



Additional Math with Ali Hashir
The Factor Theorem
 Answers

CIE O Level Additional Mathematics 4037 • Total: 62 marks

Easy (Q1–Q2)

Q1. $f(3) = 0$; $f(x) = (x - 3)(x - 2)(x + 1)$

Q2. $f(-2) = 0$; $f(x) = (x + 2)(2x + 3)(x - 2)$

Medium (Q3–Q7)

Q3 (i). $p = -8$

Q3 (ii). $f(-\frac{1}{2}) = 0$, so $2x + 1$ is a factor

Q3 (iii). Third factor is $x + 2$; $f(x) = (x - 2)(2x + 1)(x + 2)$

Q4. $b = \frac{3 - 2a^2}{a} = \frac{3}{a} - 2a$

Q5. $a = 2$, $b = -2$; remainder on division by $x + 2$ is 7

Q6. $a = 2$, $b = -2$

Q7. $(x + 2)^3 - (x + 1)^3 - 3x - 16 = 3(x^2 + 2x - 3)$, so $x^2 + 2x - 3$ is a factor

Hard (Q8–Q10)

Q8. $a = 2$, $b = -7$; $2x^3 - 7x^2 - 5x + 4 = (x - 4)(x + 1)(2x - 1)$

Q9 (a). $p = -1$ or $p = -\frac{1}{2}$

Q9 (b). $p = -1$ or $p = -2$

Q9. Divisible by $x + 2$ but not by $x - 1$: $p = -2$

Q10. $f(2b) = 0$, so $a - 2b$ is a factor; remainder on division by $a + b$ is $6b^3$

Challenge 1

$a + b = -3$

Challenge 2

• $q = -a^2$ and $a = -\frac{3p}{4}$, giving $16q = -9p^2$, i.e. $9p^2 + 16q = 0$

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Full worked solutions available at the website.

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