

1. An experiment consists of tossing two indistinguishable dice.

(a) Find the sample space.

$$\{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,2), (2,3), (2,4), (2,5), (2,6), (3,3), (3,4), (3,5), (3,6), (4,4), (4,5), (4,6), (5,5), (5,6), (6,6)\} = \{(i,j) \mid 1 \leq i \leq j \leq 6\}$$

(b) Find the event that the sum of the dice is 8.

$$\{(2,6), (3,5), (4,4)\}$$

(c) Find the event that the sum of the dice is greater than 8.

$$\{(3,6), (4,5), (4,6), (5,5), (5,6), (6,6)\}$$

(d) Find the event that the sum of the dice is greater than 12.

$$\emptyset \text{ or } \{\} \quad \text{Note that } \{\emptyset\} \text{ is not correct ... this is not the empty set because it contains a set}$$

2. A die is thrown. Let  $E$  be the event that the number thrown is even and  $F$  the event that the number thrown is greater than 4. Find

(a)  $E = \{2, 4, 6\}$

(b)  $F = \{5, 6\}$

(c)  $E \cap F = \{6\}$

(d)  $E' = \{1, 3, 5\}$

(e)  $F' = \{1, 2, 3, 4\}$

(f)  $E \cup F = \{2, 4, 5, 6\}$

(g)  $E - F = \{2, 4\}$

(h)  $E' \cup F = \{1, 3, 5, 6\}$

(i)  $(E \cap F')' = \{1, 3, 5, 6\}$

3. Let  $A$  and  $B$  be events in the sample space  $S$  as shown. Draw Venn diagrams for

(a)  $A$

(b)  $B'$

(c)  $A \cup B$

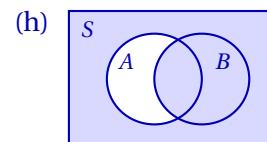
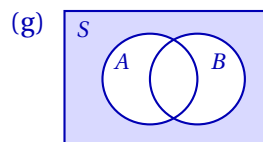
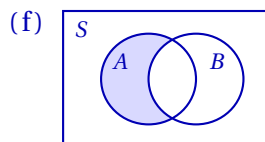
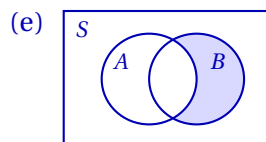
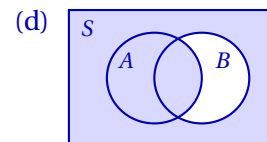
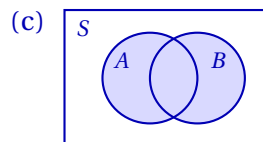
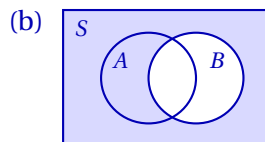
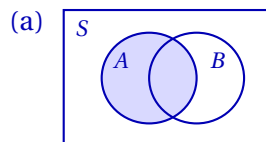
(d)  $A \cup B'$

(e)  $A' \cap B$

(f)  $A - B$

(g)  $A' - B$

(h)  $(A \cap B')'$



Bonus. Rewrite the following events using only  $A$ ,  $B$ ,  $\cap$ ,  $'$  and parentheses.

(a)  $A \cup B = (A' \cap B')'$

(b)  $A - B = A \cap B'$

(c)  $A \Delta B = (A' \cap B')' \cap (A \cap B)'$