FIITJEE Solutions **to**
NTSE-I (2015)
(For Class X Students)
(MAT)

Time: 45 Minutes   **Max Marks: 50**

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 50 questions of one mark each. All the questions are **COMPULSORY.**

4.   Answer to each question by filling the correct alternative among the four choices on the answer sheet.

Example:

Q.No.	Alternatives			
Correct way: 1	(1)	(2)	●	(4)
Q.No.	Alternatives			
Wrong way: 1	(X1)	(—2)	(3 √)	(◯4)

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

1. 2
Sol. $p^2 + q^2 = 2pq$

$p^2 + q^2 - 2pq = 0$

$(p - q)^2 = 0$

$p = q$

$\left(\dfrac{p}{q}\right)^{23} + \left(\dfrac{q}{p}\right)^{7}$

$= 1 + 1 = 2$

2. 4
Sol. Let distance be d.

$\therefore \dfrac{d}{4} - \dfrac{d}{5} = \dfrac{36}{60}$

$\dfrac{d}{20} = \dfrac{36}{60}$

d = 12 km

$\therefore$ Actual time to reach on time = $\dfrac{12}{4} - 1 = 2$ hrs

$\therefore$ Required speed = 6 km/hr

3. 2
Sol. 3A=4B,   2C=3B

$\dfrac{A}{B} = \dfrac{4}{3} = \dfrac{8}{6}, \dfrac{C}{B} = \dfrac{3}{2} = \dfrac{9}{6}$

$\therefore$ A:B:C=8:6:9

4. 2

$\dfrac{\text{hcf}(6,4,2)}{\text{lcm}(5,15,5)}$

= 2/15

5. 3
Sol. $7290 = x\left(1 - \dfrac{10}{100}\right)^3$

$7290 = x\left(\dfrac{9}{10}\right)^3$

$\dfrac{7290 \times 1000}{729} = x$

x = Rs 10000

6. 4
Sol. $\dfrac{1}{\sqrt{2}+\sqrt{3}-\sqrt{5}} + \dfrac{1}{\sqrt{2}-\sqrt{3}-\sqrt{5}}$

$\dfrac{\sqrt{2}-\sqrt{3}-\sqrt{5}+\sqrt{2}+\sqrt{3}-\sqrt{5}}{\left(\sqrt{2}-\sqrt{5}+\sqrt{3}\right)\left(\sqrt{2}-\sqrt{5}-\sqrt{3}\right)}$

$$= \frac{2\left(\sqrt{2}-\sqrt{5}\right)}{\left(\sqrt{2}-\sqrt{5}\right)^2-\left(\sqrt{3}\right)^2}$$

$$= \frac{2\left(\sqrt{2}-\sqrt{5}\right)}{-2\sqrt{10}-3}$$

$$= \frac{\left(\sqrt{2}-\sqrt{5}\right)^7 2}{4-2\sqrt{10}}$$

$$= \frac{2\left(\sqrt{2}-\sqrt{5}\right)}{2 2\left(2-5\right)} = \frac{1}{2}$$

7. 4

Sol. $3^{2x-y} = 3^{x+y} = \sqrt{27} = 3^{3/2}$

$2x - y = x + y = \dfrac{3}{2}$

$2x - y = \dfrac{3}{2}$

And $x + y = \dfrac{3}{2}$

$\therefore 3^{x-y} = 3^{1/2} = \sqrt{3}$

8. 1

Sol. Speed of A = a m/s
Speed of B = b m/s

$\therefore \dfrac{100}{b} - \dfrac{100}{a} = 5$ and $\dfrac{80}{b} = \dfrac{100}{a}$

$= \dfrac{b}{a} = \dfrac{5}{4} \Rightarrow b = \dfrac{4a}{5}$

$\dfrac{100}{4a} - \dfrac{100}{a} = 5$

5

Solving, we get a = 5 m/s

9. 3

Sol. $\sqrt{11\sqrt{11\sqrt{11\sqrt{11...\infty}}}} = x$

$x^2 = 11x$

$x^2 - 11x = 0$

$x(x - 11) = 0$

$x \neq 0, \Rightarrow x = 11$

10. 3

Sol. Since there are only odd multiples of 5, unit digit in the product will be 5.

11. 1

Sol. Final change = reduction by $\left(\dfrac{12^2}{100}\right)\%$

= reduction by 1.44%

12.   2

Sol.   Let the remainder be ax + b

$$f(1) \Rightarrow 2 = a + b$$

$$f(-1) \Rightarrow 0 = -a + b$$

$$\Rightarrow 2b = 2 \, b$$

$$= 1, a = 1$$

$$\therefore \text{ Remainder} = x + 1$$

13.   3

Sol. $\dfrac{x + 7}{2x} = \dfrac{2x + 10}{3x}$ {basic proportionality theorem}

$$\Rightarrow 3x + 21 = 4x + 20$$

$$\Rightarrow x = 1$$

14.   2

Sol.

13%

(77 – x)%   x%   (66 – x)%

English   Math
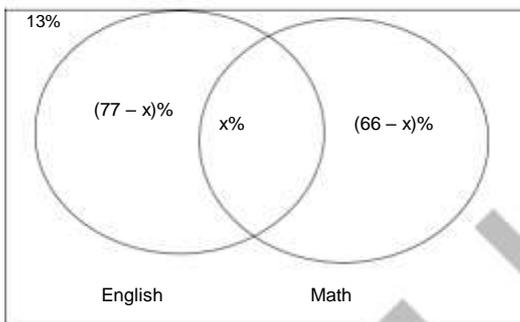
$$13 + 77 - x + x + 66 - x = 100$$

$$156 - x = 100$$

$$x = 56$$

$$\therefore \ 56\% \text{ of total} = 784$$

$$\text{Total} = \frac{784 \times 100}{} = 1400$$

15.   2

Sol. $\dfrac{160}{2 \times 7} + \dfrac{160}{7 \times 12} + \dfrac{160}{12 \times 17} + ... \dfrac{160}{27 \times 32}$

$$= 32 \left[\frac{5}{2 \times 7} + \frac{5}{7 \times 12} + ... + \frac{5}{27 \times 32} \right]$$

$$= 32 \left[\frac{1}{2} - \frac{1}{7} + \frac{1}{7} - \frac{1}{12} + ... + \frac{1}{27} - \frac{1}{32} \right]$$

$$= 32 \left[\frac{1}{2} - \frac{1}{32} \right]$$

$$= 32 \left[\frac{16 - 1}{32} \right]$$

$$= 15$$

16.   1

Sol. By rule of allegation

$$\begin{array}{ccc} 150 & & x \\ & \diagdown\diagup & \\ & 120 & \\ & \diagup\diagdown & \\ 4 & & 3 \end{array}$$
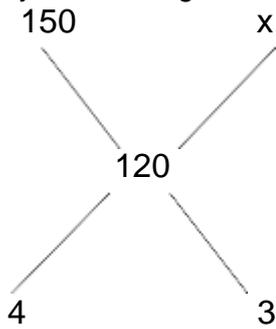
$$\frac{150-120}{120-x} = \frac{3}{4}$$

$$\Rightarrow \frac{30}{120-x} = \frac{3}{4}$$

$$\Rightarrow 120 - x = 40$$

$$\Rightarrow x = 80$$

17. 2

Sol. $\dfrac{8}{3/5} = \dfrac{x}{2/5}$

x = 16/3 hours

= 5 hours 20 minutes

18. 1

Sol. $x\left[\left[\left(1+\dfrac{1}{x}\right)\left(1+\dfrac{1}{x+1}\right)\left(1+\dfrac{1}{x+2}\right)\right]-1\right]$

$= x\left[\dfrac{x+1}{x}\cdot\dfrac{x+2}{x+1}\cdot\dfrac{x+3}{x+2} - 1\right]$

$= x\left[\dfrac{x+3}{x}-1\right]$

$= x\left[\dfrac{x+3-x}{x}\right]$

= 3

19. 3

Sol. tan x = ½

$\dfrac{\cos x + 2\sin x}{\cos x - \sin x} = \dfrac{1+\dfrac{2\sin x}{\cos x}}{1-\dfrac{\sin x}{\cos x}}$ (dividing numerator and deno min ator by cos x)

$= \dfrac{1 + 2\tan x}{1 - \tan x}$

$= \dfrac{1+1}{1-\dfrac{1}{2}} = 4$

20. 4

Sol. EC=BC

∠BCE = 90 + 60 = 150°

∠ CEB = ∠CBE =

15° ⇒ x = 45°

21.   2

Sol.
$$\frac{(3.75)^2 + (1.25)^2 - 2 \times (3.75)(1.25)}{(3.75)^2 - (1.25)^2}$$

$$= \frac{3.75 - 1.25}{3.75 + 1.25} = \frac{2.5}{5} = \frac{1}{2} = 0.5$$

$$\left[\because \frac{(a-b)^2}{a^2 - b^2} = \frac{a-b}{a+b} \right]$$

22.   1

Sol.   Let my present age be x
Difference of ages = 31 − 8 = 23
∴ father = x + 23
x + 23 = 2 x
x = 23

23.   2

Sol.   Number of digits used = $1 \times 9 + 2 \times 90 + 3 \times 101 = 492$

$\quad\quad\quad\quad\quad\quad\quad\quad (\quad) \ (\quad\quad) \ (\quad\quad\quad)$

24.   3

Sol. $x + \dfrac{1}{x} = 2N$

$x^2 + \dfrac{1}{x^2} + 2 = 4N^2$

$x^2 + \dfrac{1}{x^2} = 4N^2 - 2$

∴ mean of x^2 and $x^{1}{}_{2} = 2^{1} \left(4N^2 - 2 \right) = 2N^2 - 1$

25.   3

Sol. $100^{1/6}, 12^{1/3}, 3^{1/2}$

$\Rightarrow (100)^{1/6}, (12^2)^{1/6}, (3^3)^{1/6}$

$\Rightarrow 100^{1/6}, 144^{1/6}, 27^{1/6}$

∴ greatest = $12^{1/3} = \sqrt[3]{12}$

26.   2

Sol.
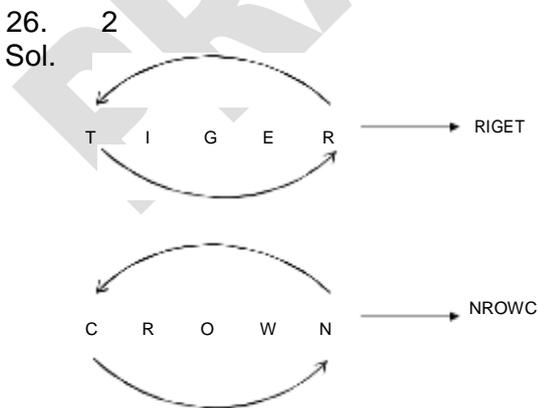
27.   1

Sol.   The pattern is +2, +1, –1, +2, –2 respectively of letters as in the English Alphabet.

28.   1
Sol.   3 times ____   ____   ____
       29731737713317385713771 73906

29.   1
Sol.   25th December 2008 → Thursday
       1st January 2009 → Thursday
       1st January 2010 → Friday

30.   3
Sol.   The net of the cube that is formed is like

	Brown	
Red	Black	Blue
	White	
	Green	
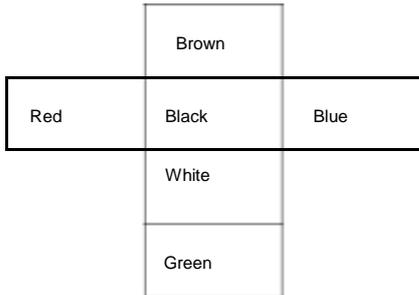
       ∴ Brown is opposite white.

31.   1

       ⇒ opposite to 3 → 6
       adjacent to 4 → 3, 6, 5, 2
       ⇒ opposite to 4 → 1
       ⇒ opposite to 5 → 2

32.   3
Sol.   2 is opposite to 5
       So, sum of the two numbers is 7.

33.   1

       ⇒ R is daughter of Q

34.   2
Sol.
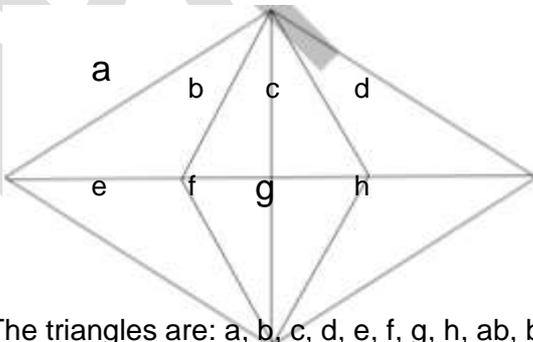
       The triangles are: a, b, c, d, e, f, g, h, ab, bc, cd, ef, fg, gh, bf, cg, abc, bcd, efg, fgh, abcd, efgh, abef, cdgh

35. 1

Sol.
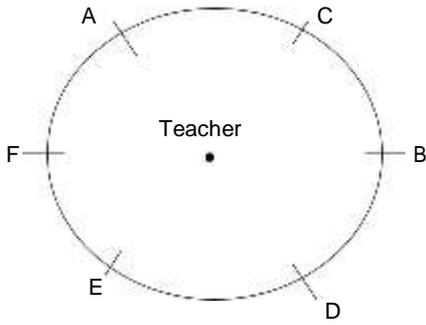
∴ A is to the right of C.

36. 3

∴ Number of students = 22 + 12 − 1 = 33

37. 3

Sol.
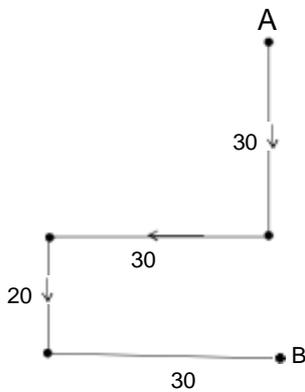
The distance between A and B = 30 + 20 = 50 m.

38. 1

⇒ Naresh entered at 12:40
⇒ meeting time = 12:10

39. 2

Sol. By observation.

40. 3

Sol. By observation.

41. 3

Sol. Pattern is:-
a x b = (sum of a, b) (product of a, b)

42. 2

Sol. $15 \times 3 \div 5 + 5 - 2$
⇒ $15 \div 3 + 5 - 5 \times 2$
$= 5 + 5 - 10 = 0$

43. 3

Sol. The required region is the region outside square and triangle but common to rectangle and circle.

44. 2
Sol. $11^2 - 9^2 = 40$
Similarly, answer = $25^2 - 21^2$
= 184

45. 3
Sol. 7 x 8 = 56
15 x 4 = 60
7 x 4 = 28
$\Rightarrow$ missing number = 8 x 15 = 120

46. 2
Sol. 1 x 3, 3 x 5, 5 x 7, <u>7 x 9</u>, 9 x 11, 11 x 13

47. 4
Sol. In all other figures, the two inner elements are identical but rotated.

48. 1
Sol. In all except 301, difference of first two digits is the third digit.

49. 4
Sol. The pattern is $a + b = \sqrt{a} + \sqrt{b}$
$\therefore$ Answer = 16 + 27 = 43

50. 4

$\Rightarrow 40 \div 8 \times 10 - 12 + 16$
= 54