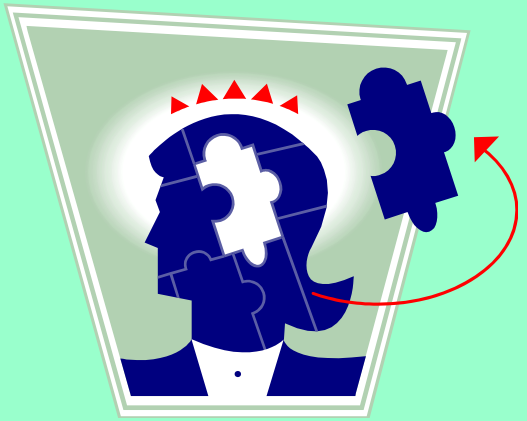
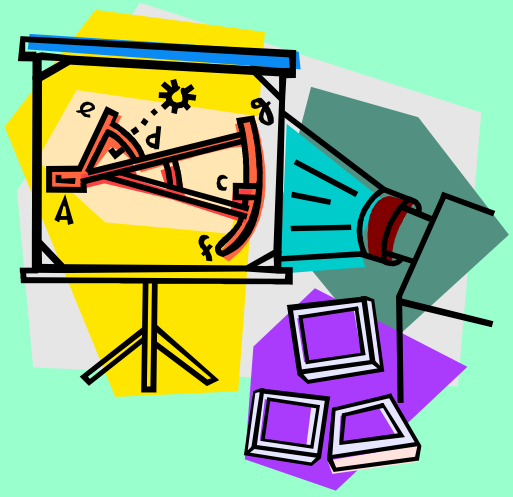


Finding the missing co-efficient

4.

$$f(x) = x^3 + px^2 + qx - 9$$



Example 1 (one value missing)

Given that $(x - 2)$ is a factor of $x^3 + kx^2 - 9x + 18$.

(a) Find k (b) hence factorise the expression fully

Solution to (a):

$x - 2 = 0$

$x = 2$

x^3	x^2	x	x^0
1	k	-9	18
	2	(2k+4)	(4k-10)
1	(k+2)	(2k-5)	4k+8

As $(x - 2)$ is a factor.

$4k+8 = 0$

$4k = -8$

$k = -2$

Example 1 (one value missing)

Given that (x - 2)is a factor of $x^3 + kx^2 - 9x + 18$.

(a) Find k (b) hence factorise the expression fully

Solution to (b):

x - 2 = 0 ⟹ x = **2**

	x^3	x^2	x	x^0
	1	k	-9	18
	↓	2	(2k+4)	(4k-10)
	1	(k+2)	(2k-5)	4k+8
		0	-9	

$$f(x) = (x-2)(x^2 + (k+2)x + (2k-5))$$

k = -2 ⟹ $f(x) = (x-2)(x^2 - 9)$ ⟸ Factorise!!

$$f(x) = (x-2)(x-3)(x+3)$$

Example 1 (one value missing)

AN ALTERNATIVE

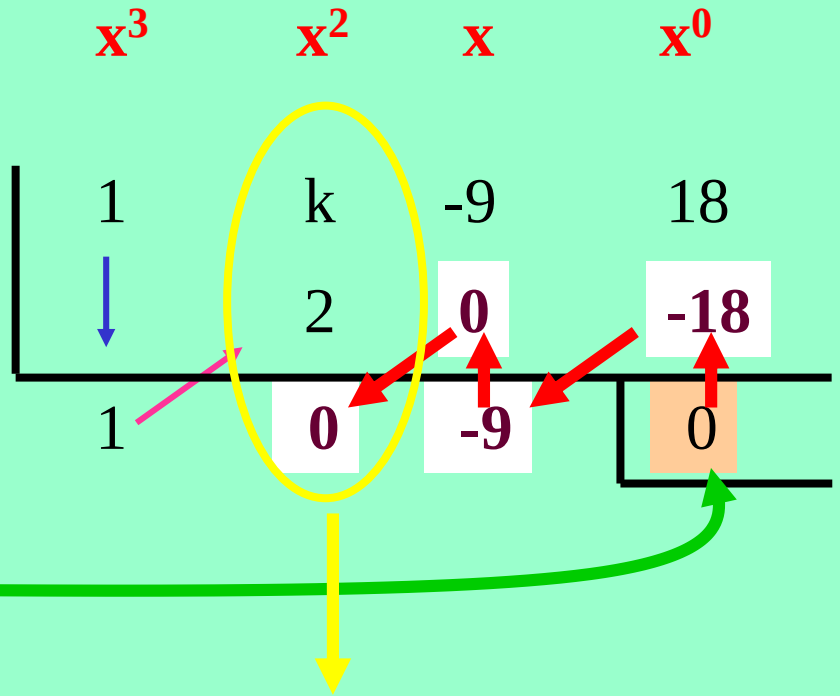
Given that (x - 2)is a factor of $x^3 + kx^2 - 9x + 18$.

(a) Find k (b) hence factorise the expression fully

Solution to (b):

x - 2 = 0

x = 2



An alternative method starts from fact if (x-2) is a factor f(x) = 0

This gives : k + 2 = 0

So k = -2 as before.

Example 2 (2 values missing)

Given that $(x - 3)$ and $(x + 1)$ are both factors of
$f(x) = 2x^4 + 7x^3 + px^2 + qx - 15$ find the values of p and q.

Solution:

$x + 1 = 0$

$x = -1$

	x^4	x^3	x^2	x	x^0
	2	7	p	q	-15
		-2	-5	-p+5	(p-q-5)
	2	5	(p-5)	(q-p+5)	0

$p - q - 20 = 0$

$x - 3 = 0$

$x = 3$

	x^4	x^3	x^2	x	x^0
	2	7	p	q	-15
		6	39	3p+117	(9p+3q+351)
	2	13	(p+39)	(3p+q+117	

$9p + 3q + 336 = 0$

Example 2 (2 values missing)

Given that (x – 3) and (x + 1) are both factors of $f(x) = 2x^4 + 7x^3 + px^2 + qx – 15$ find the values of p and q.

Factoris e?

Solution:

We now have two equations involving p and q.

$p – q - 20 = 0$

$9p + 3q + 336 = 0$

Solve these simultaneous equations.

$$\left.\begin{matrix} p - q = 20 \\ 9p + 3q = -336 \end{matrix}\right\} \begin{matrix} \times 9 \\ \times 1 \end{matrix} \left\{\begin{matrix} 9p - 9q = 180 \\ 9p + 3q = -336 \end{matrix}\right.$$

$-12q = 516$

$q = -43$

$p – q = 20 \longrightarrow p = 20 + q \longrightarrow p = 20 + (-43) \longrightarrow p = -23$

Heinemann, p.133, EX 7F,
Q1, 2(a)& 2(b), 3