5. A recycling centre measures the weight of glass deposited by the public each day.

The weight of glass, S kg, deposited at the recycling centre in a day during the summer can be modelled by $S \sim N(700, 50^2)$

(a) Using standardisation and showing your working, find the probability that, in one randomly selected day during the summer,

(i) more than 640 kg of glass is deposited at the recycling centre,

(2)

(ii) 700 kg of glass, correct to the nearest 50 kg, is deposited at the recycling centre.

(5)

The weight of glass, W kg, deposited at the recycling centre in a day during the winter can be modelled by $W \sim N(\mu, \sigma^2)$

(b) Given that $P(W > 680) = 0.0668$ and $P(W < 599) = 0.3$

(i) find **two** equations in terms of μ and σ

(3)

(ii) Hence, showing your working, find the value of μ and the value of σ

(3)

6. A biased coin has probability 0.4 of showing a head. In an experiment, the coin is spun until a head appears. If a head has not appeared after 4 spins, the coin is not spun again. The random variable X represents the number of times the coin is spun.

For example, $X = 3$ if the first two spins do not show a head but the third spin does show a head. The coin would not then be spun a fourth time since the coin has already shown a head.

(a) Show that $P(X = 3) = 0.144$

(1)

The table gives some values for the probability distribution of X

x	1	2	3	4
$P(X = x)$		0.24	0.144	

(b) (i) Write down the value of $P(X = 1)$

(ii) Find $P(X = 4)$

(3)

(c) Find $E(X)$

(2)

(d) Find $\text{Var}(X)$

(3)

The random variable H represents the number of heads obtained when the coin is spun in the experiment.

(e) Explain why H can only take the values 0 and 1 and find the probability distribution of H.

(2)

(f) Write down the value of

(i) $P(\{X = 3\} \cap \{H = 0\})$

(ii) $P(\{X = 4\} \cap \{H = 0\})$

(2)

The random variable $S = X + H$

(g) Find the probability distribution of S

(4)

5. A competition consists of two rounds.

The time, in minutes, taken by adults to complete round one is modelled by a normal distribution with mean 15 minutes and standard deviation 2 minutes.

(a) Use standardisation to find the proportion of adults that take less than 18 minutes to complete round one.

(2)

Only the fastest 60% of adults from round one take part in round two.

(b) Use standardisation to find the longest time that an adult can take to complete round one if they are to take part in round two.

(3)

The time, T minutes, taken by adults to complete round two is modelled by a normal distribution with mean μ

Given that $P(\mu - 10 < T < \mu + 10) = 0.95$

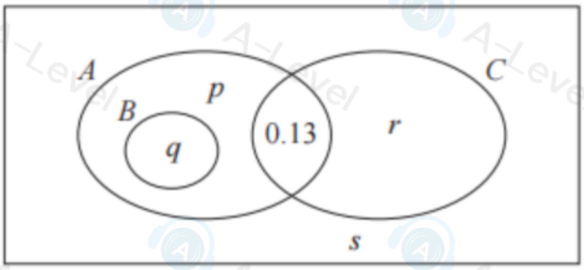
(c) find $P(T > \mu - 5 \mid T > \mu - 10)$

(5)

Leave blank

2. In the Venn diagram below, A, B and C are events and p, q, r and s are probabilities.

The events A and C are independent and $P(A) = 0.65$



(a) State which two of the events A, B and C are mutually exclusive.

(1)

(b) Find the value of r and the value of s.

(5)

The events $(A \cap C')$ and $(B \cup C)$ are also independent.

(c) Find the exact value of p and the exact value of q. Give your answers as fractions.

(6)