

Math 190  
Fall 2019  
Dr. Lily Yen

# Quiz 1

Show all your work

Family name: \_\_\_\_\_

Given name: \_\_\_\_\_

Student number: \_\_\_\_\_

Score: \_\_\_\_/20

**No calculator on this quiz.**

**Problem 1:** Find the value of  $12 + 6 \div 3 \times 2 - 1$

$$12 + 6 \div 3 \times 2 - 1 = 12 + 2 \times 2 - 1 = 12 + 4 - 1 = 16 - 1 = 15.$$

Score: /2

**Problem 2:** Estimate  $299 \times 301$  to nearest ten thousands.

$$299 \times 301 \approx 300 \times 300 = 90\,000. \text{ Actually, } 299 \times 301 = 89\,999.$$

Score: /2

**Problem 3:** A certain number is multiplied by 8. This result is then increased by 8. The final answer is 88. Find the original number

Before increasing by 8, you had 80, so before multiplying by 8, you had 10.

Alternatively, if  $8x + 8 = 88$ , then  $8x = 80$ , so  $x = 10$ .

Score: /2

**Problem 4:** The sum of the whole numbers from 1 to 10 inclusive is 55. Find the value of  $3 + 6 + 9 + 12 + 15 + 18 + 21 + 24 + 27 + 30$ .

$$3 + 6 + 9 + 12 + 15 + 18 + 21 + 24 + 27 + 30 = 3 \times (1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10) = 3 \times 55 = 165$$

Score: /3

**Problem 5:** When the digits  $\{6, 1, 7, 4\}$  are arranged to form the greatest and the least possible four-digit numbers and these are subtracted from one another, the answer is 6174. This is also true for the digits  $\{3, 6, 9, 4\}$ , for the digits  $\{2, 3, 5, 8\}$ , for the digits  $\{9, 6, 3, 8\}$ , and for the digits  $\{2, 5, 7, 8\}$ .

$$\begin{array}{r} 7641 \\ - 1467 \\ \hline 6174 \end{array} \quad \begin{array}{r} 9643 \\ - 3469 \\ \hline 6174 \end{array} \quad \begin{array}{r} 8532 \\ - 2358 \\ \hline 6174 \end{array}$$
$$\begin{array}{r} 9863 \\ - 3689 \\ \hline 6174 \end{array} \quad \begin{array}{r} 8752 \\ - 2578 \\ \hline 6174 \end{array}$$

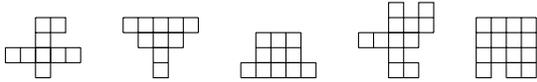
Is this always true with any set of four distinct digits  $\{a, b, c, d\}$ ? If yes, explain. If no, provide a counter example.

No. For example  $5432 - 2345 = 3087$ .

Score: /3

/12

**Problem 6:** Triominoes are made of three squares and come in two shapes,  $\square\square\square$  and  $\begin{smallmatrix} \square \\ \square\square \end{smallmatrix}$ . If you had a box of triominoes, with several of each shape, which of these patterns could you make? Provide reasons for each shape.



In the first figure it is not possible to make the horizontal bar of length 5. The second and third figures consist of 10 and 11 squares, respectively, and can therefore not be covered by *triominoes*. Beginning from the bottom, the fourth figure must be

covered thus , but the remaining squares cannot be covered with triominoes.

The last figure can be covered thus: .

Score: /3

**Problem 7:** Which of i)  $\frac{7}{3} + \frac{1}{4}$ , ii)  $\frac{7}{9} + \frac{7}{3}$ , iii)  $\frac{4}{7} + \frac{3}{5}$ , iv)  $\frac{1}{4} + \frac{1}{3}$ , or v)  $\frac{1}{2} + \frac{1}{6}$  is equal to  $\frac{7}{12}$ ?

Sums i) and ii) are clearly larger than 1 (since one of the summands is larger than 1), while  $\frac{7}{12} < 1$ . The denominator of sum iii) must be (a divisor of) 35. That leaves sum v) which is equal to  $\frac{2}{3}$  and sum iv) which is the correct answer.

Score: /2

**Problem 8:** A ball which bounces straight up and down, falls from a height of 16 m. Each time it bounces up to half the height from which it just fell. Find the total distance the ball has travelled when the top of its bounce is 1 m from the floor.

$$16\text{ m} + 2 \times 8\text{ m} + 2 \times 4\text{ m} + 2 \times 2\text{ m} + 1\text{ m} = 45\text{ m}$$

Score: /3