Question	Scheme	Marks
9 (a)	$$(1-2x)^{-\frac{1}{2}} = 1 + \left(-\frac{1}{2} \times -2x\right) + \frac{\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)(-2x)^2}{2!} + \frac{\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)\left(-\frac{5}{2}\right)(-2x)^3}{3!} + ...$$ $$(1-2x)^{-\frac{1}{2}} = 1 + x + \frac{3}{2}x^2 + \frac{5}{2}x^3 + ...$$.	M1 A1A1 [3]
(b)	$$\frac{1}{\sqrt{0.96}} = \frac{1}{\sqrt{\frac{96}{100}}} = \frac{10}{4\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = ...$$ $$\frac{10\sqrt{6}}{4 \times 6} = \frac{5\sqrt{6}}{12} *$$	M1 A1 cso [2]
ALT – confirming given result		
	$$\frac{1}{\sqrt{0.96}} = \frac{5\sqrt{6}}{12} \Rightarrow 12 = \sqrt{0.96} \times 5\sqrt{6}$$ $$12^2 = 0.96\left(5\sqrt{6}\right)^2 = 0.96 \times 5^2 \times 6 *$$	[M1 A1cso]
(c)	$$\frac{1}{\left(5\sqrt{6}-12\right)} \times \frac{\left(5\sqrt{6}+12\right)}{\left(5\sqrt{6}+12\right)}$$ $$= \frac{5\sqrt{6}+12}{150-12^2} = \frac{5\sqrt{6}+12}{6} = \frac{5\sqrt{6}}{6} + 2$$	M1 A1 [2]
(d)	$1-2x = 0.96 \Rightarrow 2x = 0.04 \Rightarrow x = 0.02$ $$\frac{9}{5\sqrt{6}-12} = 9\left(2 \times \left[\frac{5\sqrt{6}}{12}\right] + 2\right) =: 9 \times \left[2\left(1+0.02+\frac{3}{2} \times 0.02^2 + \frac{5}{2} \times 0.02^3\right) + 2\right] = ...$$ 36.37116	B1 M1:M1 A1 [4]
		Total 11 marks

Part	Mark	Notes
(a)	**M1**	For an attempt to use the Binomial Expansion The minimally acceptable attempt is as follows; - The power of x must be correct in each term. $\left[x, \; x^2 \text{ and } x^3\right]$ - The first term is 1 - The denominators are correct $-2x$ correct in each term $$(1-2x)^{-\frac{1}{2}} = 1 + \left(-\frac{1}{2} \times -2x\right) + \frac{\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)(-2x)^2}{2!} + \frac{\left(-\frac{1}{2}\right)\left(-\frac{3}{2}\right)\left(-\frac{5}{2}\right)(-2x)^3}{3!} + ...$$
	A1	The first term and one algebraic term correct and simplified

		$$(1-2x)^{-\frac{1}{2}} = 1 + x + \frac{3}{2}x^2 + \frac{5}{2}x^3 + ...$$
	A1	Fully correct simplified expansion as shown above.
(b)	**M1**	For changing 0.96 to $\dfrac{96}{100}$ or equivalent fraction and attempting to multiply numerator and denominator by either $\sqrt{6}$ $\left(\text{or } \sqrt{96}\right)$ $$\frac{1}{\sqrt{0.96}} = \frac{1}{\sqrt{\dfrac{96}{100}}} = \frac{10}{4\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = ...$$
	A1 cso	For the correct answer as shown with no errors $\dfrac{10\sqrt{6}}{4 \times 6} = \dfrac{5\sqrt{6}}{12}$ *
ALT – confirming given result		
	M1	For rearranging and squaring OR for squaring on both sides
	A1 cso	For showing that the two sides of the result are equal $$12^2 = 0.96 \left(5\sqrt{6}\right)^2 = 0.96 \times 5^2 \times 6 = 144$$
(c)	**M1**	For multiplying numerator and denominator by $5\sqrt{6}+12$ $$\frac{1}{\left(5\sqrt{6}-12\right)} \times \frac{\left(5\sqrt{6}+12\right)}{\left(5\sqrt{6}+12\right)} \qquad \text{[Can be implied by } \frac{\left(5\sqrt{6}+12\right)}{\left(150-12^2\right)} \text{ seen]}$$
	A1	For a **correct** expansion of brackets throughout. $$\frac{1}{\left(5\sqrt{6}-12\right)} \times \frac{\left(5\sqrt{6}+12\right)}{\left(5\sqrt{6}+12\right)} \left[= \frac{5\sqrt{6}+12}{150-12^2}\right] = \frac{5\sqrt{6}+12}{6} = \frac{5\sqrt{6}}{6} + 2$$
(d)	**B1**	For finding the required value of x $$1-2x = 0.96 \Rightarrow 2x = 0.04 \Rightarrow x = 0.02$$
	M1	For substituting their value of x **provided** it is $-\dfrac{1}{2} < x < \dfrac{1}{2}$ into the expansion as follows: $$\frac{9}{5\sqrt{6}-12} = 9\left(2 \times \left[\frac{5\sqrt{6}}{12}\right] + 2\right) =$$ **Note:** Must show substitution if x is incorrect.
	M1	For substituting their expansion for $\dfrac{5\sqrt{6}}{12}$ $$9 \times \left[2\left(1 + 0.02 + \frac{3}{2} \times 0.02^2 + \frac{5}{2} \times 0.02^3\right) + 2\right] = \cdots$$
	A1	For the value of 36.37116 [The calculator value is 36.37117]