

Combinations of independent events IB HL Stats Option

1. The variable X has a mean of 3 and a variance of 2. The variable Y has a mean of 5 and a variance of 3.

Find the mean and variance of,

a) $2X + 3Y$ b) $4X + 3Y$ c) $7X - 4Y$

2. Books are packed into boxes of 20. Each book has a mass of 150g and a variance of 25g. Each box has a mass of 100g and a variance of 64g. Find the expected mass and variance when of 100 books packed into boxes. Give your answer in kg. The masses can be assumed to be independent.

3. Four runners in a 400 metre relay race have analysed their times as follows:

Runner	Mean time	Variance
1	56 secs	2
2	60 secs	3
3	57 secs	4
4	62 secs	2

Calculate the expected time, in seconds, and variance when the relay is run.

4. McTavvies produce world famous sweets 'Fancy Parade'. A box contains a mixture of toffees and soft centered sweets. In a box, they aim to put 15 toffees and 20 soft centered sweets. Toffees are known to have a mean mass of 12g and a variance of 1.5g; soft centered sweets are known to have a mean mass of 10g and a variance of 1.2g.
- a) Calculate the expected mass and variance of a box of fancy Parade sweets.
- b) One toffee, T , and one soft centred sweet, S , are picked at random. Calculate the probability that the mass of $4T < 3S$.
- c) 4 toffees and 4 soft centred sweets are picked at random. Find the probability that the 4 toffees have a mass less than that of the 4 soft centred sweets.

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5. Boys in a school, at a certain age, have a mean mass of 75 kg and a variance of 64 kg. Girls, in the same school and the same age, have a mean mass of 62 kg, and a variance of 49 kg.
- a) Find the expected mean and variance of the masses of the students, if a sample of 25 boys is added to sample of 15 girls.
 - b) One boy, B , and one girl, G , are picked at random. Find the probability that the mass of the boy is greater than the mass of the girl.
 - c) 4 boys are picked at random and 5 girls are picked at random. Find the probability that the 4 boys masses are greater than the 5 girls masses.
 - d) One boy, B , and one girl, G , are picked at random. Find the probability that $4B > 5G$.

ANSWERS

1.
 - a) mean = 21, variance = 35
 - b) mean = 27, variance = 59
 - c) mean = 1, variance = 146
2. mean = 15.1 kg, variance = 2.564 kg
3. mean = 235 secs, variance = 11 secs
4.
 - a) mean = 380 g, variance = 46.5 g
 - b) 0.0011
 - c) 0.0075
5.
 - a) mean = 2805 kg, variance = 2335 kg
 - b) 0.745
 - c) 0.3274
 - d) 0.416