1. Suppose you buy lunch for the class. You have exactly enough money to purchase 20 salads or 15 sandwiches (i.e. the cost of 20 salads = cost of 15 sandwiches). The class wants 12 sandwiches total. How many salads can you buy (in addition to the sandwiches)?

2. State Polya's steps for problem-solving.

3. List ALL the ways you can make change for a $50 bill, using $5, $10 and $20 bills.

1. The members of Ms. Golett's class are standing in a circle; they are evenly spaced and are numbered in order. The student with number 7 is standing directly across from the student with number 28. How many students are in the class?

2. The school population for a certain school is predicted to increase by 50 students per year for the next 10 years. If the current enrollment is 700 students, what will the enrollment be after 10 years?

3. Find the sum. 50 + 51 + 52 + 53 + ... + 120

4. Arrange 10 people such that there are five rows each containing four people.

1. Write 384 in Babylonian numerals.

2. Write 384 as a Mayan number.

3. Convert 453_6 to a base 10 number.

4. Convert 89 to a base 3 number.

Extra Credit: What is the set of whole numbers?

1. Find the number of elements in each of these sets (i.e. the cardinality of the set) as well as the total number of subsets of that set.
    (a) A = {3, 5, 7, 9, 10}

    n(A) = _____   # of total subsets = _____

    (b) B = $\{x \,|\, x = k^2 \,,\ k = 1, 2, 3, ..., 200\}$

    n(B) = _____   # of total subsets = _____

2. True or False: If false, explain why, or fix the statement so it's true, or give a counter-example that shows why it's false.

    (a) $\varnothing$ is a proper subset of every other non-empty set.
                                                    True   or   False   *(circle one)*

If false, explain, give counter-example or fix it: _____

_____

(b) $\emptyset = \{ \emptyset \}$

True   or   False   *(circle one)*

If false, explain, give counter-example or fix it: _____

_____

(c) $\{2\} \in \{2,3,4\}$

True   or   False   *(circle one)*

If false, explain, give counter-example or fix it: _____

_____

(d) {x, y, z} is equivalent to the set {1, 2, 3}.

True   or   False   *(circle one)*

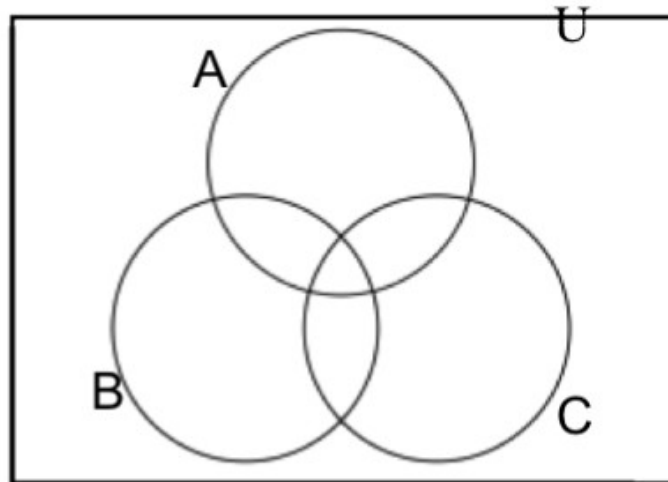If false, explain, give counter-example or fix it: _____

_____

(e) $\overline{A \cup B} = \overline{A} \cup \overline{B}$

True   or   False   *(circle one)*

If false, explain, give counter-example or fix it: _____

_____

3. Shade this, $(B \cup C) - A$, in the given Venn diagram.

4. A pollster interviewed 500 university seniors who owned credit cards. She reported that 240 owned Goldcard, 290 had Supercard, and 270 had Thriftcard. Of those seniors, the report said that 80 owned only a Goldcard and a Supercard, 70 owned only a Goldcard and a Thriftcard, 60 owned only a Supercard and Thriftcard, and 50 owned all three cards.

(a) Put all the information into this Venn diagram, where the number you put in each section represents the number of people in that category.
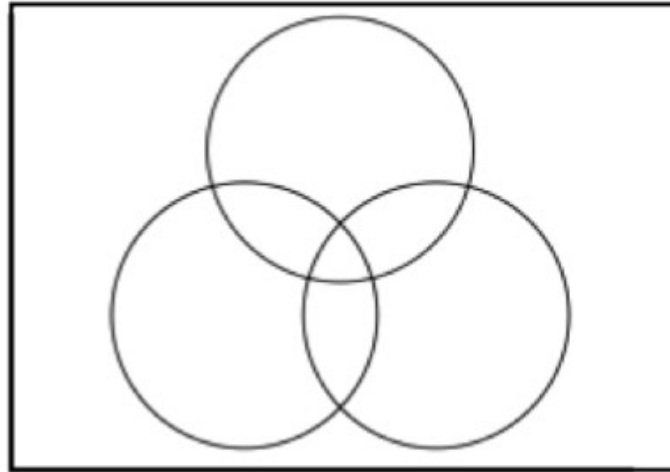
(b) When the report was submitted for publication in the local campus newspaper, the editor refused to publish it, claiming that the poll was not accurate. Was the editor right? Why or why not?

1. Explain whether the following sets are closed under (i) addition or (ii) subtraction.
    (a) {0, 1} = A

(i) _____

(ii) _____

    (b) {1, 3, 5, 7, 9, ...} = B

(i) _____

(ii) _____

2. For $15 - 8 = 7$
    (a) Create a word/story problem where the set model would be more appropriate and show how you'd show it with the set model.

    (b) Create a word/story problem where the measurement model would be more appropriate and show how you'd show it with the measurement model.

3. Jony subtracted $513 - 311$ by writing $5 - 3 = 2$ and $13 - 11 = 2$ and wrote 22 as the answer. Is this correct? If not, give the correct answer. And, how would you help this student?

4. A student was asked to add 4 + 18 + 9 + 11. The student wrote this:
        4 + 18 = 22 + 9 = 31 + 11 = 42
Is the student's work correct? If not, explain the error.

5. Perform these operations. Show your work. *For each problem, use a different algorithm and state the name of the algorithm you used.*
        (a) $3012_5 - 322_5$ = _____

        (b) $E08_{12} - 9_{12}$ = _____

        (c) $100001_2 + 11010_2$ = _____

        (d) $3325_6 + 345_6$ = _____

1. Explain whether the following sets are closed under (i) multiplication or (ii) division.
        (a) {0, 1} = A

(i) _____

(ii) _____

        (b) {1, 3, 5, 7, 9, ...} = B

(i) _____

(ii) _____

2. For $12 \div 3 = ?$
        (a) Create a word/story problem that would produce this question as a **partitive** model of division. Then compute the answer using a set model.

        (b) Create a word/story problem that would produce this question as a **measurement** model of division. Then compute the answer using a number line.

3. Haren says that he knows that 39(41) = 40(40) – 1. He also found that 49(51) = 50(50) – 1. He claims this pattern continues. Is he correct? Explain why or why not?

4. Simplify each of these expressions.

(a) $6^2 \cdot 3^2 \cdot 2^2$ (Write as one base to one power.)   (c) 0^0

(b) $4^8 \cdot 8^4 \cdot 32^2$ (Write as one base to one power.)   (d) $\dfrac{4}{0}$

5. Perform these operations. Show your work. *For each problem, use a different algorithm and state the name of the algorithm you used.*
        (a) $301_4 \cdot 11_4$ = _____

        (b) $E09_{12} \div 9_{12}$ = _____

        (c) $100001_2 \cdot 11010_2$ = _____

(d) $3555_6 \div 341_6$ = _____

1. Simplify each of these expressions. If the answer is undefined, explain why.

(a) $15^5 \cdot 3^4 \cdot 5^4$ (Write as one base to one power.)

(b) $8^5 \cdot 2^5 \cdot 16^2$ (Write as one base to one power.)

(c) 0^0

2. For $16 \div 3 = ?$
      (a) Create a word/story problem that would produce this question as a **partitive** model of division. Then compute the answer using a set model.

      (b) Create a word/story problem that would produce this question as a **measurement** model of division. Then compute the answer using a number line.

3. {3, 5, 6, 9, 12, 20} – {4, 5, 9, 12, 15} = _____

4. Use mental math strategies to evaluate these expressions. (Even though this is something you could to in your head, write out your steps.)

      (a) 45(61) + 49(45) = _____

      (b) 6284(5) = _____

      (c) $8200 \div 25$ = _____

      (d) 9539 + 701 = _____

      (e) 8706 - 87 = _____

5. **Estimate** the following calculations.

      (a) $4671(304) \approx$ _____

      (b) $98034 - 5689 \approx$ _____

1. (a) A student claims that a number is divisible by 24 if and only if it is divisible by both 6 and 4. Is this correct? Explain your answer.

(b) A student claims that a number is divisible by 24 if and only if it is divisible by both 8 and 3. Is this correct? Explain your answer. (And if your answer for part (b) is different than part (a), explain why that is.)

2. Justify each of the following, i.e. explain why each statement is correct.
         (a) 7 | 280

      (b) $15 | (2^4 \cdot 3^5 \cdot 5)$

      (c) 19 does not divide (3800 + 37) but does divide (3800 + 19)

3. Find the smallest natural number that is divisible by four different prime numbers.

4. Find the prime factorization of these numbers.
   (a) $8^4 \cdot 32^3$ (b) $2^2 \cdot 3^5 \cdot 7^{55} + 2^4 \cdot 3^4 \cdot 7^{55}$

5. Use the Venn Diagram to find the GCF and LCM of 75 and 36.

6. Use the Euclidean algorithm to find the GCF of 1575 and 1960.

7. Use the Layer Cake method to find the GCF and LCM of 45, 42, and 200. (You can leave your answer in factored form.)

1. Bill and Jeri both work at night. Bill has every sixth night off and Jeri has every ninth night off. They are both off work tonight. How many nights will it be before they are both off again?

2. I made 60 green bookmarks and 75 pink bookmarks. I want to make gift bags, such that each gift bag contains the same number of green bookmarks and the same number of pink bookmarks. And, I want to give out all the bookmarks I've made. What is the largest number of gift bags I can make this way? How many of each color bookmark will be in each gift bag?

3. (a) A student claims that a number is divisible by 20 if and only if it is divisible by both 5 and 4. Is this correct? Explain your answer.

(b) A student claims that a number is divisible by 20 if and only if it is divisible by both 2 and 10. Is this correct? Explain your answer. (And if your answer for part (b) is different than part (a), explain why that is.)

4. Simplify. (a) $|x| + x$ if $x < 0$ = _____

        (b) $|x| + x$ if $x \geq 0$ = _____

5. Use the set model to do these computations.
        (a) -3 + (-4)   (c) -3 − 4

        (b) -3 + 4   (d) -3 - (-4)

6. Use the number line to do these computations.
        (a) -3 + (-4)   (c) -3 − 4

        (b) -3 + 4   (d) -3 - (-4)

1. How would you read this expression correctly (write out the words).
            -(-5) - (-(-4)) - (-x)

2. Evaluate these expressions.
        (a) $(a \div b)b$ (assume b is not zero)
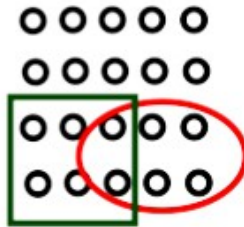
        (b) $(ab) \div b$ (assume b is not zero)

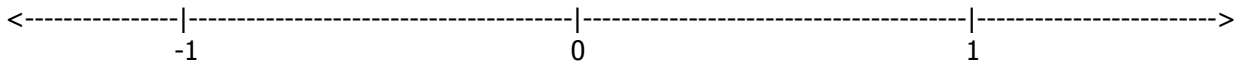   (c) $(-8 + 8) \div 8$

        (d) $(-23 - (-7)) \div 4$

        (e) $|-28| \div (2 \cdot |-7|)$

3. A student does not believe that -5 < -2. She argues that a debt of $5 is bigger, not smaller, than a debt of $2. Is she correct? How would you help her?

4. For this figure, represent each of the following as a fraction, in simplified form.

(a) The dots outside the oval region as a part of all the dots.

(b) The dots outside the rectangular region as a part of all the dots.

(c) The dots in the union of the rectangular and the oval regions as a part of all the dots.

(d) The dots inside the oval region but outside the rectangular region as a part of all the dots.

5. In each of two classes, 1/3 of the students wear glasses. Does each class have the same number of students who wear glasses? Explain your answer.

6. Order these numbers and put them on the number line.

$$\frac{3}{4}, \ \frac{9}{16}, \ \frac{5}{8}, \ \frac{2}{3}, \ -\frac{3}{8}, \ -\frac{6}{11}, \ -\frac{4}{9}$$

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<---------------|----------------------------------|----------------------------------|------------------------>
               -1                                  0                                  1
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1. Evaluate/simplify these expressions.

(a) $\dfrac{5}{6} - 3\dfrac{1}{8}$

(b) $2\dfrac{2}{5} \cdot 3\dfrac{3}{4}$

(c) $5\dfrac{3}{4} \div \dfrac{1}{2}$

(d) $\dfrac{10}{2+2/3} - \dfrac{1}{2/9}$

2. Kara is reading a book. She has finished 4/5 of the book and has 82 pages left to read. How many pages has she read?

3. Harry says that $2\frac{2}{5}\cdot 3\frac{4}{5}=2\frac{4}{5}\cdot 3\frac{2}{5}$ because multiplication is commutative. Is he right? Explain why or why not.

4. At Jackson Elementary School, the teacher to student ratio is 1:25. If the school has 1200 students total, how many additional teachers must be hired to reduce the ratio to 1:20?

5. There are approximately 2 lbs of muscle for every 5 lb of body weight. For a 140-lb woman, approximately

6. Use rectangular cakes to show how to do each of these computations. And provide the answers.

    (a) $\frac{1}{5}+\frac{2}{3}$ (b) $\frac{1}{4}\cdot\frac{2}{5}$

1. Is $\dfrac{72}{2^4\cdot 3^2\cdot 5^3}$ a terminating decimal? Explain your answer.

2. Can all fractions be written as terminating decimals? Explain your answer.

3. A refrigerator was on sale at the appliance store for 20% off. Marcus received a coupon from the store for an additional 30% off any current price in the store. If he uses the coupon to buy the refrigerator, the price would be $487.20 before taxes. What was the original price?

4. A man's age at death was 1/29 of the year of his birth. How old was he in 1949?

5. A clothing store advertised a coat at a 15% discount. The original price was $115.00, and the sale price was $100. Was the price consistent with the ad? Explain your answer, with mathematical reasoning.

6. Susan has $20.00. Sharon has $25.00. Susan claims that she has 20% less than Sharon. Sharon replies. "No. I have 25% more than you." Who is right? Explain your answer, with mathematical reasoning.

7. A fishing crew is paid 43% of the value of their catch.
(a) If they catch $10,500 worth of fish, what is the crew paid?

(b) If the crew is paid $75,000 for a year's work, what was the total catch worth?

(c) Suppose that the owner has the following expenses for a year.
      Insurance: $12,000
      Fuel: $20,000
      Maintenance $7,500
      Miscellaneous $5,000
How much does he need to make to pay all his expenses AND his crew, i.e. to just break even?

(d) If the fish are selling to the processors for an average of 22 cents/pound, how many pounds of fish does the owner need to sell to pay all his expenses in part (c) which includes the fixed expenses as well as the crew pay?

8. Convert 1.061818181818.... to a fraction.