Kansas City Area Teachers of Mathematics
2015 KCATM Math Competition

NUMBER SENSE
GRADE 8

NO CALCULATOR

INSTRUCTIONS

- **Do not open this booklet** until instructed to do so.

- Time limit: **20 minutes**

- You **may NOT use calculators**.

- Mark your answer on the answer sheet by **FILLING in the oval**.

- You **may not use rulers, protractors, or other measurement devices** on this test.

- Letter **"E" is "None of the above" or "None of these"**, which is a correct answer for some of the problems.

- With circles, **exact answers** will be given in terms of π.

- Select the most simplified form of a number, unless directed otherwise.

Student Name _____ Student Number _____

School _____

1. In the equation: $y = 5x - 7$ which statement below would be true about the rate of change?
    A. For every change in x, the y value increases by 5.
    B. For every change in x, the y value increases by 7.
    C. For every change in y, the x value increases by 5.
    D. For every change in y, the x value increases by 7.
    E. None of the above

2. Find the value: $17 - 5(2) + 4(8 - 9)$
    A.   14   B. 6   C. 49   D. 3   E. None of the above

3. Which is not equivalent to 4 ?

    A. $2^3 \div 2^1$ B. $(-2)^2$ C. $64 \div 16$ D. $2^4 (2^{-2})$ E. All are equivalent to 4.

4. In solving this two-step algebra problem: $48 = 4x + 12$ which properties would you use and in which order?
    A.   Addition, then subtraction   B. Subtraction, then division
    C. Division, then subtraction   D. Subtraction, then addition
    E. None of the above

5. Expand the scientific notation: 3.56×10^{-4}

    A. 35,600   B. 0.356   C.   0.0003560   D. 0.0356   E. None of the above

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Use the table for questions #6 - #8. The sum of the interior and exterior angles of a polygon are given in the table below.

# of Sides	Sum of Int. $\angle s$	Sum of Ext. $\angle s$
3	180	360
4	360	360
5	540	360
6	720	360
n		

6. Which expression is true for finding the sum of the interior angles?
    A.   180n   B. (n – 1)180   C. (n – 2)180   D. 360 – 180(x)
    E.   None of the above

7.   Which equation is true for the exterior angle sum, s?
    A.   s = 360   B. s = 360 – 2n   C. s = 180(n – 1)   D. s = 360n
    E.   None of the above

8.   If the shape is an octagon where n = 8, what would be the sum of the interior angles?
    A.   900   B. 1440   C. 1080   D. 360   E. None of the above

Use the three different representations of functions below in problems #9-12.

I. Table   II.   Graph   III. Equation

x	f(x)
-3	-9
3	3
6	9

$2y + 3 = 3x$

9. Which of the representations has the greatest rate of change?
    A. Table   B. Graph   C. Equation   D. All the same   E. None of the above

10. Use the table to find the value of the function, f(x) when x = 9
    A. 9   B. 12   C. 15   D. 18   E. None of the above

11. Use the graph. What is the x-intercept?
    A. (0, 3)   B. (0,-5)   C. (3, 0)   D. (-5, 0)   E. None of the above

12. Use the equation. If x = 5, what is the value of y?
    A. 6   B. 13/3   C. 10.5   D.   E. None of the above

13. Put the following numbers in order from smallest to largest. $\frac{\pi}{5}, \frac{\sqrt{4}}{5}, \frac{3}{10}$

    A. $\frac{\pi}{5}, \frac{3}{10}, \frac{\sqrt{4}}{5}$ B. $\frac{\sqrt{4}}{5}, \frac{3}{10}, \frac{\pi}{5}$ C. $\frac{3}{10}, \frac{\sqrt{4}}{5}, \frac{\pi}{5}$ D. $\frac{3}{10}, \frac{\pi}{5}, \frac{\sqrt{4}}{5}$ E. None of the above

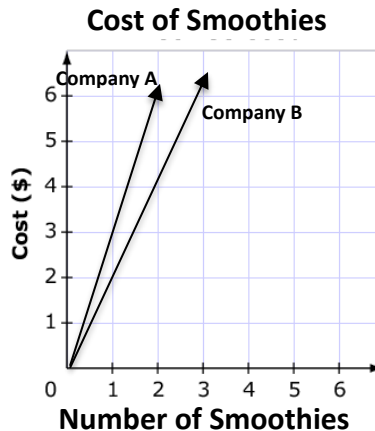14. Which set is a set of **all** irrational numbers?

    A. $\left\{\sqrt{9}, 3.14, \frac{1}{5}\right\}$ B. $\left\{\sqrt{6}, 3.14159, \frac{1}{5}\right\}$ C. $\left\{\sqrt{5}, \pi, -\sqrt{16}\right\}$ D. $\left\{\sqrt{3}, 1.75775 ..., \frac{\pi}{5}\right\}$

    E. None of the above

15. Given: 5x – 7 – 2x = __?__x + 5, which value of x will give you "no solution" as an answer?

    A. 5x   B. 3x   C. 2x   D. 1x   E. None of the above

Use the graph for problems #16-17.

Cost of Smoothies

16. The graph shows a system of 2 equations, one for Company A and one for Company B. Which company has a cheaper price on smoothies?
    A. Company A   B. Company B   C. They are both the same cost

17. If your family of 4 purchased one smoothie for each person, how much money would you save if you purchased the smoothies from the cheaper of the two companies?

    A. $1   B. $4   C. $6   D. $8   E. None of the above

Use the graph for problems #18-20.
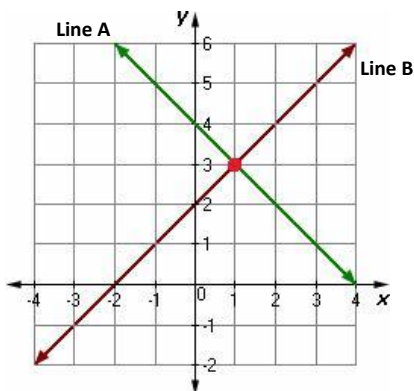
18. What is the equation of line A?

    A. $y = -1x + 2$ B. $y = 1x + 4$ C. $y = -1x + 4$
    D. $y = 1x + 2$ E. None of the above

19. On Line B, what is value of the function f(3) or the value of y, when x = 3?

    A. 1   B. 5   C. -2   D. 4
    E. None of the above

20. If Line A represents your savings account in Bank A and Line B represents your savings account in Bank B. **Let x represent months and y represent hundreds of dollars**. **What does the point of intersection mean?**
    A. The savings account in Bank A is decreasing.
    B. The savings account in Bank B is increasing.
    C. The savings account in both banks is the same, after one month both accounts have $300 in them.
    D. The savings account in both banks is the same, after three months both accounts have $100 in them.
    E. None of the above

21. Which is the **prime factorization** of 600?

    A. $3^3 \times 5^2$ B. $2^3 \times 3^1 \times 5^1$ C. $2^3 \times 5^2$ D. $2^3 \times 3^1 \times 5^2$ E. None of the above

22. In solving the multi-step problem below, **which property listed is NOT used** as a reason for a step in the process of solving the equation?

     -3(4n – 1) + 2n = - 25   *Given*

     (-12n + 2n) + 3 = -25   _____

           -10n + 3 = - 25   _____

               -10n = - 28   _____

                  n = 2.8   _____

    A.   Associative Property of Addition   B. Subtraction Property of Equality
    C.   Division Property of Equality   D. Distributive Property
    E.   All these properties were used.

23. Which of the is the **sum** of: $2\dfrac{3}{5} + 3\dfrac{1}{2} - \dfrac{7}{10}$?

    A. $5\dfrac{2}{5}$ B. $6\dfrac{4}{5}$ C. $5\dfrac{7}{10}$ D. $4\dfrac{1}{10}$ E. None of above

    .

24. Which statement is correct in converting the rate of a professional baseball pitch from 100 miles per hour to feet per second. There are 5,280 feet in 1 mile.

    A. $\dfrac{100\ mi}{1\ hr} \times \dfrac{5280\ ft}{1\ mi} \times \dfrac{60\ sec}{1\ min} \times \dfrac{60\ min}{1\ hr}$ B. $\dfrac{100\ mi}{1\ hr} \times \dfrac{1\ mile}{5280\ ft} \times \dfrac{60\ sec}{1\ min} \times \dfrac{60\ min}{1\ hr}$

    C. $\dfrac{100\ mi}{1\ hr} \times \dfrac{5280\ ft}{1\ mi} \times \dfrac{1\ min}{60\ sec} \times \dfrac{60\ min}{1\ hr}$ D. $\dfrac{100\ mi}{1\ hr} \times \dfrac{5280\ ft}{1\ mi} \times \dfrac{1\ hr}{60\ min} \times \dfrac{1\ min}{60\ sec}$

25. **Convert:** 4,230,673 cm = _____ meters

    A. 42306.73 m   B. 4230.673 m   C. 423.0673 m   D. 42,306,730 m
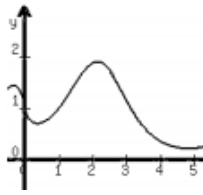   E. None of the above

26. Which of the following numbers is **NOT** divisible by 6.

    A.   21,348   B. 906   C. 8160   D. 1472   E. None of the above

27. What is the length of the diagonal of a rectangle that is 5 cm by 12 cm?

    A.   12 cm   B. 13 cm   C. 14 cm   D. 15 cm   F. None of the above

28. Describe the graph between x = 2 (the graph is at its peak) and x = 4.

        A.   The graph is linear and increasing.
        B.   The graph is linear and decreasing.
        C.   The graph is non-linear and increasing.
        D.   The graph is non-linear and decreasing.
        E.   None of the above

29. Between which two numbers does the value of $\sqrt{240}$ lie?

   A. Between 12 and 13   B. Between 13 and 14   C. Between 14 and 15
   D. Between 15 and 16   E. None of the above

30. You have a board that is going to be split into 3 different lengths. Each length is at a ratio of 2 : 4 : 5. It the board is 231 cm long, **how long is the largest piece**?

   A.   105 cm   B. 110 cm   C. 112 cm   D. 115 cm   E. None of the above

31. Solve the inequality: 3x − 2(x + 5) < 14 − x

   A.   x > 12   B.   x < 12   C. x > -12   D. x < -12   E. None of the above

32. The fraction: 2/11 is equivalent to which decimal value?

   A.   0.11   B. $0.\overline{18}$ C. 0.19   D. 0.55   E. None of the above

33. Solve: $4 + 4 \div 4 + 4 \times 4 - 4$

   A. 20   B. 14   C. 17   D. 21   E. None of the above

34. The end of the season sale is on at Nordstrom Rack. All red clearance is an additional 25% off with the discount applied at the register. You see a Marc Jacob purse that was originally $400. It was marked down to half-price, then the additional discount was applied. **How much did the purse cost after the additional discount?**

  A. $175   B. $150   C. $125   D. $100   E. None of the above

35. The chances of having twins or multiple births is 1:67. If there were approximately 14 million births in the USA in 2014, how many would you expect to have had twins or more? **Round to the nearest 1,000.**

   A.   203,000   B. 209,000   C. 210,000   D. 220,000   E. None of the above

36. Solve the problem in the cartoon below:

> Point A is twice as far from point C as point B is from A. If the distance from point B to point C is 5 inches, how far is point A from point C?
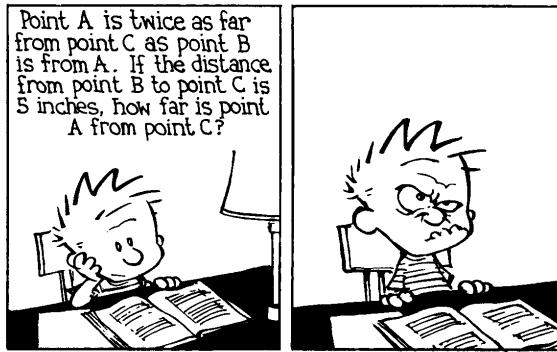
    A.   2.5   B. 8   C.   5   D. 10   E.   None of the above

37. If it takes George 8 hours to mow the lawns on his schedule, but it takes Harry only 5 hours to do the same lawns, how long would it take them if they worked together on the lawns?

    A.   3.3 hrs.   B. 3.8 hrs.   C. 3.1 hrs.   D. 4.5 hrs.   E.   None of the above

38. Divide: $157.248 \div 16$ Round to the nearest hundredth:

    A.   9.85   B.   9.91   C. 9.83   D.   9.94   E.   None of the above

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Set up the system and solve in problems #39 and 40.

39. Two brothers are creating math problems with their ages. The difference of their ages is one. Three times the younger brother's age (x) plus twice the older brother's age (y)is 42. **Which system represents this information?**

A. $\begin{array}{l} 2x + 3y = 42 \\ \quad x = y + 1 \end{array}$ B. $\begin{array}{l} 3x + 2y = 42 \\ \quad y = x + 1 \end{array}$ C. $\begin{array}{l} 2x + 3y = 42 \\ \quad y = x + 1 \end{array}$ D. $\begin{array}{l} 3x + 2y = 42 \\ \quad x = y + 1 \end{array}$

E.   None of the above

40. Solve the system from problem #39.

    A.   The ages are 8 and 9.   B.   The ages are 9 and 10.   C.   The ages are 6 and 7.
    D.   The ages are 7 and 8.   E.   None of the above

Shade the correct answer!   Name_____
Example: A ● C D E

School _____

1.	A	B	C	D	E	21.	A	B	C	D	E
2.	A	B	C	D	E	22.	A	B	C	D	E
3.	A	B	C	D	E	23.	A	B	C	D	E
4.	A	B	C	D	E	24.	A	B	C	D	E
5.	A	B	C	D	E	25.	A	B	C	D	E
6.	A	B	C	D	E	26.	A	B	C	D	E
7.	A	B	C	D	E	27.	A	B	C	D	E
8.	A	B	C	D	E	28.	A	B	C	D	E
9.	A	B	C	D	E	29.	A	B	C	D	E
10.	A	B	C	D	E	30.	A	B	C	D	E
11.	A	B	C	D	E	31.	A	B	C	D	E
12.	A	B	C	D	E	32.	A	B	C	D	E
13.	A	B	C	D	E	33.	A	B	C	D	E
14.	A	B	C	D	E	34.	A	B	C	D	E
15.	A	B	C	D	E	35.	A	B	C	D	E
16.	A	B	C	D	E	36.	A	B	C	D	E
17.	A	B	C	D	E	37.	A	B	C	D	E
18.	A	B	C	D	E	38.	A	B	C	D	E
19.	A	B	C	D	E	39.	A	B	C	D	E
20.	A	B	C	D	E	40.	A	B	C	D	E

Shade the correct answer!   Name_____

Example: A   ●   C   D   E   School _____

ANSWER KEY – JH 4.5.15

1.   ●   B   C   D   E   21.   A   B   C   ●   E

2.   A   B   C   ●   E   22.   A   B   C   D   ●

3.   A   B   C   D   ●   23.   ●   B   C   D   E

4.   A   ●   C   D   E   24.   A   B   C   ●   E

5.   A   B   ●   D   E   25.   ●   B   C   D   E

6.   A   B   ●   D   E   26.   A   B   C   ●   E

7.   ●   B   C   D   E   27.   A   ●   C   D   E

8.   A   B   ●   D   E   28.   A   B   C   ●   E

9.   ●   B   C   D   E   29.   A   B   C   ●   E

10.   A   B   ●   D   E   30.   ●   B   C   D   E

11.   A   B   C   ●   E   31.   A   ●   C   D   E

12.   ●   B   C   D   E   32.   A   ●   C   D   E

13.   A   B   ●   D   E   33.   A   B   ●   D   E

14.   A   B   C   ●   E   34.   A   ●   C   D   E

15.   A   ●   C   D   E   35.   A   ●   C   D   E

16.   A   ●   C   D   E   36.   A   B   C   ●   E

17.   A   ●   C   D   E   37.   A   B   ●   D   E

18.   A   B   ●   D   E   38.   A   B   ●   D   E

19.   A   ●   C   D   E   39.   A   ●   C   D   E

20.   A   B   ●   D   E   40.   ●   B   C   D   E