

PART A

This part of the examination consists of Questions 1 to 6.

Each question in this part of the examination is worth 4 marks.

On page 5 of your Student Booklet, fill in the box under the letter that corresponds to your answer.

CHAPTER 1: OPTIMIZATION

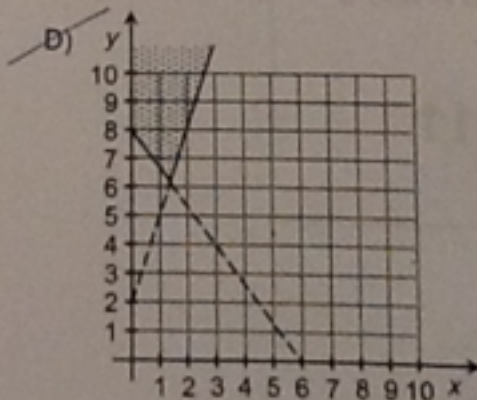
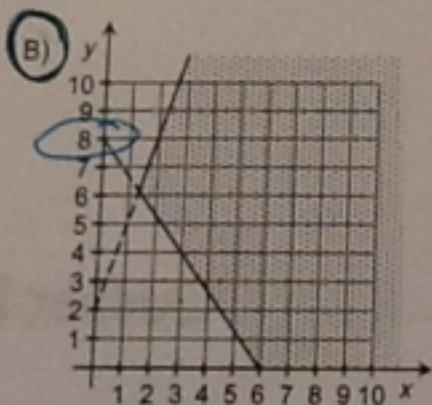
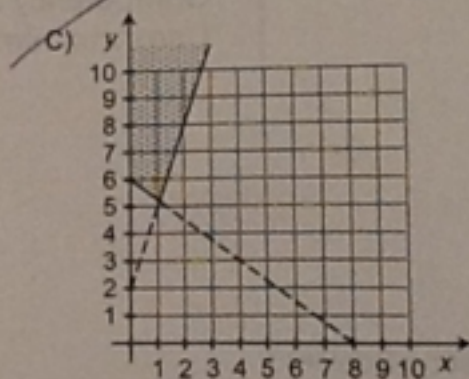
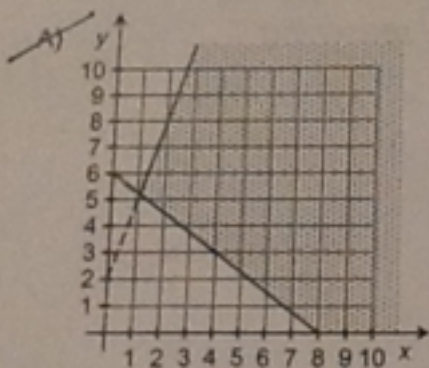
1. The system of inequalities below represents the constraints associated with an optimization situation.

Step 1: check shading
Step 2: check lines

$x \geq 0$
 $y \geq 0$
 $y \leq 8x + 2$ (shade below)
 $4x + 3y \geq 24$ (shade above)

This line is the same on all graphs
 when $x=0 \rightarrow \frac{3y}{3} = \frac{24}{3}$
 $y = 8$

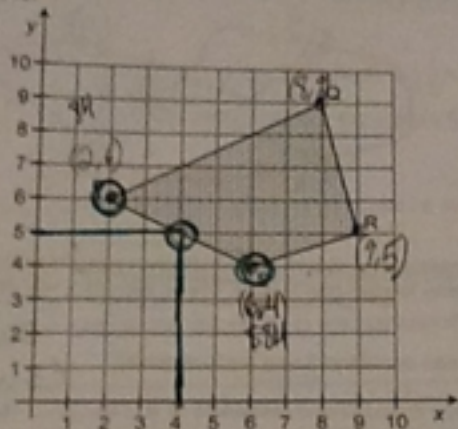
Which of the following polygons of constraints could be associated with this situation?



All

TOPIC 1: OPTIMIZATION

2. A restaurant owner would like to minimize the amount he pays in employee salaries for one hour. Different constraints limit the number of servers and the number of cooks that can work at the same time. Polygon of constraints PQRS below represents the different possibilities.



where x : number of servers that can work during the same hour

y : number of cooks that can work during the same hour

In order to determine the amount paid in employee salaries for one hour, the owner calculated the values shown in the table below.

*** REMEMBER:**
When there are several answers, all REAL points on that line will give the same answer.

VERTEX	AMOUNT PAID IN SALARIES
P(2, 6)	\$84
Q(8, 9)	\$156
R(9, 5)	\$114
S(6, 4)	\$84

$2 \cdot 6 = 12$
 $6 \cdot 4 = 24$
12 + 24 = 36
36 * 2 = 72
72 + 12 = 84

In this situation, how many solutions minimize the amount paid in employee salaries at this restaurant for one hour?

A) 1 solution

B) 2 solutions

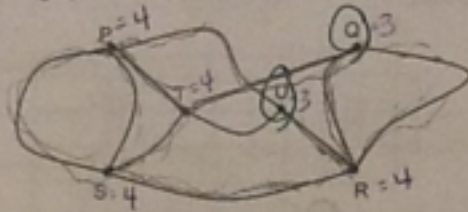
C) 3 solutions

D) More than 3 solutions

TOPIC 2: GRAPH THEORY

3. At a national park, a network of 9 trails connects 6 rest areas.

The vertices of the graph below represent the rest areas, and the edges represent the park's trails.



The park administration decides to add 2 new trails. Once these trails are open, a hiker will be able to start and finish a hike at the same rest area by walking along each trail only once.

Which rest areas could the 2 new trails connect?

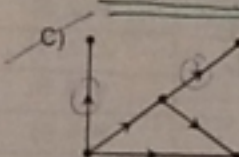
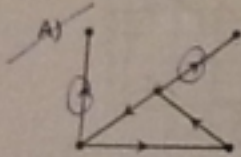
- A) Rest areas P and Q and rest areas Q and T
- B) Rest areas P and Q and rest areas Q and U
- C) Rest areas P and T and rest areas T and Q
- D) Rest areas P and T and rest areas T and R

Euler cycle!
↳ all even degrees

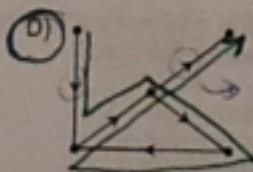
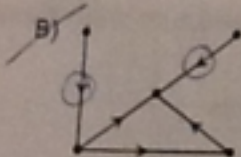
P → 6 ✓
Q → 4 ✓
U → 4 ✓

TOPIC 2: GRAPH THEORY

4. Which of the graphs below has a path that passes through all the vertices?



Does not matter if it goes through more than once



same direction ✓

TOPIC 3: TRANSFORMATIONS

5. Which one of the following geometric transformation rules must be applied to obtain the contraction of the initial figure? *Check your rules.*

A) $(x, y) \mapsto (x, y - 4)$

C) $(x, y) \mapsto (3x, 3y)$

B) $(x, y) \mapsto (x, -y)$

D) $(x, y) \mapsto (\frac{1}{2}x, \frac{1}{2}y)$

Contraction means getting smaller.

TOPIC 4: PROBABILITY

6. Each year, the Secondary V students in a school must elect a student council representative.

This year there are four candidates: Alex, Bianca, Chris and Darlene.

The results of the votes cast by the 168 students are summarized below in order of preference.

Number of students	54	47	67
1st choice	Bianca	Darlene	Chris
2nd choice	Alex	Bianca	Alex
3rd choice	Chris	Alex	Darlene
4th choice	Darlene	Chris	Bianca

Given that the votes were tallied using the Borda count, who won the election?

A) Alex

C) Chris

B) Bianca

D) Darlene

Alex: $3(0) + 2(54 + 67) + 1(47) + 0(0) = 289$

2 Bianca: $3(54) + 2(47) + 1(0) + 0(67) = 256$

Chris: $3(67) + 2(0) + 1(54) + 0(47) = 255$

(Darlene: $3(47) + 2(0) + 1(67) + 0(54) = 208$