Review for Exam 2

1. In each part of the following problem, ESTIMATE to determine whether the first quantity is less than or greater than the second. EXPLAIN briefly your steps.

(a) $161 \cdot 201$; 32,000 **(b)** 29,331÷28; 1,000 **(c)** 29,331÷31; 1,000
(d) $334 \cdot 301$; 100,000 **(e)** $8387 \div 1777$; 5 **(f)** $998 \cdot 1002$; 1000^2

2. Use front end estimation to approximate each of the following sums to the nearest dollar. Explain your work.

\$3.41	\$2.15	\$11.04	\$3.41	\$2.15
\$2.63	\$1.17	\$0.31	\$8.23	\$0.20
\$0.49	\$3.67	\$2.36	\$3.21	\$10.74
\$1.13	\$0.17	\$0.11	\$3.21	\$0.33
\$0.63	\$2.88	\$0.31	\$1.77	\$12.20
\$1.11	\$7.97	\$2.22	\$1.23	\$10.00
+ \$0.12	+ \$4.77	+ \$33.11	+ \$8.88	+ \$42.54

3. Here are snowfall amounts in inches, for each of the 12 weeks of winter, in Frostbite Falls, Minnesota: 9, 9, 32, 31, 28, 11, 10, 11, 30, 8, 12, 11. Use clustering to estimate the total winter snowfall in Frostbite Falls.

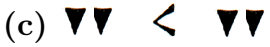
4. Evaluate each of the following Roman numerals:
(a) MCMLXVII **(b)** MMMCDXLIX **(c)** CMXCIX **(d)** MMMCCCXXXIII

5. Express each of the following as a Roman numeral:
(a) 3097 **(b)** 949 **(c)** 494 **(d)** 2222

6. Evaluate each of the following Mayan numerals:

(a)  **(b)**  **(c)**  **(d)** 

7. Express each of the following as a Mayan numeral:
(a) 20 **(b)** 361 **(c)** 3666 (hint: $3666 = 10 \cdot 18 \cdot 20 + 3 \cdot 20 + 6$)
(d) 252 **(e)** 129 **(f)** 7313 (hint: $7313 = 1 \cdot 20 \cdot 18 \cdot 20 + 5 \cdot 20 + 13$)

8. Evaluate each of the following Babylonian numerals:
(a)  **(b)**  **(c)** 

9. Express each of the following as a Babylonian numeral:
(a) 20 **(b)** 361 **(c)** 3666 (hint: $3666 = 60^2 + 60 + 6$)
(d) 252 **(e)** 129 **(f)** 7313 (hint: $7313 = 2 \cdot 60^2 + 60 + 53$)

10. Convert each of the following numbers to base ten.
(a) 20_{seven} **(b)** 100110_{two} **(c)** 101_{nine} **(d)** $\text{EE}_{\text{twelve}}$

11. Convert each of the following base ten numbers to the indicated base.
(a) 40_{ten}: base two **(b)** 1110_{ten}: base five **(c)** 567_{ten}: base four **(d)** 242_{ten}: base twelve

12. Write down, in the same base as is given, the number that's one larger than each of the following:
(a) 99999_{ten} **(b)** 111111_{two} **(c)** 44444_{five} **(d)** $\text{EEEEE}_{\text{twelve}}$

13. The odometer on your Math 1110 instructor's car records mileage in base six. (Well OK not *REALLY*, but let's pretend.) What did the odometer read just before it read 3,000,000? At that point (just before 3,000,000), how many miles (in base ten) had this car traveled? Hint: $3 \cdot 6^6 = 139968$.

14. Suppose we want to estimate $x \div y$. If we round x down and y up, will our estimate be lower than the actual value, or higher, or might it be either?

15. Perform each of the following additions or subtractions.

$$\begin{array}{rrrrr} 1101_{\text{two}} & 737_{\text{nine}} & 222_{\text{four}} & 123_{\text{four}} & 90\,\text{TE}_{\text{twelve}} \\ +\ \underline{101_{\text{two}}} & -\ \underline{448_{\text{nine}}} & +\ \underline{333_{\text{four}}} & -\ \underline{33_{\text{four}}} & +\ \underline{\text{TE}\,90_{\text{twelve}}} \end{array}$$

16. Compute each of the following.
(a) $(^-2)^8 \div (^-2)^3$ **(b)** $^-2^4$ **(c)** $(^-2)^4$ **(d)** $(^-1)^{10101}$

17. Evaluate each of the following, or explain why it can't be evaluated.
(a) $(^-10 \div 5)(^-4) \div (^-2)$ **(b)** $(^-10 \div 5)(^-4) \div (^-2 - (^-2))$
(c) $|^-5| \cdot |^-12| - |^-2|$ **(d)** $(^-10 \div^- 5)(^-4) \div (2 - (^-2))$

18. Evaluate each sum or product by first grouping together compatible numbers.
(a) $39 + 41 + 22 + 12 + 61 + 59 + 78 + 4$ **(b)** $2 \cdot 3 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 \cdot 7 \cdot 5 \cdot 5$

19. Evaluate each sum or product by trading off.
(a) $1175 + 2030$ **(b)** $94 + 2706$ **(c)** $16 \cdot 18$ **(d)** $12 \cdot 85$

20. Answer each of the following without actually performing the division. Explain your answers in all cases.
(a) Is 23,231 divisible by 23? **(b)** Is 17!+3 divisible by 4?
(c) Is 380,019 divisible by 19? **(d)** Suppose n is even. Is $3n + 5$ divisible by 6?

21. Use divisibility tests to determine whether each of the following numbers is divisible by $3, 4, 6, 9, 11$.
(a) 20,394 **(b)** 362,880 **(c)** 1,393,194 **(d)** 111,111,111 **(e)** 1,111,111,111

22. **(a)** If $a \not| b$ and $a \not| c$, is it necessarily true that $a \not| (b + c)$? Explain.
(b) If $a|c$ and $b|c$, is it always true that $ab|c$? Explain.

23. Fill in the blank in the number 987,6____4 so that the result is divisible by:
(a) 4 **(b)** 6 **(c)** 9 **(d)** 11

24. Using divisibility tests only, explain why 9,790 is divisible by: **(a)** 2; **(b)** 5; **(c)** 11; **(d)** 110.