5. A discrete random variable Y has probability function

$$\mathrm{P}(Y = y) = \begin{cases} k(3 - y) & y = 1, 2 \\ k(y^2 - 8) & y = 3, 4, 5 \\ k & y = 6 \\ 0 & \text{otherwise} \end{cases}$$

where k is a constant.

(a) Show that $k = \dfrac{1}{30}$

(2)

Find the exact value of

(b) $\mathrm{P}(1 < Y \leqslant 4)$

(2)

(c) $\mathrm{E}(Y)$

(2)

The random variable $X = 15 - 2Y$

(d) Calculate $\mathrm{P}(Y \geqslant X)$

(3)

(e) Calculate $\mathrm{Var}(X)$

(4)

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Question 5 continued

(Total for Question 5 is 13 marks)