

In 1-6, decide whether the situation is an example of the counting principle, a permutation, or a combination. Then answer the question.

1. Suppose a bakery has 15 pies, 8 cakes, and 7 cookies. How many different ways are there to choose 1 pie, 1 cake, and 1 cookie?

$$15 \cdot 8 \cdot 7 = 840 \text{ ways}$$

2. Jimmy John's advertises 2 job openings for sandwich-maker. If 13 qualified students apply, in how many ways can the 2 positions be filled?

$${}_{13}C_2 = 78 \text{ ways}$$

3. In how many ways can I arrange 10 cards on my table if I received 16?

$${}_{16}P_{10} = 29,059,430,400 \text{ ways}$$

4. A spelling bee competition starts with 50 contestants. The top five competitors get a cash prize based upon how high they finish (for example, first place gets the most money, fifth place gets the least). In how many ways can 5 competitors win prizes?

$${}_{50}P_5 = 254,251,200 \text{ ways}$$

5. Old Navy is having a deal where shoppers can mix and match a t-shirt, a pair of pants, and a sweater. They have 8 styles of t-shirts, 6 styles of pants, and 15 styles of sweaters. How many different ways are there choose 1 t-shirt, 1 pair of pants, and 1 sweater?

$$8 \cdot 6 \cdot 15 = 720 \text{ ways}$$

6. McDonalds offers the following items at \$1 shown below. If you would like to purchase 4 items from their dollar menu, in how many different ways could we make this purchase?

Small Fries, McChicken, McDouble, Hot Fudge Sundae, Small Beverage, Fruit 'N Yogurt Parfait, Baked Apple Pie, Side Salad
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$${}_{8}C_4 = 70 \text{ ways}$$

7. If a locker combination consists of 3 different numbers from 0 to 39, what is the probability that you guess the combination correctly on the first try?

$$\frac{1}{40 \cdot 39 \cdot 38} = \frac{1}{59280}$$

8. On Catalpa, 29 of 125 houses have their porch lights on. What is the probability that a house does not have their porch light on?

$$125 - 29 = 96 \quad \frac{96}{125}$$

9. A coin is flipped twice.

- a. Give the sample space.

HT TH  
HH TT

- b. Determine the probability of getting two heads.

$$\frac{1}{4}$$

10. A 7-sided die is rolled once

- a. Give the sample space.

1 2 3 4 5 6 7

- b. Determine the probability of rolling an odd number.

$$\frac{4}{7}$$

11. A card is drawn randomly from a standard 52-card deck. Find the probability of drawing the given card(s).

- a. a club

$$\frac{13}{52} = \frac{1}{4}$$

- b. a 10 of clubs

$$\frac{1}{52}$$

- c. a black card

$$\frac{26}{52} = \frac{1}{2}$$

- d. a black card or a 10

$$\frac{1}{2} + \frac{4}{52} - \frac{2}{52}$$

= 

- e. a 6 and then a 7, with replacement

$$\frac{4}{52} \cdot \frac{4}{52} = \frac{1}{169}$$

- f. 3 aces in a row without replacement

$$\frac{4}{52} \cdot \frac{3}{51} \cdot \frac{2}{50} = \frac{24}{132600}$$

$$\frac{3}{16575}$$

12. Use Pascal's triangle to expand the binomial.

- a.  $(a - b)^5$

$$= a^5 + 5a^4(-b) + 10a^3(-b)^2 + 10a^2(-b)^3 + 5a(-b)^4 + (-b)^5$$

$$= a^5 - 5a^4b + 10a^3b^2 - 10a^2b^3 + 5ab^4 - b^5$$

- b.  $(-4x^2 + y)^3$

$$= (-4x^2)^3 + 3(-4x^2)^2y + 3(-4x^2)y^2 + y^3$$

$$= -64x^6 + 48x^4y - 12x^2y^2 + y^3$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

13. Find the indicated probability.

a.  $P(A) = 0.3$

$P(B) = 0.6$

$P(A \text{ or } B) = .8$

$P(A \text{ and } B) = 0.1$

$.3 + .6 - .1 = .8$

b.  $P(A) = 35\% .35$

$P(B) = \underline{65\%}$

$P(A \text{ or } B) = 80\% .8$

$P(A \text{ and } B) = 20\% .2$

$.35 + P(B) - .2 = .8$

$P(B) = .65$

c.  $P(A) = \frac{3}{5}$

$P(\bar{A}) = \frac{2}{5}$

$P(A) = 1 - \frac{2}{5} = \frac{3}{5}$

d. A and B are independent

$P(A) = 0.15$

$P(B) = 0.6$

$P(A \text{ and } B) = .09$

$(.15)(.6) = .09$

e. A and B are dependent

$P(A) = 60\%$

$P(B|A) = 42\%$

$P(A \text{ and } B) = 25\%$

$(.6)P(B|A) = .25$

$P(B|A) \approx .42$

$P(A) \cdot P(B|A)$

14. Of 200 students at a school, 58 play football, 40 play basketball, and 93 play both. What is the probability that a randomly selected student plays either football or basketball?

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$= \frac{58}{200} + \frac{40}{200} - \frac{93}{200} = \frac{5}{200}$

$\frac{5}{200} = \frac{1}{40}$

15. When 2 six-sided dice are rolled, what is the probability that the sum is neither 2 nor 12?

$\frac{34}{36} = \frac{17}{18} = 1 - \frac{2}{36}$

16. Calculate the probability of randomly guessing all of the correct answers on a 10 question true-or-false quiz.

$P(\text{all right}) = \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} = \left(\frac{1}{2}\right)^{10} = \frac{1}{1024}$

17. The grades that students received on a recent Algebra exam are given in the table.

Grade	Number of Exams
A	6
B	15
C	7
D	2
E	0

a. A student's exam is randomly chosen. What is the probability that the student received a C or higher?

$P(A \text{ or } B \text{ or } C) = \frac{6}{30} + \frac{15}{30} + \frac{7}{30} = \frac{28}{30}$

b. A student's exam is randomly chosen. What is the probability that the student did not receive a D?

$1 - P(D) = 1 - \frac{2}{30} = \frac{28}{30}$

c. Do these probabilities represent experimental probabilities or theoretical probabilities? Explain your reasoning. Experimental b/c this is the results from an actual class (experiment).

total: 30

