Module:	6SENG001W Reasoning about Programs
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Tutorial Exercises:	5
Subject:	Evaluate Relation expressions using **Atelier B** & **ProB**
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1 Introduction

Using the B tools load & type check the following B relation definitions B machine called `Relations` into **Atelier B** & then animate/evaluate the expressions given below using **ProB**'s "*Eval terminal*" or add them to the `Relations` Machine directly as `ASSERTIONS` & use **ProB**'s "*Eval Assertions terminal*" to check if they are true or false.

2 Evaluate the following expressions

Load the `Relations.mch` machine into **Atelier B** & then **ProB** & evaluate the following expressions.

2.1 Value Expressions

1. $AAxXX$
2. $favourite$
3. $speaks$
4. $alphabet$
5. $\mathrm{card}(favourite)$
6. $\mathrm{card}(AAxXX)$
7. $\mathrm{card}(\{\ (1,2),(3,4)\ \})$

8. $\text{card}(speaks)$
9. $\text{card}(alphabet)$

2.2 Predicate Expressions

1. $(Paul, purple) \in favourite$
2. $(Paul, pink) \in favourite$
3. $(Paul, blue) \notin favourite$
4. $(Wales, French) \in speaks$
5. $(Canda, Welsh) \notin speaks$

2.3 Cartesian Products

1. $XX \times AA$
2. $AA \times AA$
3. $XX \times XX$
4. $AA \times COLOUR$
5. $\text{prj}_1(COUNTRY, LANGUAGE)(Wales, Welsh)$
6. $\text{prj}_2(COUNTRY, LANGUAGE)(Wales, Welsh)$

2.4 Relational Domain & Range

1. $\text{dom}(favourite)$
2. $\text{ran}(favourite)$
3. $\text{dom}(speaks)$
4. $\text{ran}(speaks)$
5. $\text{dom}(AAxXX)$
6. $\text{ran}(AAxXX)$