Unit 10 · Algebraic Expression

HARDER PRACTICE QUESTIONS

Full marks 29

Write your answers on separate paper. Show your working. Take out any common factor first, and factorize as far as you can.

1 A square in disguise [3]

Factorize $a^4 + 4$.

2 Without a calculator [3]

Use factors to work these out in your head:

i. $105^2 - 95^2$

ii. 999×1001

iii. $98^2 + 4 \times 98 + 4$

3 Make it perfect [3]

Find the value or values of k that make each expression a perfect square.

i. $x^2 + kx + 36$

ii. $9x^2 - 24x + k$

4 A rectangle from its area [3]

A rectangle has an area of $6x^2 + 7x - 20$ square units, and its sides are expressions with whole-number coefficients.

i. Find its sides.

ii. Write its perimeter in terms of x.

iii. Find the sides, the area and the perimeter when $x = 3$, and check that the area fits.

5 The missing expression [3]

Two expressions have the HCF $x - 2$ and the LCM $(x - 2)(x + 2)(x + 3)$. One of them is $x^2 - 4$. What is the other?

6 Spot the error [3]

Each line has a mistake. Find it and correct it.

i. $4x^2 - 9 = (4x + 9)(4x - 9)$

ii. $x^2 - 5x - 14 = (x - 7)(x - 2)$

Then show how multiplying out would have caught the mistake in ii.

7 In a real setting [4]

Two ropes are $x^2 + 5x + 6$ m and $x^2 + 7x + 12$ m long. They are to be cut into pieces of one length, with nothing left over, and the piece length is to be the HCF of the two expressions.

i. Find the piece length, in terms of x.

ii. How many pieces does each rope give, in terms of x?

iii. Find the two rope lengths, the piece length and the total number of pieces when $x = 7$.

8 Show it [3]

Two odd numbers in a row can be written $2n - 1$ and $2n + 1$. Show that the difference of their squares is always a multiple of 8. Test it on 13 and 15.

9 Think [2]

Sagar says $x^2 + 4$ must factorize, since $x^2 - 4$ does. Suppose $x^2 + 4 = (x + a)(x + b)$. What must $a + b$ and ab be? Why can't any numbers do that?

10 Make your own [2]

Find every whole number p, positive or negative, that lets you factorize $x^2 + px + 12$ with whole numbers. Give each factorization.