MATH 156
Test 1, Version B

Total = $\overline{25}$

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

   (a) 31201_4 to decimal $865 \ (\text{or } 865_{10})$

$$31201_4 = 3 \times 4^4 + 1 \times 4^3 + 2 \times 4^2 + 0 + 1 \times 4^0$$
$$= 768 + 64 + 32 + 0 + 1$$
$$= 865$$

   (b) $7A.39_{16}$ to octal 172.162_8

$$7A.39_{16} = 0\,|\,1\,1\,1 \quad 1\,0\,1\,0\,.\,0\,0\,1\,|\,1 \quad 1\,0\,0\,1\,^0_2$$
$$= 172.162_8$$

   (c) 0.28 to hexadecimal $0.\overline{47AE1}_{16}$

	int	non-int
$(0.28) \times 16 =$	4	+ 0.48
$0.48 \times 16 =$	7	+ 0.68
$0.68 \times 16 =$	$\cancel{10}$ A	+ 0.88
$0.88 \times 16 =$	$\cancel{14}$ E	+ 0.08
$0.08 \times 16 =$	1	+ (0.28)

2. (4 points) Convert 50.6875 to base 8. Give an exact answer (do not round) and show your work.

$$\underline{\hspace{2cm} 62.54_8 \hspace{1cm}}$$

$$
\begin{array}{r|cc}
 & Q & R \\
\hline
50 \div 8 & 6 & 2 \\
6 \div 8 & 0 & 6
\end{array} \uparrow
$$

$$
\begin{array}{l}
\overset{\text{int}}{} \qquad \overset{\text{non-int}}{} \\
0.6875 \times 8 = \boxed{5} + 0.5 \\
0.5 \times 8 = \boxed{4} + 0
\end{array}
$$

3. (1 point) Consider the number $FACE_{15}$. Is this a legal number in base 15? Explain briefly.

base 15 has digits 0-9 and A-E. F is not in the allowed digits, so

$$\boxed{\text{No}}$$

4. (3 points) For the pair of sentences below, is the second the negation of the first? Answer by selecting the correct choice.

       Not all ≠ None

(a) Every plant is blooming. No plant is blooming.   Yes / **No**

(b) There are no bugs in this program. There are one or more bugs in this program.

                                                      Yes / No

(c) Less than four cars are hybrids. At least four cars are hybrids.   **Yes** / No

             $< x$ $x \geq 4$

5. (3 points) Answer the questions given the following situations with "Yes", "No", or "Maybe".

(a) Priya likes pop music. Does she like pop and jazz music?   Yes / No / **Maybe**

(b) Kirsten does not like pop music. Does she like pop or jazz music? Yes / No / **Maybe**

(c) Rinka likes classical and pop music. Does she like classical music? **Yes** / No / Maybe

6. (3 points) Let p denote "This dish needs pepper." and q denote "This dish needs salt". Rewrite the following English sentences in terms of logical symbols (i.e. $p \wedge q$, $p \vee q$). Do not simplify!

(a) This dish needs salt or pepper. $q \vee p$

(b) This dish needs salt but not pepper. $q \wedge \sim p$

(c) It is not true that this dish needs both salt and pepper. $\sim (q \wedge p)$

7. (4 points) Represent $(p \lor r) \land (\sim p \land \sim q)$ 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.

   Note: if you want, you can use the blank Venn diagrams on the next pages. Just make sure to label them clearly.

$\sim p$

$\sim q$

$\sim p \land \sim q$

p

r

$p \lor r$

p   q

r

$(p \lor r) \land (\sim p \land \sim q)$