

Statistics 1 Normal Distribution Questions

- 7 (a) The weight, X grams, of soup in a carton may be modelled by a normal random variable with mean 406 and standard deviation 4.2.

Find the probability that the weight of soup in a carton:

(i) is less than 400 grams; *(3 marks)*

(ii) is between 402.5 grams and 407.5 grams. *(4 marks)*

- (b) The weight, Y grams, of chopped tomatoes in a tin is a normal random variable with mean μ and standard deviation σ .

(i) Given that $P(Y < 310) = 0.975$, explain why:

$$310 - \mu = 1.96\sigma \quad \text{span style="float: right;">*(3 marks)*$$

(ii) Given that $P(Y < 307.5) = 0.86$, find, to two decimal places, values for μ and σ .

- 2 The heights of sunflowers may be assumed to be normally distributed with a mean of 185 cm and a standard deviation of 10 cm.

(a) Determine the probability that the height of a randomly selected sunflower:

(i) is less than 200 cm; *(3 marks)*

(ii) is more than 175 cm; *(3 marks)*

(iii) is between 175 cm and 200 cm. *(2 marks)*

- (b) Determine the probability that the mean height of a random sample of 4 sunflowers is more than 190 cm. *(4 marks)*
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6 When Monica walks to work from home, she uses either route A or route B.

- (a) Her journey time, X minutes, by route A may be assumed to be normally distributed with a mean of 37 and a standard deviation of 8.

Determine:

(i) $P(X < 45)$; *(3 marks)*

(ii) $P(30 < X < 45)$. *(3 marks)*

- (b) Her journey time, Y minutes, by route B may be assumed to be normally distributed with a mean of 40 and a standard deviation of σ .

Given that $P(Y > 45) = 0.12$, calculate the value of σ . *(4 marks)*

- (c) If Monica leaves home at 8.15 am to walk to work hoping to arrive by 9.00 am, state, with a reason, which route she should take. *(2 marks)*

- (d) When Monica travels to work from home by car, her journey time, W minutes, has a mean of 18 and a standard deviation of 12.

Estimate the probability that, for a random sample of 36 journeys to work from home by car, Monica's mean time is more than 20 minutes. *(4 marks)*

- (e) Indicate where, if anywhere, in this question you needed to make use of the Central Limit Theorem. *(1 mark)*

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- 7 (a) Electra is employed by E & G Ltd to install electricity meters in new houses on an estate. Her time, X minutes, to install a meter may be assumed to be normally distributed with a mean of 48 and a standard deviation of 20.

Determine:

(i) $P(X < 60)$; *(2 marks)*

(ii) $P(30 < X < 60)$; *(3 marks)*

(iii) the time, k minutes, such that $P(X < k) = 0.9$. *(4 marks)*

- (b) Gazali is employed by E & G Ltd to install gas meters in the same new houses. His time, Y minutes, to install a meter has a mean of 37 and a standard deviation of 25.

(i) Explain why Y is unlikely to be normally distributed. *(2 marks)*

(ii) State why \bar{Y} , the mean of a random sample of 35 gas meter installations, is likely to be approximately normally distributed. *(1 mark)*

(iii) Determine $P(\bar{Y} > 40)$. *(4 marks)*

