

CONTESTANT ID #: _____

GRADE LEVEL : _____

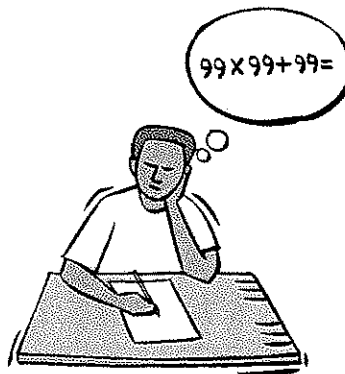
*Place Contestant ID label here BEFORE
Contest Begins*



Mathematics

State Contest

Grades 6-8



2022

FINAL SCORE: _____

(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: $2^{-3} \times (5^2 - 3^2) + 6 \times \left(8 \times \frac{2}{3}\right)$

- A. 34 B. $32\frac{1}{2}$ C. $33\frac{1}{3}$ D. 36 E. NOT

2. $5\frac{1}{4} - 3\frac{5}{6} =$

- A. $1\frac{5}{12}$ B. $1\frac{7}{12}$ C. $1\frac{2}{3}$ D. $1\frac{3}{4}$ E. NOT

3. How many seconds are there in $7\frac{1}{3}$ minutes?

- A. 470 B. 460 C. 450 D. 440 E. NOT

4. $XLV \times X =$ _____ (Roman numerals)

- A. DCL B. DCX C. CDL D. CDX E. NOT

5. A gamma ray is emitted with a wavelength of 4.75 picometers. Use the metric chart to find the wavelength of this ray in femtometers.

| Prefix | Exponential Form |
|-----------------|------------------|
| milli (m) | 10^{-3} |
| micro (μ) | 10^{-6} |
| nano (n) | 10^{-9} |
| pico (p) | 10^{-12} |
| femto (f) | 10^{-15} |

- A. 4750 fm
B. 47.5 fm
C. 0.004 75 fm
D. 0.000 004 75 fm
E. NOT

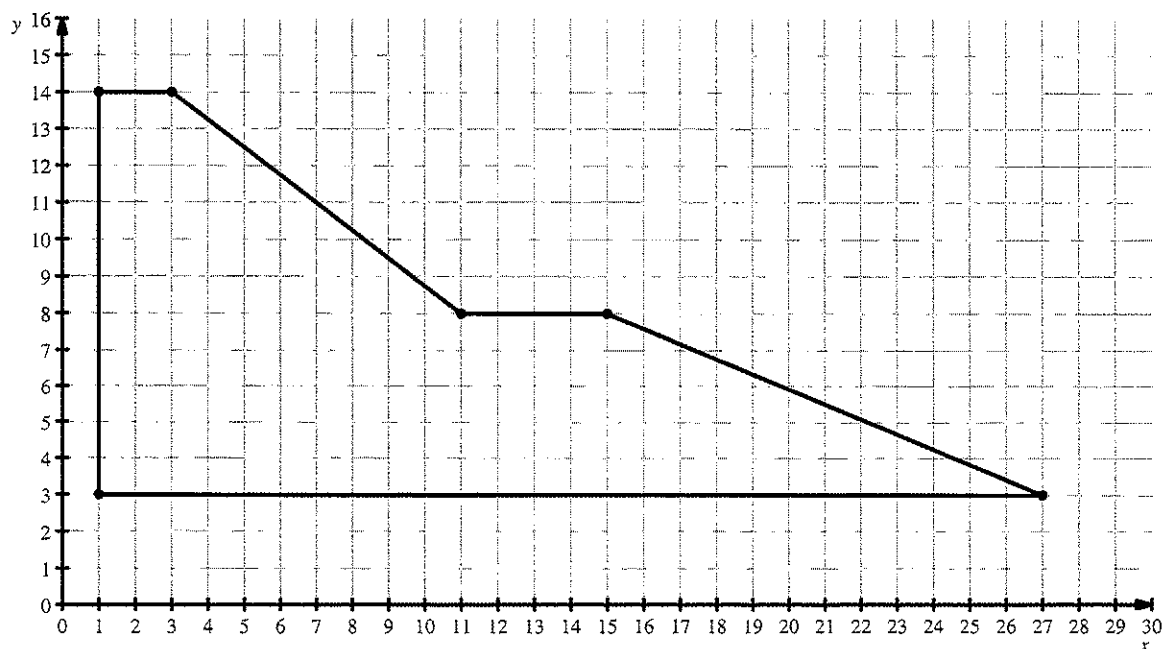
6. $3128 \div 2 \div 2 \div 2 =$

- A. 411 B. 391 C. 371 D. 351 E. NOT

7. A dozen donuts cost \$4.96. How much will 15 donuts cost?

- A. \$6.12 B. \$6.20 C. \$6.24 D. \$6.30 E. NOT

8. Find the perimeter of this figure.



- A. 62 B. 64 C. 66 D. 68 E. NOT

9. What is the sum of all composite numbers between 13 and 23?

- A. 122 B. 124 C. 126 D. 128 E. NOT

10. How many different prime divisors does 84 have?

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

11. $3\frac{1}{3} \div 2\frac{1}{2} =$
- A. $1\frac{1}{4}$ B. $1\frac{1}{6}$ C. $1\frac{1}{2}$ D. $1\frac{1}{3}$ E. NOT
12. The letter Q represents a single digit in the number 5Q32Q1. What value of Q makes this number evenly divisible by 9?
- A. 3 B. 1 C. 8 D. 5 E. NOT
13. A taco truck sold 432 tacos on Thursday, 469 tacos on Friday, 512 tacos on Saturday, and 387 tacos on Sunday. What was the average number of tacos sold each day?
- A. 440 B. 450 C. 460 D. 470 E. NOT
14. If $J \times 3 = K$, which expression is equivalent to $J^2 \div 3$?
- A. $\frac{K}{27}$ B. $\frac{K}{9}$ C. $\frac{K^2}{27}$ D. $\frac{K^2}{9}$ E. NOT
15. Point $P(-2, 3)$ is reflected over the line $y = x$ to point R . What is the y-coordinate of R ?
- A. 2 B. -2 C. 3 D. -3 E. NOT
16. $2 + 4 + 6 + 8 + 10 + \dots + 44 =$
- A. 442 B. 476 C. 506 D. 532 E. NOT

17. In a card game, players can score negative points for having unplayed cards in their hand. Four friends are playing the game. The number of points earned in the first five hands are shown below. Who has the most points after these five hands?

| Alex | Becca | Crystal | Dora |
|------|-------|---------|------|
| 43 | -17 | 18 | 35 |
| -16 | 23 | 45 | -7 |
| 53 | 8 | -31 | 16 |
| -18 | -14 | 9 | 12 |
| -2 | 13 | -17 | -26 |

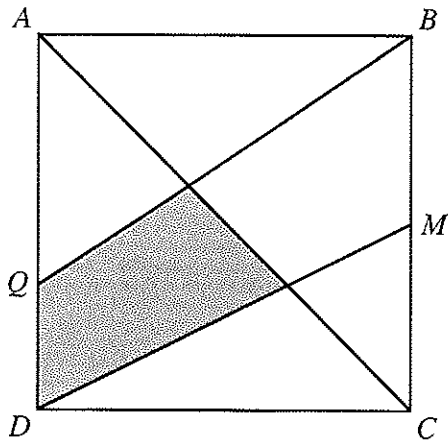
- A. Alex B. Becca C. Crystal D. Dora E. NOT
18. 1212 (base 3) = _____ (base 10)
- A. 50 B. 48 C. 54 D. 52 E. NOT
19. $12\frac{2}{7} \times 14\frac{3}{4} =$
- A. $176\frac{3}{14}$ B. $181\frac{3}{14}$ C. $178\frac{6}{7}$ D. $184\frac{6}{7}$ E. NOT
20. How many of these numbers are rational?

| | | | | |
|---|-------|----------------|--------------|-------------|
| 0 | π | $-\frac{3}{4}$ | $5.777\dots$ | $\sqrt{10}$ |
|---|-------|----------------|--------------|-------------|

- A. 1 B. 2 C. 3 D. 4 E. NOT
21. What percent of 42 is 7?
- A. $16\frac{2}{3}\%$ B. 15% C. 60% D. $12\frac{1}{2}\%$ E. NOT

22. The ratio of the two smallest angles of a triangle is 2 : 3. The ratio of the two largest angles is 1 : 2. Which term correctly classifies this triangle?
- A. obtuse B. right C. acute D. isosceles E. NOT
23. Sonya earns \$3200 per month. She saves 5% each month for a vacation that costs \$2400. How many months will she need to save to pay for the vacation?
- A. 10 B. 12 C. 15 D. 18 E. NOT
24. Let $f(x) = x^2 - 14x + 49$. Find the value of $f(19)$.
- A. 49 B. 81 C. 225 D. 144 E. NOT
25. What is the 23rd term in the sequence $-45, -37, -29, -21, \dots$?
- A. 135 B. 131 C. 127 D. 123 E. NOT
26. $\sqrt{\frac{7}{8} \times 3\frac{1}{2}} =$
- A. $1\frac{1}{2}$ B. $1\frac{3}{4}$ C. $1\frac{5}{6}$ D. $2\frac{1}{4}$ E. NOT
27. Solve for v : $3[-2(2v - 7) + 5(2v + 1)] - 2v = 2v(v + 3) + v(7 - 2v)$
- A. -5 B. 12 C. -10 D. 6 E. NOT

28. $ABCD$ is a square with sides measuring 12. M is the midpoint of \overline{BC} and $QA = 2QD$. Find the shaded area.



- A. 25.4
- B. 27.6
- C. 28.8
- D. 30.2
- E. NOT

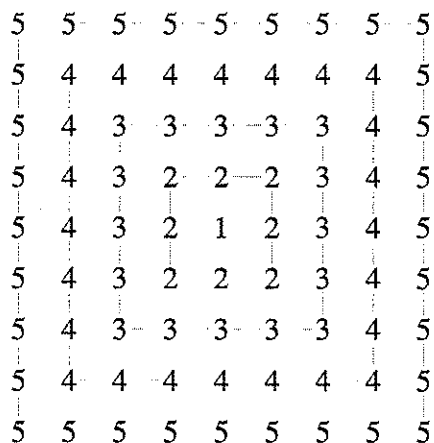
29. Which of the following is a factor of $x^2 - 2x - 80$?

- A. $x - 16$
- B. $x + 8$
- C. $x - 12$
- D. $x + 5$
- E. NOT

30. A dipper holds 2 cups. A bowl hold 7 cups. A pail holds 13 cups. A gardener needs exactly 120 cups of water for his seeds and can only use the dipper, bowl, and pail. He needs to use the least number of all of these as possible. How many times does he need to use the bowl?

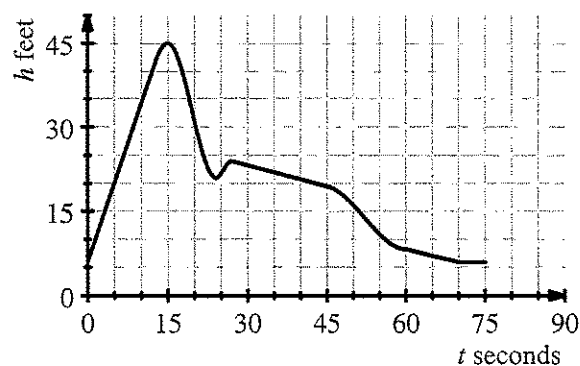
- A. 3
- B. 2
- C. 1
- D. 0
- E. NOT

31. Find the sum of all numbers in this figure.



- A. 327 B. 321 C. 335 D. 333 E. NOT

32. The graph below shows the height above ground of the first car on a roller coaster at t seconds after the ride begins. Which of the following statements are true?



- I. The height of the roller coaster car increases from $t = 0$ to $t = 15$.
 II. The car is not moving from $t = 70$ to $t = 75$.
 III. The car falls faster at $t = 20$ than at $t = 30$.

- A. I only B. I and II C. I and III D. II and III E. NOT

33. The total surface area of a square-based box is 112 cm^2 . The height of the box is 5 cm. What is the base side length?

A. 3 cm B. 4 cm C. 5 cm D. 6 cm E. NOT

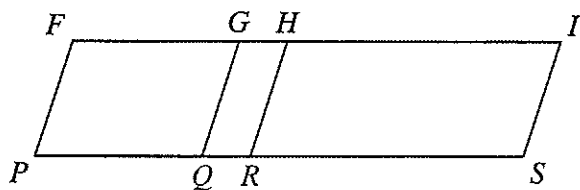
34. $\frac{7! + 5!}{5!} =$

A. 47 B. 49 C. 43 D. 45 E. NOT

35. Two dice are rolled. What is the probability the sum of the dice is “6” or “8”?

A. $\frac{11}{36}$ B. $\frac{7}{18}$ C. $\frac{5}{36}$ D. $\frac{1}{6}$ E. NOT

36. The area of parallelogram $GISQ$ is 80. The area of parallelogram $FHRP$ is 53. The area of parallelogram $FISP$ is 121. Find the area of parallelogram $GHRQ$.



A. 14
B. 16
C. 10
D. 12
E. NOT

37. What is the product of the greatest common divisor and least common multiple of 35 and 45?

A. 855 B. 875 C. 1375 D. 1575 E. NOT

38. Find the sum of the 17th and 18th terms in the sequence 1, 3, 6, 10, 15, 21, ...

A. 324 B. 320 C. 336 D. 332 E. NOT

39. If $5^{4-x} = 6$, what is the value of 5^{x-3} ?

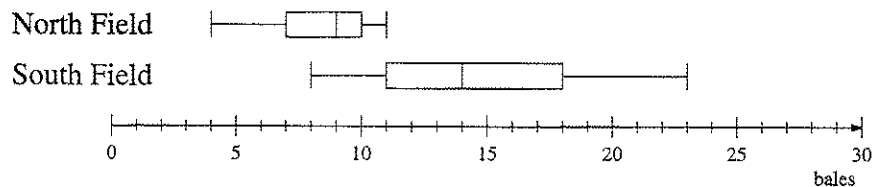
A. 3.333... B. 1.2 C. 0.7666... D. 0.8333... E. NOT

40. There are seven people at a party who want to play “42” (a domino game for exactly four players only). How many ways can the first group of four players be chosen?

A. 28 B. 21 C. 42 D. 35 E. NOT

41. A farmer recorded the number of round bales of hay produced in two fields each year for many years. The statistics are presented in the box-and-whiskers plot below. Which of the following statements are correct?

Round Bales of Hay



- I. The North Field always produces fewer bales than the South Field.
- II. Half of the measurements of the number of round bales produced in the South Field are between 11 and 18, inclusive.
- III. The South Field has a larger variation in the number of bales produced than the North Field.

A. I and II B. II and III C. III only D. I, II, and III E. NOT

42. How many integer solutions does the compound inequality $4x + 3 < 21$ and $5 - 2x \leq 7$ have?

A. 6 B. 4 C. 5 D. 7 E. NOT

43. What is the sum of the solutions to the quadratic equation $5x^2 - 23x + 12 = 0$?

A. 2.3 B. 3.8 C. 2.4 D. 4.6 E. NOT

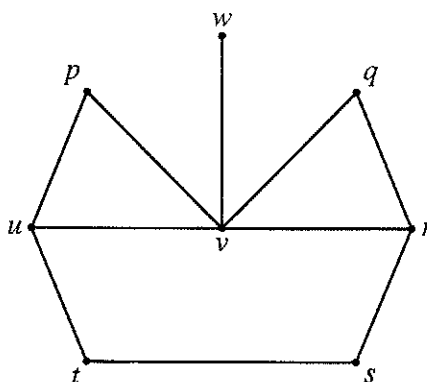
44. Four purple tokens weigh the same as five gold tokens. Three gold tokens weigh the same as eight red tokens. How many red tokens weigh the same as nine purple tokens?

A. 33 B. 35 C. 28 D. 30 E. NOT

45. A pump can drain 20 gallons of water per minute out of a tank. How long in total will it take to empty a 600-gallon tank that is 80% full if the pump is working at 50% speed for 4 minutes before being turned up to full speed?

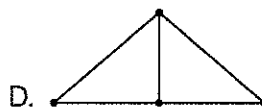
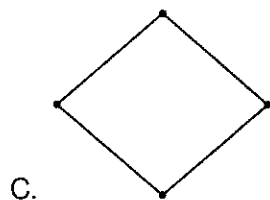
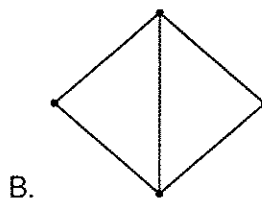
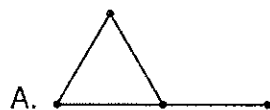
A. 25 minutes B. 26 minutes C. 27 minutes D. 28 minutes E. NOT

46. Given the graph below, which vertices are adjacent to both vertices u and v ?



A. p only B. p and t C. p , t , and w D. t only E. NOT

47. Using the same graph in question #46, what graph is isomorphic to (the same as) the induced subgraph that contains the vertices q , r , s , and v ?



E. NOT



Mathematics Grades 6-8

State Contest – 2022

Contestant Answer Sheet

GRADERS: Write scores and initial.

Score 1: _____

Score 3: _____

Score 2: _____

FINAL: _____

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

State 2022

ANSWER KEY

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