FIITJEE

MAHARASHTRA SCIENCE TALENT SEARCH EXAMINATION

for students of Class X

Time: 3 Hours **Maximum Marks: 270**

- **Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.**
- **You are not allowed to leave the examination hall before end of the test**.

INSTRUCTIONS

Note:

- The question paper contains 3 Parts
- **PART – 1** contains 30 questions of **IQ**
- **PART – 2** contains1- 15 questions of **Physics** and 16-30 questions of **Chemistry**
- **PART – 3** contains 30 questions of **Mathematics**
- All are multiple choice questions. Each question has four choices (A), (B), (C) and (D), out of which only one is correct.

Marking Scheme:

- For each question, in all the three parts, you will be awarded **3 marks** if you have darkened only the bubble corresponding to the correct answer, **zero marks** for not darkening any bubble and in all other cases **minus one (-1) mark** will be awarded.

Name of the Candidate **:** _____

Test Centre **:** _____

PART – I: IQ

SECTION A **Single Correct Choice Type**

Each question has 4 choices (A), (B) (C) and (D) for its answer, out of which **ONLY ONE** is correct.

Directions (For Question No. 1 to 7): Find the next term of given series:

1. D, G, J, M, P, _____
(A) Q (B) R
(C) S (D) T

2. B, D, G, K, P, _____
(A) S (B) V
(C) W (D) X

3. 75, 77, 70, 72, 65, ……
(A) 67 (B) 60
(C) 62 (D) 64

4. 5, 15, 45, 135, 405, ……
(A) 1115 (B) 1125
(C) 1215 (D) 1225

5. 4, 7, 11, 16, 22, 29, 37, _____
(A) 44 (B) 46
(C) 48 (D) 50

6. 7, 28, 49, 70, 91, 112, _____
(A) 135 (B) 134
(C) 133 (D) 130

7. 60, 64, 32, 36, 18, 22,_____
(A) 20 (B) 12
(C) 11 (D) 24

Directions (For Question No. 8 to 10):
Find the odd one.

8. (A) Apple (B) Mango
(C) Watermelon (D) Guava

9. (A) 441 (B) 289
(C) 361 (D) 343

10. (A) 17 (B) 27
(C) 37 (D) 47

11. In a row of boys. Ram is 9^{th} from the right and 31^{st} from the left. How many boys are there in the row?
(A) 37 (B) 38
(C) 39 (D) 40

SPACE FOR ROUGH WORK

12. If 'Book' is called 'Watch', 'Watch' is called 'Bag', 'Bag' is called 'Dictionary' and 'Dictionary' is called 'Window', which is used to carry the books?

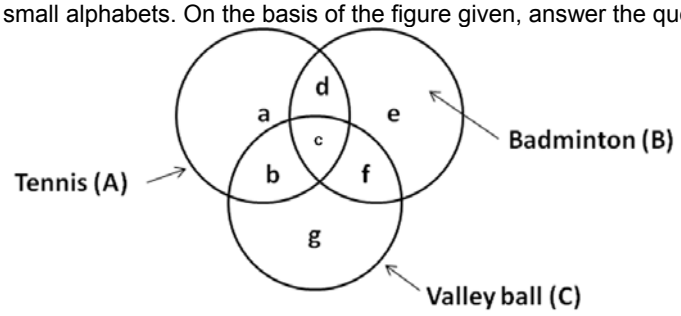
(A) Dictionary (B) Bag
(C) Book (D) Watch

Directions (For Questions No. 13):
Study the number series given below and answer the questions that follow:
7 8 9 7 6 5 3 4 2 8 9 7 2 4 5 9 2 9 7 6 4 7

13. How many 7's are preceded by 9 and followed by 6?

(A) 2 (B) 3
(C) 4 (D) 5

Directions (For Question. 14 to **17):**The figure given below consists of three intersecting circles marked A, B & C which represents group of students who play Tennis, Badminton and Volley ball. Each part of the figure is represented by a small alphabets. On the basis of the figure given, answer the questions:



14. Which small letter represents the group of persons who play all the three games?

(A) b (B) c
(C) f (D) g

15. Which small letter represents group of persons who play Tennis and Volley ball but not Badminton?

(A) g (B) e
(C) c (D) b

16. Which small letter represents the group of persons who play Tennis but neither Badminton nor Volley ball?

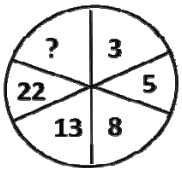
(A) a (B) b
(C) c (D) d

17. Which letter represents the group of persons who play Tennis and Badminton but not Volley ball?

(A) b (B) c
(C) d (D) f

Directions (For question No. 18 to **19):** Find the missing number in the figures shown.

18.



(A) 1 (B) 26
(C) 39 (D) 45

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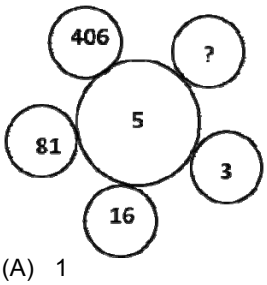
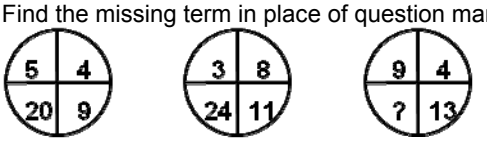
19.



(A) 1 (B) 731
(C) 1625 (D) 2031

20. Compare the knowledge of the persons X, Y, Z, A, B and C in relation to each other.
1. X knows more than A. 2. Y knows as much as B.
3. Z knows less than C. 4. A knows more than Y.
The best knowledgeable person amongst all is:
(A) X (B) Y
(C) A (D) data is inadequate

21. Find the missing term in place of question mark from among the figure.



(A) 117 (B) 36
(C) 32 (D) 26

22. How many triangles are there in the following figure?

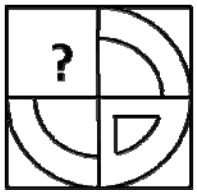
(A) 5 (B) 6
(C) 8 (D) 10

23. Rohit walked 25 metres towards South. Then he turned to his left and walked 20 metres. He then turned to his left and walked 25 metres. He again turned to his right and walked 15 metres. At what distance is he from the starting point and in which direction?
(A) 35 metres East (B) 35 metres North
(C) 40 metres East (D) 60 metres East

SPACE FOR ROUGH WORK

Directions: (Ques. 24 to 25) In each of the following questions, complete the missing portion of the given pattern by selecting from the give four alternatives.

24.



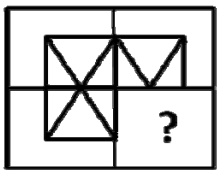
(A) 

(B) 

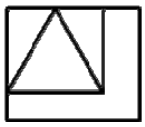
(C) 

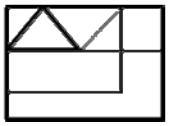
(D) 

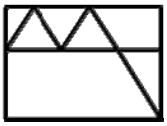
25.



(A) 

(B) 

(C) 

(D) 

Direction(For Q. 26 to 30):
Eight persons – P, Q, R, S, T, U,V and W are sitting around a circular table. S is to the immediate right of W. V is not next to either R or T. W is to the immediate right of T, Who is sitting opposite to R. U and W are sitting opposite to each other.

26. Who is to the right of U?
(A) R (B) V
(C) P (D) Q

27. Who is sitting two places to the right of W?
(A) P (B) S
(C) T (D) Can't be determined

28. If R and V interchange their places, then who is opposite to 'T'?
(A) V (B) S
(C) R (D) B

29. If V is to the immediate left of P, then who is the immediate left of R?
(A) U (B) P
(C) Q (D) can't determined

30. Who is sitting opposite to S?
(A) V (B) R
(C) T (D) none of these

SPACE FOR ROUGH WORK

PART – II: Physics

Each question has 4 choices (A), (B) (C) and (D) for its answer, out of which **ONLY ONE** is correct.

31. A uniform electric field and a uniform magnetic field are produced, pointing in the same direction. If an electron is projected with its velocity pointing in the same direction
(A) The electron will turn to its right
(B) The electron will turn to its left
(C) The electron velocity will increase in magnitude
(D) The electron velocity will decrease in magnitude

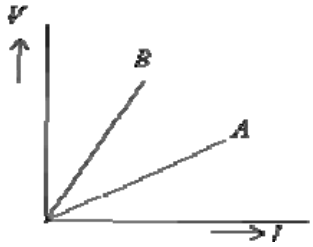
32. An object 4 cm in height is placed at a distance of 15 cm from concave lens of 10 cm focal length. Find the size of image, If v = -6 cm
(A) 160 cm (B) 16 cm
(C) 1.6 cm (D) 0.16 cm

33. A current carrying straight wire is kept along the axis of a circular loop carrying a current. The straight wire is
(A) Will exert an inward force on the circular loop
(B) Will exert an outward force on the circular loop
(C) Will exert a force on the circular loop parallel to itself
(D) Will not exert any force on the circular loop

34. An α particle and a proton travel with same velocity in a magnetic field perpendicular to the direction of their velocities. Find the ratio of the radii of their circular path
(A) 4 : 1 (B) 1 : 4
(C) 2 : 1 (D) 1 : 2

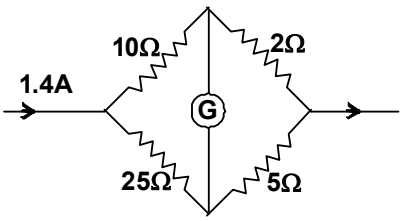
35. A wire of resistance 36 Ω is bent in the form of an equilateral triangle. The resistance between two vertices is
(A) 12 Ω (B) 24 Ω
(C) 8 Ω (D) 36 Ω

36. V-I graphs for parallel and series combination of two metallic resistors are as shown in the fig. which graph represents parallel combination?



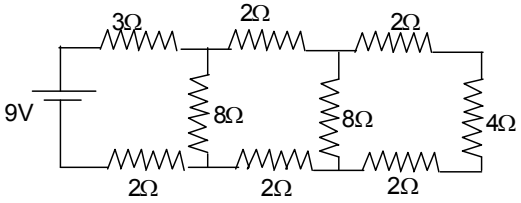
(A) A (B) AB
(C) A and B both (D) neither

37. In the given circuit, when galvanometer shows no deflection, the current in 2Ω resistance is
(A) 1.4 A (B) 1.2 A
(C) 1.0 A (D) 0.4 A



38. In the circuit shown in figure below the current through
(A) the 3Ω resistor is 1 A
(B) the 3 Ω resistor is 0.2 A
(C) the 4Ω resistor is 0.50 A
(D) the 4 Ω resistor is 1 A

39. The given network is part of another larger circuit. Calculate the potential of point D.



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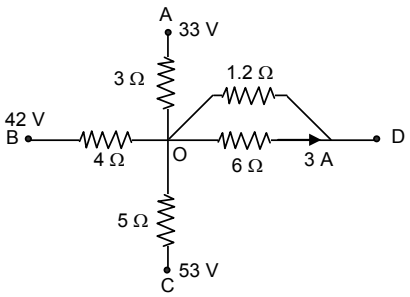
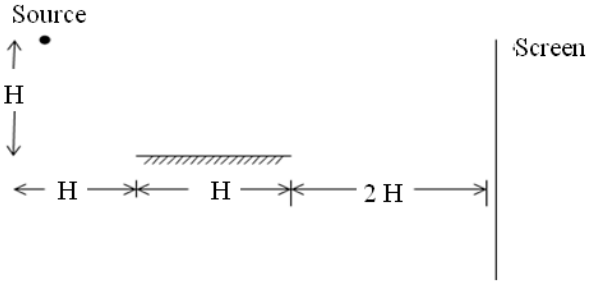


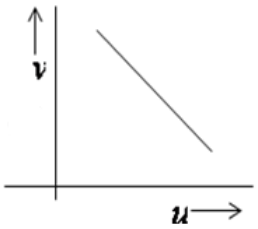
(A) 25V
(B) 12.5V
(C) 0V
(D) -25V

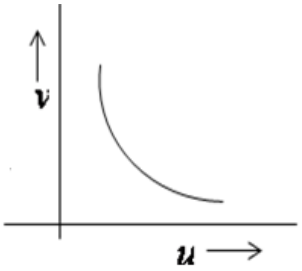
40. A point source of light has been placed as shown in the fig. What is the length on the screen that will receive reflected light from the mirror?

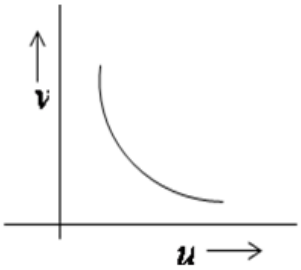


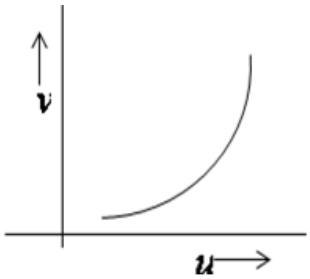
(A) 2 H
(B) 3 H
(C) H
(D) NONE

41. In an experiment to find the focal length of a concave mirror a graph is drawn between the magnitudes of u and v. the graph looks like

(A)


(B)


(C)


(D)


SPACE FOR ROUGH WORK

42. An electrical heater is used for 5 hours on a 200V supply and takes a current of 5 amperes. What is power?
(A) 41 W (B) 110 W
(C) 44 W (D) 1000 W

43. Two electronic lamps of 40 watt each are connected in parallel. The power consumed by the combination will be
(A) 66 watt (B) 8 watt
(C) 80 watt (D) 800 watt

44. The total resistance of 3 resistors, each of 3 ohms, connected in parallel will be :
(A) 9 ohm (B) 1 ohm
(C) 3 ohm (D) 1/3 ohm

45. A fish in water appears to be at 30 cm from the surface. If the refractive index of water is 4/3 the true depth at which fish remains is
(A) 10 cm (B) 70 cm
(C) 30 cm (D) 40 cm

46. Which of the following solution can turn moist red litmus paper to blue?
(A) Br OH (B) $Ba(OH)_2$
(C) $P(OH)_3$ (D) $SO_2(OH)_2$

47. Four compounds are given below
I = Potassium cyanide
II = Di nitrogen trioxide
III = potassium bromide
IV = Caustic Soda
Which set represents the compounds containing both ionic and covalent bonds?
(A) I, II, III (B) II, III, IV
(C) I, IV (D) II, III

48. To the 1 litre water at 25°C equal masses of Hydrochloric acid and sodium hydroxide are added. Then pH of the resulting solution.
(A) ≤ 1 (B) > 7
(C) = 7 (D) < 7(B)

49. Which of the following reaction is not a Redox Reaction?
(A) $2KClO_3 \rightarrow 2KCl + 3O_2$ (B) $NH_4NO_3 \rightarrow N_2O + 2H_2O$
(C) $BaCO_3 \rightarrow BaO + CO_2$ (D) $(NH_4)_2 Cr_2O_7 \rightarrow N_2 + Cr_2O_3 + 4H_2O$

50. It equivalent weight $= \dfrac{\text{Molecular weight}}{\text{Valence factor}}$

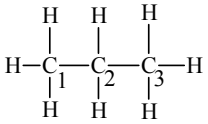
Where valence factor = number of electrons lost or gained by one molecule reductant or oxidant in a reaction and is calculated by taking the difference of oxidation number of that element in the reactant and product. It is always positive.
What will be the equivalent weight of $KMnO_4$ in the following reaction?
$MnO_4^- + H^+ + SO_3^{2-} \rightarrow Mn^{2+} + SO_4^{2-} + H_2O$
(Atomic mass K = 39; Mn = 55; 0 = 16)
(A) 158 (B) 79
(C) 39.5 (D) 31.6

SPACE FOR ROUGH WORK

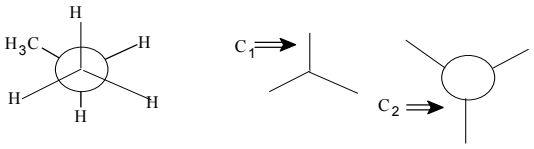
PART – III: Chemistry

Each question has 4 choices (A), (B) (C) and (D) for its answer, out of which **ONLY ONE** is correct.

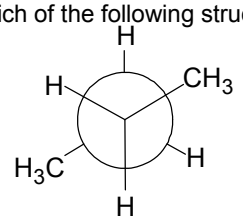
51. In Newmann projection, we sight down the C-C bond, and represent the front carbon by a point and the back carbon by a circle. Each carbon has three other bonds that are placed symmetrically around it. For Example: Propane

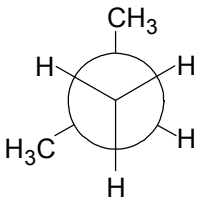


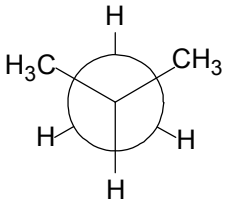
With respect to $C_1 - C_2$ propane is shown as



Which of the following structure represents n-butane?

(A) 

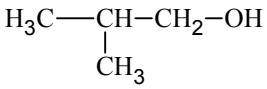
(B) 

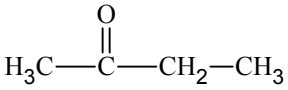
(C) 

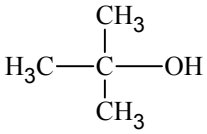
(D) None of these

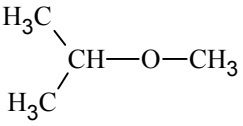
52. Which of the following is not an isomer of?

$H_3C—H_2C—O—CH_2—CH_3$

(A) 

(B) 

(C) 

(D) 

53. Which is different from the rest?

(A) Cellulose (B) Rubber

(C) Urea (D) Nylon

SPACE FOR ROUGH WORK

54. 100 ml of a gas mixture containing ammonia and Hydrogen are passed through one litre water at room temperature. The volume of gas mixture reduced by 40 ml .Then the composition of initial gas mixture is

(A) 40 ml NH_3 and 60 ml H_2 (B) 50 ml NH_3, 45 ml H_2, 5 ml water vapour

(C) 60 ml NH_3 and 40 ml H_2 (D) 96 ml NH_3 and 4 ml H_2

55. Which is not a sulphide ore?

(A) Cinnabar (B) Zinc blende

(C) Galena (D) Carnallite

56. Match the chemicals given in column –I with use in given in Column – II

Column –I (Chemical)		**Column – II (Use)**	
(I)	NaCl	(P)	as a fire extinguisher
(II)	$Na_2CO_3.10H_2O$	(Q)	Photo developer
(III)	$NaHCO_3$	(R)	Preservative
(IV)	$Na_2S_2O_3.5H_2O$	(S)	Washing of cloths

(A) I – P, II – Q, III – R, IV – S (B) I – R, II – S, III – P, IV – Q

(C) I – Q, II – P, III – R, IV – S (D) I – S, II – Q, III – P, IV – R

57. Which of the following set of atomic numbers have similar chemical properties?

(A) 4, 8, 14, 18 (B) 2, 20, 28, 32

(C) 9, 17, 33, 53 (D) 5, 13, 31, 49

58. Which of the following is a true statement?

(A) Diamond is good conductor of electricity than graphite

(B) Graphite is harder than diamond

(C) In Graphite each carbon is directly connected to four carbon atoms while in Diamond each carbon is directly connected to three carbon atoms.

(D) The C-C Bond length in Diamond is larger than C-C bond length in Graphite

59. Which of the following pair of elements donot react with water at room temperature

(A) Na, Zn (B) Cu, Hg

(C) Ba, Cs (D) K, Al

60. IUPAC name of the compound $H_2C=CH-CH_2-Br$ is

(A) 1-bromo -2-propene (B) 3-bromo -1-propene

(C) 1-bromo -3-propene (D) 3-bromo -2-propene

SPACE FOR ROUGH WORK

PART – III: Mathematics

Each question has 4 choices (A), (B) (C) and (D) for its answer, out of which **ONLY ONE** is correct.

61. When three dice are rolled, the number of possible cases that the total score is great then 16?

(A) $\frac{1}{54}$ (B) $\frac{1}{6}$

(C) 1 (D) None of these

62. If $\sec\theta = \frac{x^2 - y^2}{x^2 + y^2}$, , where x, y are two unequal non-zero real numbers, then θ has

(A) only one real value (B) only two real value

(C) infinite numbers of real value (D) no real value

63. Consider the arithmetic progression $(a - b)^2$, $a^2 + b^2$, $(a + b)^2$ …. Find n^{th} term of this A.P.

(A) $(a + nb)^2$ (B) $(a + (n - 1)b)^2$

(C) $a^2 + b^2 - 4ab + 2anb$ (D) None of these

Paragraph 1(For Q. 64 to 66):

Make a telescopic sum by using the following expressions:

(A) $\frac{1}{k(k+1)} = \frac{1}{k} - \frac{1}{k+1}$

(B) $\frac{1}{k(k+m)} = \frac{1}{m}\left(\frac{1}{k} - \frac{1}{k+m}\right)$

(C) $\frac{1}{k(k+1)(k+2)} = \frac{1}{2}\left(\frac{1}{k(k+1)} - \frac{1}{(k+1)(k+2)}\right)$

64. The value of the expression $3 - \frac{1}{2} - \frac{1}{6} - \frac{1}{12} - \frac{1}{20} - \frac{1}{30} - \frac{1}{42} - \frac{1}{56}$ is equal to

(A) $\frac{17}{8}$ (B) 1

(C) 2 (D) none of these

65. The value of the expression $\frac{1}{3} + \frac{1}{15} + \frac{1}{35} + \frac{1}{63} + \frac{1}{99} + \frac{1}{143}$ is equal to

(A) 1 (B) $\frac{1}{13}$

(C) $\frac{6}{13}$ (D) none of these

66. The value of the expression $\frac{1}{5\times7} + \frac{1}{7\times9} + \frac{1}{9\times11} + \frac{1}{11\times13} + \frac{1}{13\times15}$ is equal to

(A) 1 (B) $\frac{1}{15}$

(C) $\frac{5}{11}$ (D) none of these

SPACE FOR ROUGH WORK

Paragraph 2 (For Q. 67 to 69):

Consider the equation $x^2 + y^2 + 65 = 2(7x + 4y)$, where x & y are real.

67. The value of $A = x^2 - xy - y^2 + 2$ is

(A) 7 (B) 1
(C) 0 (D) 3

68. Unit digit of A^{2014} is equal to

(A) 0 (B) 1
(C) 3 (D) 9

69. Number of solution of the equation $\sin x = \frac{A}{2}, x \in \left[0, \frac{\pi}{2}\right]$, is

(A) 1 (B) 0
(C) 2 (D) None of these

70. If $x = \frac{a}{b+c} = \frac{b}{a+c} = \frac{c}{a+b}$ then the value of X is

(A) $\frac{1}{2}$ (B) -1
(C) both (A) and (B) (D) None of these

71. Given $x^2 - x - 1 = 0$, then simplified polynomial form of $\frac{x^3 + x + 1}{x^5}$ is equal to

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

72. Find the value of x + y + z where x, y, z satisfies the system of equation $\begin{cases} \frac{x}{2} = \frac{y}{3} = \frac{z}{5} \\ x + 3y + 6z = 15 \end{cases}$.

(A) $\frac{150}{41}$ (B) 1
(C) $\frac{12}{41}$ (D) None of these

73. If $x^2 + 2x + 5$ is a factor of $x^4 + px^2 + q$, then the value of p + q =

(A) 1 (B) 0
(C) 15 (D) 31

74. Let α, β & γ be the roots of a cubic equation which satisfy the system of equation $\begin{cases} x + y = 5 \\ y + z = 6 \\ z + x = 7 \end{cases}$. Find the sum of the roots of the cubic equation.

(A) 9 (B) 5
(C) 7 (D) 6

SPACE FOR ROUGH WORK

75. ABCD is a rectangle, P is an inner point of the rectangle such that PA=3, PB=4, PC=5. Find PD.
(A) 6 (B) $3\sqrt{2}$
(C) 5 (D) None of these

76. From the point within an equilateral triangle, perpendiculars drawn to the three sides are 6cm, 7 cm and 8 cm respectively. The length of the side of the triangle is
(A) 12 (B) $15\sqrt{2}$
(C) $14\sqrt{3}$ a (D) None of these

77. If the centroid of a triangle is (1,4) and two of its vertices are (4,-3) and (-9,7) then the area of the triangle is
(A) 183 sq. units (B) $\frac{183}{2}$ sq. units
(C) 366 sq. units (D) $\frac{183}{4}$ sq. units

78. The ratio in which (4,5) divides the join of (2,3) and (7,8) is
(A) -2:3 (B) -3:2
(C) 3:2 (D) 2:3

79. If points (k, 2k), (-2,6) and (3,1) are collinear, then k =
(A) $\frac{3}{4}$ (B) $\frac{4}{3}$
(C) $\frac{5}{3}$ (D) $\frac{3}{5}$

80. In a Δ ABC, AD is the bisector of $\angle$ BAC. If AB=16 cm, BD=12 cm, DC=3 cm. Then find AC
(A) 4 cm (B) 12 cm
(C) 8 cm (D) 6 cm

81. Two circles C_1 & C_2 having centers and radius are A(0, 0), $r_1 = 1$ and B(1, 1), $r_2 = 2$ respectively. Then the maximum number of common tangents is
(A) 1 (B) 2
(C) 3 (D) 4

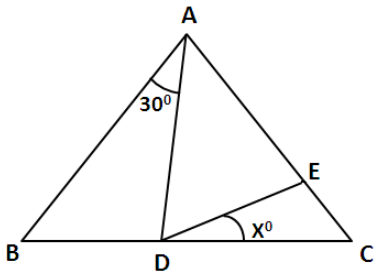
81. If four sides of a quadrilateral PQRS are tangential to a circle, then
(A) PR+PS=QS+RS (B) PQ+RS=QR+PS
(C) PQ+RS=PR+QS (D) PR+PS=QR+SQ

83. A solid sphere of radius 'r' is melted and cast into the shape of a solid cone of height 'r', the radius of the base of the cone is
(A) 2r (B) 3 r
(C) r (D) 4r

84. The algebraic sum of the deviations of the frequency distribution from its mean is
(A) always positive (B) always negative
(C) 0 (D) a non zero number

SPACE FOR ROUGH WORK

85. In the figure below AB=AC, $\angle$ BAD = 30°and AE=AD. Then $\angle$ CDE =



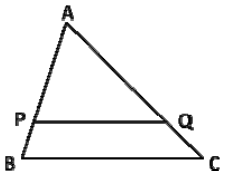
(A) 7.5° (B) 10°
(C) 15° (D) 20°

86. If the n^{th} term of an A.P. is given by a_n = 5n - 3, then the sum of first 10 terms is :
(A) 225 (B) 245
(C) 255 (D) 270

87. If $\sin 3\theta = \cos(\theta - 6°)$ where (3θ) and $(\theta - 6°)$ are both acute angles, then the value of θ is :
(A) 18° (B) 24°
(C) 36° (D) 30°

88. If the angle of depression of an object from a 75 m high tower is 30º, then the distance of the object from the tower is
(A) $25\sqrt{3}$ m (B) $50\sqrt{3}$ m
(C) $75\sqrt{3}$ m (D) 150 m

89. In the adjacent figure, P and Q are points on the sides AB and AC respectively of a triangle ABC. PQ is parallel to BC and divides the triangle ABC into 2 parts, equal in area. The ratio of PA : AB =



(A) 1 : 1 (B) $(\sqrt{2}-1):\sqrt{2}$
(C) $1:\sqrt{2}$ (D) $(\sqrt{2}-1):1$

90. If α, β are the roots of the equation $ax^2 + bx + c = 0$, then the quadratic equation whose roots are $\alpha+\beta, \alpha\beta$ is
(A) $a^2x^2 + a(b - c)x + bc = 0$ (B) $a^2x^2 + a(b - c)x - bc = 0$
(C) $ax^2 + a(b + c)x + bc = 0$ (D) $ax^2 + a(b + c)x - bc = 0$

SPACE FOR ROUGH WORK

FIITJEE

MAHARASHTRA SCIENCE TALENT SEARCH EXAMINATION

for students of Class X

Answers

1	2	3	4	5	6	7	8	9	10
C	**B**	**A**	**C**	**B**	**C**	**C**	**B**	**D**	**B**
11	12	13	14	15	16	17	18	19	20
C	**A**	**A**	**B**	**D**	**A**	**C**	**C**	**D**	**D**
21	22	23	24	25	26	27	28	29	30
B	**D**	**A**	**D**	**B**	**B**	**D**	**A**	**C**	**A**
31	32	33	34	35	36	37	38	39	40
D	**C**	**D**	**C**	**C**	**A**	**C**	**A**	**C**	**A**
41	42	43	44	45	46	47	48	49	50
C	**D**	**C**	**B**	**D**	**B**	**C**	**D**	**C**	**D**
51	52	53	54	55	56	57	58	59	60
A	**B**	**C**	**A**	**D**	**B**	**D**	**D**	**B**	**B**
61	62	63	64	65	66	67	68	69	70
A	**D**	**C**	**A**	**C**	**B**	**A**	**D**	**B**	**C**
71	72	73	74	75	76	77	78	79	80
D	**A**	**D**	**A**	**B**	**C**	**B**	**D**	**B**	**A**
81	82	83	84	85	86	87	88	89	90
B	**B**	**A**	**C**	**C**	**D**	**B**	**C**	**C**	**B**