Leave blank

**2.** A group of 40 families was asked whether their family had a dog, a cat or a rabbit as pets.

No family had a dog and a rabbit
2 families had both a dog and a cat
12 families had a dog
14 families had a cat
11 families had a rabbit
9 families did not have any of these animals as pets

A family from this group is selected at random.

$D$ represents the event that the family has a dog
$C$ represents the event that the family has a cat
$R$ represents the event that the family has a rabbit

(a) Draw a Venn diagram to illustrate this information.

**(4)**

(b) State, giving a reason, a pair of mutually exclusive events from $D$, $C$ and $R$.

**(1)**

(c) Find the probability that the family has exactly 2 of these kinds of animals as pets.

**(1)**

(d) Showing your working clearly, determine whether or not the events $D$ and $C$ are independent.

**(2)**

Sarah's family is in the group and her family has a pet cat.

(e) Find the probability that Sarah's family also has a pet rabbit.

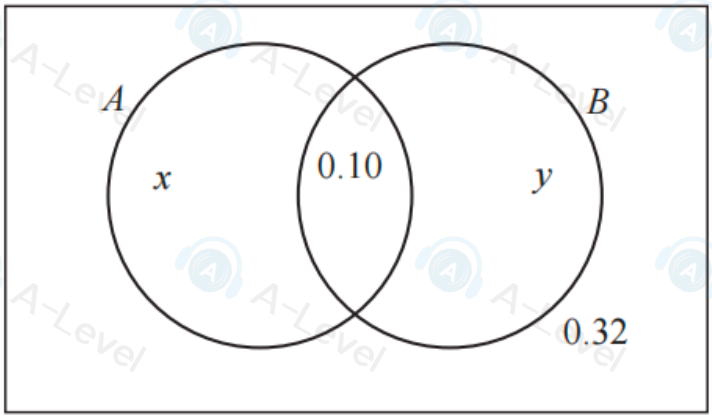
**(2)**

(f) Find the exact value of $P([D \cup R] | C')$

**(2)**

**4.** Events $A$ and $B$ are shown in the Venn diagram below

where $x$, $y$, 0.10 and 0.32 are probabilities.




(a) Find an expression in terms of $x$ for

(i) $P(A)$

(ii) $P(B \mid A)$

**(3)**

(b) Find an expression in terms of $x$ and $y$ for $P(A \cup B)$

**(1)**

Given that $P(A) = 2P(B)$

(c) find the value of $x$ and the value of $y$

**(5)**

**6.** A manufacturer fills bottles with oil.
The volume of oil in a bottle, $V$ ml, is normally distributed with $V \sim N(100, 2.5^2)$

(a) Find $P(V > 104.9)$

**(3)**

(b) In a pack of 150 bottles, find the expected number of bottles containing more than 104.9 ml

**(2)**

(c) Find the value of $v$, to 2 decimal places, such that $P(V > v \mid V < 104.9) = 0.2801$

**(6)**

Leave blank

**4.** Kris works in the mailroom of a large company and is responsible for all the letters sent by the company. The weights of letters sent by the company, $W$ grams, have a normal distribution with mean 165 g and standard deviation 35 g.

(a) Estimate the proportion of letters sent by the company that weigh less than 120 g.

**(3)**

Kris splits the letters to be sent into 3 categories: heavy, medium and light, with $\frac{1}{3}$ of the letters in each category.

(b) Find the weight limits that determine medium letters.

**(4)**

A heavy letter is chosen at random.

(c) Find the probability that this letter weighs less than 200 g.

**(3)**

Kris chooses a random sample of 3 letters from those in the mailroom one day.

(d) Find the probability that there is one letter in each of the 3 categories.

**(3)**