

TEXAS ALLIANCE FOR MINORITIES IN ENGINEERING STATE MATH & SCIENCE COMPETITION

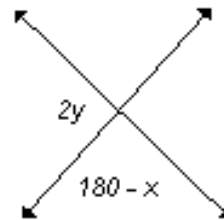
ALGEBRA II

General Information:

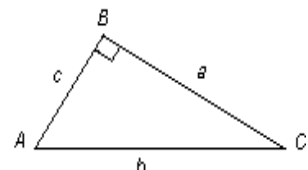
- Check to see that you have written your name on the label and that the test name on the label matches the name on this booklet.
- **DO NOT** open the test booklet and **DO NOT** start until the proctor says "begin."
- Each individual exam period will be 45 minutes and each exam contains 40 multiple choice questions.
- Students are allowed to use a non-programmable battery operated calculator during the individual and team exams.
- Students are encouraged to write on the exam booklet. Scratch paper and pencils will also be provided.
- Students will not be permitted to leave the test room while the test is in progress. If a student finishes early, he/she must remain in the test room until the exam period is completed.
- If you need to ask a question during the test, raise your hand and the proctor will come to you.
- There is no penalty for skipping a problem. The exam scores will be determined by the number of correct answers. All ties will be broken by awarding the place to the contestant who has the most consecutive correct answers before a problem is missed.
- **Students may NOT keep the test booklet.**

ALGEBRA II

- The price of an item was reduced by 15% then later reduced by 5%. The two reductions were equivalent to the single reduction of _____.
 - $19\frac{1}{4}\%$
 - 20%
 - 80%
 - $80\frac{3}{4}\%$
- If it takes 6 hours for 2 people to clean a house, how many hours will it take 4 people, working at the same rate, to clean another house that is the same size?
 - $\frac{2}{3}$
 - $1\frac{1}{2}$
 - 2
 - 3
- The vertex angle of an isosceles triangle has a degree measure of d . Find in the degree measure for a base angle of the triangle.
 - $\frac{180 - d}{2}$
 - $\frac{90 - d}{2}$
 - $\frac{180 + d}{2}$
 - $\frac{90 + d}{2}$
- Three less than three times a number is $\frac{5}{6}$. What is one more than twice the number?
 - $2\frac{2}{3}$
 - $3\frac{4}{9}$
 - $3\frac{5}{9}$
 - $2\frac{1}{2}$
- An equation of a circle with center (3, -2) and radius 2 is
 - $(x + 3) + (y - 2)^2 = 4$
 - $(x + 3) + (y - 2)^2 = 4$
 - $(x + 3)^2 + (y - 2)^2 = 2$
 - $(x - 3)^2 + (y + 2)^2 = 2$
- What is the value of r^3 if $\frac{1}{r} = \sqrt[3]{0.01}$?
 - $\frac{1}{1}$
 - 10
 - 100
 - 100
- Find the reciprocal of $\frac{3}{x+1} + \frac{2}{x}$.
 - $\frac{x+1}{5}$
 - $\frac{x^2+x}{5}$
 - $\frac{5x+2}{x^2+x}$
 - $\frac{x^2+x}{5x+2}$
- Find p in terms of m if $m/p = q$, $q = p$, $p > 0$, and $m \neq 0$.
 - \sqrt{m}
 - mq
 - m
 - p
- Which of the following is true?
 - $x > y$
 - $x < y$
 - $x = y$
 - cannot say



- Which of the following is true?
 - $a^2 > b^2 - c^2$
 - $a^2 < b^2 - c^2$
 - $a^2 = b^2 - c^2$
 - cannot say

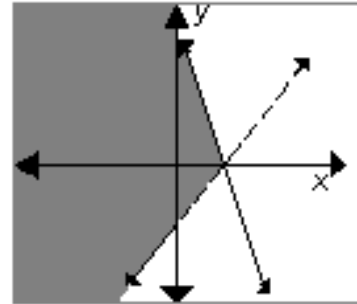


- What does y equal in the solution of the system at the right?
 - $\frac{2}{11}$
 - $\frac{42}{19}$
 - $\frac{18}{11}$
 - $\frac{2}{19}$

$$\begin{aligned} \frac{x}{2} + \frac{y}{3} &= 1 \\ \frac{x}{5} + \frac{y}{2} &= 1 \end{aligned}$$

12. Which system of inequalities is graphed at the right?

- a. $y < x - 1$ and $y \geq -2x + 2$
- b. $y > x - 1$ and $y \leq -2x + 2$
- c. $y > x - 1$ and $y \geq -2x + 2$
- d. $y > x - 1$ and $y \leq -2x + 2$



13. Teams A, B, and C played three other teams, D, E, and F, not necessarily in that order. Team A did not play team D. Team B did not play teams D or E. Which matrix shows the information correctly?

- a.

	D	E	F
A	✓	x	x
B	x	✓	x
C	x	x	✓

 b.

	D	E	F
A	x	x	✓
B	x	✓	x
C	✓	x	x

 c.

	D	E	F
A	✓	x	x
B	x	x	✓
C	x	✓	x

 d.

	D	E	F
A	x	✓	x
B	x	x	✓
C	✓	x	x

14. What are the dimensions of $[1 \ 2 \ 0 \ 3]$?

- a. 4×4
- b. 1×4
- c. 1×1
- d. 4×1

15. Rich was traveling by plane from El Paso to Texarkana. After one third of the trip, the movie started. When the movie was over, the amount of the trip left was one third of the trip completed during the movie. What fraction of the trip did the movie take?

- a. $\frac{1}{2}$
- b. $\frac{1}{3}$
- c. $\frac{2}{3}$
- d. $\frac{1}{4}$

16. Find the value of k so $\frac{x^3 - 2x^2 + kx + 6}{x + 2}$ has remainder 8.

- a. -9
- b. 9
- c. 0
- d. 1

17. Simplify: $\sqrt{9x^2 - 24x + 16}$

- a. $3x - 4$
- b. $|3x - 2\sqrt{6+4}|$
- c. $|3x - 4|$
- d. $3x - 2\sqrt{6x+4}$

18. Express $\sqrt[4]{16x^5y^8z^6}$ using exponents.

- a. $4x^{5/4}y^2z^{3/2}$
- b. $2x^{4/3}y^{1/2}z^{2/3}$
- c. $4x^{4/5}y^{1/2}z^{2/3}$
- d. $2x^{5/4}y^2z^{3/2}$

19. Find the value of c that makes this trinomial a perfect square. $n^2 - 40n + c$

- a. 20
- b. 1600
- c. 400
- d. 800

20. What is the vertex of the parabola defined by $y = (x + 3)^2 - 5$?

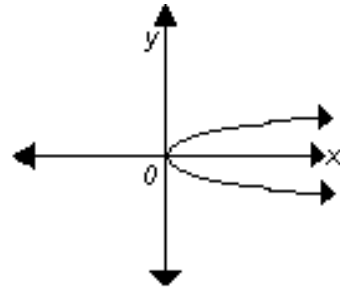
- a. (-3, -5)
- b. (3, 5)
- c. (-3, 5)
- d. (3, -5)

22. What is the equation of the axis of symmetry of the parabola defined by $y = \frac{1}{2}(x + 7)^2 - 4$?

- a. $x = 7$ b. $x = -4$ c. $x = -7$ d. $y = 7$

23. Which equation is shown by the graph?

- a. $y = 4x^2$ c. $y = \frac{1}{4}x^2$
 b. $x = 4y^2$ d. $x = \frac{1}{4}y^2$



24. Find the center of the ellipse with the equation $3x^2 + 4y^2 + 18x - 32y - 5 = 0$.

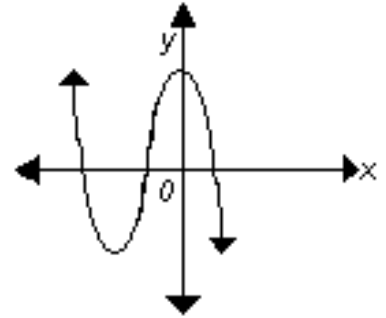
- a. (3, -4) b. (-3, 4) c. (4, -3) d. (-4, 3)

25. What is the simplest polynomial equation with integral coefficients that has roots 3 and $4 - i$?

- a. -1 b. -2 c. -1.4 d. -1.5

26. Which of the following could be a function for the graph?

- a. $f(x) = -x^3 - x^2$ c. $f(x) = x^3 + 4x^2 + x - 2$
 b. $f(x) = -x^3 + x^2$ d. $f(x) = -x^3 - 4x^2 - x - 2$



27. What is the simplest form of $\frac{(3xy^3)^2}{9x^4y}$?

- a. $\frac{2y^5}{3x^2}$ b. $\frac{y^4}{3x^3}$ c. $\frac{x^2}{y^5}$ d. $\frac{y^5}{x^2}$

28. If two fractions have denominators of $x^2 + 6x + 9$ and $x^2 - 9$, what is the least common denominator?

- a. $x^2 - 9$ b. $x^2 + 6x + 9$ c. $2x^2 + 6x$ d. $(x + 3)^2(x - 3)$

29. Simplify $32^{\sqrt{3}} * 4^{\sqrt{5}}$.

- a. $2^{5\sqrt{3} + 2\sqrt{5}}$ b. $128^{\sqrt{15}}$ c. $2^{10\sqrt{15}}$ d. $128^{\sqrt{3} + \sqrt{5}}$

30. Solve $\log_5 y = -3$

- a. -15 b. -125 c. $\frac{1}{125}$ d. $\frac{3}{5}$

31. What is S_n for the arithmetic series for which $a_1 = 3$, $d = 0.5$, and $a_n = 7.5$

- a. 52.5 b. 22.5 c. 47.25 d. 57.75

32. $27x^3 + 54x^2 + 36x + 8$ is the expanded form of which expression?

- a. $(2x + 3)^3$ b. $(2x + 3)^2$ c. $(3x + 2)^3$ d. $(3x + 2)^2$

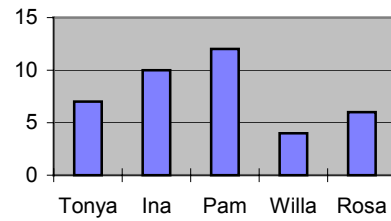
33. How many starting players scored more than Ina?

- a. 0
- b. 11
- c. 19
- d. 39

34. The team scored 48 points. How many points were scored by nonstarting players?

- a. 9
- b. 11
- c. 19
- d. 39

Points Scored by Starting Basketball Players



35. A license plate has one letter (not I or O) followed by five digits. How many possible combinations are there?

- a. 120
- b. 2,400,000
- c. 2,600,000
- d. 100,000

36. How many ways can nine people be seated at a round table?

- a. 5040
- b. 20,160
- c. 40,320
- d. 362,880

37. What is 100° expressed in radians?

- a. $\frac{5}{9}$
- b. $\frac{5\pi}{9}$
- c. $\frac{10}{9}$
- d. $\frac{10\pi}{9}$

38. Find the length of the longest side of a triangle with $A = 40^\circ$, $B = 60^\circ$, and $a = 5$.

- a. 6.43
- b. 5
- c. 6.74
- d. 7.66

39. What is the period of $y = -3 \sin 4\theta$?

- a. -3
- b. 4
- c. 4π
- d. $\frac{\pi}{2}$

40. If $y = \frac{1}{2} \cos 4x$, find all values of x so that y is a maximum.

- a. $45n^\circ$
- b. $90n^\circ$
- c. $180n^\circ$
- d. $1440n^\circ$

ALGEBRA II

Answer Key

1. a
2. d
3. a
4. c
5. b
6. c
7. d
8. a
9. a
10. c
11. c
12. b
13. d
14. b
15. a
16. a
17. c
18. d
19. c
20. b
21. a
22. c
23. b
24. b
25. a
26. d
27. d
28. d
29. a
30. c
31. a
32. c
33. a
34. c
35. b
36. c
37. b
38. d
39. d
40. b