

MRIO-2023

Do not open the Seal of the Question Booklet until you are asked to

Question Booklet Code:

A

Question Booklet Series No:

100925

Time Allowed: 120 Minutes

Total Questions: 100

Maximum Marks: 100

There shall be negative marking @ 0.25 mark per question for wrong/multiple answers

Before answering any question, check the booklet that it contains 12 pages and no page is missing, mutilated or repeated. In case of defect, get it replaced immediately.

INSTRUCTIONS FOR CANDIDATES

1. Fill in the OMR answer sheet, mentioning the Roll No. and other data as required in the place(s) indicated therein. Darken the appropriate circles in blue or black ball point pen only. Do not write any name / surname or put any symbol, sign, slogan, prayer or any mark of identification in the OMR answer sheet. Do not tamper with the bar-code or any other portion of the OMR answer sheet. Any such act is liable to render the answer sheet unfit for evaluation.
2. Correcting fluid, eraser, blade, books, textual material, script notes / loose paper, calculator, docuPen, slide rules, log tables / electronic watches, smart watch, cell phone, pager, other electrical/ electronic devices etc, are not allowed inside the examination hall. In case the candidate is found to be in possession of any of the above, he / she shall be expelled from the examination without any enquiry as to whether the same was / were used by the candidate or not.
3. A machine will read the coded information furnished by you in the OMR Answer Sheet. If the information so furnished by you is incomplete or different from the information in the application form, you shall be awarded Zero mark.
4. Answer must be given by completely darkening one of the four circles / ovals representing the most appropriate answer given on the Answer Sheet corresponding to the relevant question. For answers not shown by properly darkening in black / blue ball point pen, no marks shall be awarded.
5. No Rough work should be done on the OMR Answer Sheet, Space for rough work has been provided in the Question Booklet itself.
6. After the examination is over, candidates must ensure to fold the OMR Answer Sheet at the perforation and separate the Original Copy and Candidate's Copy of the Two Part OMR Answer Sheet in the presence of the Invigilator and handover the Original Copy to the Invigilator. The Candidate's Copy of the OMR Answer sheet may be taken by the candidate. Failure to hand over the original copy of the OMR Answer Sheet to the Invigilator before leaving the examination hall / room shall make the candidate liable for penal action.
7. Candidates may take with them the respective question-booklet after the examination is over.
8. Failure to comply with or violation of any of the above instructions shall be considered as adopting unfair means and action as deemed proper shall be taken.

SEAL

MRIO_ENG_A-1



Arithmetic

1. Pick out the least number from the options given below.

a) 0.2

b) $\frac{1}{0.2} = 5$

c) $0.\bar{2} = 0.22$

✓ d) $(0.2)^2 = 0.04$

2. Which one of the following is the value of

$$3.\overline{87} - 2.\overline{59} ?$$

✓ a) 1.28

b) 1.37

c) 1.49

d) 1.58

3. On simplification, the expression:

$$\frac{(0.013)^3 + (0.007)^3}{(0.013)^2 - 0.000091 + 0.000049}$$

is equal to:

a) 0.019

b) 0.020

c) 0.021

d) 0.023

4. The average weight of A, B and C is 45 kg. If the average weight of A, B is 40 kg and that of B, C is 43 kg, then the weight of B is:

a) 17 kg

b) 28 kg

✓ c) 31 kg

d) 37 kg

5. In the first 10 overs of a cricket game, the run rate was 3.2 per over. What should be the run rate per over in the remaining 40 overs to reach a target of 282 runs?

a) 5.5 runs.

✓ b) 6.25 runs.

c) 6.75 runs.

d) 7 runs.

6. The average age of 9 students and their teacher is 16 years. The average age of the first 4 students is 19 years and that of the last 5 students is 10 years. What is the age of the teacher?

a) 38 years

b) 36 years

✓ c) 34 years

d) 32 years

7. What is the sum of all two digits numbers that leaves a remainder of 3 when divided by 7?

a) 676

b) 683

✓ c) 689

d) 693

8. P and Q are two fixed points with 5 cm apart. R is a point on the line segment PQ such that the length of the segment PR is 3 cm. If the length of the segment PR is increased by 6%, then the length of the segment RQ is decreased by:

a) 5%

b) 7%

c) 9%

d) 10%

9. What is the compound interest at the rate of 6% per annum for 2 years on a certain sum of money, which in 2 years at the rate of 2% per annum with simple interest gives Rs.8000?

a) Rs.47,270

b) Rs.42,770

c) Rs.27,420

✓ d) Rs.24,720

10. On a certain sum of money, the simple interest for 2 years at the rate of 4% per annum is Rs.350. If the same sum of money is invested for compound interest with the same rate of interest for the same duration, then how much more interest will be earned?

a) Rs.3.50

b) Rs.5.50

c) Rs.7.00

✓ d) Rs.14.50

11. In how many years, Rs.150 will produce the same amount of interest at the rate of 8% simple interest per annum as Rs.800 will produce in 3 years at the rate of 4.5% simple interest per annum?

- $$3 \times 800 \times 4.5\%$$
$$= 1080$$
$$150 \times 8\% \times T = 1080$$
$$12T = 1080$$
$$T = 9$$
- a) 5 years.

b) 7 years.

c) 8 years.

d) 9 years.

$$SI = \frac{PRT}{100}$$
$$\Rightarrow \frac{150 \times 8 \times T}{100} = \frac{800 \times 4.5 \times 3}{100}$$
$$12T = 1080$$
$$T = 9$$

- a) 30

b) 32

☒ c) 33

d) 35

17. A shopkeeper marks his goods 30% above the cost price and allows a discount of 10% on the marked price. In order to earn 6.5% more profit, what would be the discount on the marked price?

$$CP = 100$$
$$MP = 130$$
$$SP = 117 + 6.5$$

- a) 4%

b) 5%

c) 5.5%

d) 6%

12) At what rate of simple interest per annum will the interest on a sum of money be $\frac{2}{5}$ th of the amount in 10 years?

- ☒ a) 4%

b) 5%

c) 8%

d) 10%

$$\frac{PRT}{100} = \frac{2}{5}P$$
$$\frac{10 \times R}{100} = \frac{2}{5}$$
$$R = 4\%$$

13) A certain sum of money at simple interest doubles in 10 years. In how many years, at the same simple interest, will it be tripled?

- a) 15 years

b) 18 years

c) 20 years

d) 24 years

$$SI = P$$
$$RAT$$

18. A shopkeeper sells two tape recorders at the same price. On one of these, he gains 10% and on the other, he loses 10%. What was the total loss or gain in the transaction?

$$100 - 200$$
$$100 - 110$$
$$90$$

- a) 1% loss.

b) 1% gain.

c) 2% loss.

☒ d) No loss or gain.

14. Which one of the following is the HCF of the numbers 1.08, 0.36 and 0.9?

- a) 0.3

☒ b) 0.18

c) 0.12

d) 0.03

$$108, 36, 90$$
$$6 \quad 2 \quad 5$$

15. A, B and C enter into a business partnership by investing Rs.50,000. If A subscribes Rs.4000 more than B and B subscribes Rs.5000 more than C, then what is share of A out of the total profit of Rs.35,000?

- ☒ a) Rs.14,700

b) Rs.13,600

c) Rs.11,900

d) Rs.10,400

$$C = x = 12000$$
$$B = x + 5000 = 17000$$
$$A = x + 9000 = 21000$$
$$x = \frac{36000}{3} = 12000$$

19. By what fraction, the selling price of a product be multiplied to get the cost price, if the loss is 20%?

- a) $\frac{4}{5}$

b) $\frac{6}{5}$

☒ c) $\frac{5}{4}$

d) $\frac{8}{5}$

$$CP = 100$$
$$SP = 80$$
$$Profit = SP - CP$$
$$20 = 100 - 80$$

20. A runs twice as fast as B and B runs thrice as fast as C. Then the distance covered by C in 72 minutes will be covered by A in:

- a) 24 minutes.

b) 18 minutes.

c) 16 minutes.

☒ d) 12 minutes.

$$B = 2A$$
$$C = 3B, A = 2B$$
$$A = 6C$$

16. The ratio of water and milk in a 30 liters of mixture is 7 : 3. How many liters of water be added to the mixture so that the ratio of water and milk becomes 6 : 1?

$$21x + 9x = 60$$
$$30x = 60$$
$$x = 2$$

21. Working 7 hours a day, A can complete a work in 6 days and B can complete the same work in 8 days. Working 8 hours a day, in what time would they complete the work together?

n) 2.3 days

✓ b) 3 days

c) 3.6 days

⓪ d) 4 days.

$y - A = 42$

$3 - B = 56$

$\frac{24}{8} = 3$

$21 \ 42 \ 56$

$\begin{array}{r} 21 \ 42 \ 56 \\ 3 \overline{) 68} \\ \underline{63} \\ 50 \\ \underline{48} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 20 \end{array}$

$\frac{14}{28} = \frac{1}{2}$

double the quantity of tin. What is the amount of tin in the alloy ?

a) 200 grams.

b) 250 grams.

c) 500 grams.

d) 750 grams.

22. Two trains running in opposite directions cross a man standing on the platform in 27 seconds and 17 seconds, respectively. If the two trains cross each other in 23 seconds, then what is the ratio of their speeds ?

- a) 1:3

b) 2:3

c) 3:2

d) 3:4
- $\frac{71}{S_1} = 27$

$\frac{72}{S_2} = 17$

23. If the angle of depression of a point situated at a distance of 70 meters from the base of a tower is 60° , then the height of the tower is:

- a) $35\sqrt{3}$ meters

b) 70 meters

c) $70\sqrt{2}$ meters

d) $70\sqrt{3}$ meters

24. What is the angle between the minute hand and the hour hand of a clock when the time is 4.20 PM ?

- a) 6°

b) 10°

c) 12°

d) 15°

25. A boat covers a certain distance downstream in 1 hour, while it comes back in $1\frac{1}{2}$ hours. If the speed of the stream is 3 km/hour, then the speed of the boat in still water is:

- ✓ a) 15 km/hour

b) 14 km/hour.

c) 13 km/hour.

d) 12 km/hour.

26. An alloy contains copper and tin in the ratio 3 : 2. If 250 grams of copper is added to this alloy, then the quantity of copper in the new alloy becomes

27. If $\frac{144}{0.144} = \frac{14.4}{x}$, then what is the value of x ?

a) 0.0144

✓ b) 0.144

c) 1.44

d) 14.4

$\frac{144 \times 10^3}{144} = \frac{14.4 \times 10^3}{x}$

$x = \frac{14.4 \times 10^3}{10^3}$

$x = 14.4$

28. If $x = 3 + 2\sqrt{2}$, then the value of $(\sqrt{x} - \frac{1}{\sqrt{x}})$ is:

- a) 1

b) 2

c) $2\sqrt{2}$

d) $3\sqrt{3}$

29. If $x = 0.5$ and $y = 0.2$, then the value of $\sqrt{0.6} \times (3y)^x$ is equal to:

- ✓ a) 0.6

b) 0.9

c) 1.2

d) 1.5
- $\sqrt{(3 \times 0.2)} \times \sqrt{0.6}$

30. If $a:b = 5:4$, then $(7a+3b) : (7a-3b)$ is equal to:

- ✓ a) 11:3

b) 9:11

c) 5:2

d) 4:3
- $\frac{a}{b} = \frac{5}{4}$

$\frac{7a+3b}{7a-3b} = \frac{35+12}{35-12} = \frac{47}{23}$

31. If 50% of $(x-y)$ is same as the 30% of $(x+y)$, then $x:y$ is equal to:

- a) 1:4

b) 3:5

✓ c) 4:1

d) 5:3
- $\frac{x-y}{2} = \frac{3(x+y)}{10}$

$5x - 5y = 3x + 3y$

$2x = 8y$

$\frac{x}{y} = 4$

32. On simplification, what is the value of the following expression:

$$\frac{(a-b)^2}{(b-c)(c-a)} + \frac{(b-c)^2}{(a-b)(c-a)} + \frac{(c-a)^2}{(a-b)(b-c)}$$

- a) 0
- b) $\frac{1}{3}$
- c) 2
- d) 3

33. If $x + \frac{1}{x} = \sqrt{3}$, then the value of $1 + x^6 + x^{12} + x^{18}$ is equal to:

- a) 2
- b) 1
- c) 0
- d) -1

34. At a theme park, the Jones family purchased 2 adult tickets and 3 child tickets for Rs.48. The Evans family purchased 3 adult tickets and 1 child ticket for Rs.44. What is the cost of one child ticket?

- a) Rs.6
- b) Rs.8
- c) Rs.10
- d) Rs.12

$$\begin{array}{r} 2a + 3c = 48 \\ 3a + 1c = 44 \\ \hline 2a + 3c = 48 \\ 3a + 1c = 44 \\ \hline -a + 2c = 4 \\ a = 12, c = 8 \end{array}$$

35. If $\frac{2\sqrt{14}}{\sqrt{5}} - \frac{\sqrt{7}}{\sqrt{10}} = \frac{a\sqrt{b}}{10}$, then which one of the following options is true?

- a) $a=3, b=7$
- b) $a=2, b=7$
- c) $a=3, b=70$
- d) $a=1, b=70$

$$\frac{2\sqrt{14}}{\sqrt{5}} - \frac{\sqrt{7}}{\sqrt{10}} = \frac{a\sqrt{b}}{10}$$

$$\frac{2\sqrt{14} \cdot \sqrt{10}}{\sqrt{5} \cdot \sqrt{10}} - \frac{\sqrt{7} \cdot \sqrt{10}}{\sqrt{10} \cdot \sqrt{10}} = \frac{a\sqrt{b}}{10}$$

$$\frac{2\sqrt{140}}{10} - \frac{\sqrt{70}}{10} = \frac{a\sqrt{b}}{10}$$

$$\frac{2\sqrt{4 \cdot 7 \cdot 5}}{10} - \frac{\sqrt{7 \cdot 2 \cdot 5}}{10} = \frac{a\sqrt{b}}{10}$$

$$\frac{2 \cdot 2 \sqrt{7 \cdot 5}}{10} - \frac{\sqrt{7 \cdot 2 \cdot 5}}{10} = \frac{a\sqrt{b}}{10}$$

$$\frac{4\sqrt{35}}{10} - \frac{\sqrt{35}}{10} = \frac{a\sqrt{b}}{10}$$

$$\frac{3\sqrt{35}}{10} = \frac{a\sqrt{b}}{10}$$

$$3\sqrt{35} = a\sqrt{b}$$

$$a=3, b=35$$

36. The sum and product of the roots of the equation: $2x^2 - 5x + 4 = 0$ are in the ratio:

- a) 5:2
- b) 5:4
- c) 6:3
- d) 7:4

$$\begin{array}{l} \alpha + \beta = -\frac{b}{a} = \frac{5}{2} \\ \alpha\beta = \frac{c}{a} = \frac{4}{2} = 2 \end{array}$$

$$\frac{5}{2} : 2 = \frac{5}{4}$$

37. If one of the roots of the quadratic equation: $4x^2 - 2x + (k-4) = 0$ is the reciprocal of the other root, then k is equal to:

- a) 8
- b) -8

$$\begin{array}{l} \alpha = \frac{1}{\beta} \\ \alpha\beta = 1 = \frac{c}{a} \\ \frac{k-4}{4} = 1 \\ k-4 = 4 \\ k = 8 \end{array}$$

- c) 4
- d) -4

38. For what value of k, $(x-6)$ is the highest common factor (HCF) of the polynomials $x^2 - 2x - 24$ and $x^2 + kx - 6$?

- a) 8
- b) 6
- c) 5
- d) 3

39. If $m^n = 32$, where m and n are positive integers, then value of n^{mn} is:

- a) 5^{25}
- b) 5^{10}
- c) 5^2
- d) 2^5

$$m = 2, n = 5$$

$$2^5 = 32$$

40. Pick out the solution of the equations:

$$\frac{4}{x} - \frac{6}{y} = 3 \text{ and } \frac{6}{x} - \frac{12}{y} = 10$$

- a) $X = -\frac{1}{2}, Y = \frac{6}{11}$
- b) $X = \frac{1}{2}, Y = -\frac{6}{11}$
- c) $X = \frac{1}{2}, Y = \frac{6}{11}$
- d) $X = -\frac{1}{2}, Y = -\frac{6}{11}$

41. What is the value of the expression:

$$\frac{4x^3 - x}{(2x+1)(6x-3)} \text{ for } x = 999?$$

- a) 111
- b) 222
- c) 333
- d) 666

42. If x, y are non-zero real numbers satisfying

$$x+y = 10 \text{ and } xy = 5, \text{ then the value of } \frac{x}{y} + \frac{y}{x} \text{ is:}$$

- a) 24
- b) 22
- c) 20
- d) 18

$$\frac{x^2 + y^2}{xy} = \frac{(x+y)^2 - 2xy}{xy}$$

$$= \frac{10^2 - 10}{5} = \frac{90}{5} = 18$$

43. If x is a non-zero real numbers satisfying $x + \frac{1}{x} = a$ and $x^3 + \frac{1}{x^3} = 0$, then the value $(x + \frac{1}{x})^4$ is:

- a) 4

$$x^3 + \frac{1}{x^3} = a^3 - 3a = 0$$

$$a^3 - 3a = 0$$

$$a(a^2 - 3) = 0$$

$$a = \sqrt{3}$$

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- ✓ b) 9
- c) 16
- d) 25

44. If $a = \sqrt{6} - \sqrt{5}$, $b = \sqrt{5} - 2$ and $c = 2 - \sqrt{3}$, then which one of the following options is true?

- a) $b < a < c$
- b) $a < c < b$
- c) $b < c < a$
- d) $a < b < c$

45. If $x + \frac{1}{x} = 99$, then the value of the expression: $\frac{100x}{2x^2 + 2 + 102x}$ is:

- a) $\frac{1}{6}$
- b) $\frac{1}{4}$
- c) $\frac{1}{3}$
- d) $\frac{1}{2}$

46. If x and y are positive real numbers satisfying $xy = 8$, then the minimum value of $(2x + y)$ is:

- a) 17
- b) 10
- c) 9
- ✓ d) 8

2×2

$2 \times y$

$2 \times 2 + y = 8$

8

8×1

1×8

47. If x, y and z are positive real numbers satisfying $x + y + z = 9$, then the minimum value of $x^2 + y^2 + z^2$ is:

- a) 9
- ✓ b) 27
- c) 63
- d) 81

117

$3 \times 3 + 3$

$12 \times 2 + 3$

$= 27$

48. If $\frac{2x+y}{x+4y} = 3$, then $\frac{x+y}{x+2y}$ is equal to:

- a) $\frac{5}{9}$
- b) $\frac{2}{7}$
- c) $\frac{10}{9}$
- d) $\frac{10}{7}$

$2x + y = 3x + 12y$

$-11y = x$

$x + 11y$

49. What is the minimum number of identical square tiles required to fit in a rectangular floor of length 720 cm and breadth 540 cm?

- a) 11
- b) 12

$2 \mid 720 \times 540$

$3 \mid 360, 270$

$3 \mid 120, 90$

$3 \mid 40, 30$

$2 \mid 20, 15$

$10 \times 15 = 150$

- c) 13
- d) 14

50. If x, y are positive real numbers and $\sqrt{0.03 \times 0.3x} = (0.3)^2 \times \sqrt{y}$, then what is the value of $\frac{x}{y}$?

- a) 0.009
- b) 0.09
- c) 0.9
- d) 9.0

$2 \times (25)$

Mensuration

51. The areas of a square and a rectangle are equal. The length of the rectangle is greater than the length of any side of the square by 4 cm and the breadth is less by 3 cm. What is the perimeter of the rectangle?

- ✓ a) 50 cm.
- b) 45 cm.
- c) 25 cm.
- d) 20 cm.

$a^2 = Lb$

$a^2 = Lb$

$L = a + 4$

$b = a - 3$

$a^2 = (a + 4)(a - 3)$

$a^2 = a^2 - 3a + 4a - 12$

$0 = a - 12$

$a = 12$

52. What is the diameter of a wheel that makes 226 revolutions to go 4520 meters?

- a) $\frac{75}{11}$ meters
- ✓ b) $\frac{70}{11}$ meters
- c) $\frac{45}{11}$ meters
- d) $\frac{35}{11}$ meters

$226 \times D \times 226 = 4520$

$226 \times D \times 226 = 4520$

$D = \frac{4520}{226 \times 226}$

$D = \frac{4520}{51076}$

$D = \frac{70}{11}$

53. If the circum-radius of an equilateral triangle is 10 cm, then the in-radius of the triangle is:

- a) 3 cm
- b) $3\sqrt{2}$ cm
- c) 5 cm
- d) $5\sqrt{2}$ cm



54. The sides of a triangle are in the ratio $\frac{1}{2} : \frac{1}{3} : \frac{1}{6}$, respectively. If the perimeter of the triangle is 60 cm, then the length of the largest side of the triangle is:

- a) 20 cm
- b) 25 cm

$60 = \frac{x}{2} + \frac{x}{3} + \frac{x}{6}$

$60 = \frac{3x + 2x + x}{6}$

$60 = \frac{6x}{6}$

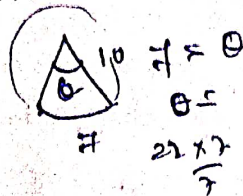
$60 = x$

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- c) 28 cm
d) 30 cm

55. What is the area of a sector of a circle with radius 10 cm, formed by an arc of length 7 cm?

- a) 30 cm²
b) 35 cm²
c) 40 cm²
d) 45 cm²



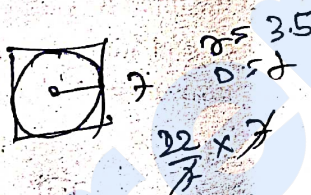
56. A wire is bent to form a square of sides 22 cm. If the wire is re-bent in the shape of a circle, then what is the radius of the circle?

- a) 7 cm.
b) 11 cm.
c) 14 cm.
d) 17 cm.

Handwritten calculation: $4 \times 22 = 88$ (perimeter of square). $2\pi r = 88$ (perimeter of circle). $r = \frac{88}{2\pi} = \frac{88}{2 \times \frac{22}{7}} = 14$ cm.

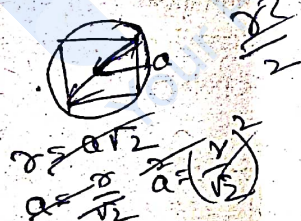
57. What is the perimeter of the largest circle that can fit inside a square with side 7 cm? (Use $\pi = \frac{22}{7}$).

- a) 14 cm.
b) 16 cm.
c) 18 cm.
d) 22 cm.



58. The area of the largest square that can be inscribed in a circle of radius r units is:

- a) r^2 unit²
b) $2r^2$ unit²
c) πr^2 unit²
d) $4r^2$ unit²



59. If each edge of a cube is increased by 10%, then what would be the percentage increase in the volume?

- a) 33.1%
b) 30.1%
c) 23.1%
d) 13.1%

Handwritten calculation: Let side = a. New side = 1.1a. New volume = (1.1a)^3 = 1.331a^3. Percentage increase = $\frac{1.331a^3 - a^3}{a^3} \times 100 = 33.1\%$.

60. Three metal cubes of edge lengths 3 cm, 4 cm and 5 cm are melted to form a single cube. What is the edge length of the new cube?

- a) 3.5 cm.
b) 4 cm.
c) 5 cm.
d) 6 cm.

Handwritten calculation: $3^3 + 4^3 + 5^3 = 27 + 64 + 125 = 216$. $\sqrt[3]{216} = 6$ cm.

61. A cube of side one meter length is cut into small cubes of side 10 cm each. How many such small cubes can be obtained?

- a) 500
b) 1000
c) 1200
d) 1500

Handwritten calculation: $\frac{100 \times 100 \times 100}{10 \times 10 \times 10} = 1000$.

62. The ratio of the volumes of two cubes is 729 : 1331. What is the ratio of their total surface areas?

- a) 9 : 11
b) 27 : 121
c) 81 : 121
d) 729 : 1331

Handwritten calculation: $\sqrt[3]{729} = 9$, $\sqrt[3]{1331} = 11$. Ratio of surface areas = 9^2 : 11^2 = 81 : 121.

63. What is the percentage increase in the area of a rectangle, if each of its sides is increased by 20%?

- a) 46%
b) 44%
c) 42%
d) 40%

Handwritten calculation: Let sides be a and b. New sides are 1.2a and 1.2b. New area = 1.44ab. Percentage increase = $\frac{1.44ab - ab}{ab} \times 100 = 44\%$.

64. There is a rectangular garden whose length is 60 meters and width is 20 meters. There is a walkway of uniform width around the garden. If the area of the walkway is 516 meters², then the width of the walkway is:

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



Handwritten calculation: $(2x+20) \times (60+2x) - 60 \times 20 = 516$. Solving for x gives x = 3 meters.

65. What is the length of the longest pole that can be placed in a room of 12 meters long, 8 meters broad and 9 meters high?

- a) 17 meters.
b) 18 meters.
c) 19 meters.
d) 20 meters.

Handwritten calculation: $\sqrt{12^2 + 8^2 + 9^2} = \sqrt{144 + 64 + 81} = \sqrt{289} = 17$ meters.

66. If the radius of a cylinder is doubled and the height remains same, then the volume will be:

- a) half of the original volume.
- b) same as the original volume.
- c) double the original volume.
- ✓ d) four times the original volume.

67. If the sum of the interior angles of a regular polygon measures up to 144° , then how many sides does the polygon have?

- a) 8 sides
- b) 9 sides
- c) 10 sides
- d) 12 sides

68. If a square S is inscribed in a circle C , then what is the ratio of the area of S to the area of C ?

- ✓ a) $1 : \pi$
- b) $2 : \pi$
- c) $2 : 3\pi$
- d) $3 : 2\pi$



$$r = \frac{s\sqrt{2}}{2}$$
$$\pi r^2 = \frac{\pi s^2}{2}$$
$$\frac{\pi s^2}{2} = \frac{s^2}{2} \times \frac{\pi}{1} \times \frac{2}{2}$$

69. If the radius of the base of a cone is tripled and the height is doubled, then which one of the following statements is true?

- a) Volume of the cone remains unchanged.
- b) Volume of the cone increases by 6 times.
- ✓ c) Volume of the cone increases by 12 times.
- d) Volume of the cone increases by 18 times.

$$V = \frac{1}{3} \times \pi r^2 h$$
$$6 \times 2 = 12$$

70. If a solid sphere of radius r units is melted and recast into a shape of a solid cone of the same radius, then the height of the cone is:

- a) r units
- b) $2r$ units
- c) $3r$ units
- ✓ d) $4r$ units

$$\frac{4}{3}\pi r^3 = \frac{1}{3}\pi r^2 h$$

71. The ratio of the volumes of a cylinder, a cone and a sphere, if each has the same diameter and the same height is:

$$\frac{1}{3}\pi r^2 h : \frac{1}{3}\pi r^2 h : \frac{4}{3}\pi r^3$$
$$1 : \frac{1}{3} : \frac{4}{3} = 3 : 1 : 4$$

- a) $1 : 2 : 3$
- b) $2 : 1 : 3$
- c) $1 : 3 : 2$
- ✓ d) $3 : 1 : 2$

$$b = \frac{2A}{h}$$

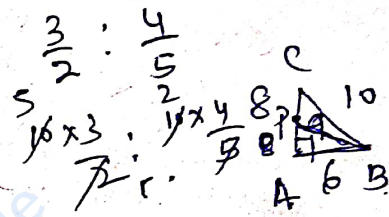
72. If the ratio of altitudes of two triangles is $4 : 5$, ratio of their areas is $3 : 2$, then what will be the ratio of their corresponding bases?

- a) $5 : 8$
- ✓ b) $15 : 8$
- c) $8 : 5$
- d) $8 : 15$

$$\frac{A}{h} = \frac{A}{h}$$
$$h = 4, h = 5$$
$$A = 3, A = 2$$
$$A = \frac{1}{2}bh, \frac{3}{2} = \frac{1}{2}b \times 4, \frac{3}{2} = 2b, b = \frac{3}{4}$$
$$\frac{2}{2} = \frac{1}{2}b \times 5, 2 = \frac{5}{2}b, b = \frac{4}{5}$$
$$\frac{3}{4} : \frac{4}{5} = 15 : 8$$

73. ABC is a triangle such that $\angle A = 90^\circ$ and P is any point on the side AC . If $BC = 10$ cm, $AC = 8$ cm and $BP = 9$ cm, then what is the length of AP ?

- a) $2\sqrt{3}$ cm
- b) $2\sqrt{5}$ cm
- c) $3\sqrt{3}$ cm
- ✓ d) $3\sqrt{5}$ cm



74. If the three successive angles of a cyclic quadrilateral are in the ratio $1 : 3 : 4$, then what is the measure of the fourth angle?

- a) 30°
- b) 36°
- c) 72°
- d) 108°

$$1 : 3 : 4 : x$$
$$x = 360 - (1 + 3 + 4) \times 180$$
$$x = 360 - 1080$$
$$x = -720$$
$$x = 108$$

75. If the number of sides of a regular polygon is 24, then what is the measure of the interior angle of the polygon?

- a) 135°
- b) 145°
- c) 155°
- d) 165°

$$\frac{(n-2) \times 180}{n}$$
$$\frac{(24-2) \times 180}{24}$$
$$\frac{22 \times 180}{24}$$
$$165$$

STATISTICS AND PROBABILITY

76. Which one of the following is the median of a data set, if its mean is 15 and mode is 30?

- a) 27.5
- b) 25
- c) 22.5
- ✓ d) 20

$$\text{Mode} = 3 \times \text{Median} - 2 \times \text{Mean}$$
$$30 = 3 \times \text{Median} - 2 \times 15$$
$$30 = 3 \times \text{Median} - 30$$
$$60 = 3 \times \text{Median}$$
$$\text{Median} = 20$$

77. The median of a data set of 9 distinct observations is 20.5. If each of the largest 4 observations of the data set is increased by 2, then the median of new data set:

- a) is increased by 2.
- b) is decreased by 2.
- ✓ c) remains the same as that of the original data set.
- d) is two times the original median.

78. If the ratio of mean and median of a data set is 2 : 3, then what is the ratio of mode and mean of the data set?

- a) 2 : 5
- ✓ b) 5 : 2
- c) 2 : 3
- d) 3 : 2

$$\frac{\text{Mean}}{\text{Median}} = \frac{2}{3}$$

79. In a batch of 15 students, the marks of 10 students who passed are 70, 50, 95, 40, 60, 70, 80, 90, 75, 80. Then what is the median marks of all the 15 students?

- ✓ a) 40
- b) 50
- c) 60
- d) 70

80. All the students of a class performed poorly in Mathematics. The teacher decided to give grace marks of 10 to each of the students. Which of the following statistical measures will not change even after the grace marks were given?

- ✓ a) Mean
- b) Median
- c) Mode
- d) Variance

81. The mean of a set of observations is $\bar{x}$. If each observation is divided by a non-zero number α and then increased by 10, then the mean of the new set of observations is:

- a) $\frac{\bar{x}}{\alpha}$
- b) $\frac{\bar{x}+10}{\alpha}$
- ✓ c) $\frac{\bar{x}}{\alpha} + 10$
- d) $\alpha\bar{x} + 10$

$$\frac{\text{mean}}{\alpha} + 10$$

82. The observations 29, 32, 48, 50, x , $x+2$, 72, 78, 84, 95 are arranged in ascending order. If the median of the data set is 63, then what is the value of x ?

- a) 61
- ✓ b) 62
- c) 62.5
- d) 63

$$\frac{x + x + 2}{2} = 63$$

$$2x + 2 = 126$$

$$2x = 124$$

$$x = 62$$

83. The mean deviation from the mean of the observations -1, 0 and 4 is:

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

$$\frac{(-1 - 1) + (0 - 0) + (4 - 1)}{3} = 1$$

84. Which measures of central tendency get affected, if the extreme observations on both the ends of a data arranged in descending order are removed?

- ✓ a) Mean and Mode
- b) Mean and Median
- c) Mode and Median
- d) Mean, Mode and Median

85. Let the median of the data set 30, 8, 7, 3, 17, 15, 21, 24, 29, 23 be x . If the median of the data set obtained by replacing 3 by 33 and 8 by 18 is y , then the difference between y and x is:

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

86. If 35 is removed from the data set: 30, 34, 35, 36, 37, 38, 39, 40, then the median of the new data set increases by:

- a) 2
- b) 1.5
- c) 1
- ✓ d) 0.5

$$\frac{36 + 37}{2} - 37$$

$$\frac{73}{2} = 36.5$$

87. Let X and Y be two random independent events. If $\text{Prob}(X) = 0.4$ and $\text{Prob}(X \cup Y^c) = 0.7$, then what is the value of $\text{Prob}(X \cup Y)$?

- a) 0.7
- b) 0.5
- c) 0.4
- d) 0.3

88. A number is selected at random from the numbers 1 to 30. What is the probability that it is a prime number?

- a) $\frac{2}{3}$
- b) $\frac{1}{6}$
- ☒ c) $\frac{1}{3}$
- d) $\frac{11}{30}$

2, 3, 5, 7, 11, 13, 17, 19
23, 29
 $\frac{10}{30} = \frac{1}{3}$

- b) $\frac{4}{9}$
- c) $\frac{1}{10}$
- d) $\frac{3}{10}$

89. Suppose X and Y are two independent events with non-zero probabilities. Then which one of the following statements is false?

- a) $\text{Prob}(X \cap Y) = \text{Prob}(X) \text{Prob}(Y)$
- b) $\text{Prob}(X/Y) = \text{Prob}(X)$
- c) $\text{Prob}(X^c \cap Y^c) = \text{Prob}(X^c) \text{Prob}(Y^c)$
- d) $\text{Prob}(X \cup Y) = \text{Prob}(X) + \text{Prob}(Y)$

90. If A and B are two independent events such that $\text{Prob}(A) = \frac{1}{4}$, $\text{Prob}(A \cup B) = \frac{1}{3}$ and $\text{Prob}(B) = x$, then the value of x is:

- a) $\frac{1}{9}$
- b) $\frac{2}{9}$
- c) $\frac{4}{9}$
- d) $\frac{5}{9}$

91. If A , B and C are three mutually exclusive and exhaustive events such that $\text{Prob}(A) = 2$, $\text{Prob}(B) = 3 \text{Prob}(C)$, then $\text{Prob}(B)$ is:

- a) $\frac{1}{6}$
- b) $\frac{3}{11}$
- c) $\frac{1}{3}$
- d) $\frac{6}{11}$

92. Two dice are thrown simultaneously. The probability of getting a sum of 9 is:

- ☒ a) $\frac{1}{9}$

9 - 5, 4
7, 5
3, 6
6, 3
 $\frac{4}{36} = \frac{1}{9}$

93. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double that of a red ball, then the number of blue balls in the bag is:

- a) 5
- ☒ b) 10
- c) 12
- d) 15

94. A box of 600 bulbs contains 12 defective bulbs. One bulb is taken out at random from this box. What is the probability that the bulb is non-defective?

- a) $\frac{1}{25}$
- b) $\frac{1}{50}$
- c) $\frac{143}{150}$
- ☒ d) $\frac{147}{150}$

12 defective
588 non-defective
 $\frac{588}{600} = \frac{147}{150}$

95. A number x is chosen at random from the set $\{-2, -1, 0, 1, 2\}$. What is the probability that $x^2 < 2$?

- a) $\frac{1}{5}$
- b) $\frac{2}{5}$
- ☒ c) $\frac{3}{5}$
- d) $\frac{4}{5}$

$(-2)^2 = 4$
 $(-1)^2 = 1$
 $0^2 = 0$
 $1^2 = 1$
 $2^2 = 4$
3 values are less than 2: $\frac{3}{5}$

96. A number is selected at random from first 50 natural numbers. What is the probability that it is a multiple of 3 and 4?

- ☒ a) $\frac{2}{25}$
- b) $\frac{4}{25}$
- c) $\frac{7}{25}$
- d) $\frac{13}{25}$

12 (12, 24, 36, 48)
 $\frac{4}{50} = \frac{2}{25}$

97. If a coin is flipped 3 times, then what is the probability of getting two tails and one head?

- a) $\frac{1}{8}$
- b) $\frac{1}{4}$
- ☒ c) $\frac{3}{8}$
- d) $\frac{1}{2}$

TTT
HTT
THT
 $\frac{3}{8}$

98. An urn contains 6 red marbles and 4 black marbles. Two marbles are drawn without replacement from the urn. What is the probability that both of the marbles are black?

- ☒ a) $\frac{2}{15}$
- b) $\frac{1}{5}$
- c) $\frac{4}{15}$
- d) $\frac{1}{3}$

$\frac{R}{6}$ $\frac{B}{4}$

$\frac{2}{4 \times 3}$
 $\frac{2 \times 1}{5}$

$\frac{2}{15}$

99. Two friends A and B apply for a job in the same company. The chances of A getting selected is $\frac{2}{5}$ and that of B is $\frac{4}{7}$. What is the probability that both of them get selected?

- a) $\frac{27}{35}$
- b) $\frac{24}{35}$
- c) $\frac{14}{35}$
- d) $\frac{8}{35}$

100. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither a green ball nor a blue ball?

- a) $\frac{2}{3}$
- b) $\frac{3}{7}$
- ☒ c) $\frac{8}{21}$
- d) $\frac{9}{22}$

$\frac{8+7}{21}$