## MATHEMATICS

Time allowed: 3 hours
Maximum
marks: 100

## General Instructions:

(i) All questions are compulsory.
(ii) The question paper consists of 25 questions divided into three sections A, B and C. Section A contains 10 questions of 3 marks each. Section B is of 10 questions of 4 marks each and Section C is of 5 questions of 6 marks each.
(iii) Internal choices have been provided in some questions. You have to attempt only one of the choices in such questions.
(iv) In questions on construction, the drawing should be neat and exactly as per the given measurements.
(v) Use of calculators is not permitted. However, you may ask for Mathematical tables.

## SECTION - A

1. Find the values of p and q for which the following system of linear equations have infinite number of solutions.
$2 x+3 y=7$
$2 p x+(p+q) y=28$
2. The sum to 20 terms of an AP is 1430 and the first term is 100 . Find the last term.

OR Find the sum of all numbers between 400 and 600 which are divisible by 9 .

$$
x^{3}+y^{3}+z^{3}-3 x y z
$$

3. Reduce each of the following rational expression in its lowest terms: $\frac{x^{2}+y^{2}+z^{2}-x y-y z-z x}{}$
4. Find the values of $a$ and $b$ so that the polynomials $P(x)$ and $Q(x)$ have $(x+1)(x-2)$ as their h.c.f.
$P(x)=\left(x^{2}+3 x+2\right)\left(x^{2}+x+a\right)$
$Q(x)=\left(x^{2}-3 x+2\right)\left(x^{2}-3 x+b\right)$
5. Ashish borrowed Rs 38255 and agreed to repay it in 3 equal quarterly instalments. If the interest charged is $8 \%$ compounded quarterly, what is the size of each instalment?
6. Tickets are numbered from 1 to 50 . They are well-shuffled and a ticket is drawn at random. What is the probability that the drawn ticket has
a) an even number
b) a number which is a multiple of 5
c) a number which is greater than 35
d) a number which is a square?
7. From an ordinary frequency table from the following cumulative frequency distribution of marks obtained by 20 students and calculate the mean marks.

| Marks Less than | 10 | 20 | 30 | 40 | 50 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| No. of Students | 2 | 7 | 15 | 18 | 20 |

8. An equilateral triangle is inscribed in a circle of radius 6 cm . Find its sides.
9. Draw a circle of radius 5 cm . Take a point P on it and draw a tangent at the point P to the circle without using the centre of the circle. Write the steps of construction.
10. In the fig $\mathrm{PQ}=\mathrm{QR}, \angle \mathrm{RQP}=72^{\circ}, \mathrm{PC}$ and QC are tangents to the circle $\mathrm{C}(\mathrm{O}, \mathrm{r})$. Find (I) $\angle \mathrm{POQ}$ and ii) $\angle \mathrm{PCQ}$.

## SECTION - B:

11. For each of the following pair of equations, draw the graph-lines and calculate the area bounded by the graph-lines and the x -axis.
$4 \mathrm{x}-3 \mathrm{y}+4=0$
$4 x+3 y-20=0$
12. The coordinates of $A$ and $B$ are $(-3, a)$ and $(1, a+4)$ respectively. The mid point of $A B$ is $(-1,1)$, Find the value of ' $a$ '.
13. If F is in the exterior of a circle with a diameter AB , prove that $\angle \mathrm{AFB}$ is an acute angle.

14. Prove the following identities:

$$
\binom{\text { Prove the following identities: }}{1+\frac{1}{\tan ^{2} \theta}}\binom{1}{1+\frac{1}{\cot ^{2} \theta}}=\frac{1}{\sin ^{2} \theta\left(1-\sin ^{2} \theta\right)}
$$

15. Construct a $\triangle \mathrm{ABC}$ in which $\mathrm{AB}=5 \mathrm{~cm} . \angle \mathrm{B}=60^{\circ}$ and altitude $\mathrm{CD}=3 \mathrm{~cm}$. Construct a $\triangle \mathrm{AQR}$ similar to $\triangle \mathrm{ABC}$ such that each side of $\triangle \mathrm{AQR}$ is 1.5 times that of the corresponding side of $\triangle \mathrm{ABC}$.
16. $\mathrm{A}(-8,4), \mathrm{B}(-2,-2), \mathrm{C}(2,2)$ and D form a rectangle. Find the coordinates of D and the length of the diagonals.
17. Derive the quadratic formula.
18. Determine the value of $\alpha$ for which the following system of linear equations has infinitely many solutions.

$$
\left\{\begin{array}{l}
\alpha x+3 y=\alpha-3 \\
12 x+\alpha y=\alpha
\end{array}\right.
$$

19. If $\alpha, \beta$ are the roots of the equation $3 x^{2}-4 x-4=0$, from the equation whose roots are $\alpha+2$ and $\beta+2$
20. A sewing machine costing Rs 5600, is purchased by Anita on paying Rs 200 initially and the remaining by 3 equal monthly instalments at $12 \%$ p.a. Calculate each monthly instalment.

## SECTION C:

21. a) Prove in a triangle, a line drawn parallel to one side, to intersect the other sides in distinct points, divides the two sides in the same ratio. .
b) In fig. $\mathrm{MN} \| \mathrm{BC}$. If $\mathrm{AM}=2 \mathrm{xcm}, \mathrm{MB}=24 \mathrm{~cm}, \mathrm{AN}=3 \mathrm{~cm}$ and $\mathrm{NC}=18$ cm , find the value of $x$.

22. a) Prove the ratio of the areas of similar triangles is equal to the ratio of the squares of their corresponding sides.
b) $\quad \mathrm{ABCD}$ is a trapezium with $\mathrm{AB} \| \mathrm{DC}$. If $\triangle \mathrm{AED} \sim \triangle \mathrm{BEC}$, prove that $\mathrm{AD}=\mathrm{BC}$.
23. Mrs Renu Chaudhary is an Income. Tax Officer. her annual income from salaries is Rs 192.306. She contributes Rs 14390 to her Provident Fund account, pays Rs 16821 as Insurance premium and purchases national Savings Certificates worth of Rs 13000. She paid Rs 14000 as advance tax. What refund will she get from Income Tax department?
a) Standard deduction:
b) Rate of Income tax

## Slab

i) Upto Rs. 50,000
ii) From Rs50,001 to Rs. 60,000
iii) Rs. 60001 to $1,50,000$
iv) Above Rs. 1,50,000 $1,50,000$.
c) Rebate in income tax maximum of
maximum of
d) Surcharge

Every salaried tax payer is entitled to a consolidated standard deduction of $1 / 3$ rd of his / her gross income subject to a maximum of Rs 30000 if the salary is upto Rs 150000 , Rs 25000 if the saraly exceeds Rs 150000 and is upto Rs 300000 . For the salary exceeding Rs 300000 and upato Rs 500000, it is Rs 20000.

## Income Tax

## No Tax

$10 \%$ of the amount exceeding Rs. 50,000
Rs. $1000+20 \%$ of the amount exceeding Rs. 60,000 .
Rs. $19000+30 \%$ of the amount exceeding Rs.
i) $20 \%$ of the amount of savings subject to a

Rs 14,000 if taxable income is upto Rs $1,50,000$.
ii) $15 \%$ of the amount of savings subject to a

Rs 10,500 if taxable income is above Rs $1,50,000$
$5 \%$ of the net income tax paid
24. A vertical tower stands on a horizontal plane and is surmounted by a vertical flagstaff of height $h$. At a point on the plane, the angle of elevation of the bottom of the flagstaff is $\alpha$ and that of the top of the

$$
\mathrm{h} \tan \alpha
$$

flagstaff is $\beta$. Prove that the height of the tower is

$$
\tan \beta-\tan \alpha
$$

25. There are 360 students in Class $X$ at a Kendriya Vidyalaya and they travel to the Vidyalaya by the following means:
130 students travel on foot
125 students travel by bus
70 students travel by cycle
35 students travel by car.
Represent this information on a pie chart.
