1) Suppose a couple is planning on have 4 children. Assuming the probability of having a boy and girl is equal, what is the probability that the couple will have 0 boys out of the 4 children?
(a) 1/4  (b) 1/8  (c) 1/16  (d) 1/32  (e) 1/64

A continuous distribution is uniformly spread across a number line from 0 to 4. The height is even between those values, and 0 everywhere else. Use this fact to answer questions 2 and 3.

2) Find P(0.3 < X < 0.8)
(a) 0.4  (b) 0.5  (c) 0.125  (d) 0.25  (e) 0.0

3) Find P(X = 0.9)
(a) 0.9  (b) 0.225  (c) 0.125  (d) 0.1  (e) 0.0

4) Ten zombies walk into a bar. The zombies are 3 times as likely to order a Coke over a Sprite. These are the only two drinks a zombie ever orders. What is the probability that exactly seven out of the ten order a Coke?
(a) 0.5256  (b) 0.4744  (c) 0.3  (d) 0.25  (e) 0.009

5) In a recent poll done by CNN on the presidential election, voters were asked who they planned to vote on and could pick from only three choices: Obama, Romney, or other/undecided (one choice). If CNN were to ask only 4 potential voters who they planned to vote on this elections, how many possible different outcomes would there be?
(a) 8  (b) 81  (c) 256  (d) 12  (e) Not enough information

6) Scores on the SATs from 2009 are approximately Normally distributed. The SAT math section had μ = 460 with a σ = 165.6. The SAT verbal section had μ = 535 with a σ = 117.1. Find the probability that a randomly selected student from 2009 scored at least a 700 on the Math section?
(a) 202.82  (b) 0.927  (c) 0.118  (d) 0.074  (e) 0.079

7) Jimmy and Steve’s 40 yard dash times when plotted are both approximately Normally distributed. Jimmy runs the 40 yard dash with a mean of 5.4 seconds with a standard deviation of 0.8. Steve runs the 40 yard dash with a mean of 4.95 with a standard deviation of 0.9. Find the probability that if Jimmy and Steve ran against each other that Jimmy would win by at least 0.2 seconds.
(a) 0.418  (b) 0.295  (c) 0.705  (d) 0.582  (e) 0.102

8) Let the random variable X represent the amount of money Dan makes doing lawn care in a randomly selected week in the summer. Assume that X is Normal with mean $240 and standard deviation $60. The probability is approximately 0.6 that, in a randomly selected week, Dan will make less than
(a) $144  (b) $216  (c) $255  (d) $360  (e) The answer cannot be determined from the information given.
9) An insurance company has estimated the following cost probabilities for the next year on a particular model of car:

<table>
<thead>
<tr>
<th>Cost</th>
<th>$0</th>
<th>$500</th>
<th>$1000</th>
<th>$2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>0.60</td>
<td>0.05</td>
<td>0.13</td>
<td>?</td>
</tr>
</tbody>
</table>

The expected cost to the insurance company is (approximately)
(a) $0, because it has the highest probability.
(b) $595.
(c) $875.
(d) $645.
(e) Missing information needed to solve.

12) A business evaluates a proposed venture as follows. It stands to make a profit of $10,000 with probability 3/20, to make a profit of $5000 with probability 9/20, to break even with probability 1/4, and to lose $5000 with probability 3/20. The expected profit in dollars is

(a) $1500 (b) $0 (c) $3000 (d) $3250 (e) $ -1500

13) A random variable X has a probability distribution as follows:

<table>
<thead>
<tr>
<th>X</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>P(X)</td>
<td>2k</td>
<td>3k</td>
<td>13k</td>
<td>2k</td>
</tr>
</tbody>
</table>

Then the probability that P(X < 2.0) is equal to

(a) 0.90. (b) 0.25. (c) 0.65. (d) 0.15. (e) 1.00.

14) In 2010, the ACT test scores followed an approximately Normal distribution. The scores that year had a mean of 16.3. A score of 19.8 put a student in the top 15% of all scores nationally. What is the standard deviation of the 2010 ACT scores?

(a) 3.5 (b) -3.5 (c) 1.036 (d) 3.38 (e) .85

15) A survey of Sun Valley high school students is taken on whether or not math is their favorite subject. Of those students surveyed, 58% of the students said “Yes” that math is their favorite subject. What is the probability that if 3 students are asked that at least 2 of the 3 say “Yes”.

(a) .619 (b) .141 (c) .195 (d) .42 (e) Impossible, 100% of students would say “yes”

18) The probability of obtaining a z-score between -2 and 2 is:

(a) 68% (b) 96% (c) 97% (d) 95% (e) 99.7%

19) You have two balanced six-sided dice. The first has faces of 2, 4, 5, 7, 9, 9. The second die has 4, 4, 6, 8, 8, 9. What is the mean number of spots on the up-face when you roll these two dice together?

(a) 9 (b) 6.5 (c) 7 (d) 6.25 (e) 12.5
20) Leona and Fred are both going to take the ACTs. They agree that if one of them scores 5 or more points better than the other, the loser will buy the winner a pizza. Suppose that in fact Fred and Leona have equal ability, so that each score varies Normally with mean 24 and standard deviation 2. What is the probability that the scores differ by 5 or more points in either direction?

(a) 0.077 (b) 0.039 (c) 0.5 (d) 0.006 (e) 0.994

1. A basketball player makes 160 out of 200 free throws. We would estimate the probability that the player makes his next free throw to be

A) 0.16. B) 50-50; either he makes it or he doesn’t. C) 0.80. D) 1.2. E) 80.

3. In a particular game, a fair die is tossed. If the number of spots showing is either 4 or 5, you win $1; if the number of spots showing is 6, you win $4; and if the number of spots showing is 1, 2, or 3, you win nothing. If it costs you $1 to play the game, the probability that you win more than the cost of playing is


Use the following to answer questions 4 through 7:

If you draw an M&M candy at random from a bag of M&M’s, the candy you draw will have one of six colors. The probability of drawing each color depends on the proportion of each color among all candies made. Assume the table below gives the probability that a randomly chosen M&M has each color.

<table>
<thead>
<tr>
<th>Color</th>
<th>Brown</th>
<th>Red</th>
<th>Yellow</th>
<th>Green</th>
<th>Orange</th>
<th>Tan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probability</td>
<td>.3</td>
<td>.3</td>
<td>?</td>
<td>.1</td>
<td>.1</td>
<td>.1</td>
</tr>
</tbody>
</table>

4. The probability of drawing a yellow candy is

A) 0.1. B) 0.2. C) 0.3. D) 3.

E) impossible to determine from the information given.

5. The probability of not drawing a red candy is

A) 0.1. B) 0.3. C) 0.6. D) 0.7. E) 0.9.
6. The probability of drawing neither a brown nor a green candy is
   A) 0.1.  B) 0.3.  C) 0.4.  D) 0.6.  E) 0.7.

7. If two M&M's are selected and the colors are independent, then the probability that both are the same color is
   A) 0.01.  B) 0.03.  C) 0.09.  D) 0.22.  E) 0.25.

9. Students at University X must have one of four class ranks—freshman, sophomore, junior, or senior. At University X, 35% of the students are freshmen and 30% are sophomores. If a University X student is selected at random, the probability that he or she is either a junior or a senior is
   A) 30%.  B) 35%.  C) 65%.  D) 70%.  E) 89.5%.

Use the following to answer questions 11 through 13:

Ignoring twins and other multiple births, assume that babies’ births at a hospital represent independent events, with the probability that a baby is a boy and the probability that a baby is a girl both being equal to 0.5.

11. Referring to the information above, the probability that the next three babies are all of the same sex is
   A) 1.  B) 0.125.  C) 0.250.  D) 0.333.  E) 0.500.

12. Referring to the information above, the probability that at least one of the next three babies is a boy is
   A) 0.125.  B) 0.333.  C) 0.500.  D) 0.75.  E) 0.875.
14. Suppose that A and B are two independent events with \( P(A) = 0.3 \) and \( P(B) = 0.3 \).

\[ P(A \cup B) \text{ is} \]
A) 0.09. B) 0.51. C) 0.52. D) 0.57. E) 0.60.

16. In a certain town 60% of the households own a cellular phone, 40% own a pager, and 20% own both a cellular phone and a pager. The proportion of households that own a cellular phone but not a pager is
A) 20%. B) 30%. C) 40%. D) 50%. E) 80%.

18. In a certain game of chance, your chances of winning are 0.2. If you play the game five times and outcomes are independent, the probability that you win at most once is
A) 0.0819. B) 0.2. C) 0.3277. D) 0.4096. E) 0.7373.

19. A multiple-choice exam has 100 questions, each with five possible answers. If a student is just guessing at all the answers, the probability that he or she gets more than 30 correct is
A) 0.3100. B) 0.2000. C) 0.1587. D) 0.1020. E) 0.0062.

20. Suppose we roll a fair die 10 times. The probability that an even number occurs exactly the same number of times as an odd number in the 10 rolls is
A) 0.1667. B) 0.2461. C) 0.3125. D) 0.4922. E) 0.5000.

1. A normal density curve has which of the following properties?
A) It is symmetric.
B) The median is equal to the mean.
C) The spread of the curve is proportional to the standard deviation.
D) It has a peak centered above its mean.
E) All of the above.
2. Items produced by a manufacturing process are supposed to weigh 90 grams. However, the manufacturing process is such that there is variability in the items produced and they do not all weigh exactly 90 grams. The distribution of weights can be approximated by a normal distribution with a mean of 90 grams and a standard deviation of 1 gram. Using the 68–95–99.7 rule, what percentage of the items will either weigh less than 87 grams or more than 93 grams?

A) 0.3%.  B) 3%.  C) 6%.  D) 94%.  E) 99.7%.

3. The time it takes for students to complete a standardized exam is approximately normal with a mean of 70 minutes and a standard deviation of 10 minutes. Using the 68–95–99.7 rule, what percentage of students will complete the exam in under an hour?

A) 68%.  B) 47.5%.  C) 32%.  D) 16%.  E) 5%.

4. Using the standard normal distribution tables, what is the area under the standard normal curve corresponding to $Z < 1.1$?

A) 0.1357.  B) 0.270%.  C) 0.3643.  D) 0.8413.  E) 0.8643.

5. Using the standard normal distribution tables, what is the area under the standard normal curve corresponding to $Z > -1.22$?

A) 0.1151.  B) 0.1112.  C) 0.3888.  D) 0.8849.  E) 0.8888.

Use the following to answer questions 6 and 7:

The temperature at any random location in a kiln used in the manufacture of bricks is normally distributed with a mean of 1000°F and a standard deviation of 50°F.

6. If bricks are fired at a temperature above 1125°F, they will crack and must be discarded. If the bricks are placed randomly throughout the kiln, the proportion of bricks that crack during the firing process is closest to

A) 0.62%.  B) 2.28%.  C) 6.2%.  D) 47.72%.  E) 49.38%.  


7. When glazed bricks are put in the oven, they will miscolor if the temperature is below 900°F. If the bricks are placed randomly throughout the kiln, the proportion of glazed bricks that miscolor is closest to
   
   A) 0.62%.  B) 2.28%.  C) 22.8%.  D) 47.72%.  E) 49.38%.

8. Birthweights at a local hospital have a normal distribution with a mean of 110 ounces and a standard deviation of 15 ounces. The proportion of infants with birthweights under 95 ounces is
   
   A) 0.159.  B) 0.341.  C) 0.500.  D) 0.682.  E) 0.841.

9. A company produces boxes of soap powder labeled “Giant Size 32 Ounces.” The actual weight of soap powder in a box has a normal distribution with a mean of 33 ounces and a standard deviation of 0.7 ounces. What proportion of boxes are underweight (i.e., weigh less than 32 ounces)?
   
   A) 0.0764.  B) 0.2426.  C) 0.4236.  D) 0.7580.  E) 0.9236.

10. A market research company employs a large number of typists to enter data into a computer. The time taken for new typists to learn the computer system is known to have a normal distribution with a mean of 90 minutes and a standard deviation of 18 minutes. The proportion of new typists that take more than two hours to learn the computer system is
    
    A) 0.048.  B) 0.394.  C) 0.452.  D) 0.548.  E) 0.952.

Use the following to answer questions 11 and 12:

The distribution of actual weights of 8.0-ounce chocolate bars produced by a certain machine is normal with a mean of 8.1 ounces and a standard deviation of 0.1 ounces.

11. The proportion of chocolate bars weighing less than 8.0 ounces is
    
    A) 0.159.  B) 0.341.  C) 0.500.  D) 0.659.  E) 0.841.
12. The proportion of chocolate bars weighing between 8.2 and 8.3 ounces is
   A) 0.819.  B) 0.636.  C) 0.477.  D) 0.136.  E) 0.022.

13. Birthweights at a local hospital have a normal distribution with a mean of 110 ounces and a standard deviation of 15 ounces. The proportion of infants with birthweights between 125 ounces and 140 ounces is
   A) 0.819.  B) 0.636.  C) 0.477.  D) 0.158.  E) 0.136.

14. The scores on a university examination are normally distributed with a mean of 62 and a standard deviation of 11. If the bottom 5% of students will fail the course, what is the lowest mark (rounded to the nearest whole number) that a student can have and still be awarded a passing grade?
   A) 62.  B) 57.  C) 44.  D) 40.  E) 3.

15. The time it takes for students to complete a standardized exam is approximately normal with a mean of 70 minutes and a standard deviation of 10 minutes. How much time should be given to complete the exam so that 80% of the students will complete the exam in the time given?
   A) 78 minutes.  B) 78.4 minutes.  C) 79.8 minutes.  D) 84 minutes.  E) 92.8 minutes.

16. A soft-drink machine can be regulated so that it discharges an average of $\mu$ ounces per cup. If the ounces of fill are normally distributed with a standard deviation of 0.4 ounces, what value should $\mu$ be set at so that 6-ounce cups will overflow only 2% of the time?
   A) 5.18.  B) 5.60.  C) 6.00.  D) 6.01.  D) 6.82.

17. The weights of boxes of cookies produced by a certain manufacturer have a normal distribution with a mean of 202 grams and a standard deviation of 3 grams. Rounded to the nearest whole number, the weight that should be stamped on each box so that only 1% of all boxes are underweight is
   A) 195 grams.  B) 200 grams.  C) 202 grams.  D) 209 grams.  E) There is not enough information given to determine this value.
18. A company produces boxes of soap powder labeled “Giant Size 32 Ounces.” The actual weight of soap powder in a box has a normal distribution with a mean of 33 ounces and a standard deviation of 0.7 ounces. 95% of all boxes actually contain more than $x$ ounces of soap powder. What is $x$?

A) 34.40.  B) 34.15.  C) 31.85.  D) 31.60.  E) 30.85.

19. On the SAT math sections, scores are distributed approximately Normal. If the standard deviation of the scores is 102, find the mean score on the math section given that a score of 512 will put you in the 40th percentile.

A) .2533  B) 410  C) 205  D) 486  E) 538

20. ACT scores from the past year are distributed approximately Normal. If the average score is 17.1, and a student scoring a 20 is in the top 10% of all test takers, what is the standard deviation of the test?

A) 1.28  B) 2.9  C) 2.26  D) 2.87  E) 2

1. Eighteen people have been exposed to a zombie. Each one independently has a 35% chance of being bitten and contracting the disease. A hospital has enough vaccination to cure 5 cases of the disease. What is the probability that the hospital will not have enough vaccination for all those infected?

(a) 0.8114  (b) 0.6450  (c) 0.3550  (d) 0.8059  (e) 0.1941

2. In a large urban setting it has been reported by Surveys R Us that 39% of males have the fear of the zombie apocalypse. If you took a random sample of 21 males from this urban setting, the probability that exactly 5 would fear the zombie apocalypse would be about

(a) 0.0539  (b) 0.8876  (c) 0.9460  (d) 0.1124  (e) 0.0675

4. In a small abandoned warehouse there is a group of 20 college students. A single zombie has found this location and broken in. If all 20 students are independently spread out across this warehouse, and the zombie has a 25% chance of finding and biting one, what is the probability more than 4 students become zombie snacks before the end of the night?

(a) 0.4148  (b) 0.5852  (c) 0.6172  (d) 0.3828  (e) 100%...Zombies are hungry creatures.
6. ABC news has reported that 30% of all steak sold at the grocery store contains ZoMb. If all the steaks you buy are independent (different cows), what is the probability that less than 8 steaks are contaminated if we purchase 23 of them?
   (a) 0.2291
   (b) 0.9176
   (c) 0.1782
   (d) 0.3819
   (e) 0.6181