

INFORMATION DOCUMENT

PROTOTYPE EXAMINATION

SCIENCE AND TECHNOLOGY

End of Cycle One Secondary

555-208

MATHEMATICS

End of Cycle One Secondary

563-212

ENGLISH, LANGUAGE ARTS

End of Cycle One Secondary

632-212

2007

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INTRODUCTION

The Ministère de l'Éducation, du Loisir et du Sport will make prototype examinations available by May 15, 2007, so that they may be taken into consideration in the end-of-cycle report for Secondary Cycle One. These examinations will be in the following subjects:

- Mathematics
- Science and Technology
- English Language Arts

The results of these optional examinations may be reflected in the end-of-cycle report for Secondary Cycle One. In addition, these examinations will help schools to fully understand these secondary-level programs and to implement teaching practices geared toward the development of the competencies.

These examinations were developed in conjunction with education consultants and teachers from various school boards and private schools.

These prototype examinations focus on the main elements of learning content, or knowledge, which consists of the concepts and strategies that appear in the Secondary Cycle One subject-specific programs. A teacher's guide produced for each examination will provide instructions on how to administer the examination as well as a marking scale, guidelines for interpreting the results and a feedback questionnaire.

It is important to note that these examinations, which each last approximately six hours, may be used in whole or in part. Educational institutions therefore have all the necessary latitude to incorporate these examinations into their schedule of educational activities. An example of a timetable for administering the prototype examination in mathematics and in science and technology is appended to this document.

The examinations and the accompanying documents will be made available to secondary schools in May 2007. Each school board or private school will be responsible for photocopying these materials.

OVERVIEW OF THE EXAMINATIONS

1. Mathematics

This examination is consistent with the principles regarding the evaluation of learning outlined by the Ministère de l'Éducation, du Loisir et du Sport.

This prototype examination provides information on the development of the three competencies in the Mathematics program (*Solves a situational problem*, *Uses mathematical reasoning* and *Communicates by using mathematical language*).

1.1 Evaluation of the Competencies in the Mathematics Program

1.1.1 Competency 1: Solves a situational problem

The objective of the competency *Solves a situational problem* is to enable students to find a coherent solution to a situational problem that meets all of the following conditions:

- The procedure required to solve the situational problem is not obvious, since it involves choosing a significant number of mathematical concepts and processes and using them in a new way.
- The situation focuses on obstacles to be overcome, which leads to a process of inquiry and involves using various strategies (strategies for understanding, organizing, solving, validating and communicating¹).
- The instructions do not suggest a procedure to be followed or the mathematical concepts and processes to be used.

The situational problems may involve one or more branches of mathematics as well as real or fictitious, realistic or imaginary, or even purely mathematical contexts. They may be related to the student's environment, the broad areas of learning or the social and historical contexts in which mathematics has evolved.

1.1.2 Competency 2: Uses mathematical reasoning

The situations used to evaluate this competency usually involve explaining one's mathematical reasoning and require students to organize and apply mathematical concepts and processes in a clearly defined context.

Because there are different aspects of reasoning, these situations may be designed for different purposes (e.g. to get students to apply mathematical concepts and processes, justify, prove, convince, assess, take a position, compare or deduce).

1. Québec Education Program, p. 220.

These situations should enable the students to:

- choose and apply the appropriate mathematical concepts and processes and present a procedure that clearly demonstrates their reasoning
- justify a statement, check a result or procedure, take a position, provide a critical assessment or convince, using mathematical arguments
- use inductive reasoning, based on observation, manipulation, simulation or a series of examples, to make a proposition or a conjecture

1.1.3 Competency 3: Communicates by using mathematical language

The competency *Communicates by using mathematical language* can be evaluated through complex tasks designed to assess the first two competencies, because the procedures involved in solving a situational problem or using mathematical reasoning require the students to interpret instructions, answer questions, explain solutions and make themselves understood by their teachers, peers, etc.

However, students may be assigned situations that focus specifically on communication. These situations require that the students use different types of representation as well as exact mathematical language reflecting the terminology, rules and conventions of mathematics. In certain cases, these situations focus specifically on the interpretation of a message; in other cases, their focus is on the production of messages.

1.2. Content of the Examination

This examination consists of two parts. The first part involves a situational problem. The second part is made up of evaluation situations that focus on competencies 2 and 3. These evaluation situations will be divided into two booklets to make it easier to administer the examination.

The evaluation situations in this examination focus on the main concepts and processes covered in the Secondary Cycle One Mathematics program. The concepts and processes involved relate to all the branches of mathematics covered in the Mathematics program (i.e. arithmetic and algebra, geometry, statistics and probability).

The administration guide and the marking guide contain information about administering and marking the evaluation situations in this examination.

1.2.1 Timetable for administering the examination

The administration of each booklet of situations for competencies 2 and 3 should take about one hour. Students are given two hours to complete the situational problem. Appendix 1 provides an example of a timetable for administering the prototype examination in mathematics.

1.2.2 Administering the situational problem

A context is provided in order to spark the students' interest and to motivate and help them draw upon their prior knowledge or experience related to the situation. A few days before administering the situational problem and without revealing the mathematical content of the examination, the teacher could touch on certain aspects of the context in order to get the students to draw on their related prior knowledge.

The teacher could read aloud the context and the task described and explain or clarify any words or expressions that are unfamiliar or unknown to one or more students.

- Hand out the documents and read aloud the context and the task described. If necessary, provide additional comments in order to limit the number of difficulties related to the situation.
- Ask the students to go through their booklets to become familiar with the different requirements.
- Make sure that the students understand what they are required to do by asking them to describe the task in their own words.

1.2.3 Administering the situations targeting competencies 2 and 3

Teachers could briefly describe the situations for competencies 2 and 3 to ensure that students are familiar with the expressions used. However, students should use resources already available in class, such as a dictionary or a memory aid, to look up the meaning of certain mathematical terms.

- Describe the basic rules for solving the problem.
- Each student must work alone to solve the situations.
- The teacher can assist the students during the examination, but must make a note of the type of help provided.
- Students may use a calculator, but must indicate the sequence of operations involved without, however, rewriting the detailed calculations performed with the calculator.

Student may use resources such as a dictionary or a memory aid that they will have prepared on their own.

1.3 Materials for Each Student

- *Student Booklets*
- Calculator
- Ruler
- Compass
- Protractor
- Memory aid

1.4 Marking Students' Work on the Evaluation Situations

Students' work on the situational problem should be marked in accordance with the evaluation criteria outlined in the Mathematics program. A marking scale will be provided.

Students' work on the situations relating to competencies 2 and 3 should be marked in accordance with the evaluation criteria for the competency targeted, which are outlined in the Mathematics program. Marking scales will be provided for each situation.

2. Science and Technology

2.1 Content of the Examination

This prototype examination makes it possible to evaluate the development of the three subject-specific competencies (*Seeks answers or solutions to scientific or technological problems, Makes the most of his/her knowledge of science and technology and Communicates in the languages used in science and technology*). It consists of three evaluation tasks: a task involving scientific inquiry, a task that gives students the opportunity to make the most of their knowledge of science and a technological task involving an analysis component and a design component. Students are given between two and three hours to complete each evaluation task. The prototype examination may be used in whole or in part. It may be administered during class time, or an adjustment may be made to the students' schedule to create a special period for taking the examination.

Appendix 2 is an example of a timetable for administering the prototype examination in science and technology. It provides information on the general content of the evaluation tasks as well as the logistics of administering the examination.

Appendix 3, which illustrates the concepts useful for carrying out the analysis and design activities related to task 2, should be given to students at the appropriate time. It is not necessary for the students to memorize these concepts, but they should understand them well enough to be able to use them properly during the examination. Appendix 3 will be included in the question booklet for task 2.

An administration guide providing instructions will accompany the prototype examination.

2.2 Dimensions of the QEP and the Science and Technology Program

2.2.1 Broad areas of learning

The evaluation tasks in the prototype examination were based on real contexts inspired by one of the broad areas of learning. They require the students to carefully examine a situation in order to develop explanations or solutions that incorporate a great deal of their subject-specific knowledge and take into account the cognitive, social and affective dimensions.

2.2.2 Cross-curricular competencies

The development of the cross-curricular competencies is not formally assessed in the prototype examination. However, it is possible for the person administering the prototype examination to evaluate certain cross-curricular competencies during one or more of the proposed evaluation tasks. A variety of approaches may be used to evaluate the cross-curricular competencies, including the observation of students' behaviours, procedures or

attitudes during the prototype examination. The cross-curricular competencies may also be assessed through self-evaluation.

2.2.3 Subject-specific competencies

The subject-specific competencies to be evaluated during the evaluation tasks are:

- *Seeks answers or solutions to scientific or technological problems*
- *Makes the most of his/her knowledge of science and technology*
- *Communicates in the languages used in science and technology*

The first evaluation task involves solving problems using a process of scientific inquiry. The students are asked to determine the nature of various samples through experimentation involving laboratory testing and a variety of strategies and techniques. Students are given two hours to complete this task, which is carried out in a laboratory or workshop.

The second evaluation task is carried out in a laboratory or workshop and involves coming up with a design based on technological analysis. It should take students one and a half hours to complete the analysis component. The design component could take two hours to complete. It is preferable to allow for a few days between the two components of this task. To help students prepare for this evaluation task, provide them with a reference document, which they will be able to consult during the technological analysis and design process. This document should be distributed several days before the examination so that the students have time to become familiar with it and ask any questions they may have about its content.

The third evaluation task tests the students' knowledge of natural phenomena and the effects of science and technology. Students are given two hours to complete this task, which can be carried out in the classroom. It does not require any special materials or technical assistance.

2.2.4 Program content

The content of the Secondary Cycle One Science and Technology program is essential to helping students develop and use the competencies. It is divided into four major areas—*The Material World*, *The Living World*, *The Earth and Space* and *The Technological World*—and also includes a section entitled *Strategies, Techniques and Attitudes*. The compulsory concepts must be covered during one of the two years of the cycle.

The prototype examination covers only some of the program's compulsory concepts. However, all four major areas as well as the three subject-specific competencies are covered at one point or another during the performance of these evaluation tasks.

2.3 Required Materials

Only the following materials are permitted during the examination:

- drawing instruments
- graph paper
- calculator with or without a graphic display
- reference materials, tools or instruments provided before or during the examination

3. English Language Arts

3.1 Content of the Examination

The activities and tasks in this learning and evaluation situation (LES) are designed to be used by teachers at the end of Secondary Cycle One to help them establish a balanced portrait of the language abilities demonstrated by students whose language of instruction is English. These activities focus specifically on important aspects of language and represent a social constructivist approach to teaching, learning and evaluating.

The activities and tasks are planned in such a way that they recognize the primacy of maintaining as comfortable and natural an atmosphere in the classroom as possible. Since students require sustained time to contextualize and to become familiar with the tasks as well as to undertake both group and independent activities, the administration of the LES will take place over several classroom periods. Sufficient time is required for students to engage in the activities wholeheartedly and do quality work.

This LES is not an examination in the traditional sense of the word. Rather, it is an opportunity for students to demonstrate competency within a complex situation that calls upon the use of knowledge, resources and strategies. The Secondary English Language Arts program is an integrated program whereby the four competencies work in harmony and support of one another. Evaluation will focus on at least two of the four competencies; rubrics for scoring the tasks will be provided.

3.2 Evaluation of the Competencies in the English Language Arts Program

3.2.1 Focus for the assessment

An issue related to media literacy will be explored through a variety of texts such as videos, newsletters, newspaper stories and interviews, using an inquiry procedure.

Within the context of a key question that focuses on the issue, students will be given time to read, listen to and discuss ideas that are presented through different text types. Throughout this process they will be building their knowledge and understanding about the issue as they prepare for different complex tasks. The question will require students to exercise critical thinking and assume a viewpoint based on what they have seen, read, heard and discussed throughout the evaluation situation.

3.2.2 Competency 1: Uses language/talk to communicate and to learn

Students will be expected to work in cooperative learning groups using different techniques such as the *jigsaw*. While working in these groups, they will have an opportunity to discuss and clarify the ideas presented through the different text types, including media. They will use graphic organizers and note-taking procedures to organize the information presented in the different texts, as well as the ideas discussed within their

group. This will provide students with additional knowledge and an opportunity to talk for meaning and understanding in relation to the information and ideas being presented.

3.2.3 Competency 2: Represents her/his literacy in different media

Although an issue relating to media literacy will be explored through the activities and tasks, students will **not** be asked to produce a media text.

3.2.4 Competency 3: Reads and listens to written, spoken and media texts

A variety of texts, including media texts will be provided. Students will work with these texts, both in groups and independently, to demonstrate an understanding of the issues explored. They will be required to respond to literature and think critically about the issue. A domain site with related Web sites will be set up through LEARN for student research purposes. Performance will be assessed by means of a rubric.

3.2.5 Competency 4: Writes a variety of genres for personal and social purposes

Once students have had a chance to explore different viewpoints surrounding the essential question, they will be asked to write for a selected audience to express and justify their own personal position on the issue that was researched, using a form modelled during the unit. They will revise, edit and proofread their writing. Performance will be assessed by means of a rubric.

3.3 Required Materials

A DVD player and TV monitor for viewing will be required. Availability of computers in the classroom or in a lab would be useful.

3.4 Administration

Approximately six to seven class periods will be required to complete the tasks. Teachers are asked to schedule classes so that the tasks can be undertaken in a continuous, sustained manner. Ideally, there should be no interruptions to the continuity of the LES once students have begun the tasks. Procedures described in the *Teacher's Guide* should be respected in order to obtain optimal results. See the table below.

Day preceding the tasks	Part I	Part II	Part III	Part IV	Part V	Part VI
Complete a survey	Read and discuss the literature. Write a response to literature.	View and discuss the video. Complete a reflection.	Read assigned text(s). View the pre-selected Web sites. Prepare research notes for sharing in a jigsaw.	Share and discuss the research.	Prepare a position paper.	Confer, revise and proofread writing.

DISTRIBUTION OF MATERIALS TO TEACHERS

As early as possible, schools should provide the teachers involved with copies of all the documents related to the prototype examination so that they have time to analyze them and determine how they will use the materials.

School boards, public schools and private schools are responsible for organizing the administration of these examinations and for establishing a timetable in this regard. Several approaches are possible: organizing an exam session during which there are no classes; adjusting the students' schedule to create a special period for taking the examinations in each subject; combining the two previously-mentioned approaches, etc. It is important to note that the examinations can be divided into several parts and administered over several days. Examples of timetables for administering the examinations are provided in the appendixes.

MARKING PROCEDURES FOR THE EXAMINATIONS

School boards, public schools and private schools are responsible for marking the prototype examination. Marking procedures may vary from one school to another. Before marking the examination, it is recommended that teachers meet to discuss the marking scale in order to ensure a common understanding of the scale. By analyzing a number of exam papers, a team of teachers can more effectively and more efficiently determine the expected quality of the work according to the evaluation criteria for these situations.

JUDGING THE STUDENTS' LEVEL OF COMPETENCY DEVELOPMENT

Near the end of the cycle, the teacher must judge the student's level of competency development. This judgment must be based on the interpretation of an adequate amount of relevant information. The information obtained from the prototype examinations should be considered with the other data collected in order to help teachers make a judgment about a student's competencies. If teachers who wish to judge the student's level of competency development by taking into account the information collected from all or part of the prototype examination, they should use the procedure outlined below:

- ❖ Before administering the prototype examination, assess each student's level of competency development by referring to the work he/she has done throughout the cycle. This work should cover a variety of contexts that involve using the relevant competencies.
- ❖ Administer the prototype examination and analyze the student's work and the observations made.
- ❖ Compare the information gathered on the development of the student's competencies during the learning process with the information gathered from the prototype examination.

If there are significant differences between the results gathered during the learning process and those gathered from the examination, try to determine why this is so. Below are examples of questions that could help teachers understand these differences.

Are the students familiar with the features of the prototype examination?

Does the proposed context resemble the one used in class? For example, does the student have to read informational materials, refer to data compiled in tables, present an argument using calculations, or explain his/her reasoning?

- ❖ Lastly, the teacher makes a judgment regarding the development of the competencies by referring to all the information gathered throughout the cycle, including the information resulting from the prototype examination, if applicable.

**EXAMPLE OF A TIMETABLE FOR ADMINISTERING THE
PROTOTYPE EXAMINATION IN MATHEMATICS
SPRING 2007**

Part I	<i>Solves a situational problem</i>	Two 75-minute periods or a single session lasting 2 hours and 30 minutes (week of May 7 or May 14, 2007)
Part II	<i>Uses mathematical reasoning and Communicates by using mathematical language</i>	Two 75-minute periods or a single session lasting 2 hours and 30 minutes (week of June 11 or June 18, 2007)

**EXAMPLE OF A TIMETABLE FOR ADMINISTERING THE
PROTOTYPE EXAMINATION IN SCIENCE AND TECHNOLOGY
SPRING 2007**

The Ministère de l'Éducation, du Loisir et du Sport suggests administering the prototype examination in three stages, as follows. Each student does each evaluation task on his/her own, without assistance. If the student receives assistance, it must be taken into consideration when judging his/her level of competency development.


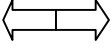



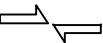


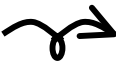
EVALUATION TASK	TIME OF YEAR	LOCATION	PERSON RESPONSIBLE
Task 1	May (class time or special period)	Laboratory or workshop	Teacher and lab and workshop technicians
Task 2	May or June (class time or special period)	Laboratory or workshop	Teacher and lab and workshop technicians
Task 3	June (exam session)	Classroom	Teacher

**CONTENT OF THE PROTOTYPE EXAMINATION
SPRING 2007**




The prototype examination is developed by the Ministère de l'Éducation, du Loisir et du Sport and consists of three evaluation tasks. The table below indicates the types of evaluation tasks, the competencies targeted by each task and the major areas of the program that are covered by each task.

TYPE OF EVALUATION TASK	MAJOR AREAS COVERED			
	The Material World	The Living World	The Earth and Space	The Technological World
Task 1 Scientific inquiry process ----- Competencies 1 and 3	X	X	X	
Task 2 Technological analysis and design ----- Competencies 1, 2 and 3	X			X
Task 3 Natural phenomena and effects of science and technology ----- Competencies 2 and 3	X	X	X	

MOTION AND FORCE



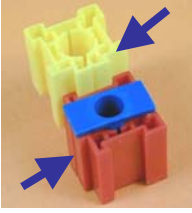



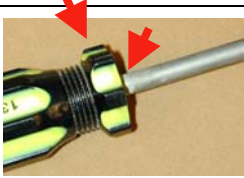

Motion		Force	
<i>Motion</i> is characterized by the change in the position of a body relative to another, which is called an <i>inertial or non-inertial reference system</i> .		<i>Force</i> refers to the capacity to act or produce an effect or any action that changes a body's state of rest or motion.	
Rectilinear translation in one direction		Force that tends to STRETCH the parts or PULL them	
Rectilinear translation in two directions		Force that tends to SQUEEZE the parts or PUSH them	
Rotation in one direction		Force that tends to SPLIT the parts	
Rotation in two directions		Force that tends to TWIST the parts	
Helical			

GUIDING FUNCTION: Rotational and translational guiding control

Translation If the guiding control only allows the part to move in a straight line, it is translational.	Rotation If the guiding control only allows the part to rotate (fully or partially), it is rotational.	
 <p>The blade is guided by the slides in the handle.</p>	<p>Full rotation</p>  <p>The pulley is guided by its shaft and shell.</p>	<p>Partial rotation</p>  <p>The upper lever is guided by the rivet and the shape of the parts.</p>

LINKING FUNCTION: Types of links

All links have four of the following characteristics:

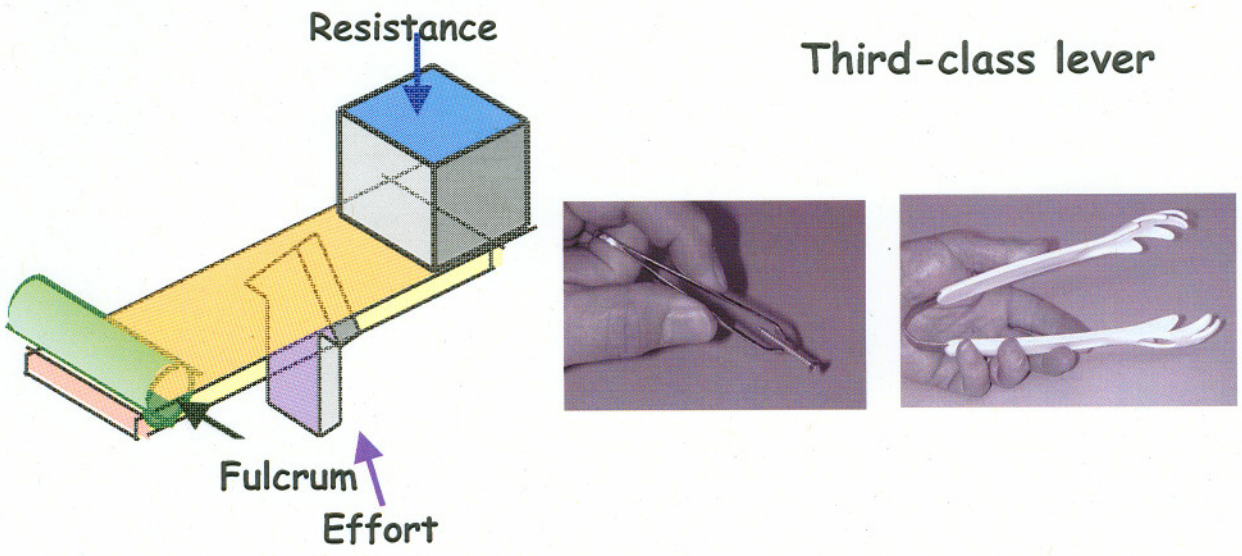
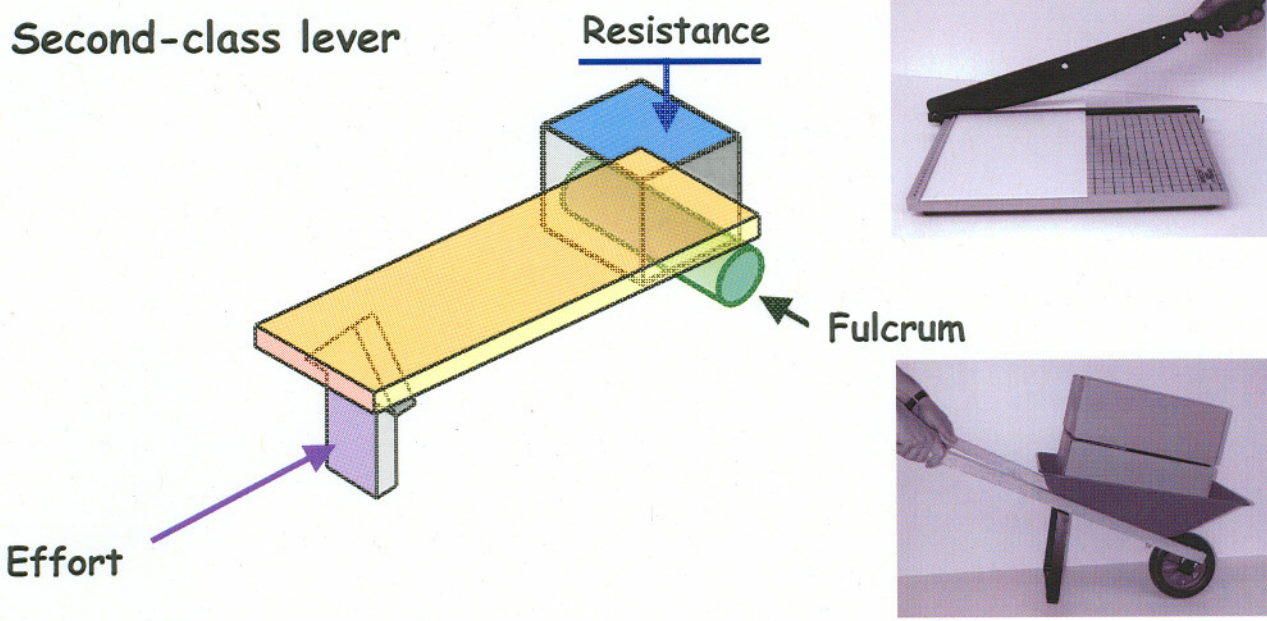
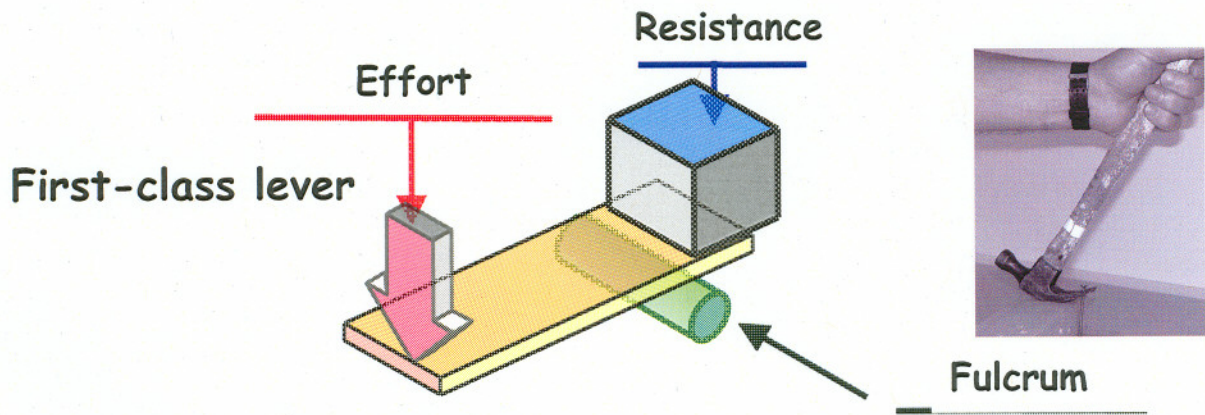
1	Direct: The parts are designed to fit together without a fastener.		or	Indirect: The parts need a fastener (e.g. nail, screw, glue) to hold them together.	
2	Rigid: The parts are joined together with a rigid fastener with no flexible material between them.		or	Flexible: There is a flexible fastener that allows parts to move in relation to one another.	
3	Removable: The parts can be separated without damaging the fastener or surfaces.		or	Permanent: The parts cannot be separated without damaging the fastener or surfaces.	
4	Complete: There is no freedom of movement between the parts.		or	Partial: The connected parts can move in relation to one another.	

SIMPLE MACHINES (qualitative study)

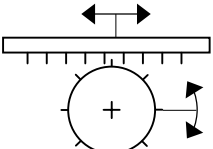
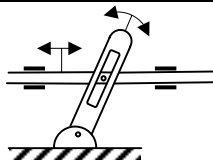
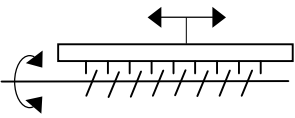
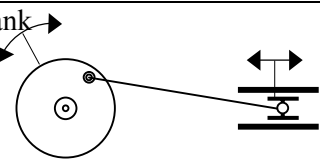
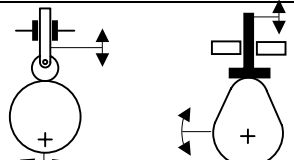
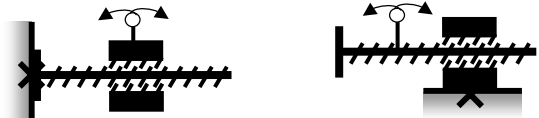
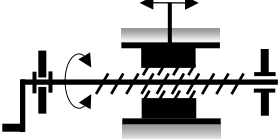
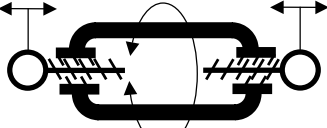
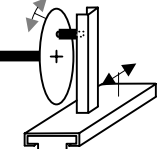
Inclined plane (wedge, screw): An inclined plane makes it possible to raise an object without having to lift it. It is therefore very useful in moving heavy objects. A wedge is made up of two inclined planes juxtaposed in order to form a cutting edge. A screw is an inclined plane wrapped around a shaft.

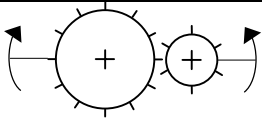
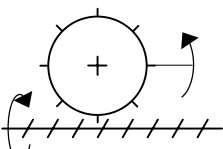
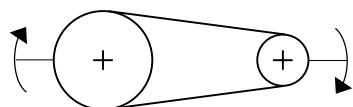
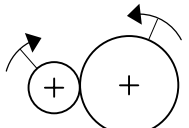
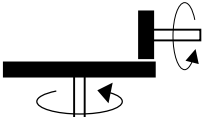
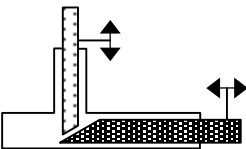
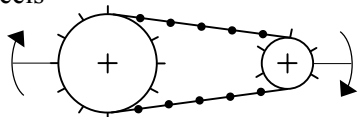
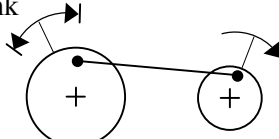
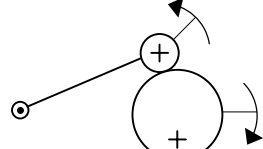
Wheel: A wheel is designed to cover distance with minimal friction. There is friction when two surfaces rub together. A wheel is also a component in a number of objects (pulley, gear, friction wheel).

Lever: A lever is a simple machine made up of a bar with a PIVOTING POINT (P), also called a fulcrum, a load or RESISTANCE (F_r) and an EFFORT (F_e), which is the force exerted by the user or the object.

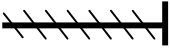

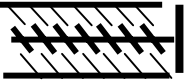


















COMPLEX MECHANICAL FUNCTIONS

<p>TRANSFORMATION OF MOTION: Mechanical action that changes the nature of motion (rotation to translation, translation to rotation)</p>	<p>Rack and pinion</p> 
<p>Crank and slide</p> 	<p>Screw and rack</p> 
<p>Connecting rod and crank</p> 	<p>Cam and roller</p> 
<p>Screw and nut</p> 	<p>Screw and nut</p> 
<p>Screw and nut</p> 	<p>Crank and slide</p> 

<p>TRANSMISSION OF MOTION: Communication of the same movement from one part to another, with possible variations in speed</p>	<p>Gears</p> 
<p>Wheel and worm gear</p> 	<p>Pulleys and belt</p> 
<p>Friction wheels (side by side)</p> 	<p>Friction wheels (vertical and horizontal)</p> 
<p>Wedge system</p> 	<p>Chain and cog wheels</p> 
<p>Crank-connecting rod-crank</p> 	<p>Cam and roller</p> 

A FEW USEFUL SYMBOLS

			
Screw	Nut	Screw and nut system	Complete flat link (2 surfaces)
			
Free-moving part (rotation) with link (translation)	Free-moving part (rotation and translation)	Complete link	Free-moving part (translation) with link (rotation)
			
Cylindrical joint (cantilevered)	Spring (compression)	Gear	Wheel or pulley
			
Cylindrical joint (clevis)	Spring (extension)	Gear (side view)	Rope pulley (side view)
			
Spherical joint	Angular spring	Rack	

ASPECTS OF THE ANALYSIS OF A TECHNICAL OBJECT (TO)

TECHNOLOGICAL ASPECT

This aspect refers to the design and serial production of the TO.

SOCIAL ASPECT

This aspect refers to the TO's impact on society and society's impact on the TO's design.

SCIENTIFIC ASPECT

This aspect refers to the scientific principles governing the TO.

ETHICAL ASPECT

This aspect refers to the moral acceptability of the TO.

TECHNICAL ASPECT

This aspect refers to the techniques used to create the TO.

HISTORICAL ASPECT

This aspect refers to the development of the TO and to discoveries that led to our ability to create it.

ERGONOMIC ASPECT

This aspect refers to the adaptation of the TO to its user.

ECONOMIC ASPECT

This aspect refers to the production costs of the TO and the impact of its production on the economy.

AESTHETIC ASPECT

This aspect refers to the harmony of shapes and the beauty of the TO.

ENVIRONMENTAL ASPECT

This aspect refers to the environmental impact of producing and using the TO.

