

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	<input type="radio"/> 1 <input type="radio"/> 2 <input checked="" type="radio"/> <input type="radio"/> 4
Q.No.	Alternatives
Wrong way: 1	<input checked="" type="radio"/> 1 <input checked="" type="radio"/> 2 <input checked="" type="radio"/> 3 ✓ <input checked="" type="radio"/> 4

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

**NTSE
STAGE I (MAT)
HINTS & SOLUTIONS**

1. 2
Sol. $p^2 + q^2 = 2pq$
 $p^2 + q^2 - 2pq = 0$
 $(p - q)^2 = 0$
 $p = q$
 $\left(\frac{p}{q}\right)^{23} + \left(\frac{q}{p}\right)^7$
 $= 1 + 1 = 2$

2. 4
Sol. Let distance be d.
 $\therefore \frac{d}{4} - \frac{d}{5} = \frac{36}{60}$
 $\frac{d}{20} = \frac{36}{60}$
 $d = 12 \text{ km}$
 $\therefore \text{Actual time to reach on time} = \frac{12}{4} - 1 = 2 \text{ hrs}$
 $\therefore \text{Required speed} = 6 \text{ km/hr}$

3. 2
Sol. $3A = 4B, \quad 2C = 3B$
 $\frac{A}{B} = \frac{4}{3} = \frac{8}{6}, \frac{B}{C} = \frac{2}{3} = \frac{6}{9}$
 $\therefore A : B : C = 8 : 6 : 9$

4. 2
Sol. $\text{HCF} = \frac{\text{hcf}(6, 4, 2)}{\text{lcm}(5, 15, 5)}$
 $= 2/15$

5. 3
Sol. $7290 = x \left(1 - \frac{10}{100}\right)^3$
 $7290 = x \left(\frac{9}{10}\right)^3$
 $\frac{7290 \times 1000}{729} = x$
 $x = \text{Rs } 10000$

6. 4
Sol. $\frac{1}{\sqrt{2} + \sqrt{3} - \sqrt{5}} + \frac{1}{\sqrt{2} - \sqrt{3} - \sqrt{5}}$
 $= \frac{\sqrt{2} - \sqrt{3} - \sqrt{5} + \sqrt{2} + \sqrt{3} - \sqrt{5}}{(\sqrt{2} - \sqrt{5} + \sqrt{3})(\sqrt{2} - \sqrt{5} - \sqrt{3})}$

$$\begin{aligned}
 &= \frac{2(\sqrt{2}-\sqrt{5})}{(\sqrt{2}-\sqrt{5})^2 - (\sqrt{3})^2} \\
 &= \frac{2(\sqrt{2}-\sqrt{5})}{7-2\sqrt{10}-3} \\
 &= \frac{2(\sqrt{2}-\sqrt{5})}{4-2\sqrt{10}} \\
 &= \frac{2(\sqrt{2}-\sqrt{5})}{2\sqrt{2}(\sqrt{2}-\sqrt{5})} = \frac{1}{\sqrt{2}}
 \end{aligned}$$

7. 4

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

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

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

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

$x = 1, y = \frac{1}{2}$

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

8. 1

Sol. Speed of A = a m/s

Speed of B = b m/s

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

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

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

Solving, we get a = 5 m/s

9. 3

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

$$x^2 = 11x$$

$$x^2 - 11x = 0$$

$$x(x - 11) = 0$$

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

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 $\left(\frac{12^2}{100}\right)\%$

= 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

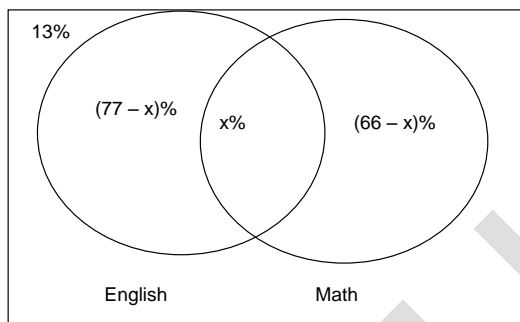
Sol. $\frac{x+7}{2x} = \frac{2x+10}{3x}$ {basic proportionality theorem}

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

$$\Rightarrow x = 1$$

14. 2

Sol.



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

$$156 - x = 100$$

$$x = 56$$

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

$$\text{Total} = \frac{784 \times 100}{56} = 1400$$

15. 2

Sol.

$$\frac{160}{2 \times 7} + \frac{160}{7 \times 12} + \frac{160}{12 \times 17} + \dots + \frac{160}{27 \times 32}$$

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

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

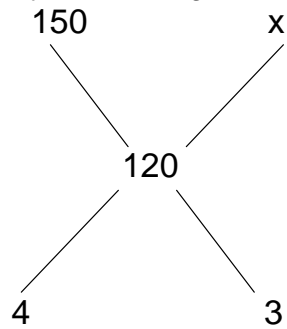
$$= 32 \left[\frac{1}{2} - \frac{1}{32} \right]$$

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

$$= 15$$

16. 1

Sol. By rule of allegation



$$\frac{150 - 120}{120 - x} = \frac{3}{4}$$
$$\Rightarrow \frac{30}{120 - x} = \frac{3}{4}$$
$$\Rightarrow 120 - x = 40$$
$$\Rightarrow x = 80$$

17. 2

Sol. $\frac{8}{3/5} = \frac{x}{2/5}$
 $x = 16/3$ hours
 $= 5$ hours 20 minutes

18. 1

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

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

19. 3

Sol. $\tan x = \frac{1}{2}$

$$\frac{\cos x + 2 \sin x}{\cos x - \sin x} = \frac{1 + \frac{2 \sin x}{\cos x}}{1 - \frac{\sin x}{\cos x}} \text{ (dividing numerator and denominator by } \cos x \text{)}$$
$$= \frac{1 + 2 \tan x}{1 - \tan x}$$
$$= \frac{1+1}{1-\frac{1}{2}} = 4$$

20. 4

Sol. $EC = BC$
 $\angle BCE = 90 + 60 = 150^\circ$
 $\angle CEB = \angle CBE = 15^\circ$
 $\Rightarrow x = 45^\circ$

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 = $31 - 8 = 23$
 \therefore father = $x + 23$
 $x + 23 = 2x$
 $x = 23$

23. 2

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

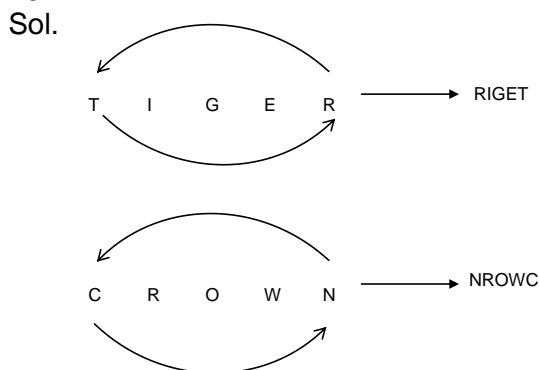
24. 3

Sol. $x + \frac{1}{x} = 2N$
 $x^2 + \frac{1}{x^2} + 2 = 4N^2$
 $x^2 + \frac{1}{x^2} = 4N^2 - 2$
 \therefore mean of x^2 and $\frac{1}{x^2} = \frac{1}{2}(4N^2 - 2) = 2N^2 - 1$

25. 3

Sol. $100^{1/6}, 12^{1/3}, 3^{1/2}$
 $\Rightarrow (100)^{1/6}, (12^2)^{1/6}, (3^3)^{1/6}$
 $\Rightarrow 100^{1/6}, 144^{1/6}, 27^{1/6}$
 \therefore greatest = $12^{1/3} = \sqrt[3]{12}$

26. 2



27. 1

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

28. 1

Sol. 3 times

2 9 7 3 1 7 3 7 7 1 3 3 1 7 3 8 5 7 1 3 7 7 1 7 3 9 0 6

29. 1

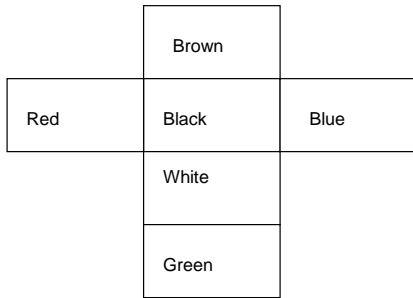
Sol. 25th December 2008 → Thursday

1st January 2009 → Thursday

1st January 2010 → Friday

30. 3

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



∴ Brown is opposite white.

31. 1

Sol. adjacent to 3 → 1, 5, 4, 2

⇒ 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.

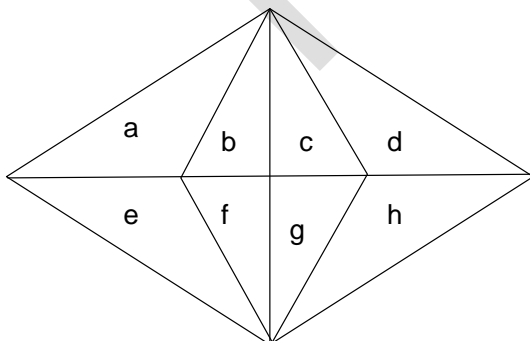
33. 1

Sol. Q is P's husband and R is P's daughter.

⇒ R is daughter of Q

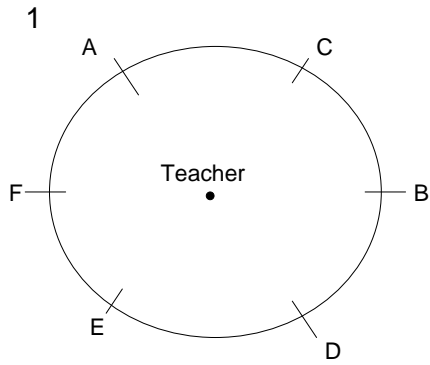
34. 2

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.
Sol.



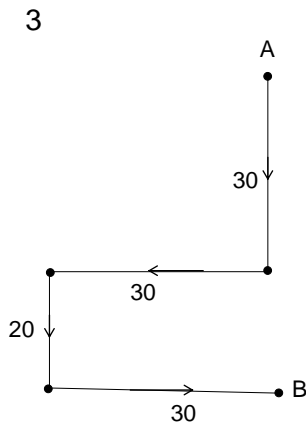
∴ A is to the right of C.

36.
Sol.

3
Puru's position = 12^{th} from right = 22^{nd} from left.

∴ Number of students = $22 + 12 - 1 = 33$

37.
Sol.



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

38.
Sol.

1
Dinesh entered at 12:20.
⇒ Naresh entered at 12:40
⇒ meeting time = 12:10

39.
Sol.

2
By observation.

40.
Sol.

3
By observation.

41.
Sol.

3
Pattern is:-
 $a \times b = (\text{sum of } a, b) (\text{product of } a, b)$

42.
Sol.

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

43.
Sol.

3
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. $7 \times 8 = 56$

$15 \times 4 = 60$

$7 \times 4 = 28$

\Rightarrow missing number = $8 \times 15 = 120$

46. 2

Sol. $1 \times 3, 3 \times 5, 5 \times 7, \underline{7 \times 9}, 9 \times 11, 11 \times 13$

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

Sol. $40 \text{ R } 8 \text{ W } 10 \text{ T } 12 \text{ P } 16$

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

= 54