Midterm TMath 171 Winter 2026

As a reminder, you are welcome to use a non-internet accessing calculator (which includes Desmos Test Mode) and one 1-sided 8.5 in by 11 in sheet of notes.

1. [6] Let a, b, and c be whole numbers. Are the following statement always true, sometimes true, or never true? Briefly justify your answer.

   (a) (§3.4 #34) $a^c \times a^b = a^{cb}$

   (b) (ExtraPractice3.2 #17) $a - b = b - a$

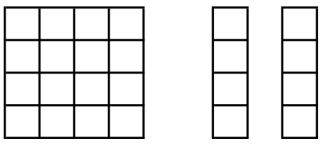
2. At Joe's Cafe 1 cup of coffee and 3 doughnuts cost \$6.60, and 2 cups of coffee and 2 doughnuts cost \$7.20.

   (a) [1] (Quiz1#2) What kind of strategy (eg, drawing, tables, clever guessing & checking, models, work backwards, etc) might you try to figure out the cost of 1 cup of coffee?

   (b) [3] (ExtraPractice §1.1#23) Use your strategy (and others if you need it) to find the cost of 1 cup of coffee.

3. Consider the number in the base pieces below with 1 flat, 2 longs, and 0 units.

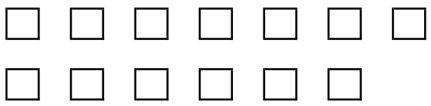
   (a) [2] (Quiz2#2) Write the number of units in positional notation for the given base.



   (b) [2] (NumberSystemActivity #3) Determine the total number of units, reporting in the Hindu-Arabic number system.

4. (§3.1 #12) Consider the number of units shown below.

   (a) [2] Sketch the minimum number of base pieces for base five to represent the set of units shown.



   (b) [1] Write the number of units in positional notation for base five.

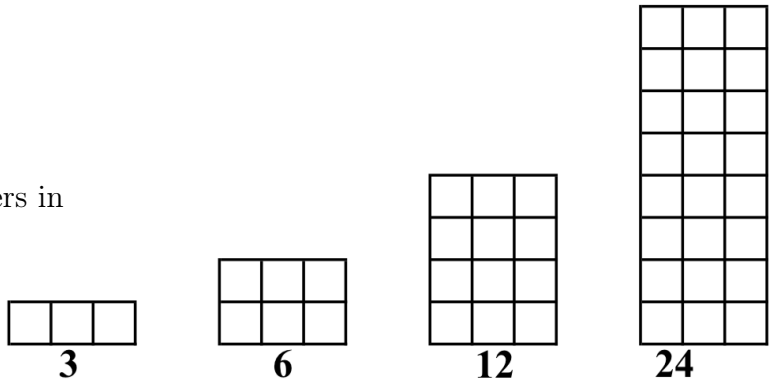
   (c) [1] Write the number of units in a different number system of your choosing (eg. Egyptian, Babylonian, etc)

5. [4] (AddActivity #4) An equation is given below in base five. Replace the suit symbols with the digits 2, 3, and 4 to make a true equation.

$$1\clubsuit_{five} + \heartsuit 3_{five} = \spadesuit 1_{five}$$

6. (PatternActivity#4) Consider the sequence of numbers illustrated below.

   (a) [3] Find the next two numbers in the sequence.



   (b) [2] Identify if the sequence is recursive, arithmetic, geometric, or none of the above. Justify your answer.

   (c) [2] Write down an expression for the 20th number in the sequence.

7. Show work and compute (you do not need to explain it to a 4th grader):

   (a) [2] (§3.2 #8) $213_{\text{four}} - 31_{\text{four}}$

   (b) [2] (DivisionActivity #3) $123_{\text{four}} \div 3_{\text{four}}$

8. [3] Find a number that:

   - is not written in base 10,
   - has 3 digits, and
   - is less than 50 units.

9. Grade the work that follows. The work may be correct or incorrect. If correct, briefly justify why. If incorrect, find the error(s) & try to detect the reason for the error. You do *not* need to provide the correct computation if there is an error.

   (a) [3] (§3.2 #22)

$$\begin{array}{rr} & 95 \\ + & 37 \\ \hline & 12 \\ + & 120 \\ \hline & 132 \end{array}$$

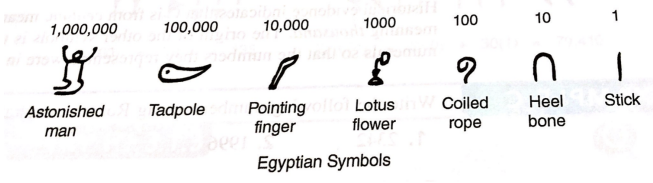
   (b) [3] (ExtraPractice §3.3 #9)

$$\begin{array}{rr} & 24 \\ \times & 38 \\ \hline & 32 \\ & 160 \\ & 120 \\ + & 600 \\ \hline & 912 \end{array}$$

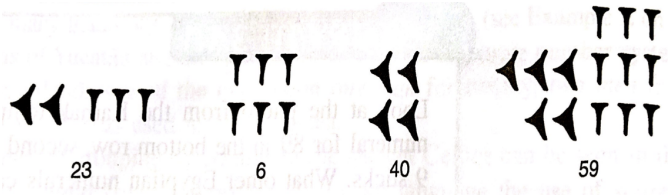
   (c) [3] (Quiz3 #3)

$$6^2 - 2^4 + 5 = 36 - 16 + 5 = 36 - 21 = 15$$

10. [5] (§3.3 #6) Introduce how to multiply numbers as you would to an elementary school student who had forgotten what multiplication is. Provide a conceptual explanation and not just a procedural explanation. Use the example 124×3 to help illustrate.



Egyptian Symbols



Babylonian