

MATH 156 REVIEW PROBLEMS

1. Convert 103_4 to decimal.
2. Convert $EC9A_{16}$ to decimal.
3. Convert $AA.CC_{16}$ to decimal. Round your answer to three decimal places.
4. a) Convert 437_{10} to octal.
b) Convert 0.953125_{10} to base 4.
5. Convert 172.09375_{10} to hexadecimal.
6. Convert 113.3_{10} to base 5.
7. Convert 0.05_{10} to binary.
8. Convert:
 - a) 26.76_8 to binary
 - b) 111101.101011_2 to hexadecimal
 - c) $CE.73_{16}$ to octal
9. State YES, NO or MAYBE.
 - a) q is true. Is $\sim q$ true?
 - b) q is true. Is $p \vee q$ true?
 - c) q is true. Is $p \wedge q$ true?
 - d) $p \wedge q$ is true. Is p true?
 - e) $p \vee q$ is true. Is p true?
 - f) $p \oplus q$ is true. Is $p \vee q$ true?
10. A running group has four members. Are the following sentences negations of one another?
 - a) At least one member showed up for the run. No members showed up for the run.
 - b) At least one member didn't show up for the run. All members showed up for the run.
 - c) All members showed up for the run. No members showed up for the run.

- d) At least two members showed up for the run. At most two members showed up for the run.
- e) At least two members showed up for the run. Fewer than two members showed up for the run.

11. Let m = "Matt was at the party." Let n = "Nina was at the party." Translate the following to logical symbols:

- a) Either Nina was at the party and Matt was not or Matt was at the party.
 b) Nina was at the party and either Matt was at the party or Nina was not.

12. Draw the Venn diagram for $p \vee (q \wedge \sim r)$.

13. Build the truth table for $(\sim p \wedge q) \vee r$.

14. Is $(p \wedge \sim q) \vee q$ logically equivalent to $p \vee q$? Justify your answer by building a truth table.

15. Draw the gate representation for $\overline{\overline{A} \overline{B}} + C$.

16. Simplify using a truth table:

$$(A + \overline{B})(A + B)$$

17. Use the laws of logic to show that $((q \wedge p) \wedge \sim (p \wedge q)) \vee (p \wedge p)$ is logically equivalent to p .

18. Use the laws of logic to simplify $(BA + \overline{C} \overline{B} C B) + \overline{\overline{A} \overline{B}}$.

19. Use the laws of logic to simplify $\sim (p \vee q) \wedge (q \vee (q \wedge \sim r))$.

20. Use the laws of logic to show that $\overline{\overline{A} \overline{B}}(\overline{A} + \overline{B}) + \overline{A} C$ is logically equivalent to \overline{A} .

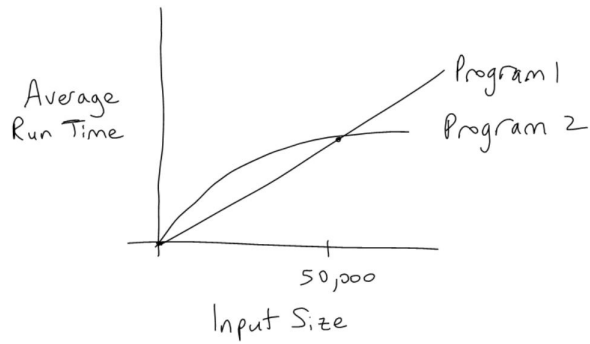
21. The following is true: "If Bak is out then his keys are in his pocket."

Answer YES, NO or MAYBE.

- a) Bak's keys are in his pocket. Is he out?
 b) Bak is out. Are his keys in his pocket?
 c) Bak's keys are not in his pocket. Is he out?
 d) Bak is not out. Are his keys in his pocket?

22. Original statement: "If alks ame then muvs mal."
 Is the statement the converse, inverse or contrapositive of the original statement? Is it logically equivalent to the original statement?
- If muvs mal then alks ame.
 - If muvs don't mal then alks don't ame.
 - If alks don't ame then muvs don't mal.
23. The following is true: "Yeks are yellow if and only if boks are not blue."
- Boks are blue. Are yeks yellow?
 - Boks are not blue. Are yeks yellow?
 - Yeks are not yellow. Are boks blue?
 - Yeks are yellow. Are boks blue?
24. a) Write a general formula for: $\frac{2}{1}, \frac{3}{2}, \frac{4}{3}, \dots, \frac{10}{9}$.
 b) Write a recursive formula for: 4, 1, -2, ...
25. Write in sigma notation: $\frac{2}{5} + \frac{2}{6} + \frac{2}{7} + \dots + \frac{2}{13}$.
26. Find a general formula and simplify it: 23, 31, 39, ...
27. An arithmetic sequence has $a_1 = 19$ and $d = 6$.
- Find a_{35} .
 - Which term equals 1243?
28. Evaluate $\sum_{j=12}^{59} (7j - 2)$.
29. Give a recursive formula for: 4, -8, 16, -32, ...
30. Calculate a_{12} , assuming that the first term is a_1 :
 $3^{16}, 3^{15}, 3^{14}, \dots$
31. Consider $-6 + 3 - \frac{3}{2} + \frac{3}{4} - \dots$
- Calculate S_8 .
 - Calculate S_∞ , if it exists.

32. Consider the following graph:



- Which program performs best for very small input sizes?
- Which program performs best for very large input sizes?
- What input size is the breakeven point between the two programs?

33. Give the order of the following expressions:

- $8n + 1$
- $8n^2 + 10000$
- 100^2
- $3n^2 + 4n!$
- $3n^2 + 4(2^n)$
- $4(2^n) + 3n!$
- $100 + 3 \log n$
- $6n(20 + 3 \log n)$
- $40n + 3 \log n$

34. Write the following from largest to smallest:

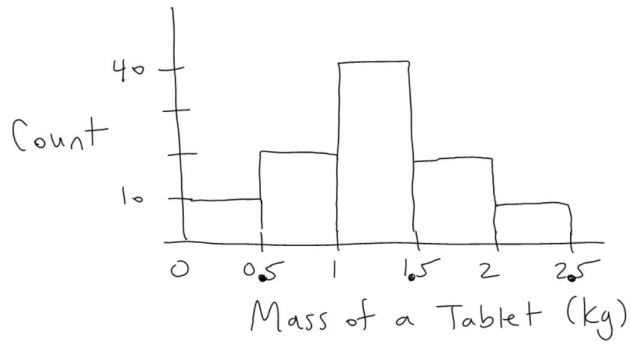
$O(\log n)$, $O(n \log n)$, $O(n^2)$, $O(n!)$, $O(1)$, $O(2^n)$, $O(n)$.

35. A mobile game company collects the following data on its users: country, number of logins, time spent playing.

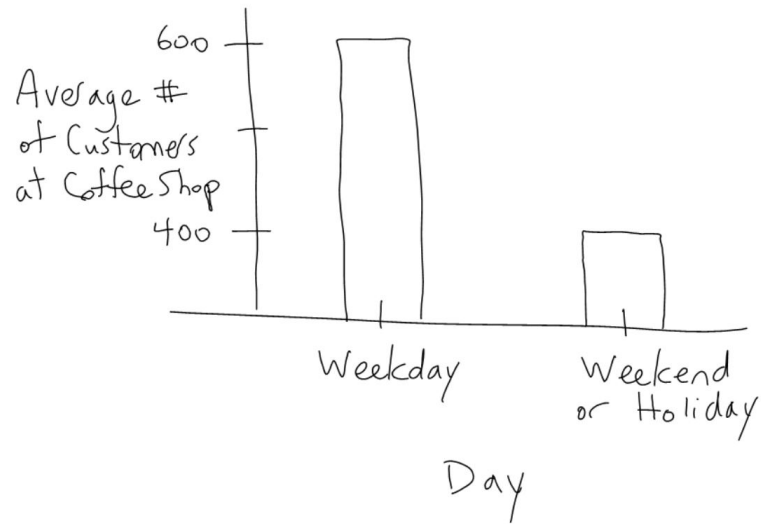
- State the experimental unit.
- List the variables and indicate what type of variable they are.

36. Consider the histogram below.

- Describe the shape.
- List any outliers.
- State the mode or modes.
- What percentage of masses were over 1.5 kg?



37. State the primary problem with the following:



38. An ordered sample has measurements: 102, 105, 110, x , y , z .
Find x , y and z if:
the median of the sample is 111,
the mean of the sample is 110.5, and
the range of the sample is 19.
39. What happens to a data set's standard deviation if:
a) every measurement is multiplied by 10?
b) every measurement is increased by 10?
40. The mean of a data set is 30 and the standard deviation is 5. What percentage of measurements fall between 7.5 and 52.5?
41. Grades on a midterm were mound-shaped, with a mean of 70 and a standard deviation of 6. What percentage of grades were less than 58?
42. A student scored 60 on the math final exam, which had a mean of 70 and a standard deviation of 5. The student scored 66 on the physics final exam, which had a mean of 72 and a standard deviation of 2. In which course did the student do better relative to the class?
43. A laptop manufacturer wants to select some newly-built laptops for quality control. Name each sampling method:
a) Every 10th laptop coming off the manufacturing line is selected, starting with the 5th laptop.
b) Suppose the laptop manufacturer has 30 different manufacturing lines. A few manufacturing lines are randomly chosen and all the laptops from these lines are selected.
c) A random number generator is used to select laptops.
d) Suppose the laptops are divided into two types: lightweight and heavy-duty. Some of the lightweight laptops are randomly selected and some of the heavy-duty laptops are randomly selected.

44. Managers at a software company want to know if coders are more productive if they sit at an individual desk rather than a long table. State whether the study is observational or experimental.

a) All coders completed a survey on their seating arrangement last month. Managers then analyzed the survey responses and the productivity of all coders.

b) Coders are randomly divided into two teams. One team has their workstations at individual desks and the other team has their workstations at long tables. After two weeks the productivity of the two teams is compared.

45. State the primary problem with the following statistical statement:
Based on polling all Math 156 students, we conclude that 90% of Camosun students like coding.

46. How many 4-symbol passwords are there if:

a) passwords are case-sensitive and only contain letters?

b) passwords are case-sensitive, only contain letters, and must contain at least one upper-case letter?

47. How many 4-digit PINs (consisting entirely of numbers):

a) start with 21?

b) end with 7?

c) start with 21 and end with 7?

d) start with 21 or end with 7?

48. A large class is polled on whether they have at least one pet and whether they have at least one sibling.

	Sibling	No Sibling
Pet	41	32
No Pet	119	8

Find the probability that a randomly-chosen student:

a) has at least one sibling

b) does not have at least one pet

c) has at least one sibling and at least one pet

d) has at least one sibling or at least one pet

49. The amount of caffeine in a regular cup of coffee is normally distributed with a mean of 100mg and a standard deviation of 10mg. State whether the probability is 0%, strictly between 0% and 50%, or at least 50%.

- a) The probability that a randomly-chosen regular cup of coffee contains less than 108mg of caffeine
- b) The probability that a randomly-chosen regular cup of coffee contains exactly 90mg of caffeine
- c) The probability that a randomly-chosen regular cup of coffee contains between 105mg and 125mg of caffeine

50. Prices of 40 randomly-chosen statistics textbooks had a mean of \$191 and a standard deviation of \$22.

- a) Find a 95% confidence interval for the average price of a statistics textbook.
- b) What would happen to the confidence interval if the confidence level were increased to 99%?