SSC-II Mathematics

Chapter-wise MCQs

Federal Board (FBISE) | National Book Foundation textbook | 775 MCQs across 12 units plus Federal Board past papers

The correct option in every question is shown in **bold**.

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Unit 1: Complex Numbers

35 practice MCQs and 24 review-exercise MCQs. Each question carries one mark.

1. The value of i^2 is

A. i **B. −1**
C. 1 D. −i

2. √(−9) is equal to

A. −3i B. 9i
C. 3i D. −9

3. The value of i^7 is

A. −1 B. 1
C. i **D. −i**

4. The value of i^{10} is

A. −1 B. −i
C. 1 D. i

5. The value of 1/i is

A. −1 B. i
C. −i D. 1

6. (2 + 3i) + (4 − 5i) equals

A. 6 + 2i **B. 6 − 2i**
C. −2 + 8i D. 6 + 8i

7. (3 + 2i)(3 − 2i) equals

A. 13 B. 9 − 4i
C. 5 D. 9 + 4i

8. $(1 + i)^2$ equals

A. −2i B. 1 + 2i
C. 2 **D. 2i**

9. The conjugate of 5 − 7i is

A. 5 + 7i B. −5 + 7i
C. −5 − 7i D. 7 − 5i

10. The modulus |3 + 4i| is equal to

A. 25 **B. 5**
C. 1 D. 7

11. (2 + i)(1 − i) equals

A. 1 − i B. 3 + i
C. 1 + i **D. 3 − i**

12. The multiplicative inverse of $3 + 4i$ is

A. $(-3 - 4i)/5$ B. $(3 - 4i)/5$

C. $(3 - 4i)/25$ D. $(3 + 4i)/25$

13. The additive inverse of $-4 + 5i$ is

A. $-5 + 4i$ B. $4 + 5i$

C. $-4 - 5i$ **D. $4 - 5i$**

14. If $a + bi = 3 - 2i$, then the values of a and b are

A. $a = 3, b = -2$ B. $a = 2, b = -3$

C. $a = -2, b = 3$ D. $a = 3, b = 2$

15. The real part of $(1 + 2i)(3 - i)$ is

A. 7 B. 1

C. 5 D. 3

16. $(2 + 3i)/(1 + i)$ equals

A. $(-1 + 5i)/2$ **B. $(5 + i)/2$**

C. $(5 - i)/2$ D. $5 + i$

17. $\sqrt{(-5)} \times \sqrt{(-20)}$ equals

A. $10i$ B. $-10i$

C. 10 **D. -10**

18. The modulus of $-5 + 12i$ is

A. 169 **B. 13**

C. 17 D. 7

19. If $z = a + bi$, then $z + \bar{z}$ is equal to

A. 0 B. $2b$

C. $2a$ D. $2bi$

20. If $z = a + bi$, then $z \cdot \bar{z}$ is equal to

A. $a^2 + b^2$ B. $a^2 - b^2$

C. $2a$ D. $2abi$

21. Which of the following is a pure imaginary number?

A. 7 B. $7 + 0i$

C. $3 + 7i$ **D. $-7i$**

22. The solution set of $x^2 + 9 = 0$ is

A. $\{3i, -3i\}$ B. $\{9i, -9i\}$

C. $\{3i\}$ D. $\{3, -3\}$

23. $a^2 + b^2$ can be factorized over complex numbers as

A. $(a + b)(a - b)$ B. $(a + bi)^2$

C. $(a + bi)(a - bi)$ D. $(a + bi)(b - ai)$

24. The value of i^{21} is

A. $-i$ **B. i**

C. 1 D. -1

25. The point $(-3, 2)$ in the Argand plane represents the complex number

A. $-3 - 2i$ B. $3 - 2i$

C. $2 - 3i$ **D. $-3 + 2i$**

26. The complex number $-3 + 2i$ lies in the

A. third quadrant B. fourth quadrant

C. second quadrant D. first quadrant

27. The number 6 written as a complex number is

A. $6 + 0i$ B. $6 - i$

C. $6i$ D. $0 + 6i$

28. $(2 - 3i)^2$ equals

A. $4 - 9i$ **B. $-5 - 12i$**

C. $13 - 12i$ D. $-5 + 12i$

29. If $(x + 2) + (y - 1)i = 5 + 3i$, then the values of x and y are

A. $x = 3, y = 4$ B. $x = 3, y = 2$

C. $x = 4, y = 3$ D. $x = 7, y = 2$

30. $(5 + 2i) - (3 - 4i)$ equals

A. $2 - 2i$ B. $8 - 2i$

C. $2 + 6i$ D. $8 + 6i$

31. $\sqrt{(-16)}$ equals

A. $-4i$ B. 4

C. $16i$ **D. $4i$**

32. A complex number whose imaginary part is zero is a

A. unit vector **B. real number**

C. pure imaginary number D. complex conjugate

33. If $z = 3 - 4i$, then $|z|$ equals

A. 1 B. $\sqrt{7}$

C. 7 **D. 5**

34. The conjugate of the conjugate of z is

A. $-z$ B. $|z|$

C. z D. $\bar{z}$

35. For $z_1 = 1 + i$ and $z_2 = 1 - i$, the product z_1z_2 is

A. $2i$ **B. 2**

C. -2 D. 0

Review Exercise: Unit 1

36. $\sqrt{(-1)}$ is equal to

A. i B. -1

C. 1 D. $-i$

37. If $x < 0$, then $\sqrt{x}$ is

A. rational **B. complex**

C. real D. irrational

38. The conjugate of $\sqrt{x} - i\sqrt{y}$ is

A. $x + iy$ B. $x - iy$

C. $x - y$ **D. $\sqrt{x} + i\sqrt{y}$**

39. If $z = x + iy$, then $z\bar{z}$ is

A. imaginary B. purely imaginary

C. a non-negative real number D. a negative real number

40. $\sqrt{(-25)} + \sqrt[3]{8}$ is equal to

A. $-5 + \sqrt{8}$ **B. 2 + 5i**

C. $2\sqrt{2} + 5i$ D. $-5 + 2i$

41. $1 + (-i)^9$ equals

A. $1 + i$ B. $-i$

C. 1 − i D. $1 + 2i$

42. $2/(1 - i)$ equals

A. i B. $1 - i$

C. $(1 + i)/2$ **D. 1 + i**

43. $(-xi)^{19}$ equals

A. x^{19} i B. x^{19}

C. $-x^{19}$ i D. $-x^{19}$

44. If $z = 3 + 4i$, then $|z|^2$ is

A. 5 B. $\sqrt{5}$

C. 16 **D. 25**

45. The solution set of $x^2 + 4 = 0$ is

A. {2i} B. {−4i}

C. {2i, −2i} D. {2, −2}

46. $(-2 + 4i) - (8 - 5i)$ equals

A. $6 - i$ **B. −10 + 9i**

C. $-10 - i$ D. $6 + 9i$

47. $(-3 + 4i) + (-7i + 4)$ equals

A. $1 - 3i$
B. $-7 - 3i$
C. $1 + 11i$
D. $-7 + 11i$

48. $(x + iy)(2 + 3i)$ equals

A. $(2x + 3y) + (3x - 2y)i$
B. $2x + 3yi$
C. $(2x - 3y) + (3x + 2y)i$
D. $(2x - 3y) + (3x - 2y)i$

49. $(-3 + 6i)(-6 + 3i)$ equals

A. $-45i$
B. $36 - 45i$
C. $-36 - 45i$
D. $45i$

50. The conjugate of $3\sqrt{2} - \sqrt{(-7)}$ is

A. $-3\sqrt{2} + i\sqrt{7}$
B. $3\sqrt{2} + i\sqrt{7}$
C. $3\sqrt{2} - i\sqrt{7}$
D. $3\sqrt{2} + \sqrt{7}$

51. The conjugate of $\sqrt{(-2)}$ is

A. $\sqrt{2}$
B. $-\sqrt{2}$
C. $i\sqrt{2}$
D. $-i\sqrt{2}$

52. If $z = -1/2 + i$, then $z \cdot \bar{z}$ equals

A. $3/4$
B. $1/4$
C. $5/4$
D. $-5/4$

53. If $z = 14 - 7i$, then $z \cdot \bar{z}$ equals

A. 245
B. 147
C. 196
D. 49

54. $(-3 - i)/(-3 + i)$ simplifies to

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

55. $(1 + 3i)/(i\sqrt{5})$ simplifies to

A. $(1 - 3i)/\sqrt{5}$
B. $(-3 - i)/\sqrt{5}$
C. $(3 + i)/\sqrt{5}$
D. $(3 - i)/\sqrt{5}$

56. $2x^2 + 18$ factorizes over the complex numbers as

A. $2(x - 3i)(x + 3i)$
B. $2(x^2 - 9)$
C. $2(x - 3)(x + 3)$
D. $(x - 3i)(x + 3i)$

57. $-x^2 - 25y^4$ factorizes over the complex numbers as

A. $(x - 5iy)(x + 5iy)$
B. $-(x - 5iy^2)(x + 5iy^2)$
C. $(x - 5y^2)(x + 5y^2)$
D. $-(x - 5y^2)(x + 5y^2)$

58. The roots of $3x^2 + 15 = 0$ are

A. $\pm\sqrt{5}$
B. $\pm i\sqrt{15}$
C. $\pm i\sqrt{5}$
D. $\pm 5i$

59. The roots of $6y^2 + 36 = 0$ are

A. $\pm\sqrt{6}$

B. $\pm 6i$

C. $\pm i\sqrt{12}$

D. $\pm i\sqrt{6}$

Unit 2: Quadratic Equations

36 practice MCQs and 19 review-exercise MCQs. Each question carries one mark.

1. The standard form of a quadratic equation in x is

A. $ax^2 + bx + c = 0, a = 0$ **B. $ax^2 + bx + c = 0, a \neq 0$**

C. $ax^3 + bx^2 + c = 0$ D. $ax + b = 0, a \neq 0$

2. Which of the following is a quadratic equation?

A. $2x + 3 = 0$ B. $x^3 + x = 0$

C. $x^2 - 5x + 6 = 0$ D. $x/2 = 5$

3. The degree of a quadratic equation is

A. 2 B. 3

C. 1 D. 0

4. The solution set of $x^2 - 5x + 6 = 0$ is

A. $\{-2, -3\}$ B. $\{-1, -6\}$

C. $\{1, 6\}$ **D. {2, 3}**

5. The solution set of $x^2 - 4 = 0$ is

A. {2, −2} B. $\{2\}$

C. $\{4, -4\}$ D. $\{16, -16\}$

6. The solution set of $(x - 2)(x + 5) = 0$ is

A. $\{-2, 5\}$ B. $\{2, 5\}$

C. {2, −5} D. $\{-2, -5\}$

7. The solution set of $x^2 = 3x$ is

A. $\{3, -3\}$ B. $\{0, -3\}$

C. $\{3\}$ **D. {0, 3}**

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

A. $\{1, 1/2\}$ **B. {1, −1/2}**

C. $\{-1, -1/2\}$ D. $\{-1, 1/2\}$

9. The solution set of $x^2 - 6x + 9 = 0$ is

A. $\{3, -3\}$ B. $\{9\}$

C. $\{-3\}$ **D. {3}**

10. The quadratic formula for $ax^2 + bx + c = 0$ is

A. $x = (-b \pm \sqrt{(b^2 - 4ac)})/2a$ B. $x = (-b \pm \sqrt{(b^2 - 4ac)})/a$

C. $x = (-b \pm \sqrt{(b^2 + 4ac)})/2a$ D. $x = (b \pm \sqrt{(b^2 - 4ac)})/2a$

11. The discriminant of $ax^2 + bx + c = 0$ is

A. $b - 4ac$ B. $4ac - b^2$

C. $b^2 - 4ac$ D. $b^2 + 4ac$

12. The discriminant of $2x^2 + 3x - 2 = 0$ is

A. 1 **B. 25**

C. 9 D. −7

13. The roots of $x^2 + 2x + 1 = 0$ are

A. real and equal B. irrational and unequal

C. real and unequal D. complex conjugates

14. If the discriminant of a quadratic equation is negative, its roots are

A. real and unequal B. rational

C. complex conjugates D. real and equal

15. If the discriminant of a quadratic equation with rational coefficients is 16, its roots are

A. real and equal B. complex

C. irrational and unequal **D. rational and unequal**

16. The roots of $x^2 + x + 1 = 0$ are

A. rational **B. complex numbers**

C. real and equal D. irrational

17. The value of k for which $x^2 + kx + 9 = 0$ has equal roots is

A. ±3 B. 9

C. 6 **D. ±6**

18. To make $x^2 + 6x$ a perfect square, we add

A. 36 B. 3

C. 9 D. 6

19. To make $x^2 - 10x$ a perfect square, we add

A. 25 B. 100

C. 5 D. 10

20. The roots of $x^2 + 4 = 0$ are

A. ±2 **B. ±2i**

C. ±4 D. ±4i

21. The sum of the roots of $2x^2 - 6x - 4 = 0$ is

A. −3 B. 2

C. 3 D. −2

22. The product of the roots of $2x^2 - 6x - 4 = 0$ is

A. −2 B. −3

C. 2 D. 3

23. The sum of the roots of $x^2 + 5x + 6 = 0$ is

A. −6 B. 5

C. 6 **D. −5**

24. The sum of the roots of $3x^2 - 11x - 4 = 0$ is

A. $-4/3$ **B. $11/3$**

C. $-11/3$ D. $4/3$

25. The quadratic equation whose roots are 2 and 3 is

A. $x^2 - 5x + 6 = 0$ B. $x^2 + 5x + 6 = 0$

C. $x^2 - 6x + 5 = 0$ D. $x^2 - 5x - 6 = 0$

26. The quadratic equation whose roots are -1 and 4 is

A. $x^2 - 3x + 4 = 0$ B. $x^2 + 3x + 4 = 0$

C. $x^2 - 3x - 4 = 0$ D. $x^2 + 3x - 4 = 0$

27. If α and β are the roots of $x^2 - 7x + 12 = 0$, then $\alpha^2 + \beta^2$ equals

A. 13 B. 37

C. 49 **D. 25**

28. If α and β are the roots of $x^2 - 7x + 12 = 0$, then $1/\alpha + 1/\beta$ equals

A. 12/7 **B. 7/12**

C. $-7/12$ D. 1/12

29. If 2 is a root of $x^2 - 5x + k = 0$, then k equals

A. 10 B. -6

C. 4 **D. 6**

30. The roots of $ax^2 + bx + c = 0$ are reciprocals of each other if

A. $b = 0$ **B. $c = a$**

C. $c = -a$ D. $a = b$

31. The roots of $ax^2 + bx + c = 0$ are equal in magnitude but opposite in sign if

A. $b = 0$ B. $b^2 = 4ac$

C. $c = 0$ D. $a = c$

32. Two numbers whose sum is 10 and product is 21 are

A. 1 and 9 B. 4 and 6

C. 3 and 7 D. 2 and 8

33. To solve $x^4 - 5x^2 + 4 = 0$, the substitution $y = x^2$ gives

A. $y^2 - 5y - 4 = 0$ **B. $y^2 - 5y + 4 = 0$**

C. $y^4 - 5y + 4 = 0$ D. $y^2 + 5y + 4 = 0$

34. The solution set of $x^4 - 5x^2 + 4 = 0$ is

A. {±1, ±2} B. {±2}

C. {±1, ±4} D. {1, 4}

35. The solution of $x + 1/x = 2$ is

A. $x = -1$ B. $x = 0$

C. $x = 2$ **D. x = 1**

36. The solution set of $x + y = 3$ and $x^2 + y^2 = 5$ is

A. {(1, 2)}
B. {(−1, −2), (−2, −1)}
C. {(1, 2), (2, 1)}
D. {(0, 3), (3, 0)}

Review Exercise: Unit 2

19 MCQs based on the Miscellaneous Exercise at the end of Unit 2 of the textbook. Written questions are converted into four-option MCQs.

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37. Which of the following is a quadratic equation?

A. $ax + b = c$
B. $ax^2 + bx + c = 0, a \neq 0$
C. $ax^2 + bx + c = 0, a = 0$
D. $ax^2 + bx + c$

38. The number of roots of $(x - 3)(x - 2) = 6$ is

A. 1
B. 3
C. 0
D. 2

39. The number that should be added to $x^2 + x$ to make it a complete square is

A. 1/4
B. 4
C. 1
D. 1/2

40. The solution set of $x^2 - 4 = 0$ is

A. {4, −4}
B. { }
C. {2, −2}
D. {0, 4}

41. The roots of the equation $(x - 1)^2 = 9$ are

A. −2 and 4
B. −2 and −4
C. −4 and 2
D. 2 and 4

42. The solution set of $2^{2x} - 2^{x+1} + 1 = 0$ is

A. {0, −1}
B. {1}
C. {0}
D. {0, 1}

43. The solution set of $x + 1/x = 2$ is

A. {−1, 1}
B. {1}
C. {0}
D. {−1}

44. Which of the following is a reciprocal equation?

A. $x^2 + 2x + 2 = 0$
B. $\sqrt{(2x + 3)} = 0$
C. $x^4 + 2x^3 + x^2 + 4x = 0$
D. $x^4 + x^3 + x^2 + x + 1 = 0$

45. 2 and −3 are the roots of

A. $(x - 2)(x - 3) = 0$
B. $(x - 2)(x + 3) = 0$
C. $(x + 2)(x - 3) = 0$
D. $(x + 2)(x + 3) = 0$

46. The discriminant of $ax^2 + bx + c = 0$ is

A. $b^2 + 4ac$
B. $-b^2 - 4ac$
C. $4ac - b^2$
D. $b^2 - 4ac$

47. If S_1 and S_2 are the roots of $ax^2 + bx + c = 0$, then the sum of the roots is

A. c/a
B. a/b
C. −b/a
D. a/c

48. The roots of $x^2 - 5x + 5 = 0$ are

A. irrational
B. imaginary
C. rational
D. equal

49. The sum and product of the roots of a quadratic equation are 2 and 5 respectively. The equation is

A. $x^2 + 2x - 5 = 0$
B. $x^2 - 2x - 5 = 0$
C. $x^2 + 2x + 5 = 0$
D. $x^2 - 2x + 5 = 0$

50. The real roots of $8x^6 - 7x^3 - 1 = 0$ are

A. $x = -1$ and $x = -1/2$
B. $x = 1$ and $x = -1/2$
C. $x = 1$ and $x = 1/2$
D. $x = -1$ and $x = 1/2$

51. The roots of $(m - 1)x^2 + 2mx + m + 3 = 0$ are equal when m is

A. 3/2
B. 3
C. 2/3
D. −3/2

52. For $m = 3/2$, the repeated root of $(m - 1)x^2 + 2mx + m + 3 = 0$ is

A. $x = 3$
B. $x = 2$
C. $x = -3$
D. $x = -2$

53. If S_1 and S_2 are the roots of $ax^2 + bx + c = 0$, then $(S_1 - 3)(S_2 - 3)$ equals

A. (c + 3b + 9a)/a
B. (c + 3b − 9a)/a
C. (c + 9a)/a
D. (c − 3b + 9a)/a

54. The roots of $25x^2 - 5ax - b = 0$ are equal and $a^2 + b = 6$. The values of a and b are

A. $a = \pm\sqrt{10}$, $b = -4$
B. $a = \pm 2$, $b = 2$
C. $a = \pm\sqrt{2}$, $b = 4$
D. $a = \pm 2\sqrt{2}$, $b = -2$

55. A box has volume $x^3 + 2x^2 - 5x - 6$ and height $x - 2$. Its length and width are

A. $x - 3$ and $x - 1$
B. $x + 3$ and $x + 1$
C. $x + 2$ and $x + 3$
D. $x + 6$ and $x + 1$

Unit 3: Matrices and Determinants

36 practice MCQs and 21 review-exercise MCQs. Each question carries one mark.

Matrices are written row by row; rows are separated by a semicolon (;). For example, [1 2; 3 4] has rows (1, 2) and (3, 4).

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1. The order of the matrix [1 2 3; 4 5 6] is

A. 2 × 3 B. 6 × 1
C. 3 × 2 D. 2 × 2

2. A matrix having an equal number of rows and columns is called a

A. column matrix **B. square matrix**
C. row matrix D. null matrix

3. The matrix [1 2 3] is a

A. column matrix B. square matrix
C. row matrix D. identity matrix

4. A matrix in which every element is zero is called a

A. singular matrix B. scalar matrix
C. identity matrix **D. null matrix**

5. The identity matrix of order 2 is

A. [1 0; 0 1] B. [0 0; 0 0]
C. [0 1; 1 0] D. [1 1; 1 1]

6. [1 2; 3 4] + [2 0; 1 1] equals

A. [3 2; 3 5] B. [3 2; 4 4]
C. [2 0; 3 4] **D. [3 2; 4 5]**

7. [5 3; 2 1] − [1 1; 1 1] equals

A. [4 4; 1 0] B. [6 4; 3 2]
C. [4 2; 1 0] D. [4 2; 1 1]

8. 3[1 2; 0 −1] equals

A. [3 6; 0 3] **B. [3 6; 0 −3]**
C. [4 5; 3 2] D. [3 2; 0 −1]

9. The transpose of [1 2; 3 4] is

A. [1 3; 2 4] B. [4 2; 3 1]
C. [4 3; 2 1] D. [1 2; 3 4]

10. The additive inverse of [1 −2; 3 0] is

A. [−1 −2; 3 0] **B. [−1 2; −3 0]**
C. [1 2; −3 0] D. [0 1; −2 3]

11. [1 2; 3 4] × [1 0; 0 1] equals

A. [4 3; 2 1] B. [0 0; 0 0]
C. [1 2; 3 4] D. [1 0; 0 4]

12. [1 2; 0 1] × [3 1; 1 0] equals

A. [4 3; 1 1]
B. [5 1; 0 0]
C. [3 2; 0 0]
D. [5 1; 1 0]

13. [2 3; 1 4] × [1; 2] equals

A. [9; 8]
B. [5; 6]
C. [8; 9]
D. [2; 8]

14. If [2 0; 0 2] is multiplied by itself, the result is

A. [2 0; 0 2]
B. [4 0; 0 4]
C. [4 4; 4 4]
D. [0 0; 0 0]

15. The product AB of two matrices is defined only if

A. number of columns of A = number of rows of B
B. number of rows of A = number of rows of B
C. A and B are both square
D. number of columns of A = number of columns of B

16. If A is of order 2 × 3 and B is of order 3 × 2, then AB is of order

A. 3 × 2
B. 2 × 3
C. 3 × 3
D. 2 × 2

17. The determinant of [a b; c d] is

A. ac − bd
B. ad + bc
C. ad − bc
D. ab − cd

18. The determinant of [3 2; 1 4] is

A. −10
B. 10
C. 12
D. 14

19. The determinant of [2 4; 1 2] is

A. 0
B. 8
C. 4
D. −4

20. The determinant of the identity matrix of order 2 is

A. −1
B. 2
C. 0
D. 1

21. A matrix is said to be singular if its determinant is

A. negative
B. one
C. zero
D. positive

22. Which of the following matrices is singular?

A. [3 1; 2 2]
B. [2 4; 1 2]
C. [1 0; 0 1]
D. [2 1; 1 1]

23. If |x 2; 3 4| = 2, then x equals

A. 2
B. −2
C. 4
D. 1

24. The adjoint of [a b; c d] is

A. [d b; c a]
B. [−a −b; −c −d]
C. [a −b; −c d]
D. [d −b; −c a]

25. The inverse of a non-singular matrix A is given by

A. |A| adj A
B. (1/|A|) adj A
C. (1/|A|) A
D. adj A − |A|

26. The inverse of [2 1; 1 1] is

A. [1 1; 1 2]
B. [2 −1; −1 1]
C. [−1 1; 1 −2]
D. [1 −1; −1 2]

27. The inverse of [3 0; 0 2] is

A. [−3 0; 0 −2]
B. [3 0; 0 2]
C. [1/3 0; 0 1/2]
D. [2 0; 0 3]

28. If [x 2; 3 y] = [4 2; 3 5], then the values of x and y are

A. x = 4, y = 5
B. x = 5, y = 4
C. x = 2, y = 3
D. x = 3, y = 2

29. In Cramer's rule, the solution of ax + by = p, cx + dy = q gives x equal to

A. |a b; c d| / |p b; q d|
B. |p q; b d| / |a c; b d|
C. |p b; q d| / |a b; c d|
D. |a p; c q| / |a b; c d|

30. The solution of x + y = 5 and x − y = 1 is

A. x = 1, y = 4
B. x = 2, y = 3
C. x = 4, y = 1
D. x = 3, y = 2

31. The solution of 2x + y = 5 and x − y = 1 is

A. x = 1, y = 3
B. x = 2, y = 1
C. x = 3, y = −1
D. x = 1, y = 2

32. The solution of 2x + 3y = 8 and x − y = −1 is

A. x = 1, y = 2
B. x = 2, y = 1
C. x = 2, y = 3
D. x = 3, y = 2

33. In the matrix inversion method, the system AX = B has the solution

A. $X = BA^{-1}$
B. X = AB
C. $X = A^{-1}B$
D. X = A + B

34. A system of two linear equations has a unique solution by Cramer's rule when the determinant of the coefficient matrix is

A. negative only
B. not zero
C. zero
D. equal to one only

35. The matrix [a b; b d] is called a

A. identity matrix
B. singular matrix
C. null matrix
D. symmetric matrix

36. The inverse of the identity matrix I is

A. I B. −I

C. 0 D. 2I

Review Exercise: Unit 3

21 MCQs based on the Miscellaneous Exercise at the end of Unit 3 of the textbook. Written questions are converted into four-option MCQs.

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37. If $[5\ 3;\ 2\ 9]^t = [5\ x/2;\ 3\ 9]$, then x equals

A. 4 B. 6

C. −6 D. −4

38. If $I_3 = [y\ 0\ x;\ 0\ z\ 0;\ x\ 0\ 1]$, then

A. x = z = 1 B. x = z = 0

C. x = y = 1 **D. y = z = 1 and x = 0**

39. The additive inverse of the unit matrix of order 2 is

A. [1 0; 0 −1] B. [0 1; 1 0]

C. [−1 0; 0 −1] D. [0 0; 0 0]

40. The multiplicative inverse of a null matrix of order 2 is

A. [1 0; 0 1] **B. impossible**

C. [0 0; 0 0] D. [0 0]

41. A matrix A is symmetric if

A. $(A^t)^t = A^t$ B. $(A^t)^t \neq -A$

C. $(A^t)^t = -A$ D. $A^t \neq A$

42. The sum of the column matrix [1; 2] and the row matrix [0 0] is

A. [1 2] **B. impossible**

C. [1; 2] D. [1 0; 2 0]

43. If A is a 1 × 2 matrix and B is a 2 × 3 matrix, then AB is of order

A. 3 × 2 B. 2 × 2

C. 3 × 1 **D. 1 × 3**

44. If AB = B, then A equals

A. A^{-1} B. B

C. I D. B^{-1}

45. [15; 25] × [3 2] equals

A. [45 30; 75 50] B. [45; 50]

C. [45 50] D. [95]

46. If $|T| = -1$, then T^{-1} equals

A. adj T **B. −adj T**

C. −T D. T

47. The matrix equation for y + x = 144 + y and x + 2y = x + 13 is

A. [1 0; 1 2][x; y] = [144; 13]
B. [1 0; 0 2][y; x] = [144; 13]
C. [1 0; 0 2][x; y] = [144; 13]
D. [1 1; 1 2][x; y] = [144; 13]

48. The matrix of coefficients for x − y = 3 is

A. [1; 1]
B. [x; y]
C. [3]
D. [1 −1]

49. [1 2] × [3] is

A. [5]
B. impossible
C. [3; 6]
D. [3 6]

50. If A and B are conformable for the product AB, then $(AB)^t$ equals

A. AB
B. $A^t B^t$
C. $B^t A^t$
D. $(BA)^t$

51. If [−3 5; −3 x − 1] is a singular matrix, then x equals

A. 6
B. −6
C. −4
D. 4

52. If adj A = [5 6; 2 3], then |A| equals

A. 1/3
B. 9
C. 15
D. 3

53. For P = [5 −1; 2 −4], the value of |P| is

A. −18
B. 22
C. 18
D. −22

54. For P = [5 −1; 2 −4], the inverse P^{-1} is

A. [2/9 1/18; −1/9 −5/18]
B. [−4 1; −2 5]
C. [−2/9 1/18; −1/9 5/18]
D. [2/9 −1/18; 1/9 −5/18]

55. The system 5x − 4 = y and 2y + 8 = 10x, when solved by the matrix inversion method, is

A. solved uniquely by x = 4/5, y = 0
B. not solvable this way because the coefficient matrix is singular
C. solved uniquely by x = 2, y = 6
D. solved uniquely by x = 1, y = 1

56. For the system 5x + 2y = 19 and 10x + 4y = 38, Cramer's rule

A. gives no solution because $D_x \neq 0$
B. gives exactly two solutions
C. is not applicable because the determinant of the coefficients is zero
D. gives a unique solution x = 3, y = 2

57. Two industries have equations 6l + 80m = 20000 and 12l + 160m = 40000 for labour cost l and material cost m. The costs cannot be found uniquely because

A. both industries have the same number of workers
B. the system has no solution
C. the determinant is negative
D. the second equation is a multiple of the first (determinant is zero)

Unit 4: Linear and Quadratic Inequalities

35 practice MCQs and 22 review-exercise MCQs. Each question carries one mark.

1. The statement "x is at least 5" is written as

A. $x < 5$ **B. $x \geq 5$**

C. $x \leq 5$ D. $x > 5$

2. The statement "x is at most 7" is written as

A. $x < 7$ B. $x > 7$

C. $x \leq 7$ D. $x \geq 7$

3. The statement "x is not less than 5" is written as

A. $x \geq 5$ B. $x \leq 5$

C. $x < 5$ D. $x > 5$

4. If $a < b$, then $a + c$ is

A. greater than $b + c$ B. greater than or equal to $b + c$

C. equal to $b + c$ **D. less than $b + c$**

5. If $a < b$ and $c > 0$, then

A. $ac = bc$ B. $a/c > b/c$

C. $ac < bc$ D. $ac > bc$

6. When both sides of an inequality are multiplied by a negative number, the inequality sign

A. is reversed B. remains the same

C. becomes equality D. is removed

7. The solution of $2x + 3 < 7$ is

A. $x > 2$ B. $x > 5$

C. $x < 5$ **D. $x < 2$**

8. The solution of $-3x > 9$ is

A. $x > -3$ **B. $x < -3$**

C. $x > 3$ D. $x < 3$

9. The solution of $5x - 2 \geq 8$ is

A. $x \geq 2$ B. $x \leq 6/5$

C. $x \leq 2$ D. $x \geq 6/5$

10. The solution of $3x + 4 \leq 10$ is

A. $x \geq 14/3$ B. $x \leq 14/3$

C. $x \geq 2$ **D. $x \leq 2$**

11. The solution of $x - 7 < -2$ is

A. $x < -9$ B. $x > -9$

C. $x < 5$ D. $x > 5$

12. The solution of $2x + 5 > 1$ is

A. $x < 3$ **B. $x > -2$**

C. $x < -2$ D. $x > 3$

13. The solution of $x/2 + 1 \geq 3$ is

A. $x \geq 2$ B. $x \leq 4$

C. $x \leq 2$ **D. $x \geq 4$**

14. The solution of $3(x - 1) < 2x + 1$ is

A. $x > 2$ B. $x < 2$

C. $x < 4$ D. $x > 4$

15. The smallest integer satisfying $x > 2.5$ is

A. 3 B. 4

C. 2.5 D. 2

16. The largest integer satisfying $2x < 9$ is

A. 4.5 **B. 4**

C. 5 D. 3

17. On a number line, the solution $x \geq 3$ is shown by

A. an open circle at 3 with shading to the right B. a closed circle at 3 with shading to the left

C. a closed circle at 3 with shading to the right D. an open circle at 3 with shading to the left

18. The solution of $x^2 - 4 < 0$ is

A. $x > -2$ B. $x < 2$

C. $x < -2$ or $x > 2$ **D. $-2 < x < 2$**

19. The solution of $x^2 - 9 > 0$ is

A. $x < -3$ or $x > 3$ B. $-3 < x < 3$

C. $x < -3$ D. $x > 3$

20. The solution of $x^2 - 5x + 6 \leq 0$ is

A. $x \leq 2$ or $x \geq 3$ **B. $2 \leq x \leq 3$**

C. $x \geq 3$ D. $x \leq 2$

21. The solution of $x^2 - 5x + 6 > 0$ is

A. $x < 2$ only B. $2 < x < 3$

C. $x > 3$ only **D. $x < 2$ or $x > 3$**

22. The solution of $(x - 1)(x + 2) < 0$ is

A. $x < -2$ or $x > 1$ B. $-1 < x < 2$

C. $-2 < x < 1$ D. $x < -1$ or $x > 2$

23. The solution of $(x - 1)(x + 2) > 0$ is

A. $x < -2$ or $x > 1$ B. $-1 < x < 2$

C. $-2 < x < 1$ D. $x < -1$ or $x > 2$

24. The solution of $x^2 - x - 6 \leq 0$ is

A. $x \leq -2$ or $x \geq 3$ **B. $-2 \leq x \leq 3$**

C. $x \leq -3$ or $x \geq 2$ D. $-3 \leq x \leq 2$

25. The solution set of $x^2 + 1 > 0$ is

A. all real numbers B. $x > 0$

C. $x > 1$ D. the empty set

26. The solution of $(x - 3)^2 \leq 0$ is

A. no real number B. all real numbers

C. $x \leq 3$ **D. $x = 3$ only**

27. The boundary line of the inequality $x + y \leq 4$ is drawn as a

A. parabola **B. solid line**

C. curve D. dotted line

28. The boundary line of the inequality $x + y < 4$ is drawn as a

A. solid line B. pair of lines

C. dotted (broken) line D. thick curve

29. To decide which side of the line $ax + by = c$ to shade, we commonly test the point

A. (c, c) **B. (0, 0)**

C. (1, 1) D. (a, b)

30. The point (0, 0) lies in the region of $x + y < 4$ because

A. $0 = 4$ B. $0 < 0$ is true

C. $0 > 4$ is true **D. $0 < 4$ is true**

31. The region represented by $y \geq 0$ lies

A. on or above the x-axis B. to the left of the y-axis

C. below the x-axis D. to the right of the y-axis

32. The region represented by $x > 0$ lies

A. above the x-axis B. below the x-axis

C. to the right of the y-axis D. to the left of the y-axis

33. Which point satisfies both $x + y > 3$ and $x - y < 1$?

A. (0, 0) B. (5, 1)

C. (3, 0) **D. (2, 2)**

34. The feasible region of two linear inequalities is the region

A. satisfying only the first inequality **B. satisfying both inequalities at the same time**

C. common to the two axes only D. lying outside both boundary lines

35. The solution of the combined inequality $x > -1$ and $x < 3$ is

A. $-1 < x < 3$ B. $x < -1$

C. $x > 3$ D. $x < -1$ or $x > 3$

Review Exercise: Unit 4

22 MCQs based on the Miscellaneous Exercise at the end of Unit 4 of the textbook. Written questions are converted into four-option MCQs.

36. The solution of the inequality $6x - 7 \geq 2x + 17$ is

A. $x \geq 6$ B. $x < 6$
C. $x \leq 6$ D. $x > 6$

37. The solution of the inequality $x < 3$ for x in N is

A. {0, 1, 2} B. {−2, −1, 0, 1, 2}
C. {1} **D. {1, 2}**

38. In general, when graphing an inequality we use the test point

A. (2, 2) **B. (0, 0)**
C. (−1, −1) D. (−3, −3)

39. The solution of $x/(-2) < 3 - x$ is

A. $x > 2$ B. $x < -2$
C. $x < 6$ D. $x < 2$

40. Which ordered pair is a solution of the inequality $4x - y \geq 3$?

A. (1, 1) B. (0, 0)
C. (0, −2) D. (−1, 2)

41. Which ordered pair is a solution of the system $2x - y \leq 5$ and $x + 2y > 2$?

A. (4, 1) B. (2, 0)
C. (3, 2) D. (1, −1)

42. The solution of $-5x \geq -80$ is

A. $\{x \mid x > 16\}$ B. $\{x \mid x \geq 16\}$
C. $\{x \mid x < 16\}$ **D. $\{x \mid x \leq 16\}$**

43. The ordered pair (7, −2) is a solution of the inequality

A. $-x - y > -3$ **B. $x + 10y < 1$**
C. $x - y < -4$ D. $2x + y < 10$

44. The solution of $(2/3)x - 4 \geq 1$ is

A. $x \geq 15/4$ B. $x \geq 7/2$
C. $x \geq 15/2$ D. $x \leq 15/2$

45. The solution of $1 - 3x \leq -14 + 2x$ is

A. $x \leq 3$ B. $x \leq -3$
C. $x \geq -3$ **D. $x \geq 3$**

46. The solution set of $7(x - 1) > -8 + 7x$ is

A. all real numbers B. $x > 1$
C. $x < 1$ D. the empty set

47. The solution of $-3(2x - 1) \geq 1 - 8x$ is

A. $x \leq 1$ **B. $x \geq -1$**

C. $x \geq 1$ D. $x \leq -1$

48. The graph of $y > 2x$ is the half-plane

A. below the dotted line $y = 2x$ B. above the solid line $y = 2x$

C. below the solid line $y = 2x$ **D. above the dotted line $y = 2x$**

49. The graph of $y < 3x$ is the half-plane

A. above the solid line $y = 3x$ B. below the solid line $y = 3x$

C. below the dotted line $y = 3x$ D. above the dotted line $y = 3x$

50. The graph of $y \geq -5$ is the half-plane

A. on and above the solid line $y = -5$ B. below the dotted line $y = -5$

C. on and below the solid line $y = -5$ D. above the dotted line $y = -5$

51. The graph of $x \leq 6$ is the half-plane

A. on and to the right of the solid line $x = 6$ **B. on and to the left of the solid line $x = 6$**

C. to the left of the dotted line $x = 6$ D. to the right of the dotted line $x = 6$

52. Which point lies in the solution region of $3x + 4y \geq 12$ and $5x + 6y \leq 30$?

A. (0, 6) B. (0, 0)

C. (3, 2) D. (6, 3)

53. Which point lies in the solution region of $y - x \geq 1$ and $y - 4 \leq 4$?

A. (3, 3) B. (5, 0)

C. (0, 9) **D. (0, 5)**

54. Which point lies in the solution region of $8x + 5y \leq 40$ and $x \geq 0$?

A. (2, 3) B. (−1, 2)

C. (5, 5) D. (6, 0)

55. Which point lies in the solution region of $2x + y \leq 12$ and $y \geq 0$?

A. (7, 0) **B. (3, 4)**

C. (2, −1) D. (6, 3)

56. The shaded region is a rectangle with vertices (2, 1), (2, 4), (6, 4) and (6, 1). The system of inequalities is

A. $2 \leq x \leq 6$ and $1 \leq y \leq 4$ B. $2 \leq x \leq 4$ and $1 \leq y \leq 6$

C. $1 \leq x \leq 4$ and $2 \leq y \leq 6$ D. $1 \leq x \leq 6$ and $2 \leq y \leq 4$

57. The shaded region is a triangle with vertices (3, 0), (3, 2) and (0, −2). The system of inequalities is

A. $x \leq 3$, $y \geq (4/3)x - 2$ and $y \leq (2/3)x + 2$ B. $x \leq 3$, $y \leq (2/3)x - 2$ and $y \geq (4/3)x - 2$

C. $x \leq 3$, $y \geq (2/3)x - 2$ and $y \leq (4/3)x - 2$ D. $x \geq 3$, $y \geq (2/3)x - 2$ and $y \leq (4/3)x - 2$

Unit 5: Algebraic Fractions

35 practice MCQs and 25 review-exercise MCQs. Each question carries one mark.

1. A rational expression is an expression of the form p(x)/q(x) where

A. p(x) and q(x) are polynomials and q(x) ≠ 0
B. p(x) is always a constant
C. p(x) and q(x) are constants
D. q(x) = 0

2. Which of the following is a rational expression?

A. $\sqrt{x} + 1$
B. $|x| + 1$
C. $(x + 1)/(x - 2)$
D. $x^{1/2}$

3. $(x^2 - 9)/(x - 3)$ in simplest form is

A. $x - 3$
B. $x + 3$
C. $(x + 3)/(x - 3)$
D. $x^2 + 3$

4. $(x^2 - 4)/(x + 2)$ in simplest form is

A. $x + 2$
B. $x - 4$
C. x^2
D. $x - 2$

5. $(x^2 + 5x + 6)/(x + 2)$ in simplest form is

A. $x + 3$
B. $x + 2$
C. $x - 3$
D. $x + 6$

6. $(x^2 - 1)/(x^2 + x)$ in simplest form is

A. $(x + 1)/x$
B. $(x - 1)/x$
C. $x/(x - 1)$
D. $x - 1$

7. The rational expression $(x + 1)/(x - 3)$ is undefined at

A. $x = 0$
B. $x = -1$
C. $x = 3$
D. $x = -3$

8. The rational expression $5/(x^2 - 4)$ is undefined at

A. $x = \pm 4$
B. $x = 0$
C. $x = 4$
D. $x = \pm 2$

9. $1/x + 1/y$ equals

A. $2/(x + y)$
B. $1/(xy)$
C. $(x + y)/(xy)$
D. $(xy)/(x + y)$

10. $1/x - 1/y$ equals

A. $(x - y)/(xy)$
B. $(y - x)/(xy)$
C. $(x + y)/(xy)$
D. $1/(x - y)$

11. $2/(x + 1) + 3/(x + 1)$ equals

A. $5/(x + 1)$
B. $6/(x + 1)$
C. $5/(2x + 2)$
D. $5/(x + 1)^2$

12. $x/(x + 1) + 1/(x + 1)$ equals

A. x B. $(x + 1)/2$

C. $x + 1$ **D. 1**

13. $1/(x - 1) + 1/(x + 1)$ equals

A. $2/x$ **B. $2x/(x^2 - 1)$**

C. $2/(x^2 - 1)$ D. $2x/(x^2 + 1)$

14. $1/(x - 1) - 1/(x + 1)$ equals

A. 0 B. $-2/(x^2 - 1)$

C. $2x/(x^2 - 1)$ **D. $2/(x^2 - 1)$**

15. $(x/3) \times (6/x^2)$ equals

A. 2/x B. $18/x$

C. $2x$ D. $x/2$

16. $(a/b) \div (c/d)$ equals

A. $bc/(ad)$ B. $ab/(cd)$

C. ad/(bc) D. $ac/(bd)$

17. $(x^2 - 1)/x \times x/(x + 1)$ equals

A. $x^2 - 1$ B. $(x - 1)/x$

C. $x + 1$ **D. x − 1**

18. $(x + 2)/(x - 1) \div (x + 2)/(x + 3)$ equals

A. $(x + 2)^2/((x - 1)(x + 3))$ **B. (x + 3)/(x − 1)**

C. 1 D. $(x - 1)/(x + 3)$

19. The L.C.M. of $x^2 - 1$ and $x + 1$ is

A. $x^2 - 1$ B. $(x + 1)^2$

C. $(x - 1)(x + 1)^2$ D. $x + 1$

20. The L.C.M. of x and x^2 is

A. 1 B. x^3

C. x^2 D. x

21. The H.C.F. of $x^2 - 4$ and $x + 2$ is

A. $x^2 - 4$ B. 1

C. $x - 2$ **D. x + 2**

22. The solution of $x/2 = 6$ is

A. x = 12 B. $x = 4$

C. $x = 8$ D. $x = 3$

23. The solution of $3/x = 6$ is

A. $x = 2$ **B. x = 1/2**

C. $x = 18$ D. $x = 1/18$

24. The solution of $1/x + 1/2 = 1$ is

A. $x = 1/2$ B. $x = 1$

C. $x = 2$ D. $x = 3$

25. The solution of $(x + 1)/2 = (x - 1)/3$ is

A. $x = 5$ **B. $x = -5$**

C. $x = 1$ D. $x = -1$

26. The solution of $2/(x - 1) = 1$ is

A. $x = 2$ B. $x = 1$

C. $x = -1$ **D. $x = 3$**

27. The solution of $x/(x - 2) = 3$ is

A. $x = 3$ B. $x = 6$

C. $x = 2$ D. $x = -3$

28. The solution of $1/(x + 2) = 1/4$ is

A. $x = -2$ B. $x = 6$

C. $x = 2$ D. $x = 4$

29. Which value must be excluded from the solution set of $1/(x - 5) = 2$?

A. $x = -5$ **B. $x = 5$**

C. $x = 2$ D. $x = 0$

30. The sum of two numbers is 10 and the sum of their reciprocals is 5/12. If one number is x, the equation is

A. $1/x + 1/(10 - x) = 5/12$ B. $x + (10 - x) = 5/12$

C. $x(10 - x) = 5/12$ D. $1/x - 1/(10 - x) = 5/12$

31. The expression $(x^2 + 2x + 1)/(x + 1)$ simplifies to

A. $x + 2$ B. x

C. $x^2 + 1$ **D. $x + 1$**

32. The expression $(2x + 4)/(x + 2)$ simplifies to

A. $x + 2$ B. x

C. 2 D. $2x$

33. If $x = 2$, the value of $(x^2 - 1)/(x + 1)$ is

A. 3 **B. 1**

C. 0 D. 2

34. The reciprocal of $(x + 1)/(x - 1)$ is

A. $(x - 1)/(x + 1)$ B. $(1 - x)/(1 + x)$

C. $-(x + 1)/(x - 1)$ D. $(x + 1)/(x - 1)$

35. A rational expression is in its lowest terms when its numerator and denominator have

A. no variables B. the same degree

C. equal values **D. no common factor other than 1**

Review Exercise: Unit 5

25 MCQs based on the Miscellaneous Exercise at the end of Unit 5 of the textbook. Written questions are converted into four-option MCQs.

36. An expression that is the ratio of two polynomials, where the polynomial in the denominator is non-zero, is called a

A. irrational expression
B. polynomial
C. compound expression
D. rational expression

37. The degree of $x^2y^3 - xy^2z^3/y - \sqrt{25}\, z^5$ is

A. 0
B. 7
C. 5
D. 6

38. A constant polynomial is also called a

A. zero degree polynomial
B. linear polynomial
C. quadratic polynomial
D. no degree polynomial

39. Ali is 2 years younger than his sister Ayesha. If Ayesha's present age is x years, Ali's age after 5 years will be

A. (x + 7) years
B. (x + 3) years
C. (x − 7) years
D. (x − 2) years

40. The value of $2\{x^3 - [x^2 - (3 - 2x^2)]\}$ at x = 2 is

A. −2
B. 6
C. 2
D. 14

41. The reduced form of $(x^2y^3 - y^2x^3 + x^2y^2z)/(x - y - z)$ is

A. not possible
B. $x^2y^2(x - y - z)/(y - x + z)$
C. $-x^2y^2$
D. x^2y^2

42. If $y = 2 - 1/y$, then the value of $y^2 + 1/y^2$ is

A. not possible
B. 0
C. 4
D. 2

43. The simplified form of $((a + b)^2 - (a - b)^2)/(8ab)$ is

A. $2(a^2 + b^2)/(8ab)$
B. 1/2
C. 2
D. $(a^2 + b^2)/(ab)$

44. The difference of the sum of a and b from the product of a and b is

A. ab + a + b
B. a + b − ab
C. 2ab − b
D. ab − a − b

45. $(x^3y^3 + y^3z^3 + z^3x^3)/(x^3y^3z^3)$ equals

A. $1/x^3 + 1/y^3 + 1/z^3$
B. $1/x^6 + 1/y^6 + 1/z^6$
C. $x^3 + y^3 + z^3$
D. $x^6 + y^6 + z^6$

46. The leading coefficient in $x^2/2 - 1/8 - x^4/4 + x^3/7$ is

A. 1/4 **B. −1/4**

C. 1/7 D. 1/2

47. The coefficients in the polynomial $\sqrt{16}\, x^2y - (1/2)y^3 + (22/7)z$ are elements of the set of

A. odd numbers B. irrational numbers

C. rational numbers D. integers

48. The degree of the quotient $(x - y)^3 \div (x - y)^2$ is

A. 0 **B. 1**

C. 2 D. 3

49. Taking $\pi = 22/7$, the circumference of a circle of radius 12.5 cm is

A. 157.14 cm B. 39.29 cm

C. 78.57 cm D. 490.18 cm

50. The surface area of a sphere is $S = 4 \times (22/7) \times r^2$. For r = 1.4 inches, S equals

A. 12.32 square inches B. 6.16 square inches

C. 49.28 square inches **D. 24.64 square inches**

51. The surface area of a sphere is $S = 4 \times (22/7) \times r^2$. If S = 38½ square feet, then r equals

A. 1.75 feet B. 1.4 feet

C. 3.5 feet D. 3.06 feet

52. Which of the following sets of numbers does NOT represent the sides of a right-angled triangle?

A. 3, 4, 5 **B. 12, 35, 36**

C. 7, 24, 25 D. 1.6, 6.3, 6.5

53. If a = 3, b = 4 and c = 1, the value of $\sqrt{(2ab + 4ac)} + \sqrt{(9b)} + 2abc/3$ is

A. 22 B. 14

C. 18 **D. 20**

54. Subtracting the sum of $(2x^3 - 3x + 4)$ and $(-3x^2 + 2x - 7)$ from $4x^3 - 3x^2 + x - 6 - \{2x^3 - (x - 6)\}$ gives

A. 3x − 3 B. 3x + 3

C. 3x − 9 D. −3x + 9

55. The product of (x − 2), (x + 3) and (2x − 7), divided by the sum of $3(x^2 - 2x - 2)$ and $(5x - x^2 - 15)$, is

A. x − 2 B. 2x − 7

C. x + 3 D. (x − 2)(x + 3)

56. $x/(x + 2) - (5x + 3)/(x - 2) + 1/2$ simplifies to

A. $(7x^2 + 30x - 16)/(8 - 2x^2)$ **B. $(7x^2 + 30x + 16)/(8 - 2x^2)$**

C. $(7x^2 - 30x + 16)/(8 - 2x^2)$ D. $(7x^2 + 30x + 16)/(2x^2 - 8)$

57. $x/(x^2 - y^2) \times (x^2 + 2xy + y^2)/(x + y) \div 3x/(x - y)$ simplifies to

A. 3 B. 1/(3x)

C. 1/3 D. x/3

58. The solution set of $12/(x^2 - 16) - 24/(x - 4) = 3$ is

A. {−2, 6}
B. {2, −6}
C. {2, 6}
D. {−2, −6}

59. The solution set of $y/(2y - 6) - 3/(y^2 - 6y + 9) = (y - 2)/(3y - 9)$ is

A. {5, −6}
B. {5}
C. {−6}
D. {−5, 6}

60. A solution of a rational equation that makes a denominator zero must be rejected because

A. it makes the equation linear
B. it is always irrational
C. the expression becomes undefined
D. it doubles the number of roots

Unit 6: Functions and Graphs

36 practice MCQs and 21 review-exercise MCQs. Each question carries one mark.

1. A function from set A to set B is a relation in which

A. some elements of A have no image

B. every element of A has exactly one image in B

C. an element of A may have two images

D. every element of B has exactly one image in A

2. The domain of the relation {(1, 2), (2, 3), (3, 4)} is

A. {2, 3, 4}

B. {1, 2, 3, 4}

C. {1, 4}

D. {1, 2, 3}

3. The range of the relation {(1, 2), (2, 3), (3, 4)} is

A. {2, 3, 4}

B. {2, 4}

C. {1, 2, 3, 4}

D. {1, 2, 3}

4. If A = {1, 2, 3} and R = {(x, y) | y = 2x}, then the range of R is

A. {1, 2, 3}

B. {3, 6, 9}

C. {2, 4, 6}

D. {1, 4, 9}

5. If f(x) = 2x + 3, then f(2) equals

A. 5

B. 7

C. 10

D. 4

6. If $f(x) = x^2 - 1$, then f(−2) equals

A. 5

B. −5

C. 3

D. −3

7. A function f: A → B is one-to-one (injective) if

A. different elements of A have different images in B

B. every element of B has an image in A

C. the range equals A

D. two elements of A have the same image

8. A function f: A → B is onto (surjective) if

A. different elements have different images

B. the domain of f equals B

C. the range is a proper subset of B

D. the range of f equals B

9. A function f: A → B is into if

A. the range of f equals B

B. at least one element of B is not the image of any element of A

C. every element of B has exactly one pre-image

D. A has only one element

10. A function that is both injective and surjective is called

A. bijective

B. constant

C. identity

D. into

11. The inverse of $f(x) = x + 5$ is

A. $f^{-1}(x) = 5 - x$ B. $f^{-1}(x) = 1/(x + 5)$

C. $f^{-1}(x) = x + 5$ **D. $f^{-1}(x) = x - 5$**

12. The inverse of $f(x) = 2x - 3$ is

A. $f^{-1}(x) = 2x + 3$ B. $f^{-1}(x) = (x - 3)/2$

C. $f^{-1}(x) = (x + 3)/2$ D. $f^{-1}(x) = 1/(2x - 3)$

13. If $f(x) = 3x$, then $f^{-1}(x)$ equals

A. $x/3$ B. $3/x$

C. $3x$ D. $x - 3$

14. The composite function $(f \circ g)(x)$ means

A. $f(x) \cdot g(x)$ B. $f(x) + g(x)$

C. $g(f(x))$ **D. $f(g(x))$**

15. If $f(x) = x + 1$ and $g(x) = x^2$, then $(f \circ g)(x)$ equals

A. $x + 2$ B. $x^2 + x$

C. $x^2 + 1$ D. $(x + 1)^2$

16. If $f(x) = x + 1$ and $g(x) = x^2$, then $(g \circ f)(x)$ equals

A. $x^2 + x$ **B. $(x + 1)^2$**

C. $x^2 + 2$ D. $x^2 + 1$

17. If $f(x) = 2x$ and $g(x) = x + 3$, then $(f \circ g)(x)$ equals

A. $x + 6$ B. $2x^2 + 3$

C. $2x + 3$ **D. $2x + 6$**

18. If $f(x) = x^2$ and $g(x) = x + 1$, then $(f \circ g)(2)$ equals

A. 9 B. 5

C. 4 D. 6

19. The graph of the constant function $y = c$ is a

A. vertical line B. line through the origin

C. horizontal line D. parabola

20. The graph of the identity function $y = x$ is a straight line

A. parallel to the y-axis **B. through the origin making 45° with the x-axis**

C. not passing through the origin D. parallel to the x-axis

21. For the line $y = mx + c$, the gradient is

A. c/m B. $m + c$

C. m D. c

22. The y-intercept of the line $y = 2x + 3$ is

A. $-3/2$ **B. 3**

C. 5 D. 2

23. The gradient of the line joining (1, 2) and (3, 6) is

A. 2 B. 1/2

C. 3 D. 4

24. The graph of $y = x^2$ is a

A. V-shaped curve B. parabola opening downwards

C. straight line **D. parabola opening upwards**

25. The vertex of the parabola $y = x^2$ is

A. (1, 1) B. (1, 0)

C. (0, 0) D. (0, 1)

26. The graph of $y = -x^2$ is a parabola that opens

A. to the right B. to the left

C. upwards **D. downwards**

27. The graph of $y = |x|$ has the shape of the letter

A. U **B. V**

C. W D. S

28. The range of the function $y = |x|$ is

A. $y \geq 0$ B. $y > 0$

C. all real numbers D. $y \leq 0$

29. The graph of $y = x^3$ passes through the origin and lies in the

A. first and fourth quadrants **B. first and third quadrants**

C. second and fourth quadrants D. first and second quadrants

30. The x-intercepts of the curve $y = x^2 - 4$ are

A. −2 and 2 B. only 2

C. −4 and 4 D. 0 and 4

31. The curve $y = x^2 + 1$ does not cut the x-axis because

A. its vertex is at the origin B. $x^2 + 1 = 0$ has equal roots

C. it opens downwards **D. $x^2 + 1 = 0$ has no real roots**

32. The gradient of a tangent drawn at a point of a curve gives

A. the area under the curve B. the y-intercept of the curve

C. the slope of the curve at that point D. the length of the curve

33. The solutions of a linear and a quadratic equation solved graphically are given by

A. the vertex of the parabola B. the x-intercepts of the line only

C. the y-intercepts of the graphs **D. the points where their graphs intersect**

34. The line $y = x + 2$ meets the parabola $y = x^2$ at the points

A. (−2, 0) and (0, 2) B. (−2, 4) and (1, 1)

C. (2, 4) and (−1, 1) D. (2, 4) and (1, 1)

35. The line $y = 2x - 1$ and the parabola $y = x^2$ meet at

A. the origin only
B. exactly one point (1, 1)
C. no point
D. two points

36. If $f(x) = x$ (identity function), then $f(5)$ equals

A. 5
B. 1
C. 0
D. 25

Review Exercise: Unit 6

21 MCQs based on the Miscellaneous Exercise at the end of Unit 6 of the textbook. Written questions are converted into four-option MCQs.

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37. If $A = \{-2, 0, 2\}$, $B = \{0, 2\}$ and $f: A \to B$ is defined by $f = \{(-2, 2), (0, 0), (2, 0)\}$, then f is

A. bijective
B. injective
C. into
D. onto

38. If set X has 3 elements and set Y has 2 elements, the number of binary relations from Y to X is

A. 2^6
B. 6
C. 9
D. 2^5

39. The domain of the relation $g = \{(1, 0), (2, 2), (3, 4)\}$ is

A. {0, 1, 2, 3, 4}
B. {0, 2, 4}
C. {1, 2, 3}
D. {0, 1, 2, 3}

40. The x-intercept of every point on the y-axis is

A. undefined
B. 0
C. −1
D. 1

41. The graph of $y = 2x^2 - 1$ cuts the y-axis at the point

A. (−1, 0)
B. $(\pm 1/\sqrt{2}, 0)$
C. (1, 0)
D. (0, −1)

42. If $y = 2x - 1$, then $f^{-1}(x)$ equals

A. $x/2 - 1$
B. $2x - 1$
C. (1 + x)/2
D. $2x + 1$

43. If $f(x) = x/2$, then $f^2(x) = f(f(x))$ equals

A. x/4
B. $1/(4x)$
C. $2x$
D. $x^2/4$

44. The function $y = x/(x - 2)$ is undefined at x equal to

A. 0
B. 2
C. −2
D. −1

45. Which of the following functions are exponential functions?

A. 2^x only
B. $(1/3)^x$ only
C. $(1/3)^x$, e^x and 2^x all
D. e^x only

46. If $f(x) = (2/3)x^2 - 5$, then $f(-3)$ equals

A. 1 B. −1
C. −3 D. 0

47. The inverse of $f(x) = 3x/(2x - 1)$ is

A. $f^{-1}(x) = (2x - 1)/(3x)$ B. $f^{-1}(x) = 3x/(2x - 1)$
C. $f^{-1}(x) = x/(2x + 3)$ **D. $f^{-1}(x) = x/(2x - 3)$**

48. The inverse $f^{-1}(x)$ of $f(x) = 3x/(2x - 1)$ is undefined at x equal to

A. 0 **B. 3/2**
C. 3 D. 1/2

49. For $f(x) = 3x/(2x - 1)$, the value of $f^{-1}(-1)$ is

A. −1/5 B. 5
C. 1/5 D. −1

50. The parabola $y = -x^2 - 4x$ opens

A. to the left B. to the right
C. upward **D. downward**

51. The quadratic $y = ax^2 + bx + c$ that cuts the x-axis at (−1, 0) and (1, 0) and the y-axis at (0, 10) is

A. $y = -10x^2 - 10$ **B. $y = -10x^2 + 10$**
C. $y = 10x^2 + 10$ D. $y = 10x^2 - 10$

52. If $f(x) = x^2 - x - 6$, the value of x (other than 3) for which $f(x) = f(3)$ is

A. x = −2 B. x = −3
C. x = 2 D. x = 6

53. The inverse function that converts degrees Celsius to degrees Fahrenheit, given $C = (5/9)(F - 32)$, is

A. $F = (5/9)C + 32$ B. $F = (5/9)(C - 32)$
C. $F = (9/5)C - 32$ **D. F = (9/5)C + 32**

54. Using $F = (9/5)C + 32$, a temperature of 25 °C equals

A. 77 °F B. 45 °F
C. 57 °F D. 13.9 °F

55. The graphs of $f(x) = x - 2$ and $g(x) = x^2 - 4x + 2$ intersect at

A. (−1, −3) and (4, 2) **B. (1, −1) and (4, 2)**
C. (1, 1) and (4, 4) D. (2, 0) and (3, 1)

56. The medicine left after n hours is $f(n) = 120(0.9)^n$ mg. The time at which 20 mg is left is approximately

A. 27 hours B. 1.7 hours
C. 17 hours D. 6 hours

57. For $A(t) = |2 \cos t|$ with t in degrees, the amplitude at t = 5 is approximately

A. 2 units B. 5 units
C. 0 units D. 10 units

Unit 7: Vectors in Plane

35 practice MCQs and 29 review-exercise MCQs. Each question carries one mark.

Here i and j are the unit vectors along the x-axis and y-axis. A vector with components a and b is written <a, b> = ai + bj.

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1. A quantity that has both magnitude and direction is called a

A. scalar **B. vector**
C. variable D. constant

2. Which of the following is a vector quantity?

A. time B. temperature
C. mass **D. velocity**

3. Which of the following is a scalar quantity?

A. displacement B. acceleration
C. speed D. force

4. A vector is represented geometrically by a

A. directed line segment B. point only
C. curve D. circle

5. The position vector of the point P(3, 4) is

A. 3i − 4j **B. 3i + 4j**
C. 7 D. 4i + 3j

6. The magnitude of the vector <3, 4> is

A. 5 B. 7
C. 25 D. 1

7. The magnitude of the vector 5i − 12j is

A. 169 B. 17
C. 7 **D. 13**

8. The magnitude of the vector <−6, 8> is

A. 2 B. −10
C. 10 D. 14

9. The magnitude of the vector 2i is

A. −2 B. 0
C. 4 **D. 2**

10. If A(1, 2) and B(4, 6), then the vector AB is

A. <3, 4> B. <4, 3>
C. <−3, −4> D. <5, 8>

11. If A(1, 2) and B(4, 6), then the magnitude of AB is

A. 7 B. √7
C. 5 D. 25

12. If A(2, 3) and B(5, 7), then the vector BA is

A. <7, 10>
B. <−3, −4>
C. <−4, −3>
D. <3, 4>

13. If u = <1, 2> and v = <3, 4>, then u + v is

A. <−2, −2>
B. <3, 8>
C. <2, 2>
D. <4, 6>

14. If u = <1, 2> and v = <3, 4>, then v − u is

A. <2, 2>
B. <3, 8>
C. <−2, −2>
D. <4, 6>

15. If u = <2, −1>, then 3u is

A. <2, −3>
B. <5, 2>
C. <6, −3>
D. <6, −1>

16. If u = <2, −1>, then −u is

A. <−2, −1>
B. <−2, 1>
C. <1, −2>
D. <2, 1>

17. If u = 2i + 3j and v = i − j, then u + v is

A. 3i + 2j
B. i + 2j
C. 3i + 4j
D. i + 4j

18. If u = 2i + 3j and v = i − j, then u − v is

A. 3i + 2j
B. i + 4j
C. 3i + 4j
D. i + 2j

19. If u = 3i + 4j, then 2u is

A. 6i + 4j
B. 3i + 8j
C. 6i + 8j
D. 5i + 6j

20. The zero vector has magnitude

A. −1
B. 1
C. 2
D. 0

21. A vector whose magnitude is 1 is called a

A. zero vector
B. position vector
C. unit vector
D. free vector

22. The unit vector in the direction of <3, 4> is

A. <3, 4>
B. <3/5, 4/5>
C. <1/3, 1/4>
D. <4/5, 3/5>

23. Two vectors are equal if they have the same

A. initial point
B. direction only
C. magnitude only
D. magnitude and direction

24. Two non-zero vectors are parallel if one is a

A. scalar multiple of the other
B. zero vector
C. unit vector
D. sum of the other and a unit vector

25. The vectors <2, 4> and <1, 2> are

A. equal
B. unit vectors
C. perpendicular
D. parallel

26. The vectors i = <1, 0> and j = <0, 1> are

A. zero vectors
B. equal
C. unit vectors along the axes
D. parallel to each other

27. The negative of a vector has

A. the same magnitude and opposite direction
B. the same magnitude and the same direction
C. the same direction and half the magnitude
D. zero magnitude

28. In the triangle law of vector addition, AB + BC equals

A. BC − AB
B. AC
C. CA
D. AB − BC

29. For any points A and B, AB + BA equals

A. AB
B. 2AB
C. BA
D. the zero vector

30. If P is the midpoint of AB, then the position vector of P is

A. (a − b)/2
B. (b − a)/2
C. (a + b)/2
D. a + b

31. The midpoint of the points with position vectors <2, 4> and <6, 8> is

A. <4, 6>
B. <8, 12>
C. <4, 4>
D. <2, 2>

32. The vector from the origin O to a point P is called the

A. scalar of P
B. position vector of P
C. unit vector of P
D. zero vector

33. If the vector <k, 6> has magnitude 10 and k > 0, then k equals

A. 8
B. 6
C. 4
D. 10

34. A translation by the vector <2, 3> moves the point (1, 1) to

A. (3, 2)
B. (3, 4)
C. (2, 3)
D. (−1, −2)

35. If u = <a, b>, then the magnitude of u is

A. $\sqrt{(a^2 - b^2)}$
B. $a^2 + b^2$
C. a + b
D. $\sqrt{(a^2 + b^2)}$

Review Exercise: Unit 7

29 MCQs based on the Miscellaneous Exercise at the end of Unit 7 of the textbook. Written questions are converted into four-option MCQs.

36. Which of the following is a scalar quantity?

A. speed B. velocity
C. torque D. force

37. Which of the following is a vector quantity?

A. work B. speed
C. velocity D. distance

38. If a and b are the position vectors of points A and B, then the vector AB is

A. $-a - b$ B. $a - b$
C. $a + b$ **D. $b - a$**

39. Which of the following is not a way of writing the vector a?

A. a in bold type **B. $|a|$**
C. a with an arrow above it D. a underlined

40. If OP = $<-6, 7>$, then $-$OP equals

A. $<6, 7>$ B. $<-6, -7>$
C. $<6, -7>$ D. $<-6, 7>$

41. If $u = -5i + 12j$, then $|u|$ equals

A. 13 B. 7
C. 169 D. 17

42. For any vector u, which of the following is true?

A. $|u| = 0$ B. $|u| + |-u| = 0$
C. $-|u| = |u|$ **D. $|-u| = |u|$**

43. The unit vector of $u = 6i + 8j$ is

A. $-(3/5)i - (4/5)j$ **B. $(3/5)i + (4/5)j$**
C. $(3/5)i - (4/5)j$ D. $-(3/5)i + (4/5)j$

44. If $a = \lambda b$, where $a = 12i - 18j$ and $b = -2i + 3j$, then λ equals

A. 6 B. -3
C. 3 **D. -6**

45. If $u = <-5x, 8>$ and $v = <10, 4y>$ are equal vectors, then

A. $x = -2, y = 2$ B. $x = -2, y = -2$
C. $x = 2, y = -2$ D. $x = 2, y = 2$

46. If $p = <5, -6>$ and $q = <2, 6>$, then $p - 2q$ equals

A. $<1, 18>$ **B. $<1, -18>$**
C. $<-9, -18>$ D. $<9, 18>$

47. If u = 5i + 10j and v = 4j, then |u − v| equals

A. √123 B. 11

C. √61 D. √11

48. Which of the following vectors represents a position vector (O is the origin)?

A. PO **B. OP**

C. QP D. PQ

49. If AB = (2/3) DC in a quadrilateral ABCD, then ABCD is a

A. trapezium B. rhombus

C. rectangle D. kite

50. For p = 3i − 4j and q = −3i − 4j, which statement is true?

A. |p| ≠ |q| and p ≠ q B. |p| ≠ |q| but p = q

C. |p| = |q| and p = q **D. |p| = |q| but p ≠ q**

51. For a = 2i − 4j and b = −2i + xj, the values of x for which |a + 2b| = 6 are

A. x = ±2 B. x = 4 ± 2√2

C. x = 2 ± 2√2 D. x = 2

52. In triangle OAB, OA = a, OB = b and M is the midpoint of OA. Then OM equals

A. (1/2)a B. −(1/2)a

C. b − (1/2)a D. a

53. In triangle OAB, OA = a, OB = b and M is the midpoint of OA. Then AM equals

A. a − b B. (1/2)a − b

C. (1/2)a **D. −(1/2)a**

54. In triangle OAB, OA = a, OB = b and M is the midpoint of OA. Then BM equals

A. −(1/2)a **B. (1/2)a − b**

C. b − (1/2)a D. a + b

55. In triangle OAB, OA = a and OB = b. Then OB + BA equals

A. b − a B. b

C. a D. a + b

56. Two tractors pull a truck with forces of 250 N at 50° and 300 N at 40° with the horizontal (same side). The resultant force is approximately

A. 547.9 N at 55.5° to the horizontal **B. 547.9 N at 44.5° to the horizontal**

C. 450 N at 45° to the horizontal D. 384.3 N at 44.5° to the horizontal

57. The paths of two balls are V_1 = 120i + 12j and V_2 = 90i − 30j (in metres). The first ball travelled farther than the second by about

A. 42 m B. 51.6 m

C. 25.73 m D. 30 m

58. For the two balls with V_1 = 120i + 12j and V_2 = 90i − 30j, the distance between the balls is about

A. 51.6 m B. 25.7 m

C. 215.5 m D. 43.7 m

59. Ahmad swims at 6 m/s in still water. If he swims due west along a current flowing west at 1.5 m/s, his resultant velocity is

A. 4.5 m/s west
B. 6 m/s west
C. 6.2 m/s west
D. 7.5 m/s west

60. Ahmad swims at 6 m/s in still water. If he swims due east against a current flowing west at 1.5 m/s, his resultant velocity is

A. 4.5 m/s east
B. 7.5 m/s east
C. 6 m/s east
D. 1.5 m/s east

61. Ahmad swims at 6 m/s due north across a river with a westward current of 1.5 m/s. His resultant speed is about

A. 6 m/s
B. 4.5 m/s
C. 7.5 m/s
D. 6.18 m/s

62. In the same situation (swimming north across a westward current), the direction of his resultant velocity is

A. 75.96° west of north
B. 14.04° west of north
C. 14.04° east of north
D. 45° west of north

63. A plane travels north at 150 km/h in a steady wind blowing due east at 50 km/h. Its resultant speed is about

A. 100 km/h
B. 200 km/h
C. 158.11 km/h
D. 150 km/h

64. For the same plane, the distance from its starting point after 10 hours is about

A. 1000 km
B. 1581.1 km
C. 1500 km
D. 2000 km

Unit 8: Application of Trigonometry

37 practice MCQs and 38 review-exercise MCQs. Each question carries one mark.

1. sin(180° − θ) is equal to

A. cos θ
B. −cos θ
C. sin θ
D. −sin θ

2. cos(180° − θ) is equal to

A. −cos θ
B. cos θ
C. −sin θ
D. sin θ

3. The value of sin 150° is

A. −1/2
B. 1/2
C. −√3/2
D. √3/2

4. The value of cos 120° is

A. √3/2
B. −√3/2
C. 1/2
D. −1/2

5. The value of sin 120° is

A. 1/2
B. √3/2
C. −1/2
D. −√3/2

6. The value of cos 150° is

A. √3/2
B. −1/2
C. −√3/2
D. 1/2

7. The value of sin 135° is

A. −1/√2
B. √3/2
C. 1
D. 1/√2

8. The value of cos 135° is

A. −1/√2
B. 1/√2
C. −1
D. 0

9. The value of tan 135° is

A. 1
B. 0
C. √3
D. −1

10. The value of cos 180° is

A. 1
B. −1
C. undefined
D. 0

11. In a triangle ABC, the law of sines states that

A. a/cos A = b/cos B = c/cos C
B. sin A/a = b/sin B
C. a/sin A = b/sin B = c/sin C
D. a sin A = b sin B = c sin C

12. In a triangle ABC, the law of cosines states that

A. $a^2 = b^2 + c^2 - 2bc \cos A$ B. $a = b + c - 2bc \cos A$

C. $a^2 = b^2 + c^2 + 2bc \cos A$ D. $a^2 = b^2 - c^2 - 2bc \cos A$

13. In a triangle ABC, cos A equals

A. $(b^2 - c^2 - a^2)/(2bc)$ B. $(b^2 + c^2 + a^2)/(2bc)$

C. $(a^2 + b^2 - c^2)/(2bc)$ **D. $(b^2 + c^2 - a^2)/(2bc)$**

14. In triangle ABC, if b = 3, c = 4 and A = 90°, then a equals

A. 1 **B. 5**

C. 25 D. 7

15. In triangle ABC, if b = c = 4 and A = 60°, then a equals

A. 8 B. 16

C. 4 D. 2

16. In triangle ABC, if b = c = 2 and A = 120°, then a equals

A. $2\sqrt{3}$ B. 2

C. $\sqrt{3}$ D. 4

17. In triangle ABC, if a = 6, b = 8 and C = 90°, then c equals

A. 14 B. 100

C. 2 **D. 10**

18. In triangle ABC, if a = 10, A = 30° and B = 90°, then b equals

A. 5 **B. 20**

C. $10\sqrt{3}$ D. 10

19. In a triangle, if A = 50° and B = 60°, then C equals

A. 70° B. 80°

C. 60° D. 110°

20. The area of triangle ABC in terms of two sides and the included angle is

A. ½ ab tan C B. ab sin C

C. ½ ab sin C D. ½ ab cos C

21. The area of a triangle with a = 4, b = 6 and C = 30° is

A. 24 square units B. 12 square units

C. 3 square units **D. 6 square units**

22. The area of a triangle with two sides 10 and 10 and the included angle 90° is

A. 50 square units B. 25 square units

C. 10 square units D. 100 square units

23. The area of a triangle with sides 3, 4 and 5 is

A. 7.5 square units B. 10 square units

C. 6 square units D. 12 square units

24. The law of sines is most useful when we are given

A. three sides
B. two angles and one side
C. only one angle
D. two sides and the included angle

25. The law of cosines is used to find the third side when we are given

A. two angles and one side
B. three angles
C. only one side
D. two sides and the included angle

26. The law of cosines is used to find an angle when we are given

A. one angle only
B. one side only
C. all three sides
D. all three angles

27. The angle of elevation is the angle between the horizontal line and the line of sight when the object is

A. above the horizontal
B. on the horizontal
C. below the horizontal
D. behind the observer

28. The angle of depression is the angle between the horizontal line and the line of sight when the object is

A. at the observer's eye level
B. below the horizontal
C. directly overhead
D. above the horizontal

29. The angle of elevation of A from B is equal to the angle of depression of

A. B from A
B. A from A
C. A from the ground
D. B from the ground

30. A tower is observed from a point 20 m from its base at an angle of elevation of 45°. The height of the tower is

A. 40 m
B. 10 m
C. 20 m
D. $20\sqrt{2}$ m

31. A pole of height 10 m casts a shadow of length $10\sqrt{3}$ m. The angle of elevation of the sun is

A. 90°
B. 60°
C. 45°
D. 30°

32. From a point 10 m from the foot of a tower, the angle of elevation of its top is 60°. The height of the tower is

A. $5\sqrt{3}$ m
B. $10\sqrt{3}$ m
C. 10 m
D. 20 m

33. A ladder 10 m long makes an angle of 60° with the ground. The height it reaches on the wall is

A. 10 m
B. $10\sqrt{3}$ m
C. $5\sqrt{3}$ m
D. 5 m

34. A ladder 10 m long makes an angle of 60° with the ground. The distance of its foot from the wall is

A. 10 m
B. $5\sqrt{3}$ m
C. $10\sqrt{3}$ m
D. 5 m

35. The length of the diagonal of a cuboid with dimensions 3 cm, 4 cm and 12 cm is

A. 13 cm B. 15 cm
C. 5 cm D. 19 cm

36. The diagonal of a cube of side 1 unit has length

A. √2 units **B. √3 units**
C. 1 unit D. 3 units

37. In an isosceles triangle with equal sides b = c, the angles B and C are

A. each 90° B. complementary
C. equal D. supplementary

Review Exercise: Unit 8

38 MCQs based on the Miscellaneous Exercise at the end of Unit 8 of the textbook. Written questions are converted into four-option MCQs.

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38. In a right triangle ABC, a = 2 cm and the hypotenuse c = 4 cm. Then α equals

A. 60° **B. 30°**
C. 120° D. 45°

39. In a triangle with a = 10, b = 15 and α = 32°, the angle β is approximately

A. 62.8° B. 42.5°
C. 46.5° **D. 52.6°**

40. The area of an equilateral triangle of side a is

A. $(3/4)a^2$ B. $(\sqrt{3}/8)a$
C. $(\sqrt{3}/4)a^2$ D. $(\sqrt{3}/16)a^2$

41. If a, a and b are the lengths of the sides of an isosceles triangle, then the semi-perimeter s equals

A. a + b/2 B. a + (a + b)/2
C. a/2 + b D. a − (a + b)/2

42. The area of triangle ABC with a = 20, b = 30 and γ = 90° is

A. 0 B. 600
C. 30 **D. 300**

43. For an equilateral triangle, the ratio of inradius : exradius : circumradius (r : r_1 : R) is

A. 1 : 2 : 3 **B. 1 : 3 : 2**
C. 1 : 1 : 2 D. 3 : 2 : 1

44. The radius of the circum-circle of a triangle with sides 6, 8 and 10 is

A. 5 B. 4
C. 2 D. 6

45. If a = 5, b = 10 and c = 20 are the sides of a triangle ABC, then

A. the triangle is obtuse B. the triangle is acute
C. such a triangle is not possible D. α = 0°

46. The circum-radius R of a triangle ABC is given by

A. $(b/2)\sec(\beta/2)$ B. $(c/2)\cos(\gamma/2)$

C. $(a/2)\sec(\alpha/2)$ **D. $(c/2)\operatorname{cosec}\gamma$**

47. In an equilateral triangle ABC, the value of $\tan(\alpha/2)$ is

A. $\sqrt{3}$ **B. $1/\sqrt{3}$**

C. 1/2 D. 1

48. The shadow of a man 5.6 ft tall makes an angle of elevation of 45° with the sun. The length of the shadow is

A. 8.4 ft B. 11.2 ft

C. 5.6 ft D. 2.8 ft

49. In triangle ABC with s the semi-perimeter, $R(\sin\alpha + \sin\beta + \sin\gamma)$ equals

A. s B. s^2

C. $1/s^2$ D. 1/s

50. Solving the triangle with $a = 8$, $\alpha = 15°$ and $\beta = 20°$ gives

A. $\gamma = 35°$, $b \approx 10.6$ B. $\gamma = 145°$, $b \approx 6.05$

C. $\gamma = 35°$, $b \approx 6.05$ **D. $\gamma = 145°$, $b \approx 10.6$**

51. For the triangle with $a = 34$, $b = 41$ and $\alpha = 115°$,

A. $\beta \approx 33°$ B. $\beta \approx 90°$

C. no triangle can be formed D. two different triangles can be formed

52. Solving the triangle with $b = 17.3$, $c = 14.5$ and $\beta = 98.2°$ gives

A. $\gamma \approx 56.1°$, $\alpha \approx 25.7°$, $a \approx 14.6$ **B. $\gamma \approx 56.1°$, $\alpha \approx 25.7°$, $a \approx 7.6$**

C. $\gamma \approx 25.7°$, $\alpha \approx 56.1°$, $a \approx 7.6$ D. $\gamma \approx 33.9°$, $\alpha \approx 47.9°$, $a \approx 12.9$

53. Solving the triangle with $c = 55.4$, $\alpha = 115°$ and $\beta = 45°$ gives

A. $\gamma = 20°$, $a \approx 146.8$, $b \approx 114.5$ B. $\gamma = 20°$, $a \approx 55.4$, $b \approx 45$

C. $\gamma = 70°$, $a \approx 146.8$, $b \approx 114.5$ D. $\gamma = 20°$, $a \approx 114.5$, $b \approx 146.8$

54. Solving the triangle with $a = 34$, $c = 48$ and $\beta = 108°$ gives

A. $b \approx 66.8$, $\alpha \approx 43.1°$, $\gamma \approx 28.9°$ B. $b \approx 58.9$, $\alpha \approx 28.9°$, $\gamma \approx 43.1°$

C. $b \approx 66.8$, $\alpha \approx 28.9°$, $\gamma \approx 43.1°$ D. $b \approx 82$, $\alpha \approx 28.9°$, $\gamma \approx 43.1°$

55. Solving the triangle with $a = 44$, $b = 33$ and $c = 55$ gives angles

A. 53.13°, 36.87° and 90° B. 36.87°, 53.13° and 90°

C. 45°, 45° and 90° D. 60°, 60° and 60°

56. The diagonals of a parallelogram are 12 cm and 22 cm and meet at 143°. The length of its longer side is about

A. 7.2 cm **B. 16.2 cm**

C. 14.5 cm D. 18.0 cm

57. Two friends walk 1.5 km along a straight road, turn so that the angle between the two roads is 100°, walk 0.95 km and then return home. The length of the last portion is about

A. 2.45 km
B. 1.63 km
C. 1.50 km
D. 1.91 km

58. In the same walk (1.5 km, 0.95 km and the return), the total distance walked is about

A. 3.15 km
B. 4.36 km
C. 2.45 km
D. 5.0 km

59. A kite has two pairs of congruent adjacent sides of lengths 20 in and 35 in, and the two shorter sides meet at 115°. The diagonal between the points where the unequal sides meet is about

A. 40.2 in
B. 55 in
C. 28.5 in
D. 33.7 in

60. In the same kite, the angle at which the two longer sides meet is about

A. 57.6°
B. 65.0°
C. 32.4°
D. 115°

61. The distances between three street intersections are 55 m, 63 m and 77 m. The area of the triangular park is about

A. 855.9 m^2
B. 2664 m^2
C. 1711.9 m^2
D. 3423.8 m^2

62. The base of an isosceles triangle is 14.5 cm and the vertex angle is 110°. One of the congruent sides measures about

A. 7.25 cm
B. 8.85 cm
C. 12.4 cm
D. 17.7 cm

63. For the same isosceles triangle, the perimeter is about

A. 40.5 cm
B. 23.4 cm
C. 17.7 cm
D. 32.2 cm

64. A triangular park has two angles of 80° and 60° and its longest side is 90 m. The other two sides are about

A. 79.1 m and 58.7 m
B. 70 m and 50 m
C. 90 m and 60 m
D. 137.3 m and 121.6 m

65. From the higher observer, the angle of depression to a pipe is 55°. From a point 5 stories (45 ft) lower, the angle of inclination to the pipe is 20°. The horizontal distance from the pipe to the apartment complex is about

A. 73.7 ft
B. 45.0 ft
C. 42.3 ft
D. 28.0 ft

66. In the same situation, the distance from the higher observer to the pipe is about

A. 42.3 ft
B. 55.9 ft
C. 45.0 ft
D. 73.7 ft

67. A geologist is 4 miles from the northern-most point of a crater and 2 miles from the southern-most point, with an angle of 117° between the lines of sight. The diameter of the crater is about

A. 5.22 miles B. 2.0 miles

C. 6.0 miles D. 4.47 miles

68. The circumference of the circum-circle of an equilateral triangle of side 6 cm is about

A. 37.7 cm **B. 21.8 cm**

C. 10.9 cm D. 32.6 cm

69. The circumference of the ex-circle (opposite one vertex) of an equilateral triangle of side 6 cm is about

A. 21.8 cm B. 18.8 cm

C. 32.6 cm D. 10.9 cm

70. If the angle between two congruent sides of a triangle measures 60°, the triangle is

A. scalene B. obtuse

C. right-angled **D. equilateral**

71. For the 3-4-5 right triangle (area $\Delta = 6$), $1/r^2 + 1/r_1^2 + 1/r_2^2 + 1/r_3^2$ equals

A. 25/18 B. 50/6

C. 5/6 D. 25/36

72. In the 3-4-5 triangle with $a = 3$, the exradius $r_1 = a \cos(\beta/2) \cos(\gamma/2) \sec(\alpha/2)$ equals

A. 6 **B. 2**

C. 3 D. 1

73. From the top of a 680 m mountain, the angles of depression of two points on opposite sides are 48° and 32°. The tunnel between the points is about

A. 612.3 m B. 1288 m

C. 1700.5 m D. 1088.2 m

74. In the trapezium ABCD with BC || AD, BD is perpendicular to AD, angle A = 37°, AD = 12.6 cm and CD = 22.5 cm, the measure of angle C is about

A. 24.96° B. 37°

C. 53° D. 65.04°

75. A cuboid has sides 12 cm, 5 cm and 5 cm. The angle α between the base diagonal AC and the space diagonal AG is about

A. 67.4° B. 22.6°

C. 24.6° **D. 21.0°**

Unit 9: Chord and Arcs of a Circle

36 practice MCQs and 17 review-exercise MCQs. Each question carries one mark.

1. A line segment joining any two points of a circle is called a

A. secant
B. tangent
C. chord
D. radius

2. The longest chord of a circle is its

A. secant
B. arc
C. radius
D. diameter

3. A chord that passes through the centre of a circle is called a

A. diameter
B. sector
C. arc
D. tangent

4. The perpendicular from the centre of a circle to a chord

A. is parallel to the chord
B. bisects the chord
C. is equal to the radius
D. is equal to the chord

5. The line joining the centre of a circle to the midpoint of a chord is

A. parallel to the chord
B. a tangent to the circle
C. equal to the chord
D. perpendicular to the chord

6. Equal chords of a circle are

A. unequal in distance from the centre
B. equidistant from the centre
C. diameters
D. parallel to each other

7. Chords of a circle that are equidistant from the centre are

A. diameters
B. unequal in length
C. equal in length
D. perpendicular

8. In a circle of radius 5 cm, a chord is 6 cm long. Its distance from the centre is

A. 4 cm
B. 3 cm
C. 2 cm
D. 8 cm

9. In a circle of radius 13 cm, a chord is 24 cm long. Its distance from the centre is

A. 12 cm
B. 10 cm
C. 7 cm
D. 5 cm

10. A chord of length 8 cm is at a distance of 3 cm from the centre of a circle. The radius is

A. 5 cm
B. 4 cm
C. 11 cm
D. $\sqrt{7}$ cm

11. A chord of length 16 cm is at a distance of 6 cm from the centre. The radius is

A. 8 cm
B. 14 cm
C. 10 cm
D. $\sqrt{28}$ cm

12. If two chords AB and CD of a circle are equal, then their distances from the centre are

A. double
B. equal
C. unequal
D. zero

13. If two chords of a circle are at unequal distances from the centre, the chord nearer to the centre is

A. equal
B. shorter
C. longer
D. a tangent

14. A quadrilateral whose all four vertices lie on a circle is called

A. a cyclic quadrilateral
B. a trapezium
C. a rhombus
D. a tangential quadrilateral

15. A line that meets a circle at two distinct points is called a

A. tangent
B. radius
C. diameter
D. secant

16. A chord divides a circle into two parts called

A. quadrants
B. segments
C. sectors
D. tangents

17. The region bounded by two radii and the arc between them is called a

A. chord
B. semicircle
C. sector
D. segment

18. Equal arcs of a circle subtend

A. unequal angles at the centre
B. no angle at the centre
C. right angles at the centre
D. equal angles at the centre

19. If two arcs of a circle subtend equal angles at the centre, then the corresponding chords are

A. equal
B. perpendicular
C. unequal
D. parallel

20. The perpendicular bisector of a chord of a circle passes through

A. no fixed point
B. the centre of the circle
C. the endpoint of the chord only
D. a point outside the circle

21. The number of circles that can pass through three non-collinear points is

A. none
B. infinitely many
C. two
D. exactly one

22. A chord of length 10 cm lies in a circle of radius 5 cm. Its distance from the centre is

A. 2.5 cm
B. 0 cm
C. 5 cm
D. 10 cm

23. In a circle of radius 10 cm, a chord is at a distance of 6 cm from the centre. The length of the chord is

A. 20 cm
B. 8 cm
C. 16 cm
D. 12 cm

24. In a circle of radius 13 cm, a chord is at a distance of 12 cm from the centre. The length of the chord is

A. 10 cm B. 5 cm
C. 2 cm D. 25 cm

25. The length of the longest chord of a circle of radius r is

A. r B. $r\sqrt{2}$
C. πr **D. 2r**

26. The perpendicular bisectors of two non-parallel chords of a circle meet at

A. the centre of the circle B. a point on the circle
C. a point outside the circle D. the midpoint of one chord

27. If the midpoint of a chord is M and the centre is O, then OM is

A. parallel to the chord B. equal to the chord
C. perpendicular to the chord D. equal to the radius

28. If AB is a chord of a circle with centre O and M is its midpoint, then angle OMA measures

A. 60° **B. 90°**
C. 180° D. 45°

29. A straight line drawn from the centre of a circle to bisect a chord (which is not a diameter) is

A. parallel to the chord B. equal to the chord
C. a tangent to the circle **D. perpendicular to the chord**

30. If two chords of a circle are congruent, then their corresponding minor arcs are

A. congruent B. parallel
C. perpendicular D. unequal

31. Equal chords of a circle subtend at the centre

A. unequal angles **B. equal angles**
C. supplementary angles D. right angles

32. If two chords of a circle subtend equal angles at the centre, then the chords are

A. perpendicular to each other B. unequal
C. equal D. parallel

33. A circle cannot be drawn through three points that are

A. collinear B. vertices of a triangle
C. vertices of a right triangle D. non-collinear

34. The centre of the circle passing through the three vertices of a triangle lies at the intersection of its

A. altitudes only B. medians
C. angle bisectors **D. perpendicular bisectors of the sides**

35. A chord subtends an angle of 60° at the centre of a circle of radius 7 cm. The length of the chord is

A. $7\sqrt{3}$ cm B. 3.5 cm
C. 7 cm D. 14 cm

36. A chord subtends an angle of 90° at the centre of a circle of radius 5 cm. The length of the chord is

A. 5√3 cm
B. 5√2 cm
C. 5 cm
D. 10 cm

Review Exercise: Unit 9

17 MCQs based on the Miscellaneous Exercise at the end of Unit 9 of the textbook. Written questions are converted into four-option MCQs.

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37. One and only one circle can pass through

A. two points
B. three non-collinear points
C. four points
D. five points

38. The number of circles that can pass through a single point is

A. infinite
B. 1
C. 3
D. 2

39. A diameter of a circle which bisects a chord is

A. parallel to the chord
B. equal to the chord
C. collinear with the chord
D. perpendicular to the chord

40. In a circle with centre O, OC = 3 cm is perpendicular to the chord AB = 8 cm at C. The radius of the circle is

A. 4 cm
B. 4.5 cm
C. 5 cm
D. 10 cm

41. A diameter of a circle perpendicular to a chord

A. intersects the chord at its end point only
B. only touches the chord
C. trisects the chord
D. bisects the chord

42. Two chords of a circle which are equidistant from the centre are

A. parallel
B. congruent
C. unequal
D. diameters

43. Two congruent chords of a circle are

A. equidistant from the centre
B. always parallel
C. at unequal distances from the centre
D. always diameters

44. The length of a chord of a circle of radius 5 cm is 8 cm. The distance of the chord from the centre is

A. 6 cm
B. 5 cm
C. 3 cm
D. 4 cm

45. A chord of a circle is 24 cm long and is at a distance of 5 cm from the centre. The radius of the circle is

A. 5 cm
B. 13 cm
C. 10 cm
D. 26 cm

46. A chord AB = 4 cm is 3 cm from the centre O of a circle. A chord DE parallel to AB passes through the midpoint of the perpendicular from O to AB. The length of DE is about

A. 6.6 cm B. 3.3 cm

C. 4.5 cm D. 5.6 cm

47. An angle whose vertex is the centre of a circle and whose arms pass through the end points of an arc is called

A. an interior angle B. an inscribed angle

C. an exterior angle **D. a central angle**

48. The corresponding arcs of two congruent chords of a circle are

A. minor only B. major

C. congruent D. unequal

49. The central angle of a quadrant of a circle is

A. 60° B. 30°

C. 45° **D. 90°**

50. If a circle is divided into ten equal arcs, the central angle of each arc is

A. 60° B. 90°

C. 36° D. 10°

51. The number of central angles that can be drawn for an arc is

A. finite **B. one**

C. two D. infinite

52. Two congruent chords of two congruent circles have

A. the same central angles B. proportional central angles

C. acute central angles only D. different central angles

53. The central angle of an arc which includes a semicircle in it is

A. greater than 90° but less than 180° B. less than 90°

C. greater than 180° D. exactly 180°

Unit 10: Tangents and Angles of a Circle

32 practice MCQs and 21 review-exercise MCQs. Each question carries one mark.

1. The measure of the central angle of a circle is

A. equal to the inscribed angle on the same arc
B. half the inscribed angle on the same arc
C. 90° always
D. twice the inscribed angle on the same arc

2. The angle at the centre of a circle subtended by an arc is 80°. The inscribed angle on the same arc is

A. 40°
B. 100°
C. 160°
D. 80°

3. The angle in a semicircle is

A. an obtuse angle
B. a straight angle
C. a right angle
D. an acute angle

4. Angles in the same segment of a circle are

A. complementary
B. equal
C. supplementary
D. unequal

5. The sum of the opposite angles of a cyclic quadrilateral is

A. 180°
B. 360°
C. 270°
D. 90°

6. In a cyclic quadrilateral ABCD, if angle A = 70°, then angle C equals

A. 20°
B. 70°
C. 110°
D. 290°

7. The length of an arc of a circle of radius r that subtends a central angle θ (in radians) is

A. $r^2\theta$
B. rθ
C. r/θ
D. θ/r

8. A tangent to a circle meets the circle at

A. no point
B. three points
C. two points
D. exactly one point

9. A tangent to a circle is perpendicular to the radius drawn at

A. the midpoint of the radius
B. any point on the circle
C. the point of contact
D. the centre

10. The number of tangents that can be drawn to a circle from a point outside it is

A. 1
B. 3
C. infinitely many
D. 2

11. The number of tangents that can be drawn to a circle from a point on it is

A. 1
B. 0
C. infinitely many
D. 2

12. The tangent segments drawn to a circle from an external point are

A. perpendicular
B. equal in length
C. unequal in length
D. parallel

13. The radius of a circle is 5 cm and the point P is 13 cm from the centre. The length of the tangent from P is

A. √194 cm
B. 8 cm
C. 12 cm
D. 18 cm

14. The radius of a circle is 3 cm and the point P is 5 cm from the centre. The length of the tangent from P is

A. 2 cm
B. 8 cm
C. √34 cm
D. 4 cm

15. The length of a tangent from P is 8 cm and the radius is 6 cm. The distance of P from the centre is

A. 10 cm
B. 2 cm
C. √28 cm
D. 14 cm

16. PA and PB are tangents from P to a circle with centre O. If angle APB = 60°, then angle AOB equals

A. 30°
B. 120°
C. 90°
D. 60°

17. PA and PB are tangents from P to a circle. If angle APB = 80°, then angle PAB equals

A. 50°
B. 80°
C. 100°
D. 40°

18. The tangents drawn at the two ends of a diameter of a circle are

A. intersecting
B. perpendicular
C. equal to the diameter
D. parallel

19. The distance between the centres of two circles of radii 5 cm and 3 cm touching externally is

A. 2 cm
B. 15 cm
C. 8 cm
D. 4 cm

20. The distance between the centres of two circles of radii 7 cm and 3 cm touching internally is

A. 5 cm
B. 4 cm
C. 10 cm
D. 21 cm

21. Two circles of radii 6 cm and 4 cm have their centres 10 cm apart. The circles

A. touch externally
B. intersect at two points
C. do not touch
D. touch internally

22. A central angle of 140° stands on an arc. The inscribed angle in the major segment on the same arc is

A. 35°
B. 140°
C. 70°
D. 280°

23. A line drawn perpendicular to a radius of a circle at its outer end is a

A. diameter
B. tangent
C. secant
D. chord

24. The angle in a segment of a circle greater than a semicircle is

A. greater than a right angle
B. a straight angle
C. a right angle
D. less than a right angle

25. The angle in a segment of a circle smaller than a semicircle is

A. zero
B. a right angle
C. greater than a right angle
D. less than a right angle

26. A central angle of 90° stands on a minor arc. The angle subtended by the same arc in the major segment is

A. 90°
B. 45°
C. 135°
D. 180°

27. ABCD is a quadrilateral inscribed in a circle. If angle B = 85°, then angle D equals

A. 275°
B. 105°
C. 85°
D. 95°

28. AB is a diameter of a circle and C is a point on the circle. If angle BAC = 35°, then angle ABC equals

A. 55°
B. 90°
C. 35°
D. 145°

29. The angle in a semicircle subtends an angle of

A. 60°
B. 180°
C. 45°
D. 90°

30. Two circles touch externally. The distance between their centres equals

A. the product of their radii
B. twice the larger radius
C. the sum of their radii
D. the difference of their radii

31. Two circles touch internally. The distance between their centres equals

A. the difference of their radii
B. the product of their radii
C. the sum of their radii
D. the larger radius

32. The tangent to a circle and the radius through the point of contact are

A. parallel
B. perpendicular
C. equal
D. inclined at 45°

Review Exercise: Unit 10

21 MCQs based on the Miscellaneous Exercise at the end of Unit 10 of the textbook. Written questions are converted into four-option MCQs.

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33. A tangent line touches a circle at how many points?

A. 3
B. 2
C. 4
D. 1

34. A tangent line is ____ to the radial segment at the point of contact.

A. parallel
B. perpendicular
C. equal
D. similar

35. The number of tangents that can be drawn to a circle from a point outside it is

A. 2
B. 3
C. infinite
D. 1

36. If two tangents are drawn at both ends of a diameter of a circle, they are

A. intersecting
B. equal to the diameter
C. parallel
D. perpendicular

37. The radius of a circle is 4 cm. The distance between the two tangents drawn at the ends of a diameter is

A. 2 cm
B. 6 cm
C. 4 cm
D. 8 cm

38. The number of tangents that can be drawn to a circle from a point on the circle is

A. 1
B. infinite
C. 2
D. none

39. Two tangents drawn to a circle from a point outside it are

A. perpendicular
B. not congruent
C. congruent
D. parallel

40. If two circles touch externally, the distance between their centres equals the sum of their

A. areas
B. radii
C. circumferences
D. diameters

41. If two congruent circles touch externally, the distance between their centres equals

A. a sector of a circle
B. a chord of a circle
C. the radius of a circle
D. the diameter of a circle

42. Two circles of radii 1.4 cm and 2.5 cm touch internally. The distance between their centres is

A. 1.1 cm
B. 3.9 cm
C. 1.4 cm
D. 2.5 cm

43. The angle subtended by an arc at the centre of a circle is called a

A. reflex angle
B. central angle
C. inscribed angle
D. straight angle

44. An angle inscribed in a half circle (semicircle) is

A. 0°
B. 180°
C. 90°
D. 45°

45. If the central angle of a minor arc of a circle is 100°, the angle inscribed in the corresponding major arc is

A. 50°
B. 75°
C. 100°
D. 200°

46. The central angle of a minor arc of a circle is

A. greater than 180° B. greater than 360°

C. less than 360° only **D. less than 180°**

47. The central angle of a major arc of a circle is

A. less than 180° **B. greater than 180°**

C. greater than 90° only D. less than 90°

48. All angles in the same segment of a circle are

A. supplementary B. acute

C. equal D. obtuse

49. If ABCD is a cyclic quadrilateral and angle A = 60°, then angle C equals

A. 120° B. 180°

C. 150° D. 60°

50. An exterior angle of a cyclic quadrilateral is ____ the opposite interior angle.

A. less than B. greater than

C. the supplement of **D. equal to**

51. In a circle of diameter 12 cm, a central angle of 90° cuts off an arc. The length of the chord joining the end points of the arc is

A. 12 cm B. 12√2 cm

C. 6√2 cm D. 6 cm

52. The diameter of a circle is 20 cm and a chord parallel to it is 12 cm long. The distance between the chord and the centre is

A. 6 cm **B. 8 cm**

C. 16 cm D. 4 cm

53. In a cyclic quadrilateral ABCD with AB = 4 cm, BC = 5 cm, CD = 6 cm, DA = 3 cm and AC = 8 cm, the diagonal BD (by $p \times q = ac + bd$) is

A. 4.875 cm B. 8.0 cm

C. 4.75 cm D. 39 cm

Unit 11: Practical Geometry of Circles

33 practice MCQs and 14 review-exercise MCQs. Each question carries one mark.

1. The centre of a given circle can be located by drawing

A. two tangents
B. the bisectors of two radii
C. two parallel chords
D. the perpendicular bisectors of two non-parallel chords

2. The perpendicular bisector of any chord of a circle passes through

A. the centre of the circle
B. the point of contact of a tangent
C. a point outside the circle
D. the endpoint of the chord

3. To draw a circle through three non-collinear points A, B and C, the centre is found at the intersection of

A. the medians of the triangle
B. the perpendicular bisectors of AB and BC
C. the angle bisectors of the triangle
D. the altitudes of the triangle

4. A circle passing through all three vertices of a triangle is called its

A. excircle
B. incircle
C. circumcircle
D. unit circle

5. To complete a circle when only a part of its arc is given, we first choose

A. one point on the arc
B. three points on the arc
C. the tangent line
D. two points outside the arc

6. The tangent at a point P of a circle with centre O is drawn

A. perpendicular to OP at P
B. at 45° to OP
C. through O
D. parallel to OP through P

7. If PT is a tangent at P to a circle with centre O, then angle OPT measures

A. 180°
B. 60°
C. 45°
D. 90°

8. To draw a tangent to a circle from an external point P, we draw a circle on OP as diameter where O is the centre. This circle cuts the given circle at

A. no point
B. the centre of the given circle
C. the points of contact of the tangents
D. the midpoint of OP only

9. In drawing tangents from an external point P, angle OTP is 90° because it is

A. an angle in a semicircle
B. an angle between two chords
C. an exterior angle
D. an angle at the centre

10. The number of tangents drawn from an external point to a circle is

A. 4
B. 2
C. 3
D. 1

11. A tangent drawn at a point on a circle is

A. not possible
B. one of two possible
C. unique
D. one of infinitely many

12. The centre of a circle which touches a given line at a given point lies on

A. the bisector of the line
B. the parallel to the line
C. the given line
D. the perpendicular to the line at that point

13. Two tangents to a circle meet at an angle of 60°. The angle between the radii drawn to the points of contact is

A. 30°
B. 120°
C. 60°
D. 90°

14. Two tangents to a circle meet at an angle of 90°. The angle between the radii drawn to the points of contact is

A. 45°
B. 60°
C. 180°
D. 90°

15. To draw two tangents to a circle meeting at an angle of 70°, the angle between the radii to the points of contact is

A. 110°
B. 140°
C. 70°
D. 20°

16. A common tangent that does not cross the line segment joining the centres of two circles is called a

A. secant
B. chord
C. direct (external) common tangent
D. transverse (internal) common tangent

17. A common tangent that crosses the line segment joining the centres of two circles is called a

A. transverse (internal) common tangent
B. diameter
C. direct (external) common tangent
D. secant

18. The maximum number of common tangents of two circles is

A. 2
B. 4
C. 6
D. 3

19. The number of common tangents of two separate circles (neither touching nor intersecting, each outside the other) is

A. 3
B. 1
C. 4
D. 2

20. The number of common tangents of two circles touching externally is

A. 2
B. 4
C. 1
D. 3

21. The number of common tangents of two circles touching internally is

A. 0
B. 1
C. 2
D. 3

22. The number of common tangents of two circles intersecting at two points is

A. 2 B. 1

C. 4 D. 3

23. The number of common tangents of two circles, one lying completely inside the other without touching, is

A. 2 B. 4

C. 0 D. 1

24. For two circles touching externally, the transverse common tangent passes through

A. no particular point B. the centre of the smaller circle

C. the centre of the larger circle **D. the point of contact**

25. Direct common tangents to two equal circles are

A. equal to the diameter **B. parallel to each other**

C. intersecting on the circles D. perpendicular to each other

26. The length of a direct common tangent to two circles with radii r_1, r_2 and distance d between centres is

A. $d - (r_1 - r_2)$ B. $\sqrt{(d^2 + (r_1 - r_2)^2)}$

C. $\sqrt{(d^2 - (r_1 + r_2)^2)}$ **D. $\sqrt{(d^2 - (r_1 - r_2)^2)}$**

27. The length of a transverse common tangent to two circles with radii r_1, r_2 and distance d between centres is

A. $\sqrt{(d^2 - (r_1 + r_2)^2)}$ B. $\sqrt{(d^2 - (r_1 - r_2)^2)}$

C. $d - (r_1 + r_2)$ D. $\sqrt{(d^2 + (r_1 + r_2)^2)}$

28. Two circles of radii 8 cm and 3 cm have their centres 13 cm apart. The length of a direct common tangent is

A. 10 cm B. 5 cm

C. 12 cm D. $\sqrt{194}$ cm

29. Two circles of radii 7 cm and 5 cm have their centres 13 cm apart. The length of a transverse common tangent is

A. 5 cm B. $\sqrt{25}$ cm

C. $\sqrt{145}$ cm D. 12 cm

30. A tangent PT is drawn from a point P that is 10 cm from the centre of a circle of radius 6 cm. The length PT is

A. 16 cm **B. 8 cm**

C. 4 cm D. $\sqrt{136}$ cm

31. The midpoint of the segment OP is found in the construction of tangents from P by drawing

A. a chord through P B. the angle bisector at O

C. the perpendicular bisector of OP D. a tangent at O

32. Instruments normally used for geometrical constructions of circles are

A. calculator only B. protractor only

C. set square only **D. compass and straightedge (ruler)**

33. To find the radius of a circle from part of its arc, after finding the centre we measure

A. the length of a tangent
B. the length of the arc
C. the distance from the centre to any point on the arc
D. the distance between two chords

Review Exercise: Unit 11

14 MCQs based on the Miscellaneous Exercise at the end of Unit 11 of the textbook. Written questions are converted into four-option MCQs.

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34. The angle between a tangent and the radial segment at the point of contact is

A. 30°
B. 45°
C. 60°
D. 90°

35. The direct common tangents of two equal circles are

A. parallel
B. not parallel
C. converging
D. intersecting

36. The number of common tangents that can be drawn to two intersecting circles is

A. 3
B. infinite
C. 2
D. 1

37. Two circles of radii 3 cm and 3.2 cm touch externally. The distance between their centres is

A. 0.2 cm
B. 6.2 cm
C. 6 cm
D. 5.3 cm

38. The centres and the point of contact of two touching circles are

A. converging
B. non-collinear
C. collinear
D. coincident

39. In which type of triangle do the incentre and the circumcentre coincide?

A. right-angled
B. equilateral
C. isosceles
D. scalene

40. Two circles of radii 4 cm and 4.8 cm touch internally. The distance between their centres is

A. 4 cm
B. 8.8 cm
C. 8 cm
D. 0.8 cm

41. Two tangents are drawn at the ends of a diameter of a circle of radius 3.5 cm. The distance between the tangents is

A. 7 cm
B. 10.5 cm
C. 5 cm
D. 3.5 cm

42. Transverse common tangents of two circles intersect each other at

A. 2 points
B. 3 points
C. 1 point
D. 4 points

43. A circle is inscribed in a square of side 6 cm. The radius of the circle is

A. 6 cm
B. 12 cm
C. 24 cm
D. 3 cm

44. A square is inscribed in a circle of radius 5 cm. The length of the diagonal of the square is

A. 10 cm
B. 2.5 cm
C. 5 cm
D. 20 cm

45. The perpendicular bisectors of ____ always pass through the centre of a circle.

A. tangents
B. chords
C. secants
D. radial segments

46. The number of circles that can be drawn through three non-collinear points is

A. 2
B. 3
C. infinite
D. 1

47. The number of pairs of parallel tangents that a circle has is

A. infinite
B. 1
C. 3
D. 2

Unit 12: Basic Statistics

51 practice MCQs and 25 review-exercise MCQs. Each question carries one mark.

1. The cumulative frequency of a class is

A. the class mark of that class

B. the sum of the frequencies of that class and all earlier classes

C. the frequency of that class only

D. the difference of two frequencies

2. The graph of a cumulative frequency distribution is called an

A. frequency polygon

B. bar chart

C. histogram

D. ogive

3. The last cumulative frequency in a cumulative frequency table equals

A. the total frequency

B. the range

C. the mean

D. the highest class mark

4. An ogive is plotted by taking

A. class marks against frequencies

B. lower class limits against frequencies

C. upper class boundaries against cumulative frequencies

D. class widths against frequencies

5. The median of a grouped data set is read from the ogive at the position

A. N/4

B. N/2

C. 3N/4

D. N

6. The first quartile Q_1 is read from the ogive at the position

A. 3N/4

B. N/2

C. N/4

D. N/10

7. The third quartile Q_3 is read from the ogive at the position

A. 3N/4

B. N

C. N/4

D. N/2

8. Quartiles divide a data set into

A. hundred equal parts

B. two equal parts

C. ten equal parts

D. four equal parts

9. Deciles divide a data set into

A. ten equal parts

B. five equal parts

C. four equal parts

D. hundred equal parts

10. Percentiles divide a data set into

A. four equal parts

B. twenty equal parts

C. ten equal parts

D. hundred equal parts

11. The fifth decile D_5 is equal to the

A. third quartile

B. median

C. first quartile

D. mode

12. The 50th percentile P_{50} is equal to the

A. mode
B. range
C. median
D. mean

13. The 25th percentile P_{25} is equal to the

A. third quartile
B. first decile
C. median
D. first quartile

14. The inter-quartile range (IQR) is

A. $Q_3 - Q_1$
B. $(Q_3 + Q_1)/2$
C. $Q_1 - Q_3$
D. $Q_3 + Q_1$

15. If $Q_1 = 12$ and $Q_3 = 30$, then the inter-quartile range is

A. 42
B. 9
C. 18
D. 21

16. If $Q_1 = 12$ and $Q_3 = 30$, then the semi-interquartile range is

A. 21
B. 9
C. 18
D. 42

17. A box-and-whisker plot is drawn using the

A. mean and mode only
B. range only
C. five-number summary
D. standard deviation only

18. The five-number summary consists of

A. minimum, Q_1, median, Q_3, maximum
B. minimum, mean, mode, maximum, range
C. Q_1, Q_2, Q_3, Q_4, Q_5
D. mean, median, mode, range, variance

19. The range of the data 5, 8, 12, 20 is

A. 25
B. 15
C. 12
D. 5

20. The range of a data set is

A. largest value + smallest value
B. mean − median
C. $Q_3 - Q_1$
D. largest value − smallest value

21. If the variance of a data set is 25, its standard deviation is

A. 625
B. 12.5
C. 5
D. 50

22. The standard deviation is the

A. positive square root of the variance
B. square of the variance
C. difference of mean and median
D. half of the variance

23. The variance of grouped data is given by

A. $\Sigma f(x - \bar{x})^2 / \Sigma fx$
B. $\Sigma f(x - \bar{x})^2 / \Sigma f$
C. $\Sigma f(x - \bar{x}) / \Sigma f$
D. $\Sigma(x - \bar{x}) / \Sigma f$

24. The mean of the data 2, 4, 4, 4, 5, 5, 7, 9 is

A. 4.5 B. 4

C. 6 **D. 5**

25. The standard deviation of the data 2, 4, 4, 4, 5, 5, 7, 9 is

A. √5 **B. 2**

C. 4 D. 5

26. A larger standard deviation indicates that the data are

A. more spread out B. all equal

C. closer to the mean D. always negative

27. When comparing two data sets, the set with the smaller standard deviation is

A. less consistent B. always larger in mean

C. more consistent D. always larger in range

28. A scatter diagram is used to show

A. the frequency of one variable B. the median of the data

C. the percentage of data in classes **D. the relationship between two variables**

29. If both variables increase together on a scatter diagram, the correlation is

A. positive B. zero

C. negative D. undefined

30. If one variable decreases as the other increases, the correlation is

A. positive B. perfect positive

C. negative D. zero

31. If the points of a scatter diagram are scattered randomly, there is

A. strong positive correlation **B. no correlation**

C. perfect negative correlation D. perfect positive correlation

32. The line of best fit on a scatter diagram

A. joins the first and the last points B. is always horizontal

C. passes through the origin always **D. passes as close as possible to all the points**

33. The height and weight of students are most likely to show

A. negative correlation B. zero variance

C. positive correlation D. no correlation

34. The sample space when a fair coin is tossed once is

A. {HH, TT} B. {T}

C. {H} **D. {H, T}**

35. When two coins are tossed together, the number of outcomes in the sample space is

A. 4 B. 8

C. 3 D. 2

36. When three coins are tossed together, the number of outcomes in the sample space is

A. 3 **B. 8**

C. 9 D. 6

37. The probability of getting an even number on a fair die is

A. 1/2 B. 1/3

C. 1/6 D. 2/3

38. The probability of getting a number greater than 4 on a fair die is

A. 1/6 B. 1/2

C. 1/3 D. 2/3

39. The probability of an impossible event is

A. 1 B. −1

C. 1/2 **D. 0**

40. The probability of a sure event is

A. 0 **B. 1**

C. 100 D. 1/2

41. The probability of any event always lies between

A. −1 and 1 B. 0 and 100

C. 1 and 2 **D. 0 and 1**

42. If P(A) = 0.4, then P(not A) equals

A. 1.4 B. 0.4

C. 0.6 D. 0.04

43. Two events A and B that cannot occur together are called

A. mutually exclusive events B. independent events

C. dependent events D. sure events

44. For mutually exclusive events A and B, P(A or B) equals

A. P(A) − P(B) **B. P(A) + P(B)**

C. P(A)/P(B) D. P(A) × P(B)

45. If A and B are mutually exclusive, P(A) = 0.3 and P(B) = 0.5, then P(A or B) is

A. 0.2 B. 0.15

C. 0.8 D. 0.35

46. For independent events A and B, P(A and B) equals

A. P(A) − P(B) B. P(A)/P(B)

C. P(A) + P(B) **D. P(A) × P(B)**

47. The probability of getting two heads when two fair coins are tossed is

A. 1/2 **B. 1/4**

C. 1/3 D. 3/4

48. The probability that the sum of two numbers on two fair dice is 7 is

A. 1/6 B. 1/12
C. 7/36 D. 1/7

49. Drawing two cards one after the other without replacement gives

A. mutually exclusive events only **B. dependent events**
C. independent events D. impossible events

50. A bag has 3 red and 2 blue balls. Two balls are drawn without replacement. The probability that both are red is

A. 3/5 B. 6/25
C. 3/10 D. 9/25

51. A tree diagram for the tossing of three coins shows

A. 6 outcomes B. 3 outcomes
C. 9 outcomes **D. 8 outcomes**

Review Exercise: Unit 12

25 MCQs based on the Miscellaneous Exercise at the end of Unit 12 of the textbook. Written questions are converted into four-option MCQs.

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52. Which of the following is not a measure of dispersion?

A. variance **B. arithmetic mean**
C. standard deviation D. range

53. The median of the data 4, 3, 0, 2, 1 is

A. 3 B. 4
C. 0 **D. 2**

54. Which of the following is a measure of dispersion?

A. quartile B. median
C. range D. arithmetic mean

55. Which of the following is used to compare the consistency of two data sets?

A. coefficient of variation (C.V.) B. arithmetic mean
C. geometric mean D. standard deviation

56. The sum of the deviations taken from the arithmetic mean is

A. Σx **B. 0**
C. Σf D. n

57. The variance of the five values 4, 4, 4, 4, 4 is

A. 0 B. does not exist
C. 5 D. 4

58. Which of the following divides the data into four equal parts?

A. percentile B. decile
C. median **D. quartile**

59. Which of the following divides the data into ten equal parts?

A. percentile
B. median
C. decile
D. quartile

60. Which of the following divides the data into two equal parts?

A. percentile
B. median
C. decile
D. quartile

61. Which of the following divides the data into hundred equal parts?

A. quartile
B. decile
C. median
D. percentile

62. The line of best fit is given by the equation

A. $y = x^2$
B. $y = mx^2 + c$
C. y = mx + c
D. $x = y^2$

63. The coefficient of variation is given by the formula

A. (100/mean) × SD
B. (SD/100) × mean
C. (mean/SD) × 100
D. (SD/range) × 100

64. The probability of drawing a king in one draw is ____ the probability of drawing 2 kings in 2 draws.

A. smaller than
B. equal to
C. unrelated to
D. greater than

65. The probability of drawing 2 aces in 2 draws with replacement is ____ the probability of drawing 2 jacks in 2 draws without replacement.

A. smaller than
B. unrelated to
C. greater than
D. equal to

66. The probability of rolling an even number on a standard die in 2 attempts is ____ the probability of rolling an odd number in 2 attempts.

A. equal to
B. smaller than
C. unrelated to
D. greater than

67. For the data x = 5, 10, 15, 20, 25, 30, 35, 40 with frequencies f = 2, 4, 6, 8, 10, 7, 5, 3, the mean is about

A. 22.5
B. 23.44
C. 20
D. 25

68. For the same data, the variance is about

A. 9.12
B. 23.44
C. 83.14
D. 45

69. For the same data, the standard deviation is about

A. 8.3
B. 9.12
C. 23.44
D. 83.14

70. Time of exercise has $Q_1 = 15$ and $Q_3 = 45$. Its inter-quartile range is

A. 60
B. 45
C. 15
D. 30

71. Blood pressure falls as the time of exercise increases. The type of correlation is

A. negative
B. perfect positive
C. zero
D. positive

72. A box-and-whisker plot has median 20 s, $Q_1 = 10$ s and $Q_3 = 30$ s. The percentage of athletes who finished in the first 10 seconds is

A. 10%
B. 50%
C. 75%
D. 25%

73. For the same plot, the inter-quartile range is

A. 10 s
B. 20 s
C. 40 s
D. 30 s

74. In the box-and-whisker plots of the Hazel and Mauve sections, which section has the higher median and the larger inter-quartile range?

A. Mauve has the higher median, Hazel the larger IQR
B. Hazel section (both)
C. Mauve section (both)
D. Hazel has the higher median, Mauve the larger IQR

75. A bag has 2 choco and 3 lemon cookies. Bareera draws one cookie and then Hadiya draws one (no replacement). The probability that both are lemon is

A. 3/10
B. 3/5
C. 6/25
D. 9/25

76. Machine A makes 60% of the products with 20% defective, and machine B makes 40% with 15% defective. The probability that a randomly selected product is defective is

A. 0.35
B. 0.12
C. 0.18
D. 0.175

Federal Board Past Paper MCQs

62 MCQs from FBISE SSC-II Mathematics (Science Group) papers: Annual 2026 (Sets B, D, M), Annual 2025 and Annual 2023. Options are in the original paper order. Only questions that fall within the new textbook are included; figure-based and out-of-syllabus questions are left out.

Annual 2026, Set B (Paper code 2SA-I 26008 (B))

1. If $z = 3 + 2i$, then $z + \bar{z}$ equals

A. 6 B. 4i
C. 6 + 4i D. 0

2. If α and β are the roots of $x^2 - 5x + 6 = 0$, then $\alpha + \beta$ is

A. 5 B. 6
C. −5 D. −6

3. If A = [1 0; 2 1] and B = [3 1; 2 4], then AB is

A. [3 1; 8 6] B. [5 4; 8 6]
C. [3 1; 4 5] D. [1 3; 2 4]

4. If f(x) = 2x + 1 and g(x) = x − 3, then (f o g)(x) is

A. 2x − 5 B. 2x − 1
C. 2x + 1 D. 2x − 3

5. The solution of $|x| < 3$ is

A. $x \geq 3$ B. $x > 3$
C. $x \leq -3$ **D. $-3 < x < 3$**

6. The discriminant of $x^2 - 5x + 6 = 0$ is

A. 25 **B. 1**
C. −1 D. 49

7. If a = i + j and b = i − j, then i can be expressed as

A. a + b B. (1/2)(a − b)
C. (1/2)(a + b) D. a − b

8. The area of a triangle with sides a, b and included angle C is

A. ab cos C **B. (1/2) ab sin C**
C. (1/2) ab cos C D. ab sin C

9. A roller coaster loop is best modelled as a

A. straight line B. triangle
C. circular arc D. rectangle

10. Two circles of radii 4 cm and 6 cm touch externally. The distance between their centres is

A. 2 cm **B. 10 cm**
C. 24 cm D. 12 cm

11. Two coins are tossed simultaneously. The probability of getting two heads is

A. 2/4 B. 3/4

C. 1/4 D. 4/4

12. A scatter diagram with points close to a straight line rising from left to right indicates

A. no correlation B. negative correlation

C. positive correlation D. curved relation

13. Which of the following represents a linear function?

A. $y = x^2$ **B. $y = 2x + 3$**

C. $y = 1/x$ D. $y = x^3$

14. The angle between a tangent and the radius at the point of contact is

A. 0° B. 45°

C. 60° **D. 90°**

15. The expression $(x^2 - 9)/(x - 3)$ can be factorized (simplified) as

A. $x - 3$ B. $x^2 + 3$

C. $x^2 - 3$ **D. $x + 3$**

Annual 2026, Set D (Paper code 2SA-I 26008 (D))

1. The product $(1 + i)(1 - i)$ gives

A. 0 **B. 2**

C. $1 - i$ D. $1 + i$

2. If α and β are the roots of $2x^2 - 4x + 1 = 0$, then $\alpha + \beta$ equals

A. 2 B. 1/2

C. −2 D. 4

3. If A is a matrix of order 2×3 and B is a matrix of order 3×2, then the order of AB is

A. 2×2 B. 3×3

C. 2×3 D. 3×2

4. If $f(x) = x^2$ and $g(x) = x + 1$, then $g(f(x))$ equals

A. $x^2 + 1$ B. $(x + 1)^2$

C. $x^2 + 2x + 1$ D. $x^2 + x + 1$

5. The solution of $|x - 2| = 4$ is

A. $x = 6$ or $x = 2$ B. $x = 6$

C. x = 6 or x = −2 D. $x = 2$

6. The discriminant of $2x^2 - 3x - 2 = 0$ is

A. 1 B. −7

C. 25 D. 5

7. If $a = 2i + j$ and $b = i + j$, then the vector i is equal to

A. a − b B. $2a - b$

C. $b - a$ D. $(1/2)(a - b)$

8. In triangle ABC, if angle A = 30°, a = 5 cm and b = 10 cm, then sin B equals

A. 1 B. 1/2
C. 2 D. √3/2

9. Which real-life object best demonstrates equal arcs subtended by equal chords?

A. Square table top B. Ladder
C. Door frame **D. Round clock face making**

10. If two circles touch internally and their radii are 9 cm and 3 cm, the distance between their centres is

A. 12 cm **B. 6 cm**
C. 3 cm D. 9 cm

11. From a deck of cards, one card is drawn. The probability that it is a king is

A. 4/52 B. 1/52
C. 2/4 D. 1/4

12. If most points in a scatter diagram are widely spread with no clear pattern, it shows

A. strong positive correlation B. strong negative correlation
C. no correlation D. perfect correlation

13. The slope of the line y = 4x + 1 is

A. 1 B. −4
C. −1 **D. 4**

14. If a line touches a circle at exactly one point, the line is called

A. secant B. chord
C. tangent D. diameter

15. $x^2 + 5x + 6$ equals

A. (x − 1)(x − 6) B. (x − 2)(x − 3)
C. (x + 1)(x + 6) **D. (x + 2)(x + 3)**

Annual 2026, Set M (Paper code 2SA-I 26008 (M))

1. Two fair dice are thrown. The probability that the sum is 7 is

A. 3/36 B. 1/36
C. 6/36 D. 5/36

2. In a scatter diagram, a downward sloping line of best fit shows

A. positive correlation **B. negative correlation**
C. no correlation D. perfect correlation

3. The y-intercept of the line y = −x + 4 is

A. −1 **B. 4**
C. 1 D. −4

4. The radius drawn to the point of contact of a tangent is always

A. parallel to the tangent B. inclined to the tangent
C. perpendicular to the tangent D. equal to the tangent

5. $(x^2 - 1)/(x - 1)$ equals

A. $x - 1$ **B. $x + 1$**

C. $x^2 + 1$ D. 1

6. The difference $(5 + 2i) - (3 + 7i)$ gives

A. $2 - 5i$ B. $8 - 5i$

C. $2 + 5i$ D. $-2 - 5i$

7. If α and β are the roots with $\alpha + \beta = 9$ and $\alpha\beta = 20$, then the quadratic equation is

A. $x^2 - 9x + 20 = 0$ B. $x^2 + 9x + 20 = 0$

C. $x^2 - 20x + 9 = 0$ D. $x^2 + 20x + 9 = 0$

8. If A = [2 1; 0 3], then AA is

A. [4 5; 0 9] B. [4 2; 0 6]

C. [2 1; 0 3] D. [6 1; 0 9]

9. If $f(x) = x + 4$ and $g(x) = x^2$, then $f(g(x))$ is

A. $x^2 + 4$ B. $(x + 4)^2$

C. $x^2 + 8$ D. $x^2 - 4$

10. The solution of $|x| \geq 4$ is

A. $-4 \leq x \leq 4$ B. $x > 4$

C. $x < -4$ **D. $x \leq -4$ or $x \geq 4$**

11. If the discriminant of a quadratic equation is zero, then the roots are

A. unequal B. complex

C. equal D. imaginary

12. If $a = i + 2j$ and $b = i - j$, then j can be expressed as

A. $(1/2)(a - b)$ B. $(1/3)(a + b)$

C. $(1/2)(b - a)$ **D. $(1/3)(a - b)$**

13. The area of a triangle whose sides measure 10 cm and 12 cm with included angle 60° is

A. $30\sqrt{2}$ cm² B. $60\sqrt{3}$ cm²

C. 120 cm² **D. $30\sqrt{3}$ cm²**

14. The length of the curved part of a circular road of radius 16 m and central angle 45° is

A. 8π **B. 4π**

C. π/4 D. 64π

Annual 2025, Mathematics (Science Group) Paper code 2SA-II 25008-20081

1. The solution set of $121y^2 - 1 = 0$ is

A. {121} B. {−1/11}

C. {1/11, −1/11} D. {1/121, −1/121}

2. Using the properties of cube roots of unity, the value of $\omega^{13} + \omega^{17}$ is

A. $2/\omega$ **B. −1**

C. $2/\omega^2$ D. ω^2

3. The nature of the roots of the equation $2x^2 + 5x - 1 = 0$ is

A. real (rational), unequal
B. real (irrational), unequal
C. real (rational), equal
D. imaginary, unequal

4. The mean proportional of $16x^4y^4$ and z^8 is

A. $\pm 8x^2y^2z^4$
B. $4y^2z^4$
C. $8x^2y^2z^4$
D. $\pm 4x^2y^2z^4$

5. If a : b = x : y, then the invertendo property is

A. a/x = b/y
B. a/(a − b) = x/(x − y)
C. (a + b)/a = (x + y)/y
D. b/a = y/x

6. Which type of fraction is $x^3(x + 1)/(x^3 + 1)$?

A. improper fraction
B. proper fraction
C. irrational fraction
D. an identity

7. If set A has 2 elements and set B has 3 elements, the number of binary relations from A × B is

A. 6
B. 32
C. 64
D. 8

8. The class mark of the class limits (10 – 16) is

A. 10
B. 16
C. 13
D. 28

9. Which measure of central tendency can have more than one value?

A. mode
B. mean
C. median
D. harmonic mean

10. A 20 foot long ladder making an angle of 60° with the ground leans against a wall. The distance of the foot of the ladder from the wall is

A. 10√3
B. 20√3
C. 10
D. 20

11. In a circle, OC = 3 cm and AB = 8 cm, where OC is perpendicular to the chord AB. The radius of the circle is

A. 4 cm
B. 5 cm
C. 4.5 cm
D. 11 cm

12. The semi-circumference and the diameter of a circle both subtend a central angle of

A. 90°
B. 180°
C. 270°
D. 360°

13. Two tangents drawn from a point outside the circle are

A. perpendicular
B. parallel
C. unequal
D. equal

Annual 2023, Mathematics (Science Group), Paper code 2SA-II 2309-2091

1. An equation which remains unchanged when x is replaced by 1/x is called a/an

A. exponential equation
B. reciprocal equation
C. radical equation
D. linear equation

2. In the set of data 41, 43, 47, 51, 57, 52, 59 the median is

A. 51
B. 52
C. 47
D. 51.5

3. A line segment having both end points on a circle and not passing through the centre is a

A. diameter
B. tangent
C. radius
D. chord

4. The centre of the incircle is called the

A. circumcentre
B. excentre
C. incentre
D. centroid

5. If $u/v = v/w = K$, then u is equal to

A. $u = vK^2$
B. $u = v^2K$
C. $u = wK^2$
D. $u = w^2K$