Cuaderno de Prácticas

MATEMÁTICAS DISCRETAS

Grado en Ingeniería Informática

CURSO 2024/25

Datos personales

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Grupo de teoría : A
Grupo de prácticas : 1

Archivos

In[ ]:=
```
indice={
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        {"Capítulo 2: Aritmética Básica. Variables y Funciones","Operaciones aritméticas eleme
            ,"Tipos de datos y números","Diferentes precisiones en el cálculo"},
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        {"Capítulo 4: Programación en Mathematica",
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            ,"Formas enunciativas y conectivas","Tablas de verdad"},
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            , conjuntos adecuados de conectivas, equivalencias e implicaciones lógicas
                y argumentaciones"
            ,"Tautología y contradicción / Equivalencias lógicas e implicaciones lógicas",
            "Formas normales y Argumentaciones válidas","Conjuntos adecuados de conectivas"},
        {"Capítulo 7: Conjuntos y aplicaciones (Partición de un conjunto,Aplicaciones)"
            ,"Operaciones con conjuntos","Producto cartesiano","Partes de un conjunto"},
        {"Capítulo 8: Relaciones binarias y conjuntos ordenados","Relaciones binarias",
            "Relaciones de equivalencia","Relaciones de orden y Diagramas de orden o de Hasse"
};
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Out[•]=

Introducción	Apartado 1	Apartado 2	Apartado 3
Capítulo 1: El entorno de trabajo	Generalidades sobre Mathematicas	Interfaz de Usuario	
Capítulo 2: Aritmética Básica. Variables y Funciones	Operaciones aritméticas elementales	Tipos de datos y números	Diferentes precisiones en el cálculo
Capítulo 3: Polinomio. Cálculos básicos y Divisibilidad	Lista y Representación y formato de una lista	La función Table	Vectores y matrices
Capítulo 4: Programación en Mathematica	Expresiones lóghicas y Representaciones gráficas	Órdenes condicionales	Bucles y estructuras de control
Capítulo 5: Lógica proposicional 1: Conectivas y tablas de verdad	Formas enunciativas y conectivas	Tablas de verdad	
Capítulo 6: Lógica proposicional 2: Tautologías, contradicciones,formas normales , conjuntos adecuados de conectivas, equivalencias e implicaciones lógicas y argumentaciones	Tautología y contradicción / Equivalencias lógicas e implicaciones lógicas	Formas normales y Argumentaciones válidas	Conjuntos adecuados de conectivas
Capítulo 7: Conjuntos y aplicaciones (Partición de un conjunto,Aplicaciones)	Operaciones con conjuntos	Producto cartesiano	Partes de un conjunto
Capítulo 8: Relaciones binarias y conjuntos ordenados	Relaciones binarias	Relaciones de equivalencia	Relaciones de orden y Diagramas de orden o de Hasse

Práctica I

Ejercicio I . 6

Texto del ejercicio 1

Solución :

Ejercicio 2.1

Calcular con 5 y 10 cifras significativas :

a) $3\ (1+4)\ -2^2\times 5-5^{1/5}$

In[•]:=
```
N[3(1+4)-2^2×5-5^(1/5),10]
```

Out[•]=
```
-6.379729661
```

b) $\frac{1}{2}+\frac{1}{3}+\frac{1}{5}$

In[•]:=
```
N[1/2+1/3+1/5,10]
```

Out[•]=
```
1.033333333
```

c) $\frac{\sqrt{5}}{\sqrt[3]{3}}$

In[•]:=
```
N[Sqrt[5]/Cbrt[3],10]
```

Out[•]=
```
1.550402942
```

i) 2^{1000}

In[•]:=
```
N[2^1000,10]
```

Out[•]=
```
1.071508607×10^301
```

Práctica 2

Ejercicio 2.1

d) e^2

In[•]:=
```
N[E^2,10]
```

Out[•]=
```
7.389056099
```

e) Ln (Cos (π/3))

In[•]:=
```
N[Log[Cos[π/3]],10]
```

Out[•]=
```
-0.6931471806
```

f) $\left| \frac{1}{2} + \frac{1}{3} - \sqrt{2} \right|$

In[•]:=
```
N[Abs[1/2+1/3-√2],10]
```

Out[•]=
```
0.5808802290
```

g) Sen(π)+Tan(π)

In[•]:=
```
N[Sin[π]+Tan[π],10]
```

Out[•]=
```
0
```

h) ArcSin[0.5]-ArcCos[0.5]

In[•]:=
```
N[ArcSin[0.5]-ArcCos[0.5],10]
```

Out[•]=
```
-0.523599
```

Ejercicio 2.3

In[•]:=
```
x=26268082;
y=2004;
```

a) Comprobar si x es primo

In[•]:=
```
PrimeQ[x]
```

Out[•]=
```
False
```

b) Calcular el cociente y el resto de dividir x entre y

In[•]:=
```
Quotient[x,y]
```

Out[•]=
```
13 107
```

In[•]:=
```
Mod[x,y]
```

Out[•]=
```
1654
```

c) Calcular una aproximación decimal con 20 cifras decimales de la raíz cuadrada de x

In[•]:=
```
N[Sqrt[x],20]
```

Out[•]=
```
5125.2397017115209262
```

d) Calcular el entero más próximo al número (πy-e)/x

In[•]:=
```
Round[(π*y-e)/x]
```

Out[•]=
```
0
```

e) Calcular el número de Fibonacci del día del mes en que naciste

In[•]:=
```
Fibonacci[6]
```

Out[•]=
```
8
```

Ejercicio 3.1

a) Formar una lista con todos los múltiplos de 11 positivos, menores que los dos últimos dígitos del año en que naciste

In[•]:=
```
lista = Select[Range[11,2004,11],#<2004 &]
```

Out[•]=
```
{11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143, 154, 165, 176, 187, 198, 209,
 220, 231, 242, 253, 264, 275, 286, 297, 308, 319, 330, 341, 352, 363, 374, 385, 396,
 407, 418, 429, 440, 451, 462, 473, 484, 495, 506, 517, 528, 539, 550, 561, 572, 583,
 594, 605, 616, 627, 638, 649, 660, 671, 682, 693, 704, 715, 726, 737, 748, 759, 770,
 781, 792, 803, 814, 825, 836, 847, 858, 869, 880, 891, 902, 913, 924, 935, 946, 957,
 968, 979, 990, 1001, 1012, 1023, 1034, 1045, 1056, 1067, 1078, 1089, 1100, 1111,
 1122, 1133, 1144, 1155, 1166, 1177, 1188, 1199, 1210, 1221, 1232, 1243, 1254, 1265,
 1276, 1287, 1298, 1309, 1320, 1331, 1342, 1353, 1364, 1375, 1386, 1397, 1408, 1419,
 1430, 1441, 1452, 1463, 1474, 1485, 1496, 1507, 1518, 1529, 1540, 1551, 1562, 1573,
 1584, 1595, 1606, 1617, 1628, 1639, 1650, 1661, 1672, 1683, 1694, 1705, 1716,
 1727, 1738, 1749, 1760, 1771, 1782, 1793, 1804, 1815, 1826, 1837, 1848, 1859,
 1870, 1881, 1892, 1903, 1914, 1925, 1936, 1947, 1958, 1969, 1980, 1991, 2002}
```

In[•]:=
```
Table[i,{i,11,2004,11}]
```

Out[•]=
```
{11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143, 154, 165, 176, 187, 198, 209,
 220, 231, 242, 253, 264, 275, 286, 297, 308, 319, 330, 341, 352, 363, 374, 385, 396,
 407, 418, 429, 440, 451, 462, 473, 484, 495, 506, 517, 528, 539, 550, 561, 572, 583,
 594, 605, 616, 627, 638, 649, 660, 671, 682, 693, 704, 715, 726, 737, 748, 759, 770,
 781, 792, 803, 814, 825, 836, 847, 858, 869, 880, 891, 902, 913, 924, 935, 946, 957,
 968, 979, 990, 1001, 1012, 1023, 1034, 1045, 1056, 1067, 1078, 1089, 1100, 1111,
 1122, 1133, 1144, 1155, 1166, 1177, 1188, 1199, 1210, 1221, 1232, 1243, 1254, 1265,
 1276, 1287, 1298, 1309, 1320, 1331, 1342, 1353, 1364, 1375, 1386, 1397, 1408, 1419,
 1430, 1441, 1452, 1463, 1474, 1485, 1496, 1507, 1518, 1529, 1540, 1551, 1562, 1573,
 1584, 1595, 1606, 1617, 1628, 1639, 1650, 1661, 1672, 1683, 1694, 1705, 1716,
 1727, 1738, 1749, 1760, 1771, 1782, 1793, 1804, 1815, 1826, 1837, 1848, 1859,
 1870, 1881, 1892, 1903, 1914, 1925, 1936, 1947, 1958, 1969, 1980, 1991, 2002}
```

In[•]:=
```
Range[11,2004,11]
```

Out[•]=
```
{11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143, 154, 165, 176, 187, 198, 209,
 220, 231, 242, 253, 264, 275, 286, 297, 308, 319, 330, 341, 352, 363, 374, 385, 396,
 407, 418, 429, 440, 451, 462, 473, 484, 495, 506, 517, 528, 539, 550, 561, 572, 583,
 594, 605, 616, 627, 638, 649, 660, 671, 682, 693, 704, 715, 726, 737, 748, 759, 770,
 781, 792, 803, 814, 825, 836, 847, 858, 869, 880, 891, 902, 913, 924, 935, 946, 957,
 968, 979, 990, 1001, 1012, 1023, 1034, 1045, 1056, 1067, 1078, 1089, 1100, 1111,
 1122, 1133, 1144, 1155, 1166, 1177, 1188, 1199, 1210, 1221, 1232, 1243, 1254, 1265,
 1276, 1287, 1298, 1309, 1320, 1331, 1342, 1353, 1364, 1375, 1386, 1397, 1408, 1419,
 1430, 1441, 1452, 1463, 1474, 1485, 1496, 1507, 1518, 1529, 1540, 1551, 1562, 1573,
 1584, 1595, 1606, 1617, 1628, 1639, 1650, 1661, 1672, 1683, 1694, 1705, 1716,
 1727, 1738, 1749, 1760, 1771, 1782, 1793, 1804, 1815, 1826, 1837, 1848, 1859,
 1870, 1881, 1892, 1903, 1914, 1925, 1936, 1947, 1958, 1969, 1980, 1991, 2002}
```

In[•]:=
```
Table[i 5,{i,1,5,1}]
```

Out[•]=
```
{5, 10, 15, 20, 25}
```

In[•]:=
```
{5,10,15,20,25}
```

Out[•]=
```
{5, 10, 15, 20, 25}
```

b) Calcular, utilizando el resultado del apartado anterior y las funciones de la tabla 3.1., los múltiplos de 11. entre 15 y 70.

In[•]:=
```
lista;
Select[lista,15≤#≤70&]
```

Out[•]=
```
{22, 33, 44, 55, 66}
```

c) Unir a la lista obtenida en el apartado b), una nueva formada por los múltiplos de 5 entre 10 y 50, pero que en la tercera posición tenga el elemento ϕ. ¿Cuántos elementos tiene la lista que acabamos de conseguir? ¿Cuáles son los elementos que se encuentran en primera, última y octava posición?

In[•]:=
```
multiplosDe5 = Range[10,50,5]
```

Out[•]=
```
{10, 15, 20, 25, 30, 35, 40, 45, 50}
```

In[•]:=
```
multiplosDe5Conϕ = Insert[multiplosDe5, ϕ,3]
```

Out[•]=
```
{10, 15, ϕ, 20, 25, 30, 35, 40, 45, 50}
```

Unir listas

In[•]:=
```
listaCombinada = Join[lista, multiplosDe5Conϕ]
```

Out[•]=
```
{11, 22, 33, 44, 55, 66, 77, 88, 99, 110, 121, 132, 143, 154, 165, 176, 187, 198,
 209, 220, 231, 242, 253, 264, 275, 286, 297, 308, 319, 330, 341, 352, 363, 374,
 385, 396, 407, 418, 429, 440, 451, 462, 473, 484, 495, 506, 517, 528, 539, 550,
 561, 572, 583, 594, 605, 616, 627, 638, 649, 660, 671, 682, 693, 704, 715, 726,
 737, 748, 759, 770, 781, 792, 803, 814, 825, 836, 847, 858, 869, 880, 891, 902,
 913, 924, 935, 946, 957, 968, 979, 990, 1001, 1012, 1023, 1034, 1045, 1056, 1067,
 1078, 1089, 1100, 1111, 1122, 1133, 1144, 1155, 1166, 1177, 1188, 1199, 1210,
 1221, 1232, 1243, 1254, 1265, 1276, 1287, 1298, 1309, 1320, 1331, 1342, 1353,
 1364, 1375, 1386, 1397, 1408, 1419, 1430, 1441, 1452, 1463, 1474, 1485, 1496,
 1507, 1518, 1529, 1540, 1551, 1562, 1573, 1584, 1595, 1606, 1617, 1628, 1639,
 1650, 1661, 1672, 1683, 1694, 1705, 1716, 1727, 1738, 1749, 1760, 1771, 1782,
 1793, 1804, 1815, 1826, 1837, 1848, 1859, 1870, 1881, 1892, 1903, 1914, 1925,
 1936, 1947, 1958, 1969, 1980, 1991, 2002, 10, 15, ϕ, 20, 25, 30, 35, 40, 45, 50}
```

Determinar el número total de elementos

In[•]:=
```
Length[listaCombinada]
```

Out[•]=
```
192
```

Obtener la primera, octava y última posición

In[•]:=
```
{First[listaCombinada],Last[listaCombinada],listaCombinada[[8]]}
```

Out[•]=
```
{11, 50, 88}
```

Ejercicio 3.2

Crear una tabla como en el ejercicio 3.4 . cuya primera fila esté formada por los cinco primeros múltiplos positivos del día del mes en que naciste, la segunda fila por sus cubos y la tercera por la potencia quinta de dichos números

In[•]:=
```
tabla=Table[(3*j)^i,{i,1,3},{j,1,5}]
```

Out[•]=
```
{{3, 6, 9, 12, 15}, {9, 36, 81, 144, 225}, {27, 216, 729, 1728, 3375}}
```

Práctica 3

De archivo de practicas el capitulo 4. Cada ejercicio hay que hacerlo con Do, For y While

```
p=1;
Do[p=p*i,{i,2006,2104,1}]
Do[If[Mod[i,17]==0,p=p*i],{i,2006,2104,1}]
p=1;
For[i=2006, i≤ 2104, i= i+17, p=p*i]
For[i=2006, i≤ 2104, i= i+17,If[Mod[i,17]==0,p=p*i]]
```

Out[•]=

73 850 604 651 472 793 760

Ejercicio 4.3

In[•]:=

```
d1d2 = 03;
m1m2 = 06;
anyo = 2004;
anyoPlusMes = anyo*(m1m2 + 6);
```

a) Construir un bucle que nos de todos los múltiplos de D1D2 comprendidos entre el año de tu nacimiento y el año de tu nacimiento multiplicado por M1M2 + 6.

In[•]:=

```
listaAMultiplosFor={};
listaAMultiplosDo = {};
listaAMultiplosWhile={};
For[i=anyo,i≤anyoPlusMes,i++,
    If[Mod[i,d1d2]==0,
        AppendTo[listaAMultiplosFor,i];
    ]
]

i = anyo;
While[i ≤ anyoPlusMes,
  If[Mod[i, d1d2] == 0,
    AppendTo[listaAMultiplosWhile, i]
  ];
  i++;
];
Do[
  If[Mod[i, d1d2] == 0,
    AppendTo[listaAMultiplosDo, i]
  ],
  {i, anyo, anyoPlusMes}
];
If[listaAMultiplosFor === listaAMultiplosWhile === listaAMultiplosDo,
  Print[listaAMultiplosFor]
];
```

```
{2004, 2007, 2010, 2013, 2016, 2019, 2022, 2025, 2028, 2031, 2034, 2037, 2040, 2043, 2046,
 2049, 2052, 2055, 2058, 2061, 2064, 2067, 2070, 2073, 2076, 2079, 2082, 2085, 2088, 2091,
 2094, 2097, 2100, 2103, 2106, 2109, 2112, 2115, 2118, 2121, 2124, 2127, 2130, 2133, 2136,
 2139, 2142, 2145, 2148, 2151, 2154, 2157, 2160, 2163, 2166, 2169, 2172, 2175, 2178, 2181,
 2184, 2187, 2190, 2193, 2196, 2199, 2202, 2205, 2208, 2211, 2214, 2217, 2220, 2223, 2226,
 2229, 2232, 2235, 2238, 2241, 2244, 2247, 2250, 2253, 2256, 2259, 2262, 2265, 2268, 2271,
```

2274, 2277, 2280, 2283, 2286, 2289, 2292, 2295, 2298, 2301, 2304, 2307, 2310, 2313, 2316,
2319, 2322, 2325, 2328, 2331, 2334, 2337, 2340, 2343, 2346, 2349, 2352, 2355, 2358, 2361,
2364, 2367, 2370, 2373, 2376, 2379, 2382, 2385, 2388, 2391, 2394, 2397, 2400, 2403, 2406,
2409, 2412, 2415, 2418, 2421, 2424, 2427, 2430, 2433, 2436, 2439, 2442, 2445, 2448, 2451,
2454, 2457, 2460, 2463, 2466, 2469, 2472, 2475, 2478, 2481, 2484, 2487, 2490, 2493, 2496,
2499, 2502, 2505, 2508, 2511, 2514, 2517, 2520, 2523, 2526, 2529, 2532, 2535, 2538, 2541,
2544, 2547, 2550, 2553, 2556, 2559, 2562, 2565, 2568, 2571, 2574, 2577, 2580, 2583, 2586,
2589, 2592, 2595, 2598, 2601, 2604, 2607, 2610, 2613, 2616, 2619, 2622, 2625, 2628, 2631,
2634, 2637, 2640, 2643, 2646, 2649, 2652, 2655, 2658, 2661, 2664, 2667, 2670, 2673, 2676,
2679, 2682, 2685, 2688, 2691, 2694, 2697, 2700, 2703, 2706, 2709, 2712, 2715, 2718, 2721,
2724, 2727, 2730, 2733, 2736, 2739, 2742, 2745, 2748, 2751, 2754, 2757, 2760, 2763, 2766,
2769, 2772, 2775, 2778, 2781, 2784, 2787, 2790, 2793, 2796, 2799, 2802, 2805, 2808, 2811,
2814, 2817, 2820, 2823, 2826, 2829, 2832, 2835, 2838, 2841, 2844, 2847, 2850, 2853, 2856,
2859, 2862, 2865, 2868, 2871, 2874, 2877, 2880, 2883, 2886, 2889, 2892, 2895, 2898, 2901,
2904, 2907, 2910, 2913, 2916, 2919, 2922, 2925, 2928, 2931, 2934, 2937, 2940, 2943, 2946,
2949, 2952, 2955, 2958, 2961, 2964, 2967, 2970, 2973, 2976, 2979, 2982, 2985, 2988, 2991,
2994, 2997, 3000, 3003, 3006, 3009, 3012, 3015, 3018, 3021, 3024, 3027, 3030, 3033, 3036,
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3084, 3087, 3090, 3093, 3096, 3099, 3102, 3105, 3108, 3111, 3114, 3117, 3120, 3123, 3126,
3129, 3132, 3135, 3138, 3141, 3144, 3147, 3150, 3153, 3156, 3159, 3162, 3165, 3168, 3171,
3174, 3177, 3180, 3183, 3186, 3189, 3192, 3195, 3198, 3201, 3204, 3207, 3210, 3213, 3216,
3219, 3222, 3225, 3228, 3231, 3234, 3237, 3240, 3243, 3246, 3249, 3252, 3255, 3258, 3261,
3264, 3267, 3270, 3273, 3276, 3279, 3282, 3285, 3288, 3291, 3294, 3297, 3300, 3303, 3306,
3309, 3312, 3315, 3318, 3321, 3324, 3327, 3330, 3333, 3336, 3339, 3342, 3345, 3348, 3351,
3354, 3357, 3360, 3363, 3366, 3369, 3372, 3375, 3378, 3381, 3384, 3387, 3390, 3393, 3396,
3399, 3402, 3405, 3408, 3411, 3414, 3417, 3420, 3423, 3426, 3429, 3432, 3435, 3438, 3441,
3444, 3447, 3450, 3453, 3456, 3459, 3462, 3465, 3468, 3471, 3474, 3477, 3480, 3483, 3486,
3489, 3492, 3495, 3498, 3501, 3504, 3507, 3510, 3513, 3516, 3519, 3522, 3525, 3528, 3531,
3534, 3537, 3540, 3543, 3546, 3549, 3552, 3555, 3558, 3561, 3564, 3567, 3570, 3573, 3576,
3579, 3582, 3585, 3588, 3591, 3594, 3597, 3600, 3603, 3606, 3609, 3612, 3615, 3618, 3621,
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19839, 19842, 19845, 19848, 19851, 19854, 19857, 19860, 19863, 19866, 19869, 19872,
19875, 19878, 19881, 19884, 19887, 19890, 19893, 19896, 19899, 19902, 19905, 19908,
19911, 19914, 19917, 19920, 19923, 19926, 19929, 19932, 19935, 19938, 19941, 19944,
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20271, 20274, 20277, 20280, 20283, 20286, 20289, 20292, 20295, 20298, 20301, 20304,
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22 899, 22 902, 22 905, 22 908, 22 911, 22 914, 22 917, 22 920, 22 923, 22 926, 22 929, 22 932,
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22 971, 22 974, 22 977, 22 980, 22 983, 22 986, 22 989, 22 992, 22 995, 22 998, 23 001, 23 004,
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23 079, 23 082, 23 085, 23 088, 23 091, 23 094, 23 097, 23 100, 23 103, 23 106, 23 109, 23 112,
23 115, 23 118, 23 121, 23 124, 23 127, 23 130, 23 133, 23 136, 23 139, 23 142, 23 145, 23 148,
23 151, 23 154, 23 157, 23 160, 23 163, 23 166, 23 169, 23 172, 23 175, 23 178, 23 181, 23 184,
23 187, 23 190, 23 193, 23 196, 23 199, 23 202, 23 205, 23 208, 23 211, 23 214, 23 217, 23 220,
23 223, 23 226, 23 229, 23 232, 23 235, 23 238, 23 241, 23 244, 23 247, 23 250, 23 253, 23 256,
23 259, 23 262, 23 265, 23 268, 23 271, 23 274, 23 277, 23 280, 23 283, 23 286, 23 289, 23 292,
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23 331, 23 334, 23 337, 23 340, 23 343, 23 346, 23 349, 23 352, 23 355, 23 358, 23 361, 23 364,
23 367, 23 370, 23 373, 23 376, 23 379, 23 382, 23 385, 23 388, 23 391, 23 394, 23 397, 23 400,
23 403, 23 406, 23 409, 23 412, 23 415, 23 418, 23 421, 23 424, 23 427, 23 430, 23 433, 23 436,
23 439, 23 442, 23 445, 23 448, 23 451, 23 454, 23 457, 23 460, 23 463, 23 466, 23 469, 23 472,
23 475, 23 478, 23 481, 23 484, 23 487, 23 490, 23 493, 23 496, 23 499, 23 502, 23 505, 23 508,
23 511, 23 514, 23 517, 23 520, 23 523, 23 526, 23 529, 23 532, 23 535, 23 538, 23 541, 23 544,
23 547, 23 550, 23 553, 23 556, 23 559, 23 562, 23 565, 23 568, 23 571, 23 574, 23 577, 23 580,
23 583, 23 586, 23 589, 23 592, 23 595, 23 598, 23 601, 23 604, 23 607, 23 610, 23 613, 23 616,

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23 979, 23 982, 23 985, 23 988, 23 991, 23 994, 23 997, 24 000, 24 003, 24 006, 24 009, 24 012,
24 015, 24 018, 24 021, 24 024, 24 027, 24 030, 24 033, 24 036, 24 039, 24 042, 24 045, 24 048}
```

b) Usar un bucle para crear una lista con los 25 primeros múltiplos de D1D2 + M1M2 .

In[ ]:=
```
diaMes=(d1d2+m1m2);
listaBMultiplosFor={};
listaBMultiplosWhile={};
listaBMultiplosDo = {};
For[i = 1, i ≤ 25, i++,
  AppendTo[listaBMultiplosFor, i * diaMes];
];
i = 1;
While[i ≤ 25,
  AppendTo[listaBMultiplosWhile, i * diaMes];
  i++;
];
Do[
  AppendTo[listaBMultiplosDo, i * diaMes],
  {i, 1, 25}
];
If[listaBMultiplosFor === listaBMultiplosWhile === listaBMultiplosDo,
  Print[listaBMultiplosFor]
];
```

```
{9, 18, 27, 36, 45, 54, 63, 72, 81, 90, 99, 108,
 117, 126, 135, 144, 153, 162, 171, 180, 189, 198, 207, 216, 225}
```

c) Calcular el producto de los múltiplos de D1D2 + M1M2 comprendidos entre A1A2A3A4 y A1A2A3A4 + 100

In[ ]:=
```
diaMes=(d1d2+m1m2);
anyoMas100=(anyo+100);
listaCMultiplosFor=1;
listaCMultiplosWhile=1;
listaCMultiplosDo = 1;
For[i = anyo, i ≤ anyoMas100, i++,
  If[Mod[i, diaMes] == 0,
    listaCMultiplosFor *= i;
  ]
];
i = anyo;
While[i ≤ anyoMas100,
  If[Mod[i, diaMes] == 0,
    listaCMultiplosWhile *= i;
  ]×
  i++;
];
Do[
  If[Mod[i, diaMes] == 0,
    listaCMultiplosDo *= i;
  ],
  {i, anyo, anyoMas100}
];
If[listaCMultiplosFor === listaCMultiplosWhile === listaCMultiplosDo,
  Print[listaCMultiplosFor]
];
```

2 713 259 615 850 273 646 479 903 734 601 216 000

d) Calcular la suma de los múltiplos de D1D2 + M1M2 + 10 comprendidos entre A1A2A3A4 y (A1A2A3A4)^2 .

In[•]:=
```
diaMesMas10=(d1d2+m1m2+10);
anyoElev2=(anyo^2);
sumaMultiplosFor=0;
sumaMultiplosWhile=0;
sumaMultiplosDo=0;
For[i = anyo, i ≤ anyoElev2, i++,
  If[Mod[i, diaMesMas10] == 0,
    sumaMultiplosFor += i;
  ]
];
i = anyo;
While[i ≤ anyoElev2,
  If[Mod[i, diaMesMas10] == 0,
    sumaMultiplosWhile += i;
  ]×
  i++;
];
Do[
  If[Mod[i, diaMesMas10] == 0,
    sumaMultiplosDo += i;
  ],
  {i, anyo, anyoElev2}
];
If[sumaMultiplosFor === sumaMultiplosWhile === sumaMultiplosDo,
  Print[sumaMultiplosFor]
];
```

424 432 016 800

Práctica 4

Ejercicio 5.1

Determina según tu DNI el valor de verdad de la siguiente forma enunciativa:

In[•]:=
```
dni=26268082;
termina = Mod[dni,10];
Mod[dni,2]==0 && Mod[dni,3]==0 && (termina=1 ||termina=7 ||termina=3)
```

Out[•]=

False

Ejercicio 5.2

Evaluar las siguientes formas enunciativas en las combinaciones de valores de verdad indicadas

a) ¬X1; X1=V

In[•]:=
```
xa=True;
TrueQ[Not[xa]]
```

Out[•]=
```
False
```

b) x1⟺x2;x1=V,x2=F

In[•]:=
```
xb1=True;
xb2=False;
TrueQ[Equivalent[xb1,xb2]]
```

Out[•]=
```
False
```

c) ((¬x1)∧x2)⇒x3;x1=V,x2=F,x3=V

In[•]:=
```
xc1=xc3=True;
xc2=False;
TrueQ[Implies[And[Not[xc1],xc2],xc3]]
```

Out[•]=
```
True
```

d) (x1∨x2)⟺(¬x2);x1=V,x2=v

In[•]:=
```
xd1=xd2=True;
TrueQ[Equivalent[Or[xd1,xd1],Not[xd2]]]
```

Out[•]=
```
False
```

e)[(x1⊽x2)⊼(¬x3)]⇒(¬x3);x1=V,x2=F,x3=V

In[•]:=
```
xe1=xe3=True;
xe2=False;
TrueQ[Implies[Nand[Nor[xe1,xe2],Not[xe3]],Not[xe3]]]
```

Out[•]=
```
False
```

f)(¬((¬(x1∧x2))⇒x3))⊼(x4∨x5);x5=F y tomando el resto de variables cualesquiera valores.

In[•]:=
```
xf1=xf2=xf3=xf4=xf5=False;
TrueQ[Nand[Not[Implies[Not[And[xf1,xf2]],xf3]],Or[xf4,xf5]]]
```

Out[•]=
```
True
```

Ejercicio 5.6

Calcular las tablas de verdad de las siguientes formas enunciativas (e,f,j,k):

In[•]:=
```
TablaVerdad[FormaE_,nombres_]:=Module[{p,n,j,f,resto},
n=Length[nombres];
p=Table[False,{t,n}];
tabla=Table["F",{x,2^n},{y,n+1}];
Do[j=i;
For[f=n,f>0,f--,resto=Mod[j,2];
j=Floor[j/2];
If[resto==0,p⟦f⟧=True;
tabla⟦i+1,f⟧="V",p⟦f⟧=False];];
If[FormaE[p],tabla⟦i+1,n+1⟧="V"];
   ,{i,0,2^n-1}];
Grid[Join[{Join[nombres,{FormaE[nombres]}]},tabla],Dividers→{Join[{True},Table[False,{i,2,n}
];
```

e) ((qvr)⇒((¬r)⇒q))

In[•]:=
```
fe[{q_, r_}] := Implies[Or[q, r], Implies[Not[r], q]]
TablaVerdad[fe, {"q", "r"}]
```

Out[•]=

q	r	q || r ⇒ (! r ⇒ q)
V	V	V
V	F	V
F	V	V
F	F	V

f)(((¬p)⇒q)⇒(((¬s)⇒(¬q))⇒p))

In[•]:=
```
ff[{p_,q_,s_}]:=Implies[Implies[Not[p], q], Implies[Implies[Not[s], Not[q]], p]]
TablaVerdad[ff, {"p", "q", "s"}]
```

Out[•]=

p	q	s	(! p ⇒ q) ⇒ ((! s ⇒ ! q) ⇒ p)
V	V	V	V
V	V	F	V
V	F	V	V
V	F	F	V
F	V	V	F
F	V	F	V
F	F	V	V
F	F	F	V

j)¬(¬((p⇒¬(q⇒r))⇒¬((p⊼q)⊽r)))

In[•]:=
```
fj[{p_,q_,r_}]:=Not[Not[Implies[Implies[p,Not[Implies[q,r]]],Not[Nor[Nand[p,q],r]]]]]
TablaVerdad[fj,{"p","q","r"}]
```

Out[•]=

p	q	r	(p ⇒ ! (q ⇒ r)) ⇒ ! ((p ⊼ q) ∇ r)
V	V	V	V
V	V	F	F
V	F	V	V
V	F	F	V
F	V	V	V
F	V	F	V
F	F	V	V
F	F	F	V

k)(q⇒p)⇒(q⟺r)

In[•]:=
```
fk[{q_,p_,r_}]:=Implies[Implies[q,p],Equivalent[q,r]]
TablaVerdad[fk,{"p","q","s"}]
```

Out[•]=

p	q	s	(p ⇒ q) ⇒ p ⟺ s
V	V	V	V
V	V	F	F
V	F	V	V
V	F	F	V
F	V	V	F
F	V	F	V
F	F	V	F
F	F	F	V

Práctica 5

Copiar la manera de hacer tautología del libro tema 6
Forma enunciativa restringida, tomar apuntes de eso

Ejercicio 6.6

Estudiar si los siguientes pares de formas enunciativas son lógicamente equivalentes o implican lógicamente una a la otra:

In[•]:=
```
Tautologia[FormaE_,n_]:=Module[{p,j,f,resto},
 tautologia=True;
 p=Table[False,{t,n}];
 Do[j=i;
 For[f=n,f>0,f--,resto=Mod[j,2];
 j=Floor[j/2];
 If[resto==0,p[[f]]=True,p[[f]]=False];];
If[FormaE[p],Null,tautologia=False;Break[];];
,{i,0,2^n-1}];
 Return[tautologia];];
```

a) (p ⟺ q) ⊽ r, (r ∧ (¬ q)) ⇒ p

In[•]:=
```
Equivalencia[{p_,q_,r_}]:=Equivalent[Nor[Equivalent[p,q],r],Implies[And[r,Not[q]],p]];
ImplicaAB[{p_,q_,r_}]:=Implies[Nor[Equivalent[p,q],r],Implies[And[r,Not[q]],p]]
ImplicaBA[{p_,q_,r_}]:=Implies[Implies[And[r,Not[q]],p],Nor[Equivalent[p,q],r]]
If[Tautologia[Equivalencia,3],
    Print["Son lógicamente equivalentes"],
    Print["No son lógicamente equivalentes"]
]
If[Tautologia[ImplicaAB,3],
    Print["A implicaca lógicamente B"],
    Print["A no implicaca lógicamente B"]
]
If[Tautologia[ImplicaBA,3],
    Print["B implicaca lógicamente A"],
    Print["B no implicaca lógicamente A"]
]
```

```
No son lógicamente equivalentes

A implicaca lógicamente B

B no implicaca lógicamente A
```

b)(p⇒(¬q))⊼r,¬((p∧q)∨r)

In[•]:=
```
Equivalencia[{p_,q_,r_}]:=Equivalent[Nand[Implies[p,Not[q]],r],Not[Or[And[p,q],r]]];
ImplicaAB[{p_,q_,r_}]:=Implies[Nand[Implies[p,Not[q]],r],Not[Or[And[p,q],r]]]
ImplicaBA[{p_,q_,r_}]:=Implies[Not[Or[And[p,q],r]],Nand[Implies[p,Not[q]],r]]
If[Tautologia[Equivalencia,3],
    Print["Son lógicamente equivalentes"],
    Print["No son lógicamente equivalentes"]
]
If[Tautologia[ImplicaAB,3],
    Print["A implicaca lógicamente B"],
    Print["A no implicaca lógicamente B"]
]
If[Tautologia[ImplicaBA,3],
    Print["B implicaca lógicamente A"],
    Print["B no implicaca lógicamente A"]
]
```

```
No son lógicamente equivalentes

A no implicaca lógicamente B

B implicaca lógicamente A
```

c)(p⇒r)∧(r⊽(¬q)),(p⊽r)∧q

In[•]:=
```
Equivalencia[{p_,q_,r_}]:=Equivalent[And[Implies[p,r],Nor[r,Not[q]]],And[Nor[p,r],q]];
ImplicaAB[{p_,q_,r_}]:=Implies[And[Implies[p,r],Nor[r,Not[q]]],And[Nor[p,r],q]]
ImplicaBA[{p_,q_,r_}]:=Implies[And[Nor[p,r],q],And[Implies[p,r],Nor[r,Not[q]]]]
If[Tautologia[Equivalencia,3],
    Print["Son lógicamente equivalentes"],
    Print["No son lógicamente equivalentes"]
]
If[Tautologia[ImplicaAB,3],
    Print["A implicaca lógicamente B"],
    Print["A no implicaca lógicamente B"]
]
If[Tautologia[ImplicaBA,3],
    Print["B implicaca lógicamente A"],
    Print["B no implicaca lógicamente A"]
]
```

```
Son lógicamente equivalentes
A implicaca lógicamente B
B implicaca lógicamente A
```

Ejercicio 6.15

Dadas las siguientes formas enunciativas:

A) Nand[p, Implies[q, r]] B) And[Implies[p,q],Nor[r,Not[q]]] C) Nor[And[Not[p],q],Or[r,s]]

In[•]:=
```
TablaVerdad[FormaE_,nombres_]:=Module[{p,n,j,f,resto},
n=Length[nombres];
p=Table[False,{t,n}];
tabla=Table["F",{x,2^n},{y,n+1}];
Do[j=i;
For[f=n,f>0,f--,resto=Mod[j,2];
j=Floor[j/2];
If[resto==0,p⟦f⟧=True;
tabla⟦i+1,f⟧="V",p⟦f⟧=False];];
If[FormaE[p],tabla⟦i+1,n+1⟧="V"];
   ,{i,0,2^n-1}];
Grid[Join[{Join[nombres,{FormaE[nombres]}]},tabla],Dividers→{Join[{True},Table[False,{i,2,n}
];
```

In[•]:=
```
A[{p_,q_,r_}]:=Nand[p,Equivalent[q,r]];
B[{p_,q_,r_}]:=And[Implies[p,q],Nor[r,Not[q]]];
c[{p_,q_,r_,s_}]:=Nor[And[Not[p],q],Or[r,s]];
```

i) Calcular sus tablas de verdad

In[•]:=
```
TablaVerdad[A, {"p", "q", "r"}]
```

Out[•]=

p	q	r	p ⊼ (q ⟺ r)
V	V	V	F
V	V	F	V
V	F	V	V
V	F	F	F
F	V	V	V
F	V	F	V
F	F	V	V
F	F	F	V

In[•]:=
```
TablaVerdad[B,{"p","q","r"}]
```

Out[•]=

p	q	r	(p ⇒ q) && (r ∇ ! q)
V	V	V	F
V	V	F	V
V	F	V	F
V	F	F	F
F	V	V	F
F	V	F	V
F	F	V	F
F	F	F	F

In[•]:=
```
TablaVerdad[c,{"p","q","r","s"}]
```

Out[•]=

p	q	r	s	(! p && q) ∇ (r || s)
V	V	V	V	F
V	V	V	F	F
V	V	F	V	F
V	V	F	F	V
V	F	V	V	F
V	F	V	F	F
V	F	F	V	F
V	F	F	F	V
F	V	V	V	F
F	V	V	F	F
F	V	F	V	F
F	V	F	F	F
F	F	V	V	F
F	F	V	F	F
F	F	F	V	F
F	F	F	F	V

ii) Calcular sus formas normales .

```
FormasNormales[FormaE_,nombres_]:=Module[{cadena,cadena2,n,cad,cad2,j,f,resto},
 n=Length[nombres];
 cadena="";
 cadena2="";
 cad="";
```

```
cad2="";
contradiccion=True;
tautologia=True;
p=Table[False,{t,n}];
Do[
j=i;
cad="";
cad2="";
For[f=n,f>0,f--,
resto=Mod[j,2];
j=Floor[j/2];
If[resto==0,p[[f]]=True;
If[f==n,
cad=StringJoin[ToString[nombres[[f]]],cad],
cad=StringJoin[ToString[nombres[[f]]]," ∧ ", cad]
];

If[f==n,
cad2=StringJoin["(~",ToString[nombres[[f]]],")",cad2],cad2=StringJoin["(~",ToString[nombres[[f]
    ")"," ∨ ",cad2]
];
      ,p[[f]]=False;
If[f==n,
cad=StringJoin["(~",ToString[nombres[[f]]],")",cad],cad=StringJoin["(~",ToString[nombres[[f]]],
    ")"," ∧ ",cad]
];
If[f==n,
cad2=StringJoin[ToString[nombres[[f]]],cad2],
cad2=StringJoin[ToString[nombres[[f]]]," ∨ ",cad2]
];
    ];
];
If[FormaE[p],
If[cadena=="",
cadena=StringJoin[cadena,"(",cad,")"],
cadena=StringJoin[cadena," ∨ (",cad,")"]
];
contradiccion=False;,
If[cadena2=="",
cadena2=StringJoin[cadena2,"(",cad2,")"],
cadena2=StringJoin[cadena2," ∧ (",cad2,")"]
];
tautologia=False;
];
  ,{i,0,2^n-1}];
If[contradiccion,
Print["Es una contradicción."],
Print["No es contradicción y la forma normal disyuntiva es: ",cadena]];
If[tautologia,
Print["Es una tautología."],
Print["No es tautología y la forma normal conjuntiva es: ",cadena2]];
];
```

In[•]:=
```
FormasNormales[A,{"p","q","r"}]
```

No es contradicción y la forma normal disyuntiva es:
(p ∧ q ∧ (~r)) ∨ (p ∧ (~q) ∧ r) ∨ ((~p) ∧ q ∧ r) ∨
((~p) ∧ q ∧ (~r)) ∨ ((~p) ∧ (~q) ∧ r) ∨ ((~p) ∧ (~q) ∧ (~r))

No es tautología y la forma normal conjuntiva es: ((~p) ∨ (~q) ∨ (~r)) ∧ ((~p) ∨ q ∨ r)

In[•]:=
```
FormasNormales[B,{"p","q","r"}]
```

No es contradicción y la forma normal disyuntiva es: (p ∧ q ∧ (~r)) ∨ ((~p) ∧ q ∧ (~r))

No es tautología y la forma normal conjuntiva es:
((~p) ∨ (~q) ∨ (~r)) ∧ ((~p) ∨ q ∨ (~r)) ∧ ((~p)
∨ q ∨ r) ∧ (p ∨ (~q) ∨ (~r)) ∧ (p ∨ q ∨ (~r)) ∧ (p ∨ q ∨ r)

In[•]:=
```
FormasNormales[c,{"p","q","r";"s"}]
```

Es una contradicción.

Es una tautología.

iii) Buscar formas enunciativas lógicamente equivalentes utilizando los siguientes conjuntos adecuados {¬,∧}, {¬,→} y {⊽}. Comprobar el resultado con Mathematica .

In[•]:=
```
BooleanConvert[Nand["p",Equivalent["q","r"]],"AND"]
BooleanConvert[Nand["p",Equivalent["q","r"]],"IMPLIES"]
Clear[p,q,r,ExpNor]
ExpNor=BooleanConvert[Nand["p",Equivalent["q","r"]],"NOR"]
A=ExpNor/. Not[x_]:>(x⊽x);
A
```

Out[•]=
```
! (p && q && r) && ! (p && ! q && ! r)
```

Out[•]=
```
p ⇒ ((q ⇒ r) ⇒ ! (! q ⇒ ! r))
```

Out[•]=
```
(! p ⊽ ! q ⊽ ! r) ⊽ (! p ⊽ q ⊽ r)
```

Out[•]=
```
((p ⊽ p) ⊽ (q ⊽ q) ⊽ (r ⊽ r)) ⊽ ((p ⊽ p) ⊽ q ⊽ r)
```

In[•]:=
```
BooleanConvert[And[Implies[p,q],Nor[r,Not[q]]],"AND"]
BooleanConvert[And[Implies[p,q],Nor[r,Not[q]]],"IMPLIES"]
Clear[p,q,r,ExpNor]
ExpNor=BooleanConvert[And[Implies[p,q],Nor[r,Not[q]]],"NOR"]
A=ExpNor/. Not[x_]:>(x⊽x);
A
```

Out[•]=
```
q && ! r
```

Out[•]=
```
! (q ⇒ r)
```

Out[•]=
```
! q ⊽ r
```

Out[•]=
```
(q ⊽ q) ⊽ r
```

In[•]:=
```
BooleanConvert[Nor[And[Not[p],q],Or[r,s]],"AND"]
BooleanConvert[Nor[And[Not[p],q],Or[r,s]],"IMPLIES"]
Clear[p,q,r,ExpNor]
ExpNor=BooleanConvert[Nor[And[Not[p],q],Or[r,s]],"NOR"]
A=ExpNor/. Not[x_]:>(x⊽x);
A
```

Out[•]=
```
! (! p && q) && ! r && ! s
```

Out[•]=
```
(p ⇒ (! r ⇒ s)) ⇒ ! (! p ⇒ (! q ⇒ (! r ⇒ s)))
```

Out[•]=
```
(p ⊽ ! q) ⊽ r ⊽ s
```

Out[•]=
```
(p ⊽ (q ⊽ q)) ⊽ r ⊽ s
```

Ejercicio 6.17

Utiliza el método de refutación para determinar si la siguiente forma argumentativa es válida o inválida:

$(p \vee q) \wedge (r \Rightarrow t), p \oplus (s \vee (\neg t)), r \barwedge (\neg q); \therefore ((\neg p) \wedge q) \Rightarrow r$

```
Argumentaciona[{p_,q_,r_,t_,s_}]:=Implies[And[And[Or[p,q],Implies[r,t]],Xor[p,Or[s,Not[t]]],
    Nand[r,Not[q]]],Implies[And[Not[p],q],r]];
If[Tautologia[Argumentaciona,5],
    Print["Es una argumentación válida"],
    Print["Es una argumentación inválida"]
]
```

```
Es una argumentación inválida
```

Práctica 6

Ejercicio 7.1 . (g e i)

Sea X=A∪B∪Z,donde A es el conjunto formado por las letras distintas de tu primer apellido, B es el conjunto formado por los números distintos de tu DNI y Z es el conjunto formado por los números naturales impares menores que 10 junto con las vocales. Comprobar las siguientes propiedades:

```
A={"b","c","d","e","f","g","h","j","k","ñ","o","p","q","v","w","q","y","z"};
B={1,3,4,5,7,9};
Z={1,3,5,7,9,"a","e","i","o","u"};
x=Union[a,b,z];
```

g) Distributivas: A∪(B∩Z)=(A∪B)∩(A∪Z))

```
Union[A,Intersection[A,Z]]==Intersection[Union[A,B],Union[A,Z]]
Intersection[A,Union[B,Z]]==Union[Intersection[A,B],Union[A,Z]]
```

i) Leyes de Morgan :

```
Complement[Union[A,Z]]==Intersection[Complement[A],Complement[Z]]
Complement[Intersection[A,Z]]==Union[Complement[A],Complement[Z]]
```

Ejercicio 7.14 .

In[•]:=
```
A={"b","c"};
B={1,3};
```

a) AxB y AxAxB

```
cartesianoAB={};
Do[Do[AppendTo[cartesianoAB,{A[[i]],B[[j]]}],{i,1,Length[A]}];,{j,1,Length[B]}];
cartesianoAB
CARTESIANO[conjuntos_]:=Module[{i,j,k,cartesianotemp},cartesiano=Table[{conjuntos[[1,i]]},
    {i,Length[conjuntos[[1]]]}];
 Do[cartesianotemp={};
 Do[Do[AppendTo[cartesianotemp,Append[cartesiano[[k]],conjuntos[[i,j]]]];,{k,Length[cartesiano]}]
    ,{j,Length[conjuntos[[i]]]}
];
 cartesiano=cartesianotemp;,{i,2,Length[conjuntos]}];
 cartesiano];
CARTESIANO[{A,A,B}]
```

Out[•]=
```
{{b, 1}, {c, 1}, {b, 3}, {c, 3}}
```

Out[•]=
```
{{b, b, 1}, {c, b, 1}, {b, c, 1}, {c, c, 1}, {b, b, 3}, {c, b, 3}, {b, c, 3}, {c, c, 3}}
```

b) Una aplicación entre A y P (B) que sea inyectiva y otra P (B) y A que sea sobreyectiva

```
PartesB=Subsets[B];
A={1,2}; (*GUARDAR DOMINIO EN A*)
B=PartesB; (*GUARDAR CODOMINIO EN B*)
For[i=1,i≤Length[A],i++,
    f[A[[i]]]=B[[i]]
    ]
Imagen={};
Do[Imagen=Union[Imagen,Append[{},f[A[[i]]]],{i,1,Length[A]}];
Print["El conjunto imagen es: ",Imagen];
If[Length[Imagen]==Length[B],Print["Es sobreyectiva"],Print["No es sobreyectiva"]];
If[Length[A]==Length[Imagen],Print["Es inyectiva"],Print["No es inyectiva"]];
If[Length[A]==Length[B]&&Length[B]==Length[Imagen],Print["Es biyectiva"],
    Print["No es biyectiva"]];
```

```
El conjunto imagen es: {{}, {1}}

No es sobreyectiva

Es inyectiva

No es biyectiva
```

```
PartesB=Subsets[B];
For[i=1,i≤Length[PartesB],i++,
    f[PartesB[[i]]]=A[[Mod[i,Length[A]]+1]]
    ]
A=Subsets[{a,b}]; (*GUARDAR DOMINIO EN A*)
B={1,2}; (*GUARDAR CODOMINIO EN B*)
Imagen={};
Do[Imagen=Union[Imagen,Append[{},f[A[[i]]]],{i,1,Length[A]}];
Print["El conjunto imagen es: ",Imagen];
If[Length[Imagen]==Length[B],Print["Es sobreyectiva"],Print["No es sobreyectiva"]];
If[Length[A]==Length[Imagen],Print["Es inyectiva"],Print["No es inyectiva"]];
If[Length[A]==Length[B]&&Length[B]==Length[Imagen],Print["Es biyectiva"],
    Print["No es biyectiva"]];
```

```
El conjunto imagen es: {f[{a}], f[{b}], f[{a, b}], {a}}

No es sobreyectiva

Es inyectiva

No es biyectiva
```

c) Un aplicación no inyectiva de AxB en P (AxB)

```
cartesianoAB={};
Do[Do[AppendTo[cartesianoAB,{A[[i]],B[[j]]}],{i,1,Length[A]}];,{j,1,Length[B]}];
cartesianoAB;
PartesAB=Subsets[cartesianoAB];
DOM=cartesianoAB; (*GUARDAR DOMINIO EN A*)
COD=PartesAB; (*GUARDAR CODOMINIO EN B*)
For[i=1,i≤Length[DOM],i++,
    f[DOM[[i]]=COD[[i]]
    ]
Imagen={};
Do[Imagen=Union[Imagen,Append[{},f[A[[i]]]]],{i,1,Length[A]}];
Print["El conjunto imagen es: ",Imagen];
If[Length[Imagen]==Length[B],Print["Es sobreyectiva"],Print["No es sobreyectiva"]];
If[Length[A]==Length[Imagen],Print["Es inyectiva"],Print["No es inyectiva"]];
If[Length[A]==Length[B]&&Length[B]==Length[Imagen],Print["Es biyectiva"],
    Print["No es biyectiva"]];
```

```
El conjunto imagen es: {{}, {1}}

No es sobreyectiva

Es inyectiva

No es biyectiva
```

d) Una aplicación no sobreyectiva de P(AxB) en AxB

```
A={1,3};
B={"c","b"};
DOM=Subsets[CARTESIANOAB[{A,B}]];
COD=CARTESIANOAB[{A,B}];
f[DOM[[1]]=COD[[1]];
For[i=1,i≤Length[DOM],i++,
    f[DOM[[i]]=COD[[1]]
    ]

Imagen={};
Do[Imagen=Union[Imagen,Append[{},f[DOM[[i]]]]],{i,1,Length[DOM]}];
Print["El conjunto imagen es: ",Imagen];
If[Length[Imagen]==Length[COD],Print["Es sobreyectiva"],Print["No es sobreyectiva"]];
If[Length[DOM]==Length[Imagen],Print["Es inyectiva"],Print["No es inyectiva"]];
If[Length[DOM]==Length[COD]&&Length[COD]==Length[Imagen],Print["Es biyectiva"],
    Print["No es biyectiva"]];
```

```
El conjunto imagen es: {{1, c}}

No es sobreyectiva

No es inyectiva

No es biyectiva
```