ALGEBRA I TEST 1980

Scoring Formula: 4R - W + 40

Edited by Bruce Myers and Carolyn Pritchett,
Austin Peay State University, Clarksville,
Tennessee

This test was prepared from a list of Algebra I questions submitted by Roane State Community College.

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; one and only one is correct. You are to work each problem, determine the correct answer, and indicate your choice by making a heavy black mark in the correct place on the separate answer sheet provided. You must use a pencil with 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 much 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 to the next. The working time for the entire test is 80 minutes.

Contributors to TMTA for Annual Mathematics Contest:

1. Find the product $(x + 2y + 1)(x + 2y - 1)$.

   (a) $x^2 + 4xy + 4y^2 - 1$

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

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

   (d) $x^2 + 4xy - 2x + 4y + 4y^2 - 1$

   (e) $x^2 - 4xy + 2x - 4y + 4y^2 - 1$

2. The complex fraction $\dfrac{\frac{x}{2} + \frac{y}{3}}{\frac{3}{y} + \frac{2}{x}}$ can be simplified to

   (a) $\dfrac{6}{x + y}$

   (b) 1

   (c) $\dfrac{xy}{6}$

   (d) $\dfrac{3x + 2y}{6}$

   (e) none of these

3. $\sqrt{9}$ equals

   (a) 3

   (b) -3

   (c) 3 or -3

   (d) $3i$

   (e) none of these

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

   (a) 0

   (b) 36

   (c) -36

   (d) 18

   (e) -18

5. $(x^{-1}y^0)^{-2}$ can be simplified to:

   (a) $\dfrac{1}{x^2y}$

   (b) x^2y^{-2}

   (c) $\dfrac{y}{x^2}$

   (d) $\dfrac{1}{x^2}$

   (e) x^2

6. If $\dfrac{2x - 9}{3x + 2} < 0$, then the values which x may be are:

   (a) $x > -2/3$

   (b) $x < -2/3$ or $x > 9/2$

   (c) $-2/3 < x < 9/2$

   (d) $x < 9/2$

   (e) $x < -2/3$ or $x \geq 9/2$

7. $\dfrac{x^3 - 1}{x^2 - 1}$ simplifies to

   (a) $x + 1$

   (b) x

   (c) $x - 1$

   (d) $\dfrac{x^2 + x + 1}{x + 1}$

   (e) none of these

8. The solution set for $\dfrac{3}{\sqrt{4x + 1}} = -2$ is

   (a) $\{5/16\}$

   (b) $\{16/5\}$

   (c) $\left\{\dfrac{5}{16}, -\dfrac{5}{16}\right\}$

   (d) $\emptyset$

   (e) none of these

9. Mrs. Billings flew her own plane from her home town to a city due east where she attended a business meeting. After spending six hours in the city, she then flew back home. Her plane in still air had a speed of 156 miles per hour, and the wind blew from the west at 12 miles per hour all day. If 10 1/3 hours elapsed from the time she left her home airport until she returned, how far was the city from her town?

   (a) 338 miles

   (b) 336 miles

   (3) 340 miles

   (4) 350 miles

   (5) none of these

10. $\dfrac{1}{\sqrt{x} - 1}$ equals

   (a) $\dfrac{\sqrt{x}}{\sqrt{x} - 1}$

   (b) $\dfrac{\sqrt{x}}{x - 1}$

   (c) $\dfrac{\sqrt{x} - 1}{x + 1}$

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

   (e) none of these

11. If $\log_a 2 = .1012$ and $\log_a 3 = .1112$, what is $\log_a 12$?

   (a) .4248

   (b) .6070

   (c) .4448

   (d) .3136

   (e) .0011

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12. If $2(x - 5) = 3(2x + 1)$, then x equals

  (a) 5

  (b) -7/4

  (c) -1/2

  (d) -13/4

  (e) none of these

13. $\dfrac{\sqrt{3} + \sqrt{27}}{\sqrt{3} - \sqrt{27}}$ can be simplified and expressed as

  (a) $\dfrac{3 + 3\sqrt{3}}{-24}$

  (b) -39/24

  (c) $\dfrac{30 + 3\sqrt{3}}{-24}$

  (d) $\dfrac{\sqrt{30}}{-\sqrt{24}}$

  (e) -2

14. $\dfrac{16x^4y^{-2}z^{10}}{2x^{-1}y^4z^5}$ simplifies to

  (a) $8x^3y^{-6}z^5$

  (b) $8x^3y^6z^5$

  (c) $14x^5y^{-6}z^5$

  (d) $\dfrac{8x^5z^5}{y^2}$

  (e) $\dfrac{8x^5z^5}{y^6}$

15. The graph of the equation $x^2 + y^2 = 4$ is a

  (a) straight line

  (b) parabola

  (c) circle

  (d) ellipse

  (e) hyperbola

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16. The expression $\dfrac{4\sqrt{6} + 2\sqrt{150}}{\sqrt{3}}$ simplies to

    (a) $6\sqrt{52}$

    (b) $12\sqrt{13}$

    (c) $14\sqrt{2}$

    (d) $2\sqrt{14}$

    (e) none of these

17. If a, b and c belong to the set of real numbers and $a < b$, then which of the following is NOT always true?

    (a) $b > a$

    (b) $ca < cb$

    (c) $a - b < 0$

    (d) $b - a > 0$

    (e) $a + c < b + c$

18. Simplify $\dfrac{\frac{1}{x} - 1}{\frac{1}{x} + 1}$.

    (a) $\dfrac{1 - x}{1 + x}$

    (b) $\dfrac{1 - x^2}{1 + x^2}$

    (c) -1

    (d) 1

    (e) 0

19. The expression $(3a - b)^2 - (2a + b)^2$ is equivalent to the factored expression

    (a) $(a - 2b)5a$

    (b) $5a^2 - 10ab$

    (c) $[(3a - b) - (2a + b)]^2$

    (d) $5a^2 - 2ab + 2b^2$

    (e) none of these

20. The numerator of a fraction is 7 less than the denominator. If the numerator is decreased by 2 and the denominator is increased by 3, the value of the fraction is then 1/3. What is the fraction?

    (a) 3/5

    (b) 8/15

    (c) -1/6

    (d) 3/10

    (e) 1/8

21. If each a and b represents a real number, which one of the following statements is always correct?

    (a) $(a + b)^3 = a^3 + b^3$

    (b) $a^3 + b^3 = (a + b)(a^2 + ab + b^2)$

    (c) $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

    (d) $a^2 - b^2 = (a - b)(a - b)$

    (e) $a - b = (\sqrt{a} - \sqrt{b})(\sqrt{a} - \sqrt{b})$

22. Evaluate $m(n^2 - p^2)$ when $m = 2$, $n = -4$, $p = -3$.

    (a) -28

    (b) 14

    (c) 50

    (d) 98

    (e) 28

23. Completely factor $2x^3 + 2x^2 - 312x$.

    (a) $2x(x + 12)(x - 13)$

    (b) $x(2x + 24)(x - 13)$

    (c) $(2x^2 + 24x)(x + 13)$

    (d) $(x - 12)(2x^2 + 26)$

    (e) $2x(x - 12)(x + 13)$

24. The solution set of $|x - 1| < 5$ is

    (a) $\{6\}$

    (b) $\{x \mid x < 6\}$

    (c) $\{x \mid -4 < x < 6\}$

    (d) $\{x \mid x < -4 \text{ or } x > 6\}$

    (e) none of these

25. The solution set for the system of equations $\begin{array}{l} 4x - 3y = -3 \\ 7x + 2y = 2 \end{array}$ is

    (a) $\{(0, -1)\}$

    (b) $\{(-1, 0)\}$

    (c) $\{(1, 0)\}$

    (d) $\{(0, 1)\}$

    (e) none of these

26. Given $3^{x+y} = 81$ and $3^{x-y} = 1/3$, then

    (a) $x = 2/3, y = 2/5$

    (b) $x = 2/5, y = 2/3$

    (c) $x = 5/2, y = 3/2$

    (d) $x = 3/2, y = 5/2$

    (e) none of these

27. If $a * b = c$ means $c = a^2(b + 1)$, then $4 * 3$ is

    (a) 12

    (b) 45

    (c) 63

    (d) b

    (e) none of these

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28. $(\sqrt{6} - \sqrt{3})(\sqrt{6} + \sqrt{3})$ equals

    (a) 3

    (b) $3\sqrt{3}$

    (c) 1

    (d) 0

    (e) none of these

29. The statement "If p, then q." has as its contrapositive

    (a) If q, then p

    (b) If not p, then not q.

    (c) If not q, then not p.

    (d) p if and only if q.

    (e) If not q, then p.

30. The solution set of $x^2 - 2x + 1 = 0$ is

    (a) {1}

    (b) {1, -1}

    (c) {-1}

    (d) {i, -i}

    (e) none of these

31. Factor $x^2y^2 - x^3y^3 + xy$ completely.

    (a) $xy(xy - x^2y^2 + 1)$

    (b) $x(xy^2 - x^2y^3 + y)$

    (c) $y(x^2y - x^3y^2 + x)$

    (d) 0

    (e) $x^2y^2(1 - xy) + 1$

32. If $s = \frac{n}{2}(a + \ell)$, then a is equal to

    (a) $\frac{2s}{n} - \ell$

    (b) $\frac{2s - \ell}{n}$

    (c) $\frac{\ell - 2s}{n}$

    (d) $2s - n\ell$

    (e) none of these

33. Simplify $2x(x + (3x - 1) - 2(x - 1)) + 2$.

    (a) $x^2 + 2x + 1$

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

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

    (d) $2(3x^3 - 3x^2 + 4x + 2)$

    (e) $4x^2 + 6$

34. If $x < 0$, then $|x|$ is

    (a) x

    (b) $-x$

    (c) 0

    (d) undefined

    (e) none of these

35. The solution set for $|x - 1| \leq 0$ is

    (a) $\{x | x \leq 1\}$

    (b) $\{x | x \geq 1\}$

    (c) $\{x | x = 1\}$

    (d) $\emptyset$

    (e) $\{x | -1 \leq x \leq 1\}$

36. Completely factor $x^3 - 2x^2 - 2x + 1$.

    (a) $(x + 1)(x^2 - x + 2)$

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

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

    (d) $(x + 1)^2(x - 2)$

    (e) $(x + 1)(x^2 - 3x + 1)$

37. The solution set for $x^4 + 5x^2 - 36 = 0$ is

    (a) $\{6, -6, 2i\sqrt{10}, -2i\sqrt{10}\}$

    (b) $\{6i, -6i, 2i\sqrt{10}, -2i\sqrt{10}\}$

    (c) $\{2i, -2i, 3, -3\}$

    (d) $\{3i, -3i, 2, -2\}$

    (e) none of these

38. $\dfrac{\dfrac{x}{3} - \dfrac{y}{5}}{\dfrac{5x^2}{3} - \dfrac{3y^2}{5}}$ may be simplified and expressed as

    (a) $5x - 3y$

    (b) $\dfrac{1}{5x + 3y}$

    (c) $\dfrac{15}{5x + 3y}$

    (d) $\dfrac{5x + 3y}{15}$

    (e) none of these

39. $A(2, 4)$ and $B(-1, 2)$ are two points in the coordinate plane. The slope of the line that contains A and B is

    (a) $3/2$

    (b) $2/3$

    (c) 2

    (d) $1/2$

    (e) none of these

40. If $h = \frac{1}{2}gt^2$, then t is equal to

(a) $\frac{2h}{gt}$

(b) $\sqrt{\frac{g}{2h}}$

(c) $\sqrt{\frac{2h}{g}}$

(d) $-\sqrt{\frac{2h}{g}}$

(e) both (c) and (d)