Class Exercise 7 - Solutions

1. **Swiping for Success**

It is becoming strangely common for people to use Tinder to look for work and LinkedIn to look for romance. In a recent poll, 10% of adults said they would consider using Tinder for job searching, while 14% said they would consider using LinkedIn to meet a potential date. The same poll found that 70% of adults would use neither platform in this way. In the next twelve adults that you encounter, what is the probability that

(a) three or four of them would use Tinder to look for work?

Solution

Let X = the number of people who use Tinder to find work.

X is a binomial random variable with $n = 12$ and $p = 0.10$

$$\begin{aligned} P(X = 3 \cup X = 4) &= P(X = 3) + P(X = 4) \\ &= C_3^{12} \cdot (0.10)^3 \cdot (1 - 0.10)^9 + C_4^{12} \cdot (0.10)^4 \cdot (1 - 0.10)^8 \\ &= 0.0852 + 0.0213 \\ &= 0.1065 \end{aligned}$$

(b) at most three of them would use LinkedIn to look for a date?

Solution

Let Y = the number of people who use LinkedIn to look for a date.

Y is a binomial random variable with $n = 12$ and $p = 0.14$

$$\begin{aligned} P(Y \leq 3) &= P(Y = 0) + P(Y = 1) + P(X = 2) + P(Y = 3) \\ &= C_0^{12} \cdot (0.14)^0 \cdot (1 - 0.14)^{12} + C_1^{12} \cdot (0.14) \cdot (1 - 0.14)^8 \\ &\quad + C_3^{11} \cdot (0.14)^2 \cdot (1 - 0.14)^{10} + C_3^{12} \cdot (0.14)^3 \cdot (1 - 0.14)^9 \\ &= 0.1637 + 0.3197 + 0.2863 + 0.1553 \\ &= 0.9250 \end{aligned}$$

(c) more than nine of them would use neither platform in this way?

Solution

Let $Z =$ the number of people who use neither platform in this way.

Z is a binomial random variable with $n = 12$ and $p = 0.70$

$$\begin{aligned} P(Z > 9) &= P(Z = 10) + P(Z = 11) + P(Z = 12) \\ &= C_{10}^{12} \cdot (0.70)^{10} \cdot (1 - 0.70)^2 + C_{11}^{12} \cdot (0.70)^{11} \cdot (1 - 0.70) + C_{12}^{12} \cdot (0.70)^{12} \cdot (1 - 0.70)^0 \\ &= 0.1678 + 0.0712 + 0.0138 \\ &= 0.2528 \end{aligned}$$

(d) five or eight of them would find the idea of using Tinder to look for work completely unacceptable?

Solution

Let $W =$ the number of people who find using Tinder for work unacceptable.

W is a binomial random variable with $n = 12$ and $p = 0.30$

$$\begin{aligned} P(W = 5 \cup W = 8) &= P(W = 5) + P(W = 8) \\ &= C_5^{12} \cdot (0.30)^5 \cdot (1 - 0.30)^7 + C_8^{12} \cdot (0.30)^8 \cdot (1 - 0.30)^4 \\ &= 0.1585 + 0.0078 \\ &= 0.1663 \end{aligned}$$

2. **Fruit or Art?**

In Scotland, a group of students visited a modern art gallery and placed a pineapple in an empty exhibit space to see whether visitors would mistake it for a work of art. When they returned four days later, they discovered that not only was the pineapple still there, it had even been placed under a glass display case. The height of a mature pineapple is normally distributed with a mean of 30 cm and a standard deviation of 4 cm.

(a) What is the probability that a randomly selected pineapple is at less than 23 cm?

Solution

Let $X =$ the height of the pineapple.

X is normally distributed with $\mu = 30$ and $\sigma = 4$

$$P(X < 23) = P(Z < -1.75) = 0.0401$$

(b) What is the probability that a randomly selected pineapple is between 19 cm and 37 cm?

Solution

$$\begin{aligned} P(19 < X < 37) &= P(-2.75 < Z < 1.00) \\ &= P(Z < 1.00) - P(Z < -2.75) \\ &= 0.8413 - 0.0030 \\ &= 0.8383 \end{aligned}$$

(c) 5% of pineapple are smaller than how many centimetres?

Solution

$$\begin{aligned} X &= Z\sigma + \mu \\ &= -1.645(4) + 30 \\ &= 23.42\,cm \end{aligned}$$

(d) At a store there are seven pineapples. What is the probability that four or five of them are larger than 36 cm?

Solution

$$\begin{aligned} P(X > 29) &= P(Z > -0.25) \\ &= 0.5987 \end{aligned}$$

Let Y = the number of pineapples at the store that are larger than $29\,cm$

Y is a binomial random variable with $n = 7$ and $p = 0.5987$

$$\begin{aligned} P(Y = 4 \cup Y = 5) &= P(Y = 4) + P(Y = 5) \\ &= C_4^7 \cdot (0.5987)^4 \cdot (1 - 0.5987)^3 + C_5^7 \cdot (0.5987)^5 \cdot (1 - 0.5987)^2 \\ &= 0.2906 + 0.2601 \\ &= 0.5507 \end{aligned}$$