

## Extension 1 Algebra Worksheet



1. The polynomial  $p(x) = x^3 - ax + b$  has a remainder of 2 when divided by  $(x - 1)$  and a remainder of -1 when divided by  $(x + 2)$ . Find the values of  $a$  and  $b$ .
2. Factorize  $8x^3 + 27$ .
3. Solve the inequality  $(x+3) / 2x > 1$
4. Sum the geometric series  
 $(1 + x)^r + (1 + x)^{r+1} + \dots + (1 + x)^n$
5. The polynomial  $x^3$  is divided by  $x + 3$ . Calculate the remainder.
6. Find an expression for the coefficient of  $x^8y^4$  in the expansion of  $(2x + 3y)^{12}$
7. The polynomial  $p(x)$  is given by  $p(x) = ax^3 - 25x^2 + cx - 120$ , where  $a$  and  $c$  are constants. The three zeros of  $p(x)$  are 2, 3 and  $\alpha$ . Find the value of  $\alpha$ .
8. Let  $p$  and  $q$  be positive integers with  $p \leq q$ . Use the binomial theorem to expand  $(1+x)^{p+q}$ , and hence write down the term of  $\{(1+x)^{p+q}\} / x^q$  which is independent of  $x$ .
9. If the polynomial  $x^4 + 2x^3 + 8x^2 + 12x + 18$  is divided by another polynomial  $x^2 + 5$ , the remainder comes out to be  $(px + q)$ , show that the respective values of  $p$  and  $q$  are 2 and 3.
10. The cubic polynomial  $P(x) = x^3 + rx^2 + sx + t$ , where  $r$ ,  $s$  and  $t$  are real numbers, has three real zeros, 1,  $\alpha$  and  $-\alpha$ .
  - (i) Find the value of  $r$ .
  - (ii) Find the value of  $s + t$