

F Summer Pre Trials Harder Practice 1

1. Factorise fully the following:

(a) $(\text{dog})^2 - 2(\text{dog})(\text{cat}) - 3(\text{cat})^2$.

$(\text{dog} + \text{cat})(\text{dog} - 3\text{cat})$

(b) $(2x + 3y)^2 - (2x + 3y)(x + y) - 6(x + y)^2$.

$-x(4x + 5y)$

(c) $(x + 1)^3 - 4(x + 1)^2$.

$(x - 3)(x + 1)^2$

(d) $x^2(2x - 1) + 3x(2x - 1)^2$.

$x(2x - 1)(7x - 3)$

(e) $4(2x - 3)^3(x + 1)^2 + 3(2x - 3)^4(x + 1)$.

$5(2x - 1)(x + 1)(2x - 3)^3$

(f) $(x^2 + 2x - 3)^2 - 4(x^2 - 2x + 1)$.

$(x + 1)(x + 5)(x - 1)^2$

(g) $(2a^2 - ab - 3b^2)^2 - 9(4a^2 - 12ab + 9b^2)$.

$(a + b + 3)(a + b - 3)(2a - 3b)^2$

(h) $(m^2 - 4mn + 4n^2) - (m^2 - mn - 2n^2)^2$.

$(1 - m - n)(1 + m + n)(m - 2n)^2$

2. Solve the following

(a) $2x^4 + 16x^2 = 18$.

$x = \pm 1$

(b) $3x^4 + 192 = 60x^2$.

$x = \pm 2$ or $x = \pm 4$

(c) $\pi x^6 + 25\pi x^3 = 54\pi$.

$x = -3$ or $x = \sqrt[3]{2}$

(d) $x + 2 = 3\sqrt{x}$.

$x = 4$ or $x = 1$

3. Solve the following

(a) $2x^9 + 5x^8 = 3x^7$.

$x = 0$ or $x = \frac{1}{2}$ or $x = -3$

(b) $4\pi x^4 = \pi x^2$.

$x = \pm \frac{1}{2}$ or $x = 0$

4. Solve the following

(a) $3^{x+1} - 3^x = 54$.

$x = 3$

(b) $2^{x+1} + 2^x = 96$.

$x = 5$

(c) $2^{x+1} = 24 + 2^{x-1}$.

$x = 4$

(d) $\sqrt{x+3} - \sqrt{x} = 1$.

$x = 1$

(e) $\sqrt{x-2} + \sqrt{x+6} = \sqrt{2x+10}$.

$x = 3$ (only)

(f) $\sqrt{2x} + \sqrt{x+7} = \sqrt{5x+15}$.

$x = 2$ (only)

(g) $\sqrt{x} + \sqrt{x+3} = \sqrt{x+8}$.

$x = 1$ (only)

5. Write in standard form

(a) $3 \times 10^a + 4 \times 10^{a-1}$.

3.4×10^a

(b) $2 \times 10^{a+1} - 7 \times 10^a$.

$1.3 \times 10^{a+1}$

(c) $9 \times 10^{a+1} + 9 \times 10^{a-1}$.

$9.09 \times 10^{a+1}$

(d) $(7 \times 10^a) \times (8 \times 10^a)$.

$5.6 \times 10^{2a+1}$

(e) $(2 \times 10^a) \div (4 \times 10^b)$.

$5 \times 10^{a-b-1}$

6. Simplify fully

(a) $\frac{3 \times 7^n + 4 \times 7^{n-1}}{5 \times 7^{n+1}}$.

$\frac{5}{49}$

(b) $\frac{5^n + 5^{n-2}}{13 \times 5^{n-1}}$.

$\frac{2}{13}$

(c) $\frac{4 \times 3^{n+10} - 3^{n+9}}{55 \times 3^{n+8}}$.

$\frac{2}{11}$

(d) $\frac{10^{n+1} + 3 \times 10^n}{26 \times 10^{n-1}}$.

$\frac{5}{13}$

7. Solve the following simultaneous equations

(a) $\begin{cases} x + y = a + ab - b \\ x - y = b + ab - a \end{cases}$. (Solve for x and y)

$(x, y) = (ab, a - b)$

(b) $\begin{cases} ax + y = 1 \\ x + y = -1 \end{cases}$.

$(x, y) = \left(\frac{2}{a-1}, \frac{a+1}{1-a}\right)$

(c) $\begin{cases} T - 3mg = 3ma \\ 5mg - T = 5ma \end{cases}$. (Solve for T and a .)

$(T, a) = \left(\frac{15mg}{4}, \frac{g}{4}\right)$