Indices

Express as a power of 7

Ex1

$$\frac{7^3 \times 7^6}{7^2} = \frac{7^9}{7^2} = 7^7$$

Ex2

$$x^4 \times x^q = x^9$$ Find q

$$4 + q = 9$$

$$q = 9 - 4$$

$$\underline{q = 5}$$

Ex3

$$(p^4)^q = p^{12}$$

$$4 \times q = 12$$

$$\underline{q = 3}$$

Ex4 Express as a power of 2

$$2^3 \times 4^2 \times 8^4$$

$$= 2^3 \times (2^2)^2 \times (2^3)^4$$

$$= 2^3 \times 2^4 \times 2^{12} = 2^{19}$$

Exercise

1) $\dfrac{5^4 \times 5^9}{5^2 \times 5^3} = \dfrac{5^{13}}{5^5} = 5^8$

2) $3x^6 \times px^q = 18x^{10}$ Find p and q

$p = 6$ $q = 4$

3) $(2x^2)^q = px^6$ Find p and q

$p = 8$ $q = 3$

4) Express as a power of 3

$3^1 \times 9^2 \times 27^3$

$= 3^1 \times (3^2)^2 \times (3^3)^3$

$= 3^1 \times 3^4 \times 3^9 = 3^{14}$

Rearranging Formulae

Ex 1 $y = 2x - 3$ $[x]$

$y + 3 = 2x$

$\dfrac{y+3}{2} = x$ $x = \dfrac{y+3}{2}$

Ex 2 $4y - 3p = 6$ $[p]$

$4y - 6 = 3p$

$$\frac{4y-6}{3} = p \qquad p = \frac{4y-6}{3}$$

Exercise

1) $4h - 2k = 5$ $\qquad [k]$

$4h - 5 = 2k$

$\frac{4h-5}{2} = k \qquad k = \frac{4h-5}{2}$

2) $6p - q^2 = r$ $\qquad [q]$

$6p - r = q^2$

$\pm\sqrt{6p-r} = q \qquad q = \pm\sqrt{6p-r}$

3) $A = \pi r^2$ $\qquad [r]$

$\frac{A}{\pi} = r^2 \qquad r = \sqrt{\frac{A}{\pi}}$

4) $V = \pi r^2 h$ $\qquad [h]$

$\frac{V}{\pi r^2} = h \qquad h = \frac{V}{\pi r^2}$

Ex1 $\quad y = \frac{2x-3}{x+4}$ $\qquad [x]$

$y(x+4) = 2x - 3$

$yx + 4y = 2x - 3$

$$yx - 2x = -3 - 4y$$

$$x(y-2) = -3 - 4y$$

$$x = \frac{-3-4y}{y-2}$$

Ex2

$$6p - 3q = 11 + q \qquad [q]$$

$$6p - 11 = q + 3q$$

$$6p - 11 = 4q$$

$$\frac{6p-11}{4} = q$$

Exercise

1)

$$y = \frac{x}{2x+3} \qquad [x]$$

$$(2x+3)y = x$$

$$2xy + 3y = x$$

$$3y = x - 2xy$$

$$3y = x(1-2y)$$

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

2)

$$8p - 2q + 5 = 3p + q + 1 \qquad [p]$$

$$8p - 3p = q + 1 + 2q - 5$$

$$5p = 3q - 4$$

$$p = \frac{3q-4}{5}$$

3) $8p - 2q + 5 = 3p + q + 1$ $[q]$

$8p + 5 - 3p - 1 = q + 2q$

$5p + 4 = 3q$

$\frac{5p+4}{3} = q$

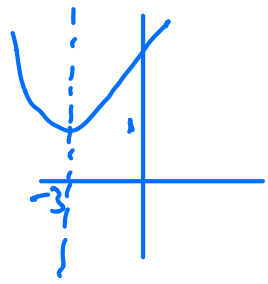
$q = \frac{5p+4}{3}$

Completing the Square

Ex1 $x^2 + 6x + 10$

$= (x+3)^2 + 10 - 9$

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



Ex2 $x^2 - 5x + 8$

$= (x - \frac{5}{2})^2 + 8$

$= (x - \frac{5}{2})^2 + 8 - \frac{25}{4}$

$= (x - \frac{5}{2})^2 + \frac{32}{4} - \frac{25}{4}$

$= (x - \frac{5}{2})^2 + \frac{7}{4}$

Exercise

1) $x^2 + 10x + 7$ Min Value

$= (x+5)^2 + 7 - 25$

$= (x+5)^2 - 18$ -18

2) $x^2 - 8x + 10$

$= (x-4)^2 + 10 - 16$

$= (x-4)^2 - 6$ -6

3) $x^2 + x + 4$

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

$= (x+\frac{1}{2})^2 + \frac{16}{4} - \frac{1}{4}$ $= (x+\frac{1}{2})^2 + \frac{15}{4}$

$+\frac{15}{4}$

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

$= (x-\frac{3}{2})^2 + 1 - \frac{9}{4}$

$= (x-\frac{3}{2})^2 + \frac{4}{4} - \frac{9}{4}$

$= (x-\frac{3}{2})^2 - \frac{5}{4}$ $-\frac{5}{4}$