

COLLEGE MATH Form DR Sets and Logic NAME _____

Show all work on this test or on separate paper.

Turn in ALL work sheets!

In 1-4, let $U = \{2, 3, 5, 7, 9, 10, 12, 15\}$,

$A = \{3, 5, 7, 9\}$ $B = \{10, 12, 15\}$ $C = \{2, 10, 12\}$

Find each of the following sets.

1. $B \cup C =$

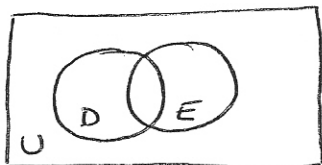
2. $B \cap C =$

3. $B - C =$

4. $A' =$

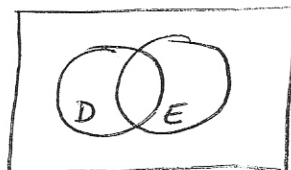
In 5-6, shade the following in a Venn diagram. (You may wish to number the regions.)

5.



$D' \cap E$

6.



$D' \cup E'$

In 7-10, label the diagram and answer the questions.

A survey of 150 students revealed the following results:

61 like Spanish

54 like math.

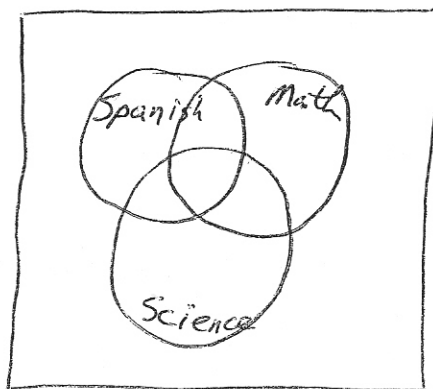
57 like science.

9 like Spanish and math.

15 like math and science.

17 like Spanish and science.

5 like all three subjects.



7. How many like none of the subjects?

8. How many like math only?

9. like math or science, but not both?

10. How many don't like math?

SHOW ALL WORK ON THIS TEST OR SEPARATE PAPER. Justify all answers.

In 1 - 2 state De Morgan's Laws:

1. 2.

In 3 - 8, give negations for each of the following statements:

3. It is rainy or it is cold.
4. It is rainy and it is not cold.
5. If it rains, then it will be cold.
6. Some dogs have fleas. 7. All dogs have fleas.
8. No dogs have fleas.

In 9-11, given: "If you are smart, then you will study for this test."

9. Contrapositive:
10. Inverse:
11. Converse:

In 12-15, given: "If you do not smoke, then your breath is clean."

12. Converse:
13. Contrapositive:
14. Inverse:
15. Which of the above is equivalent to the original statement?

In 16-17, complete the truth tables:

P	Q	$P \wedge Q$	$P \vee Q$	$P \rightarrow Q$	$\sim Q \rightarrow P$
T	T				
T	F				
F	T				
F	F				

18. Express the disjunction as an implication:
"You broke even or you were lucky."
19. Express the implication as a disjunction:
"If you broke even, then you were lucky."

In 20-27, use logical principles (name the principle or fallacy!) or Euler circles to determine if the arguments are valid or invalid. Show or explain each answer.

20. If Jane is intelligent, then she earns A's in math. She earns A's in math. Therefore, Jane is intelligent.
21. If Jane is intelligent, then she earns A's in math. She is not intelligent. Therefore, she does not earn A's in math.

22. ~~the cause~~ If Jane were intelligent, then she would make A's in math, and she does not make A's in math. *Therefore, Jane is not intelligent.*
23. If you watch too much TV, then you will go crazy. If you go crazy, then you can't do your homework. You watch too much TV. Therefore, you can't do your homework.

24. All insects have six legs. All fleas have six legs. Therefore, all fleas are insects.
25. All birds have feathers. All penguins are birds. Therefore, all penguins have feathers.

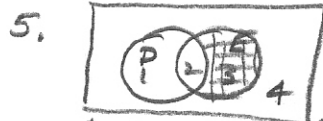
26. All teachers assign work. No people who assign work are lovable. Therefore, no teachers are lovable.

27. Select the statement that is the negation of the statement "If the weather is cold, then the ball game will not be played."
- A. The weather is cold and the ball game was not played.
 - B. If the ball game is played, then the weather is not cold.
 - C. The weather is cold and the ball game will be played.
 - D. If the weather is not cold, then the ball game will be played.
28. Select the statement below that is logically equivalent to "If Tom studies, then he will pass CLAST."
- A. If Tom passed CLAST, then he studied.
 - B. If Tom did not pass CLAST, then he did not study.
 - C. Tom studies and does not pass CLAST.
 - D. If Tom does not study, then he will not pass CLAST.
29. Select the statement below that is NOT logically equivalent to "If Mary works late, then Joe will prepare dinner."
- A. If Joe does not prepare dinner, then Mary did not work late.
 - B. Joe prepares dinner or Mary does not work late.
 - C. Mary does not work late or Joe prepares dinner.
 - D. If Joe prepares dinner, then Mary works late.
30. Select the statement below that is logically equivalent to "It is not true that some dogs bark or some birds do not have feathers."
- A. No dogs bark and all birds have feathers.
 - B. Some dogs do not bark or some birds have feathers.
 - C. No dogs bark and some birds have feathers.
 - D. Some dogs do not bark and some birds have feathers.
31. All of the following arguments A-D have true conclusions, but one of the arguments is not valid. Select the argument that is not valid.
- A. All robins have wings and all birds have wings; therefore, all robins are birds.
 - B. All turtles are reptiles and all reptiles have a scaly skin; therefore, turtles have a scaly skin.
 - C. All mammals have hair. A deer is a mammal. Therefore, a deer has hair.
 - D. All birds have wings and all robins are birds; therefore, all robins have wings.
32. Select the rule of logical equivalence that directly (in one step) transforms statement "i" into statement "ii."
- i. If Joe takes calculus, then he will buy a calculator.
 - ii. Joe will not take calculus or he will buy a calculator.
- A. "If p, then q" is equivalent to "(not p) or q."
 - B. "Not (p and q)" is equivalent to "(not p) or (not q)."
 - C. "If p, then q" is equivalent to "if not q, then not p."
 - D. Correct equivalence rule is not given.

LAM I Sets and Logic Solutions DR

9-10.

1. $B = \{10, 12, 15\}$ $C = \{2, 10, 12\}$



1. $B \cup C = \{2, 10, 12, 15\}$

2. $B \cap C = \{10, 12\}$

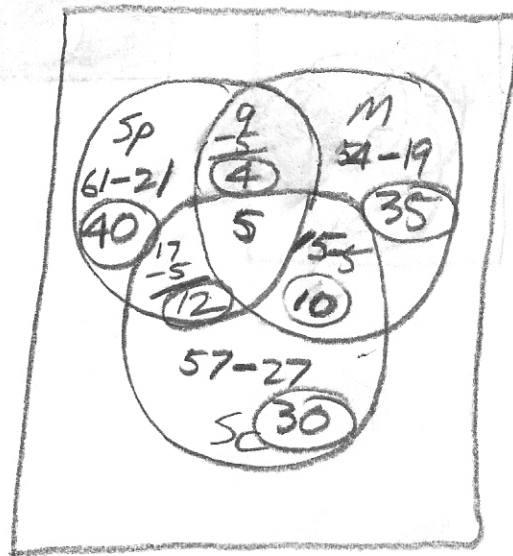
3. $B - C = \{15\}$

4. $A' = \{2, 10, 12, 15\}$

5. $D' = \{3, 4\}$ $E = \{2, 3\}$

$D' \cap E = \{3\}$

6. $D' \cup E' = \{3, 4\} \cup \{1, 4\} = \{1, 3, 4\}$



TOTAL = $61 + 35 + 10 + 30 = 136$

7. $\frac{150}{-136} = 14$

8. $\frac{35}{+42} = 81$

10. $150 - 54 = 96$

LOGIC

1. DeMorgan Laws

1. $\sim(p \vee q) = \sim p \wedge \sim q$

2. $\sim(p \wedge q) = \sim p \vee \sim q$

3. It is NOT raining AND it is NOT cold.

4. It is NOT raining OR it is cold.

5. P happens and q does not follow. It rains and it is NOT cold.

6. No dogs have fleas.

7. Some dogs do NOT have fleas.

8. Some dogs have fleas.

9. If you don't study, then you are not smart.

10. If you are not smart, then you do not study.

11. If you study, then you are smart.

12. If breath is clear, then you don't smoke.

13. If breath is not clear, then you do smoke.

14. If you smoke, then breath is not clear.

15. Contrapositive.

18. Broke or Lucky. (Negating one implies the other!)

If not broke ^{even}, then you were lucky.

or If not lucky, then you broke even.

19. If broke even, then you were lucky.

You did not break even, or you were lucky.

20. Jane intell. \rightarrow A's in math.

\therefore Intell Fallacy of Converse

21. Jane intell \rightarrow A's in math.

\therefore \sim A's Fallacy of Inverse

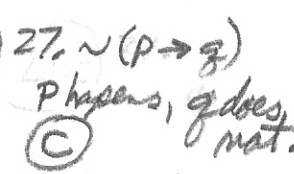
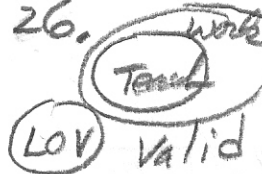
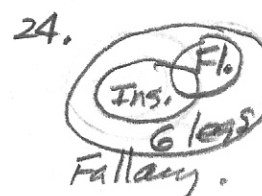
22. Intell \rightarrow A's

\therefore \sim Intell Valid CONTRAD.

23. TV \rightarrow Crazy

\therefore TV \rightarrow No Hawk Valid TRANS.

$\sim q \rightarrow p$	$p \wedge q$	$p \vee q$	$p \rightarrow q$
F	T	T	T
T	T	F	F
F	F	T	T
T	F	F	F



28. Contrapositive

29. Converse

30. DeMorgan's Law



32. Identical DIST.