PRACTICE PAPER 09 (2024-25)
CHAPTER 08 SEQUENCE AND SERIES

SUBJECT: MATHEMATICS | **MAX. MARKS : 40**
CLASS : XI | **DURATION : 1½ hrs**

General Instructions:
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. If the third term of G.P. is 4, then the product of its first 5 terms is:
(a) 4^3 (b) 4^4 (c) 4^5 (d) none of these

2. In a *G.P*, the 3*rd* is 24 and the 6*th* term is 192, then the 10*th* term is:
(a) 1084 (b) 3290 (c) 3072 (d) 2340

3. Which term of the *G.P* 5, 10, 20, 40,.... is 5120?
(a) 11*th* (b) 10*th* (c) 6*th* (d) 5*th*

4. 18th term from the end of the sequence 3, 6, 12,...25*th* term is:
(a) 393216 (b) 393206 (c) 313216 (d) 303216

5. The 5th term from the end of the sequence 16, 8, 4, 2 ... $\frac{1}{16}$ is:
(a) 1 (b) 2 (c) 3 (d) 4

6. If the 8*th* term of *G.P* is 192 with a common ratio of 2, then the 12th term is:
(a) 1640 (b) 2084 (c) 3072 (d) 3126

7. If *n* terms of a *G.P.* 3, 32, 33... are needed to give the sum 120, then the value of n is:
(a) 2 (b) 3 (c) 4 (d) 5

8. If nth term of a G.P. is 2^n, then find the sum of its first 6 terms.
(a) 126 (b) 124 (c) 190 (d) 154

For Q9 and Q10, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct answer out of the following choices.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

9. **Assertion (A):** The first term of a *GP* is 1. The sum of third and fifth term is 90, then the common ratio are 3 or –3.
Reason (R): Common ratio of *GP* $a_1, a_2, a_3, \ldots$ is given by $a_2 - a_1 = a_3 - a_2 = \ldots\ldots$

10. Assertion (A): Sum of 7 terms of the GP 3, 6, 12, ... is 381.

Reason (R): Sum of first n terms of the G. P is given by $S_n = \frac{a(r^n - 1)}{r - 1}$, where a = first term, r = common ratio and |r| > 1.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. If *a*, *b*, *c*, *d* are in G.P. ; prove that, *a* + *b*, *b* + *c*, *c* + *d* are also in G.P.

12. Prove that : $9^{1/3}. 9^{1/9}. 9^{1/27}$ .... = 3

13. Express $6.2\overline{45}$ as rational numbers using G.P.

14. Find the values of *p*, if sum to infinity for the G.P. *p*, 1, $\frac{1}{p}$, ... is $\frac{25}{4}$.

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Three numbers are in AP their sum is 15. If 1, 3, 9 be added to them respectively they form a GP. Find the numbers.

OR

Find the value of *n*, so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be geometric mean between *a* and *b*.

16. Find the sum of '*n*' terms of the series : 0.5 + 0.55 + 0.555 + ... *n* terms.

17. If the *p*th, *q*th and *r*th term of a G.P. are *a*, *b*, *c* respectively, prove that : $a^{q-r} . b^{r-p} . c^{p-q} = 1$.

OR

The 5th, 8th and 11th term of a GP are *p*, *q* and *s*, respectively. Show that *q*2 = *ps*.

SECTION – D

Questions 18 carry 5 marks.

18. The sum of two numbers is '6' times their geometric mean, show that the numbers are in the ratio $(3 + 2\sqrt{2}) : (3 - 2\sqrt{2})$.

OR

If S_n denotes the sum of *n* terms of a G.P., prove that $(S_{10} - S_{20})^2 = S_{10} (S_{30} - S_{20})$.

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

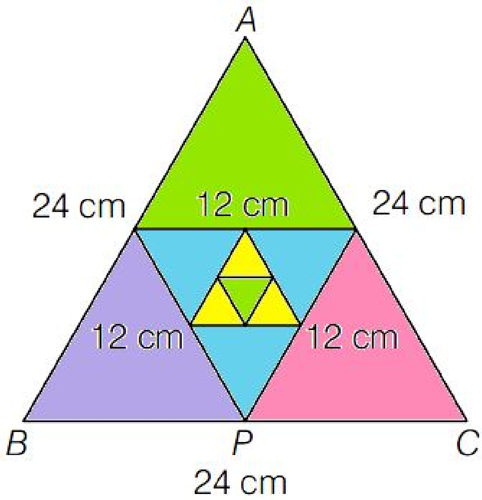
19. A sequence of non-zero numbers is said to be a geometric progression, if the ratio of each term, except the first one, by its preceding term is always constant. Rahul, being a plant lover, decides to open a nursery and he bought few plants and pots. He wants to place pots in such a way that the number of pots in the first row is 2, in second row is 4 and in the third row is 8 and so on…..

(a) Find the constant multiple by which the number of pots is increasing in every row (1)
(b) Find the number of pots in 8th row. (1)
(c) Find the difference in number of pots placed in 7th row and 5th row (2)

OR

(c) If Rahul wants to place 510 pots in total , then find the total number of rows formed in this arrangement (2)

20. In Rangoli competition in school, Preeti made Rangoli in the equilateral shape. Each side of an equilateral triangle is 24 cm. The mid-point of its sides are joined to form another triangle. This process is going continuously infinite.



Based on above information, answer the following questions.
(a) Find the side of the 5th triangle is (in cm) (1)
(b) Find the sum of perimeter of first 6 triangle is (in cm) (2)

OR

(b) Find the area of all the triangle is (in sq cm). (2)
(c) Find the sum of perimeter of all triangle is (in cm). (1)

PRACTICE PAPER 09 (2024-25)
CHAPTER 08 SEQUENCE AND SERIES (ANSWERS)

SUBJECT: MATHEMATICS **MAX. MARKS : 40**
CLASS : XI **DURATION : 1½ hrs**

General Instructions:
(i). **All** questions are compulsory.
(ii). This question paper contains 2**0** questions divided into five Sections A, B, C, D and E.
(iii). **Section A** comprises of **10 MCQs** of **1 mark** each. **Section B** comprises of 4 questions of **2 marks** each. **Section C** comprises of 3 questions of **3 marks** each. **Section D** comprises of 1 question of **5 marks** each and **Section E** comprises of 2 Case Study Based Questions of **4 marks** each.
(iv). There is no overall choice.
(v). Use of Calculators is not permitted

SECTION – A
Questions 1 to 10 carry 1 mark each.

1. If the third term of G.P. is 4, then the product of its first 5 terms is:
(a) 4^3 (b) 4^4 (c) 4^5 (d) none of these
Ans. *(c)* 4^5
Here, $a_3 = 4 \Rightarrow ar^2 = 4$
Product of first 5 terms = $a.\ ar.\ ar^2.\ ar^3.\ ar^4$
$= a^5 \cdot r^{10} = (ar^2)^5 = (4)^5$

2. In a *G.P*, the 3*rd* is 24 and the 6*th* term is 192, then the 10*th* term is:
(a) 1084 (b) 3290 (c) 3072 (d) 2340
Ans. *(c)* 3072
Here, $a_3 = 24$ and $a_6 = 192$
So, $ar^2 = 24$ and $ar^5 = 192$
On dividing, we get $r^3 = 8 \Rightarrow r = 2, a = 6$
$a_{10} = ar^9 = (6.\ 2^9) = 3072$

3. Which term of the *G.P* 5, 10, 20, 40,.... is 5120?
(a) 11*th* (b) 10*th* (c) 6*th* (d) 5*th*
Ans. (a) 11th
Given sequence 5, 10, 20, 40, ... is a G.P.
Here $a = 5$, $r = 2$ and $an = 5120$
As we know that the general term of a GP is given by $a_n = ar^{n-1}$
$\Rightarrow 5120 = 5.\ 2^{n-1} \Rightarrow 2^{n-1} = 5120/5$
$\Rightarrow 2^{n-1} = 1024 \Rightarrow 2^{n-1} = 2^{10} \Rightarrow n - 1 = 10 \Rightarrow n = 11$
Hence, 11th term is 5120.

4. 18th term from the end of the sequence 3, 6, 12,...25*th* term is:
(a) 393216 (b) 393206 (c) 313216 (d) 303216
Ans. (a) 393216
Here, $a = 3$, $r = 2$, $m = 18$ and $n = 25$
We know that if a sequence has n term then *m*th term from end is equal to $(n - m + 1)$.
$a_{18} = ar^{18-1} = ar^{17}$
$= 3\,(2)^{17} = 3 \times 131072 = 393216$

5. The 5th term from the end of the sequence 16, 8, 4, 2 ... $\frac{1}{16}$ is:
(a) 1 (b) 2 (c) 3 (d) 4

Ans. (a) 1

Given sequence is 16, 8, 4, 2, ... $\frac{1}{16}$

Here, a = 16 and $r = \frac{1}{2}$

We know that $a_n = ar^{n-1}$

So, n = 5th term $\Rightarrow a_5 = ar^4$

On putting $r = \frac{1}{2}$ we get $a_5 = 16\left(\frac{1}{2}\right)^4 = 16 \times \frac{1}{16} = 1$

6. If the 8*th* term of *G.P* is 192 with a common ratio of 2, then the 12th term is:

(a) 1640 (b) 2084 (c) 3072 (d) 3126

Ans. (c) 3072

Here, a_8 = 192 and r = 2

We know that $a_n = ar^{n-1}$

So, $a^8 = ar^{8-1} = ar^7 = 192 \Rightarrow a2^7 = 192$

$\Rightarrow a = \frac{192}{128} \Rightarrow a = \frac{3}{2}$

On putting $a = \frac{3}{2}$ and n = 12 in $a_n = ar^{n-1}$, we get

$a_{12} = ar^{12-1} \Rightarrow a_{12} = ar^{11}$

$= \frac{3}{2} \times 2^{11} = 3 \times 2^{10} = 3 \times 1024 = 3072$

7. If n terms of a *G.P.* 3, 32, 33... are needed to give the sum 120, then the value of n is:

(a) 2 (b) 3 (c) 4 (d) 5

Ans. *(c) 4*

Explanation: Here, S_n = 120, a = 3 and r = 3

So, $S_n = a\left(\frac{r^n - 1}{r - 1}\right) \Rightarrow 20 = 3\left(\frac{3^n - 1}{3 - 1}\right)$

$\Rightarrow 240 = 3(3^n - 1) \Rightarrow 80 = 3^n - 1 \Rightarrow 81 = 3^n \Rightarrow 3^4 = 3^n \Rightarrow n = 4$

8. If nth term of a G.P. is 2^n, then find the sum of its first 6 terms.

(a) 126 (b) 124 (c) 190 (d) 154

Ans. (a) 126

Sum of n terms of a GP, $S_n = a\left(\frac{r^n - 1}{r - 1}\right)$

Given that $a_n = 2^n$

$\Rightarrow a_1 = 2$

$\Rightarrow a_2 = 4$

$\Rightarrow a_3 = 8$

Common ratio (r) = 4 ÷ 2 = 8 ÷ 4 = 2

Sum of 6 terms = $2\left(\frac{2^6 - 1}{2 - 1}\right) = 2(64 - 1) = 2(63) = 126$

For Q9 and Q10, a statement of assertion (A) is followed by a statement of reason (R). Choose the correct answer out of the following choices.

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

9. **Assertion (A):** The first term of a *GP* is 1. The sum of third and fifth term is 90, then the common ratio are 3 or –3.

Reason (R): Common ratio of *GP* $a_1, a_2, a_3, \ldots$ is given by $a_2 - a_1 = a_3 - a_2 = \ldots\ldots$

Ans. Here, $a = 1$, $a_3 + a_5 = 90 \Rightarrow r^2 + r^4 = 90$

$\Rightarrow r^4 + r^2 - 90 = 0 \Rightarrow r^4 + 10r^2 - 9r^2 - 90 = 0.$

$\Rightarrow r^2(r^2 + 10) - 9(r^2 + 10) = 0 \Rightarrow (r^2 + 10)(r^2 - 9) = 0$

But $r^2 + 10 \neq 0 \Rightarrow r^2 - 9 = 0 \Rightarrow r^2 = 9$

$\Rightarrow r = \pm 3.$

Hence *A* is true.

$\therefore$ *A* is true but *R* is false.

10. **Assertion (A):** Sum of 7 terms of the GP 3, 6, 12, ... is 381.

Reason (R): Sum of first n terms of the G. P is given by $S_n = \dfrac{a(r^n - 1)}{r - 1}$, where a = first term, r = common ratio and |r| > 1.

Ans: (a) Both A and R are true and R is the correct explanation of A.

Assertion Given GP 3, 6, 12, ...

Here, $a = 4$, $r = 16/4 = 4 > 1$

$$\Rightarrow S_6 = 4\left(\frac{4^6 - 1}{4 - 1}\right) = \frac{4(4095)}{3} = 5460$$

Hence, Assertion and Reason both are true and Reason is the correct explanation of Assertion.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. If a, b, c, d are in G.P. ; prove that, $a + b, b + c, c + d$ are also in G.P.

Ans: Let r be common ratio of the G.P. a, b, c, d then $b = ar$, $c = ar^2$ and $d = ar^3$.

$\therefore a + b = a + ar = a(1 + r)$; $b + c = ar + ar^2 = ar(1 + r)$; $c + d = ar^2(r + 1)$

Now, $(b + c)^2 = [ar(1 + r)]^2 = [a(1 + r)][ar^2(1 + r)] = (a + b)(c + d)$

$\therefore a + b, b + c, c + d$ are in G. P.

12. Prove that : $9^{1/3} . 9^{1/9} . 9^{1/27} \ldots\ldots = 3$

Ans:

$$9^{1/3}.9^{1/9}.9^{1/27}\ldots = 9^{(1/3+1/9+1/27+\ldots)} = 9^{\frac{1/3}{1-1/3}} = 9^{1/2} = 3$$

13. Express $6.2\overline{45}$ as rational numbers using G.P.

Ans. $6.2\overline{45} = 6.2 + 0.045 + 0.00045 + 0.0000045 + \ldots..$

Clearly, $0.045 + 0.00045 + 0.0000045 + \ldots..$ forms GP where $a = 0.045$ and $r = 0.01$

$$\therefore 6.2\overline{45} = 6.2 + \frac{a}{1 - r}$$

$$= \frac{62}{10} + \frac{0.045}{1 - 0.01} = \frac{62}{10} + \frac{0.045}{0.99} = \frac{62}{10} + \frac{45}{990}$$

$$= \frac{62}{10} + \frac{5}{110} = \frac{682 + 5}{110} = \frac{687}{110}$$

14. Find the values of p, if sum to infinity for the G.P. $p, 1, \dfrac{1}{p}, \ldots\ldots$ is $\dfrac{25}{4}$.

Ans: $\dfrac{p}{1-\dfrac{1}{p}} = \dfrac{25}{4} \Rightarrow \dfrac{p^2}{p-1} = \dfrac{25}{4}$

$\Rightarrow 4p^2 = 25p - 25$

$\Rightarrow 4p^2 - 25p + 25 = 0$

$(4p - 5)(p - 5) = 0 \Rightarrow p = \dfrac{5}{4}, 5$

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. Three numbers are in AP their sum is 15. If 1, 3, 9 be added to them respectively they form a GP. Find the numbers.

Ans. Let these numbers be $a - d, a, a + d$ (keeping in mind the rule of selection of three numbers in AP).

Given that $(a - d) + a + (a + d) = 15$

$\Rightarrow 3a = 15 \Rightarrow a = 5$

$\therefore$ The numbers are now $5 - d, 5, 5 + d$.

Adding 1, 3, 9 in the numbers respectively. We get the new numbers i.e.,

$5 - d + 1, 5 + 3, 9 + 5 + d$ are in GP

$\Rightarrow 6 - d, 8, 14 + d$ form a GP

$\Rightarrow \dfrac{8}{6-d} = \dfrac{14+d}{8}$

$\Rightarrow 64 = (6 - d)(14 + d) \Rightarrow 64 = 84 - 14d + 6d - d^2$

$\Rightarrow d^2 + 8d - 20 = 0 \Rightarrow d^2 + 10d - 2d - 20 = 0 \Rightarrow (d + 10)(d - 2) = 0$

$\Rightarrow d = -10$ or $d = 2$

Therefore, the numbers are 15, 5, –5 or 3, 5, 7.

OR

Find the value of n, so that $\dfrac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be geometric mean between a and b.

Ans. $\dfrac{a^{n+1}+b^{n+1}}{a^n+b^n}$ is the G.M. between a and b.

$\Rightarrow \dfrac{a^{n+1}+b^{n+1}}{a^n+b^n} = \sqrt{ab}$

$\Rightarrow a^{n+1} + b^{n+1} = a^{\left(n+\frac{1}{2}\right)} b^{\frac{1}{2}} + a^{\frac{1}{2}} b^{\left(n+\frac{1}{2}\right)}$

$\Rightarrow a^{n+1} - a^{\left(n+\frac{1}{2}\right)} b^{\frac{1}{2}} = a^{\frac{1}{2}} b^{\left(n+\frac{1}{2}\right)} - b^{n+1}$

$\Rightarrow a^{\left(n+\frac{1}{2}\right)}\left[a^{\frac{1}{2}} - b^{\frac{1}{2}}\right] = b^{\left(n+\frac{1}{2}\right)}\left(a^{\frac{1}{2}} - b^{\frac{1}{2}}\right) \quad \Rightarrow a^{\left(n+\frac{1}{2}\right)} = b^{\left(n+\frac{1}{2}\right)} \left[\because a^{\frac{1}{2}} - b^{\frac{1}{2}} \neq 0 \text{ as } a \neq b\right]$

$\Rightarrow \left(\dfrac{a}{b}\right)^{\left(n+\frac{1}{2}\right)} = 1 \quad \Rightarrow \left(\dfrac{a}{b}\right)^{\left(n+\frac{1}{2}\right)} = \left(\dfrac{a}{b}\right)^0 \Rightarrow \left(n+\dfrac{1}{2}\right) = 0 \Rightarrow n = \dfrac{-1}{2}$

16. Find the sum of 'n' terms of the series : 0.5 + 0.55 + 0.555 + ... n terms.

Ans: $S_n = 0.5 + 0.55 + 0.555 + \ldots$ n terms

$= 5[0.1 + 0.11 + 0.111 + \ldots$ n terms$]$

$= \dfrac{5}{9}[0.9 + 0.99 + 0.999 + \ldots$ n terms$]$

$S_n = \frac{5}{9}$ [(1 – 0.1) + (1 – 0.01) + (1 – 0.001) + ... n terms]

$= \frac{5}{9}$ [n – {0.1 + 0.01 + 0.001 + ... n terms}]

$= \frac{5}{9}\left[n - \frac{0.1\{1-(0.1)^n\}}{1-0.1}\right]$

$= \frac{5}{9}\left[n - \frac{1}{9}\{1-(0.1)^n\}\right] = \frac{5}{81}[9n - 1 + (0.1)^n]$

17. If the pth, qth and rth term of a G.P. are a, b, c respectively, prove that : $a^{q-r} . b^{r-p} . c^{p-q} = 1$.

Ans: Let A be the first term and R the common ratio of a given G.P.

Given $a_p = a$, $a_q = b$, $a_r = c$,

$\therefore a = AR^{p-1}$; $b = AR^{q-1}$; $c = AR^{r-1}$

Consider $a^{q-r}\, b^{r-p}\, c^{p-q}$

$= (AR^{p-1})^{q-r}\, (AR^{q-1})^{r-p}\, (AR^{r-1})^{p-q}$

$= A^{q-r}\, R^{(p-1)\,(q-r)} . A^{r-p}\, R^{(q-1)\,(r-p)}\, A^{p-q}\, R^{(r-1)\,(p-q)}$

$= A^{q-r+r-p+p-q}\, R^{(p-1)\,(q-r)+(q-1)\,(r-p)+(r-1)\,(p-q)}$

$= A^0\, R^{pq-pr-q+r+qr-pq-r+p+pr-qr-p+q}$

$= A^0\, R^0 = 1$

OR

The 5th, 8th and 11th term of a GP are p, q and s, respectively. Show that $q2 = ps$.

Ans. Let 'a' be the first term and 'r' be the common ratio of the given GP.

Here, $a_5 = p \Rightarrow ar^4 = p$ …(i)

$a_8 = q \Rightarrow ar^7 = q$ …(ii)

$a_{11} = s \Rightarrow ar^{10} = s$ …(iii)

Squaring both sides of equation (ii), we get

$q^2 = (ar^7)^2 \Rightarrow q^2 = a^2 r^{14}$

$\Rightarrow q^2 = (ar^4)(ar^{10})$

$\Rightarrow q^2 = ps$ [$\because p = ar^4$ and $s = ar^{10}$]

SECTION – D

Questions 18 carry 5 marks.

18. The sum of two numbers is '6' times their geometric mean, show that the numbers are in the ratio $(3+2\sqrt{2}):(3-2\sqrt{2})$.

Ans:

Let the two numbers be a and b, $(a > b)$

We have, $a + b = 6\sqrt{ab}$ ...(i)

Also, $(a-b)^2 = (a+b)^2 - 4ab$

$= (6\sqrt{ab})^2 - 4ab = 32ab$

$\Rightarrow a - b = \sqrt{32ab}$ $(a > b)$

$= 4\sqrt{2}\sqrt{ab}$ ...(ii)

From (i) and (ii), we have

$$\frac{a+b}{a-b} = \frac{6\sqrt{ab}}{4\sqrt{2}\sqrt{ab}} = \frac{3}{2\sqrt{2}}$$

Applying componendo and dividendo, we get

$$\Rightarrow \frac{a+b+a-b}{a+b-a+b} = \frac{3+2\sqrt{2}}{3-2\sqrt{2}}$$

$$\Rightarrow \quad \frac{2a}{2b} = \frac{3+2\sqrt{2}}{3-2\sqrt{2}}$$

$$\Rightarrow \quad \frac{a}{b} = \frac{3+2\sqrt{2}}{3-2\sqrt{2}}$$

$$\Rightarrow \quad a : b = 3+2\sqrt{2} : 3-2\sqrt{2}.$$

OR

If S_n denotes the sum of n terms of a G.P., prove that $(S_{10} - S_{20})^2 = S_{10}(S_{30} - S_{20})$.

Ans:

$(S_{10} - S_{20})^2$

$$= \left\{\frac{a(1-r^{10})}{1-r} - \frac{a(1-r^{20})}{1-r}\right\}^2 = \frac{a^2}{(1-r)^2}\{r^{20} - r^{10}\}^2$$

$$= \frac{a^2}{(1-r)^2}(r^{40} + r^{20} - 2r^{30}) \quad \ldots (i)$$

$S_{10}(S_{30} - S_{20})$

$$= \frac{a(1-r^{10})}{1-r}\left\{\frac{a(1-r^{30})}{1-r} - \frac{a(1-r^{20})}{1-r}\right\}$$

$$= \frac{a^2}{(1-r)^2}(1-r^{10})(r^{20} - r^{30})$$

$$= \frac{a^2}{(1-r)^2}(r^{20} - r^{30} - r^{30} + r^{40})$$

$$= \frac{a^2}{(1-r)^2}(r^{40} + r^{20} - 2r^{30}) \quad \ldots (ii)$$

From (i) and (ii) we get

$(S_{10} - S_{20})^2 = S_{10}(S_{30} - S_{20})$

SECTION – E (Case Study Based Questions)

Questions 19 to 20 carry 4 marks each.

19. A sequence of non-zero numbers is said to be a geometric progression, if the ratio of each term, except the first one, by its preceding term is always constant. Rahul, being a plant lover, decides to open a nursery and he bought few plants and pots. He wants to place pots in such a way that the number of pots in the first row is 2, in second row is 4 and in the third row is 8 and so on…..

(a) Find the constant multiple by which the number of pots is increasing in every row (1)

(b) Find the number of pots in 8th row. (1)
(c) Find the difference in number of pots placed in 7th row and 5th row (2)

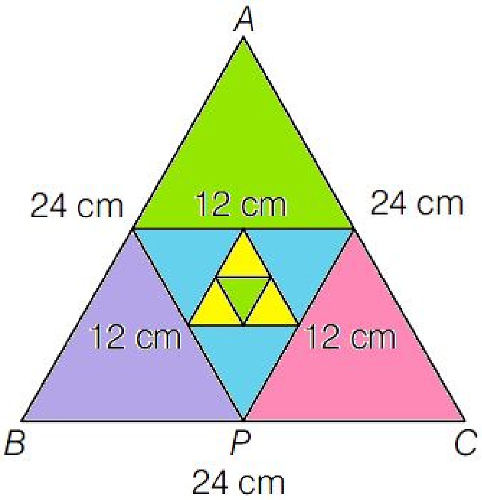
OR

(c) If Rahul wants to place 510 pots in total , then find the total number of rows formed in this arrangement (2)
Ans. (a) The number of pots in each row is 2, 4, 8... .
∴ This forms a geometric progression,
Where $a = 2$, $r = 4/2 = 2$
Hence, the constant multiple by which the number of pots is increasing in every row is 2.
(b) Number of pots in 8th row = $a_8 \Rightarrow a_8 = ar^{8-1} = 2(2)^7 = 2^8 = 256$
(c) Number of pots in 7th row, $a_7 = 2(2)^{7-1} = 2.2^6 = 2^7 = 128$
Number of pots in 5th row, $a_5 = 2(2)^{5-1} = 2.2^4 = 2^5 = 32$
Required answer = 128 – 32 = 96

OR

(c) Let there be n number of rows.
$\therefore\ S_n = a\left(\frac{r^n - 1}{r-1}\right) \Rightarrow 510 = 2\left(\frac{2^n - 1}{2-1}\right) \Rightarrow \frac{510}{2} = 2^n - 1$
$\Rightarrow 255 = 2^{n-1} \Rightarrow 256 = 2^n \Rightarrow 2^8 = 2^n \Rightarrow n = 8$

20. In Rangoli competition in school, Preeti made Rangoli in the equilateral shape. Each side of an equilateral triangle is 24 cm. The mid-point of its sides are joined to form another triangle. This process is going continuously infinite.



Based on above information, answer the following questions.
(a) Find the side of the 5th triangle is (in cm) (1)
(b) Find the sum of perimeter of first 6 triangle is (in cm) (2)

OR

(b) Find the area of all the triangle is (in sq cm). (2)
(c) Find the sum of perimeter of all triangle is (in cm). (1)
Ans: (a) Side of first triangle is 24.
Side of second triangle is 24/2 = 12
Similarly, side of second triangle is 12/2 = 6
∴ a = 24, r = 12/24 = 1/2
∴ Side of the fifth triangle, $a_5 = ar^4 = 24 \times \left(\frac{1}{2}\right)^4 = \frac{24}{16} = 1.5cm$
(b) Perimeter of first triangle = 24 × 3 = 72
Perimeter of second triangle = 72/2 = 36
Similarly, perimeter of third triangle = 36/2 =18
∴ a = 72 r = 36/72 = 1/2

$\therefore$ Sum of perimeter of first 6 triangle, $S_6 = \dfrac{a(1-r^6)}{1-r} = \dfrac{72\left(1-\left(\frac{1}{2}\right)^6\right)}{1-\frac{1}{2}} = \dfrac{72 \times 63 \times 2}{2^6} = \dfrac{567}{4} cm$

OR

(b) Area of first triangle = $\dfrac{\sqrt{3}}{4}(24)^2$

Area of second triangle = $\dfrac{\sqrt{3}}{4}(12)^2$

Similarly, Area of third triangle = $\dfrac{\sqrt{3}}{4}(6)^2$

$\therefore$ a = $\dfrac{\sqrt{3}}{4}(24)^2$, r = 1/4

Sum of the areas of all triangles $= \dfrac{a}{1-r} = \dfrac{\frac{\sqrt{3}}{4}(24)^2}{1-\frac{1}{4}} = \dfrac{\sqrt{3}}{3}(24)^2 = 192\sqrt{3}cm$

(c) The sum of perimeter of all triangle 3(24 + 12 + 6 + ...) is

$$3\left(\frac{a}{1-r}\right) = 3\left(\frac{24}{1-\frac{1}{2}}\right) = 144cm$$