Mathematics University Entrance Exam Compiled for Grade 11 Students Attending Cluster-Centered Tutorial Program

Prepared for third Month

December 2025

Finfinne/Addis Ababa

INSTRUCTION: THERE ARE A TOTAL OF 60 MULTIPLE CHOICE QUESTIONS PROVIDED TO YOU. CAREFULLY SELECT THE BEST ANSWER AND WRITE THE LETER OF YOUR CHOICE ON SPACE PROVIDED.

1. The value of θ in the following figure 1 given below is _____

   A. 61^o
   B. 120^o
   C. 40^o
   D. 80^o

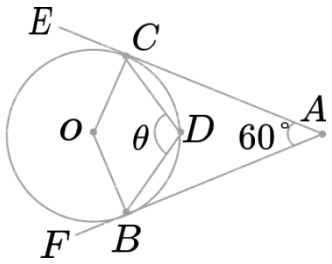


Figure 1

2. For the figure given below E is the center of the circle. What is the value of an angle θ ?

   A. 182^o
   B. 192^o
   C. 168^o
   D. 144^o

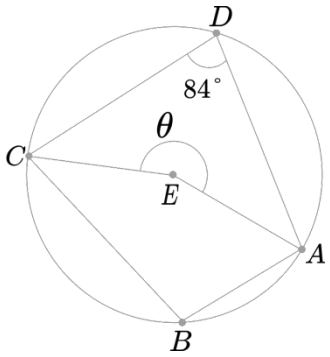


Figure 2

3. In the figure 3 blow O is the center of the circle and the line segments $\overline{AB}$ and $\overline{AC}$ are intersecting the circle at D and E respectively. If m(<ACD)=30° and m(<BEC)=50°, then which one of the following is equal to m(<BAC)?

   A. 80°
   B. 70°
   C. 30°
   D. 20°

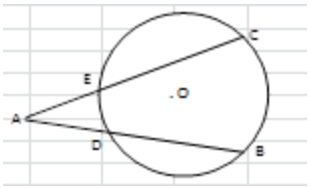


Figure 3

4. $\overline{AB}$ and $\overline{CD}$ are equal chords in a circle of radius 5 cm. If each chord is 8 cm, what is the distance between the chords?

   A, 8 cm B, 3 cm C, 5 cm D, 6cm

5. Consider a circle with center O and the line segment$\overline{AB}$, $\overline{AC}$ and $\overline{BC}$ are chords of the circle as shown in the figure 4 blow. if m($< ABC$) $= 60°$ and m($< ACB$) $= 40°$ then what is the m($< BOC$)?

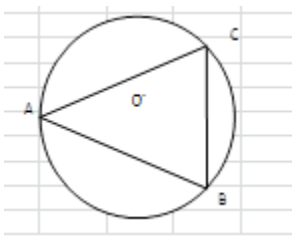


Figure 4

A. $160°$
B. $120°$
C. $80°$
D. $100°$

6. A sector of a circle of diameter 8cm is formed by a central angle $45°$ what is the area of the sector?

A. $2\pi cm^2$ B. $8\pi cm^2$ C. $(2\pi + 8)cm^2$ D. πcm^2

7. The altitude of a frustum of regular square pyramid is 9cm. what is the volume of the frustum if the side length of the upper base is 6cm and the side length of lower base is10cm.

A. $324cm^3$ C. $196cm^3$
B. $108cm^3$ D. $588cm^3$

8. What is the total surface area of regular square pyramid with slant height 8cm and base $25cm^2$

A. $65cm^2$ B. $80cm^2$ C. $90cm^2$ D. $105cm^2$

9. A spherical fuel container with radius 3m is filled with fuel. What is the amount (in m^3) of fuel in the container?

A. 18π B. 9π C. 36π D. $\frac{12}{3}\pi$

10. A water tank is a circular cylinder with base radius 2m height 3m. if the tank is empty and water is pumped in to at rate of $2m^3/\min$ how long does it take for the tank to be full?

A. 1.5min B. $\frac{3}{2}\pi$ min C. 6π. . D. 12min

11. If a box with square base and open top is made from 1,200cm^2 materials, what is the largest volume of the box in cm^3?

A. 4,000 B, 8,000 C. 15,000 D. 3,000

12. What is the surface area of sphere with radius 6 cm?

A. $24\pi cm^2$ B. $36\pi cm^2$ C. $48\pi cm^2$ D. $144\pi cm^2$

13. If the volume of a right circular cone is $64cm^3$ and the diameter of its base is 8cm, what is the height of the cone?

A. 4cm B. 12cm C. 8cm D. 3cm

B.

14. If the ratio of radii of two spheres is 3:2 what is the ratio of their surface area?

A. $\frac{3}{2}$ B. $\sqrt{\frac{3}{2}}$ C. $\frac{81}{16}$ D. $\frac{9}{4}$

15. A solid metal cube whose volume is $4.5\pi s^2$ is melted down and formed to the sphere. What is the surface area of the sphere?

A. $6\pi s^2$ B. $9\pi s^2$ C. $12\pi s^2$ D. $15\pi s^2$

16. A right circular cone is inscribed in a right circular cylinder with the same height h and base radius r. what is the volume of cone if h=2r?

A. $\frac{7}{3}\pi r^3$ B. $\frac{5}{3}\pi r^3$ C. $\frac{2}{3}\pi r^3$ D. πr^3

17. A grain store in the form of a right circular cylinder surmounted by a hemisphere whose diameter is equal to the diameter of the base of the cylinder. If the total height of the grain store is 15cm and the radius of hemisphere is 3cm, what is the amount of the grain required to fill the store?

A. $126cm^2$ B. $63cm^2$ C. $252cm^2$ D. $504cm^2$

18. In a regular hexagonal pyramid of length of base 8cm and lateral age 10cm. which one is not true?

A. Lateral surface area is $96\sqrt{21}cm^2$
B. Total surface area is $96\sqrt{21}cm^2$
C. Volume is $192\sqrt{2}cm^3$
D. Base area is $96\sqrt{21}cm^2$

19. Square pyramid with base 8cm has altitude 12cm. what is the area of the cross section 8cm from the base or 4cm from the vertex?

A. $64cm^2$ B. $9cm^2$ C. $c\frac{64}{9}m^2$ D. $\frac{8}{3}cm^2$

20. The diagonal of one face of a cube is 12cm. what is the volume of the inscribed sphere in cubic cm?

A. $72\sqrt{2}\,\pi$ B. $36\sqrt{2}\,\pi$ C. $18\sqrt{2}\,\pi$ D. $9\sqrt{2}\,\pi$

21. In the right circular cone, the angle formed between its slant hight and altitude is 30°. If the slant hight of the cone is 10cm, what is its volume?

A. $\frac{125\sqrt{3}}{3}\pi$ B. $\frac{25\sqrt{3}}{3}\pi$ C. $\frac{75\sqrt{3}}{3}\pi$ D. $\frac{220\sqrt{3}}{3}\pi$

22. How long is the diagonal of a cube if its age is 10cm long?

A. 5cm B. 10cm C. $10\sqrt{3}$cm D. $5\sqrt{3}$cm

23. The volume of right circular cone of height 12cm and slant height 13cm is equal to:

A. $100\,\pi$ cm^3 B. $200\,\pi$ cm^3 C. $75\,\pi$ cm^3 D. $300\,\pi$ cm^3

24. The height of a right circular cylinder is 6cm. If the radius of its base is 3 cm, what is the lateral surface area of this cylinder?

A. $45\,\pi$ cm^2 B. $54\,\pi$ cm^2 C. $64\,\pi$ cm^2 D. $36\,\pi$ cm^2

25. Through a right cylinder whose radius is 2cm and hieght 8cm, a triangular prism of base adges 1cm of the same height is drilled out. Then which one is not true?

A. Lateral surface area is $32\pi + 24$

B. Total surface area is $78\pi + \frac{60-\sqrt{3}}{2}$

C. Volume of the resulting figure is $40 - \frac{5\sqrt{3}}{2}$

D. Volume of triangular prism $5\sqrt{3}$

26. Equation of the tangent line to a circle with equation$x^2 + y^2 + 2x + 2y - 2 = 0$ at the point $P(2,3)$ is _____

A. $3x + 4y - 7 = 0$ C. $3x + 4y + 3 = 0$

B. $3x + 4y + 7 = 0$ D. $3x + 4y - 3 = 0$

27. What is the distance of two points $P(3,2)$ and $Q(2,4)$?

A, 5 B, 2 C, $\sqrt{5}$ D, $\sqrt{10}$

28. The distance between the point $P(b,6)$ and $Q(0,10)$ is $5units$, what are the values of b?

A, ± 4 B, ± 3 C, ± 5 D, ± 2

29. Which one of the following is the equation of a line whose x- intercept and y-intercept are 1 and -2 respectively?

A. $x - y + 2 = 0$ C. $x - 2y - 1 = 0$

B. $-2x + y - 1 = 0$ D. $2x - y - 2 = 0$

30. What are the co- ordinates of a point that divides the line segment joining points A (2, 3) and B (5,-7) in the ratio 3:4?

A. $\left(\frac{-23}{7}, \frac{-2}{7}\right)$ B. $\left(\frac{23}{7}, \frac{-9}{7}\right)$ C. $\left(\frac{23}{7}, \frac{9}{7}\right)$ D. $\left(\frac{2}{7}, \frac{-9}{7}\right)$

31. In coordinate plane, if point A(2,3) and a B(8,7) are connected by a line segment that is divided by a point p in the ratio 1:3, what are the coordinate of point P?

A. (4,5) B. (3.5, 4) C. (5, 4.5) D. (3,6.5)

B.

32. The mid - point of a line joining the points $P(-1,3)$ and $Q(x_2, y_2)$ is $M(3,4)$. What is the point $Q(x_2, y_2)$?

$A, (5,7)$ B $(3,5)$ $C, (7,5)$ $D,$ $(7,3)$

33. What is the slope of the function $2x - y + 3 = 0$?

A, 1 B, -2 C, 2 D, -1

34. If the lines $2kx + 4y + 3 = 0$ *and* $x + 2y - 1 = 0$ are parallel lines, then what is the value of k? $A. -2$ $B. 2$ $C. -1$ $D. 1$

35. The equation of the line that passes through the point $(2, -1)$ and perpendicular to the line $2x + 4y + 3 = 0$ is given by;

A. $-2x + y - 4 = 0$
B. $.x + 2y = 0$
C. $.-2x + y + 5 = 0$
D. $x - 2y + 2 = 0$

36. What is the equation of circle with center $(2, -3)$and radius$\sqrt{5}$ units?

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

37. A right triangle has vertices $P(-1, 1), Q(3, 4)$ and $R(-1,4)$. Which one of the following is the gradient of the hypotenuse of this triangle?

A. $\frac{4}{3}$ B. $\frac{3}{4}$ C. $-\frac{3}{4}$ D. 4

38. Which of the following line with the same equations are parallel?

A. $l_1: 4x - y = 2$ *and* $l_2: -x + 4y - 3 = 0$
B. $l_1: x - y + 3$ *and* $l_2: -x + y - 9 = 0$
C. $l_1: x - 2y + 1$ *and* $l_2: x + 2y - 1 = 0$
D. $l_1: 2x + 3y = 5$ *and* $l_2: 3x + 2y = 4$

39. A line l_1 in the x, y plane has equation$x - y + 3 = 0$. A second line l_2 which is perpendicular to l_1 contains the point $(2, 3)$ which one of the following gives equation of l_2?

A. $y - x - 3 = 0$
B. $y + x - 5 = 0$
C. $y - x + 5 = 0$
D. $3y - 2x + 3 = 0$

40. The slope of the line passing through P(1,-1) and Q(0,1) is equal to:

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

41. What is equation of the tangent line to the graph of f(x)=$2x^3 - 3x^2 + 1$ at x=2?

A. $y = 12x - 19$ B. $y = 2x + 5$ C. $y = 6x - 7$ D. $y = 120x - 235$

42. When rational expression $\frac{x^2-3}{x^3+x^2+x+1}$ decomposed to $\frac{A}{x+1} + \frac{Bx+c}{x^2+1}$ which of the following is **false**?

A. The value of A is -1
B. The value of C is -2
C. The value of B is 2
D. The value of B is -2

43. Let $R_1(x) = \frac{x^3+9x}{x^2-2}$, $x \neq \pm\sqrt{2}$ and $R_2(x) = \frac{x^2+3x}{x-\sqrt{2}}$, $x \neq \sqrt{2}$ be a rational function then what is the simplified form of $\frac{R_1(x)}{R_2(x)}$?

A. $\frac{x-3}{x+\sqrt{2}}$, $x \neq \pm\sqrt{2}, 0$ B. $\frac{x-\sqrt{2}}{x+3}$, $x \neq -3,0$ C. $x-3$ D. 1

44. If the rational expression $\frac{7-x}{x^2-9}$ is decomposed in to its partial fraction it gives:

A. $\frac{-5}{3(x-3)} - \frac{2}{3(x+3)}$ C. $\frac{2}{3(x-3)} + \frac{5}{3(x+3)}$

B. $\frac{-5}{3(x+3)} + \frac{2}{3(x-3)}$ D. $\frac{2}{3(x+3)} - \frac{5}{3(x-3)}$

45. Which of the following is the simplified form of $\frac{t-\frac{1}{t}}{t+\frac{t}{1-t}} \div \frac{t^2-2t+}{t}, t \neq 0, and t \neq 1$

A. $t+1$ B. $t-1$ C. $1-t$ D. $-t-1$

46. What is the solution set of the inequality $1-\frac{3}{x} \leq \frac{4}{x^2}$?

A. $(-\infty,-1]\cup[4,\infty)$ C. $(-\infty,-1)\cup(4,\infty)$

B. $[-1,4]$ D. $[-1,0]\cup(0,4]$

47. Which of the following is a not rational expression?

A. $\frac{2x+3}{5x^2+9x-4}$ B. $\frac{2}{x^3-1}$ C. $\frac{2x^2-x}{\sqrt{x^2+1}}$ D. $\frac{6x^3+4x-7}{x^2+1}$

48. Which of the following is simplified form of $\frac{4-(a-2)^2}{a^4+2a^2+1} \div \frac{1-\frac{1}{a^2+1}}{a}$?

A. $\frac{4-a}{a}$ B. $\frac{a}{a^2+1}$ C. $-\frac{1}{a^2(a^2+1)}$ D. $\frac{4-a}{a^2+1}$

49. Which one of the following rational functions has neither horizontal nor oblique asymptote?

A. f(x) = $\frac{x^3-1}{x^2-2x+1}$ B. f(x) = $\frac{x^3+1}{x+4}$ C. f(x) = $\frac{-3}{x^2-1}$ D. f(x) = $\frac{x^2+1}{x^2-2x+4}$

50. The simplest form of the rational expression $\frac{x^2-9}{x+1} \div \frac{x^2-2x-3}{x^2+2x+1}$ is :

A. $\frac{x+3}{x+1}$ B. $\frac{x+3}{x-1}$ C. x -1 D. x+3

B. What is the domain of the rational function $f(x) = \frac{x^2-4}{2x+4}$?

A. $\mathbb{R} \setminus \{-2\}$ B. $\mathbb{R} \setminus \{-2,2\}$ C. $\mathbb{R}$ D. $\mathbb{R} \setminus \{2\}$

51. Which of the following is **false** about the graph of rational expression f(x) $=\frac{6x^2+12}{x^2-4}$

A. It`s horizontal asymptote is $y = 6$

B. It`s vertical asymptote $x = -2$

C. Oblique asymptote is $y = x$

D. It`s vertical asymptote $x = 2$

52. What is the solution set of the rational equation $\frac{1}{x+1} - \frac{5}{x(x+1)} = \frac{6}{x^2(x+1)}$?

A) $\mathbb{R} \setminus \{0, -1\}$ B) $\{0, -1, 6\}$ C) {-2, 3} D) {6}

53. The solution set of the rational equality $\frac{x^2}{x-3} = \frac{x+6}{x-3}$ is:

A. $\mathbb{R} \setminus \{3\}$ B. $\{-2, 3\}$ C. $\{3\}$ D. $\{-2\}$

54. The solution set of the rational inequality $\frac{1}{x-1} \geq \frac{4}{x+2}$ is :

A. $(-2,1]$

B. $(-\infty, -2) \cup (1, \infty)$

C. $(-\infty, -2) \cup (1,2]$

D. $(-\infty, -2) \cup (2, \infty)$

55. What is the solution set of the rational inequality $\frac{x+1}{x^2+x} < 0$?

A. $(-\infty, 0)$

B. $\{0\}$

C. $(-\infty, -1) \cup (-1, 0)$

D. $\mathbb{R} \setminus \{-1,0\}$

56. If $p(x) = 3x^2$ and $Q(x) = x^2 + x$, then what is the solution set of $\frac{P(x)}{3q(x)} - \frac{1}{x} = \frac{1}{q(x)}$?

57. $\{-1, 2\}$ B. $\{, 2\}$ C. $\{-3, 2\}$ D. $\{-3\}$

57. Which one of the following function could most likely be drown as in the figure 5 blow?

A. A. $\frac{x+3}{x+2}$ B. $\frac{x^2-2x}{x^2-4}$ C. $\frac{-x^2-x+6}{x^2-4}$ D. $\frac{x^2+x-6}{x^2-4}$

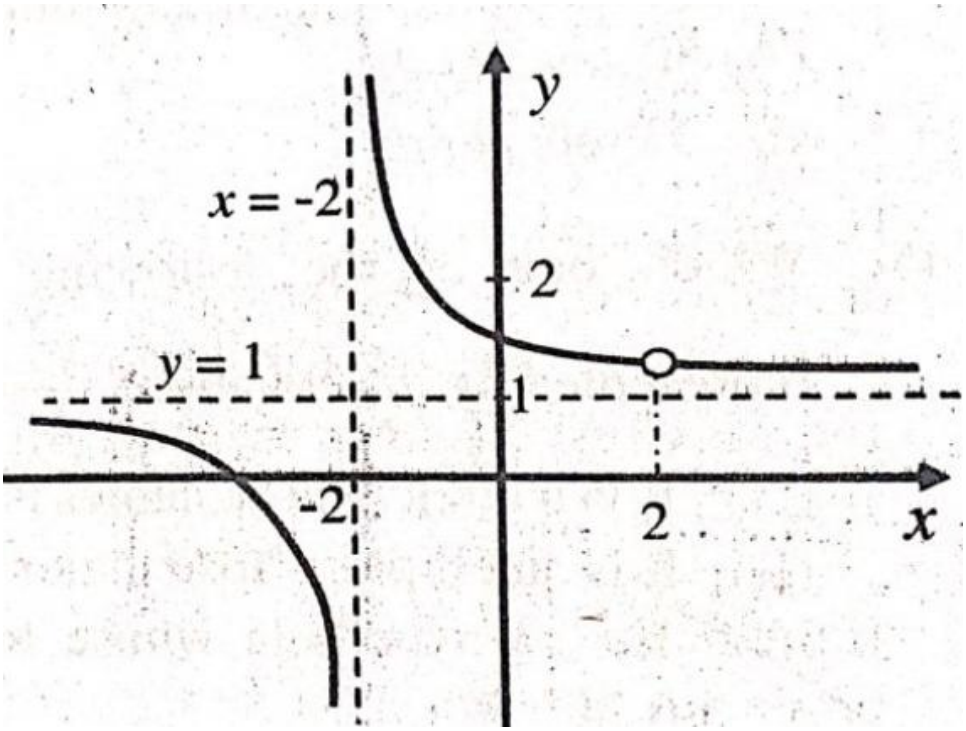


Figure 5

58. What is the solution set of $\frac{1-\frac{1}{x}}{1-\frac{1}{x^2}} = 3x^2 - \frac{x}{1+\frac{1}{x}}$?

A. $\left\{-1, \frac{1}{3}\right\}$ C. $\left\{3, -\frac{1}{3}\right\}$

B. $\left\{\frac{1}{3}\right\}$ D. $\left\{-\frac{1}{3}\right\}$

59. which of the following is true about the graph of $f(x)=\dfrac{x^3-x}{x^3(x-1)}$?

A. the vertical asymptotes of the graphs are $x=0$ and $x=1$
B. the horizontal asymptotes of the graph is y=1
C. the graph intersect its horizontal asymptotes at point $(-1,0)$
D. the graph intersects the vertical line $x=1$ at point $(1,2)$

60. what is the solution set of $\dfrac{1}{1+\dfrac{1}{x}}-\dfrac{1}{1-\dfrac{1}{x}}=\dfrac{x+\dfrac{1}{x}}{x-\dfrac{1}{x}}$?

A. $\{\ \}$ B. $\{-1\}$ C. $\{1\}$ D. $\{-1,1\}$