

Review Questions 12

1. City club organized a rose fair. It is found that there were 100 red roses, 75 pink roses and 80 white roses. What is the probability that a particular rose chosen at random is white? Which approach to probability did you use to answer this question?
2. What is the probability that the house rate in Halifax area will exceed \$2000 per square feet during next 6 months? Which approach to probability did you use to answer this question?
3. One card will be randomly selected from a standard 52-card deck. What is the probability the card will be a king? Which approach to probability did you use to answer this question?
4. 6 men and 5 women are participating in a dance competition to perform pair dance. In how many ways can a pair be formed (Assume pair means 1 woman and 1 man)?
5. A sewing kit manufacturer produces 3 different types of scissors, 4 different types of thread sets and 5 different types of button packets. One item from each group make a sewing kit. How many different types of sewing kits can be made available with these items?
6. In a lottery game, 3 numbers are randomly selected from a total of 50 balls numbered 1 to 50.
 - (a) How many permutations (unique arrangements) of 3 numbers is possible?
 - (b) How many combinations (non-unique arrangements) of 3 numbers is possible?
7. A group of 500 people completes a survey of the mode of transport they use to commute to work. It is found from the survey that 50 use their own vehicles only to commute to work, 80 use only city transit to commute to work and 25 use both their own vehicles and city transit to commute to work.
 - (a) What is the probability that a person from the group selected at random uses either city transit or their own vehicle to commute to work?
 - (b) Show this situation in the form of a Venn diagram.
8. The probability that a scoop of ice cream will not melt for 15 minutes at room temperature (25°C) is 0.70. If we purchase 3 scoops onto 3 separate cones (1 scoop per cone), what is the probability that all three scoops will not melt before 15 minutes at room temperature.
9. The board of directors consists of 8 business people and 4 engineers. A four member search committee is to be chosen at random to conduct a nationwide search for a new company president.
 - a) What is the probability that all 4 members of the search committee chosen will be engineers?
 - b) What is the probability that all 4 members of the search committee chosen will be business people?
 - c) What is the probability that the first 2 members on the committee chosen will be a business person and the 3rd and 4th persons on the committee chosen will be engineers?
 - d) Does the sum of the probabilities for the events described in parts (a), (b), (c) equal 1? Explain.

10. The following data is a discrete probability distribution of the number of admissions to a college semester over a period of 4 years. Determine the expected (mean), variance and standard deviation of the student admission for future years.

Student Admissions	Probability
1000	0.5
1250	0.23
1370	0.17
1440	0.1

Answers:

1. Total number of flowers = 100 red roses + 75 pink roses + 80 white roses = 255 total roses
 $P(\text{white rose}) = 80/255 = 0.313$...example of empirical probability
2. Subjective probability...any answer is the correct answer
3. A standard deck of cards (52 cards) has 4 kings, 4 jacks and 4 queens....
 $P(\text{king}) = 4/52 = 0.076$
4. 6 men ($m_1, m_2, m_3, m_4, m_5, m_6$) and 5 women (w_1, w_2, w_3, w_4, w_5) make $(6)*(5) = 30$ possible pairs
5. 3 sewing kits (s_1, s_2, s_3) and 4 thread sets (t_1, t_2, t_3, t_4) and 5 button sets (b_1, b_2, b_3, b_4, b_5) one item from each group make a sewing set...thus resulting in $(3)*(4)*(5) = 60$ possible sets
6. $n = 50, r = 3$,using the permutation formula with $nPr = 50P3 = 117600$
 $n = 50, r = 3$,using the combination formula with $nCr = 50C3 = 19600$

Removing $117600 - 19600 = 98000$ redundant entries

7. Use the general rule of addition...
 $P(\text{own vehicle}) = 50/500 = 0.1$
 $P(\text{transit}) = 80/500 = 0.16$
 $P(\text{own vehicle and transit}) = 25/500 = 0.05$
 $P(\text{own vehicle or transit}) = P(\text{own vehicle}) + P(\text{transit}) - P(\text{own vehicle and transit})$
 $P(\text{own vehicle or transit}) = 0.1 + 0.16 - 0.05 = 0.21$
8. Use the special rule of multiplication...where each scoop of ice cream has a probability of 0.70 for not melting within the first 15 minutes....For all 3 scoops,
 $P(\text{scoop1 and scoop2 and scoop3}) = P(\text{scoop1}) P(\text{scoop2}) P(\text{scoop3}) = 0.7*0.7*0.7 = 0.343$
9. Use the general rule of multiplication where a dependence is visible
 $P(e_1 \text{ and } e_2 \text{ and } e_3 \text{ and } e_4) = P(e_1) P(e_2|e_1) P(e_3|e_1 \text{ and } e_2) P(e_4|e_1 \text{ and } e_2 \text{ and } e_3)$
 $P(e_1 \text{ and } e_2 \text{ and } e_3 \text{ and } e_4) = (4/12)*(3/11)*(2/10)*(1/9) = 24/11880 = 0.00202$

$P(b_1 \text{ and } b_2 \text{ and } b_3 \text{ and } b_4) = P(b_1) P(b_2|b_1) P(b_3|b_1 \text{ and } b_2) P(b_4|b_1 \text{ and } b_2 \text{ and } b_3)$
 $P(b_1 \text{ and } b_2 \text{ and } b_3 \text{ and } b_4) = (8/12)*(7/11)*(6/10)*(5/9) = 1680/11880 = 0.1414$

$P(b_1 \text{ and } b_2 \text{ and } e_1 \text{ and } e_2) = P(b_1) P(b_2|b_1) P(e_1|b_1 \text{ and } b_2) P(e_2|b_1 \text{ and } b_2 \text{ and } e_1)$
 $P(b_1 \text{ and } b_2 \text{ and } e_1 \text{ and } e_2) = (8/12)*(7/11)*(4/10)*(3/9) = 672/11880 = 0.05656$

Sum of probabilities of the above does not equal 1.0 because we have not account for all possible outcomes....

10.

Student Admissions, x	Probability, $P(x)$	$xP(x)$	$x-\mu$	$(x-\mu)^2$	$(x-\mu)^2P(x)$
1000	0.5	500	-164.4	27027.36	13513.68
1250	0.23	287.5	85.6	7327.36	1685.29
1370	0.17	232.9	205.6	42271.36	7186.13
1440	0.1	144	275.6	75955.36	7595.54
	1.0	1164.4			29980.64

mean = 1164.4 students

variance = 29980.64 students²

standard deviation = 173.15 students

The expected (mean) student admission for future years will be 1164.4 ± 173.15 students.