Set Notation

Note Title 09/09/2005

A set is a collection of items. It is shown by listing the items in curly brackets

e.g. $A = \{\text{Anna, Emma, Kat}\}$

$P = \{1, 2, 3, 4, \ldots 15\}$

$Q = \{\text{even numbers less than } 20\}$

$R = \{\text{factors of } 12\}$

The <u>intersection</u> of 2 sets is written using the symbol $\cap$

e.g. $P \cap Q = \{2, 4, 6, 8, 10, 12, 14\}$

$Q \cap R = \{2, 4, 6, 12\}$

The <u>union</u> of 2 sets is written using the symbol $\cup$

e.g. $P \cup Q = \{1, 2, 3, 4\ 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18\}$

$Q \cup R = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 1, 3\}$

Empty Set, Universal Set, Complement

Suppose set $S = \{\text{factors of } 15\}$

Then $Q \cap S = \{ \ \}$ (an EMPTY SET)

Another symbol for an empty set is $\emptyset$

so $Q \cap S = \emptyset$

The set of 'everything' (ie/ everything we are concerned with in the question being considered) is called the 'UNIVERSAL SET' and written as $\mathcal{E}$ or E

For our purposes, we will say that

$E = \{1, 2, 3, \ldots 20\}$

The COMPLEMENT of a set P is written P' and means "everything which is not in set P (but is in the universal set)"

$P' = \{16, 17, 18, 19, 20\}$

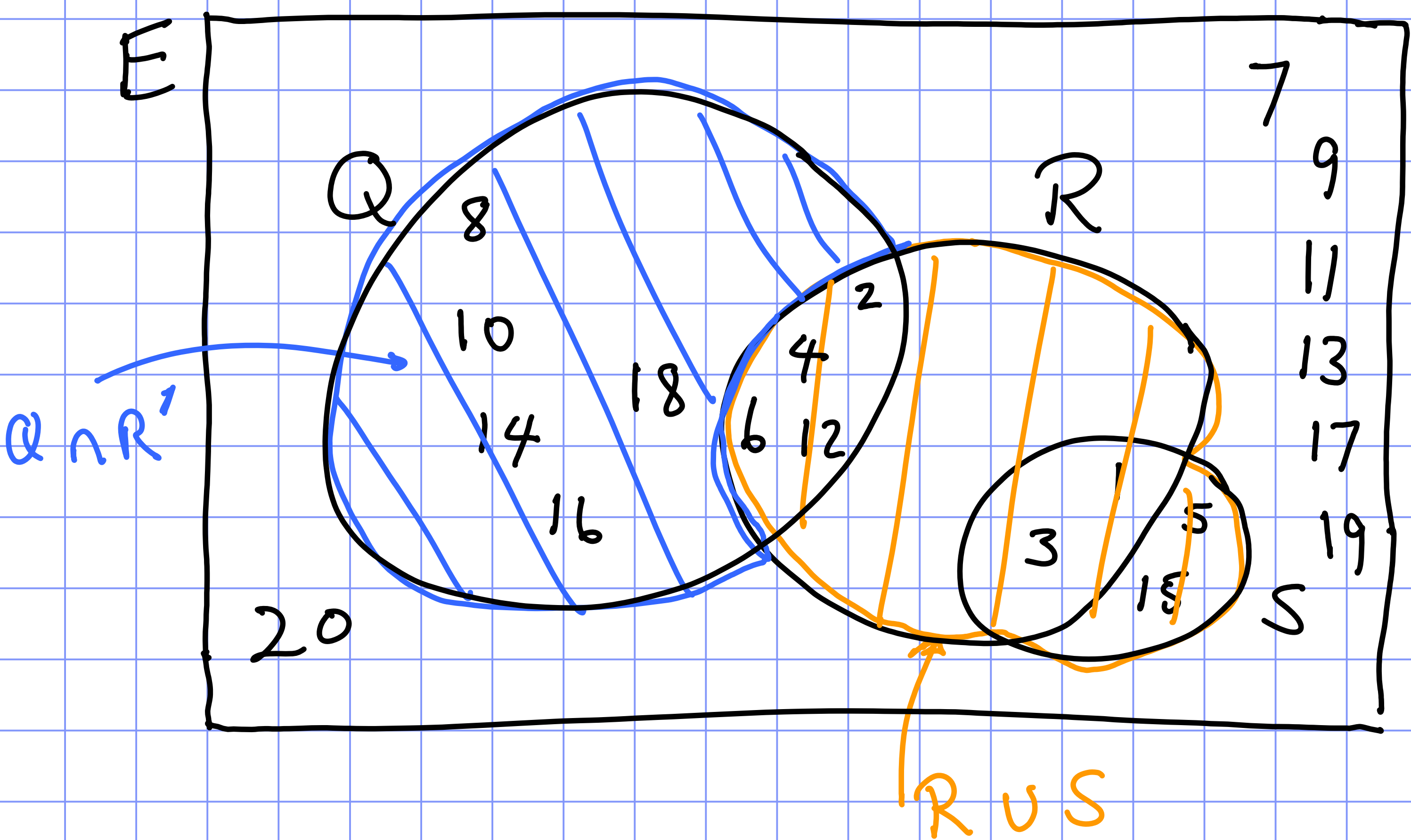
We can write

$P' \cap Q = \{16, 18\}$

Venn diagrams

These are a way of showing the relationship between sets in a diagram.
The Universal Set is represented by a rectangle, and other sets by circles inside the rectangle.

Example Draw a Venn Diagram showing the sets E, Q, R and S above



The notation $n(R)$ means the number of items in the set R

So $n(R) = 6$

$n(R \cap S) = 2$

$n(R \cup S) = 8$

$n(S) = 4$

Note that $n(R \cup S) \neq n(R) + n(S)$ because this would count the items in $R \cap S$ twice.

However, we can state a rule

$$n(R \cup S) = n(R) + n(S) - n(R \cap S)$$

and

If $R \cap S = \emptyset$, then $n(R \cup S) = n(R) + n(S)$