

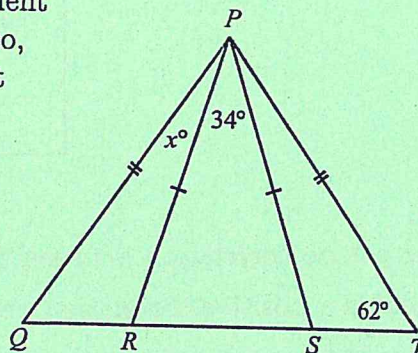
Dick Schaff Math Superbowl XLIII
Level 3: Secondary Math I Huddle – 2016

- Directions:** (1) Select the most correct answer for each question and mark it on your answer form.
 (2) No calculators of any sort are allowed.
 (3) Note that N.O.T. means "None of these."

1. Evaluate the expression $3x^2 + 4x - 2$ if $x = -3$.
 a) 37 b) -41 c) 13 d) -5 e) N.O.T.

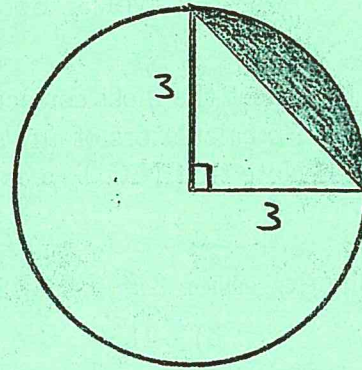
2. Translate the following to an algebraic expression, using x to represent the unknown number:
 "A number increased by 14% of itself."
 a) $x + 0.14x$ b) $x + 14x$ c) $x(14x)$ d) $14x$ e) N.O.T.

3. In the diagram, points R and S lie on segment QT . Segment PQ is congruent to PT , and PR is congruent to PS . Also, $m\angle PTQ = 62^\circ$, $m\angle RPS = 34^\circ$, and $m\angle QPR = x^\circ$. What is the value of x ?



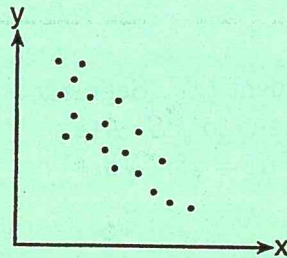
- a) 11 b) 17 c) 22 d) 28 e) N.O.T.
4. If the line passing through the points $(2, 7)$ and $(a, 3a)$ has a slope of 2, then the value of a is
 a) $\frac{5}{2}$ b) 10 c) 3 d) $\frac{11}{5}$ e) N.O.T.
5. A woman walks three miles due east, then four miles due north, then five miles due east. How far is she from her starting point?
 a) 12 miles b) 19 miles c) $5\sqrt{2}$ miles d) $4\sqrt{5}$ miles e) N.O.T.
6. Solve the following for y in terms of x : $x = \frac{2}{3}(y - \frac{1}{3})$
 a) $y = \frac{3}{2}x + 2$ b) $y = \frac{9x+2}{6}$ c) $y = 9x + \frac{1}{3}$ d) $y = \frac{3x-1}{6}$ e) N.O.T.

7. If the radius of the circle shown is 3 units, what is the area of the shaded region?



- a) 9π b) $\frac{9}{2}$ c) $9\pi + \frac{9}{2}$ d) $9\pi - 9$ e) N.O.T.

8. Which statement is true about the data shown in the scatter plot below?



- a) There is no correlation between the two sets of data.
b) There is a positive correlation between the two sets of data.
c) There is a negative correlation between the two sets of data.
d) The correlation between the data is both positive and negative.
e) N.O.T.
9. The set $S = \{1, 2, 3, \dots, 49, 50\}$ contains the first 50 positive integers. After the multiples of 2 and the multiples of 3 are removed, how many integers remain in the set S ?
- a) 8 b) 9 c) 16 d) 17 e) N.O.T.
10. Which statement must be true about the line $4x + 9y = 22$?
- a) A perpendicular line will have slope $\frac{9}{4}$.
b) A parallel line will have slope $-\frac{9}{4}$.
c) The given line is a horizontal line.
d) The given line has a y -intercept at the point $(0, \frac{11}{2})$
e) N.O.T.

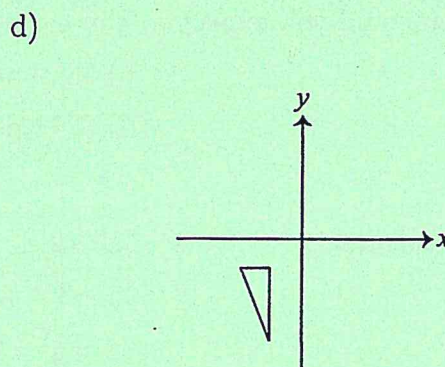
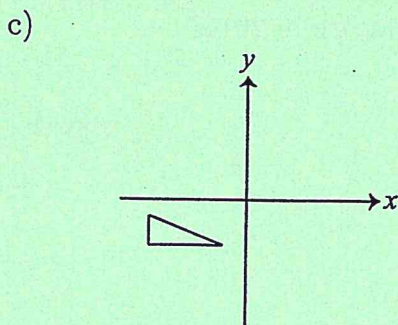
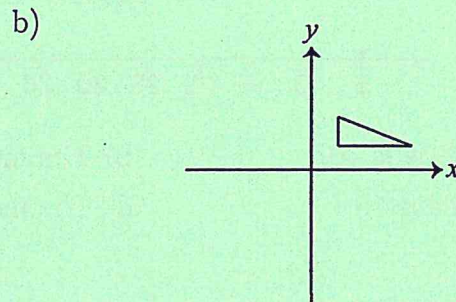
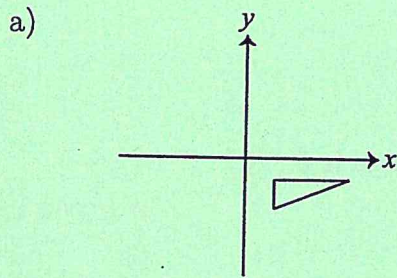
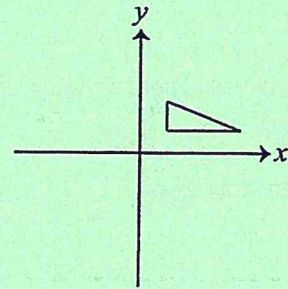
11. Mrs. Ruiz recorded her twenty students' grades in the frequency table below.

Score	10	9	8	7	6	5	4
Frequency	4	5	3	2	3	2	1

Which statement is true for this data set?

- a) mode > median > mean b) mean > median > mode
 c) median > mean > mode d) median > mode > mean e) N.O.T.

12. The triangle shown in the figure to the right is reflected in the x -axis, and the resulting triangle is reflected in the y -axis. Which of the following best represents the final position of the triangle?



e) N.O.T.

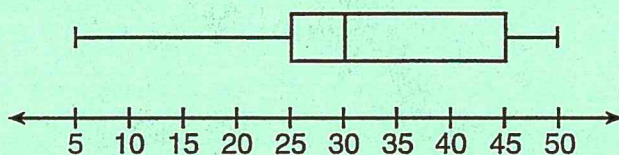
13. Which of these sets is a function?

- a) $\{(3, 4), (3, 5), (3, 6), (3, 7)\}$ b) $\{(6, 7), (7, 8), (8, 9), (6, 5)\}$
 c) $\{(4, 3), (5, 3), (6, 3), (7, 3)\}$ d) $\{(0, 2), (4, 8), (0, 6), (9, 11)\}$ e) N.O.T.

14. Joseph and Rose own a house painting company. Rose can paint a particular house in 8 hours, while Joseph can paint the same house in 16 hours. If Rose and Joseph work together, which of the following must be true about the time needed to paint the house together?
- It will take them less than 8 hours to paint the house together.
 - It will take them between 8 and 16 hours to paint the house together.
 - It will take them between 16 and 24 hours to paint the house together.
 - It will take them more than 24 hours to paint the house together.
 - N.O.T.

15. When is $-x$ greater than x ?
- When x is positive.
 - When x is negative.
 - When x is zero.
 - Never.
 - N.O.T.

16. For the box-and-whisker plot below, which of the following statements must be true?



- The second quartile is 30.
 - The interquartile range is 5.
 - The third quartile is 50.
 - The mean is 42.5.
 - N.O.T.
17. Suppose the average monthly cost y (in dollars) for daycare of a two-year-old toddler is given by the equation $y = 12x + 340$, where x is the number of years after 1990. Based on this equation, how much could you expect to pay each month for childcare in 2016?
- \$640 per month
 - \$312 per month
 - \$652 per month
 - \$712 per month
 - N.O.T.

18. Solve the following inequality: $7 > |-3x + 2|$.
- $x > \frac{5}{3}$ or $x < -3$
 - $-3 < x < \frac{5}{3}$
 - $x < -\frac{5}{3}$ or $x > 3$
 - $-\frac{5}{3} < x < 3$
 - N.O.T.

19. What is the average rate of change of the function $f(x) = 2^x$ from $x = -1$ to $x = 4$?
- $\frac{11}{3}$
 - $\frac{31}{6}$
 - $\frac{31}{10}$
 - $\frac{11}{10}$
 - N.O.T.

20. If two lines are graphed and we determine that they are parallel, then which of the following must be true?
- The equations of the lines will have a common solution of $(0, 0)$.
 - The lines will have slopes which are negative reciprocals.
 - The lines will have slopes which are positive.
 - The equations of the lines will have an infinite number of common solutions.
 - N.O.T.

21. A local deli charges a fee for delivering food. On Wednesday, they delivered two dozen bagels to an office at a total cost of \$8. On Thursday, three dozen bagels were delivered at a total cost of \$11. Which system of equations could be used to find the cost of a dozen bagels, b , if the delivery fee is f ?

a)
$$\begin{cases} b + 2f = 8 \\ b + 3f = 11 \end{cases}$$

b)
$$\begin{cases} 2b + f = 8 \\ b + 3f = 11 \end{cases}$$

c)
$$\begin{cases} b + 2f = 8 \\ 3b + f = 11 \end{cases}$$

d)
$$\begin{cases} b + f = 8 \\ 2b + 3f = 11 \end{cases}$$

e) N.O.T.

22. Four friends are playing a math game. One of the game questions asked them to write an algebraic equation.

Jennifer wrote: $3(4x - 0)$

Kathleen wrote: $7 < 5(2 + x)$

Susan wrote: $19x$

Nancy wrote: $11 = 2x + 3$

Who wrote an algebraic equation?

- a) Jennifer b) Kathleen c) Susan d) Nancy e) N.O.T.

23. A student spent 15 minutes painting a 2-foot by 3-foot bulletin board. To the nearest tenth of a minute, how long did it take the student to paint 1 square foot?

- a) 1.6 minutes b) 2.5 minutes c) 5 minutes d) 7.5 minutes e) N.O.T.

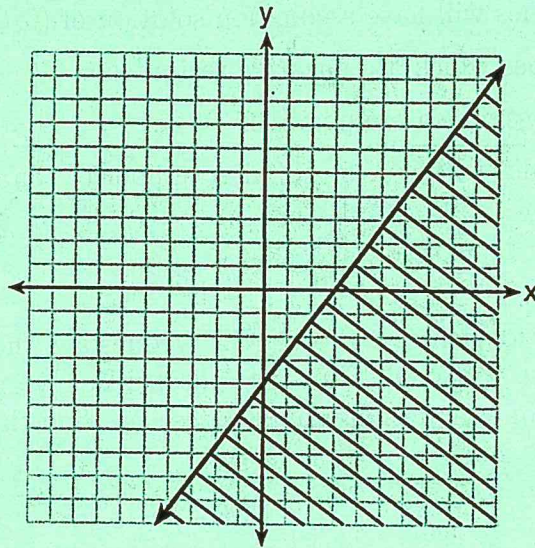
24. Solve the following system of equations:
$$\begin{cases} x - y = -1 \\ 3x + y = 9 \end{cases}$$

- a) $(2, 3)$ b) $(2, -3)$ c) $(3, 4)$ d) $(4, -3)$ e) N.O.T.

25. The first term of a sequence is 20. If a term in the sequence is y and y is even, then the next term is $\frac{1}{2}y$. If a term in the sequence is y and y is odd, then the next term is $3y + 1$. With these rules, the second term would be 10. What is the ninth term of the sequence?

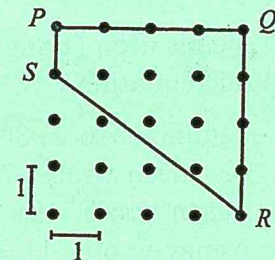
- a) 1 b) 2 c) 3 d) 4 e) N.O.T.

26. Which inequality is shown in the graph below?



- a) $y \geq \frac{3}{4}x + 3$ b) $y \leq \frac{4}{3}x + 3$ c) $y \geq \frac{4}{3}x - 4$ d) $y \leq \frac{3}{4}x - 4$ e) N.O.T.

27. In the diagram, the horizontal distance between adjacent dots in the same row is one unit, and the vertical distance between adjacent dots in the same column is one unit. What is the perimeter of quadrilateral $PQRS$?



- a) 12 b) 13 c) 14 d) 15 e) N.O.T.

28. Which of the following must be true about the product of the first six primes?

- a) The product must be odd. b) The product's last digit is 0.
 c) The product is prime. d) The product's first digit is 1. e) N.O.T.

29. Which relationship can best be described as causal?

- a) The alarm goes off and the sun rises.
 b) The car is moving slowly and the driver is singing.
 c) The snow is falling and the stores run out of snow shovels.
 d) The birds are chirping and the rain is coming down.
 e) N.O.T.

30. The distance between the points $(2, -1)$ and $(-7, -3)$ is

- a) $\sqrt{85}$ b) $\sqrt{65}$ c) $\sqrt{29}$ d) $\sqrt{53}$ e) N.O.T.