

5. A company has 1825 employees.  
The employees are classified as professional, skilled or elementary.

The following table shows

- the number of employees in each classification
- the two areas,  $A$  or  $B$ , where the employees live

	$A$	$B$
Professional	740	380
Skilled	275	90
Elementary	260	80

An employee is chosen at random.

Find the probability that this employee

$$(a) \quad \frac{275 + 90}{1825} = \frac{1}{5} = 0.2 \quad (1 \text{ mark})$$

(a) is skilled,

(b) lives in area  $B$  and is not a professional.

$$(b) \quad \frac{90 + 80}{1825} = \frac{34}{365} = 0.093235 \quad (1 \text{ mark}) \quad (1)$$

Some classifications of employees are more likely to work from home.

- 65% of professional employees in both area  $A$  and area  $B$  work from home
- 40% of skilled employees in both area  $A$  and area  $B$  work from home
- 5% of elementary employees in both area  $A$  and area  $B$  work from home
- Event  $F$  is that the employee is a professional
- Event  $H$  is that the employee works from home
- Event  $R$  is that the employee is from area  $A$

(c) Using this information, complete the Venn diagram on the opposite page.

(d) Find  $P(R' \cap F)$

(e) Find  $P([H \cup R]')$

(f) Find  $P(F | H)$

(4)

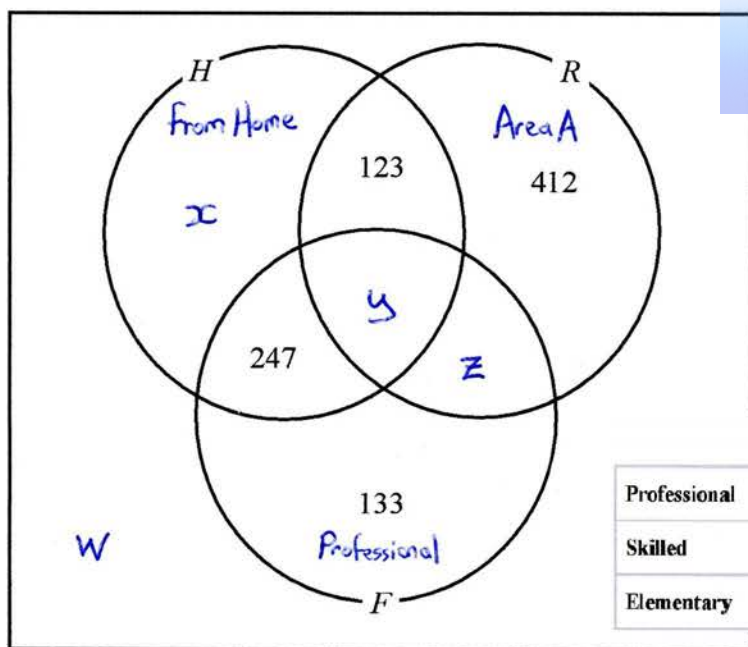
(1)

(1)

(2)

## Question 5 continued

(c)



	A	B
Professional	740	380
Skilled	275	90
Elementary	260	80

- 65% of professional employees in both area A and area B work from home
- 40% of skilled employees in both area A and area B work from home
- 5% of elementary employees in both area A and area B work from home

$$W + x + 123 + 412 = \text{not Professional} = 275 + 90 + 260 + 80$$

$$\Rightarrow W + x = 170$$

$$y + z + 123 + 412 = \text{Area A} = 740 + 275 + 260$$

$$\Rightarrow y + z = 740$$

$$65\% \text{ Professional work from Home} \Rightarrow \frac{247 + y}{740 + 380} = \frac{65}{100}$$

$$\Rightarrow y = \frac{65}{100}(740 + 380) - 247 = 481 \quad (1 \text{ mark})$$

$$y + z = 740 \Rightarrow 481 + z = 740 \Rightarrow z = 259 \quad (1 \text{ mark})$$

$$65\% \text{ of Prof.} + 40\% \text{ of Skilled} + 5\% \text{ of Elem. work from Home}$$

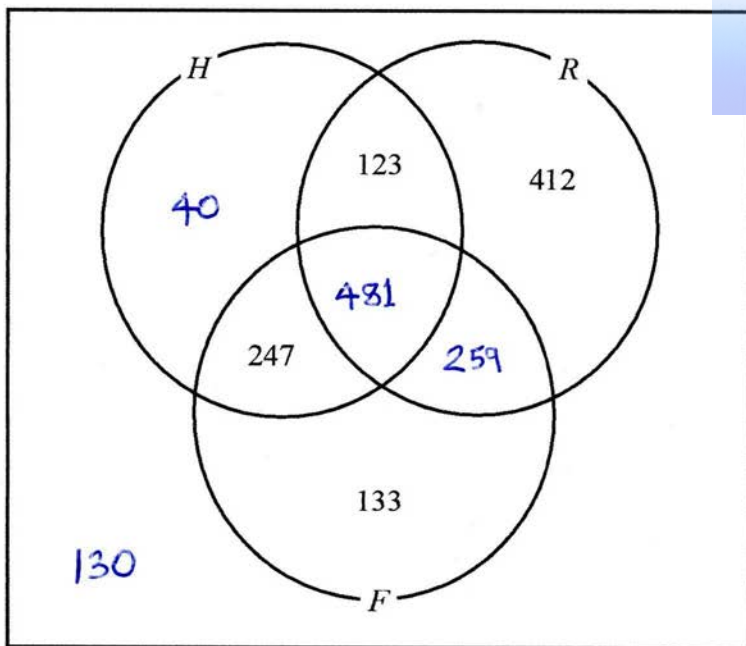
$$\Rightarrow (0.65 \times (740 + 380)) + (0.4 \times (275 + 90)) + (0.05 \times (260 + 80))$$

$$\Rightarrow 728 + 146 + 17 = 891 \text{ work from Home}$$

$$\Rightarrow x + y + 123 + 247 = 891$$

$$\Rightarrow x + 481 + 123 + 247 = 891 \Rightarrow x = 40 \quad (1 \text{ mark})$$

$$W + x = 170 \Rightarrow W + 40 = 170 \Rightarrow W = 130 \quad (1 \text{ mark})$$



(d) Find  $P(R' \cap F)$

$$\text{(d)} \quad P(R' \cap F) = \frac{247 + 133}{1825} = \frac{76}{365} = 0.2082... \\ = 0.208 \text{ 3sf (1mark)}$$

(e) Find  $P([H \cup R]')$

$$\text{(e)} \quad P([H \cup R]') = \frac{130 + 133}{1825} = \frac{263}{1825} = 0.1441... \\ = 0.144 \text{ 3sf (1mark)}$$

(f) Find  $P(F|H)$

$$\text{(f)} \quad P(F|H) = \frac{247 + 481}{40 + 123 + 247 + 481} = \frac{728}{891} = 0.8170... \\ = 0.817 \text{ 3sf (1mark)}$$