. Which of the following statements is (are) true of a normal distribution?
   I. Exactly 95% of the data are within two standard deviations of the mean.
   II. The mean = the median = the mode.
   III. The area under the normal curve between $z = 1$ and $z = 2$ is greater than the area between $z = 2$ and $z = 3$.

8. Consider the experiment of drawing two cards from a standard deck of 52 cards. Let event A = "draw a face card on the first draw," B = "draw a face card on the second draw," and C = "the first card drawn is a diamond."
   (a) Are the events A and B *independent?*
   (b) Are the events A and C *independent?*

9. A normal distribution has mean 700 and standard deviation 50. The probability is 0.6 that a randomly selected term from this distribution is above x. What is x?

10. Suppose 80% of the homes in Lakeville have a desktop computer and 30% have both a desktop computer and a laptop computer. What is the probability that a randomly selected home will have a laptop computer given that it has a desktop computer?

11. Consider a probability density curve defined by the line $y = 2x$ on the interval [0,1] (the area under $y = 2x$ on [0,1] is 1). Find $P(0.2 \le X \le 0.7)$.

12. Half Moon Bay, California, has an annual pumpkin festival at Halloween. A prime attraction to this festival is a "largest pumpkin" contest. Suppose that the weights of these giant pumpkins are approximately normally distributed with a mean of 125 pounds and a standard deviation of 18 pounds. Farmer Harv brings a pumpkin that is at the 90% percentile of all the pumpkins in the contest. What is the approximate weight of Harv's pumpkin?

13. Consider the following two probability distributions for independent discrete random variable X and Y:

X	2	3	4
$P(X)$	0.3	0.5	?

Y	3	4	5	6
$P(Y)$	?	0.1	?	0.4

If $P(X = 4 \text{ and } Y = 3) = 0.03$, what is $P(Y = 5)$?

14. A contest is held to give away a free pizza. Contestants pick an integer at random from the integers 1 through 100. If the number chosen is divisible by 24 or by 36, the contestant wins the pizza. What is the probability that a contestant wins a pizza?

Use the following excerpt from a random number table for questions 15 and 16:

79692	51707	73274	12548	91497	11135	81218	79572	06484	87440
41957	21607	51248	54772	19481	90392	35268	36234	90244	02146
07094	31750	69426	62510	90127	43365	61167	53938	03694	76923
59365	43671	12704	87941	51620	45102	22785	07729	40985	92589
91547	03927	92309	10589	22107	04390	86297	32990	16963	09131

15. Men and women are about equally likely to earn degrees at City U. However, there is some question whether or not women have equal access to the prestigious School of Law. This year, only 4 of the 12 new students are female. Describe and conduct five trials of a simulation to help determine if this is evidence that women are under represented in the School of Law.

16. Suppose that, on a planet far away, the probability of a girl being born is 0.6, and it is socially advantageous to have three girls. How many children would a couple have to have, on average, until they have three girls? Describe and conduct five trials of a simulation to help answer this question.

17. Consider a random variable X with the following probability distribution:

X	20	21	22	23	24
$P(X)$	0.2	0.3	0.2	0.1	0.2

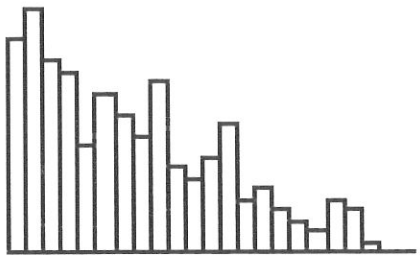
(a) Find $P(X \leq 22)$.
(b) Find $P(X > 21)$.
(c) Find $P(21 \leq X < 24)$.
(d) Find $P(X \leq 21 \text{ or } X > 23)$.

18. In the casino game of roulette, a ball is rolled around the rim of a circular bowl while a wheel containing 38 slots into which the ball can drop is spun in the opposite direction from the rolling ball; 18 of the slots are red, 18 are black, and 2 are green. A player bets a set amount, say \$1, and wins \$1 (and keeps her \$1 bet) if the ball falls into the color slot the player has wagered on. Assume a player decides to bet that the ball will fall into one of the red slots.

(a) What is the probability that the player will win?

Cumulative Review Problems

1. Consider the following histogram:



Which of the following statements is true and why?

I. The mean and median are approximately the same value.
II. The mean is probably greater than the median.
III. The median is probably greater than the mean.

2. You are going to do an opinion survey in your school. You can sample 100 students and desire that the sample accurately reflects the ethnic composition of your school. The school data clerk tells you that the student body is 25% Asian, 8% African American, 12% Latino, and 55% Caucasian. How could you sample the student body so that your sample of 100 would reflect this composition and what is such a sample called?

3. The following data represent the scores on a 50-point AP Statistics quiz:
46, 36, 50, 42, 46, 30, 46, 32, 50, 32, 40, 42, 20, 47, 39, 32, 22, 43, 42, 46, 48, 34, 47, 46, 27, 50, 46, 42, 20, 23, 42

Determine the five-number summary for the quiz and draw a box plot of the data.

4. The following represents some computer output that can be used to predict the number of manatee deaths from the number of powerboats registered in Florida.

Predictor	Coef	St Dev	*t* ratio	*P*
Constant	−41.430	7.412	−5.59	.000
Boats	0.12486	0.01290	9.68	.000

(a) Write the least-square regression line for predicting the number of manatee deaths from the number of powerboat registrations.
(b) Interpret the slope of the line in the context of the problem.

5. Use the *empirical rule* to state whether it seems reasonable that the following sample data could have been drawn from a normal distribution: 12.3, 6.6, 10.6, 9.4, 9.1, 13.7, 12.2, 9, 9.4, 9.2, 8.8, 10.1, 7.0, 10.9, 7.8, 6.5, 10.3, 8.6, 10.6, 13, 11.5, 8.1, 13.0, 10.7, 8.8.