1. The system calculates taxes based on salary

Employees with a salary of up to **$4000 (inclusive)** do **not** pay taxes.

- The next **$1,500** is taxed at **10%**.
- The next **$28,000** is taxed at **22%**.
- All amounts **above that** are taxed at **40%**.

Which group of values belongs to a single equivalence class?

a) $4,800, $14,000, $28,000
b) $5,200, $5,500, $28,000
c) $28,001, $32,000, $35,000
d) $5,800, $28,000, $32,000

Equivalence classes		**0-4000**	**4001-5500**	**5501-33500**	**>33500**
Tax		**0%**	**10%**	**22%**	**40%**
Values for equivalence classes	***a***		**4800**	**14000**	**28000**
	b		**5200**	**5500**	**28000**
	c			**28001**	**32000**	**35000**
	d			**5800**	**28000**	**32000**

Given the **definition** of equivalence classes, where we need one representative for each class, and the requirement of the problem that asks us to choose the option containing values from the **same** equivalence class, the correct answer is option **“d”**.

All three values — **5800**, **28000**, and **32000** — belong to the **same equivalence class** and are taxed at the **same rate of 22%**.

2. Calculating bonuses based on employee seniority

Bonuses are calculated based on the employee's length of service in the company.

Categories:

- For a working period of **less than or equal to 2 years → 0 bonus**
- **More than 2 years but less than 5 years → 1000 lei bonus**
- **From 5 years up to (but not including) 10 years → 1500 lei bonus**
- **10 years or more → 2000 lei bonus**

Question:

How many **test cases** are needed to cover **all equivalence classes**?

Work experience years)		**<=2**	**>2 <5**	**>=5 <10**	**>=10**
Exact intervals		**0-2**	**3-4**	**5-9**	**>=10**
Bonus		**0**	**1000**	**1500**	**2000**
Valid values per interval		**1**	**3**	**7**	**24**
Definition of test cases for equivalence classes	**Case 1**: choose a value less than or equal to 2 years – *e.g., 1*				
	Case 2: choose a value more than 2 years but less than 5 – *e.g., 3*				
	Case 3: choose a value more than 5 years but less than 10 – *e.g., 7*				
	Case 4: choose a value more than 10 years – *e.g., 24*				

Considering the **definition of equivalence classes**, where we need one representative value for each equivalence class, the **number of test cases** required to cover **all equivalence classes** is **4**.

3. **Test a homework grading software**

Depending on the number of points scored, the grades are:

- **1–49 → Grade C**
- **50–74 → Grade B**
- **75–100 → Grade A**

What values are needed to achieve full coverage using Boundary Value Analysis (BVA)?

Two value boundary				
Individual values for each grade				
Grade		**C**	**B**	**A**
Points Range		**1-49**	**50-74**	**75-100**
Invalid Value		**0**	**49**	**74**
Lower Boundary		**1**	**50**	**75**
Upper Boundary		**49**	**74**	**100**
Invalid Value		**50**	**75**	**101**

Test Values Required:

- **Grade C:** `0, 1, 49, 50`
  (Testing values below, at the boundary, and crossing into the next grade)
- **Grade B:** `49, 50, 74, 75`
  (Boundary entry from C, valid B range, and entry into A)
- **Grade A:** `74, 75, 100, 101`
  (Boundary entry from B, valid A range, and value just beyond max)

Three value boundary				
Individual values for each grade				
Grade		**C**	**B**	**A**
Points Range		**1-49**	**50-74**	**75-100**
LI -1		***0***	***49***	***74***
Lower Boundary		***1***	***50***	***75***
LI + 1		***2***	***51***	***76***
LS -1		***48***	***73***	***99***
Upper Boundary		***49***	***74***	***100***
LS +1		***50***	***75***	***101***

Values required to achieve coverage level:

- **C:** 0, 1, 2, 48, 49, 50
- **B:** 49, 50, 51, 73, 74, 75
- **A:** 74, 75, 76, 99, 100, 101

Test Values for the Range “CBA 1 – 100”								
Grade		**C**		**B**		**A**		
Grade values		***1***	***49***	***50***	***74***	***75***	***100***	
Test data	0	1	49	50	74	75	100	101

The test data for the range “CBA 1–100” are: 0, 1, 49, 50, 74, 75, 100, 101.

4. **Create test cases based on the techniques learned.**

Based on the solution to Exercise 3, create the necessary test cases to verify the grading software.

Test Cases for Grade C:

Test Case 1
Step: Enter the value `0`
Expected result: Error message

Test Case 2
Step: Enter the value `1`
Expected result: C

Test Case 3
Step: Enter the value `49`
Expected result: C

Test Case 4
Step: Enter the value `50`
Expected result: B

Test Cases for Grade B:

Test Case 5
Step: Enter the value `49`
Expected result: C

Test Case 6
Step: Enter the value `50`
Expected result: B

Test Case 7
Step: Enter the value `74`
Expected result: B

Test Case 8
Step: Enter the value `75`
Expected result: A

Test Cases for Grade A:

Test Case 9
Step: Enter the value `74`
Expected result: B

Test Case 10
Step: Enter the value `75`
Expected result: A

Test Case 11
Step: Enter the value `100`
Expected result: A

Test Case 12
Step: Enter the value `101`
Expected result: Error message