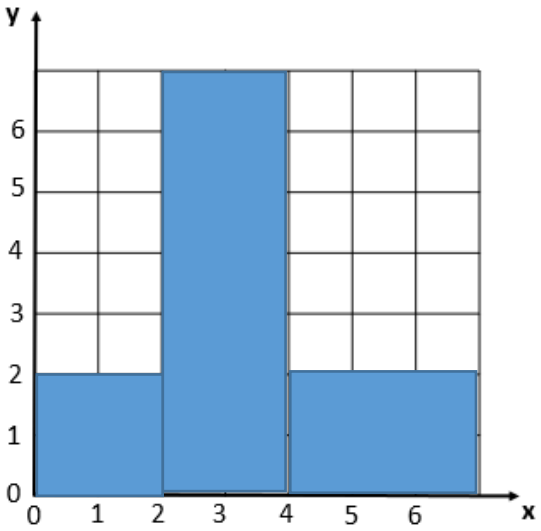
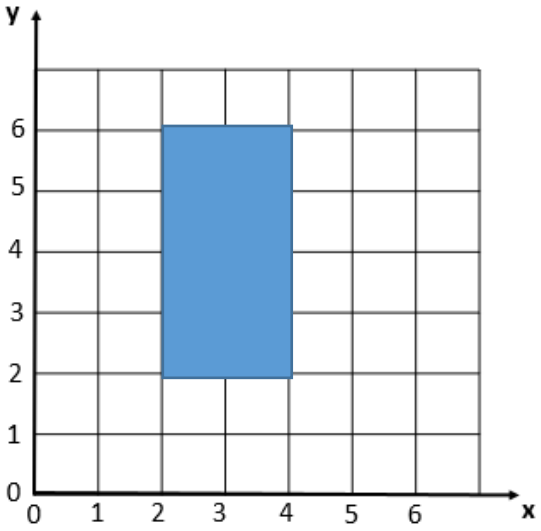
1. Draw the shape corresponding to the Boolean expression

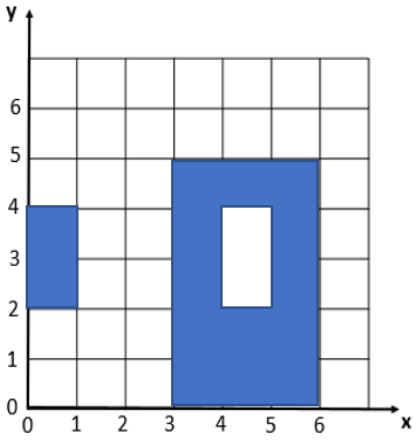
a, `(x > 2 and x < 4) or (y < 2)`



b, `(x>2 and x<6) and (y>2 and y<6) and not(x>4)`



2, Write the boolean condition for this grid



2. Demonstrate these equalities using the 9 simplification rules you have learnt:

- !(C and D) and (!C or D) and (C or !D) = !C
  !(C and D) and (!C or D) and (C or !D) = !C or !D and (!C or D) and (C or !D)
  = (!C or !D) and (!C or D) and (C or !D)
  = !C or (!D and D) and (C or !D)
  = !C or False and (C or !D)
  = !C or (False and C) or (False and !D)
  = !C or False or False
  = !C

- ! (!C and (!B or !C)) = C

  ! (!C and (!B or !C)) = !((!C and !B) or (!C and !C)
  =!((!C and !B) or !(C or C)
  = !(!C and !B) or !C
  =!(!C and (!C or True))
  =!(!C and !C)
  = !(!C
  =C

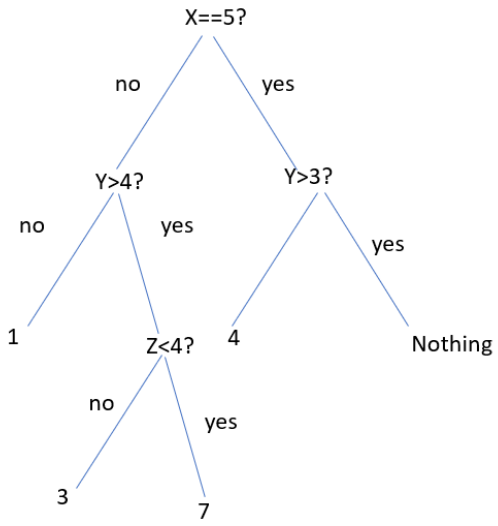
- (A and B) or (A and !B) = A

  (A and B) or (A and !B) = A and (B or True)

  = A and True

  = A

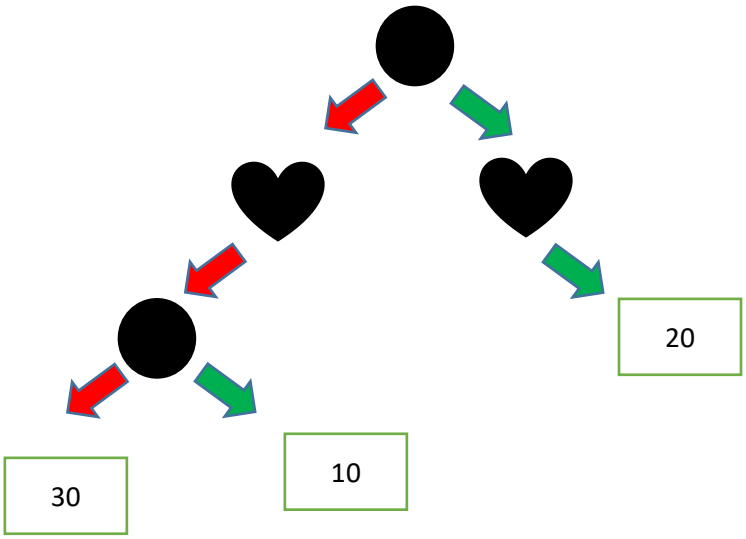
3.. What is the output of flowchart? If x=6 and y = 5 and z = 1



So (If x=6 and y = 5 and z = 1) = 7

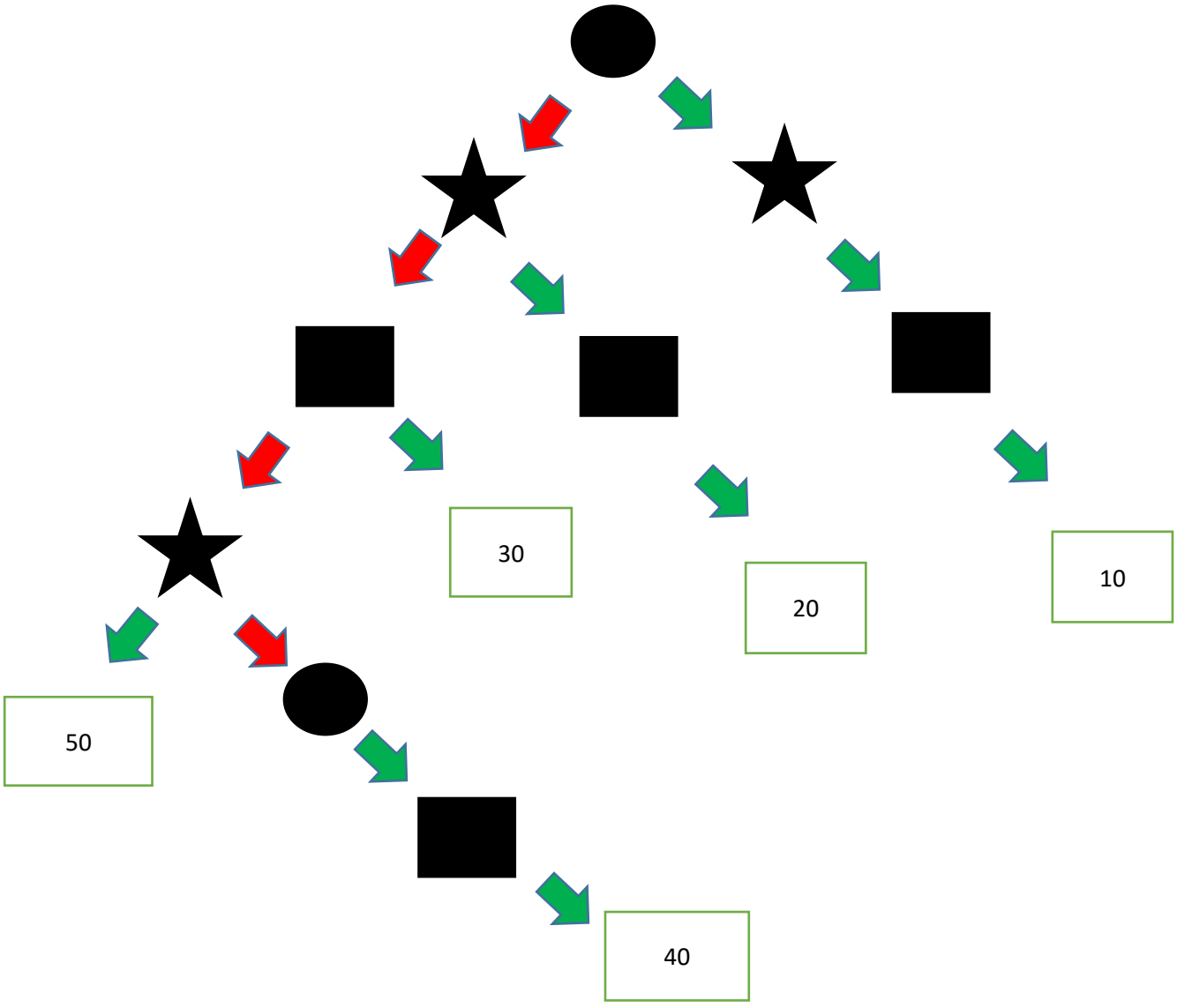
4. Draw the tree of conditions

CELL CONTENTS EXACTLY	POINTS
●	10
● ♥	20
<NOTHING>	30



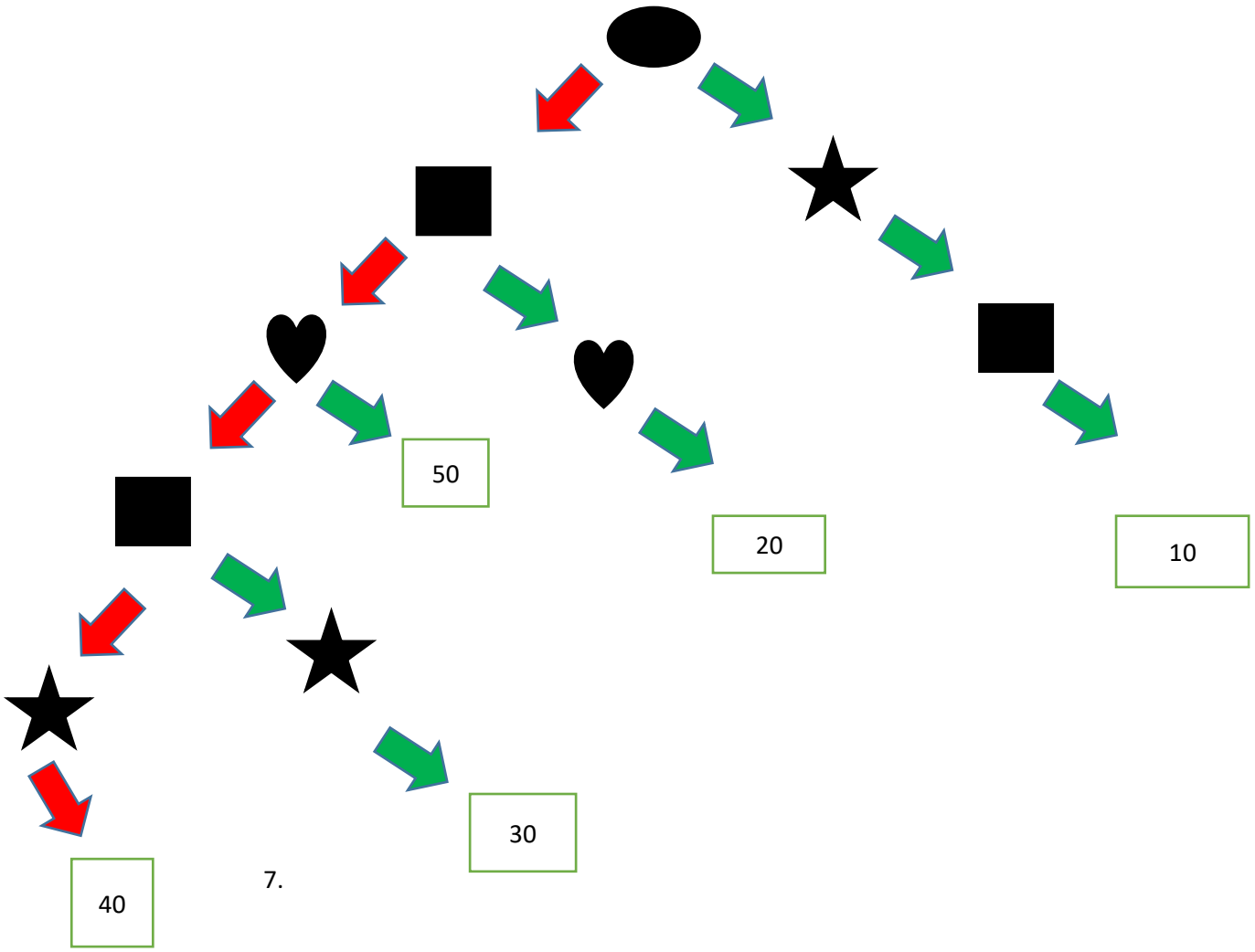
5. Draw the tree of conditions

CELL CONTENTS EXACTLY	POINTS
● ★ ■	10
★ ■	20
■	30
● ■	40
★	50

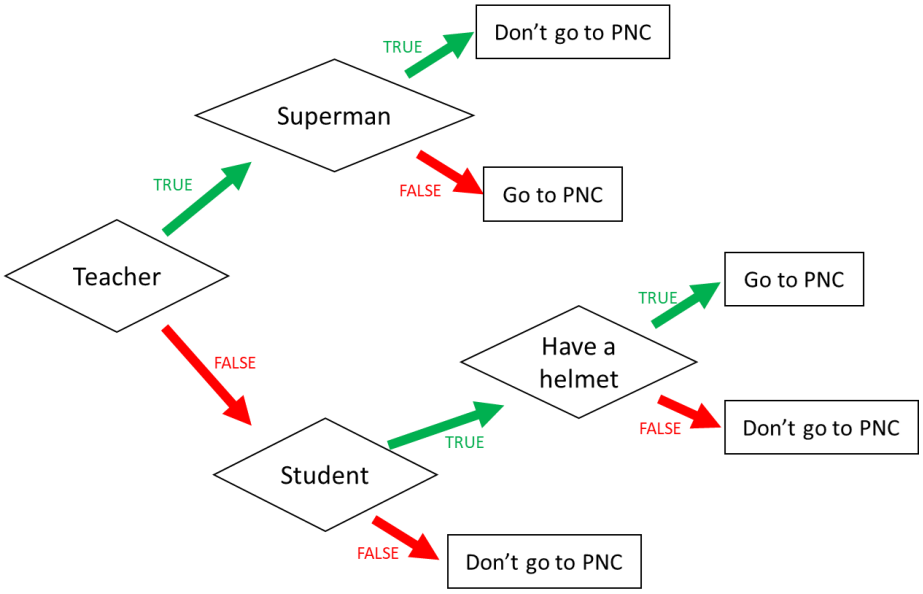


6. Draw the tree of conditions

CELL CONTENTS EXACTLY	POINTS
● ★ ■	10
■ ♥	20
■ ★	30
<nothing>	40
♥	50



7.



1. I am a teacher and I am superman, can I go to PNC?

   Answer: no

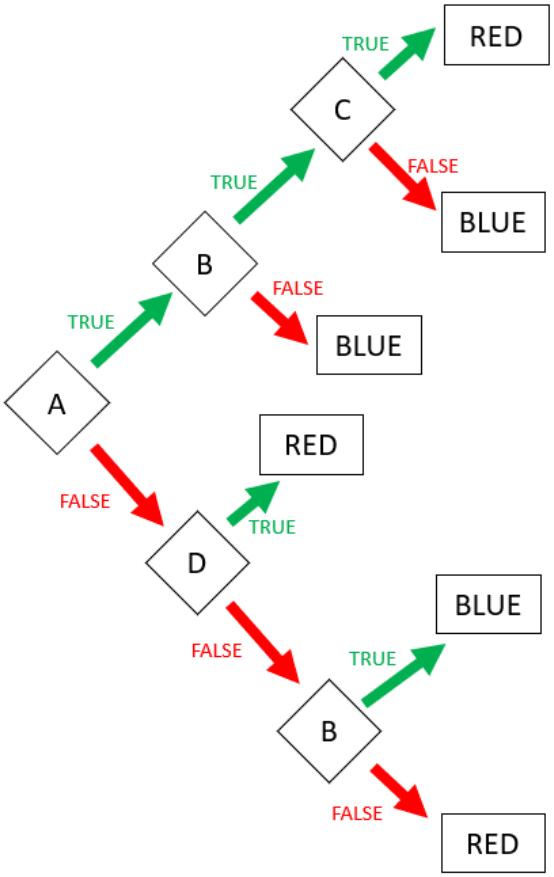
2. I am not a teacher and not a student, can I go to PNC?

   Answer: no

3. When can I go to PNC? (Express the condition using a Boolean expression)

I go to PNC if:

I am a Teacher and I am not superman or I am not Teacher and I am student and have a helmet



Expression: **RED** = ABC or !AD or !A!D!B

Expression: **BLUE** (FALSE) =!A!D!B

9. Encoding

- First 3 characters “MIX”, repeated many times (max repetition is 5)
- Then 1 character “!”, repeated many times (max repetition is 5)
- Then 1 number (0-3)

Examples:

MIXMIXMIX!1 MIX!!!!!3 MIXMIXMIX!!!2

Q1. Propose an **encoding structure** to encode this image.

Encoding parts	Encoding values (in binary)
The repetition of text “MIX”: 1…5	001…101
The repetition of character “!”: 1…5	001…101
The number of the end: 0..3	00…11

Q2. What is the total **size** of your encoding? Give explanations.

Encoding size:8bits

Explanation:

Part1: 101 that mean text of MIX repeated 5 times

Part2: 101 that mean character if ! reqpeated 5 times
Part3: 11 that mean the number at the end is 3.

We want to encode **a text** following those rules:

- ✓ 3 letters: A, B, C
- ✓ The letters are always in the alphabetic order
- ✓ Letters are repeated from 1 to 10 times
  - Each letter is repeated the same number of times
- ✓ The last character must be either: X, Y, or Z

Examples:

ABCZ	Good
AAAABBBBCCCCX	Good
AABBCCY	Good
AAABBBCCCX	Good
AABBBBCCX	Bad: letter A is repeated 2 times but letter B 3 times

Q1. Propose an **encoding structure** to encode this image. (20pts)

Encoding parts	Encoding values (in binary)
The repetition of text "ABC"1….10	0001…1010
The repetition of text 0. X 1. Y 2. Z	 00..00 00…01 00…10

Q2. What is the total **size** of your encoding? Give explanations.

Encoding size:(4pts)

10 Bits

Explanation:(6pts)

Part1: 1010 that mean text of ABC repeated 10 times

Part2: 00,01,10 that mean the number at the end is 3