Chapter 1.2: Number puzzles and sequences

Question 1 **0 1 2 3 4 10%**

For the given sequence, find the closed formula $a_n = mn + b$

4, 6, 8, 10, 12

Question 2 **0 1 2 3 4 10%**

For the given sequence, find the recursive formula $a_1 = ?, a_n = m \cdot a_{n-1} + b$

2, 6, 14, 30, 62

Question 3 **0 1 2 3 4 10%**

Evaluate the following summation $\sum_{k=1}^{5} (4k+2)$

Sum result:

Chapter 1.3: Truthtellers, liars, and propositional logic

Question 4 ¶ **0 1 2 3 4 15%**

Create a truth table for the following expression. $(p \wedge q) \vee (p \wedge \neg r)$

p	q	r
T	T	T
T	T	F
T	F	T
T	F	F
F	T	T
F	T	F
F	F	T
F	F	F

.

.

Question 5 ¶ **0 1 2 3 4 10%**

Given three propositional variables **p**, **q**, and **r**, write a compound statement that will meet the following criteria. Use parenthesis to explicitly define the order of operation.

a. p and q are true, but not r.

b. p and one other statement are true, but not all three.

c. all three statements are true, or just one is, but not any combination of two.

Question 6 9 **0 1 2 3 4 15%**

Translate the following statements into propositional logic using the given variables.

D: We can dance
S: We can sing
L: We can leave your friends behind
F: Your friends dance
M: Your friends are friends of mine

a. We can dance and sing.

b. We can dance and we can leave your friends behind.

c. Your friends don’t dance, and your friends are not friends of mine.

d. We can dance and sing, or, we can dance and your friends dance.

e. We can dance or we can sing, and we can’t leave your friends behind.

f. Either we can dance or we can sing, but not both.

g. We cannot dance and we cannot sing, but your friends are friends of mine.

Chapter 1.4: Predicates

Question 7 ٩ **0 1 2 3 4 5%**

Given the following predicate, define a domain that makes the quantified statement either true or false.

a. *P(n)* is the predicate "*n* ends with the number 5".
Quantified statement: $\forall n \in D, P(n)$ is true.

D = { }

b. *Q(n)* is the predicate "*n* is divisible by 4".
Quantified statement: $\forall n \in D, Q(n)$ is false.

D = { }

Question 8 ٩ **0 1 2 3 4 10%**

a. Translate the following statement into a quantified statement using predicate logic.
"For every element *x* that is a member of the domain *D*, *x* is even.", D = { 2, 3, 4, 5, 6 }.

b. Write the negation of the statement from (a). Simplify so that the negation sign ¬ is not present.

c. Which statement is true?

Chapter 1.5: Implications

Question 9	**0**	**1**	**2**	**3**	**4**	**10%**

a. Translate the following into quantified predicate logic. Define your predicates.
"There exists an integer *x* such that if *x* ends in a 4, then *x* is even."

b. Write the negation of the statement from (a). Simplify so that the negation sign ¬ is not present.

c. Which statement is true?

Question 10	**0**	**1**	**2**	**3**	**4**	**5%**

For the following statement, find the contrapositive, converse, and inverse. Write in English, not symbolic logic. *"if you collect a green mushroom, then you get an extra life."*

a. Contrapositive:

b. Converse:

c. Inverse:

Question 11 ۹ **0 1 2 3 4 10%**

Let *D* be the domain of all people. Given the following predicates, translate the following English statements into logical statements, using $\neg, \wedge, \vee, \rightarrow, \exists, \forall$. Make sure to use $\forall$ or $\exists$ for each.

R(x) is “x is a rich man”

W(x) is “x has to work hard”

B(x) is “x builds a big tall house”

C(x) is “x fills his yard with chicks, turkeys, and geese”

a. For all people *x*, if *x* is a rich man, then *x* wouldn’t have to work hard.

b. There exists a person *x* that is a rich man, and who also has to work hard.

c. For all people *x*, if *x* has chickens, turkeys, and geese in his yard, then *x* is a rich man.

d. For all people *x*, if *x* has to work hard, then either *x* builds a big tall house or *x* fills his yard with chickens, turkeys, and geese.