Foundation Check In - 6.01 Algebraic expressions

1. Express the following as a simplified single expression.

   $(2x + 3) – (x – 2)$

2. Simplify the following algebraic expression.

   $x^2 \times 2x^5 \times x$

3. Multiply out and simplify the following expression.

   $(x + 2)(3x – 1)$

4. Factorise the following expression.

   $x^2 – 7x + 10$

5. Express the following as a simplified single expression.

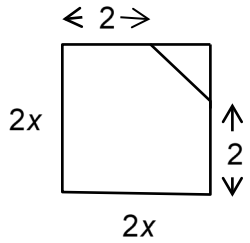
   $4x^4y^2 \div 2x^3y^2$

6. Explain why $x^2 – 6x + 9 \equiv (x – 3)^2$ is an identity but $x^2 – 5x + 10 = (x – 3)^2$ is an equation.

7. The area of a rectangle is given as $x^2 + 5x + 4$. Show that the perimeter of the rectangle is $2(2x + 5)$.

8. Show that a% of b is the same as b% of a.

9. The diagram on the right shows a square with sides of length $2x$. Write down an expression for the area of the triangle marked on one corner.



10. The area of a chessboard is given as $64x^2 – 256x + 256\,\text{cm}^2$. Find an expression for the length of a single square on the board.

Extension

1, 1, 2, 3, 5… and 2, 5, 7, 12, 19… are examples of Fibonacci sequences. Show that the sum of the first ten terms of any Fibonacci sequence is always $11(5a + 8b)$ where a and b are the first 2 terms.

Answers

1. $x + 5$

2. $2x^8$

3. $3x^2 + 5x - 2$

4. $(x - 2)(x - 5)$

5. $2x$

6. $x^2 - 6x + 9 \equiv (x - 3)^2$ is an identity because it is true for all values of x, but $x^2 - 5x + 10 = (x - 3)^2$ is an equation because it is only true when $x = -1$.

7. $x^2 + 5x + 4 = (x + 4)(x + 1)$ so the length is $x + 4$ and the width is $x + 1$, giving a perimeter of $4x + 10 = 2(2x + 5)$.

8. $\frac{a}{100} \times b = \frac{ab}{100} = \frac{b}{100} \times a$

9. Area $= \frac{1}{2}(2x - 2)(2x - 2) = 2x^2 - 4x + 2$

10. Factorising by the number of squares gives $64(x^2 - 4x + 4)$, then factorising again to find the length of the side of each square gives $x^2 - 4x + 4 = (x - 2)(x - 2)$. Side length is $x - 2$ cm.

Extension

a, b, $a + b$, $a + 2b$, $2a + 3b$, $3a + 5b$, $5a + 8b$, $8a + 13b$, $13a + 21b$, $21a + 34b$.
Sum of the first ten terms is $55a + 88b = 11(5a + 8b)$.

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AO1	3	Expand and simplify a binomial product			
AO1	4	Factorise a quadratic expression into brackets			
AO1	5	Simplify algebraic quotients using the laws of indices			
AO2	6	Understand the difference between an equation and an identity			
AO2	7	Factorise and collect like terms to derive a length from an area			
AO2	8	Use algebra to generalise a mathematical concept			
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