

8 ESSENTIAL QUESTIONS TO MASTER

EXPANSION & FACTORISATION

1	Simplify $(2x - 3)(x + 2) - x(2x - 1)$	
2	Factorise (a) $48x^2 - 27y^2$ (b) $32a^2 - 50b^2 - 8a + 10b$	
3	(a) Expand and simplify the following expression: $(4a + 3)(3a - 3b + 6)$ (b) Factorise the expression completely $3x^3 - 27x$ (c) If $5(x - y)^2 = 405$ and $xy = 17$, find the value of $3x^2 + 3y^2$	
4	(a) Simplify $x^2 - (x - 2)^2 + (x - 1)^2 - (x - 4)^2$ (b) Find the value of $100^2 - 99^2 + 98^2 - 97^2$	
5	Factorise the following completely: (a) $-3(x - 1) + 15x - 15$ (b) $100x^2 + 220xy + 121y^2$	
6	Factorise the following completely: (a) $12ax + 7by + 28ay + 3bx$ (b) $64x^2y^2 - 81$	
7	(a) Expand $(4x - 5)^2$ (b) Without using a calculator, use algebraic rules to evaluate $\frac{81}{81^2 - 85 \times 77}$ Leave your answer as a fraction.	
8	It is given that $a + b = 7$ and $ab = -4$. Find the value of $a^2 + b^2$.	

Answer Key:

1	$(2x - 3)(x + 2) = 2x(x) + 2x(2) - 3(x) - 3(2)$ $= 2x^2 + 4x - 3x - 6$ $= 2x^2 + x - 6$ $-x(2x - 1) = -2x^2 + x$ $(2x^2 + x - 6) + (-2x^2 + x)$ $2x^2 + x - 6 - 2x^2 + x$ $(2x^2 - 2x^2) + (x + x) - 6$ $= 2x - 6$	
2	(a) $48x^2 - 27y^2 = 3(16x^2 - 9y^2)$ $a^2 - b^2 = (a - b)(a + b)$ $3(4x - 3y)(4x + 3y)$ (b)	

	$32a^2 - 8a - 50b^2 + 10b$ $2(16a^2 - 25b^2) - 2(4a - 5b)$ $2[(4a)^2 - (5b)^2] - 2(4a - 5b)$ $2(4a - 5b)(4a + 5b) - 2(4a - 5b)$ $2(4a - 5b)[(4a + 5b) - 1]$ $2(4a - 5b)(4a + 5b - 1)$	
3	(a) $4a \times (3a - 3b + 6) = 12a^2 - 12ab + 24a$ $4a \times (3a - 3b + 6) = 12a^2 - 12ab + 24a$ $3 \times (3a - 3b + 6) = 9a - 9b + 18$ $12a^2 - 12ab + 24a + 9a - 9b + 18$ $12a^2 - 12ab + 33a - 9b + 18$ (b) Greatest common factor: $3x^3$ and $-27x$ is $3x$. Factoring this out, we get: $3x(x^2 - 9)$ The expression $x^2 - 9$ is a difference of squares, which can be factored as $(x + 3)(x - 3)$. Substituting the factored form of $x^2 - 9$ back into the expression, answer will be: $3x(x + 3)(x - 3)$ (c) $(x - y)^2 = \frac{405}{5} = 81$ $x^2 - 2xy + y^2 = 81$ $x^2 - 2(17) + y^2 = 81$ $x^2 - 34 + y^2 = 81$ $x^2 + y^2 = 81 + 34$ $x^2 + y^2 = 115$ $3(x^2 + y^2) = 3(115)$ $3x^2 + 3y^2 = 345$	
4	(a) $x^2 - (x^2 - 4x + 4) + (x^2 - 2x + 1) - (x^2 - 8x + 16)$ $x^2 - x^2 + 4x - 4 + x^2 - 2x + 1 - x^2 + 8x - 16$ $(x^2 - x^2 + x^2 - x^2) + (4x - 2x + 8x) + (-4 + 1 - 16)$ $0x^2 + 10x - 19$ Answer: $10x - 19$ (b) $100^2 - 99^2 = (100 + 99)(100 - 99) = (199)(1) = 199$ $98^2 - 97^2 = (98 + 97)(98 - 97) = (195)(1) = 195$ $199 + 195 = 394$	
5	(a) $-3(x - 1) = -3x + 3$ $-3x + 3 + 15x - 15$ $(-3x + 15x) + (3 - 15)$ $12x - 12$ $12(x - 1)$ (b)	

	$100x^2 + 220xy + 121y^2$ $(10x)^2 = 100x^2$ $(11y)^2 = 121y^2$ $2(10x)(11y) = 220xy$ $(10x + 11y)(10x + 11y)$ $(10x + 11y)^2$	
6	(a) $12ax + 7by + 28ay + 3bx$ $12ax + 3bx + 28ay + 7by$ $3x(4a + b) + 7y(4a + b)$ $(4a + b)(3x + 7y)$ (b) $64x^2y^2 = (8xy)^2$ $81 = 9^2$ $a^2 - b^2 = (a - b)(a + b)$ $64x^2y^2 - 81 = (8xy)^2 - 9^2 = (8xy - 9)(8xy + 9)$	
7	(a) $(4x - 5)^2 = (4x)^2 - 2(4x)(5) + (5)^2$ $= 16x^2 - 40x + 25$ (b) 85 and 77 are close to 81. Specifically: $85 = 81 + 4$ $77 = 81 - 4$ $\begin{array}{r} 81 \\ \hline 81^2 - (81 + 4)(81 - 4) \end{array}$ $(81 + 4)(81 - 4) = 81^2 - 4^2 = 81^2 - 16$ $\begin{array}{r} 81 \\ \hline 81^2 - (81^2 - 16) \end{array}$ $81^2 - (81^2 - 16) = 81^2 - 81^2 + 16 = 16$ $\begin{array}{r} 81 \\ \hline 16 \end{array}$	
8	We know that $(a + b)^2 = a^2 + 2ab + b^2$. We are given $a + b = 7$ and $ab = -4$. We want to find $a^2 + b^2$. We can rearrange the equation $(a + b)^2 = a^2 + 2ab + b^2$ to solve for $a^2 + b^2$: $a^2 + b^2 = (a + b)^2 - 2ab$ Now Substitute the given values: $a^2 + b^2 = (7)^2 - 2(-4)$ $a^2 + b^2 = 49 + 8$ $a^2 + b^2 = 57$ Therefore, the value of $a^2 + b^2$ is 57.	