Sample Paper - 3

GENERAL INSTRUCTIONS

All questions are compulsory.
The question paper consist of 30 questions divided into four sections A, B, C and D. Section A comprises of 6 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each, Section C comprises of 10 questions of 3 marks each and Section D comprises of 8 questions of 4 marks each.
There is no overall choice.
Use of calculator is not allowed.

SECTION-A

(1 mark each)

1. Check the divisibility of the following numbers by 9 :
(a) 108 (b) 616

2. Multiply the following:
(a) $15xy^2, 17yz^2$
(b) $-5a^2bc, 11ab, 13abc^2$

3. Is 500 a perfect cube?

4. What is the usual form for 2.3×10^{-10} ?

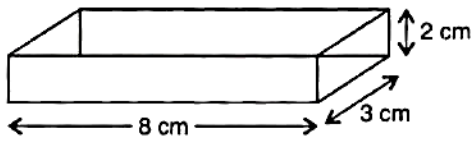
5. Factorise : $9x^2-1$

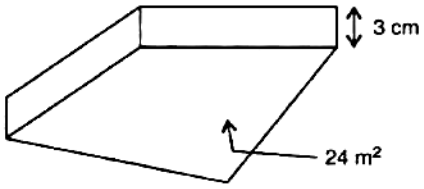
6. What is a parallelepiped?

SECTION-B

(2 marks each)

7. Find the volume of the following cuboids figure.
(a)





(b)

8. Represent the number $\frac{7}{4}$ on the number line.

9. Using prime factorisation, find the cube root of 5832.

10. Factorise the following :

(a) $18+11x+x^2$

(b) $y^2-2y-15$

11. A machinery worth Rs. 10,500 depreciated by 5%. Find its value after one year.

12. Using a suitable identity to get the product

$\left(3x-\frac{1}{3}\right)\left(3x-\frac{1}{3}\right)$.

SECTION-C

(3 marks each)

13. Verify $x+y=y+x$, if $x=\frac{-3}{16}$ and $y=\frac{1}{9}$.

14. If 25 metres of costs Rs. 337.50, then

(a) What will be the cost of 40 metres of the same type of cloth?

(b) What will be the length of the cloth bought for Rs. 810?

15. There is a narrow rectangular plot, reserved for a school, in Mahuli village. The length and breadth of the plot are in the ratio 11:4. At the rate Rs. 100 per metre it will cost the village panchayat Rs. 75000 to fence the plot. What are the dimensions of the plot?

16. By what number should $(-8)^{-3}$ be multiplied so that the product may be equal to $(-6)^{-3}$?

17. Construct a quadrilateral ABCD, given AB = 5-1 cm, AD = 4 cm, BC = 2.5 cm, $\angle A = 60°$ and $\angle B = 85°$.

18. Radius of a cylinder is r and the height is h. Find the change in the volume if the

(a) height is doubled

(b) height is doubled and the radius is halved

(c) height remains same and the radius is halved.

19. The perimeters of two squares are 40 and 96 metres respectively. Find the perimeter of another square equal in area to the sum of the first two squares.

20. The parallel sides of a trapezium are 40 cm and 20 cm. If its non-parallel sides are equal, each being 26 cm, find the area of the trapezium.

21. A number is increased by 20% and then it is decreased by 20%. Find the net increase or decrease per cent.

22. If a + b = 25 and $a^2+b^2=225$, then find ab.

SECTION-D

(4 marks each)

23. A mixture of paint is prepared by mixing 1 part of red pigments with 8 parts of base. In the following table, find the parts of base that is needed to be added.

Part of red pigment	1	4	7	12	20
Part of base	8	---	---	---	---

24. Find the three rational numbers between $\frac{1}{2}$ and -2.

25. Factorise:

(a) $a^4 - b^4$ (b) $p^4 - 81$

(c) $x^4 - (y+2)^4$ (d) $x^4 - (x-z)^4$

(e) $a^4 - 2a^2b^2 + b^4$

26. (a) Divide 34 into two parts in such a way that $\left(\frac{4}{7}\right)^{th}$ of one part is equal to $\left(\frac{2}{5}\right)^{th}$ of the other.

(b) Which of the following equation are linear equation in one variable.

(a) $x^2 + x = 1$ (b) $2x - 7 = \frac{2}{3}$

(c) $x^2 + x = 10$ (d) $x - 15 = 3x$

27. The cost of a notebook is Rs. 10. Draw a graph after making a table showing cost of 2, 3, 4... notebooks. Use it to find (a) the cost of 7 notebooks.
(b) the number of notebooks that can be purchased for Rs. 50.

28. (a) Find the value of the expression $\left(81x^2 + 16y^2 - 72xy\right)$, when $x = \frac{2}{3}$ and $y = \frac{3}{4}$

(b) If a = 2 and b = 5, then verify $(a+b)^2 = a^2 + b^2 + 2ab$.

29. (a) Find the amount of Rs. 50000 after 2 years compounded annually. The rate of interest being 8% p.a. during the first year and 9% p.a. during the second year. Also, find the compound interest.

(b) If (a) decreased value $= P\left(1 - \frac{R}{100}\right)^n$ and (b) depreciated value $= P\left(1 + \frac{R}{100}\right)^n$ then select right answer.

30. If $51x\,3$ is a multiple of 9, where x is a digit, then that is the value of x?

Solutions

Section 'A'

(1 mark each)

1. (a) 108

$\because \quad 1+0+8=9$

and 9 is divisible by 9

½

$\therefore$ 108 is divisible by 9.

(b) 616

We have, $6+1+6=13$

and 13 is not divisible by 9

$\therefore$ 616 is also not divisible by 9.

½

2. (a) $15xy^2 \times 17yz^2 = (15\times 17)\times x \times y^2 \times y \times z^2$

$= 255xy^3z^2$

½

(b) $-5a^2bc \times 11ab \times 13abc^2 = (-5\times 11\times 13)a^2bc \times ab \times abc^2$

$= -715a^4b^3c^3$

½

3. $500 = 5\times 5\times 5\times 2\times 2$

½

$\because$ In the above prime factorisation 2×2 remain after grouping the prime factors in triples.

$\therefore$ 500 is not a perfect cube.

½

4. $2.3\times 10^{-10} = 23\times 10^{-1}\times 10^{-10}$

½

$= 23\times 10^{-11}$

$= \dfrac{23}{100000000000}$

$= 0.0000000023$

½

5. $9x^2 - 1 = (3x)^2 - (1)^2$

½

$= (3x+1)(3x-1)$

½

6. When the ends of a quadrilateral prism are parallelograms, then it is called a parallelepiped.

Section 'B'

(2 marks each)

7. (a) l = 8 cm, b = 3 cm, h = 2 cm

The volume of cuboid $= l \times b \times h$

$= 8 \times 3 \times 2$

The volume of cuboid $= 48\ cm^3$ **1**

(b) Height = 3 cm = 0.03 m

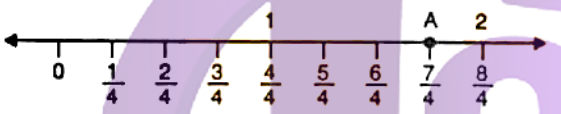
Area of rectangle part $= 24\ m^2$

The volume of cuboid = Area of rectangle part × Height

$= 24m^2 \times 0.03m$

The volume of cuboid $= 0.72\ m^3$ **1**

8. To represent $\frac{7}{4}$, we make 7 markings each of a distance equal to $\frac{1}{4}$ on the right of 0. The 7th point represent the rational number $\frac{7}{4}$ as shown in the figure. **1**



The point A is $\frac{7}{4}$.

9. The prime factorisation of 5832 is

2	5832
2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

1

$5832 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$

Therefore, $\sqrt[3]{5832} = \sqrt[3]{2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3}$

$= 2 \times 3 \times 3$

$= 18$ **1**

10. (a) $18 + 11x + x^2 = x^2 + 11x + 18$

$= x^2 + (9+2)\,x + 18$

$= x^2 + 9x + 2x + 18$

½

$= x(x+9) + 2(x+9)$

$= (x + 9)\,(x + 2)$

½

(b) $y^2-2y-15=y^2-(5-3)y-15$

$=y^2-5y+3y-15$

½

$=y(y-5)+3(y-5)$

$=(y-5)(y+3)$

½

11. P = Rs. 10,500

Reduction = 5% of Rs. 10,500 per year

$=\frac{5}{100}\times 10500\times 1$

Reduction = Rs. 525

Value after 1 year = 10,500 − 525

Cost value after 1 year = Rs. 9975 **2**

12. Using the identity $(a-b)^2=a^2-2ab+b^2$,

We have, $\left(3x-\frac{1}{3}\right)\left(3x-\frac{1}{3}\right)=\left(3x-\frac{1}{3}\right)^2$ **1**

$=(3x)^2-2(3x)\left(\frac{1}{3}\right)+\left(\frac{1}{3}\right)^2$

$=9x^2-2x+\frac{1}{9}.$ **1**

Section 'C'

(3 marks each)

13. $x+y=-\frac{3}{16}+\frac{1}{9}$

$=\frac{-3\times 9+1\times 16}{144}$ [∵ LCM of 16 and 9 is 144]

$=\frac{-27+16}{144}=\frac{-11}{144}$ **1**

$y+x=\frac{1}{9}+\frac{-3}{16}$ **1**

$=\frac{1}{9}-\frac{3}{16}$

$=\frac{16\times 1-9\times 3}{144}$

$=\frac{16-27}{144}=-\frac{11}{144}$

$\Rightarrow \quad x+y=y+x.$ **1**

14. (a) Let cost of cloth be Rs. x.

Length of cloth (m)	25	40
Cost of cloth (Rs.)	Rs.337.50	x

Here, cost will be increase by increasing the length of cloth. Hence, it is directly proportional. ½

$$\frac{25}{337.5}=\frac{40}{x}$$

$$x=\frac{337.5\times 40}{25}=Rs.540$$ 1

(b) Let the length of cloth be y m.

Length of cloth (m)	25	Y
Cost of cloth (Rs.)	Rs.337.50	810

Here, as the length will increase by increasing the amount so, it is directly proportional. ½

$$\frac{25}{337.5}=\frac{y}{810}$$

$$\Rightarrow \quad y=\frac{25\times 810}{337.5}$$

$$\Rightarrow \quad y = 60 \text{ metres.}$$ 1

15. Let the length and breadth of the plot be 11 x and 4x, respectively.

$$\therefore \textit{ Perimeter of the plot } = \frac{\textit{Total cost}}{\textit{Cost of 1 meter}} = \frac{75000}{100} = 750m$$ 1

We know that perimeter of rectangle = 2 (l + b)

∴ According to question,

$$2(11x+4x)=750$$

or, $$15x=\frac{750}{2}$$

or, $$15x=375$$ 1

or, $$x=\frac{375}{15}$$

or, $$x = 25$$

Hence, length of plot $=11\times 25=275\ m$

and breadth of the plot $4\times 25=100\ m.$ 1

16. Let the number be x

$$(-8)^{-3}\times x=(-6)^{-3}$$

$$\left(\frac{1}{-8}\right)^3\times x=\left(\frac{1}{-6}\right)^3$$ 1

$$-\frac{1}{512}\times x=-\frac{1}{216}$$ 1

$$x=\frac{512}{216}$$

$$x=\frac{64}{27}$$

$$x=\left(\frac{4}{3}\right)^3$$

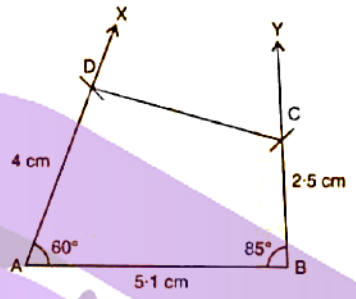
$x = \left(\frac{3}{4}\right)^{-3}$ **1**

17. Steps of Construction:

(a) Draw AB = 5·1 cm.

(b) Construct $\angle XAB = 60°$ at A.

(c) With A as centre and radius AD = 4 cm, cut off AD = 4 cm along AX. **1**



(d) Construct $\angle ABY = 85°$ at B.

(e) With B as centre and radius BC = 2.5 cm cut off BC = 2.5 cm along BY.

(f) Join CD.

Thus, ABCD is the required quadrilateral. **2**

18. Volume of cylinder $= \pi r^2 h$

(a) Height is doubled i.e., h' =2h

Volume of cylinder $= \pi r^2 h'$

$= \pi r^2 (2h)$

$= 2\pi r^2 h$ **(Double of the original)** **1**

(b) $h' = 2h$ and $r' = \frac{r}{2}$

Then volume of cylinder $= \pi r^2 h$

$= \pi \left(\frac{r}{2}\right)^2 \times 2h$

$= \pi \times \frac{r^2}{4} \times 2h$

$= \frac{1}{2}\pi r^2 h$ **(Half of the original)** **1**

(c) $r' = \frac{r}{2}$ unit

Volume of cylinder $= \pi r'^2 h$

$= \pi \left(\frac{r}{2}\right)^2 h$

$= \frac{1}{4}\pi r^2 h$ cubic unit

(One fourth of the original) **1**

19. Let the sides of two squares are a and b respectively.

4a = 40 and 4b = 96

$\therefore$ a = 10 m and b = 24 m

Given, **1**

The perimeter of another square = Sum of area of two squares.

= Area of Ist square + Area of IInd square

$= a^2 + b^2$

$= (10)^2 + (24)^2$

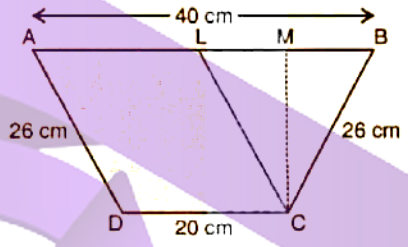
$= 100 + 576$

$= 676\ m^2$ **1**

Hence, the perimeter of another square = 676 m.

1

20. Let ABCD be the trapezium such that AB = 40 cm and CD = 20 cm and AD = BC = 26 cm.



½

Now, draw CL || AD

Then, ALCD is a parallelogram

So, AL=CD=20cmandCL=AD=26cm. **½**

In ΔCLB, we have

CL = CB = 26 cm

Therefore, ΔCLB is an isosceles triangle. **½**

Draw altitude CM of ΔCLB. **½**

Since ΔCLB is an isosceles triangle.

So, CM is also the median.

Then, LM = $MB = \frac{1}{2}BL = \frac{1}{2} \times 20cm = 10cm$

[as BL = AB -AL = (40 - 20) cm = 20 cm].

Applying Pythagoras theorem in ΔCLM,

we have, $CL^2 = CM^2 + LW^2$

$26^2 = CM^2 + 10^2$

$CM^2 = 26^2 - 10^2$

$= (26-10)(26+10)$

$= 16 \times 36 = 576$

CM = $\sqrt{576}$ = 24 cm

Hence, the area of the trapezium $= \frac{1}{2} \times$ (sum of parallel sides) × Height

$= \frac{1}{2}(20+40) \times 24$

$= 30 \times 24 = 720\ cm^2$ **1**

21. Let the number be 100

Increase in the number = 20% of 100 =20 **1**

So, increased number = 100 + 20 = 120

Decrease in the number = 20% of 120

$= \frac{20}{100} \times 120 = 24$ **1**

So, new number = 120 – 24 = 96

Net decrease = 100 – 96 = 4

Hence, net decrease per cent

$= \frac{4}{100} \times 100 = 4\%$ **1**

22. We know that,

$(a+b)^2 = a^2 + b^2 + 2ab$ **½**

Here, $a+b = 25,\ a^2 + b^2 = 225$

$\Rightarrow \quad (25)^2 = 225 + 2ab$ **½**

$\Rightarrow$ 625 = 225 + 2ab **½**

$625 - 225 = 2ab$ **½**

$\Rightarrow$ 400 = 2ab **½**

$\Rightarrow \quad ab = \frac{400}{2}$

$\Rightarrow$ ab = 200 **½**

Section 'D'

(4 marks each)

23. As the part of red pigment increases/ part of base also increases in the same ratio. It is a case of direct proportion, we make use of the relation of the type $\frac{x_1}{y_1} = \frac{x_2}{y_2} = \frac{x_3}{y_3}$ ...

(a) Here, $x_1 = 1, y_1 = 8$ and $x_2 = 4$

Therefore, $\frac{x_1}{y_1} = \frac{x_2}{y_2}$

$\frac{1}{8} = \frac{4}{y_2}$

$\Rightarrow \quad y_2 = 4 \times 8 = 32$ **1**

(b) Here, $x_2\ 4, y_2 = 32\ and\ x_3 = 7$

$\frac{x_2}{y_2} = \frac{x_3}{y_3}$

$\Rightarrow \quad \frac{4}{32} = \frac{7}{43}$

$\Rightarrow \quad y_3 = \frac{7 \times 32}{4} = 56$ **1**

(c) Here, $x_3 = 7, y_3 = 56$ and $x_4 = 12, y_4 = ?$

$\frac{x_3}{y_3} = \frac{x_4}{y_4}$

$\Rightarrow \quad \frac{7}{56}=\frac{12}{y_4}$

$\Rightarrow \quad y_4=\frac{12\times 56}{7}$

$\Rightarrow \quad y_4=96$ **1**

(d) Here, $x_4=12, y_4=96$ and $x_5=20, y_5=?$

$\frac{12}{96}=\frac{202}{y_5}$

$\Rightarrow \quad y_5=\frac{20\times 96}{12}$

$\Rightarrow \quad y_5=160$

The table is

Part of pigment	1	4	7	12	20
Part of Base	8	32	56	96	160

24. A rational number between $\frac{1}{2}$ and -2

$=\left[\frac{1}{2}+(-2)\right]\div 2$

$=\left[\frac{1-4}{2}\right]\div 2$

$=\left[-\frac{3}{2}\right]\times\frac{1}{2}=-\frac{3}{4}$

A rational number between $\frac{1}{2}$ and $\left(\frac{-3}{4}\right)$

$=\left[\frac{1}{2}+\left(-\frac{3}{4}\right)\right]\div 2$

$=\left[\frac{2-3}{4}\right]\times\frac{1}{2}$

$=-\frac{1}{4}\times\frac{1}{2}=-\frac{1}{8}$ **1**

A rational number between $\left(-\frac{3}{4}\right)$ and (-2)

$=\left[\left(-\frac{3}{4}\right)+(-2)\right]\div 2$

$=\left[\frac{(-3)+(-8)}{4}\right]\times\frac{1}{2}$

$=\frac{-11}{4}\times\frac{1}{2}=\frac{-11}{8}$ **1**

Thus, the three rational numbers are $\left(-\frac{3}{4}\right),\left(-\frac{1}{8}\right)$ and $\left(-\frac{11}{8}\right)$. **1**

25. (a) Using $a^2-b^2=(a-b)(a+b)$

$a^4 - b^4 = (a^2)^2 - (b^2)^2$

$= (a^2 + b^2)(a^2 - b^2)$

$= (a^2 + b^2)(a + b)(a - b)$ **1**

(b) $p^4 - 81 = \left(p^2\right)^2 - (9)^2$

$= (p^2 + 9)\left(p^2 - 9\right)$ $[a^2 - b^2 = (a+b)(a-b)]$

$= \left(p^2 + 9\right)(p - 3)(p + 3)$ **½**

(c) $x^4 - (y+2)^4 = (x^2)^2 - [(y+2)^2]^2$

$= [(x^2) + (y+2)^2]\,[(x^2) - (y+2)^2]$

$= [(x)^2 + (y+2)^2][(x - y - z)(x + y + 2)]$ **½**

(d) $x^4 - (x-z)^4 = (x^2)^2 - [(x-z)^2]^2$

$= [x^2 - (x-z)^2][x^2 + (x-z)^2]$

$= \left[(x - x + z)(x + x - z)\right]\left[(x^2 + (x-z)^2\right]$ **1**

$= z(2x - z)\left[x^2 + (x)^2 + (z)^2 - 2xz\right]$

$= z(2x - z)[2x^2 - 2xz + z^2]$

(e) $a^4 - 2a^2b^2 + b^4 = \left(a^2\right)^2 + \left(b^2\right)^2 - 2\left(a^2\right)\left(b^2\right)$

$= (a^2 - b^2)^2$

$= [(a^2 - b^2)(a^2 + b^2)]$

$= [(a - b)(a + b)(a^2 + b^2)]$ **1**

26. (a) Let, Ist part = x

Then, IInd part $= (34 - x)$ **1**

According to question,

$\left(\frac{4}{7}\right)^{th}$ of Ist part $\left(\frac{2}{5}\right)^{th}$ of IInd part **1**

or $\frac{4}{7}x = \frac{2}{5}(34 - x)$

or $20x = 14(34 - x)$,

[by cross multiplication]

or $20x = 14 \times 34 - 14x$

or $20x + 14x = 14 \times 34$

or $34x = 14 \times 34$

or $x = \frac{14 \times 34}{34}$ **1**

or $x = 14$

Hence, two parts are 14 and $34 - 14 = 20$

i.e., 1st part = 14 and Und part = 20

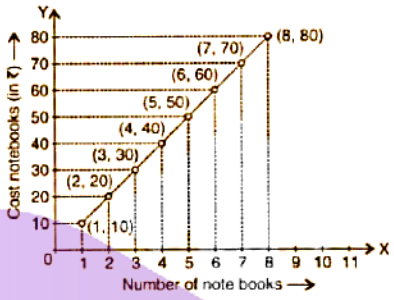
(b) Linear equation in one variable are

(c) $2x - 7 = \frac{2}{3}$ and (d) $x - 15 = 3x$ **2**

27. Let x: number of notebooks

y: cost of a notebook

x	1	2	3	4	5	6	7	8
y	10	20	30	40	50	60	70	80



(a) The cost of 7 notebooks is equal to the coordinate of the point (7, 70), i.e. cost of 7 notebooks = Rs. 70 **1**

(b) The number of notebooks that can be purchased for Rs. 50 is equal to the abscissa of the point (5, 50). Hence, 5 notebooks can be purchased for Rs. 50. **1**

28. (a) $81x^2+16y^2-72xy=(9x)^2+(4y)^2-2\times 9x\times 4y$ **1**

$=(9x-4y)^2$

$[\because a^2+b^2-2ab=(a-b)^2]$

Now, putting $x=\frac{2}{3}$ and $y=\frac{3}{4}$, then

$=\left(9\times\frac{2}{3}-4\times\frac{3}{4}\right)^2$

$=(6-3)^2=3^2=9$ **1**

(b) Putting a = 2 and b = 5, then

L.H.S $=(a+b)^2$

$=(2+5)^2=7^2=49$ **1**

and R.H.S $=a^2+b^2+2ab$

$=2^2+5^2+2\times 2\times 5$

= 4 + 25 + 20 = 49

Hence, L.H.S = R.H.S =49 **1**

29. (a) Here P=' 50000, R_1 = 8% p.a. and R_2 = 9% p.a

Since, $A=P\left(1+\frac{R_1}{100}\right)\left(1+\frac{R_2}{100}\right)$ **1**

$=50000\times\left(1+\frac{8}{100}\right)\left(1+\frac{9}{100}\right)$ **1**

$=50000\times\frac{27}{25}\times\frac{109}{100}$ **1**

Amount =Rs.58860

Therefore $C.I. = A - P$

$= 58860 - 50000$

=Rs. 8860

(b) (a) is right answer. **1**

30. We have, the sum of the digits of 51x 3=5+l+x+3=9+x **1**

Since, 51x 3 is divisible by 9.

∴ (9+x) must be divisible by 9. **1**

∴ (9 + x) must be equal to 0 or 9 or 18 or 27 or...

But x is a digit, then

$9 + x = 9 \Rightarrow x = 0$

$9 + x = 18 \Rightarrow x = 9$ **1**

$x = 27 \Rightarrow x = 18$, which is not possible. **1**

∴ The required value of x = 0 or 9.