Homework #3 Name: _____

If a question is wrong, or has no acceptable answer, do not mark any choice.
If a question has several correct answers, choose the most accurate/complete/informative one.
On a separate sheet, write a detailed justification of your choice.
You will be graded on the accuracy and precision of this justification only.
You will get 1 point for each correct answer and 0 points for missing or incorrect answers.
Your grade will be written on the back of this page.

1. How many iterations does Euclid *gcd* algorithm executes on input 15 and 4:

   [-A-] 1
   [-B-] 2
   [-C-] 3
   [-D-] 4

2. Let $f : \mathbb{N}_{24} \to \mathbb{N}_{24}$ be defined by $f(n) = a\,n + 5$ (mod 24 is intended).
   For which value of a is f bijective.

   [-A-] 2
   [-B-] 3
   [-C-] 4
   [-D-] 5

3. Let $f : \mathbb{N} \times \mathbb{N} \to \mathbb{N}$ be defined by
   $f(0, y) = y$
   $f(x + 1, y) = 1 + f(x, y)$
   the value of $f(4, 4)$ is:

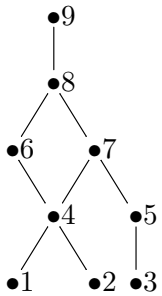
   [-A-] 0
   [-B-] 4
   [-C-] 8
   [-D-] 12

4. Let $f : \mathbb{N} \to \mathbb{N}$ be defined by
   $f(0) = 0$
   $f(1) = 0$
   $f(n + 2) = 1 + f(n)$
   the value of $f(7)$ is:

   [-A-] 1
   [-B-] 3
   [-C-] 4
   [-D-] 7

5. Consider the Hasse diagram of the poset P to the right.
   Which of the following is **not** a topological sort of P.

   [-A-] 1,2,3,4,5,6,7,8,9
   [-B-] 1,2,4,6,7,8,9,3,5
   [-C-] 3,2,1,5,4,7,6,8,9
   [-D-] 3,5,1,2,4,6,7,8,9



6. Let $f : \mathbb{N}_9 \to \mathbb{N}_9$ be defined by $f(x) = (4x + 6) \bmod 9$.

[-A-] f has a fixpoint
[-B-] 4 is a fixpoint of f
[-C-] 5 is a fixpoint of f
[-D-] f has no fixpoints

7. $f(n) = O(g(n))$ iff there exist constants c and m such that:

[-A-] $|g(n)| \leqslant |f(n)|$, for $n \geqslant m$
[-B-] $|f(n)| \leqslant |g(n)|$, for $n \geqslant m$
[-C-] $|g(n)| \leqslant c|f(n)|$, for $n \geqslant m$
[-D-] $|f(n)| \leqslant c|g(n)|$, for $n \geqslant m$

8. if $f(n) = O(g(n))$ then

[-A-] $f(n) \leqslant g(n)$, for all n
[-B-] $|f(n)| \leqslant |g(n)|$, for all n
[-C-] $|f(n)| \leqslant c|g(n)|$, for some c and all n
[-D-] none of the above

9. Comparing rates of growth:

[-A-] $\log(n^2) = O(\log(n))$
[-B-] $\log(n^2) = O(n)$
[-C-] $\log(n^2) = O(n^2)$
[-D-] All of the above

10. Let $f : \mathbb{N}_{12} \to \mathbb{N}_{12}$ be defined by $f(x) = (7\,x + 2) \bmod 12$. The inverse, say g, of f is:

[-A-] $g(x) = (7\,x + 5) \bmod 12$
[-B-] $g(x) = (5\,x + 7) \bmod 12$
[-C-] $g(x) = (7\,x + 10) \bmod 12$
[-D-] $g(x) = (10\,x + 7) \bmod 12$

11. Which function of n is computed by *mistery*:

[-A-] n^2
[-B-] $2 * n + 1$
[-C-] $n(n-1)/2$
[-D-] none of the above

```
procedure mistery(n)
  r := 0
  for i := 1 to n
    r := r + 2*i - 1
  return r
end
```