



# OKLAHOMA SCHOOL of SCIENCE and MATHEMATICS

## 22<sup>nd</sup> Annual OSSM Middle School Math: An Awesome Contest—Round Two

7<sup>th</sup> and 8<sup>th</sup> Grade Test B

Spring 2024

### Before you begin:

1. Please write your name on your answer sheet.
2. On your name tag you have been given a three-digit OSSM student ID number. On the answer sheet, in the lower right-hand corner, there is a place to fill in the three-digit student ID number (use the first three boxes, leaving the rest blank).
3. Fill in the appropriate bubbles for your OSSM student ID.

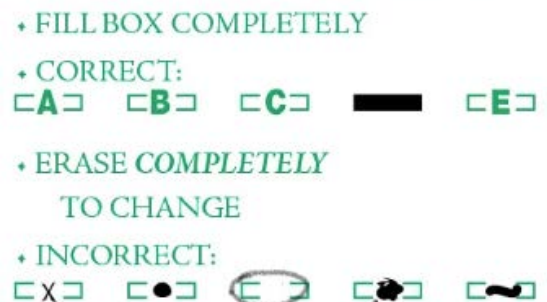
### Directions:

Use the scratch paper provided to do your work.

Choose the appropriate answer, and then fill in the corresponding bubble

ON THE ANSWER SHEET.

DO NOT MAKE ANY STRAY MARKS ON YOUR ANSWER SHEET; it may cause the machine to misread your answer sheet and may disqualify your score.



This is a 40-question, 1-hour contest. All questions are multiple-choice. Figures are not to scale. Each question is worth one point. Your score will be the number of correct answers. There is no partial credit or penalty for wrong answers. Please continue working or reworking problems until time is called.

**Do Not Open or Turn Over Until Instructed To Do So**

Fill in your answers ON THE ANSWER SHEET by filling in the corresponding bubble.

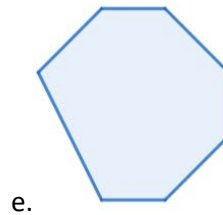
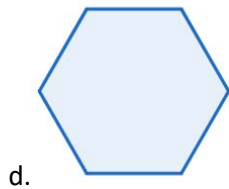
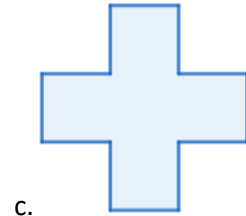
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You may use this space for scratch paper.

1.  $123 + 234 + 345 =$

- a. 602
- b. 612
- c. 692
- d. 702
- e. 792

2. Which of the following shapes is an octagon?



3. Which of these numbers is a square root of a square root of 1,600,000,000?

- a. 200
- b. 400
- c. 2,000
- d. 4,000
- e. 40,000

4. What is the slope of the line with equation  $-4x + 4y = 8$ ?

- a. -4
- b. -2
- c. -1
- d. 1
- e. 2

5. Elijah has 108 M&Ms. He is willing to share with James, as long as James only takes whole M&Ms. Which fraction of Elijah's M&Ms can James **NOT** take?

- a.  $\frac{1}{6}$
- b.  $\frac{1}{8}$
- c.  $\frac{1}{9}$
- d.  $\frac{1}{12}$
- e.  $\frac{1}{27}$

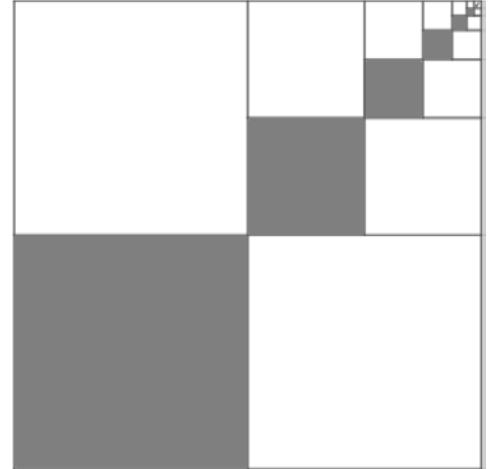
6. Anna, Robin, Danny, and Sydney are starting a company together. One of them will be the President, one will be Vice President, one will be Treasurer, and one will be Project Manager. How many possible ways are there to assign one of the jobs to each woman?
- 12
  - 16
  - 20
  - 24
  - 28
7. The three angles of my triangle have degree-measures  $3x^\circ$ ,  $4x^\circ$ , and  $5x^\circ$ . What is the value of  $x$ ?
- 3
  - 6
  - 12
  - 15
  - 18
8. If I pour out 8 cups of milk from my jug, I would have 3 cups less remaining in the jug than I would have if I had poured out half of the milk instead. How many cups of milk are in the jug before I pour anything out?
- 10
  - 11
  - 11.5
  - 12
  - 12.5
9. What is the greatest common factor of the numbers  $12 \times 12$  and  $4 \times 81$ ?
- 24
  - 36
  - 48
  - 54
  - 72
10. The numerical value of the area of a square is exactly equal to the numerical value of its perimeter. What is the length of the side of the square?
- 2
  - 4
  - 6
  - 8
  - 10
11. About how much less time does a trip of 70 miles take if you travel 75 miles per hour than if you travel 70 miles per hour?
- 3 minutes
  - 3.5 minutes
  - 4 minutes
  - 4.5 minutes
  - 5 minutes

12. Which of the following is **NOT** a whole number?

- a.  $\sqrt{4900}$
- b.  $\sqrt{6400}$
- c.  $\sqrt{9000}$
- d.  $\sqrt{12100}$
- e.  $\sqrt{40000}$

13. In this figure, the large square is divided into four equal smaller squares. The lower left sub-square is shaded, and then the entire subdivision/shading process is repeated (to infinity!) inside the upper right sub-square. What fraction of the largest square is shaded?

- a.  $1/4$
- b.  $8/27$
- c.  $8/25$
- d.  $1/3$
- e.  $5/12$



14. On the website scamazon.com, 15 yo-yos and 25 frisbees cost a total of \$600. What is the total cost of 21 yo-yos and 35 frisbees?

- a. \$700
- b. \$750
- c. \$770
- d. \$800
- e. \$840

15. If  $\frac{1}{x} = -2$ , then  $\frac{1}{1+x^2} =$

- a.  $-1/3$
- b.  $1/5$
- c.  $2/3$
- d.  $4/5$
- e.  $4/3$

16. Evaluate  $16^{-3/4}$ .

- a.  $-12$
- b.  $-8$
- c.  $1/12$
- d.  $1/8$
- e.  $12$

17.  $N$  is the smallest two-digit number whose value is strictly less than twice the product of its digits. What is the sum of the digits of  $N$ ?

- a. 8
- b. 9

- c. 10
- d. 11
- e. 12

18. If the edge length of cube  $A$  is 10% of the edge length of cube  $B$ , then the volume of cube  $A$  is \_\_\_\_\_ of the volume of cube  $B$ .

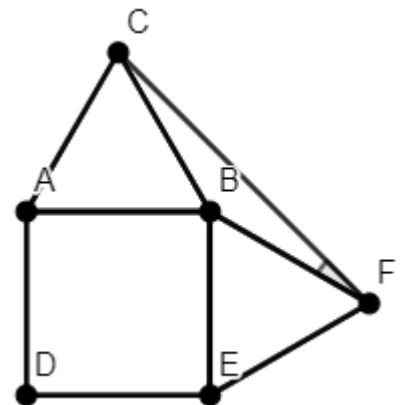
- a. 0.001 %
- b. 0.01 %
- c. 0.1 %
- d. 1 %
- e. 10 %

19. Which, if any, is a true inequality?

- a.  $20 \times 24 < 6 \times 8 \times 10$
- b.  $20 \times 24 < 19 \times 25$
- c.  $20 \times 24 < 2 \times 120 + 12 \times 20$
- d.  $20 \times 24 < 3 \times 5 \times 5 \times 7$
- e. None of the above is a true inequality.

20. This diagram is made of a square ( $ABED$ ), two equilateral triangles ( $\triangle ABC$  and  $\triangle EBF$ ), and an isosceles triangle ( $\triangle BFC$ ). What is the measure of  $\angle BFC$ ?

- a.  $5^\circ$
- b.  $10^\circ$
- c.  $12^\circ$
- d.  $15^\circ$
- e.  $20^\circ$



21. Evaluate  $N \times N - N \times N \times N$ , if  $N = -2$ .

- a. -12
- b. -8
- c. -4
- d. 12
- e. 24

22. What is the sum of the first fifty odd positive whole numbers?

- a. 2000
- b. 2500
- c. 2525
- d. 4900
- e. 4950

23. The rule " $x \rightarrow -x$ " is an example of a rule that, if you apply it twice in a row, gives you back the same number you started with (since  $-(-x) = x$ ). Which of the following rules also has the property that doing it twice in a row always gives you back the number you started with?

- a.  $x \rightarrow 2x$
- b.  $x \rightarrow 0$

- c.  $x \rightarrow |x|$
- d.  $x \rightarrow 1 + x$
- e.  $x \rightarrow 1 - x$

24.  $\frac{\sqrt{2 \cdot 4 \cdot 6 \cdot 8 \cdot 10 \cdot 12}}{\sqrt{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5 \cdot 6}} =$

- a.  $\sqrt{2}$
- b. 8
- c.  $6\sqrt{2}$
- d. 12
- e.  $6\sqrt{6}$

25. A parallelogram in the  $xy$ -plane has vertices at  $(2, -1)$ ,  $(7, 1)$ ,  $(1, 4)$ , and  $(-4, 2)$ . What are the coordinates of the point where its two diagonals intersect?

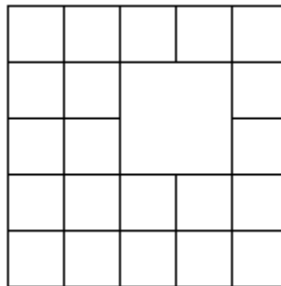
- a.  $(\frac{5}{4}, \frac{5}{4})$
- b.  $(\frac{5}{4}, \frac{7}{4})$
- c.  $(\frac{3}{2}, \frac{3}{2})$
- d.  $(\frac{7}{4}, \frac{5}{4})$
- e.  $(\frac{7}{4}, \frac{5}{4})$

26. One tablet of iodine makes 2 quarts of water drinkable. If you have 5 people who need one gallon of water each per day for 7 days, how many iodine tablets do you need? ( $4 \text{ quarts} = 1 \text{ gallon}$ ).

- a. 28
- b. 35
- c. 70
- d. 140
- e. 280

27. How many squares appear in this figure?

- a. 34
- b. 35
- c. 36
- d. 37
- e. 38



28.  $(\sqrt[16]{16}) \times (\sqrt[16]{16}) =$

- a. 1
- b.  $\sqrt{2}$
- c. 2
- d. 4

e.  $\sqrt{8}$

29. If  $2y - x = z$ , then  $2x + 2z =$

- a.  $-2y$
- b.  $3y$
- c.  $-3y$
- d.  $4y$
- e.  $-4y$

30. A rectangle has area  $300 \text{ cm}^2$  and perimeter  $70 \text{ cm}$ . Which of the following is the distance between two opposite corners of the rectangle?

- a.  $20 \text{ cm}$
- b.  $21 \text{ cm}$
- c.  $24 \text{ cm}$
- d.  $25 \text{ cm}$
- e.  $28 \text{ cm}$

31. The number  $111$ —made by writing down 3 ones—is evenly divisible by 3 (because  $111 = 3 \times 37$ ). Which of the following numbers is evenly divisible by 99?

- a. The number made by writing down 9 ones
- b. The number made by writing down 11 ones
- c. The number made by writing down 18 ones
- d. The number made by writing down 22 ones
- e. The number made by writing down 99 ones

32. A container with a circular base has a height of 2 meters. A pole 6 meters long (but no longer) can be placed completely inside the container, resting at an angle. What is the volume of the tank?

- a.  $8\pi \text{ m}^3$
- b.  $12\pi \text{ m}^3$
- c.  $16\pi \text{ m}^3$
- d.  $24\pi \text{ m}^3$
- e.  $32\pi \text{ m}^3$

33. The graph of the equation  $|y - 1| = |y + 1|$  in the  $xy$ -plane is, geometrically:

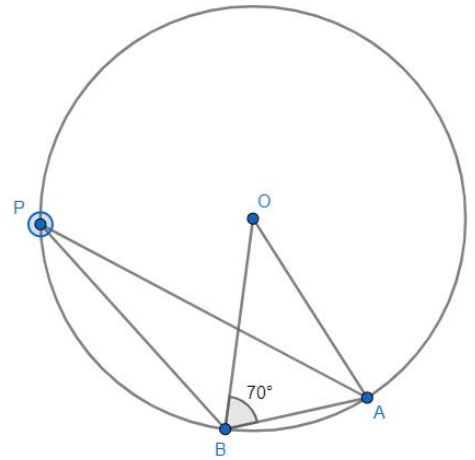
- a. a horizontal line
- b. a vertical line
- c. a circle
- d. a square
- e. the empty set (the equation has no solutions in the  $xy$ -plane)



34. The circle shown is centered at  $O$  with points  $P, B, A$  along the circumference.

If  $\angle OBA = 70^\circ$ , what is the measure of  $\angle BPA$ ?

- $20^\circ$
- $25^\circ$
- $30^\circ$
- $35^\circ$
- Not enough information.

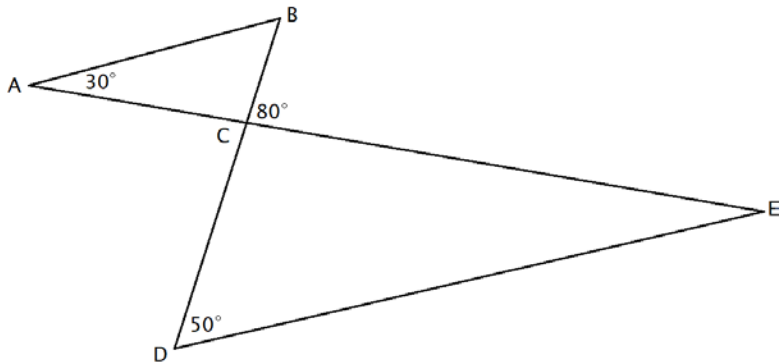


35. How many different “words” of at least one letter can be made from the letters in OSSM? Your list should include words like M, MSS, SMS, and MOSS... but not MOOS, because there is only one O available to use in OSSM.

- 32
- 34
- 36
- 38
- 40

36. In the diagram, which of the following **MUST** BE TRUE?

- $\angle ABC = \angle CED$
- $AB = CD$
- $DC^2 + CE^2 = DE^2$
- $\overline{AB}$  is parallel to  $\overline{DE}$
- The area of  $\triangle ABC$  is one-fourth the area of  $\triangle CDE$

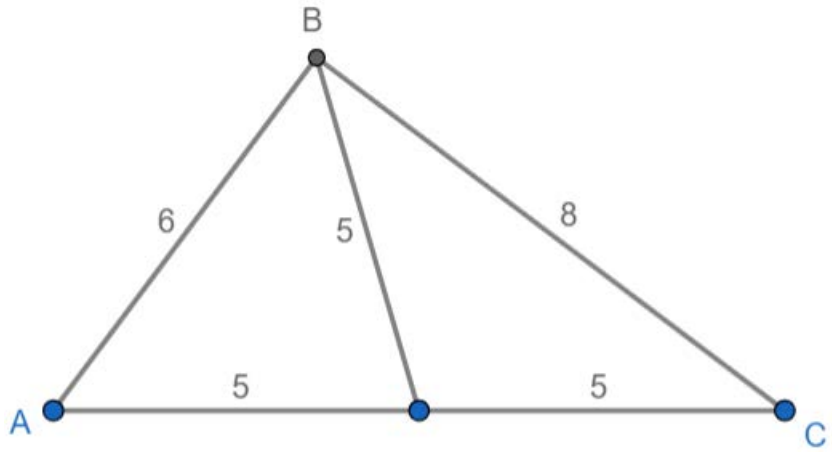


37. The length of a rectangle is increased by 10% and the width of the same rectangle is decreased by 10%. How does the area of the new rectangle compare to the original rectangle?

- The area of the new rectangle is less than the area of the original rectangle.
- The two rectangles have the exact same area.
- The area of the new rectangle is greater than the area of the original rectangle.
- No determination can be made unless the exact length and width of the original rectangle are given.

38. What is the area of  $\triangle ABC$ ?

- a. 18
- b. 20
- c. 24
- d. 25
- e. 30



39. In the time it takes Tajvir to knit twelve scarves, Yuehuan can knit fifteen scarves. If Tajvir starts knitting scarves at 8am, and Yuehuan starts at noon, then by 8pm Tajvir will have knitted exactly 1 more scarf than Yuehuan has. How long does it take Yuehuan to knit one scarf?

- a. 1 hour, 30 minutes
- b. 1 hour 36 minutes
- c. 1 hour, 45 minutes
- d. 1 hour, 48 minutes
- e. 2 hours

40. Two equal circles, each of radius 2, are positioned so that each one passes through the other one's center. What is the area of the shaded region where they overlap?

- a.  $\frac{8\pi}{3} - 2\sqrt{3}$
- b.  $\frac{8\pi}{3} - \sqrt{3}$
- c.  $4 - \frac{\pi}{3}$
- d.  $\frac{\pi}{3} + 2\sqrt{3}$
- e.  $\frac{2\pi}{3} + \sqrt{3}$

