Ramy DERBAL

Standard rating scale:**Rating pending processing of any requests for clarification**	Weighted rating scale:**Rating pending processing of any requests for clarification**

Advanced Algorithmics: Operational Research (CCTL)

Standard rating scale:**Rating pending processing of any requests for clarification**

-Question 1 **Single answer question**

What is the Monte Carlo method in operations research?

Correct answers

	Answer expected	Answer seizure	Answer discordant	
HAS	☑	☑	No	A method for simulating random processes.
B	■	■	No	A method for solving linear systems in integers.
C	■	■	No	A method for solving differential equations.
D	■	■	No	A method for project planning.
E	■	■	No	The equivalent of constraint programming

-Question 2 **Single answer question**

What is operational research?

Correct answers

	Answer expected	Answer seizure	Answer discordant	
HAS	■	■	No	A mathematical discipline.
B	☑	☑	No	A field of management that uses mathematical methods to solve complex problems.
C	■	■	No	A complex project management technique
D	■	■	No	Methods to improve productivity.
E	■	■	No	A technique that allows one to systematically find optimal solutions to a problem.

-Question 3 — **Question and answer multiple**

What are some true statements about RO?

Incorrect answers | 1 discrepancy

	Answer expected	Answer seizure	Answer discordant	
HAS	☑ ESSENTIAL	☑	No	It is a set of methods for decision support
B	■	■	No	It is a tool that is only used in the field of logistics.
C	☑ ESSENTIAL	■	Yes(+1)	It deals only with theoretical problems.
D	■	■	No	She is interested in quadratic problems
E	☑ ESSENTIAL	☑	No	It is based on mathematical modeling of problems

-Question 4 — **Question and answer multiple**

In Operational Research, to model a problem, it is necessary to:

Partially correct answers | 1 discrepancy

	Answer expected	Response entered	Discordant response	
HAS	■	■	No	List all solutions to a problem
B	■	■	No	Determine a greedy resolution algorithm
C	☑ ESSENTIAL	☑	No	Determine the equation of the objective function
D	☑ ESSENTIAL	☑	No	Mathematically model the constraints of the solutions
E	■	☑	Yes(+1)	Model the cost of the problem constraints
F	■	■	No	Calculate the cost of the optimal solution

-Question 5 — **Question and answer multiple**

What are the methods that will inevitably end up finding the optimal:

Correct answers | 0 discordance

	Answer expected	Response entered	Discordant response	
HAS	☑ ESSENTIAL	☑	No	Methods by separation and evaluation
B	■	■	No	Genetic algorithms
C	☑ ESSENTIAL	☑	No	Dynamic programming.
D	■	■	No	Greedy algorithms
E	■	■	No	Simulated annealing

-Question 6 **Question of association**

Associate each method with its operating principle

Incorrect answers | 3 discrepancies

Element to associate	Expected response	Response entered	Answer discordant
Algorithm evolutionary or genetic	5. Population method which uses an analogy with the phenomenon of natural selection and evolution of individuals within of a population	4. Meta- inspired by the behavior of individuals of superorganisms that explore a environment and communicate with each other to optimize their exploration	Yes(+1)
Method taboo	6. Trajectory algorithm using a non-exhaustive memory of already visited solutions which are avoided during exploration	5. Population method which uses an analogy with the phenomenon of natural selection and evolution of individuals within of a population	Yes(+1)
Colony of ants artificial	4. Meta- inspired by the behavior of individuals of superorganisms that explore an environment and communicate with each other them to optimize their exploration	6. Trajectory algorithm using a non-exhaustive memory of already visited solutions which are avoided during exploration	Yes(+1)
Search at neighborhood variable	1. Local search that performs a research by changing structure of neighborhoods during exploration	1. Local search that performs a research by changing structure of neighborhoods during exploration	No
Multi-start	2. Search that restarts regularly of a new random solution to explore a new area of the solutions space	2. Search that restarts regularly of a new random solution to explore a new area of the solutions space	No

-Question 7 **Single answer question**

What is a local optimum in an optimization problem?

Correct answers

	Answer expected	Answer seizure	Answer discordant	
HAS	■	■	No	The solution closest to the global optimal solution
B	■	■	No	A solution that cannot be improved.
C	☑	☑	No	A solution that is optimal in a limited region of the search space.
D	■	■	No	A solution that is obtained by a metaheuristic
E	■	■	No	A good solution

-Question 8 **Single answer question**

A chocolate maker decides to make chocolate eggs. When he goes to inspect his reserves, he notices that he has 8 kilos of cocoa, 4 kilos of hazelnuts and 5 kilos of milk left. The chocolatier has two specialties: the Extra egg and the Sublime egg.

- An Extra egg requires 1 kilo of cocoa, 1 kilo of hazelnuts and 2 kilos of milk. A Sublime
- egg requires 3 kilos of cocoa, 1 kilo of hazelnuts and 1 kilo of milk.

He will make a profit of 20 euros by selling an Extra egg, and 30 euros by selling a Sublime egg.

How many decision variables and constraints does the problem have?

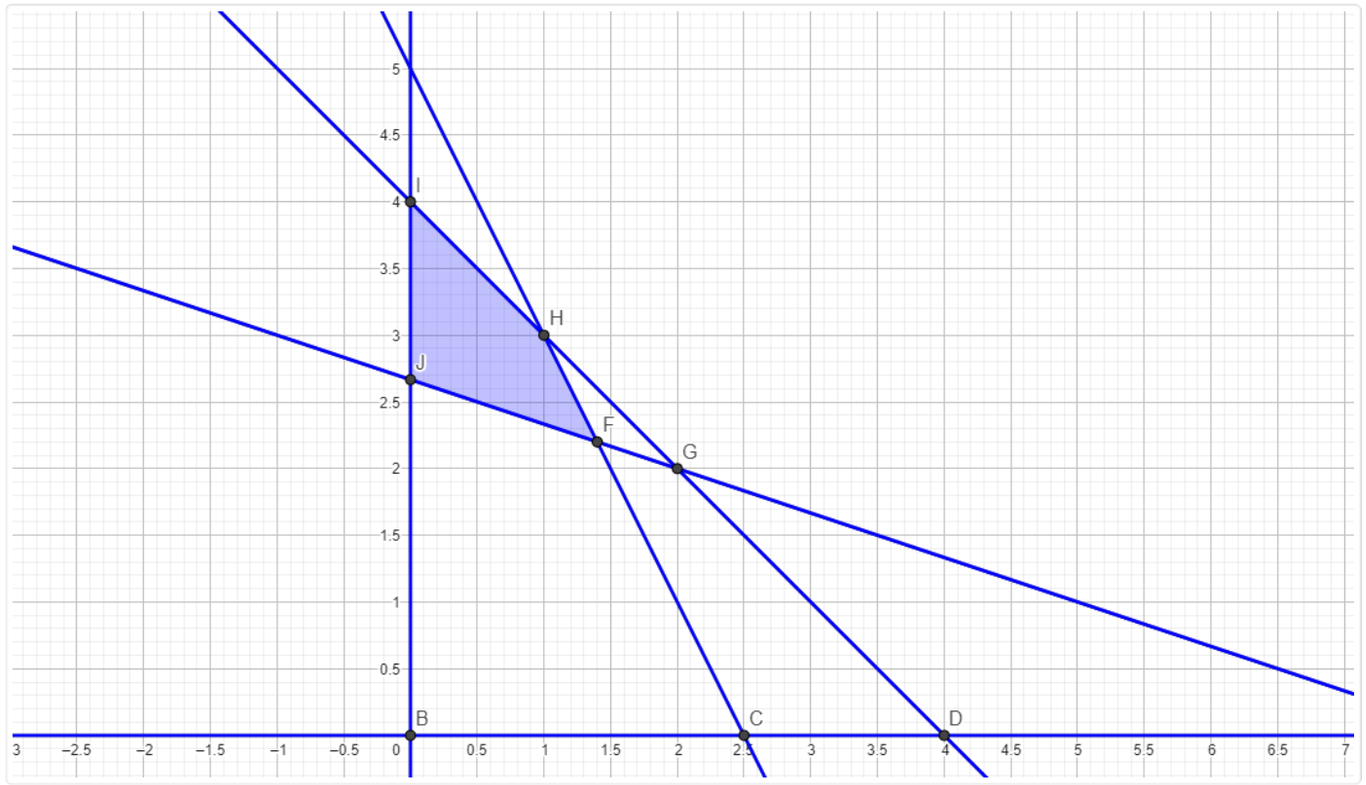
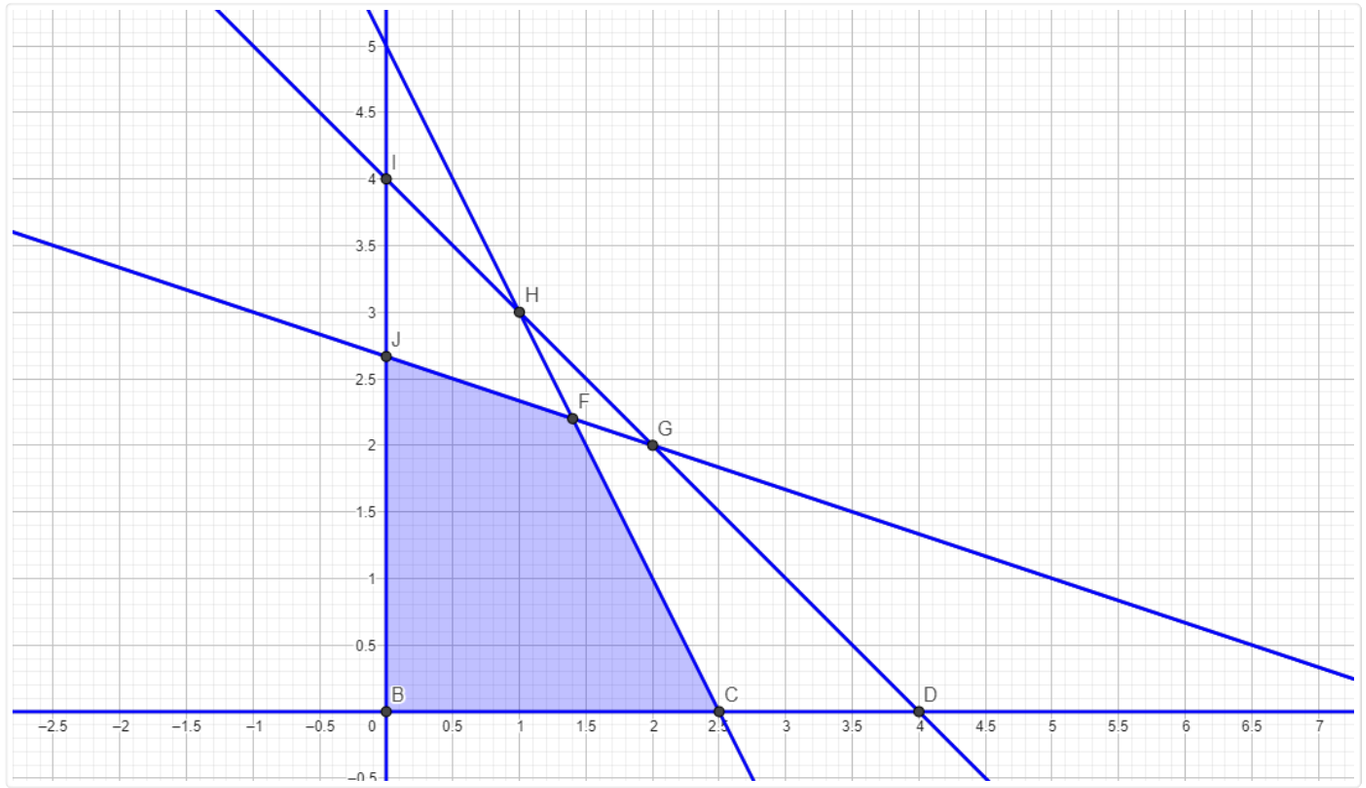
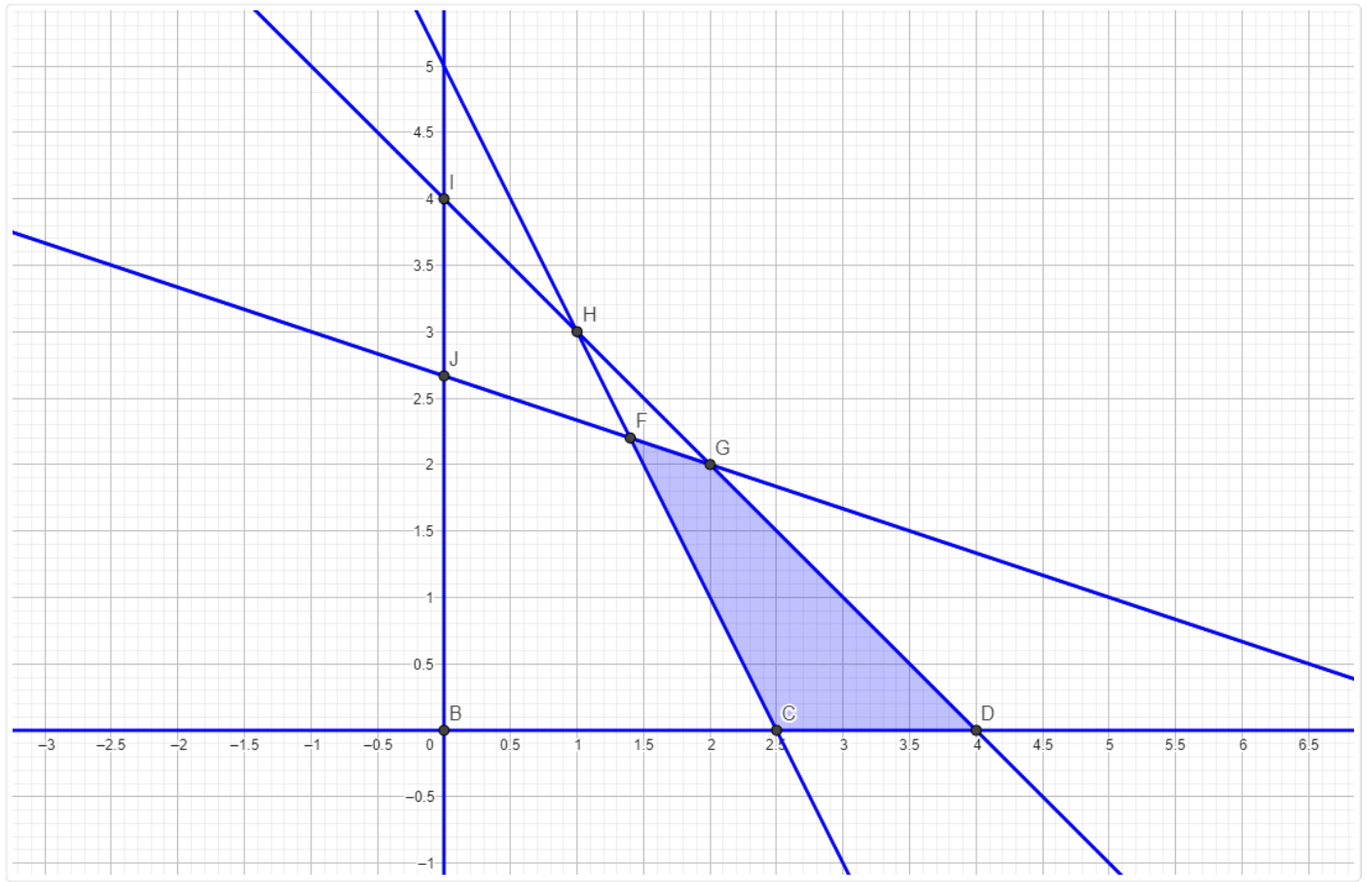
Incorrect answers

	Answer expected	Response entered	Discordant response	
HAS	☑	■	Yes(+1)	2 variables and 5 constraints
B	■	■	No	3 variables and 5 constraints
C	■	☑	Yes(+1)	2 variables and 4 constraints
D	■	■	No	3 variables and 4 constraints
E	■	■	No	2 variables and 3 constraints

-Question 9 **Single answer question**

Which of the following polyhedra corresponds to this problem?

Correct answers

	Answer expected	Answer seizure	Answer discordant	
HAS	■	■	No	Proposition 1 
B	☑	☑	No	Proposition 2 
C	■	■	No	Proposition 3 

-Question 10 **Single answer question**

Which of the following is not a feasible solution?

Correct answers

	Answer expected	Response entered	Discordant response	
HAS	■	■	No	B (0 ; 0)
B	■	■	No	A (2.5 ; 0)
C	■	■	No	F (1.4; 2.2)
D	☑	☑	No	H (1 ; 3)
E	■	■	No	J (0; 2.67)

-Question 11 **Single answer question**

The optimal solution corresponds to:

Correct answers

	Answer expected	Response entered	Discordant response	
HAS	■	■	No	At any point in the polyhedron.
B	☑	☑	No	At one of the extreme points of the polyhedron.
C	■	■	No	The point furthest from the origin point of the reference point.
D	■	■	No	At point (0; 0)
E	■	■	No	At point (4.35; 5)

-Question 12 **Single answer question**

The optimal solution corresponds to the point:

Incorrect answers

	Answer expected	Response entered	Discordant response	
HAS	■	■	No	B (0 ; 0)
B	■	☑	Yes(+1)	A (2.5 ; 0)
C	☑	■	Yes(+1)	F (1.4; 2.2)
D	■	■	No	H (1 ; 3)
E	■	■	No	J (0; 2.67)

-Question 13 **Single answer question**

The value of the optimal solution is:

Incorrect answers

	Answer expected	Response entered	Discordant response	
HAS	☑	■	Yes(+1)	Z = 94
B	■	■	No	Z = 0
C	■	■	No	Z = 50
D	■	☑	Yes(+1)	Z = 110
E	■	■	No	Z = 12

-Question 14 **Single answer question**

Can the solution be improved if a new constraint is added to the model?

Correct answers

	Answer expected	Response entered	Discordant response	
HAS	■	■	No	Yes, but it depends on the objective function
B	■	■	No	Yes, but it depends on the constraints of the model
C	■	■	No	Yes, but it depends on the type of variables
D	■	■	No	Yes, in all cases.
E	☑	☑	No	No

-Question 15 **Single answer question**

What are the conditions required for a problem to be formulated as a linear programming problem?

Correct answers

	Answer expected	Answer seizure	Answer discordant	
HAS	■	■	No	The objective function and constraints must be linear
B	■	■	No	The problem must have at least one objective function and one constraint
C	■	■	No	Decision variables must be continuous
D	☑	☑	No	All of the above
E	■	■	No	The problem has only one decision variable

-Question 16 — **Question and answer multiple**

What do you call a solution where all constraints are satisfied in a linear programming problem?

Partially correct answers — 2 discrepancies

	Answer expected	Response entered	Discordant response	
HAS	☑	■	Yes(+1)	Optimal solution
B	☑	☑	No	Feasible solution
C	■	■	No	Feasible solution
D	☑	■	Yes(+1)	Admissible solution
E	■	■	No	Good solution

-Question 17 — **Single answer question**

What is the difference between an optimal solution and a feasible solution in a linear programming problem?

Correct answers

	Answer expected	Answer seizure	Answer discordant	
HAS	☑	☑	No	A feasible solution satisfies all constraints, while an optimal solution minimizes/ maximizes the objective function.
B	■	■	No	An optimal solution satisfies all constraints, while a feasible solution minimizes/ maximizes the objective function.
C	■	■	No	A feasible solution maximizes the objective function, while an optimal solution minimizes the constraints.
D	■	■	No	There is no difference between the two.
E	■	■	No	The optimal solution satisfies all constraints, but not the feasible solution

-Question 18 — **Single answer question**

What is the effect of adding a new constraint to an existing linear programming problem?

Correct answers

	Answer expected	Answer seizure	Answer discordant	
HAS	☑	☑	No	May reduce the space of feasible solutions, depending on the nature of the new constraint.
B	■	■	No	May increase the space of feasible solutions, depending on the nature of the new constraint.
C	■	■	No	Do not affect the space of feasible solutions.
D	■	■	No	Transform the problem into a nonlinear programming problem.
E	■	■	No	Don't change anything

-Question 19 — Single answer question

What is the meaning of objective function in linear programming?

Correct answers

	Answer expected	Answer seizure	Answer discordant	
HAS	■	■	No	It represents the constraints of the problem.
B	■	■	No	It is used to determine the decision variables of the problem.
C	☑	☑	No	It quantifies the objective to be maximized or minimized.
D	■	■	No	It allows to minimize decision variables.
E	■	■	No	It quantifies the number of constraints in the problem

-Question 20 — Single answer question

Which metaheuristic is known for its ability to escape local optima by allowing probabilistic transitions to lower quality solutions?

Correct answers

	Answer expected	Response entered	Discordant response	
HAS	■	■	No	Genetic algorithm
B	■	■	No	Taboo research
C	☑	☑	No	Simulated annealing
D	■	■	No	Particle Swarm Optimization
E	■	■	No	Ant colonies

-Question 21 — Question and answer multiple

What are the methods that will inevitably end up finding the optimal:

Correct answers	0 discordance

	Answer expected	Response entered	Discordant response	
HAS	☑ ESSENTIAL	☑	No	Methods by separation and evaluation
B	■	■	No	Genetic algorithms
C	☑ ESSENTIAL	☑	No	Dynamic programming.
D	■	■	No	Greedy algorithms
E	■	■	No	Simulated annealing

-Question 22 **Question of association**

Associate each method with its operating principle

Incorrect answers	5 discrepancies

Element to associate	Expected response	Response entered	Answer discordant
Algorithm evolutionary or genetic	5. Population method which uses an analogy with the phenomenon of natural selection and evolution of individuals within of a population	2. Search that restarts regularly of a new random solution to explore a new area of the solutions space	Yes(+1)
Method taboo	6. Trajectory algorithm using a non-exhaustive memory of already visited solutions which are avoided during exploration	1. Local search that performs a research by changing structure of neighborhoods during exploration	Yes(+1)
Colony of ants artificial	4. Meta- inspired by the behavior of individuals of superorganisms that explore an environment and communicate with each other them to optimize their exploration	6. Trajectory algorithm using a non-exhaustive memory of already visited solutions which are avoided during exploration	Yes(+1)
Search at neighborhood variable	1. Local search that performs a research by changing structure of neighborhoods during exploration	5. Population method which uses an analogy with the phenomenon of natural selection and evolution of individuals within of a population	Yes(+1)
Multi-start	2. Search that restarts regularly of a new random solution to explore a new area of the solutions space	4. Meta- inspired by the behavior of individuals of superorganisms that explore a environment and communicate with each other to optimize their exploration	Yes(+1)

-Question 23 **Question and answer multiple**

Among these steps of different metaheuristics, which ones fall under intensification (2 answers)?

Incorrect answers	2 discrepancies

	Answer expected	Response entered	Discordant response	
HAS	☑ ESSENTIAL	☑	No	Pheromone deposition by an ant
B	■	■	No	Restarting from a new initial solution
C	■	■	No	Mutation of a gene in an individual
D	■	☑	Yes(+1)	Added a visited solution to the taboo list
E	☑ ESSENTIAL	■	Yes(+1)	Decrease in temperature

-Question 24 **Single answer question**

What is the correct definition of the neighborhood of a solution?

Correct answers

	Answer expected	Answer seizure	Answer discordant	
HAS	■	■	No	The neighborhood of a solution is the set of solutions obtained by local optimization of this solution.
B	■	■	No	The neighborhood of a solution is the function that defines the optimality of this solution
C	☑	☑	No	The neighborhood of a solution is a set of valid solutions that can be constructed by a given transformation
D	■	■	No	The neighborhood of a solution is the set of solutions that must be visited to find the optimal one.
E	■	■	No	The neighborhood of a solution is another solution that we obtain by modifying this solution

-Question 25 **Single answer question**

If a taboo method has difficulty extracting itself from a local optimum, what approach should be favored to try to improve its operation?

Incorrect answers

	Answer expected	Response entered	Discordant response	
HAS	☑	■	Yes(+1)	Diversify by increasing the size of the taboo list
B	■	■	No	Intensify by increasing the size of the taboo list
C	■	☑	Yes(+1)	Diversify by reducing the size of the taboo list
D	■	■	No	Intensify by decreasing the size of the taboo list
E	■	■	No	None of these approaches

-Question 26 **Single answer question**

In the simulated annealing algorithm, what happens if, during an iteration, a solution of lower quality than the current solution is found?

Correct answers

	Answer expected	Answer seizure	Answer discordant	
HAS	■	■	No	This solution is rejected
B	■	■	No	This solution is accepted with a probability that depends on the time elapsed since the current solution was improved.
C	■	■	No	This solution is accepted with a probability that depends on the value of the optimal
D	☑	☑	No	This solution is accepted with a probability that depends on the current temperature, and on the energy variation between the solution considered and the current solution
E	■	■	No	This solution is accepted with a probability that depends on the temperature variation