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Mathematics

9709/32

Paper 3 Pure Mathematics 3

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Question No(1)

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Question No (1)

Expand $(9 - 3x)^{\frac{1}{2}}$ in ascending powers of x , up to and including the term in x^2 , simplifying the coefficients.

Solution:

$$\begin{aligned}
 & (9-3x)^{\frac{1}{2}} \\
 & (9-3x)^{\frac{1}{2}} = (9)^{\frac{1}{2}} \left[1 - \frac{3x}{9}\right]^{\frac{1}{2}} \\
 & = (3^2)^{\frac{1}{2}} \left(1 - \frac{x}{3}\right)^{\frac{1}{2}} \\
 & = 3 \left(1 - \frac{x}{3}\right)^{\frac{1}{2}}
 \end{aligned}$$

Binomial expansion

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \dots$$

$$\begin{aligned}
 & = 3 \left[1 + \left(\frac{1}{2}\right) \left(-\frac{x}{3}\right) + \frac{\frac{1}{2}(\frac{1}{2}-1)}{2!} \left(-\frac{x}{3}\right)^2 \right] \\
 & = 3 \left[1 - \frac{x}{6} + \frac{\frac{1}{2}(-\frac{1}{2})}{2 \times 1} \left(\frac{x^2}{9}\right) \right]
 \end{aligned}$$

$$(9-3x)^{\frac{1}{2}} = 3 - \frac{x}{2} - \frac{x^2}{24} \quad \underline{\underline{\text{Ans}}}$$

