Module:	6SENG001W Reasoning about Programs
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Tutorial Exercises:	1
Subject:	B Specification of a PaperRound & use of Atelier B & ProB
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1 B Specification of a PaperRound

This is a (partial) specification of a simple a *paper round manager* system.

```
MACHINE $PaperRound$

    VARIABLES
        $houseset$

    INVARIANT
        $houseNumbers \subseteq \mathbb{N}_1$

    INITIALISATION
        $houseNumbers := \{ \}$

    OPERATIONS

        $addNewHouse( \ newHouse \ ) =$
            PRE
                    $newHouse \in \mathbb{N}_1 \ \wedge \ newHouse \notin houseNumbers$
            THEN
                    $houseNumbers := houseNumbers \cup \{ \ newHouse \ \}$
            END ;

        $numbHouses \leftarrow howManyHouses =$
            BEGIN
                    $ans := card( \ houseNumbers \ )$
            END

END
```

1.1 Explanatory Notes

1. $PaperRound$ is the name of this B specification. It is an example of a *B abstract machine*.

2. It keeps track of houses that receive paper deliveries by recording the house numbers using the state variable $houseNumbers$.

   $houseNumbers$ holds values that are *sets of natural mumbers*, i.e. subsets of $\{\ 1,\ 2,\ 3,\ \ldots\ \}$.

   So a possible value could be: $houseNumbers = \{\ 1,\ 24,\ 37,\ 59\ \}$.

3. $PaperRound$ has two operations that allow its state to be manipulated.

4. Operation $addNewHouse$ — adds the number of a house that wants to have papers delivered.

   The house number of the new house is *passed* into the operation using the parameter $newHouse$.

5. Operation $howManyHouses$ — is an enquiry operation that returns the number of houses that currently have a paper delivered to them.

   For example, if $houseNumbers = \{\ 1,\ 24,\ 37,\ 59\ \}$ then
   $howManyHouses$ will return 4.