PSiA
Private Schools Interscholastic Association

# Mathematics

District Contest

Grades 6-8
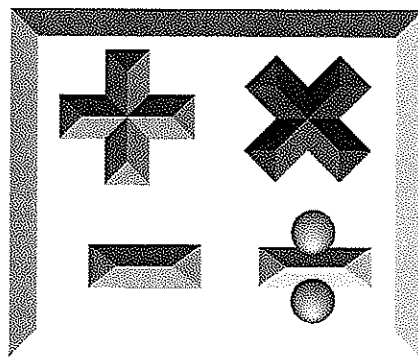
2023

(Please do not open test until the signal is given to begin.)

Directions: Choose the best answer to each problem. For answers not listed as choices, choose "E. NOT" for "None of these".

1. Evaluate: $(4^2 - 1) \div 3 + 6 \times 7^0$

   A. 47   B. 23   C. 11   D. 5   E. NOT

2. A rectangle has length 8 cm and width 7 cm. What is its perimeter?

   A. 56 cm   B. 30 cm   C. 28 cm   D. 15 cm   E. NOT

3. $\dfrac{7}{8} \times 32 =$

   A. 28   B. 30   C. 26   D. 35   E. NOT

4. How many prime numbers are there between 30 and 40?

   A. 3   B. 0   C. 1   D. 2   E. NOT

5. $5\dfrac{1}{6} \times 4\dfrac{5}{6} =$

   A. $22\dfrac{5}{36}$ B. $22\dfrac{35}{36}$ C. $24\dfrac{5}{36}$ D. $24\dfrac{35}{36}$ E. NOT

6. What percent of 60 is 42?

   A. 75%   B. 70%   C. $66\dfrac{2}{3}\%$ D. $62\dfrac{1}{2}\%$ E. NOT

7. $7\dfrac{1}{2}$ feet = _____ yards

   A. 90   B. $2\dfrac{1}{2}$ C. $3\dfrac{1}{3}$ D. $22\dfrac{1}{2}$ E. NOT

8. $\dfrac{3}{7} + \dfrac{7}{10} =$

    A. $1\dfrac{4}{35}$ B. $1\dfrac{8}{35}$ C. $1\dfrac{19}{70}$ D. $1\dfrac{9}{70}$ E. NOT

9. Each movie rental costs $2.99. How much will it cost to rent six movies?

    A. $17.92   B. $19.92   C. $17.94   D. $19.94   E. NOT

10. What is the sum of the digits in the hundred thousandth's and millionth's places of 15.38704925?

    A. 4   B. 13   C. 11   D. 7   E. NOT

11. Isabella has $3\dfrac{3}{4}$ cups of sugar. Juliet has $5\dfrac{1}{6}$ cups of sugar. How many more cups of sugar does Juliet have than Isabella?

    A. $1\dfrac{5}{6}$ B. $1\dfrac{1}{3}$ C. $1\dfrac{5}{12}$ D. $1\dfrac{7}{12}$ E. NOT

12. If Q represents a single digit, what value of Q makes the number 4Q73 have a remainder of 7 when divided by 9?

    A. 2   B. 3   C. 4   D. 5   E. NOT

13. 241 (base 5) = _____ (base 10)

    A. 73   B. 77   C. 69   D. 71   E. NOT

14. 31 quarters + 23 dimes = X nickels + 160 pennies. What is X?

    A. 169   B. 173   C. 177   D. 181   E. NOT

15. What is the greatest common divisor between 102 and 120?

    A. 2   B. 3   C. 4   D. 6   E. NOT

16. Calculate the total surface area.

6
7   3
6
15
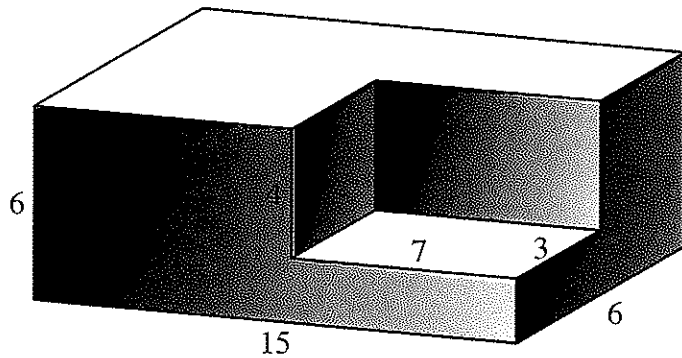
A. 432
B. 288
C. 386
D. 464
E. NOT

17. If $p = 17$ and $q = 12$, what is $p^2 - 2pq + q^2$?

   A. 28   B. 41   C. 25   D. 36   E. NOT

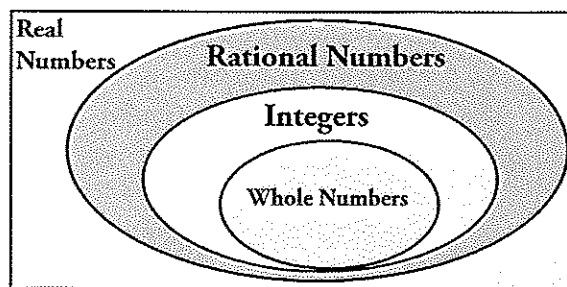18. $4\dfrac{2}{5} - 1.64 + \dfrac{13}{4} =$

   A. 6.01   B. 5.79   C. 6.13   D. 5.87   E. NOT

19. $6\dfrac{3}{8}$ hectometers = _____ centimeters

   A. 6375   B. 63750   C. 637500   D. 6375000   E. NOT

20. When the number −5 is placed in the diagram, which section should it be placed in?

   A. Whole Numbers   B. Integers   C. Rational Numbers   D. Real Numbers   E. NOT

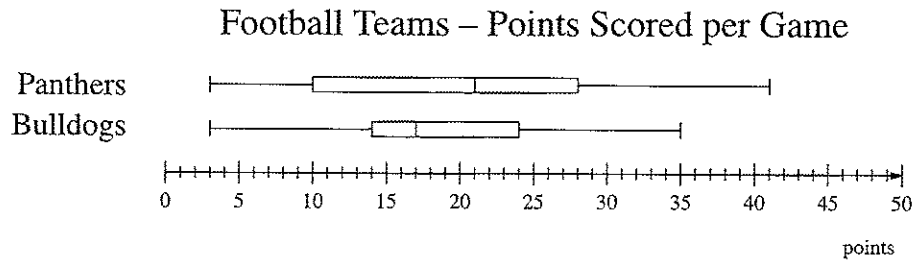21. Rainfall in each hour is given in the chart. What is the average rate of rainfall over these four hours?

Hour	Rainfall (in inches)
1	1.32
2	0.76
3	0.54
4	0.90

A. 0.76 in/hr

B. 0.65 in/hr

C. 0.96 in/hr

D. 0.88 in/hr

E. NOT

22. Solve for x: $3(x-4)+7(x+2)=3(2x+8)$

A. $4\dfrac{1}{2}$ B. $5\dfrac{1}{2}$ C. $4\dfrac{3}{4}$ D. $5\dfrac{1}{4}$ E. NOT

23. Using the box-and-whiskers plot, which of the following statements is true?

Football Teams – Points Scored per Game

A. The least number of points scored by the Bulldogs was 14.

B. The median number of points scored by the Panthers is 4 points greater than that of the Bulldogs.

C. The range of points scored by both teams was equal.

D. One-quarter of the Panthers' games resulted in scored greater than or equal to 21.

E. NOT

24. Find the area of the polygon.
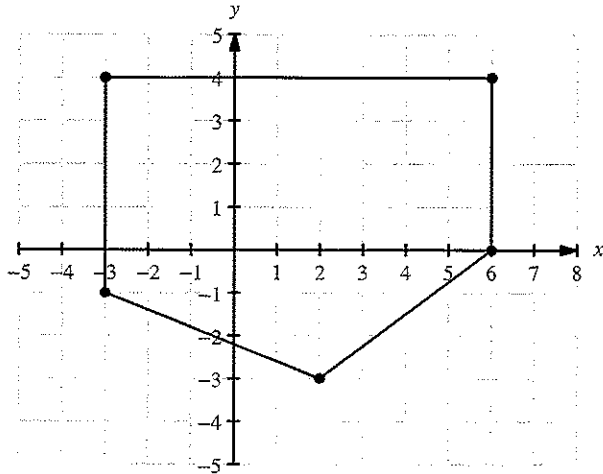
A. 50

B. 51

C. 52

D. 53

E. NOT

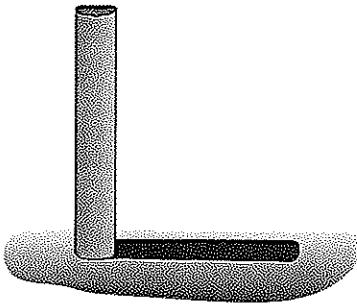25. A 40-foot tall pole projects a shadow that is 30 feet long. How far is it from the top of the pole to the tip of the shadow?

A. 48 ft

B. 50 ft

C. 56 ft

D. 70 ft

E. NOT

26. How many positive integral divisors of 96 are also multiples of 4?

A. 16   B. 6   C. 8   D. 12   E. NOT

27. If $f(x) = 7x - 5$, then $f(8) - f(6) =$

A. 18   B. 10   C. 4   D. 7   E. NOT

28. Two ants are 28 inches apart. They start moving toward each other, one at 1 inch per second, the other at $1\frac{1}{2}$ inches per second. How long does it take for them to meet?

    A. 10.8 seconds   B. 11 seconds   C. 11.2 seconds   D. 11.4 seconds   E. NOT

29. $1\frac{3}{11} + 2\frac{3}{11} + 3\frac{3}{11} + 4\frac{3}{11} + 5\frac{3}{11} =$

    A. $16\frac{4}{11}$ B. $16\frac{3}{11}$ C. $15\frac{3}{11}$ D. $15\frac{14}{11}$ E. NOT

30. Find the volume of a square-based pyramid with base sides of 6 m and height of 12 m.

    A. 864 m^3 B. 432 m^3 C. 288 m^3 D. 144 m^3 E. NOT

31. How many positive 4-digit integers contain at least one "3" as a digit?

    A. 3599   B. 3168   C. 2700   D. 2496   E. NOT

32. Which of the following is a factor of $x^2 - 7x - 60$?

    A. $x - 10$ B. $x - 15$ C. $x + 5$ D. $x + 12$ E. NOT

33. When $\frac{17}{60}$ is written as the repeating decimal 0.$abccc$..., where a, b, and c are digits, what is abc?

    A. 48   B. 64   C. 56   D. 42   E. NOT

34. $\frac{5! - 3!}{3!} =$

    A. 16   B. 17   C. 21   D. 19   E. NOT

35. If $18^2 - 12^2 = 5k$, then $k =$

    A. 24   B. 18   C. 48   D. 36   E. NOT

36. A meal costs $24.00. Joe tipped the waitress 20% of the meal cost. Tax is an additional 8% of the meal cost. What was the total spent after tip and tax?

A. $30.36   B. $30.72   C. $31.06   D. $31.32   E. NOT

37. A card is dealt from a standard deck of 52 cards. What is the probability of getting a red Queen?

A. $\dfrac{1}{26}$ B. $\dfrac{1}{52}$ C. $\dfrac{1}{13}$ D. $\dfrac{1}{4}$ E. NOT

38. What is the slope of the line that passes through the points $(2, 5)$ and $(-3, 15)$?

A. -2 B. 2 C. $-\dfrac{1}{2}$ D. $\dfrac{1}{2}$ E. NOT

39. Three years ago, Bree was two years younger than twice Sarah's age. Five years from now, Bree will be 17 years older than half of Sarah's age. What is Bree's age now?

A. 13   B. 15   C. 18   D. 21   E. NOT

40. If $3^{2x-1} = 27$, then $5^{x-1} =$

A. 125   B. 25   C. 5   D. $\dfrac{1}{5}$ E. NOT

41. Billie has 8 books and can take 2 books to a sleepover. How many ways can she choose the 2 books to take?

A. 64   B. 56   C. 32   D. 28   E. NOT

42. How many space diagonals does the Platonic solid dodecahedron have?

A. 60   B. 100   C. 120   D. 75   E. NOT

43. $\overline{AE} \parallel \overline{BD}$. $AB = 6$, $BC = 9$, $DC = 12$. What is DE?
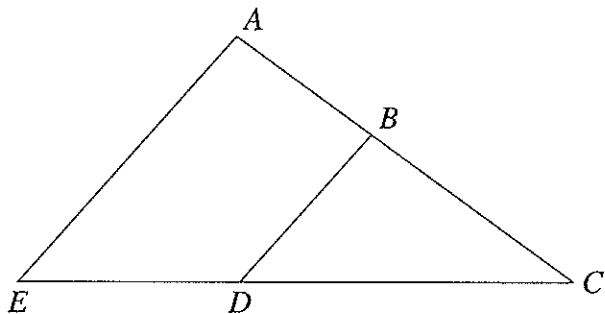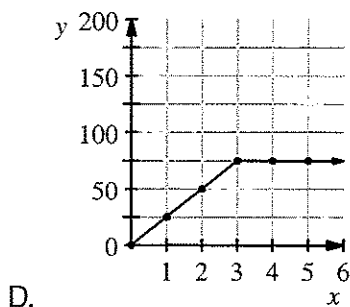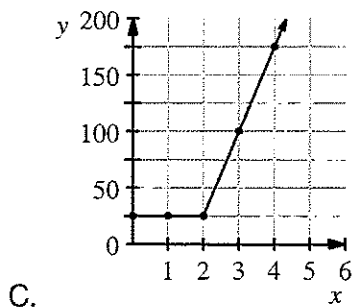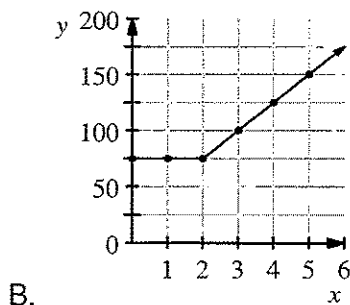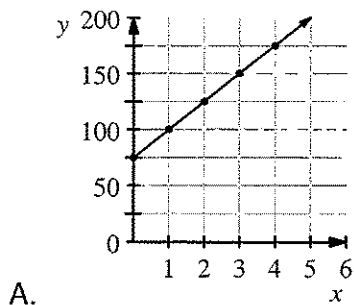
A. 7
B. 8
C. 9
D. 10
E. NOT

44. What is the domain of $f(x) = \dfrac{4x - 3}{2x + 1}$?

A. $\left(-\infty, -\dfrac{1}{2}\right) \cup \left(-\dfrac{1}{2}, \infty\right)$

B. $\left(-\infty, \dfrac{3}{4}\right) \cup \left(\dfrac{3}{4}, \infty\right)$

C. $\left(-\infty, -\dfrac{1}{2}\right) \cup \left(-\dfrac{1}{2}, \dfrac{3}{4}\right) \cup \left(\dfrac{3}{4}, \infty\right)$

D. $(-\infty, \infty)$

E. NOT

45. A cleaning service charges \$75 per visit plus \$25 for each hour over 2 hours of service. Which graph shows the cost y to hire the cleaning company for x hours?
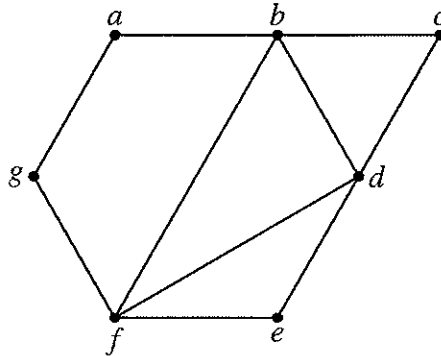
A.

B.

C.

D.

E. NOT

Graph Theory

Use the graph of G to answer questions 46 through 48.

G :

46. What is the order of G?

    A. 10   B. 9   C. 8   D. 7   E. NOT

47. What is the size of G?
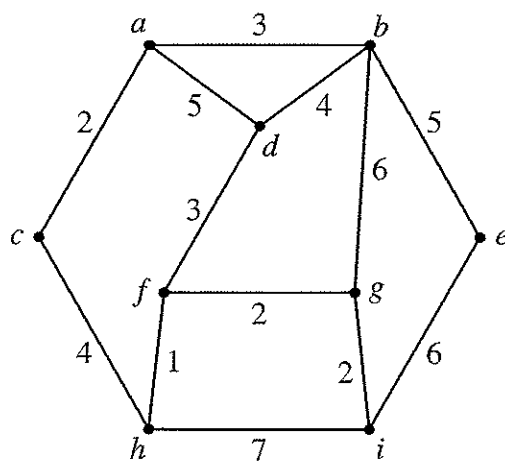
    A. 10   B. 9   C. 8   D. 7   E. NOT

48. An *independent set* is a set of vertices where no two vertices in the set are adjacent. What is the largest possible number of vertices from G that can be in an independent set?

    A. 1   B. 2   C. 3   D. 4   E. NOT

49. How many edges does the graph K_9 have?

    A. 27   B. 36   C. 45   D. 54   E. NOT

50. Find the distance from vertex a to vertex i.

A. 11   B. 12   C. 13   D. 14   E. NOT

Mathematics Grades 6-8

District Contest

Contestant Answer Sheet

PSIA Private Schools Interscholastic Association

Contestant ID: _____   Grade Level: _____

INSTRUCTIONS: Place the PRINTED CAPITAL letter of each answer choice (A, B, C, D, or E) in the blank corresponding to the test item number. SCORING: +5 for each correct answer; –2 for each incorrect answer; no deduction for skipped or unanswered items. Visible erasures and mark-outs constitute a 2-point deduction ONLY if a correct answer is not written in the answer space.

1. _____	18. _____	35. _____
2. _____	19. _____	36. _____
3. _____	20. _____	37. _____
4. _____	21. _____	38. _____
5. _____	22. _____	39. _____
6. _____	23. _____	40. _____
7. _____	24. _____	41. _____
8. _____	25. _____	42. _____
9. _____	26. _____	43. _____
10. _____	27. _____	44. _____
11. _____	28. _____	45. _____
12. _____	29. _____	46. _____
13. _____	30. _____	47. _____
14. _____	31. _____	48. _____
15. _____	32. _____	49. _____
16. _____	33. _____	50. _____
17. _____	34. _____	

Mathematics Grades 6-8

District 2023

ANSWER KEY

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REMINDERS: PRINTED CAPITAL letters only. SCORING: +5 for each correct answer; –2 for each incorrect answer; no deduction for skipped or unanswered items. Visible erasures and mark-outs constitute a 2-point deduction ONLY if a correct answer is not written in the answer space.

1. C	18. A	35. D
2. B	19. B	36. B
3. A	20. B	37. A
4. D	21. D	38. A
5. D	22. B	39. D
6. B	23. B	40. C
7. B	24. C	41. D
8. D	25. B	42. B
9. C	26. C	43. B
10. B	27. E (14)	44. A
11. C	28. C	45. B
12. A	29. A	46. D
13. D	30. D	47. A
14. A	31. B	48. C
15. D	32. C	49. B
16. A	33. A	50. A
17. C	34. D	