MATH 132 - Exam 3 Review
All material covered in class is eligible for exam, this review is not all inclusive.

1. A test consists of ten true-or-false questions. If a student randomly chooses answers for each question, find the probability that the student:

   (a) answers exactly 7 questions correctly (round to 2 decimal places).
   (b) answers at least 1 question correctly (round to 3 decimal places).

2. A box contains 9 red balls and 8 white balls. A random sample of 7 balls is drawn. Find the probability that the sample contains 4 red balls and 3 white balls (round to 2 decimal places).

3. Five numbers are chosen at random from the whole numbers between 1 and 13, inclusive, without replacement. What is the probability that:

   (a) all the numbers are even?
   (b) all the numbers are odd?
   (c) at least one of the numbers is odd?

4. In a certain manufacturing process the probability of a type I defect is 0.12, the probability of a type II defect is 0.22, and the probability of having both types of defects is 0.02. Find the probability of having neither defect.

5. Enrollment statistics at a certain college show that 55% of all students are men, 18% of the student body consists of women majoring in business, and 40% of all students major in business. A student is selected at random. Find the conditional probability that the person majors in business if we are certain the person is a woman.

6. The probability that a fisherman catches a tuna in any one trip is 0.15. What is the probability, rounded to 3 places, that he catches a tuna on:

   (a) each of three excursions?
   (b) at least one of three excursions?
7. Draw a tree diagram to illustrate the following situation and answer the question. A training program is used by a corporation to direct hires to appropriate jobs. The program consists of 2 steps. Step I identifies 30% as management trainees, 60% as non-managerial workers, and 10% to be fired. In step II, 75% of the management trainees are assigned to managerial positions and 5% are fired. In step II, 60% of the non-managerial workers are kept in the same category, 10% are assigned to management positions, and 30% are fired. What percentage (rounded to the nearest whole number) are fired?

8. The probability that Rachael will spend her next summer in Europe is 0.6 and the probability that she will stay in town and take summer classes is 0.4. If she goes to Europe, the probability that she will go to Spain and learn Spanish is 0.8. If she stays in town the probability that she will take a Spanish class is 0.1. Draw a tree diagram and find the probability that:

(a) Rachael will go to Europe but won’t be learning Spanish.
(b) Rachael will be learning Spanish.

9. In Oak Tree County, 40% of the registered voters are Republicans, 50% are Democrats, and 10% are Independents. 70% of Republican voters voted for Candidate A, 30% of Democrat voters voted for Candidate A, and 60% of Independent voters voted for Candidate A. If a randomly chosen voter voted for A, what is the probability, rounded to 3 decimal places, that the voter is a Democrat? (Hint: Use a tree diagram).

10. In a family with 3 children, excluding multiple births, what is the probability of having 2 boys and 1 girl, in that order? Assume that a boy is as likely as a girl at each birth.

11. In a family with 3 children, excluding multiple births, what is the probability of having 2 boys and 1 girl, in any order? Assume that a boy is as likely as a girl at each birth.
12. Suppose that 6 female and 5 male applicants have been successfully screened for 5 positions. If the 5 positions are filled at random from the 11 finalists, what is the probability of selecting:

(a) 3 females and 2 males.
(b) 4 females and 1 male.
(c) 5 females.
(d) at least 4 females.

13. From a survey involving 1,000 students at a large university, a market research company found that 750 students owned stereos, 450 owned cars, and 350 owned cars and stereos. If a student at the university is selected at random, what is the probability that:

(a) the student owns either a car or a stereo.
(b) the student owns neither a car or a stereo.

14. In order to test a new car, an automobile manufacturer wants to select 4 employees to test drive a car for 1 year. If 12 management and 8 union employees volunteer to be test drivers and the selection is made at random, what is the probability that at least 1 union employee is selected?

15. A shipment of 60 inexpensive digital watches, including 9 that are defective, is sent to a department store. The receiving department selects 10 watches at random for testing and rejects the whole shipment if 1 or more in the sample are found to be defective. What is the probability that the shipment will be rejected?

16. In 2 throws of a die what is the probability that you will get an even number on each throw? An even number on the first or second throw?

17. In 2 throws of a fair die what is the probability that you will get at least 5 on each throw?
18. Two balls are drawn in succession, without replacement, out of a box containing 2 red and 5 white balls. Find the probability that:

(a) the second ball is red.
(b) at least 1 ball is red.
(c) both balls are the same color.

19. The following table shows probabilities for red-green color blindness, where M represents male, F represents female, C represents color-blind and C' represents not color-blind. Find the probability that:

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>F</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.035</td>
<td>0.004</td>
<td>0.039</td>
</tr>
<tr>
<td>C'</td>
<td>0.452</td>
<td>0.509</td>
<td>0.961</td>
</tr>
<tr>
<td>Totals</td>
<td>0.487</td>
<td>0.513</td>
<td>1.000</td>
</tr>
</tbody>
</table>

(a) A randomly selected person is either male or color-blind.
(b) The conditional probability that a female is color blind.

20. A fair coin is tossed six times. Find the probability that the coin lands on heads exactly once.

21. In a study to determine the frequency and dependency of IQ ranges relative to males and females, 1000 people were chosen at random and the following IQ results were recorded.

<table>
<thead>
<tr>
<th>Below 90</th>
<th>90-120</th>
<th>Above 120</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>0.130</td>
<td>0.286</td>
<td>0.104</td>
</tr>
<tr>
<td>Male</td>
<td>0.120</td>
<td>0.264</td>
<td>0.096</td>
</tr>
<tr>
<td>Totals</td>
<td>0.250</td>
<td>0.550</td>
<td>0.200</td>
</tr>
</tbody>
</table>

(a) What is the probability of a person being female or having an IQ below 90?
(b) What is the conditional probability that a male has an IQ above 120?

22. A medical screening program administers three independent medical tests. Of the persons taking the tests, 70% pass test I, 85% pass test II, and 80% pass test III. A participant is chosen at random. What is the probability that the person passes exactly 1 of the 3 tests?

23. Three dice are rolled. Find the probability at least one 2 is rolled.
24. Three dice are rolled. Find the probability that exactly two "2"'s are rolled.

25. A box of chocolates contains 24 chocolates. Four of the chocolates have cherry centers. All chocolates appear the same. Two chocolates are selected. Find the probability that:

(a) Both have cherry centers.
(b) One has a cherry center and one does not.

26. Six children are selected from a group of 10 boys and 12 girls. Find the probability that half are boys and half are girls.

27. A mathematics class is composed of 12 freshmen, 10 sophomores, and 6 juniors. Three of the freshmen, two of the sophomores, and one junior receive A grades in the course. If a student is selected at random from the class, find the probability that the student is:

(a) an A student.
(b) an A freshman student.
(c) a sophomore.

28. Of 400 college students, 120 are enrolled in math, 220 are enrolled in English, and 55 are enrolled in both. If a student is selected at random, find the probability that the student is:

(a) enrolled in mathematics.
(b) enrolled in mathematics or English.
(c) enrolled in English but not in mathematics.
(d) not enrolled in English or is enrolled in mathematics.

29. Couples in a city were surveyed and the following was found. The probability that the husband is employed is 0.85, that the wife is employed is 0.60, and that both are employed is 0.55. If a couple is selected at random, find the probability that neither is employed.

30. In a corporation, 65% of the employees are female, executives, or both. Furthermore, 55% of the employees are female, and 5% are female executives. Find the percentage of employees who are male executives.
31. A branch office of a corporation employs six women and five men. If four employees are selected at random to help open a new branch office, find the probability that at least one is a woman.

32. A box contains 12 light bulbs, 3 of which are defective. If 3 bulbs are selected at random without replacement, what is the probability that all 3 are defective?

33. A wallet contains seven $1 bills, three $5 bills, and five $10 bills. A bill is selected at random from the wallet. Find the probability that the bill is:
   (a) a $5 bill, given that it is not a $1 bill.
   (b) a $1 bill, given that it is smaller than $10.

34. A class has 15 boys and 10 girls. One student is selected. $F$ is the event of selecting a girl, and $K$ is the event of selecting Kate, one of the girls in the class. Find:
   (a) $P(K|F)$
   (b) $P(F|K)$

35. A mathematics professor assigns two problems for homework and knows that the probability of a student solving the first problem is 0.75, the probability of solving the second is 0.45, and the probability of solving both is 0.20.
   (a) Jed has solved the second problem. What is the probability he also solves the first problem?
   (b) Edna has solved the first problem. What is the probability she also solves the second problem?
36. A university cafeteria surveyed the students who ate breakfast there for their coffee preferences. The findings are summarized as follows:

<table>
<thead>
<tr>
<th></th>
<th>Do Not Drink Coffee</th>
<th>Prefer Regular Coffee</th>
<th>Prefer Decaffeinated Coffee</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>23</td>
<td>145</td>
<td>69</td>
<td>237</td>
</tr>
<tr>
<td>Male</td>
<td>18</td>
<td>196</td>
<td>46</td>
<td>260</td>
</tr>
<tr>
<td>Totals</td>
<td>41</td>
<td>341</td>
<td>115</td>
<td>497</td>
</tr>
</tbody>
</table>

A student is selected at random from this group. Find the probability that the student:

(a) is male.
(b) is a female who prefers regular coffee.
(c) is male, given that the student prefers decaffeinated coffee.

37. A company motor pool contains six Dodge and eight Ford cars. Each of two salespeople is randomly assigned a car. Find the probability that both are assigned Dodges.

38. Ms. Speegle’s fourth-grade class has 11 boys and 9 girls. She randomly selects two students to return books to the library. Find the probability that the students selected are:

(a) 2 girls.
(b) a boy and a girl, in that order.
(c) a boy and a girl, order being unimportant.

39. The probabilities that two students will show up for class are 0.6 and 0.8, respectively. Assume that the students actions are independent of each other. Find the probability that:

(a) both show up for class.
(b) at least one will show up for class.
40. In the Perri Manufacturing Company, 28% of the employees are sales and administration staff, and 72% are production staff. The company offers a free six-month fitness program for all employees. Forty percent of the sales and administration participate and 64% of the production staff participate. At the end of the program, an employee is selected at random to assess the value of the program. The person is selected from those who participated in the program. Find the probability that the person selected is on the production staff.

41. A mythology class is composed of 10 sophomores, 25 juniors, and 15 seniors. On the first exam, 3 sophomores, 5 juniors, and 6 seniors earned A’s. Find the probability that:

(a) a student earned an A.
(b) a student who received an A is a junior.

42. At a clinic, a preliminary test for hepatitis has been found to be 95% accurate, in that 95% of those with hepatitis have a positive reaction. However, 2% of those without hepatitis have a positive reaction. Suppose 70% of those examined have hepatitis. Find the probability that a person who has a positive reaction has hepatitis.

43. If the probability of a certain event $E$ is $\frac{3}{5}$, what are the odds for $E$?

44. If the odds for $E$ are 2:7, what is $P(E)$?