Grade 11 Academic Mathematics
Exploration – How Many Ways?

Indicator: ***11Ac1 – Apply basic The Fundamental Coounting Principle***

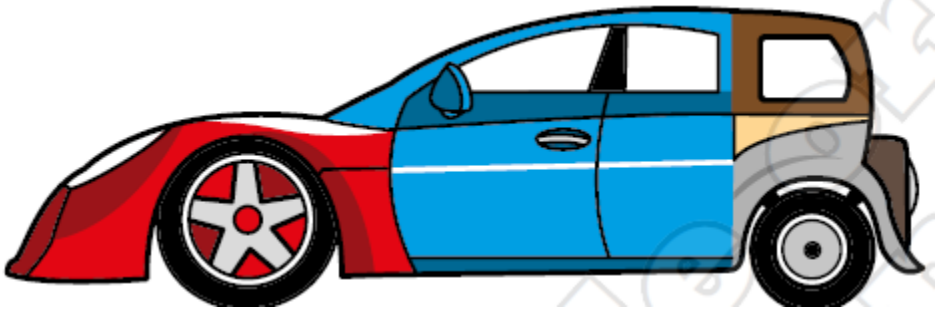
How Many Ways?

Teacher Notes:

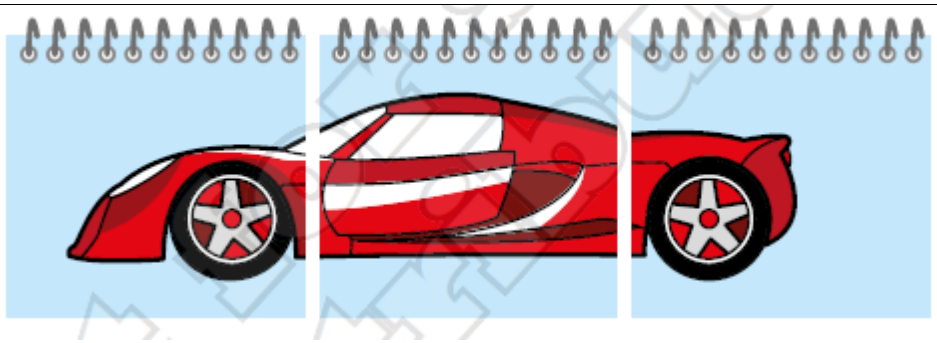
Fundamental Counting Principle

$$\text{Total number of ways} = \begin{matrix}\text{number}\\ \text{of ways for}\\ \text{choice 1}\end{matrix} \times \begin{matrix}\text{number}\\ \text{of ways for}\\ \text{choice 2}\end{matrix} \times \begin{matrix}\text{number}\\ \text{of ways for}\\ \text{choice 3}\end{matrix} \times \ldots$$

.

	Plan	Resources
Lesson 1 Introduction to the task Defining the problem and plan		• Exploration worksheets • Explorations rubric and supporting document (students should already have these)
	Look at this picture of mixed up car part. It was made using a special children's book that lets you make funny looking cars! Now give out the student exploration worksheets and have groups start defining the problem they will explore and their plan for solving the problem. Move around and listen to students discussing their problem and plan. If several groups have chosen the same picture them to select something different so there is variety across the class. Remind students to refer to the explorations rubric and supporting document to guide them as they work on their problem and plan.	

After exploration lesson 1, the teacher should collect each group's work and mark their definition of the problem and their plan. Then return this to the students at the start of the next lesson so they can implement their plan.

Lesson 2 Gathering and recording information	 This lesson is for students to gather the information they need to solve the problem. They should have already planned in lesson 1 what specific pieces of information they will need to be able to solve the problem. *(This may not take a full class period.)*	• ICT lab / library access
Lesson 3 Generating solutions and suggesting conclusions	Use a drawing program to make your own pages for the book. Remember to think about how the parts of the cars will join up. When you have drawn all your cars, print out the pages and cut them up to make your book. This lesson is for groups to use the information they have gathered to perform calculations and therefore answer the problem they defined in lesson 1. The teacher should remind the class that each group needs to answer each question. Groups can also use this period to prepare their product for presentation (this could be a report, poster or PPT). Remind students that their work will be assessed based on the mathematical content, clarity and organisation – the focus is not on creative / artistic aspects. Also remind students to refer to the explorations rubric to make sure they have met all the requirements and included all necessary information in their product.	• Calculators • Computer access if preparing a PPT or report • Poster paper • Scissors • Glue etc • Explorations rubric and supporting document (students should already have this)
Lesson 4 Presentation to the class	It is important for students to be given the opportunity to explain their work to the class. Sometimes students learn better from each other than they do from the teacher. Ensure that all groups have a fair chance to present. Each group should only need a few minutes and all groups should be able to present within one period.	• Data projector • Wall space to display posters / booklets
After the exploration Review / discussion	After all groups have presented their work, the teacher should lead a class discussion to ensure key mathematical ideas are understood:	

Grade 11 Academic Mathematics
Exploration – How Many Ways?

Indicator: ***11Ac1 – Apply basic The Fundamental Coounting Principle***

How Many Ways?

Students have 4 class periods to complete the following task. The exploration is to be completed in groups of 2-4 students.	
1. Explaining: ▪ How many different cars you make with your book? ▪ How did you get your answer? *Generating solutions*	
2. Explaining: ▪ How many cars can you make when the head and feet match? ▪ How did you work this out? *Defining realistic problems*	
3. Collect enough information to help you solve the problem. ▪ How many cars can you make when none of the parts match? *Generating solutions*	
1. Answer the question you defined in part 1 ▪ Write a conclusion that is based on your information and solution from parts 2 and 3 ▪ Give reasons for your conclusion ▪ Reflect on the conclusion and process – how good / accurate is your conclusion? Why? What are the limitations of your conclusion or of the process you followed? Why? How could you improve next time? *Suggesting conclusions*	

ASSESSMENT CRITERIA: EXPLORATIONS

Skill	Criteria	4	3	2	1	0
Inquiring **Experimenting**	**Defining realistic problems**	- Writes a clear and complete problem - Plans a complete process that will lead to a solution	- Writes a clear and complete problem - Plans a partly complete process that will lead to a solution	- Writes an incomplete problem - Plans a partly complete process that will lead to a solution	- Writes an incomplete problem - Plans an unsuitable process that does not lead to a solution	- Writes no problem - Writes no plan
Handling **Researching**	**Gathering and recording information**	- Collects sufficient information, all is relevant - Acknowledges sources	- Collects sufficient information, most is relevant - Acknowledges sources	- Collects information, some is relevant	- Collects information, little is relevant	- Collects no relevant information
Creating	**Generating solutions**	- Creates a complete solution to the problem - Makes no errors	- Creates a complete solution to the problem - Makes one or two minor errors	- Creates an incomplete solution to the problem - Makes no obvious errors but does not solve the problem **OR** - Creates a complete solution to the problem - Makes many errors	- Attempts to create a solution	- Creates no solution
	Suggesting conclusions	- Suggests accurate conclusions - Gives reasons using results - Reflects on the process	- Suggests accurate conclusions - Gives reasons using results	- Suggests accurate conclusions - Gives no reasons **OR** - Suggests inaccurate conclusions - Gives some reasons	- Suggests inaccurate conclusions - Gives no reasons	- Suggests no conclusions
Participating	**Collaborating with other students**	- Contributes fully to the group's work - Understands the group's results completely	- Contributes fully to the group's work - Understands most of the group's results	- Contributes partly to the group's work - Understands some of the group's results	- Contributes little to the group's work - Understands little of the group's results	- Makes no contribution
						20

معيار التقويم: الاستكشاف

المهارة	المعيار	4	3	2	1	0
الاستفسار التجريب	تحديد مسألة حقيقية	- يكتب مسألة واضحة وكاملة. - يخطط لإجراءات كاملة لتوصله إلى الحل.	- يكتب مسألة واضحة وكاملة . - يخطط لإجراءات شبه كاملة لتوصله إلى الحل.	- يكتب مسالة ليست كاملة. - يخطط لإجراءات شبه كاملة لتوصله إلى الحل.	- يكتب مسألة ليست كاملة. - يخطط لإجراءات غير مناسبة لا توصله للحل.	- لا يكتب أية مسألة. - لا يكتب أية خطة.
معالجة البيانات البحث	جمع وتسجيل المعلومات	- يجمع معلومات كافية جميعها ذات علاقة. - يوثق المصادر.	- يجمع معلومات كافية معظمها ذات علاقة. - يوثق المصادر.	- يجمع معلومات بعضها له علاقة.	- يجمع معلومات القليل منها له علاقة	- لا يجمع أية معلومات لها علاقة
الخلق والإبداع	إنشاء الحلول	- يبني أو يكون حلا كاملا للمسألة ليس فيه أية أخطاء.	- يبني أو يكون حلا كاملا للمسألة. - يرتكب خطأ أو خطأين بسيطين.	- يبني حلا غير كامل للمسالة. - لا يرتكب أية أخطاء واضحة ولكن لا يحل المسألة **أو** - يبني حلا كاملا للمسألة - يرتكب العديد من الأخطاء.	- يحاول بناء حل.	- لا يبني أية حلول.
	التوصل إلى الاستنتاجات	- يتوصل إلى استنتاجات دقيقة. - يعطي أسبابًا مستخدمًا النتائج. - يظهر ويوضح الإجراءات.	- يتوصل إلى استنتاجات دقيقة. - يعطي أسبابًا مستخدمًا النتائج.	- يتوصل إلى استنتاجات دقيقة. - لا يعطي أية أسباب. **أو** - يتوصل إلى استنتاجات غير دقيقة. - يعطي بعض الأسباب.	- يتوصل إلى استنتاجات غير دقيقة. - لا يعطي أية أسباب.	- لا يتوصل لأية استنتاجات.
المشاركة	التعاون مع الطلاب الآخرين	- يشارك بفاعلية كاملة في عمل المجموعة. - يفهم نتائج المجموعة بشكل كامل.	- يشارك بفاعلية كاملة بعمل المجموعة. - يفهم معظم نتائج المجموعة.	- يشارك جزئيًا بعمل المجموعة. - يفهم بعض نتائج المجموعة.	- يشارك قليلًا بعمل المجموعة. - يفهم القليل من نتائج المجموعة.	- لا يقوم بأية مشاركة.
20						