FIITJEE NTSE STAGE-I (2018) (For Class X Students) (MAT)

Time: 120 Minutes **Max Marks: 100**

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you open the Question Booklet.

1. Use blue/black ball point pen only.
2. Write your Roll No. very clearly (only one digit in on block) on this booklet and on the **ANSWER SHEET**.
3. This test consists of 100 questions of one mark each. All the questions are **COMPULSORY.**
4. Answer to each question by darkening the correct alternative among the four choices on the **ANSWER SHEET.**

Example:

Correct way:

Q.No.	Alternatives
1	(1) (2) ● (4)

Wrong way:

Q.No.	Alternatives
1	(1 ✗) (2) (3 √) (4)

5. Separate sheet has been provided for rough work in this test booklet.

1. 4

By observation

x should be 5

$5+\frac{25}{5}=10$

$\therefore\ 5^2+\frac{50}{5^2}$ = 25 + 2 = 27

2. 1

$x + y = 3$

$x^2 + y^2 = 15$

we know that

$(x + y)^2 = x^2 + y^2 + 2xy$

$(3)^2 = 15 + 2xy$

$9 – 15 = 2xy$

$–6 = 2xy$

Now, $(x – y)^2 = (x + y)^2 – 4(xy)$

$= (3)^2 – 2(–6)$

$= 9 + 12 = 21$

3. 2

Let $\frac{a}{3}=\frac{b}{5}=\frac{c}{7}$ = 105

$\therefore$ a = 315, b = 525, c = 735

$= \frac{315\ +\ 525\ +\ 735}{525}=3$

4. 3

$(x + y)^2 = x^2 + y^2 + 2xy$

$(25)^2=425+2xy$

$2xy = 625 – 425 = 200$

$xy = 100$

5. 1

$\frac{0.64}{a^2}=64$

$\frac{0.64}{64}=a^2$

$\frac{64}{6400}=a^2$

$\sqrt{\frac{1}{100}}=a$

$\frac{1}{10}=a=0.1$

6. 2

Quotent = 20

Divisor = 20 × 30 = 600

Remainder = 600 ÷ 4 = 150

Divident = 600 × 20 × 20 + 150 = 12150

7. 4

$3^{a-2b} = 27$

$3^{a-2b} = 3^3$

$a - 2b = 3$ ……(i) [If $a^m = a^n$ then $m = n$]

$9^{a+b} = 3$

$3^{2a+2b} = 3$

$2a + 2b = 1$ ……(ii)

Adding eq. (i) and (ii)

$a - 2b + 2a + 2b = 4$

$3a = 4$

$a = \frac{4}{3}$ [Put the value of a in equation (i)]

$\frac{4}{3} - 2b = 3$

$\frac{4}{3} - \frac{3}{1} = 2b$

$\frac{4-9}{3} = 2b \;=\; -\frac{5}{6} = b$

Now, $-\frac{a}{b} = -\frac{\frac{4}{3}}{-\frac{5}{6}} = \frac{4}{3} \times \frac{6}{5} = \frac{8}{5}$

8. 4

$\sqrt{17 + x\sqrt{11}} = \sqrt{11} + \sqrt{6}$

S.B.S. (squaring both sides)

$17 + x\sqrt{11} = 11 + 6 + 2\sqrt{66}$

$17 + x\sqrt{11} = 17 + 2\sqrt{66}$

$x\sqrt{11} = 2\sqrt{66}$

$x = 2\sqrt{\frac{66}{11}} = 2\sqrt{6}$

$x^2 = 24$

9. 1

$\sqrt{0.02 \times 0.2 \times a} = 0.2 \times 0.2 \times \sqrt{b}$

$\sqrt{\frac{2}{100} \times \frac{2}{10} \times a} = \frac{2}{10} \times \frac{2}{10} \times \sqrt{b}$

$\frac{2}{10}\sqrt{\frac{a}{10}} = \frac{2}{10} \times \frac{2}{10} \times \sqrt{b}$

$\sqrt{\frac{a}{10}} = \frac{2}{10} \times \sqrt{b}$

$\frac{\sqrt{a}}{\sqrt{10}} = \frac{2 \times \sqrt{b}}{10}$

$\frac{\sqrt{a}}{\sqrt{b}} = \frac{2\sqrt{10}}{10}$

$\sqrt{\frac{a}{b}} = \sqrt{\frac{40}{100}}$

$\frac{a}{b} = 0.4$

10. 1

Sum of roots = $7-\sqrt{3}+7+\sqrt{3}=14$

Product of roots = $(7-\sqrt{3})(7+\sqrt{3})=49-3=46$

Quadratic equation kx^2 – (sum of roots)x + product of roots = 0

$x^2 - 14x + 46 = 0$

11. 2

In a triangle PQR

$\angle Q = 3\angle R = 2(\angle P + \angle R)$

We know that sum of angles of a triangle is 180°

$\angle P + \angle Q + \angle R = 180°$

$(\angle P + \angle R) + \angle Q = 180°$

$\frac{3}{2}\angle R + 3\angle R = 180°$

$9\angle R = 180° \times 2$

$\angle R = \frac{180\times 2}{9} = 40°$

Then $\angle Q = 3\angle R$

$= 3 \times 40 = 120°$

12. 2

$\frac{p}{q}=\frac{x+3}{x-3}$

Appling components and Dividends

$\frac{p+q}{p-q}=\frac{x+3+x-3}{x+3-x+3}$

$\frac{p+q}{p-q}=\frac{2x}{6}$

$\frac{p+q}{p-q}=\frac{x}{3}$

Again applying components and Dividends

$\frac{p+q+p-q}{p+q-p+q}=\frac{x+3}{x-3}$

$\frac{2p}{2q}=\frac{x+3}{x-3}$

Squaring both sides

$\frac{p^2}{q^2}=\frac{x^2+6x+9}{x^2-6x+9}$

$\frac{p^2+q^2}{p^2-q^2}=\frac{x^2+6x+9+x^2-6x+9}{x^2+6x+9-x^2+6x-9}$

Applying components and Dividends

$\frac{p^2+q^2}{p^2-q^2}=\frac{2x^2+18}{12x}=\frac{2(x^2+9)}{12x}$

Now, $\frac{p^2-q^2}{p^2+q^2}=\frac{6x}{x^2+9}$

13. 1

Perimeter of a square = 2(24 + 12) = 72

Side of square = $\frac{72}{4} = 18$

Area of square = 18 × 18 = 324

14. 1

$$\frac{\frac{1}{3}\pi(1)^2 \times h}{\frac{1}{3}\pi(2)^2 \times H} = \frac{2}{3}$$

$$\frac{h}{H} = \frac{8}{3} = 8:3$$

15. 3

x = 3y – 3

x – 2y – 6

∴ x = 24

y = 9

x + y = 24 + 9 = 33

16. 1

Let two numbers are x and y

According to question

(x – y) : (x + y) : xy

1 : 7 : 24

$(x - y)^2 = (x + y)^2 - 4xy$

$(1a)^2 = (7a)^2 - 4(24a)$

$a^2 = 49a^2 - 96a$

$48a^2 - 96a = 0$

48a(a – 2) = 0

a = 2

So product of the two numbers is 24 × 2 = 48.

17. 1

Arrange the given observations in ascending order

6, 7, 7, 7, 9, 9, 14, 15

Mode = 7

Range = 15 – 6 = 9

$$\text{Median} = \frac{\left(\frac{8}{2}\right)\text{term} + \left(\frac{8}{2}+1\right)\text{term}}{2}$$

$$= \frac{7+9}{2} = 8$$

$$\text{Now mean} = \frac{\text{median + mode + Range}}{3}$$

$$= \frac{8+7+9}{3} = \frac{24}{3} = 8$$

18. 4

Let income 300

Expenditure = 80% of 300 = 240

Income = $300 + 16\frac{2}{3}\%$ of 300 = 350

Expenditure = $240 + 37\frac{1}{2}\%$ of 240 = 330

Saving = $\frac{20}{350} \times 100 = 5\frac{5}{7}\%$

19. 3

Let cost of table = x

Cost of chair = y

$5x + 5y = 3110$

$x - y = 210$

$x = 520$

$y = 310$

$2x + 2y = 2(520 + 310) = 1660$

20. 2

$$5 = a + \frac{1}{1 + \frac{1}{6 + \frac{1}{2}}}$$

$$5 = a + \frac{1}{1 + \frac{1}{\frac{13}{2}}}$$

$$5 = a + \frac{1}{1 + \frac{2}{13}}$$

$$5 = a + \frac{1}{\frac{15}{13}}$$

$$5 = a + \frac{13}{15}$$

$$a = \frac{62}{15}$$

21. 4

Let the number $8 \times 7 = 56$

$56 \times \frac{7}{8} - 56 \times \frac{5}{7} = 9$

If difference is 9, then number = 56

If difference is 5, then number = $\frac{56 \times 5}{9} = \frac{280}{9}$

$\therefore 9 \times \frac{280}{9} = 280$

22. 3

Height of cone (h) = 24 cm

Base of cone (r) = 6 cm

Volume of sphere = volume of cone [$\because$ cone melted and reshape into a sphere]

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

$R^3 = \frac{6\times 6\times 24}{4}$

R = 6 cm

$\frac{1}{3}\pi\times 6^2\times 24 = \frac{4}{3}\pi r^3$

$r = 6$

$\therefore\ 4\pi r^2 = 144\pi$ sq. cm

23. 4

Let total work 60 unit

(LCM of 10, 12, 15)

Work done by P + Q = $\frac{60}{10} = 6$ unit/day

Work done by Q + R = $\frac{60}{15} = 4$ unit/day

Work done by R + P = $\frac{60}{20} = 3$ unit/day

Work done by P + Q + R = $\frac{6+4+3}{2} = \frac{13}{2}$ unit/day

Work done by R = $\frac{13}{2} - 6 = \frac{1}{2}$ unit/day

Time taken by R alone = $60 \div \frac{1}{2}$ = 120days

24. 3

$\sqrt{3}, \sqrt[3]{2}, \sqrt{2}, \sqrt[3]{4}$

$(\sqrt{3})^6, (\sqrt[3]{2})^6, (\sqrt{2})^6, (\sqrt[3]{4})^6$

27, 4, 8, 16

$\therefore\ \sqrt[3]{2}$ is smallest

25. 4

By options

8 R 8 P 8 S 8 Q 8 = 57

8 × 8 + 8 ÷ 8 – 8 = 57

26. 4

Quantity of milk = $60 \times \left(1 - \frac{12}{60}\right)^2$

$60 \times \frac{16}{25}$ = 38.4

27. 4

15 × 3 + 1 = 46

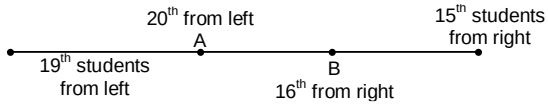
12 × 3 + 1 = 37

9 × 3 + 1 = 28

8 × 3 + 1 = 25

$\therefore$ 33 is different

28. 3



By observation
A's final position from left = 30
A's final position from right = 16
Total boys = 30 + 16 – 1 = 45

29. 1

Number of small cubes on each edges = $\frac{15}{3} = 5$

Small cubes have only one face = $6(5-2)^2 = 54$

30. 2

Let present age of son = x yrs
Age of father when his son born = 3x yrs
Now, present age of father = (3x + x) yrs
4x = 48
x = 12
4 yrs ago age of boy is (12 – 4) yrs
i.e., 8 yrs

31. 2

2 12 30 [56] 90 120
+10 +18 +26 +34 +42

[∵ 120 should be replaced with 132]
Or
$2^2 - 2 = 2$
$4^2 - 4 = 12$
$6^2 - 6 = 30$
$8^2 - 8 = 56$
$10^2 - 10 = 90$
$12^2 - 12 = 132$

32. 4

10 100 200 310 [430]
+90 +100 +110 +120

33. 4

0.5 2 4.5 8 12.5 [18]
+1.5 +2.5 +3.5 +4.5 +5.5

34. 4

109 74 46 25 11 [4]
–35 –28 –21 –14 –7

35. 4

$\frac{2}{3}, \frac{4}{7}, \frac{?}{?}, \frac{11}{21}, \frac{16}{31}$

Number are 2, 4, ?, 11, 16
Pattern +2, +3, +4, +5
So answer is 7
Denominator's are 3, 7, ?, 21, 31
Pattern +4, +6, +8, +10
So, answer is 13

36. 3

Total apples in a basket = 12 × 12 = 144 [1 dozen = 12 things]
Two dozen are added,
Now, total apples = 144 × 24 = 168
Ten apples spoil and are removed
Now, remaining apples are 168 – 10 = 158
Remaining apples are transferred equally into two baskets
Then each basket have $\frac{158}{2} = 79$

37. 2

Time between 8 and 9 will the hands of a clock be together is
(8 × 30) × $\frac{2}{11}$ min past 8 o'clock
i.e., $\frac{480}{11}$ min past 8 o'clock
[between h to (h + 1) hours $\rightarrow$ hand of a clock will be together]
[$\because$ 30h × $\frac{2}{11}$ min past h hour]
$43\frac{7}{11}$ min past 8 o'clock

38. 4

9	A	12
B	10	7
8	C	11

Sum of each column, each row and diagonal is same
So, sum of diagonal = 9 + 10 + 11 = 30
Hence,
9 + 8 + B = 30
B = 13
and
9 + A + 12 = 30
A = 9
8 + C + 11 = 30
C = 11

39. 3

$$\frac{7^{n+3} + 14 \times 7^{n+4}}{7^{n+3}}$$
$$= \frac{7^{n+3}(1 + 14 \times 7')}{7^{n+3}}$$
= 1 + 98 = 99

40. 1

$$\tan x = 5 - \sqrt{3}$$
$$\cot x = \frac{1}{\tan x} = \frac{1}{5-\sqrt{3}} \times \frac{5+\sqrt{3}}{5+\sqrt{3}}$$
$$= \frac{5+\sqrt{3}}{(5)^2 - (\sqrt{3})^2} = \frac{5+\sqrt{3}}{22}$$
Now, 22 tan (90 – x) = 22 × cot x
$$= 22 \times \frac{5+\sqrt{3}}{22} = (5+\sqrt{3})$$

41. 4

$a = \frac{1}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{2+\sqrt{3}}{1}$

Now, $a^2 = (2+\sqrt{3})^2 = (2)^2 + (\sqrt{3})^2 + 2(2)(\sqrt{3})$

$= 4 + 3 + 4\sqrt{3}$

$= 7 + 4\sqrt{3}$

$b = \frac{1}{2+\sqrt{3}} \times \frac{2-\sqrt{3}}{2-\sqrt{3}} = \frac{2-\sqrt{3}}{1}$

and, $b^2 = (2-\sqrt{3})^2 = (2)^2 + (\sqrt{3})^2 - 2(2)(\sqrt{3})$

$= 4 + 3 - 4\sqrt{3}$

$= 7 - 4\sqrt{3}$

$7a^2 + 11ab = 7b^2$

$= 7a^2 - 7b^2 + 11ab$

$= 7(a^2 - b^2) + 11ab$

$= 7(8\sqrt{3}) + 11(1)$

$= 56\sqrt{3} + 11$

42. 1

Let total capacity of the tank (LCM of 12, 15 and 10) = 60 litres

A can fill a tank in 12 minutes

i.e., In 1 minute A can fill = 5 litre

B can fill a tank in 15 minutes

i.e., In 1 minute B can fill = 4 litre

C can empty a tank in 10 minutes

i.e., in 1 minute C can empty = 6 litre

If all pipes are opened simultaneously then A, B and C fill (in 1 minute) = (5 + 4 – 6) litre

Now If all pipes are opened simultaneously then in

$\frac{60}{3}$ = 20 minutes

they fill the tank.

43. 1

Principle = Rs. P

Rate = 3% p.a

Time = t years

Simple interest = $P \times \frac{3t}{100}$

Amount = $P + \frac{P \times 3t}{100}$

$P + \frac{3Pt}{100} = 800$

$P\left(1 + \frac{3t}{100}\right) = 100$ .....(i)

Principle = Rs. P

Rate = 5% p.a.

Time = t year

Simple interest = $P \times \frac{5t}{100}$

Amount = $P \times \frac{5Pt}{100}$

$P + \frac{5Pt}{100} = 1000$

$P\left(1 + \frac{5t}{100}\right) = 1000$ .....(ii)

Dividing eq. (ii) by (i)

$\frac{P\left(1 + \frac{5t}{100}\right)}{P\left(1 + \frac{3t}{100}\right)} = \frac{1000}{800}$

$4+\frac{20t}{100}=5+\frac{15t}{100}$

$\frac{20t}{100}-\frac{15t}{100}=\frac{5t}{100}=1$

t = 20 years

Now, $P\left(1+\frac{3\times 20}{100}\right)=800$

$P\left(\frac{8}{5}\right)=800$

$P=\frac{800\times 5}{8}$

P = Rs. 500

44. 1

$x^2 - 2x - 1 = 0$

If a and b are roots of $x^2 - 2x - 1 = 0$

In the quadratic equation $ax^2 + bx + c = 0$

Then sum of roots (a + b) = –(–2) = 2

[$\because$ sum of roots = $\frac{\text{coeff. of } x}{\text{coeff. of } x^2}$]

and product of roots ab = –1

[$\because$ product of roots = $\frac{\text{constant term}}{\text{coeff. of } x^2}$]

Now $a^2b + ab^2 = ab(a + b)$

= (–1)(2) = –2

45. 3

$k=\frac{20}{100}\times\frac{60}{100}\times 100000$

k = 12,000

46. 1

$\frac{5}{100}\times\frac{60}{100}\times 100000$

= 3000

47. 3

$\frac{15}{100}\times\frac{60}{100}\times 100000$

= 9000

48. 2

WB = $\frac{60}{100}\times\frac{20}{100}\times 100000$

= 12,000

M = $\frac{5}{100}\times\frac{20}{100}\times 100000$

= 10000

Ratio = 12000 : 1000

= 12 : 1

49. 3

WB = $\frac{20}{100} \times \frac{20}{100} \times 100000$

= 40000

N = $\frac{5}{100} \times \frac{20}{100} \times 100000$

= 1000

Difference = 4000 – 1000 = 3000

50. 2

The number of ways in which 6 students can be seated at a round table is (6 – 1)! = 51

5 × 4 × 3 × 2 × 1 = 120 ways

51. …….

ABCDEFG ZYXWUVT BCDEF YXWVU CDE XWV W D

The above pattern should be followed.

Therefore incorrect question.

52. 3

R > P > S > Q > T

53. 3

As 6th to the left of 19th from the left end is W

54. ✶

No such consonants are there.

All option are incorrect.

55. 2

7 M 4 P J V 1 8 3 E W 2 Q 16 T A 8 Z 15 F U 9 H N

Solutions (Q. 56 to 60):

Days	Name of Person	Perform in Stage shows
Monday	D	Speech
Tuesday	A	Monologue
Wednesday	F	Dance
Thursday	B	Play
Friday	G	Mimicry
Saturday	C	Debate
Sunday	E	Music

56. 2

57. 4

58. 1

59. 4

60. 4

Solutions (Q. 61 to 63):

61. 3

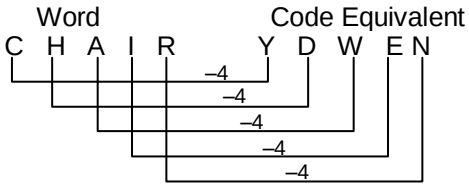
By observation

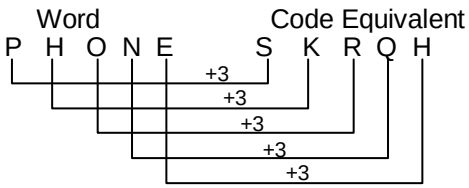
62. 1
By observation

63. 2
By observation

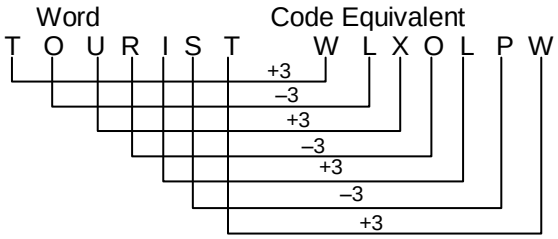
64. 2
By observation

Solutions (Q. 65 to 67):

(A)


(B)


(C) TROUPE $\longrightarrow$ GILFKV
Each letter in the word is replaced by the letter which occupies the same position from the other end of the alphabet to obtain the code.

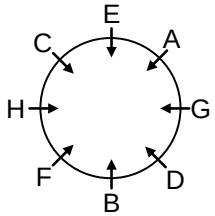
(D)


65. 2
By observation

66. 1
By observation

67. ✶
QLFIMZQ $\rightarrow$ last Q replaced by O.
Question incorrect

Solutions (Q. 68 to 70):



68. 2

69. 1

70. 4

71. ✶
All option are incorrect

72. 4
BHAGAT, BHAGIRATH, BHAGWAN, BHAGWAT

73. 1
As M is the father of S and P is the daughter of S
So, P is the grand daughter of M.

74. 3
$Z = 26 \times 2 = 52$
$ACT = 1 + 3 + 20 = 24 \times 1$
$\therefore BAT = 2 + 1 + 20 = 23 \times 2 = \boxed{46}$

75. 3
$20 \times 3 = 60 \times 3 = 180$
$4 \times 5 = 20 \times 5 = 100$
$7 \times 7 = 49 \times 7 = 343$

76. 4
$1 \leftrightarrow 5$
$2 \leftrightarrow 6$
$3 \leftrightarrow 4$

77. ✶
There are 15 straight lines.
All option are incorrect.

78. 1
By observation

79. 3
By observation

80. 4
KILOMETER after replacement
Word $\rightarrow$ EEIL$\boxed{N}$MOSU

81. 1
By observation

82. 2
By observation

83. ✶
All option are incorrect.

84. 2
$I \rightarrow 4 \times 2 \times 3 = 24 - 4 = 20$
$II \rightarrow 5 \times 4 \times 2 = 40 - 12 = 28$
$III \rightarrow 3 \times 2 \times 4 = 24 - 4 = 20$
Total $= 20 + 28 + 20 = \boxed{68}$

85. 2
We have total number of squares = $8^2 + 7^2 + 6^2 + 5^2 + 4^2 + 3^2 + 2^2 + 1^2$
= 64 + 49 + 36 + 25 + 16 + 9 + 4 + 1
= 204

86. ✶
All option are incorrect.

87. 4
By observation

88. 4
By observation

89. 2
By observation

90. 1
By observation

91. 2
By observation

92. ✶
All option are incorrect.

93. 4
By observation

94. ✶
All option are incorrect.

95. 3
By observation

96. ✶
All option are incorrect.

97. 4
By observation

98. 1
By observation

99. 2
By observation

100. 4
By observation

ANSWER KEY

1.	**4**	2.	**1**	3.	**2**	4.	**3**
5.	**1**	6.	**2**	7.	**4**	8.	**4**
9.	**1**	10.	**1**	11.	**2**	12.	**2**
13.	**1**	14.	**1**	15.	**3**	16.	**1**
17.	**1**	18.	**4**	19.	**3**	20.	**2**
21.	**4**	22.	**3**	23.	**4**	24.	**3**
25.	**4**	26.	**4**	27.	**4**	28.	**3**
29.	**1**	30.	**2**	31.	**2**	32.	**4**
33.	**4**	34.	**4**	35.	**4**	36.	**3**
37.	**2**	38.	**4**	39.	**3**	40.	**1**
41.	**4**	42.	**1**	43.	**1**	44.	**1**
45.	**3**	46.	**1**	47.	**3**	48.	**2**
49.	**3**	50.	**2**	51.	✶	52.	**3**
53.	**3**	54.	✶	55.	**2**	56.	**2**
57.	**4**	58.	**1**	59.	**4**	60.	**4**
61.	**3**	62.	**1**	63.	**2**	64.	**2**
65.	**2**	66.	**1**	67.	✶	68.	**2**
69.	**1**	70.	**4**	71.	✶	72.	**4**
73.	**1**	74.	**3**	75.	**3**	76.	**4**
77.	✶	78.	**1**	79.	**3**	80.	**4**
81.	**1**	82.	**2**	83.	✶	84.	**2**
85.	**2**	86.	✶	87.	**4**	88.	**4**
89.	**2**	90.	**1**	91.	**2**	92.	✶
93.	**4**	94.	✶	95.	**3**	96.	✶
97.	**4**	98.	**1**	99.	**2**	100.	**4**