TWENTY-NINTH ANNUAL MATHEMATICS CONTEST
Sponsored by
THE TENNESSEE MATHEMATICS TEACHERS' ASSOCIATION

DIRECTIONS:

Do not open this booklet until you are told to do so.

This is a test of your competence in high school mathematics. For
each problem there are listed 5 possible answers. You are to work each
problem, determine the best answer, and indicate your choice by making a
heavy black mark in the proper place on the separate answer sheet provided.
You must use a pencil with a soft lead (No. 2 lead or softer).

This test has been constructed so that most of you are not expected to
answer all questions. Do your very best on the questions you feel you know
how to work. You will be penalized for incorrect answers, so it is
advisable not to do wild guessing.

If you should change your mind about an answer, be sure to erase
completely. Do not mark more than one answer for any problem. Make no
stray marks of any kind on your answer sheet. The answer sheets will not
be returned to you. If you wish a record of your performance, mark your
answers in this booklet also. You will be able to keep this booklet after
the test is completed.

When told to do so, open your test booklet to page 2 and begin. When
you have finished one page, go on the the next. The working time for the
entire test is 80 minutes.

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1. The expression x^4-16 completely factored is

   a) $(x^2 - 4)^2$

   b) $(x^2 + 4)^2$

   c) $(2x - 1)^4$

   b) $(x^2 - 4)(x + 1)(x - 1)$

   e) $(x^2 + 4)(x + 2)(x - 2)$

2. $\dfrac{13\sqrt{6} + 5\sqrt{150}}{\sqrt{3}}$ simplifies to

   a) $13\sqrt{2} + 2\sqrt{25}$

   b) $38\sqrt{2}$

   c) $2\sqrt{13} + 5\sqrt{2}$

   d) $2\sqrt{38}$

   e) 276

3. If $\dfrac{3}{\sqrt{x+1}} = 1$, then x is

   a) 10

   b) 8

   c) 2
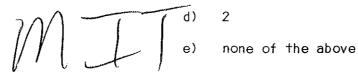
   d) 5

   e) none of the above

4. The converse of "If p, then q" is:

   a) If p, then not q

   b) If q, then not p

   c) If q, then p

   d) If not p, then not q

   e) If not q, then p

5. To complete the square of $2x^2 + 2x = 6$ what should be added to both sides of the equation?

   a) 1/2

   b) 1/4

   c) 1

   d) 2

   e) none of the above

6. When $x = -2$, $y = -3$ and $z = 4$, then $\dfrac{x^2 - xy}{z^2 + xz}$ is

   a) 7/20

   b) 1/4

   c) 5/4

   d) -1/4

   e) -5/4

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7. $\dfrac{x^2 + 11x + 28}{x^2 - 49}$ simplified to lowest terms is

   a) $\dfrac{x - 4}{x + 7}$ d) $4/7$

   b) $\dfrac{x + 4}{x - 7}$ e) $-4/7$

   c) $\dfrac{x - 4}{x - 7}$

8. The value of $\left(\dfrac{3^{-1} - 2^{-2}}{2^{-1} + 2^{-2}}\right)^{-1}$ when simplified is

   a) 4 d) 9

   b) $1/9$ e) $1/64$

   c) $-1/6$

9. If $ab = 3/2$ and $ac = 5/2$, then b/c is

   a) $15/4$ d) $1/2$

   b) $2/3$ e) $4/15$

   c) $3/5$

10. In the expression $4x^3$, 3 is called the

   a) coefficient   d) base

   b) exponent   e) denominator

   c) numerator

11. If $4x + 2y = 9x - 12$ then y is

   a) $\dfrac{2x - 3}{5}$ d) $\dfrac{12x - 5}{2}$

   b) $\dfrac{5x - 12}{2}$ e) $\dfrac{13x - 12}{2}$

   c) $\dfrac{3x - 2}{5}$

12. An equation of the horizontal line through (1, 1) is

a) $y = -x + 5$ d) $y = 1$

b) $y = x + 2$ e) $y = 3x + 1$

c) $y = 2x - 1$

13. If $2 - m \leq 4$, then

a) $m \leq 2$ d) $m \geq -2$

b) $m \leq -2$ e) none of the above

c) $m > -2$

14. The length of a rectangle is 3 meters less than twice the width. The perimeter of the rectangle is 42 meters. The length and width of the rectangle are

a) $L = 5$, $W = 16$ d) $L = 8$, $W = 13$

b) $L = 16$, $W = 5$ e) $L = 17$, $W = 10$

c) $L = 13$, $W = 8$

15. What values of p make $3p^2 + 9p + 30 = 2p^2 - 2p$ a true statement?

a) $\{5, 6\}$ d) $\{4, 3\}$

b) $\emptyset$ e) $\{-5, -6\}$

c) a repeated zero root

16. The distance between the points (6, 3) and (5, -4) is

a) $5\sqrt{2}$ d) 7

b) 8 e) none of these

c) 10

17. The expression $\dfrac{x + 5}{x + 6} - \dfrac{x - 1}{x + 1} - \dfrac{10}{x^2 + 7x + 6}$ can be simplified to

    a) $\dfrac{x - 1}{x^2 + 7x + 6}$

    b) $\dfrac{1}{x + 6}$

    c) $\dfrac{-4}{x^2 + 7x + 6}$

    d) $\dfrac{-4}{(x + 1)(x + 6)}$

    e) $\dfrac{-6}{x + 6}$

18. The value of the determinant $\begin{vmatrix} 5 & 3 & 8 \\ 3 & 1 & 4 \\ 2 & 4 & 6 \end{vmatrix}$ is

    a) 16

    b) -4^2

    c) 0

    d) 2

    e) -58

19. If the two largest angles of a triangle are equal and the difference between one of the equal angles and the third angle is 30 degrees, then the number of degrees in the third angle is

    a) 25

    b) 40

    c) 50

    d) 55

    e) 75

20. The law of the lever can be expressed by the equation EA = rs. The value of s when r = 20, E = 40 and A = 10 is

    a) 20

    b) 2

    c) 40

    d) 4

    e) 15

21. The solution set for $|2x + 3| \geq 5$ is

    a) $-4 \leq x \leq 1$

    b) $x \leq -4$ or $x \geq 1$

    c) $x \leq -4$ and $x \geq 1$

    d) $-4 < x < 1$

    e) $-4 \leq x \leq 1$

22. The expression $\dfrac{xy - yw + xz - zw}{xy + yw + xz + zw}$ can be simplified to

a) -1

d) 0

b) 1

e) $\dfrac{x - w}{x + w}$

c) $\dfrac{x + w}{x - w}$

23. The graph of the equation $y = 2x^2 + 5x + 2$ is

a) straight line

d) ellipse

b) parabola

e) hyperbola

c) circle

24. The function $f(x) = ax^2 + bx - 1$ has $f(-3) = 26$ and $f(4) = 19$. Then b is

a) 1

d) 2

b) 3

e) -3

c) -2

25. The solution set for the system $5x + 2y = 3$ is

$$7x - 5y = -1$$

a) $\{(1/3,\ 2/3)\}$

d) $\{(1,\ -1)\}$

b) $\{(3,\ 2)\}$

e) $\{(2/3,\ -1/3)\}$

c) $\{(8/15,\ -2/3)\}$

26. The complete factorization of $4x^3 - 75 + 12x^2 - 25x$ is

a) $(x + 3)^2(2x - 5)(2x + 5)$

d) $(2x - 5)(2x + 5)(x + 3)$

b) $(2x - 5)^2(x + 3)$

e) none of the above

c) $(x - 3)(2x + 5)(2x - 5)$

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37. The coefficient of x^2 in the expansion of $(x + 2)^4$ is

    a)   32   d)   4

    b)   8   e)   24

    c)   6

38. The solution for $\dfrac{x - 2}{x + 3} \leq 0$ is

    a) $x \leq -3$ or $x \geq 2$ d) $-3 < x < 2$

    b) $-3 < x \leq 2$ e) $x < -3$ or $x > 2$

    c) $-3 \leq x \leq 2$

39. The solution set of $\left| x + 1 \right| = 9$ is

    a) $\{8, -10\}$ d) $\{9\}$

    b) $\{-10\}$ e) $\{8\}$

    c) $\{-8, 10\}$

40. If a train travels M miles in 5 hours, how many miles will it travel in K hours at the same rate?

    a) $\dfrac{K}{5M}$ d) $\dfrac{M}{5K}$

    b) $\dfrac{5M}{K}$ e) $\dfrac{KM}{5}$

    c) $\dfrac{5K}{M}$

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