Set Theory & Probability Mastery

Practice Worksheet (Compact Layout)

I DO

E = {integers from 1 to 12}
A = {factors of 12}
B = {multiples of 3}

(a) List the members of the set $A \cap B$.

A number is chosen at random from the universal set E.
(b) Find the probability that this number is in the set $A \cup B$.

WE DO

E = {integers from 1 to 15}
C = {factors of 15}
D = {multiples of 5}

(a) List the members of the set $C \cap D$.

A number is chosen at random from the universal set E.
(b) Find the probability that this number is in the set $C \cup D$.

YOU DO 1

E = {integers from 1 to 10}
X = {factors of 20}
Y = {multiples of 2}

(a) List the members of the set $X \cap Y$.

A number is chosen at random from the universal set E.
(b) Find the probability that this number is in the set $X \cup Y$.

YOU DO 2

E = {integers from 1 to 16}
F = {factors of 16}
M = {multiples of 4}

(a) List the members of the set $F \cap M$.

A number is chosen at random from the universal set E.
(b) Find the probability that this number is in the set $F \cup M$.

CHALLENGE

E = {integers from 1 to 20}
P = {prime numbers}
Q = {factors of 18}
R = {multiples of 3}

(a) List the members of the set $P \cap (Q \cup R)$.

A number is chosen at random from the universal set E.
(b) Find the probability that this number is in the set $(P \cup Q \cup R)'$.

ANSWERS & WORKED SOLUTIONS

I Do

Step 1: List the sets: E = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}, A = {1, 2, 3, 4, 6, 12}, B = {3, 6, 9, 12}.

Step 2: (a) $A \cap B$ contains elements in BOTH sets. **Answer: {3, 6, 12}**

Step 3: (b) $A \cup B$ contains elements in EITHER set: {1, 2, 3, 4, 6, 9, 12}.

Step 4: There are 7 elements in the union out of 12 total. **Answer: 7/12**

We Do

Step 1: E = {1 to 15}, C = {1, 3, 5, 15}, D = {5, 10, 15}.

Step 2: (a) $C \cap D$ (in BOTH sets). **Answer: {5, 15}**

Step 3: (b) $C \cup D$ = {1, 3, 5, 10, 15}.

Step 4: 5 elements out of 15 total = 5/15. Simplify fraction. **Answer: 1/3**

You Do 1

Step 1: E = {1 to 10}. X = {1, 2, 4, 5, 10} *(Note: 20 is excluded as it's not in the universal set),* Y = {2, 4, 6, 8, 10}.

Step 2: (a) $X \cap Y$. **Answer: {2, 4, 10}**

Step 3: (b) $X \cup Y$ = {1, 2, 4, 5, 6, 8, 10}.

Step 4: 7 elements out of 10. **Answer: 7/10**

ANSWERS & WORKED SOLUTIONS (CONTINUED)

You Do 2

Step 1: E = {1 to 16}. F = {1, 2, 4, 8, 16}, M = {4, 8, 12, 16}.

Step 2: (a) $F \cap M$. **Answer: {4, 8, 16}**

Step 3: (b) $F \cup M$ = {1, 2, 4, 8, 12, 16}.

Step 4: 6 elements out of 16. Simplify 6/16. **Answer: 3/8**

Challenge

Step 1: List all sets within 1 to 20.

P = {2, 3, 5, 7, 11, 13, 17, 19}

Q = {1, 2, 3, 6, 9, 18}

R = {3, 6, 9, 12, 15, 18}

Step 2: (a) First find $(Q \cup R)$ = {1, 2, 3, 6, 9, 12, 15, 18}. Then intersect with P (which of these are prime?). **Answer: {2, 3}**

Step 3: (b) Find the union of all three sets: $P \cup Q \cup R$ = {1, 2, 3, 5, 6, 7, 9, 11, 12, 13, 15, 17, 18, 19}. This contains 14 numbers.

Step 4: The notation ' indicates the complement (everything OUTSIDE the sets). Total numbers = 20. Outside numbers = 20 − 14 = 6. (They are {4, 8, 10, 14, 16, 20}).

Step 5: Probability = 6/20. Simplify. **Answer: 3/10**