

Name _____

ID _____

1. Compute the answer. Show all your work.

a) (2 points) $3+2 - 4\times 3 + 7\times 2 = ?$

b) (2 points) $(6 \times 5) \div (35 \div 7) - 4 = ?$

c) (2 points) $15 \div 5 \times 3 = ?$

d) (2 points) $3 - (4 - 3) + 5 \times (-2) = ?$

2. Indicate whether each statement is true or false. EXPLAIN.

a) (5 points) $18 \div (3 \times 2) = 18 \div 3 \times 2.$

b) (5 points) $2 \times (3 \times 5) = (2 \times 3) \times (2 \times 5)$

3. In each part, express the number using a single exponent. Explain why your answer is reasonable.

a) (5 points) Express $22^4 \times 22^7$ using a single exponent. Explain why your answer is reasonable.

b) (5 points) Express $(5^6)^3$ using a single exponent. Explain why your answer is reasonable.

4. (5 points) Use a visual representation to explain WHY it is true that

$$2(3+7) = 2 \times 3 + 2 \times 7$$

Write the explanation as you would explain it to your students.

5. (5 points) Use the measurement model of division with a visual representation to explain why

it is true that $4 \div \frac{3}{5} = 6 \frac{2}{3}$

6.

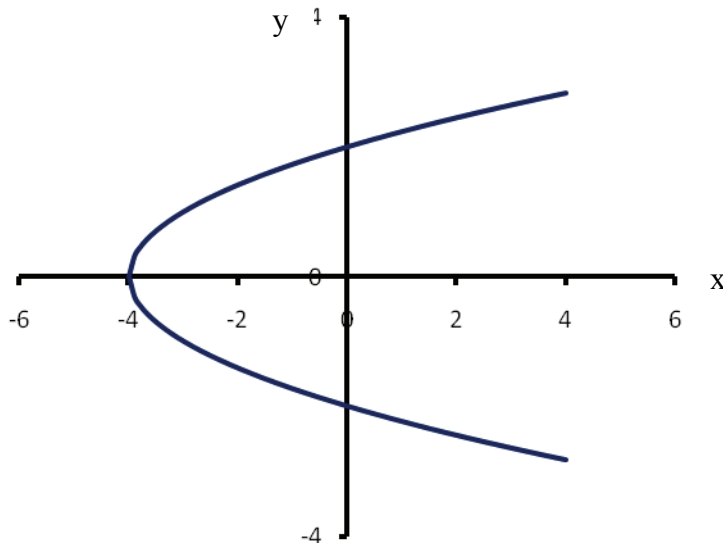
- a) (6 points) Find the next two terms in the sequence; find the 100th term in the sequence; find the n th term in the sequence.

1, 5, 9, 13, 17, _____, _____, _____, ..., 100th _____nth _____

- b) (4 points) Use the patterns you see in the table to fill in the missing terms.

x	Y
14	28
12	23
10	18
8	_____
_____	8
4	_____
2	_____

7. (6 points) For each of parts (a), and (b), a relation is represented either graphically or in set notation. In each case, determine whether the relation is a function. Explain.

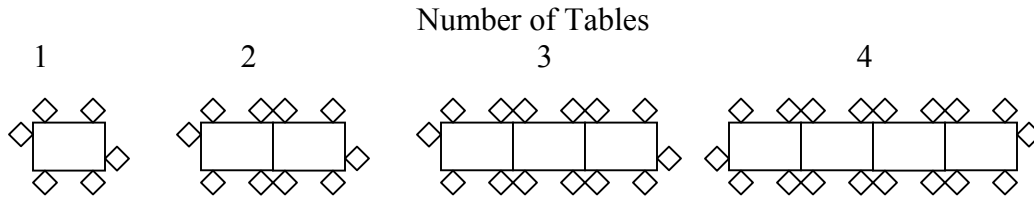


a)

- b) $\{(-1, 8), (1, 12), (-2, 8), (2, 20), (3, 21)\}$

8. Consider the sequence: 3, 9, 27, 81, 243, 729, ...
- a) (2 points) Describe how each number is obtained from the previous number.
- b) (5 points) What is the *units* digit of the 10th number in this sequence? What is the units digit of the 75th number in this sequence? Explain how you know.
9. (10 points) Use a Singapore-style strip diagram to solve the following:
Yuki, Mollie, Brandon, and Anna share an apple pie for desert. Brandon eats half the amount Mollie eats. Yuki east four times as much pie as Brandon. Mollie eats one-fourth of the pie. How much does Anna eat? (Assume all the pie is eaten.)

10. (Adapted from Prentice Hall Mathematics Algebra 2). The diagram below shows arrangements of tables and chairs. Each small table can seat 6 people. When you join tables, you lose space for some chairs. See diagrams.



a) (2 points) Complete the table that lists the number of tables and the number of chairs in each arrangement shown in the diagram.

Number of Tables	Number of Chairs

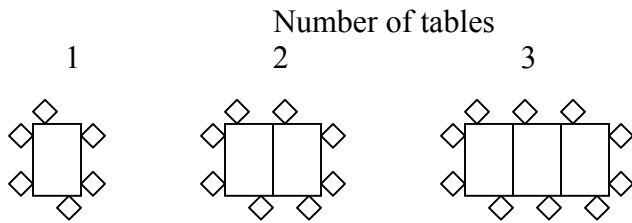
b) (4 points) Find the number of chairs needed for arrangements of 5 tables and 8 tables.

c) (4 points) Is it possible to make an arrangement with 60 chairs? If so how many tables would be needed? Explain.

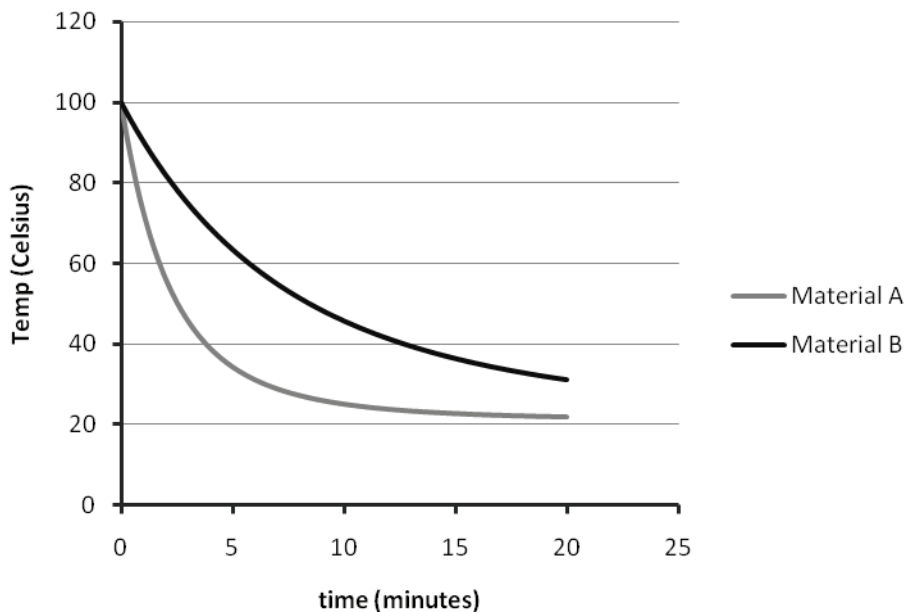
d) (2 points) Write an expression for the number of chairs needed for n tables.

(#9 cont'd)

- e) (2 points) Suppose you can arrange the tables and chairs differently. See diagram below.
Write an expression for the number of chairs needed when k tables are arranged in this way:



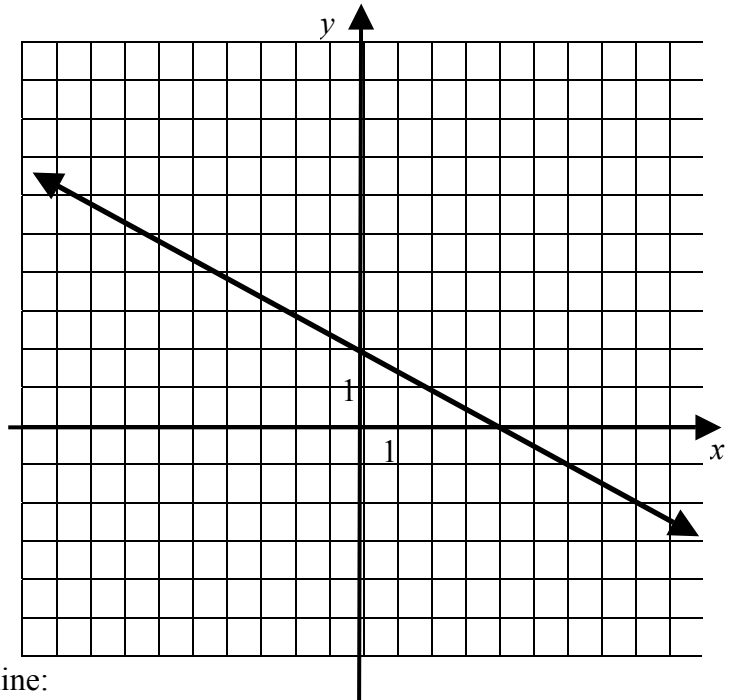
11. (5 points) The graphs below represent the temperature (in degrees Celsius) of fresh, hot coffee t minutes after it is poured into a cup and left to stand on the kitchen counter. The two mugs are made of different materials (A and B). Which material is the better insulator? EXPLAIN.



12. A straight line (sketched below) passes through the points $(0, 2)$ and $(4, 0)$.

- a) (2 points) Find the slope of this line.
Explain.

Slope = _____



- b) (2 points) Write the equation of this line:

- c) (2 points) Use the equation to determine the exact value of x when $y = -4$.

- d) (4 points) Find the equation of a line that is parallel to this line and passes through the point $(-6, 2)$.

13. Neatly sketch an Algebra Tile representation of the solution of each problem:

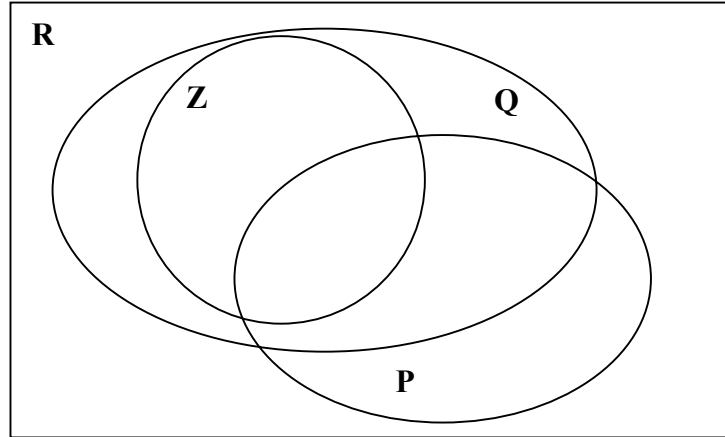
(a) (5 points) $(2x - 3)(x+3) = \underline{\hspace{2cm}}$

(b) (5 points) $(\underline{\hspace{1cm}})(\underline{\hspace{1cm}}) = x^2 - 6x + 8$

14. For this problem, consider the set of real numbers, **R**. Let **Z** denote the set of integers, let **Q** denote the set of rational numbers, and let **P** denote the set of positive real numbers.

a) (6 points) Put each of the following numbers in the appropriate region of the Venn diagram below:

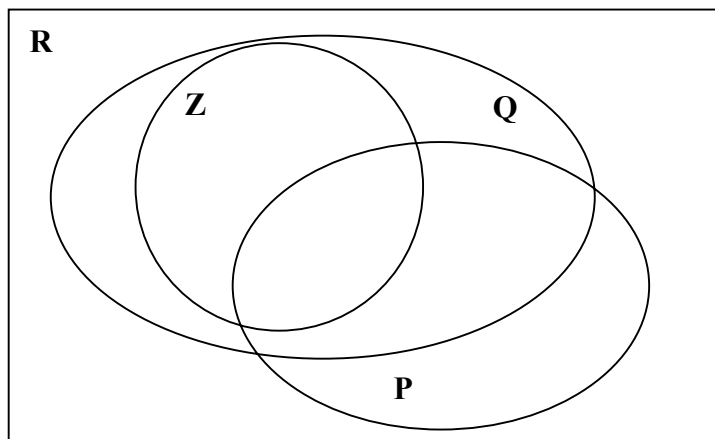
- i) 0
- ii) 7.8
- iii) -5
- iv) $14.\overline{532}$
- v) 2.25
- vi) -1.0100100100001



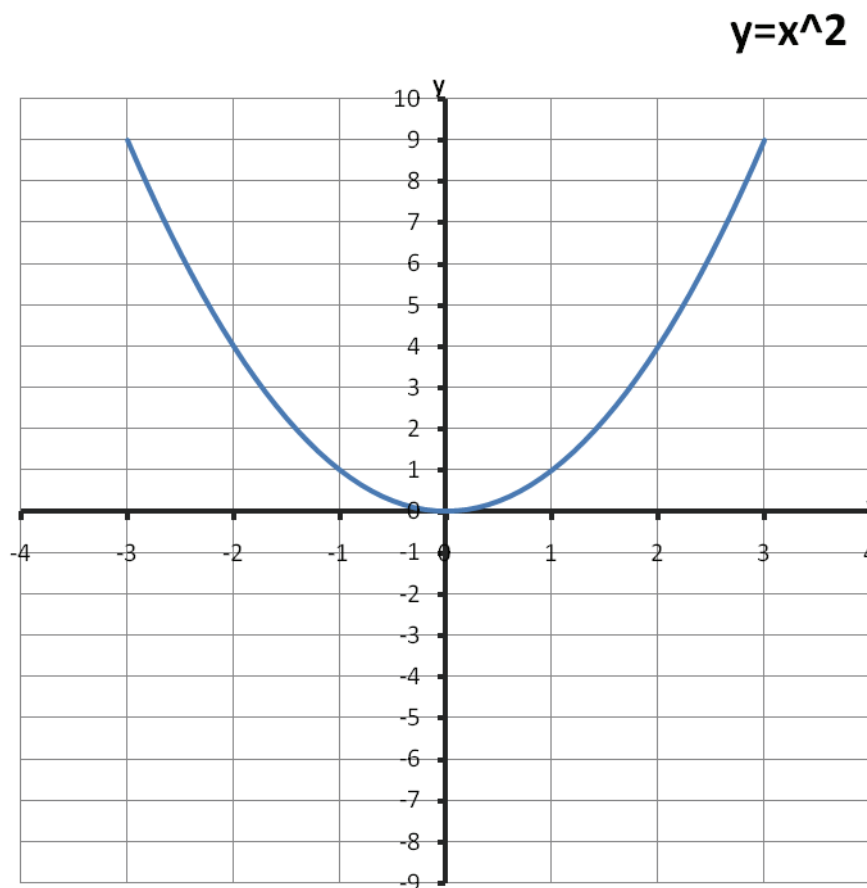
b) (2 points) Shade the region of the diagram that represents $P \cap Q^c$

c) (2 points) Give a verbal description of the numbers that belong to $P \cap Q^c$

d) (2 points) Shade the part of the diagram (below) where the Natural numbers live



15. The graph of $y = x^2$ is shown below.



a) (4 points) On the same coordinate system (above), show the graph of $y = x^2 - 3$. Label it!

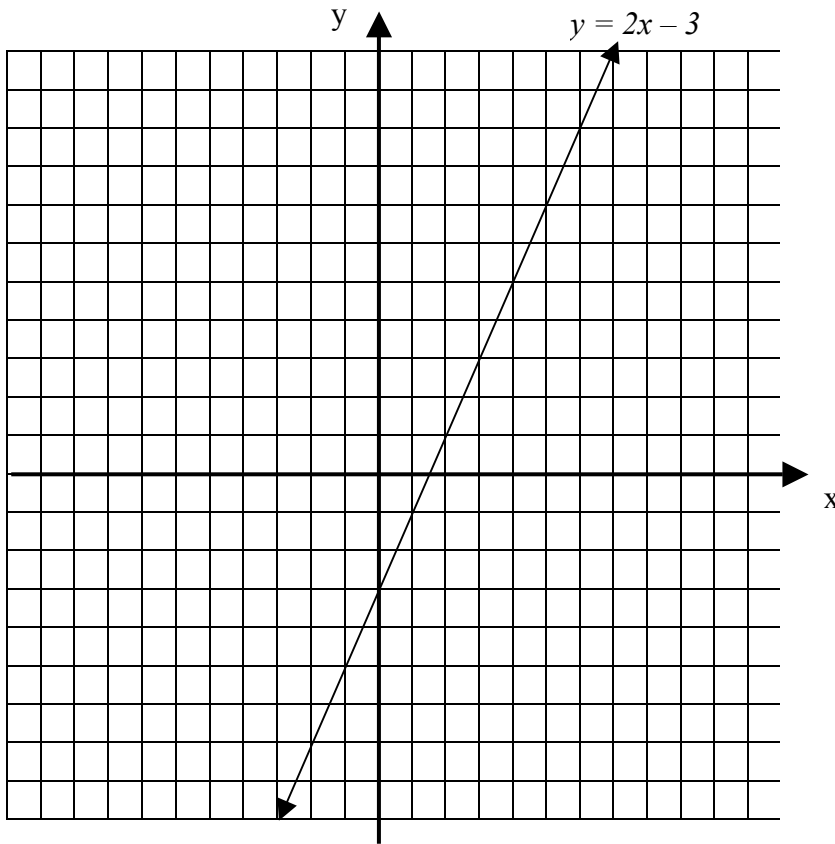
b) (4 points) On the same coordinate system (above), show the graph of $y = (x+2)^2$. Label it!

c) (4 points) On the same coordinate system (above), show the graph of $y = -x^2$. Label it!

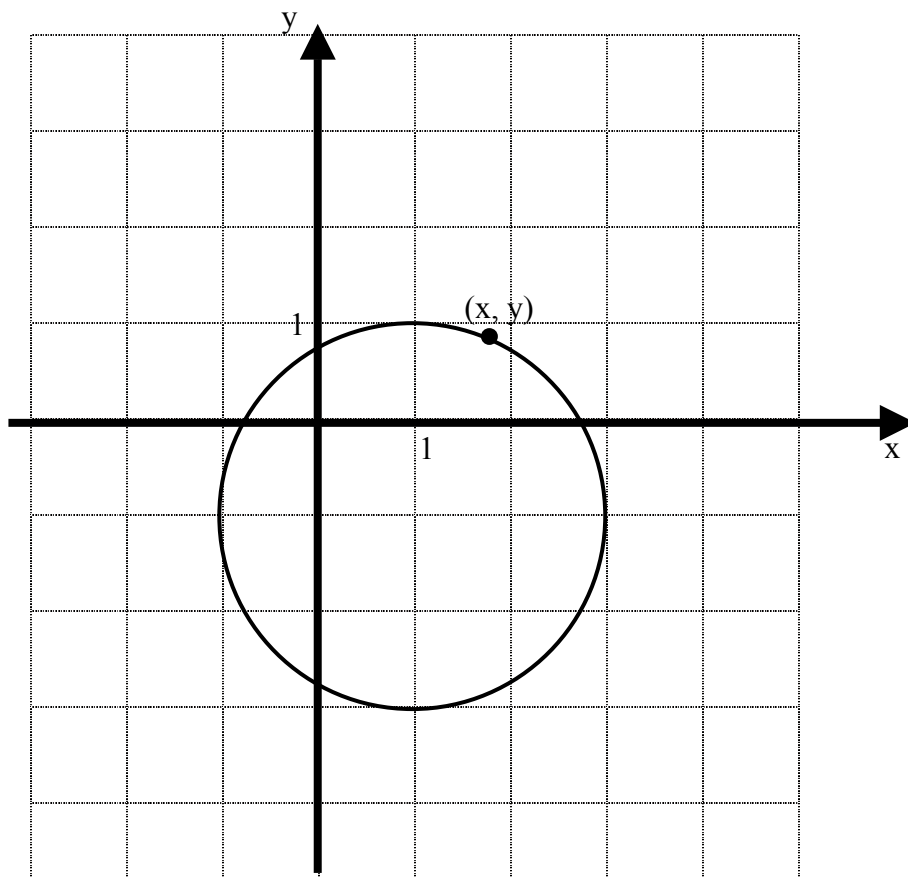
16. The graph of $y = 2x - 3$ is shown below. (Assume the squares in the grid are unit squares.)
 Use colored shading to represent the following on the same coordinate system (below).
 Clearly indicate which is which!

a) (2 points) $y > 2x - 3$

b) (2 points) $y < 2x - 3$



17. Consider the circle sketched below.



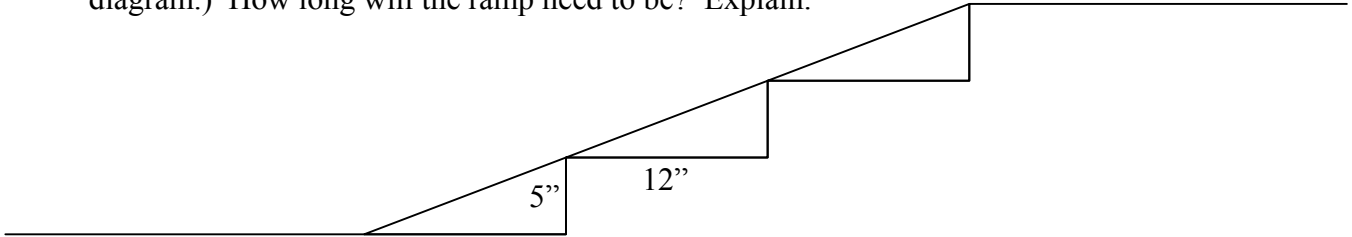
- a) (2 points) Give the coordinates of the center of the circle.
- b) (2 points) Find the radius of the circle.
- c) (2 points) Find the equation of the circle.
- d) (4 points) Explain why your equation is reasonable. It is not enough to appeal to the formula for a circle.

18. Jaynie thinks of a number. If you triple her number, then subtract 6, then divide the answer by 5 you get 3. What number is Jaynie thinking of? Explain this in two ways...

a) (6 points) Use input-output machine language and notation to explain your answer

b) (6 points) Use standard algebraic notation and methods to explain your answer.

19. (10 points) A ramp is to be placed over the top of some steps to allow a wheelbarrow to be pushed up the steps. Each step 12 inches deep and 5 inches high. There are three steps. (See diagram.) How long will the ramp need to be? Explain.



20. (10 points) An article that costs \$100 is reduced by 25%. What percent increase on the reduced price will restore the article to its original cost? Explain.

21. Recently Bo moved to America and was placed in your classroom. Bo is having a difficult time understanding why a negative number times a negative number is a positive. Using models, diagrams, manipulatives, etc., describe how you would explain and help Bo understand this concept. Give two possible explanations:

a) (5 points) First explanation

b) (5 points) Second explanation

22. A student has strained her knee in an intramural volleyball game. Her doctor prescribes a new, long-acting anti-inflammatory drug. She is to take a 1000mg dose as soon as she gets home and then rest for a few days. Her kidneys eliminate 50% of the drug from her body every 2 days.

a) (5 points) Approximately how much of the medicine is in her bloodstream after 6 days? Explain

b) (5 points) Make a sketch showing the amount of the drug in her system for a period of 8 days after she takes the medicine. Use your sketch to *estimate* how much of the drug is in her body one day after taking the medicine.

