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Unit 2: Sets, Venn Diagrams, and Logic Test Review

1. A = {x: x є Z, 0 < x ≤ 12}, B = {x: x є Z, 5 ≤ x < 15}

Determine if the following statements are true or false

a: Sets A and B have 8 elements in common

b: 5 є A and 5 є B

c: 12 є A or B

d: There are 12 unique elements in sets A and B

2. U = {x: x є N, x < 16}, A = {x: x є U, x is even}, B = {x: x є U, 3 < x < 10}, C = {x: x є U, x ≤ 9}

Determine if the following statements are true or false

a: {2, 4, 6} c A

b: A c B

c: If x є B, then x є C

d: -1 є C

3. U is the set of all integers greater than -2 and less than 11. Find A ∩ B’ if:

a: A = {2, 4, 6, 8, 10} and B = {-1, 0, 1, 2, 3, 4}

b: A = {x: x є Z, 0 ≤ x ≤ 8} and B = {1, 3, 5, 7, 9}

c: A = {-1, 0, 1, 2} and B = {x: x є N, x < 11}

4. Given U = {x: x є Z, 0 ≤ x ≤ 12}, A = {0, 2, 4, 6, 8, 10}, and B = {2, 6, 8, 9, 11, 12}

a: Construct a Venn Diagram to represent the relationship between these sets

b: Find n(A U B)’)

5. In a recent survey of the latest 50 movies released from Hollywood, movie watchers claimed that:

* 35 of the movies were shorter than 2 hours
* 20 of the movies were interesting
* 8 of the movies were two hours or more long and were not interesting

a: How many movies were both interesting and shorter than 2 hours?

b: Draw a Venn Diagram to represent this information

Each Hollywood movie grosses $100 million dollars if it is interesting and $30 million dollars if it is not interesting.

c: What was the total earned on these 50 movies?

The movies cost $50 million dollars to make if they are shorter than two hours and $70 million dollars otherwise

d: How much money did these 50 movies cost to make in total?

6. There are three choices for science classes at an International High School, where all 225 students are required to take at least one science class.

* 150 take biology
* 100 take chemistry
* 80 take physics
* 15 take biology and physics
* 60 take biology and chemistry
* 40 take physics and chemistry
* 10 students take all three courses

a: Draw a Venn Diagram to represent this information

b: How many students do not take chemistry?

c: How many students do not take biology or chemistry?

7. Consider the following logical propositions

P: The temperature is less than 0 degrees Celsius

Q: The water is frozen

Write each of the following in words

a: ⌐P ʌ ⌐Q

b: (P ʌ Q) → P

c: (P ʌ Q) → ⌐Q

8. Determine whether the following statements are true or false

a: P ʌ Q, given that P is true and Q is false.

b: P ᴠ Q, given that both P and Q are true.

c: ⌐P ᴠ ⌐Q, given that P is true and Q is true.

d: (P ʌ Q) → P, given that P is false and Q is false.

9. Let P, Q, and R be the statements:

P: x is a multiple of four

Q: x is a factor of 36

R: x is a square number

a: Write a sentence in words, for the statement (P ᴠ R) ʌ ⌐Q

b: Use the truth table below to determine the truth values of (P ᴠ R) ʌ ⌐Q

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| --- | --- | --- | --- | --- | --- |
| **P** | **Q** | **R** | **⌐Q** | **P ᴠ R** | **(P ᴠ R) ʌ ⌐Q** |
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c: Write down one possible value of x for which (P ᴠ R) ʌ ⌐Q is true.

c: Write the following statement in symbolic form: If Sarah cannot see well in the dark, then she does not eat lots of carrots.

d: Is the statement in part c the inverse, converse, or contrapositive of the statement in part a?

11. Use a truth table to show that P → Q and its contrapositive are logically equivalent.