Section 15-7: The Counting Principle, Sample Spaces, and Probability

1. 010321a, P.I. A.S.19
If Laquisha can enter school by any one of three doors and the school has two staircases to the second floor, in how many different ways can Laquisha reach a room on the second floor? Justify your answer by drawing a tree diagram or listing a sample space.

2. 010731a, P.I. A.S.19
Kimberly has three pair of pants: one black, one red, and one tan. She also has four shirts: one pink, one white, one yellow, and one green. Draw a tree diagram or list the sample space showing all possible outfits that she could wear, if an outfit consists of one pair of pants and one shirt. How many different outfits can Kimberly wear?

3. 089922a, P.I. A.S.19
The Grimaldis have three children born in different years.
a Draw a tree diagram or list a sample space to show all the possible arrangements of boy and girl children in the Grimaldi family.
b Using your information from part *a*, what is the probability that the Grimaldis have three boys?

4. fall0736ia, P.I. A.S.19
Mr. Laub has three children: two girls (Sue and Karen) and one boy (David). After each meal, one child is chosen at random to wash dishes. If the same child can be chosen for both lunch and dinner, construct a tree diagram or list a sample space of all the possible outcomes of who will wash dishes after lunch and dinner on Saturday. Determine the probability that one boy and one girl will wash dishes after lunch and dinner on Saturday.

Independent Events

5. 080111a, P.I. A.N.7
A certain car comes in three body styles with a choice of two engines, a choice of two transmissions, and a choice of six colors. What is the minimum number of cars a dealer must stock to have one car of every possible combination?

[A] 36 [B] 42 [C] 13 [D] 72

6. 060403a, P.I. A.N.7
How many different outfits consisting of a hat, a pair of slacks, and a sweater can be made from two hats, three pairs of slacks, and four sweaters?

[A] 9 [B] 24 [C] 12 [D] 29

7. 080204a, P.I. A.N.7
Juan has three blue shirts, two green shirts, seven red shirts, five pairs of denim pants, and two pairs of khaki pants. How many different outfits consisting of one shirt and one pair of pants are possible?

[A] 130 [B] 420 [C] 84 [D] 19

8. 010405a, P.I. A.N.7
In a school building, there are 10 doors that can be used to enter the building and 8 stairways to the second floor. How many different routes are there from outside the building to a class on the second floor?

[A] 10 [B] 18 [C] 1 [D] 80

9. 080404a, P.I. A.N.7
The school cafeteria offers five sandwich choices, four desserts, and three beverages. How many different meals consisting of one sandwich, one dessert, and one beverage can be ordered?

[A] 12 [B] 3 [C] 1 [D] 60

10. 010503a, P.I. A.N.7
A deli has five types of meat, two types of cheese, and three types of bread. How many different sandwiches, consisting of one type of meat, one type of cheese, and one type of bread, does the deli serve?

[A] 25 [B] 10 [C] 75 [D] 30

11. 089923a, P.I. A.N.7
Paloma has 3 jackets, 6 scarves, and 4 hats. Determine the number of different outfits consisting of a jacket, a scarf, and a hat that Paloma can wear.

12. 060501a, P.I. A.N.7
Jeremy's bedroom has two doors leading into the hallway. His house has four doors leading to the outside. Using the doorways, in how many different ways can Jeremy leave his room and go outside?

[A] 8 [B] 6 [C] 4 [D] 5

13. 080502a, P.I. A.N.7
Cole's Ice Cream Stand serves sixteen different flavors of ice cream, three types of syrup, and seven types of sprinkles. If an ice cream sundae consists of one flavor of ice cream, one type of syrup, and one type of sprinkles, how many different ice cream sundaes can Cole serve?

[A] 3 [B] 10,836 [C] 336 [D] 26

14. 060728a, P.I. A.N.7
Max goes through the cafeteria line and counts seven different meals and three different desserts that he can choose. Which expression can be used to determine how many different ways Max can choose a meal and a dessert?

[A] $7! \bullet 3!$ [B] ${}_7P_3$

[C] $7 \bullet 3$ [D] ${}_7C_3$

15. 010612a, P.I. A.N.7
Robin has 8 blouses, 6 skirts, and 5 scarves. Which expression can be used to calculate the number of different outfits she can choose, if an outfit consists of a blouse, a skirt, and a scarf?

[A] $8+6+5$ [B] ${}_{19}C_3$

[C] $8 \cdot 6 \cdot 5$ [D] 8!6!5!

16. 060607a, P.I. A.N.7
Leo purchased five shirts, three pairs of pants, and four pairs of shoes. Which expression represents how many different outfits consisting of one shirt, one pair of pants, and one pair of shoes Leo can make?

[A] $5+3+4$ [B] $5 \cdot 3 \cdot 4$

[C] ${}_{12}C_3$ [D] ${}_{12}P_3$

17. 080704a, P.I. A.N.7
Jen and Barry's ice cream stand has three types of cones, six flavors of ice cream, and four kinds of sprinkles. If a serving consists of a cone, one flavor of ice cream, and one kind of sprinkles, how many different servings are possible?

[A] ${}_{13}P_3$ [B] 72 [C] ${}_{13}C_3$ [D] 90

18. 080636a, P.I. A.N.7
Debbie goes to a diner famous for its express lunch menu. The menu has five appetizers, three soups, seven entrees, six vegetables, and four desserts. How many different meals consisting of either an appetizer *or* a soup, one entree, one vegetable, and one dessert can Debbie order?

19. 010218a
When Kimberly bought her new car, she found that there were 72 different ways her car could be equipped. Her choices included four choices of engine and three choices of transmission. If her only other choice was color, how many choices of color did she have?

[A] 6 [B] 12 [C] 65 [D] 60

[2] 6, and a correct tree diagram is drawn or sample space is listed.
[1] A correct tree diagram is drawn or sample space is listed, but no answer or an incorrect answer is found.
or [1] An appropriate answer is found, based on an incorrect tree diagram or sample space.
or [1] 6, but no tree diagram is drawn or sample space is listed.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
[1]

[2] 12, and a correct tree diagram or a correct sample space is shown.
[1] An incomplete tree diagram or sample space is shown with at least 8 possible combinations shown, and an appropriate number of outfits is found.
or [1] A correct tree diagram or sample space is shown, but the number of possible outfits is missing or is incorrect.
or [1] 12, but 3×4 is used to find the number of outfits.
[0] 12, but no work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
[2]

a [1] A correct tree diagram or listing of all 8 possibilities is shown.
b [1] $\frac{1}{8}$
or [1] An appropriate answer is given for an incorrect part a tree diagram or listing.
a and b
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
[3]

[3] $\frac{4}{9}$, and a correct tree diagram or sample space is shown.
[2] A correct tree diagram or sample space is shown, but no probability or an incorrect probability is given.
or [2] An incorrect tree diagram or sample space is shown, but an appropriate probability is found.
[1] Appropriate work is shown, but one conceptual error is made.
or [1] $\frac{4}{9}$, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
[4]

[5] D

[6] B

[7] C

[8] D

[9] D

[10] D

[2] 72 and an appropriate method, such as $3\times6\times4$, is shown.
[1] 72 and no explanation is given.
or [1] An appropriate method is shown, but the student has one computational mistake or an incomplete listing, such as 2 of the 3 clothing categories.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
[11]

[12] A

[13] C

[14] C

[15] C

[16] B

[17] B

[18] [3] 1,344, and appropriate work is shown, such as 8 • 7 • 6 • 4.
[2] Appropriate work is shown, but one computational error is made.
[1] Appropriate work is shown, but two or more computational errors are made.
or [1] Appropriate work is shown, but one conceptual error is made, such as basing the answer on ordering an appetizer and a soup, using 5 • 3 • 7 • 6 • 4.
or [1] 1,344, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[19] A