

Set Theory & Probability Mastery

Practice Worksheet (Compact Layout)

I DO

$$E = \{\text{integers from 1 to 12}\}$$

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

$$B = \{\text{multiples of 3}\}$$

- (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

$$E = \{\text{integers from 1 to 15}\}$$

$$C = \{\text{factors of 15}\}$$

$$D = \{\text{multiples of 5}\}$$

- (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 $C \cup D$.
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YOU DO 1

$E = \{\text{integers from 1 to 10}\}$

$X = \{\text{factors of 20}\}$

$Y = \{\text{multiples of 2}\}$

- (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

$E = \{\text{integers from 1 to 16}\}$

$F = \{\text{factors of 16}\}$

$M = \{\text{multiples of 4}\}$

- (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 $E = \{\text{integers from 1 to 20}\}$ $P = \{\text{prime numbers}\}$ $Q = \{\text{factors of 18}\}$ $R = \{\text{multiples of 3}\}$

(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: $E = \{1 \text{ to } 15\}$, $C = \{1, 3, 5, 15\}$, $D = \{5, 10, 15\}$.

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: $E = \{1 \text{ to } 10\}$. $X = \{1, 2, 4, 5, 10\}$ (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: $E = \{1 \text{ to } 16\}$. $F = \{1, 2, 4, 8, 16\}$, $M = \{4, 8, 12, 16\}$.

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: $3/10$**