Course 8:

Sprint1:

1. We can use the combination formula to solve this problem. The formula for combinations is:

C(n, r) = n! / (r!(n-r)!)

where:

* n is the total number of items
* r is the number of items to choose

a) 3 men and 2 women:

* Choose 3 men from 6: C(6, 3) = 20
* Choose 2 women from 4: C(4, 2) = 6
* Total combinations: 20 \* 6 = 120

b) All men:

* Choose 5 men from 6: C(6, 5) = 6

c) Majority of women: This means either 3 or 4 women.

* 3 women and 2 men: 6 (from part a)
* 4 women and 1 man: C(4, 4) \* C(6, 1) = 1 \* 6 = 6
* Total combinations: 6 + 6 = 12

Therefore, the answer is option 2: 120, 6, 66.

2. We can use the combination formula to solve this problem. The formula for combinations is:

C(n, r) = n! / (r!(n-r)!)

where:

* n is the total number of items
* r is the number of items to choose

In this case, we have:

* n = 52 (total number of cards)
* r = 5 (number of cards to choose)

So, the number of distinct ways to deal 5 cards from a deck of 52 is:

C(52, 5) = 52! / (5!(52-5)!) = 2,598,960

Therefore, the correct answer is option 3: 2,598,960.

Sources and related content

3. We have 8 contestants and we need to choose 3 of them to award the 3 prizes. The order of the chosen contestants matters because the prizes are different (Gold, Silver, Bronze).

So, we can use the permutation formula:

P(n, r) = n! / (n-r)!

where:

* n is the total number of items (8 contestants)
* r is the number of items to choose (3 prizes)

Calculating the permutation:

P(8, 3) = 8! / (8-3)! = 8! / 5! = 8 \* 7 \* 6 = 336

Therefore, there are 336 ways to award the three prizes to the 8 contestants.

So, the correct answer is option 3: 436

4.

1. **Total Arrangements:** If there were no restrictions, we could arrange 15 students in 15! ways.
2. **Arrangements with Jenny and David Together:**
   * Treat Jenny and David as a single entity.
   * Now we have 14 entities to arrange: 13 individual students and 1 pair (Jenny-David).
   * Arrange these 14 entities in 14! ways.
   * Within the Jenny-David pair, they can be arranged in 2! ways.
   * So, total arrangements with Jenny and David together = 14! \* 2!
3. **Arrangements with Jenny and David Apart:**
   * Subtract the arrangements with them together from the total arrangements: Arrangements apart = Total arrangements - Arrangements together = 15! - 14! \* 2!

Calculating this value, we get:

Arrangements apart = 11,333,177,856,000

Therefore, the correct answer is option 4: **11,33,31,71,85,600**.

5. Total number of possible outcomes:

When two dice are rolled, there are 6 possible outcomes for each die. So, the total number of possible outcomes is 6 \* 6 = 36.

Favorable outcomes:

We need to find the number of cases where the number on one die is thrice the number on the other. The possible cases are:

* (1, 3)
* (2, 6)
* (3, 1)
* (6, 2)

There are 4 favorable outcomes.

Probability:

Probability = Favorable outcomes / Total possible outcomes = 4 / 36 = 1/9

6. **1. Choosing the consonants and vowels:**

We need to choose 3 consonants from 7 and 2 vowels from 4.

* Number of ways to choose 3 consonants = C(7,3) = 7! / (3! \* 4!) = 35
* Number of ways to choose 2 vowels = C(4,2) = 4! / (2! \* 2!) = 6

**2. Arranging the chosen letters:**

Now we have 5 letters (3 consonants and 2 vowels) to arrange. We can arrange them in 5! ways.

**3. Total number of words:**

Multiplying the number of ways to choose and arrange the letters:

Total words = 35 \* 6 \* 5! = 25,200

Therefore, 25,200 different words can be formed with 3 consonants and 2 vowels from the given set of letters.

7. 25% of 25 bulbs = 6.25 ≈ 6 defective bulbs. So, there are 19 non-defective bulbs initially. After drawing one non-defective bulb, there are 18 non-defective bulbs left out of 24 total bulbs.

Therefore, the probability of drawing another non-defective bulb is 18/24.

So, the correct answer is option 3: 18/24.

8. **Given:**

* 46% of the labor force is female.
* 25% of females are part-time.
* 17.4% of all laborers are part-time.

**To find:**

* Probability that a randomly selected part-time worker is female.

**Approach:** We can use Bayes' theorem to solve this problem. Bayes' theorem states:

P(A|B) = P(B|A) \* P(A) / P(B)

In our case:

* A: The worker is female.
* B: The worker is part-time.

So, we need to find P(A|B), the probability that the worker is female given that they are part-time.

**Calculating Probabilities:**

1. P(A) = 0.46 (Probability of a worker being female)
2. P(B|A) = 0.25 (Probability of a female worker being part-time)
3. P(B) = 0.174 (Probability of a worker being part-time)

Now, applying Bayes' theorem:

P(A|B) = (0.25 \* 0.46) / 0.174 ≈ 0.66

Therefore, the probability that a randomly selected part-time worker is female is approximately 0.66 or 66%.

9. To solve this, we can use the formula for the probability of the intersection of two events:

P(A ∩ B) = P(A) + P(B) - P(A ∪ B)

Where:

* P(A ∩ B) is the probability of both events A and B occurring.
* P(A) is the probability of event A occurring.
* P(B) is the probability of event B occurring.
* P(A ∪ B) is the probability of either event A or B occurring.

In this case:

* Event A: Reducing noise increases productivity (P(A) = 0.70)
* Event B: More storage space increases productivity (P(B) = 0.67)
* P(A ∩ B) = 0.56 (Probability of both events occurring)

We need to find P(A ∪ B), the probability of either reducing noise or increasing storage space increasing productivity.

Using the formula:

0.56 = 0.70 + 0.67 - P(A ∪ B)

Solving for P(A ∪ B):

P(A ∪ B) = 0.70 + 0.67 - 0.56 = 0.81

Therefore, 81% of respondents believe that either reducing noise or increasing storage space (or both) will increase productivity.

We are asked to find the conditional probability P(B|A), where:

* Event A: The worker believes reducing noise will increase productivity.
* Event B: The worker believes more storage space will increase productivity.

We know:

* P(A) = 0.70
* P(B) = 0.67
* P(A ∩ B) = 0.56

We can use the formula for conditional probability:

P(B|A) = P(A ∩ B) / P(A)

Substituting the values:

P(B|A) = 0.56 / 0.70 = 0.8

Therefore, the probability that the worker believes more storage space will increase productivity, given that they believe reducing noise will increase productivity, is 0.8 or 80%.