Multiples:

rule of 2: 36478 is a multiple of 2 because 8 (the last digit) is a multiple of 2

$36478=36470+8$ and 36470 is a multiple of 2

rule of 3: 264 is a multiple of 3 because $2+6+4$ is a multiple of 3

$264=2(100)+6(10)+4=2(99)+6(9)+(2+6+4)$ and $2(99)+6(9)$ is a multiple of 3

rule of 4: 94524 is a multiple of 4 because 24 (last two digits) is a multiple of 4

$94524=94500+24$ and 94500 is a multiple of 4

rule of 5: 743665 is a multiple of 5 because 5 (last digit) is a multiple of 5

$74365=74360+5$ and 74360 is a multiple of 5

rule of 6: 29622 is a multiple of 6 because 29622 is a multiple of 2 and a multiple of 3

rule of 8: 59136 is a multiple of 8 because 136 (last three digits) is a multiple of 8

$59136=59000+136$ and 59000 is a multiple of 8

rule of 9: 648 is a multiple of 9 because $6+4+8$ is a multiple of 9

$648=6(100)+4(10)+8=6(99)+4(9)+(6+4+8)$ and $6(99)+4(9)$ is a multiple of 9

rule of 10: 89210 is a multiple of 10 because the last digit is 0

rule of 11: 836 is a multiple of 11 because $8-3+6$ is a multiple of 11

$836=8(100)+3(10)+6=8(99)+3(11)+(8-3+6)$ and $8(99)+3(11)$ is a multiple of 11

EXERCISE

1)

Is 36470587624275 a multiple of 3?

2)

Is 47385900738828 a multiple of 8?

3)

Is 49775883661205 a multiple of 11?

4)

Show that every palindrome with an even number of digits (like 637736) is a multiple of 11

5)

Show that any 3-digit-repeater (like 726726) is a multiple of 7 and 11 and 13

6)

If n and x are positive integers, prove the following using the factor theorem:

a) x^n+1 is a multiple of $x+1$ if n is odd

b) x^n-1 is a multiple of $x+1$ if n is even

c) x^n-1 is a multiple of $x-1$

SOLUTIONS

1)

Yes. Because $3+6+4+7+0+5+8+7+6+2+4+2+7+5=66$ a multiple of 3

2)

No. Because 828 is not multiple of 8

3)

No. Because $4-9+7-7+5-8+8-3+6-6+1-2+0-5=-9$ not a multiple of 11

4)

$6-3+7-7+3-6=0$ and 0 is a multiple of 11

5)

$7\times11\times13=1001$ and $726726=726\times1001$

6)

a) if n is odd:

$f(x)=x^n+1$ so $f(-1)=0$ so $(x+1)$ is a factor of $f(x)$

b) if n is even:

$f(x)=x^n-1$ so $f(-1)=0$ so $(x+1)$ is a factor of $f(x)$

c) $f(x)=x^n-1$ so $f(1)=0$ so $(x-1)$ is a factor of $f(x)$