Poisson distributions 2B

Note that because you are required to use tables in this exercise, when calculating the difference between two values (for example in question **2b**), you would obtain a slightly different answer on your calculator; this is because the table contains values already rounded to 4 d.p. and so you may introduce inaccuracy at the fourth decimal place when combining values.

1 a Use tables with $\lambda = 5.5$

$P(X \leqslant 3) = 0.2017$

b Use tables with $\lambda = 5.5$

$P(X \geqslant 6) = 1 - P(X \leqslant 5) = 1 - 0.5289 = 0.4711$

c Use tables with $\lambda = 5.5$

$P(3 \leqslant X \leqslant 7) = P(X \leqslant 7) - P(X \leqslant 2)$

$= 0.8095 - 0.0884 = 0.7211$

2 a Use tables with $\lambda = 10$

$P(X \geqslant 8) = 1 - P(X \leqslant 7) = 1 - 0.2202 = 0.7798$

b Use tables with $\lambda = 10$

$P(7 \leqslant X \leqslant 12) = P(X \leqslant 12) - P(X \leqslant 6)$

$= 0.7916 - 0.1301 = 0.6615$

c Use tables with $\lambda = 10$

$P(4 < X < 9) = P(X \leqslant 8) - P(X \leqslant 4)$

$= 0.3328 - 0.0293 = 0.3035$

3 a Use tables with $\lambda = 3.5$

$P(X \geqslant 2) = 1 - P(X \leqslant 1) = 1 - 0.1359 = 0.8641$

b Use tables with $\lambda = 3.5$

$P(3 \leqslant X \leqslant 6) = P(X \leqslant 6) - P(X \leqslant 2)$

$= 0.9347 - 0.3208 = 0.6139$

c Use tables with $\lambda = 3.5$

$P(2 < X \leqslant 5) = P(X \leqslant 5) - P(X \leqslant 2)$

$= 0.8576 - 0.3208 = 0.5368$

4 a Use tables with $\lambda = 4.5$

$P(X \geqslant 5) = 1 - P(X \leqslant 4) = 1 - 0.5321 = 0.4679$

b Use tables with $\lambda = 4.5$

$P(3 < X \leqslant 5) = P(X \leqslant 5) - P(X \leqslant 3)$

$= 0.7029 - 0.3423 = 0.3606$

c Use tables with $\lambda = 4.5$

$P(1 \leqslant X < 7) = P(X \leqslant 6) - P(X \leqslant 0)$

$= 0.8311 - 0.0111 = 0.8200$

5 **a** Use tables with $\lambda = 8$

$P(X \leqslant a) = 0.3134$

so $a = 6$

b Use tables with $\lambda = 8$

$P(X \leqslant b) = 0.7166$

so $b = 9$

c Use tables with $\lambda = 8$

$P(X < c) = P(X \leqslant c-1) = 0.0996$

so $c-1 = 4$

$c = 5$

d Use tables with $\lambda = 8$

$P(X > d) = 1 - P(X \leqslant d) = 0.8088$

so $P(X \leqslant d) = 1 - 0.8088 = 0.1912$

so $d = 5$

6 **a** Use tables with $\lambda = 3.5$

$P(X \leqslant a) = 0.8576$

so $a = 5$

b Use tables with $\lambda = 3.5$

$P(X > b) = 1 - P(X \leqslant b) = 0.6792$

so $P(X \leqslant b) = 1 - 0.6792 = 0.3208$

so $b = 2$

c Use tables with $\lambda = 3.5$

$P(X \leqslant c) \geqslant 0.95$

This is true for all values of $c > 6$

d Use tables with $\lambda = 3.5$

$P(X > d) \leqslant 0.005$

So $1 - P(X \leqslant d) \leqslant 0.005$

$P(X \leqslant d) \geqslant 1 - 0.005$

$P(X \leqslant d) \geqslant 0.995$

This is true for all values of $d > 8$