Set	Complement
N	$N' = \{x \mid x \in R, x \notin N\}$
I	$I' = \{x \mid x \in R, x \notin I\}$
Q	$\overline{Q}$
$\overline{Q}$	Q

c) Sets N and $\overline{Q}$ are disjoint sets. Sets W and $\overline{Q}$ are disjoint sets. Sets I and $\overline{Q}$ are disjoint sets. *Sets* Q and $\overline{Q}$ are disjoint sets.
d) Yes. e.g., Q' is the set of numbers that cannot be described as a ratio of two integers, which is the set of irrational numbers.
e) *W, I, Q, R*
f) No. e.g., The area of a region in a Venn diagram is not related to the number of elements in the set.

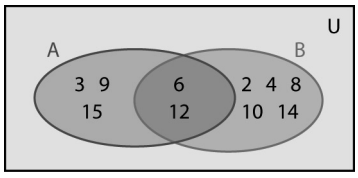
18. a) $S = \{1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289\}$
$n(S) = 17$
$E = \{4, 16, 36, 64, 100, 144, 196, 256\}$
$n(E) = 8$
b) $n(S) = 17$, $n(E) = 8$
$n(O) = n(S) - n(E)$
$n(O) = 17 - 8$
$n(O) = 9$
c) $n(U) = 300$, $n(S) = 17$
$n(S') = n(U) - n(S)$
$n(S') = 300 - 17$
$n(S') = 283$

19. a) e.g., $A \subset B$ if all elements of A are also in B. For example, all weekdays are also days of the week, so weekdays is a subset of days of the week.
b) e.g., A' consists of all the elements in the universal set but not in A. For example, all days of the week that are not weekdays are weekend days. So weekend days is the complement of weekdays.

20. e.g., Disagree; since both the subsets are empty, they both contain the same elements and are therefore the same subset.

Lesson 3.2: Exploring Relationships between Sets, page 160

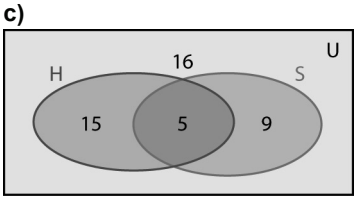
1. a)



b) i) $n(A) = 5$
ii) $n(A \text{ but not } B) = n(A) - n(A \text{ and } B)$
$n(\text{A but not } B) = 5 - 2$
$n(\text{A but not } B) = 3$
iii) $n(B) = 7$
iv) $n(B \text{ but not } A) = n(B) - n(A \text{ and } B)$
$n(B \text{ but not } A) = 7 - 2$
$n(B \text{ but not } A) = 5$
v) $n(A \text{ and } B) = 2$
vi) $n(A \text{ or } B) = n(\text{A but not } B) + n(A \text{ and } B) + n(B \text{ but not } A)$
$n(A \text{ or } B) = 3 + 2 + 5$
$n(A \text{ or } B) = 10$
vii) $n(A) = 5$, therefore $n(A') = 5$

2. a) 8 students are in both the drama club and the band.
b) 11 students are in the drama club only.
6 students are in the band only.
c) Drama: 11 + 8 = 19
Band: 8 + 6 = 14
d) Drama club or band: 11 + 8 + 6 = 25
e) 38 students in grade 12 – 25 in drama club or band = 13 students in neither drama club nor band

3. a) hockey or soccer: 45 – 16 = 29
hockey and soccer: 20 + 14 = 34
overlap: 34 – 29 = 5
5 students like hockey and soccer.
b) only hockey: 20 – 5 = 15
only soccer: 14 – 5 = 9
15 + 9 = 24
24 students like only hockey or only soccer.
c)



4. a) ski or snowboard: 55 – 9 = 46
ski and snowboard: 25 + 32 = 57
Overlap: 57 – 46 = 11
11 guests plan to ski and snowboard.
b) only ski: 25 – 11 = 14
14 guests will only ski.
c) only snowboard: 32 – 11 = 21
21 guests will only snowboard.

5. a) $n(U) - n(U \text{ but not } A \text{ or } B)$: 25 – 4 = 21
$n(A) + n(B)$: 13 + 10 = 23
$n(A \text{ and } B)$: 23 – 21 = 2
$n(A \text{ only})$: 13 – 2 = 11
$n(B \text{ only})$: 10 – 2 = 8
b)