

9 ESSENTIAL QUESTIONS TO MASTER

SIMPLE ALGEBRAIC FRACTIONS & FORMULA

1	Simplify $\frac{15a^3b^2}{5ca} \div \frac{3b}{2c}$	
2	Express as a single fraction $\frac{3x+4}{2x^2+x-3} - \frac{1}{x-1}$	
3	Simplify (a) $\frac{3a^2}{4b} \div \frac{a}{6}$ (b) $\left(\frac{3x}{4} + \frac{5x}{16}\right) \times \frac{4}{x}$	
4	(a) Express as a single fraction: $1 - \frac{3a-b}{a+2b}$ (b) Simplify $\frac{4x}{3} + \frac{5x}{3} = 10$	
5	Simplify the following algebraic fractions: (a) $\frac{3x}{5y^3} \times \frac{4}{xy} \div \frac{2}{y^2}$ (b) $\frac{9x^2 - z^2}{3x + z} \times \frac{4}{x^2 - 5x - 14}$	
6	Simplify $\frac{5x}{3} - \frac{2(1+4x)}{7}$	
7	Simplify $\frac{x}{x^2-9} - \frac{3}{3-x}$	
8	(a) It is given that $\frac{2x+5z}{6x-z}$ (i) Find y when x = 1 and z = 2 (ii) Express x in terms of y and z. (b) Simplify $\frac{9x^2-25}{x^2+\frac{10}{3}+\frac{25}{9}}$	
9	If $y = \frac{2x-3}{x+1}$, express x in terms of y.	

Answer Key:

1	$\frac{15a^3b^2}{5ca} \div \frac{3b}{2c}$ $\frac{15a^3b^2}{5ca} = \frac{3a^2b^2}{c}$	
---	---	--

	$\frac{3a^2b^2}{c} \div \frac{3b}{2c} = \frac{3a^2b^2}{c} \times \frac{2c}{3b}$ $\frac{3a^2b^2 \times 2c}{c \times 3b} = \frac{6a^2b^2c}{3bc}$ $\frac{6a^2b^2c}{3bc} = 2a^2b$	
2	To express the given expression as a single fraction, we first need to find a common denominator. Denominator of the first fraction is $2x^2 + x - 3$, which can be factored as $(2x + 3)(x - 1)$. Denominator of the second fraction is $x - 1$. Thus, the common denominator is $(2x + 3)(x - 1)$. $\frac{3x + 4}{(2x + 3)(x - 1)} - \frac{1}{x - 1} = \frac{3x + 4}{(2x + 3)(x - 1)} - \frac{2x + 3}{(2x + 3)(x - 1)}$ $\frac{3x + 4 - (2x + 3)}{(2x + 3)(x - 1)} = \frac{3x + 4 - 2x - 3}{(2x + 3)(x - 1)} = \frac{x + 1}{(2x + 3)(x - 1)}$ Actual answer: $\frac{x+1}{(2x+3)(x-1)}$	
3	(a) $\frac{3a^2}{4b} \times \frac{6}{a}$ $\frac{18a^2}{4ab}$ $\frac{9a}{2b}$ (b) The least common denominator for 4 and 16 is 16. Convert $\frac{3x}{4}$ to an equivalent fraction with a denominator of 16: $\frac{3x}{4} \times \frac{4}{4} = \frac{12x}{16}$ $\left(\frac{12x}{16} + \frac{5x}{16}\right) \times \frac{4}{x}$ $\frac{12x + 5x}{16} = \frac{17x}{16}$ $\frac{17x}{16} \times \frac{4}{x}$ $\frac{17x \times 4}{16 \times x} = \frac{68x}{16x}$ Cancel the common factor of x: $\frac{68}{16}$ $\frac{68 \div 4}{16 \div 4} = \frac{17}{4}$	

4	(a) $1 = \frac{a+2b}{a+2b}$ $1 - \frac{3a-b}{a+2b} = \frac{a+2b}{a+2b} - \frac{3a-b}{a+2b}$ $\frac{a+2b-(3a-b)}{a+2b}$ $\frac{a+2b-3a+b}{a+2b} = \frac{-2a+3b}{a+2b}$ $\frac{-2a+3b}{a+2b}$ (b) $\frac{4x+5x}{3} = 10$ $\frac{9x}{3} = 10$ $3x = 10$ $x = \frac{10}{3}$	
5	(a) $\frac{3x}{5y^3} \times \frac{4}{xy} \div \frac{2}{y^2}$ $\frac{3x}{5y^3} \times \frac{4}{xy} \times \frac{y^2}{2}$ $\frac{3x \times 4 \times y^2}{5y^3 \times xy \times 2} = \frac{12xy^2}{10xy^4}$ $\frac{12xy^2}{10xy^4} = \frac{6 \times 2 \times x \times y^2}{5 \times 2 \times x \times y^2 \times y^2} = \frac{6}{5y^2}$ (b) $9x^2 - z^2 = (3x-z)(3x+z)$ $x^2 - 5x - 14 = (x-7)(x+2)$ $\frac{(3x-z)(3x+z)}{3x+z} \times \frac{4}{(x-7)(x+2)}$ $\frac{(3x-z)}{1} \times \frac{4}{(x-7)(x+2)}$ $\frac{4(3x-z)}{(x-7)(x+2)}$	

	$\frac{12x - 4z}{(x - 7)(x + 2)}$ $\frac{12x - 4z}{x^2 - 5x - 14}$	
6	$\frac{5x}{3} - \frac{2 + 8x}{7}$ $\frac{5x}{3} \times \frac{7}{7} - \frac{2 + 8x}{7} \times \frac{3}{3}$ $\frac{35x}{21} - \frac{6 + 24x}{21}$ $\frac{35x - (6 + 24x)}{21}$ $\frac{35x - 6 - 24x}{21}$ $\frac{11x - 6}{21}$	
7	First, notice that $x^2 - 9$ can be factored as a difference of squares: $x^2 - 9 = (x - 3)(x + 3)$. Also, notice that $3 - x = -(x - 3)$. To rewrite the expression it would be: $\frac{x}{(x - 3)(x + 3)} - \frac{3}{-(x - 3)}$ $\frac{x}{(x - 3)(x + 3)} + \frac{3}{x - 3}$ Now, we want to get a common denominator, which will be $(x - 3)(x + 3)$. To do this, we multiply the second term by $\frac{x+3}{x+3}$: $\frac{x}{(x - 3)(x + 3)} + \frac{3(x + 3)}{(x - 3)(x + 3)}$ Now that we have a common denominator, we can add the numerators: $\frac{x + 3(x + 3)}{(x - 3)(x + 3)}$ $\frac{x + 3x + 9}{(x - 3)(x + 3)}$ $\frac{4x + 9}{(x - 3)(x + 3)}$	

	$\frac{4x+9}{x^2-9}$	
8	(a) (i) Find y when $x = 1$ and $z = 2$. Substitute $x = 1$ and $z = 2$ into the equation $y = \frac{2x+5z}{6x-z}$ $y = \frac{2(1) + 5(2)}{6(1) - 2} = \frac{2 + 10}{6 - 2} = \frac{12}{4} = 3$ So $y = 3$. (ii) Express x in terms of y and z: We have $y = \frac{2x+5z}{6x-z}$. Multiply both sides by $(6x-z)$: $y(6x - z) = 2x + 5z$ $6xy - yz = 2x + 5z$ Now we want to isolate x. move all terms with x to one side and other terms to other side: $6xy - 2x = 5z + yz$ Factor out x: $x(6y - 2) = 5z + yz$ Divide by $(6y - 2)$ $x = \frac{5z + yz}{6y - 2}$ (b) Simplify $\frac{9x^2-25}{x^2+\frac{10}{3}x+\frac{25}{9}}$ First, factor the numerator and the denominator: The numerator is a difference of squares : $9x^2 - 25 = (3x)^2 - (5)^2 = (3x - 5)(3x + 5)$ The denominator is a perfect square trinomial: $x^2 + \frac{10}{3}x + \frac{25}{9} = \left(x + \frac{5}{3}\right)^2 = \left(x + \frac{5}{3}\right)\left(x + \frac{5}{3}\right)$ So the expression becomes: $\frac{(3x - 5)(3x + 5)}{\left(x + \frac{5}{3}\right)\left(x + \frac{5}{3}\right)}$ To simplify further, we can multiply the numerator and denominator of the fraction in the denominator by 3: $x + \frac{5}{3} = \frac{3x + 5}{3}. \text{ Then,}$ $\left(x + \frac{5}{3}\right)\left(x + \frac{5}{3}\right) = \frac{(3x + 5)(3x + 5)}{9}$ So, the expression becomes: $\frac{(3x-5)(3x+5)}{\frac{(3x+5)(3x+5)}{9}} = \frac{(3x-5)(3x+5) \cdot 9}{(3x+5)(3x+5)}$ Now, we can cancel the common factor $(3x + 5)$ from the numerator and denominator (assuming $3x + 5 \neq 0$): $\frac{(3x - 5) \cdot 9}{3x + 5} = \frac{9(3x - 5)}{3x + 5}$ Therefore, the simplified expression is $\frac{9(3x-5)}{3x+5}$.	
9	We are given the equation $y = \frac{2x-3}{x+1}$. We want to express x in terms of y, which means we need to isolate x on one side of the equation.	

First, Multiply both sides by $(x + 1)$: $y(x + 1) = 2x - 3$ $yx + y = 2x - 3$ now, move all terms containing x to one side and all other terms to the other side: $yx - 2x = -3 - y$ Factor out x : $x(y - 2) = -3 - y$ Now, divide both sides by $(y - 2)$: $x = \frac{-3-y}{y-2}$ We can multiply the numerator and denominator by 1 to get: $x = \frac{3+y}{2-y}$ Therefore, $x = \frac{3+y}{2-y}$	
--	--