

Workbook



Table of Contents

Linear Combinations of Normal Probability Distributions.....	3
Linear Combinations of Normal Probability Distributions.....	3

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Linear Combinations of Normal Probability Distributions

Questions

- 1) The weight of men in England has a normal probability distribution with an expectation of 75kg and a standard deviation of 10kg .
The weight of women in England has a normal probability distribution with an expectation of 65kg and a standard deviation of 8kg .
What are the chances that a randomly selected woman weighs more than a randomly selected man?

- 2) A person's annual spending on clothing has a normal probability distribution with an expectation of \$3,000 and a standard deviation of \$1,000 .
Annual spending on entertainment has a normal probability distribution with an expectation of \$4,000 and a standard deviation of \$1,500 .
The correlation coefficient of annual spending on clothing and annual spending on entertainment is 0.6.
 - a. What are the expectation and standard deviation of the total annual spending on clothing and entertainment?
 - b. What are the chances that total annual spending on clothing and entertainment is more than \$8,000 ?
 - c. What is the top 10th percentile of the total annual spending on clothing and entertainment?

- 3) The daily consumption of vegetables in a restaurant has a normal probability distribution with an expectation of 50kg and a standard deviation of 4kg .
The price of vegetables is \$6 per kg .
 - a. What are the expectation and variance of the daily cost of vegetables for the restaurant?
 - b. What is the probability of the daily cost of vegetables being less than \$290 ?
 - c. What is the 40th percentile of the probability distribution of the cost of vegetables for the restaurant?

- 4) The volume of a bottle of wine has a normal probability distribution with an expectation of 750ml and a standard deviation of 20ml.
A person buys a box containing four bottles of wine.
- What are the expectation and standard deviation of the volume of wine in the box?
 - The person pours the wine in the box into a container with a capacity of 3.1 liters. What is the probability that the wine will overflow from the container?
- 5) A farmer has a farm with a cow and a goat. The yield of a cow's milk has a normal probability distribution with an average of 20 liters per day and standard deviation of 5 liters, and the yield of the goat's milk has a normal probability distribution with an average of 10 liters per day and a standard deviation of 2 liters.
The cow's milk is sold for \$2 per liter, and the goat's milk is sold for \$3 per liter.
- What are the chances that the farmer's daily proceeds from milk will be at least \$62?
 - What are the chances that the combined milk yield of the cow and the goat will be less than 30 liters on at least four of five consecutive days?
 - What are the chances that the cow's yield will be lower than the goat's yield on a given day?

Answer Key

- 1) 0.2117
- 2) a. $E(T) = 7000\$$, $\sigma(T) = 2247\$$ b. 0.3264 c. 9881
- 3) a. $E(Y) = 300$, $V(Y) = 576$ b. 0.3372 c. 294
- 4) a. $E(T) = 3000\text{ml}$, $\sigma(T) = 40\text{ml}$ b. 0.0062
- 5) a. 0.7549 b. 0.1875 c. 0.0314