

Mindbenz Olympiad of Mathematics (MOM)

Sample Paper

Grade - 7

Maximum Marks: 60

Time Allowed – 55 Minutes

Section: A Fundamental Check (10 Questions $\times$ 1 mark = 10 marks)

1. What is the units digit of the number (3^{33}) ?

- a) 0
- b) 3
- c) 5
- d) 7

2. If $a * b = a^2 + 2b$, what is the value of $(2 * 3) * 1$?

- a) 102
- b) 100
- c) 66
- d) 74

3. How many diagonals does a convex heptagon have?

- a) 14
- b) 20
- c) 27
- d) 9

4. A quantity P is first increased by 12.5% and then decreased by 8%. The net percentage change is:

- a) 4.5% increase
- b) 3.5% increase
- c) 4% increase
- d) 3% increase

5. Which of the following statements makes the construction of $\triangle PQR$ impossible?

- a) $PQ = 7 \text{ cm}$, $QR = 5 \text{ cm}$, $\angle Q = 90^\circ$
- b) $\angle P = 60^\circ$, $\angle Q = 70^\circ$, $\angle R = 50^\circ$
- c) $PQ = 8 \text{ cm}$, $QR = 4 \text{ cm}$, $PR = 3 \text{ cm}$
- d) $PQ = QR = 6 \text{ cm}$, $\angle Q = 60^\circ$

6. Simplify: $(x^3 - x) / (x^2 + x)$ for $x \neq 0, -1$.

- a) x
- b) $x - 1$
- c) $x + 1$
- d) 1

7. A 3D shape has 8 faces and 12 vertices. How many edges does it have ?

- a) 20
- b) 18
- c) 22

d) 16

8. What is the reflection of the point $(-4, 7)$ in the y-axis?

a) $(4, -7)$

b) $(-4, -7)$

c) $(4, 7)$

d) $(7, -4)$

9. What is the value of $(0.125)^{(-2/3)}$?

a) 4

b) 8

c) $1/4$

d) $1/8$

10. A sequence is defined by $a_n = a_{(n-1)} + a_{(n-2)}$ for $n > 2$. If $a_1 = 1$ and $a_2 = 1$, what is a_8 ?

a) 13

b) 21

c) 34

d) 8

Section: B Application Zone (10 Questions $\times$ 1 mark = 10 marks)

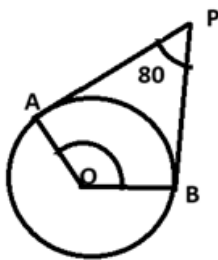
11. A wire bent into a square encloses an area of 484 cm^2 . If the same wire is bent into a circle, what is the area it will enclose? (Use $\pi = 22/7$)

- a) 616 cm^2
- b) 308 cm^2
- c) 1232 cm^2
- d) 154 cm^2

12. The mean of 11 numbers is 35. If the mean of the first 6 numbers is 32 and that of the last 6 numbers is 37, find the 6th number.

- a) 25
- b) 29
- c) 30
- d) 23

13. What is the measure of the reflex angle AOB?

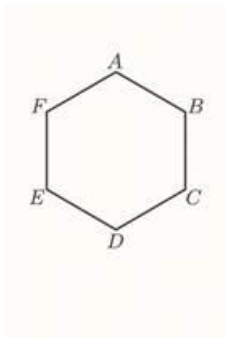


- a) 100°
- b) 260°
- c) 280°
- d) 200°

14. A trader professes to sell his goods at cost price, but he uses a weight of 900 grams instead of 1 kg. What is his actual profit percentage?

- a) 10%
- b) 9%
- c) 11.11%
- d) 12.5%

15. What is the measure of angle AFB?



- a) 30°
- b) 45°
- c) 60°
- d) 20°

16. In a school, 40% of the students play football, 50% play cricket, and 10% play both. What percentage of students play neither football nor cricket?

- a) 10%
- b) 20%
- c) 15%
- d) 0%

17. In $\triangle XYZ$, $XY = XZ$. A point D is on YZ such that $XD \perp YZ$. If $\angle YXD = 40^\circ$, what is the measure of $\angle YXZ$?

- a) 80°
- b) 90°
- c) 100°
- d) 50°

18. A number is chosen at random from the first 100 positive integers. What is the probability that it is a perfect square or a perfect cube?

- a) 0.14
- b) 0.13
- c) 0.12
- d) 0.1

19. The sum of the current ages of a father and son is 52. Eight years ago, the product of their ages was 128. In how many years will the son's age be half of his father's age?

- a) 8 years
- b) 10 years
- c) 16 years
- d) 18 years

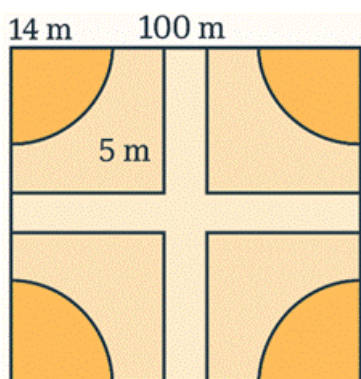
20. A solid metallic sphere of radius 6 cm is melted and recast into a wire of diameter 0.4 cm. What is the length of the wire?

- a) 72 m
- b) 54 m
- c) 90 m

d) 720 m

Section C: Maths Mastery (20 Questions $\times$ 2 marks = 40 marks)

21. A square park has a side of 100 m. At each corner of the park, there is a flower bed in the form of a quadrant of a circle of radius 14 m. Two paths, each 5 m wide, run through the center of the park, parallel to the sides.



What is the area of the remaining portion of the park? (Use $\pi = 22/7$)

- a) 8424 m²
 - b) 8375 m²
 - c) 8409 m²
 - d) 8349 m²
22. A contractor employs 50 men to complete a task in 120 days. After 70 days, he finds that only half of the work is done. How many additional men must he employ to complete the work in the scheduled time?

- a) 20
- b) 25
- c) 30

d) 15

23. If $3^{(x-y)} = 27$ and $3^{(x+y)} = 243$, what is the value of x ?

a) 0

b) 2

c) 4

d) 6

24. A boat covers 24 km upstream and 36 km downstream in 6 hours, while it covers 36 km upstream and 24 km downstream in 6.5 hours. What is the speed of the current?

a) 1 km/h

b) 1.5 km/h

c) 2 km/h

d) 2.5 km/h

25. A point $P(3, 2)$ is rotated 90° clockwise about the origin. What are the coordinates of the new point P' ?

a) $(-2, 3)$

b) $(2, -3)$

c) $(-3, -2)$

d) $(3, 2)$

26. In an examination, a student scores 4 marks for every correct answer and loses 1 mark for every wrong answer. A student attempts 200 questions and scores 200 marks. Find the number of questions he answered correctly.

a) 80

b) 100

c) 60

d) 120

27. A, B, and C can do a piece of work in 20, 30, and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day?

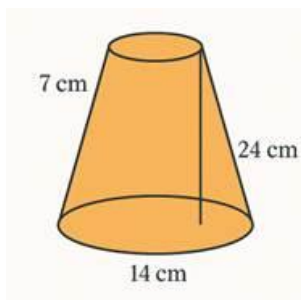
a) 103 days

b) 12 days

c) 15 days

d) 18 days

28. The radii of the top and bottom circular bases are 7 cm and 14 cm, respectively. The height of the frustum is 24 cm.



What is the volume of the original (uncut) cone?

a) 24696 cm³

b) 12348 cm³

c) 9856 cm³

d) 6174 cm³

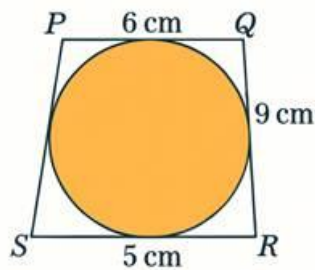
29. The sum of the first n terms of a certain sequence is given by $S_n = 3n^2 - n$. What is the 20th term of this sequence?

- a) 114
- b) 118
- c) 122
- d) 116

30. A two-digit number is 18 less than the square of the sum of its digits. How many such numbers are there?

- a) 1
- b) 2
- c) 3
- d) 4

31. A circle is inscribed in quadrilateral PQRS, touching all four sides. The lengths of sides $PQ = 6\text{ cm}$, $QR = 9\text{ cm}$, and $RS = 5\text{ cm}$. What is the length of side SP ?



- a) 2 cm
- b) 7 cm
- c) 10 cm
- d) 6 cm

32. If $x = 2 + 2^{(2/3)} + 2^{(1/3)}$, find the value of $x^3 - 6x^2 + 6x$.

- a) 2

b) 4

c) 8

d) 6

33. A sum of money is invested at compound interest. The interest in the second year is ₹220, and the interest in the third year is ₹242. What is the principal amount?

a) ₹2000

b) ₹2100

c) ₹1800

d) ₹2200

34. A merchant mixes two varieties of rice in a 5:3 ratio by weight. The cheaper variety costs ₹40 per kg, and the more expensive variety costs ₹65 per kg. He then sells the mixture at ₹55 per kg. What is his percentage profit or loss on selling 200 kg of this mixture?

a) 5% loss

b) 7.5% profit

c) 11% profit

d) 12% loss

35. The solution to the equation $(x-a)/(b+c) + (x-b)/(c+a) + (x-c)/(a+b) = 3$ is:

a) $a+b+c$

b) $a-b-c$

c) 1

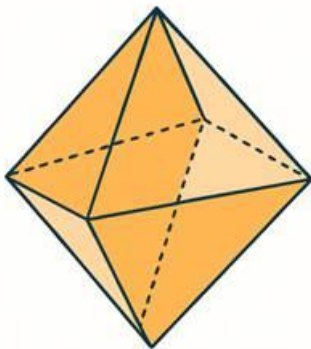
d) 0

36. A tank has a leak which would empty it in 8 hours. A tap is turned on which admits 6 liters a minute into the tank, and it is now emptied in 12 hours. How many liters does the tank hold?

- a) 8640 liters
- b) 8220 liters
- c) 7260 liters
- d) 8450 liters

37. A regular octahedron is a solid with 8 identical faces, which are all equilateral triangles.

If the length of each edge of a regular octahedron is 'a', what is its total surface area?



- a) $2\sqrt{3} a^2$
- b) $4\sqrt{3} a^2$
- c) $8a^2$
- d) $3\sqrt{3} a^2$

38. The batting average of a cricketer for 40 innings is 50 runs. His highest score exceeds his lowest score by 172 runs. If these two innings are excluded, the average of the remaining 38 innings is 54 runs. Find his highest score.

- a) 174

b) 176

c) 170

d) 172

39. What is the remainder when $1! + 2! + 3! + \dots + 100!$ is divided by 10?

a) 1

b) 3

c) 5

d) 7

40. In a group of people, 35% have brown hair, 25% have brown eyes, and 10% have both brown hair and brown eyes. What percentage of the people in the group have neither brown hair nor brown eyes?

a) 50%

b) 40%

c) 60%

d) 45%

Answer Key

Section A

1. c) 5

2. a) 102

3. a) 14

4. b) 3.5% increase

- 5. c) $PQ = 8 \text{ cm}$, $QR = 4 \text{ cm}$, $PR = 3 \text{ cm}$
- 6. b) $x - 1$
- 7. b) 18
- 8. c) (4, 7)
- 9. a) 4
- 10. b) 21

Section B

- 11. a) 616 cm^2
- 12. b) 29
- 13. d) 200°
- 14. c) 11.11%
- 15. a) 30°
- 16. b) 20%
- 17. a) 80°
- 18. c) 0.12
- 19. c) 16 years
- 20. a) 72 m

Section C

- 21. c) 8309 m^2
- 22. a) 20
- 23. c) 4
- 24. c) 2 km/h

25. b) (2,-3)

26. a) 80

27. c) 15 days

28. c) 9856 cm³

29. d) 116

30. b) 2

31. a) 2 cm

32. a) 2

33. a) ₹2000

34. c) 11% profit

35. a) $a+b+c$

36. a) 8640 liters

37. a) $2\sqrt{3} a^2$

38. a) 174

39. b) 3

40. a) 50%
