

CSCA — China Scholarastic Competency Assessment

Mathematics Mock Examination

Analytic Geometry & Solid Geometry

⌚ Time: 60 min

♦ Questions: 50

⦿ 2 pts each

🎯 Total: 100 pts

Name: _____ Student ID: _____ Score: _____

§ Instructions

- ① This exam consists of 50 multiple-choice questions. Choose ONE best answer per question.
- ② Each question is worth 2 points. Total score: 100 points. Time allowed: 60 minutes.
- ③ Analytic Geometry: Questions 1–40 (80%). Solid Geometry: Questions 41–50 (20%).
- ④ Calculators are NOT permitted. Answers must be based on exact mathematical reasoning.
- ⑤ Write your answer letter clearly in the answer box provided at the end of the exam.

► Part A Analytic Geometry | Questions 1–40 | 80 pts

1. Which is the standard equation of a circle with center $(3, -2)$ and radius 5?

- (A) $(x-3)^2+(y+2)^2=5$
- (B) $(x+3)^2+(y-2)^2=25$
- (C) $(x-3)^2+(y+2)^2=25$
- (D) $(x-3)^2+(y-2)^2=25$

2. The slope of the line through $(-1, 4)$ and $(3, -2)$ is:

- (A) $3/2$
- (B) $-3/2$
- (C) $2/3$
- (D) $-2/3$

3. The equation of a line with slope 2 passing through $(1, 3)$ is:

- (A) $y = 2x + 1$
- (B) $y = 2x - 1$
- (C) $y = 2x + 5$
- (D) $y = x + 2$

4. The focus of the parabola $y^2 = 8x$ is located at:

- (A) $(2, 0)$
- (B) $(0, 2)$
- (C) $(4, 0)$
- (D) $(8, 0)$

5. The eccentricity of the ellipse $x^2/25 + y^2/16 = 1$ is:

- (A) $3/5$
- (B) $4/5$
- (C) $5/3$
- (D) $5/4$

6. The distance between A(1, 2) and B(4, 6) is:

- (A) 3
- (B) 5
- (C) $\sqrt{7}$
- (D) 7

7. Which equation represents a hyperbola with foci on the y-axis?

- (A) $x^2/9 - y^2/16 = 1$
- (B) $y^2/9 - x^2/16 = 1$
- (C) $x^2/9 + y^2/16 = 1$
- (D) $y^2/16 + x^2/9 = 1$

8. The midpoint of (-2, 5) and (4, -1) is:

- (A) (1, 2)
- (B) (2, 4)
- (C) (1, 3)
- (D) (-1, 2)

9. The distance from point (2, -3) to the line $3x - 4y + 1 = 0$ is:

- (A) $13/5$
- (B) 2
- (C) $17/5$
- (D) $19/5$

10. The vertex of the parabola $y = x^2 - 4x + 3$ is at:

- (A) (2, -1)
- (B) (-2, 1)
- (C) (2, 1)
- (D) (4, 3)

11. The asymptotes of the hyperbola $x^2/4 - y^2/9 = 1$ are:

- (A) $y = \pm(3/2)x$
- (B) $y = \pm(2/3)x$
- (C) $y = \pm(9/4)x$
- (D) $y = \pm(2/9)x$

12. Two lines are perpendicular if the product of their slopes equals:

- (A) 0
- (B) 1
- (C) -1

(D) undefined

13. The center of the circle $x^2 + y^2 - 6x + 4y - 3 = 0$ is:

- (A) (3, -2)
- (B) (-3, 2)
- (C) (6, -4)
- (D) (3, 2)

14. Which point lies on the ellipse $x^2/16 + y^2/9 = 1$?

- (A) (4, 3)
- (B) (4, 0)
- (C) (0, 4)
- (D) (3, 3)

15. The directrix of the parabola $x^2 = -12y$ is:

- (A) $y = -3$
- (B) $y = 3$
- (C) $x = 3$
- (D) $x = -3$

16. For any point on an ellipse, the sum of distances to its two foci equals:

- (A) $2a$
- (B) $2b$
- (C) $2c$
- (D) $a + c$

17. The circle passing through the origin with center (2, 3) has equation:

- (A) $x^2 + y^2 - 4x - 6y = 0$
- (B) $x^2 + y^2 + 4x + 6y = 0$
- (C) $x^2 + y^2 - 4x - 6y + 13 = 0$
- (D) $x^2 + y^2 - 2x - 3y = 0$

18. If the line $y = kx + 1$ is tangent to the parabola $y^2 = 4x$, then $k =$

- (A) 1
- (B) 2
- (C) $1/2$
- (D) -1

19. The equation $x^2/m + y^2/(m-5) = 1$ represents an ellipse when:

- (A) $m > 5$
- (B) $0 < m < 5$
- (C) $m > 5$ or $m < 0$
- (D) $m > 0$ and $m \neq 5$

20. The angle between the lines $y = \sqrt{3} \cdot x$ and $y = 0$ is:

- (A) 30°
- (B) 45°
- (C) 60°
- (D) 90°

21. The length of the latus rectum of the ellipse $x^2/25 + y^2/9 = 1$ is:

- (A) $18/5$
- (B) $9/5$
- (C) $5/9$
- (D) $25/9$

22. For the hyperbola $x^2/a^2 - y^2/b^2 = 1$, the relation between a , b , c is:

- (A) $c^2 = a^2 + b^2$
- (B) $c^2 = a^2 - b^2$
- (C) $a^2 = b^2 + c^2$
- (D) $b^2 = a^2 + c^2$

23. A line through $(0, 3)$ and $(2, 0)$ in intercept form is:

- (A) $x/2 + y/3 = 1$
- (B) $x/3 + y/2 = 1$
- (C) $2x + 3y = 1$
- (D) $x/2 - y/3 = 1$

24. Translating circle $x^2 + y^2 = 4$ by $(x, y) \rightarrow (x+2, y-3)$ gives:

- (A) $(x-2)^2 + (y+3)^2 = 4$
- (B) $(x+2)^2 + (y-3)^2 = 4$
- (C) $(x-2)^2 + (y-3)^2 = 4$
- (D) $(x+2)^2 + (y+3)^2 = 4$

25. The eccentricity of a hyperbola always satisfies:

- (A) $e = 1$
- (B) $0 < e < 1$
- (C) $e > 1$
- (D) $e < 0$

26. The foci of the ellipse $x^2/36 + y^2/20 = 1$ are at:

- (A) $(\pm 4, 0)$
- (B) $(\pm 6, 0)$
- (C) $(0, \pm 4)$
- (D) $(\pm \sqrt{56}, 0)$

27. If the parabola $y^2 = 2px$ passes through $(2, 4)$, then $p =$

- (A) 2
- (B) 4
- (C) 8
- (D) 1

28. The tangent line to circle $x^2+y^2=25$ at point $(3, 4)$ is:

- (A) $3x + 4y = 25$
- (B) $4x + 3y = 25$
- (C) $3x - 4y = 25$
- (D) $x + y = 7$

29. The chord intercepted by circle $x^2+y^2=25$ on the x-axis has length:

- (A) 5
- (B) 10
- (C) 25
- (D) $\sqrt{25}$

30. The distance between parallel lines $3x+4y-6=0$ and $3x+4y+4=0$ is:

- (A) 2
- (B) $10/5$
- (C) 10
- (D) 1

31. An ellipse has foci at $(\pm 2, 0)$ and sum of focal radii = 6. Its equation is:

- (A) $x^2/9 + y^2/5 = 1$
- (B) $x^2/5 + y^2/9 = 1$
- (C) $x^2/4 + y^2/2 = 1$
- (D) $x^2/9 + y^2/4 = 1$

32. If $P(a, b)$ is symmetric to $Q(2, -3)$ about the x-axis, then $a + b =$

- (A) 5
- (B) -5
- (C) -1
- (D) 1

33. For the line $y = kx+1$ to intersect the unit circle $x^2+y^2=1$ at two distinct points, k must satisfy:

- (A) $k > 1$ or $k < -1$
- (B) $-1 < k < 1$
- (C) $k \neq 0$
- (D) any real k

34. The equation of the ellipse with foci $F_1(-\sqrt{5}, 0)$, $F_2(\sqrt{5}, 0)$ and sum $2a = 6$ is:

- (A) $x^2/9 + y^2/4 = 1$
- (B) $x^2/4 + y^2/9 = 1$
- (C) $x^2/9 + y^2/5 = 1$
- (D) $x^2/5 + y^2/9 = 1$

35. The eccentricity of the ellipse in Q34 is:

- (A) $\sqrt{5}/3$
- (B) $\sqrt{5}/2$
- (C) $2/3$
- (D) $3/\sqrt{5}$

36. A hyperbola has eccentricity $e = \sqrt{5}/2$ and focus at $(\sqrt{5}, 0)$. Its equation is:

- (A) $x^2/4 - y^2 = 1$
- (B) $x^2 - y^2/4 = 1$
- (C) $y^2 - x^2/4 = 1$
- (D) $x^2/5 - y^2/4 = 1$

37. The asymptotes of the hyperbola in Q36 are:

- (A) $y = \pm(1/2)x$
- (B) $y = \pm 2x$
- (C) $y = \pm x$
- (D) $y = \pm 4x$

38. Two lines are parallel if they have:

- (A) equal slopes and different intercepts
- (B) equal slopes and equal intercepts
- (C) opposite slopes
- (D) slopes whose product is -1

39. The equation of the circle with diameter endpoints A(0,0) and B(4,2) is:

- (A) $(x-2)^2 + (y-1)^2 = 5$
- (B) $(x-2)^2 + (y-1)^2 = 25$
- (C) $x^2 + y^2 = 20$
- (D) $(x-4)^2 + (y-2)^2 = 5$

40. A line through the intersection of $2x+y-3=0$ and $x-y+1=0$, perpendicular to $x-2y+4=0$ has slope:

- (A) -2
- (B) 2
- (C) $1/2$
- (D) $-1/2$

► **Part B** Solid Geometry | Questions 41–50 | 20 pts

41. The volume of a sphere with surface area $100\pi \text{ cm}^2$ is:

- (A) $500\pi/3 \text{ cm}^3$
- (B) $4000\pi/3 \text{ cm}^3$
- (C) $250\pi/3 \text{ cm}^3$
- (D) $2000\pi/3 \text{ cm}^3$

42. A right circular cone has base radius 3 cm and slant height 5 cm. Its lateral surface area is:

- (A) $12\pi \text{ cm}^2$
- (B) $15\pi \text{ cm}^2$
- (C) $18\pi \text{ cm}^2$
- (D) $9\pi \text{ cm}^2$

43. A cuboid with dimensions $3 \times 4 \times 12$ has space diagonal of length:

- (A) 11
- (B) 13
- (C) $\sqrt{109}$
- (D) $\sqrt{125}$

44. The three views (front, side, top) of a cylinder are respectively:

- (A) circle, rectangle, rectangle
- (B) rectangle, circle, circle
- (C) rectangle, rectangle, circle
- (D) circle, circle, rectangle

45. Two planes both perpendicular to the same plane are:

- (A) always parallel
- (B) always perpendicular
- (C) parallel or intersecting
- (D) always intersecting

46. A regular quadrilateral pyramid has base side 4 cm and slant height 6 cm. Its lateral surface area is:

- (A) 48 cm^2
- (B) 96 cm^2
- (C) 24 cm^2
- (D) 64 cm^2

47. The distance between P(1, 2, 3) and Q(4, 6, 3) in 3D space is:

- (A) 5
- (B) $\sqrt{41}$
- (C) $\sqrt{50}$
- (D) 7

48. If a line is perpendicular to one of two parallel planes, its relation to the other plane is:

- (A) skew
- (B) parallel
- (C) perpendicular
- (D) intersecting

49. A sphere is inscribed in a cube with edge 6 cm. The volume of the sphere is:

- (A) $36\pi \text{ cm}^3$
- (B) $288\pi \text{ cm}^3$
- (C) $108\pi \text{ cm}^3$

(D) $72\pi \text{ cm}^3$

50. A regular tetrahedron with edge $a = 6 \text{ cm}$ has volume:

(A) $18\sqrt{2} \text{ cm}^3$

(B) $36\sqrt{2} \text{ cm}^3$

(C) $12\sqrt{3} \text{ cm}^3$

(D) $6\sqrt{6} \text{ cm}^3$

Answer Sheet

Name: _____ Student ID: _____

Circle your answer for each question:

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)
11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)
21.	22.	23.	24.	25.	26.	27.	28.	29.	30.
(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)
31.	32.	33.	34.	35.	36.	37.	38.	39.	40.
(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)
41.	42.	43.	44.	45.	46.	47.	48.	49.	50.
(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)	(A) (B) (C) (D)

§ Answer Key (Teacher Copy)

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1. C	2. B	3. A	4. A	5. A	6. B	7. B	8. A	9. D	10. A
11. A	12. C	13. A	14. B	15. B	16. A	17. A	18. A	19. C	20. C
21. A	22. A	23. A	24. A	25. C	26. A	27. B	28. A	29. B	30. A
31. A	32. A	33. C	34. A	35. A	36. A	37. A	38. A	39. A	40. A
41. A	42. B	43. B	44. C	45. C	46. A	47. A	48. C	49. A	50. A

— End of Examination —