6. Three events A, B and C are such that

$$P(A) = 0.1 \qquad P(B|A) = 0.3 \qquad P(A \cup B) = 0.25 \qquad P(C) = 0.5$$

Given that A and C are mutually exclusive

(a) find $P(A \cup C)$

(1)

(b) Show that $P(B) = 0.18$

(3)

Given also that B and C are independent,

(c) draw a Venn diagram to represent the events A, B and C and the probabilities associated with each region.

(5)

3. (i) Bob shops at a market each week. The event that

Bob buys carrots is denoted by C

Bob buys onions is denoted by O

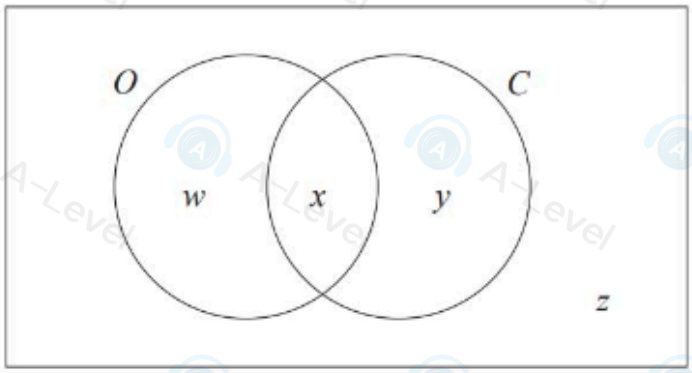
At each visit, Bob may buy neither, or one, or both of these items. The probability that

Bob buys carrots is 0.65

Bob does **not** buy onions is 0.3

Bob buys onions but not carrots is 0.15

The Venn diagram below represents the events C and O



where w, x, y and z are probabilities.

(a) Find the value of w, the value of x, the value of y and the value of z

(4)

For one visit to the market,

(b) find the probability that Bob buys either carrots or onions but not both.

(1)

(c) Show that the events C and O are **not** independent.

(2)

(ii) F, G and H are 3 events. F and H are mutually exclusive. F and G are independent.

Given that

$$\mathrm{P}(F) = \frac{2}{7} \qquad \mathrm{P}(H) = \frac{1}{4} \qquad \mathrm{P}(F \cup G) = \frac{5}{8}$$

(a) find $\mathrm{P}(F \cup H)$

(1)

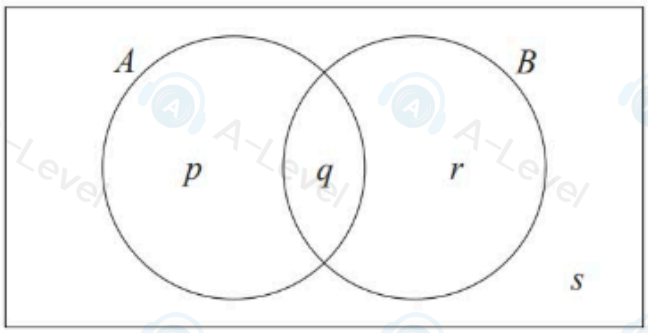
(b) find $\mathrm{P}(G)$

(3)

(c) find $\mathrm{P}(F \cap G)$

(1)

4. (i) In the Venn diagram below, A and B represent events and p, q, r and s are probabilities.



$$P(A) = \frac{7}{25} \qquad P(B) = \frac{1}{5} \qquad P\left[(A \cap B') \cup (A' \cap B)\right] = \frac{8}{25}$$

(a) Use algebra to show that $2p + 2q + 2r = \frac{4}{5}$

(4)

(b) Find the value of p, the value of q, the value of r and the value of s

(5)

(ii) Two events, C and D, are such that

$$P(C) = \frac{x}{x+5} \qquad P(D) = \frac{5}{x}$$

where x is a positive constant.

By considering $P(C) + P(D)$ show that C and D **cannot** be mutually exclusive.

(4)