Term: Fall 2023

Instructor: Patricia Wrean

Name: Solution Set

MATH 156-X01
Test 1, Version A

Total = $\frac{\quad}{25}$

- **All of the work on this test must be your own.**
- You may use a scientific calculator. You may not use a calculator with graphing capability or a smartphone app. You may not share calculators between students.

GOOD LUCK!

1. (8 points) Convert the following numbers into the indicated base. Give exact answers (do not round) and show your work.

(a) 56073_8 to decimal

23611 (or 23611_{10})

$56073_8 = 5\times8^4 + 6\times8^3 + 0 + 7\times8^1 + 3\times8^0$

$= 20480 + 3072 + 0 + 56 + 3$ ← can skip this step

$= 23611$

2

(b) 14.92 to base 5

24.43_5

	Q	R
$14 \div 5$	2	4 ↑
$2 \div 5$	0	2

	int	non-int
$0.92\times5 =$	4	$+ 0.6$
$0.6\times5 =$	3 ↓	$+ 0$

4

(c) $BF.31_{16}$ to octal

277.142_8

$BF.31_{16} = 1011\ 1111.0011\ 0001_2$

$= 277.142_2$

2

2. (3 points) Convert 0.18 to hexadecimal. Give an exact answer. Show your work.

$0.2\overline{E147A}_{16}$

$0.18 \times 16 = 2 + 0.88$

$0.88 \times 16 = 14 \to E + 0.08$

$0.08 \times 16 = 1 + 0.28$

$0.28 \times 16 = 4 + 0.48$

$0.48 \times 16 = 7 + 0.68$

$0.68 \times 16 = 10 \to A + 0.88$

(-½) no base

(-1) incorrect repeater bar

(-1) no repeater bar

(-½) if wrote Q + R instead of int/non-int

3. (1 point) Consider the number 17_{16}. Is it a legal number in hexadecimal? Explain briefly.

yes, 1 and 7 are both legal digits in hexadecimal

(in fact, $17_{16} = 1 \times 16^1 + 7 \times 16^0 = 16 + 7 = 23_{10}$)

4. (3 points) Answer the questions given the following situations with "Yes", "No", or "Maybe".

   (a) Zack programs in Java or Python. Does he program in Python? Yes / No / Maybe

   (b) Chedo programs in Java. Does he program in Java or Python? Yes / No / Maybe

   (c) Lynda programs in Java but not Python. Does she program in Java?

   Yes / No / Maybe

5. (3 points) Let p denote "Gord likes cocoa", q denote "Leah likes cocoa", and r = "Leah likes tea". Rewrite the following English sentences in terms of logical symbols (i.e. $p \wedge q$, $p \vee q$). Do not simplify!

   (a) Leah likes cocoa but Gord doesn't. $q \wedge \sim p$

   (b) It's not true that Leah doesn't like cocoa or doesn't like tea. $\sim(\sim q \vee \sim r)$

   (c) Leah likes tea or doesn't like cocoa but not both. $r \oplus \sim q$

6. (3 points) Circle all statements below which are the negation of the statement "All of the doors are locked."

   (a) One of the doors is unlocked.

   (b) All of the doors are unlocked.

   (c) Not all of the doors are locked.

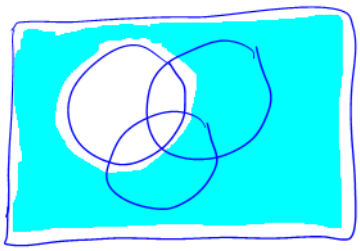
   (d) Some of the doors are unlocked.*

   (e) At least one of the doors is unlocked.

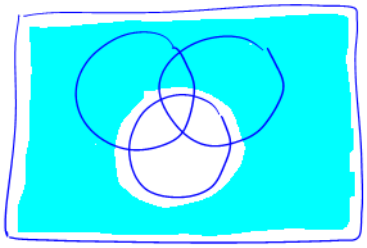
(1) c
(1) e
(1) not choosing anything else

* there is a bit of controversy in the Math dept about the use of "some" so I accepted both circled and uncircled as correct here

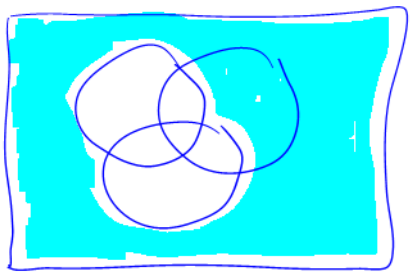
7. (4 points) Represent $\sim(q \vee \sim p \wedge \sim r)$ on the following Venn diagram by shading in the appropriate regions. Show intermediate steps on separate sketches and label them clearly to get full credit.



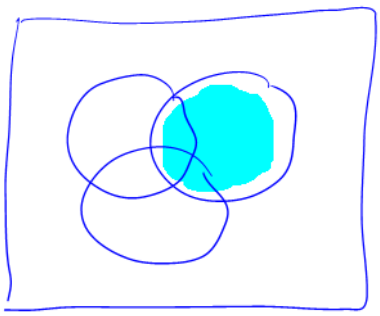
~p



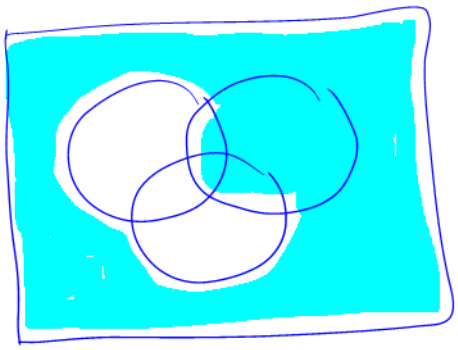
~r



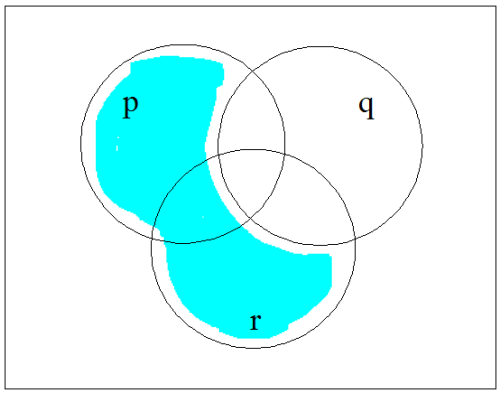
~p ∧ ~r



q



q ∨ ~p ∧ ~r



~(q ∨ ~p ∧ ~r)

(-1) per mistake for max of (-2) per diagram

(-3) no intermediate sketches