

- Write a proof for the divisibility test for 13.
- Find a divisibility test for:    i 25    ii 125
- Find the highest power of 5 that divides:
- i 112 250    ii 235 555 790    iii 48 126 953 125
- Find a divisibility test for:    a 6    b 12    c 14    d 15
- Determine whether each of these integers is divisible by 11:
- a 10 763 732    b 8 924 310 064 538    c 1 086 326 715
- Determine whether each of these integers is divisible by 3, 9, or 11:
- a 201 984    b 101 582 283    c 41 578 912 245
- d 10 415 486 358
- Consider an integer of the form  $n^2 - n + 7$ ,  $n \in \mathbb{Z}$ . By considering different values of  $n$ , determine the possible values of its last digit. Prove that these are the only possible values.
- For each of the following binary numbers:
- i find the highest power of 2 that divides the number
- ii determine whether the number is divisible by 3.
- a 101 110 101 001    b 1 001 110 101 000    c 1 010 101 110 100 100
- For each of the following ternary (base 3) numbers:
- i find the highest power of 3 that divides the number
- ii determine whether the integer is divisible by 2
- iii determine whether the integer is divisible by 4.
- a 10 200 122 221 210    b 221 021 010 020 120    c 1 010 101 110 100 100
- Find a divisibility test for 7 when the number is written in base 8. Generalise this result to base  $n$ .
- Find a divisibility test for 9 when the number is written in base 8. Generalise this result to base  $n$ .
- A positive integer  $X$  has a base 25 representation given by  $(x_n x_{n-1} \dots x_0)_{25}$ .
- Show that  $X$  is divisible by 5 if  $x_0$  is divisible by 5.
- Show that  $X$  is divisible by 2 if the sum of its digits (in base 25) is even.
- Without using a conversion to base 10, determine whether or not  $(664089735)_{25}$  is divisible by 20.