

**MARKS**

6  
(4, 2)

5. Suppose you have torn a tendon and are facing surgery to repair it. The orthopedic surgeon explains the risks to you: Infection occurs in 3% of such operations, the repair fails in 14%, both infection and failure occur in 1%.

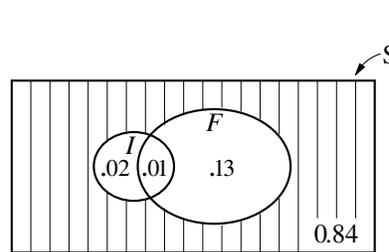
- (a) Find the percentage of these tendon-repair operations that succeed and are free from infection.
- (b) Can the two outcomes ‘infection’ and ‘failure’ reasonably be modelled as being *probabilistically independent*? Answer *Yes* or *No* and then justify your answer.

(a) Define event  $I$ : *infection occurs*,  $\Pr(I) = 0.03$ ,  
and event  $F$ : *repair fails*,  $\Pr(F) = 0.14$ .

We can show the probabilities given in the statement of the question as in the Venn diagram at the right.

We see that the percentage of operations that succeed and are free from infection is given by:

$$\Pr(\overline{F} \cap \overline{I}) = \text{shaded area} = 0.84 = 84\%.$$



84	(a)
Percentage	

(b) For **probabilistic independence**, we must have:  $\Pr(I) \times \Pr(F) = \Pr(I \cap F)$ .

We have:  $\Pr(I) = 0.03$ ,  $\Pr(F) = 0.14$ ,  
 $\Pr(I \cap F) = 0.01$ .

But:  $\Pr(I) \times \Pr(F) = 0.03 \times 0.14 = 0.0042 \neq \Pr(I \cap F)$ ;

hence, the two outcomes **cannot** reasonably be modelled as being probabilistically independent.

No	(b)
Yes or No	