Question	Working	Answer	Mark	Notes
23	$\frac{12}{x}\times\frac{x-12}{x-1}$ oe **or** $\frac{x-12}{x}\times\frac{12}{x-1}$ oe		5	M1 for a correct expression for P(P,Y) or P(Y,P)
	$2\left(\frac{12}{x}\times\frac{x-12}{x-1}\right)=\frac{18}{47}$ oe **or** $\frac{12}{x}\times\frac{x-12}{x-1}+\frac{x-12}{x}\times\frac{12}{x-1}=\frac{18}{47}$ oe			M1 for a correct equation for P(P,Y) + P(Y,P) = $\frac{18}{47}$ This M mark implies first M mark
	$18x^2-1146x+13536(=0)$ oe **or** $9x^2-573x+6768(=0)$ oe **or** $3x^2-191x+2256(=0)$ oe			M1 dep on M2 simplified to a 3 term quadratic (ax^2+bx+c (=0) in any form) with at least 2 coefficients (a or b or c) are correct
	$(3x-47)(x-48)(=0)$ or $x=\frac{--191\pm\sqrt{(-191)^2-(4\times3\times2256)}}{2\times3}$ or $3\left[\left(x-\frac{191}{6}\right)^2-\left(\frac{191}{6}\right)^2\right]+2256(=0)$ $\left(x+\frac{-191}{2\times3}\right)^2-\left(\frac{-191}{2\times3}\right)^2+\frac{2256}{3}(=0)$			M1 ft dep on first M1 for solving *their* 3-term quadratic equation using any method – if factorising, allow brackets which expand to give 2 out of the 3 terms correct. If using the formula or completing the square allow one sign error and some simplification as far as $(x=)\frac{191\pm\sqrt{36\,481-27\,072}}{6}$ or $3\left(x-\frac{191}{6}\right)^2-\frac{9409}{12}(=0)$ Award this mark for answers of 48 and $\frac{47}{3}$ dep on M3
	Working required	48		A1 cao, dep on first 3 M marks. Do not award if non-integer solution also given.
				Total 5 marks

WITH REPLACEMENT				
23	$\frac{12}{x}\times\frac{x-12}{x}$ oe or $\frac{x-12}{x}\times\frac{12}{x}$ oe		5	M0
	$2\left(\frac{12}{x}\times\frac{x-12}{x}\right)=\frac{18}{47}$ oe or $\frac{12}{x}\times\frac{x-12}{x}+\frac{x-12}{x}\times\frac{12}{x}=\frac{18}{47}$ oe			M1 for a correct equation for P(P,Y) + P(Y,P) = $\frac{18}{47}$ **This M mark DOES NOT imply the first M mark**
	$18x^2-1128x+13536(=0)$ oe or $9x^2-564x+6768(=0)$ oe or $3x^2-188x+2256(=0)$ oe			M1 dep on previous M1 simplified to a 3 term quadratic (ax^2+bx+c (=0) in any form) with at least 2 coefficients (a or b or c) are correct
	$(x=)\frac{--188\pm\sqrt{(-188)^2-(4\times3\times2256)}}{2\times3}$ or $3\left[\left(x-\frac{188}{6}\right)^2-\left(\frac{188}{6}\right)^2\right]+2256(=0)$ oe or $(x=)\frac{188\pm4\sqrt{517}}{6}$ or $\left(x+\frac{-188}{2\times3}\right)^2-\left(\frac{-188}{2\times3}\right)^2+\frac{2256}{3}(=0)$ or (x =) 46(.491756) and 16(.174910)			M1 ft dep on second M1 for solving *their* 3-term quadratic equation using any method – if factorising, allow brackets which expand to give 2 out of the 3 terms correct. If using the formula or completing the square allow one sign error and some simplification as far as $(x=)\frac{188\pm\sqrt{35344-27\,072}}{6}$ or $3\left(x-\frac{188}{6}\right)^2-\frac{2068}{3}(=0)$ Award this mark for both values of x dep on M2
	Working required			A0
				Total 3 marks