### Partial Fractions

**AH Maths Exam Questions**

<table>
<thead>
<tr>
<th>Source: 2019 Specimen P2 Q1 AH Maths (same Question as 2017 Q2)</th>
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<th>Source: 2019 Q4 AH Maths</th>
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<th>Source: 2018 Q2 AH Maths</th>
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### 2016 Q13 AH Maths

(4) Express \( \frac{3x + 32}{(x + 4)(6 - x)} \) in partial fractions and hence evaluate \( \int_{3}^{4} \frac{3x + 32}{(x + 4)(6 - x)} \, dx \).

Give your answer in the form \( \ln \left( \frac{p}{q} \right) \).

### 2012 Q15a AH Maths

(5) Express \( \frac{1}{(x-1)(x+2)^2} \) in partial fractions.

### 2014 Q14b AH Maths

(6) (a) Given the series \( 1 + r + r^2 + r^3 + \ldots \), write down the sum to infinity when \( |r| < 1 \).

Hence obtain an infinite geometric series for \( \frac{1}{2 - 3r} \).

For what values of \( r \) is this series valid?

(b) Express \( \frac{1}{3r^2 - 5r + 2} \) in partial fractions.

Hence, or otherwise, determine the first three terms of an infinite series for \( \frac{1}{3r^2 - 5r + 2} \).

For what values of \( r \) does the series converge?
### Source: 2011 Q1 AH Maths

| (7) | \[
Express \frac{13-x}{x^2+4x-5} \text{ in partial fractions and hence obtain} \int \frac{13-x}{x^2+4x-5} \, dx.
\] |

### Source: 2009 Q14 AH Maths

| (8) | \[
Express \frac{x^2+6x-4}{(x+2)^2(x-4)} \text{ in partial fractions. Hence, or otherwise, obtain the first three non-zero terms in the Maclaurin expansion of } \frac{x^2+6x-4}{(x+2)^2(x-4)}.
\] |

### Source: 2008 Q4 AH Maths

| (9) | \[
Express \frac{12x^2+20}{x(x^2+5)} \text{ in partial fractions. Hence evaluate} \int_1^2 \frac{12x^2+20}{x(x^2+5)} \, dx.
\] |

### Source: 2007 Q4 AH Maths

| (10) | \[
Express \frac{2x^2-9x-6}{x(x^2-x-6)} \text{ in partial fractions. Given that} \int_4^6 \frac{2x^2-9x-6}{x(x^2-x-6)} \, dx = \ln \frac{m}{n},
\]
determine values for the integers \(m\) and \(n\).