FOUNDATION & HIGHER

HIGHER EXTENDS

Name ..... Class .....

A4: Manipulating expressions

Solve problems by expanding, factorising and simplifying

20 marks · 25 minutes · Non-calculator

1) A rectangle is $(x + 5)$ cm by $(x + 2)$ cm. A square of side x cm is cut out. The remaining area is $45\,\text{cm}^2$. Find x.

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[Question 1: 3 marks]

2) Show that a square of side $(2x + 3)$ has area $24x$ more than a square of side $(2x - 3)$. The difference in their areas is $72\,\text{cm}^2$. Find x.

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[Question 2: 3 marks]

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3) An open box is made from a 20 cm by 20 cm card by cutting a square of side x cm from each corner. Show that its volume is $4x^3 - 80x^2 + 400x$

[Question 3: 3 marks]

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4) A rectangle has area $(x^2+7x+12)\,\text{cm}^2$ and one side $(x+3)\,\text{cm}$. Find an expression for its perimeter.

..... cm

[Question 4: 3 marks]

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5) Simplify $\dfrac{x^2-9}{x^2+5x+6}$ and use your answer to evaluate it when $x = 7$

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[Question 5: 3 marks]

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6) $(2x + 1)(x - 3) + 4 \equiv ax^2 + bx + c$. Find a, b and c.

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[Question 6: 2 marks]

7) The product of two consecutive positive integers is 132. Find them.

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[Question 7: 3 marks]

End of paper – 20 marks in total

Answers and brief mark scheme

Q	Answer	Method / notes
1	5	$x^2 + 7x + 10 - x^2$ (P1); $7x + 10 = 45$ (P1); A1.
2	3	Expansions $4x^2 + 12x + 9$ and $4x^2 - 12x + 9$ (P1); difference $24x$ (P1); $x = 3$ (A1).
3	Shown	Base $(20 - 2x)$ (P1); $x(20 - 2x)^2$ (P1); expansion (A1).
4	$4x + 14$	Other side $(x + 4)$ (P1, P1); A1.
5	$\frac{4}{9}$	Factorises (P1); $\frac{x-3}{x+2}$ (P1); $\frac{4}{9}$ (A1).
6	$a = 2, b = -5, c = 1$	Expansion (P1); A1.
7	11 and 12	$n^2 + n - 132 = 0$ (P1); $(n + 12)(n - 11)$ (P1); A1.