

Worksheet: Operations on Sets

This worksheet covers operations on sets, including complements, relative complements, unions, intersections, symmetric differences and Cartesian products. You could read the study guide: [Basics of Sets](#), to help you with the language and notation of sets.

Model answers for
this sheet



Operations on Sets
study guide



1. You are given the following sets:
 - U , the set of natural numbers less than 17 (the universe);
 - A , the set of multiples of 4 less than 17;
 - B , the set of all even numbers less than 17, and;
 - C , the set of prime numbers less than 17.
 - a) Write out these sets using proper set notation, and draw them all on a single Venn diagram.
 - b) Work out the following operations on A , B , C , writing your answer in set notation. Remember that you should perform operations in brackets first.
 - i) A^c ii) $B \cup C$ iii) $A \cap C$ iv) $B \setminus C$
 - v) $C \setminus B$ vi) $C \oplus B$ vii) $B \cap (C^c)$ viii) $A \cup (B \cup C)$
 - ix) $A \cup (B \cap C)$ x) $(B^c) \cap C$ xi) $(A \oplus B) \cup C$ xii) $(A \cup B) \setminus (B \cup C)$

2. You are given the two sets $X = \{1, 2, 3, 4\}$ and $Y = \{1, 2, 3, 4, 5\}$.

- a) Write down all elements of $V = X \times Y$.

You are given two more sets $D = \{(1, d) : d \in Y\}$ and $E = \{(e, 3), (f, 4) : e, f \in X\}$.

b) Write down all elements of D and E and draw these sets in a Venn diagram with universe set V .

c) Work out the following operations on D and E , writing your answer in proper set notation.

i) D^c ii) E^c iii) $D \cup E$ iv) $D \cap E$

v) $D \setminus E$ vi) $E \setminus D$ vii) $D \oplus E$ viii) $D \times D$

3. You are given the following sets:

- $W = \{w: w \text{ is a positive whole number less than } 20\}$ (the universe set);
- $F = \{1, 4, 6, 8, 9, 10, 16\}$;
- $G = \{2, 3, 4, 8, 9, 10, 11, 14, 16\}$, and;
- $H = \{1, 3, 5, 7, 9, 10, 11, 12, 19\}$.

a) Work out the following sets, writing your answer in correct set notation. Draw a Venn diagram for each of your answers.

i) $F \cup (G \cap H)$ ii) $(F \cup G) \cap (F \cup H)$ iii) $(G \cup H)^c$ iv) $G^c \cap H^c$

v) $H \cap (G \cup F)$ vi) $(H \cap G) \cup (F \cap H)$ vii) $(G \cap F)^c$ viii) $F^c \cup G^c$

b) Do you notice anything about your answers? Write down your observations.

c) Remember the sets U , A , B , and C from Question 1. With U in place of W , A in place of F , B in place of G and C in place of H , work out Question 3 a) i)-viii) once more. Do these answers agree or disagree with your observation in part b)?



This worksheet is one of a series on mathematics produced by the Learning Enhancement Team with funding from the UEA Alumni Fund. Scan the QR-code with a smartphone app for [more resources](#).



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