NMOT TEST PAPER_22-12-2017
JUNIOR GROUP_VIII & X
ANSWER-KEY SOLUTIONS

Ques	1	2	3	4	5	6	7	8	9	10
Ans.	A	C	A	B	C	B	A	D	A	D
Ques	11	12	13	14	15	16	17	18	19	20
Ans.	A	C	D	B	C	7	3	2	5	5

1. ar $\Delta DFE = 6 = \frac{1}{2} \times 4 \times EF$ $\Rightarrow$ $EF = 3$ $\therefore$ DE = 5 unit

from ΔDEA $x^2 + 25 = (y + 3)^3$ .... (1)

In ΔADF $y^2 + 16 = x^2$ .... (2)

from (1) & (2) $y = \frac{16}{3}$ $x = \frac{20}{3}$

Let G in mid pt of EC, then DE = EG = GC

$DE = \frac{1}{2}$ EC, we have DC = DE + EG + GC = 5 + 5 + 5 = 15 unit

Area of ABCD = $15 \times \frac{20}{3}$ = 100 Square unit.

2. $13^4 - 11^4 = (13^2 - 11^2)(13^2 + 11^2) = 290\,(13 - 11)(13 + 11) = 145\,(2)\,(24)\,(2) = 145.3.\,2^5$

3. $f(x) = \frac{9^x}{9^x + 3}$

$f(1-x) = \frac{9^{1-x}}{9^{1-x}+3} + \frac{9}{3(9^x+3} = \frac{3}{9^x+3}$

$f(x) + f(1-x) = \frac{9^x}{9^x+3} + \frac{3}{9^x+3} = \frac{9^x}{9^x+3} = 1$

$\therefore$ $f\left(\frac{1}{2016}\right) + f\left(\frac{2015}{2016}\right) = 1$

$f\left(\frac{2}{2016}\right) + f\left(\frac{2014}{2016}\right) = 1$

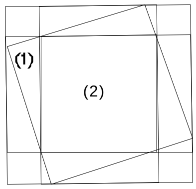
and number an But $f\left(\frac{1008}{2016}\right) = f\left(\frac{1}{2}\right) = \frac{9^{1/2}}{9^{1/2}+3} = \frac{3}{3+3} = \frac{1}{2}$

required sum = 1 + 1 + ... + (1007 times) + $\frac{1}{2}$ = 1007.5

4. (500 G 1088) L (10M120) = $\sqrt{1024}$ L $\sqrt{16 \times 100}$

= 32 L (4 × 10) = 32 L 40 = $\sqrt{36}$ = 6

5.



area (1) = $\frac{1}{2} \times 3 \times 1$

area of such four triangles = $4 \times \frac{3}{2} = 6$

area of (2) = $3 \times 3 = 9$

$\therefore$ area of larger square = $9 + 6 = 15$

6. $x^4 + 6x^2 + 25$ ....(1)

$3x^4 + 4x^2 + 28x + 5$ .... (2)

If f(x) is factor (1) & (2)

then f(x) is also factor of (2) – 3 (1)

$$3x^4 + 4x^2 + 28x + 5$$
$$3x^4 + 18x^2 + 75$$
$$- \quad - \quad -$$
$$-14x^2 + 28x - 70$$

$$x^2 + bx + c \;\overline{)\; -14x^2 + 28x - 70\;}\; -14$$
$$-14x^2 + 14bx - 14c$$
$$+ \quad + \quad +$$
$$(14b + 28)\,x + 14C - 70$$

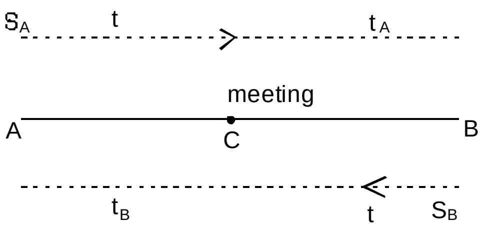
$14b + 28 = 0$ $\qquad$ $14C = 70$

$b = -2$ $\qquad$ $C = 5$

$\therefore f(x) = x^2 - 2x + 5$

$f(1) = 1 - 2 + 5 = 4$

7.



Distance AC = = $S_A\, t = S_B\, t_B$

$$t = \frac{s_B\, t_B}{s_A}$$

Distance BC = $s_A t_A = s_B\, t$

$$\frac{s_A}{s_B} = \frac{t}{t_A} = \frac{s_B t_B}{s_A t_A}$$

$$\frac{s_A^{\,2}}{s_B^{\,2}} = \frac{t_B}{t_A}$$

$$\frac{s_A}{s_B} = \sqrt{\frac{t_B}{t_A}}$$

8. Let it take value a & b hr respectively to fill reservoir

ATQ $\left(\frac{1}{a}\right)\left(\frac{b}{3}\right)+\left(\frac{a}{2}\right)\left(\frac{1}{b}\right)=\frac{5}{6}$ ....(1) $\frac{1}{a}+\frac{1}{b}=\frac{1}{2.4}$ ....(2)

$\frac{b}{3a}+\frac{a}{2b}=\frac{5}{6}$ ....(1) $\frac{1}{a}+\frac{1}{b}=\frac{5}{12}$ ....(2)

from (2) $a = \frac{12b}{5b-12}$ put in (1)

$$\frac{b}{3}\left(\frac{5b-12}{12b}\right)+\frac{12b}{5b-12}\times\frac{1}{2b}=\frac{5}{6}$$

$5b^2 - 54b + 144 = 0$

$(b - 6)(5b - 24) = 0$ $\Rightarrow b = 6$ or $24/5$

$a = 4$ or 4.8

9. $x = \frac{1}{2}$ then $3f(2) + \frac{2f\left(\frac{1}{2}\right)}{\frac{1}{2}} = \frac{1}{4}$

$3f(2) + 4f\left(\frac{1}{2}\right) = \frac{1}{4}$ .....(1)

$x = 2$ than $3f\left(\frac{1}{2}\right) + \frac{2f(2)}{2} = 4$

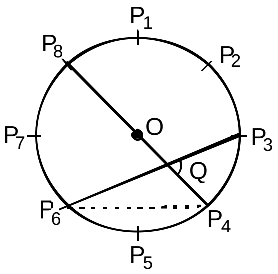
$3f\left(\frac{1}{2}\right) + f(2) = 4$ .....(2)

Solving (1) & (2) yields $f(2) = \frac{67}{20}$

11. Two adjacent points make an angle of $\frac{360^\circ}{8} = 45^\circ$ at the centre 'O" of the circle.

$\angle P_8OP_6 = 45^\circ \times 2 = 90^\circ$

$\therefore$ $\angle P_8P_4P_6 = \frac{90^\circ}{2} = 45^\circ$



(Angle subtended at any point on circumference from an arc is half the angle subtended on centre from same arc)

$\therefore$ $\angle P_3OP_4 = 45^\circ$

$\Rightarrow$ $\angle P_3P_6P_4 = \frac{45^\circ}{2} = 22.5^\circ$

$\angle Q = \angle P_3P_6P_4 + P_8P_4P_6 = 67.5^\circ$

(exterior angle = sum of remote interior angles). Ans. (1)

Alternate solution $\angle Q = \frac{1}{2}$ [arc $P_8 P_7 P_6$ + arc P_3P_4] = $\frac{1}{2}$ [90 + 45] = 67.5º

12. Let the portion of work done by A,B,C in one day respectively x, y, z

$\therefore$ work done by A, B and C in 3 days.

$= 3x + 3y + 3z = \frac{37}{100}$ ....(1)

Also given that 4y = 5x ....(2)

$7x + 7y = 1 - \frac{37}{100} = \frac{63}{100}$ ....(3)

from (3) , $x + y = \frac{9}{100}$

$4x + 4y = \frac{36}{100}$

$5x - 5y = 0$

$9x = \frac{36}{100} \Rightarrow x = \frac{1}{25}$

$y = \frac{1}{25}$, $z = \frac{1}{30}$

A take 25 days, B takes 20 days, C take 30 days.

13. When we pour $\frac{1}{x}$ of the water , we make the water $\frac{x-1}{x}$ of its original size.

Let the n be the number of pouring require. Then

$\frac{1}{2} \times \frac{2}{3} \times \ldots\ldots\ldots\ldots \times \frac{n-1}{n} = \frac{1}{10}$

$\frac{1}{n} = \frac{1}{10}$

n = 10

14. $\angle ADB = \angle ACB = 40^\circ$. since $\angle BAC = 70^\circ$ we have $\angle ABC = 70^\circ$. So BC = AC = 6

15. Number divide by 9 or sum of digit of number, divide by 9 given same rem.

as sum of digit of N = 1274 when divided by 9 given remainder 5.

So sum of digit of n + 1 will be

such that when it divide by 9 given rem = 6

So in option (c) 1239 divided by 9 given rem = 6.

16. (10a + b) + (10b + a) = 132

11 (a + b) = 132

a + b = 12

$\therefore$ (a,b) = (3, 9), (4, 8), (5,7), (6,6), (7,5), (8,9), (9,3)

So, 7 two digit number are possible.

17. (x + 7) P(2x) = 8x P(x + 1) .... (1)

Let P(x) has degree n, with leading co-efficient C.

$\therefore$ Leading co-efficient of both sides of equation (1)

$2^x . C = 8C$

n = 3.

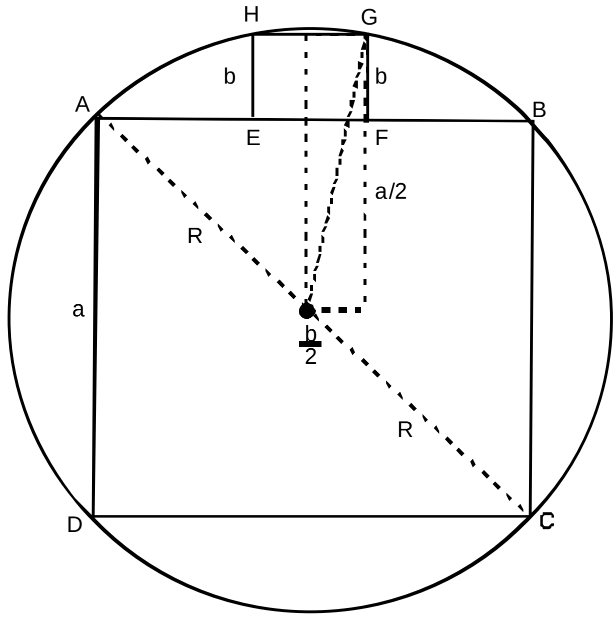
18. LCM (a,b) = $2^2 \times 3$

LCM (b, c) = 3×5

$\therefore$ LCM (a,c) = $2^2 \times 5 = 20$

Sum of digit = 2+0=2.

19.



$R^2 = \left(\frac{a}{2}+b\right)^2 + \left(\frac{b}{2}\right)^2$ ....(i)

$\Delta R = \sqrt{2}\,a$ ....(ii)

by solving (i) and (ii)

a = 5b

$\therefore$ k = 5.

20. Let Total Tea = T total member = n

Total coffee = C

T + C = 8 × n ___(1) $\frac{T}{4}+\frac{C}{6} = 8$ ....(2)

If n = 4 from (1)

T + C = 32

multiply eq (2) by 4 we get

$T+\frac{2}{3}C = 32$ (Less coffe so n should be more)

If n=6 from (1)

T+C=48

multiply eq (2) by 6 we get

$\frac{3}{2}T + C = 48$ (more tea so n should be less)

so 4<n<6

so n=5