QB365

Model Question Paper 3

11th Standard CBSE

**Mathematics**

Reg.No. :

Time : 02:00:00 Hrs

Total Marks : 100

## Section-A

1) Find the vertix and the directrix of the parabola $y^2$-3x - 2y + 7 = 0. 2

2) If one end of a diameter of circle $x^2+y^2$ - 4x - 6y+11 = 0 is (3,4), then find the coordinate of the other end of the diameter 2

3) If lx +my = 1 touches the circle $x^2+y^2 = a^2$, then prove that the point (l,m) lies on the circle $x^2+y^2=a^{-2}$. 2

4) Let L,M,N be the feet of the perpendiculars drawn from a point P(3,4,5) on the X,Y and Z-axes respectively.Find the coordinates of L, M and N. 2

5) Find the centroid of a triangle, the mid-point of whose sides are D(1, 2, -3), E (3, 0, 1) and F(-1, 1, -4). 2

6) If the distance between the points (a,0,1) and (0,1,2) is $\sqrt{27}$ ,then find the value of a. 2

7) Using distance formula, show that the following points are collinear. 2

Points A(1,-1,3), B(2,-4,5) and C(5,-13,11)

8) Locate the point (-2,-3,4) in space. 2

9) $limx\rightarrow 0\frac{tanx-sinx}{x}$ 2

10) Find the derivate of the following functions from first principle 2

$x^3$ - 27

11) Evaluate the following 2

$\lim_{x\rightarrow 0}\frac{x \quad sin\infty-\infty sin \quad x}{x-\infty}$

12) Find the component statement of the following compound statements and check whether they are true or false. 2

Number 3 is prime or it is odd.

13) The marks obtained by 7 students are 8,9,11 ,13,14,15,21.Find the variance and standard deviation of these marks. 2

14) A coin tossed. If it shows tail, we draw a ball from a box which contains 2 red and 3 black balls. If it shows for this experiment. 2

15) In a simultaneous toss of two coins , find the probability of no tail 2

## Section-B

16) Find the equation of circle whose center is(1, 2) and touches X-axis 3

17) Prove that the line lx + my + n=0 will touch the parabola $y^2$=4ax, if ln=$am^2$ 3

18) Find the equation of set of point P such that $PA^2 + PB^2 = 2k^2$ , where A and B are the points (3,4,5) and (-1,3,-7), respectively. 3

19) What are the conditions of the vertices of a cube whose edge is 5 units, one of whose vertices coincides with the origin and threee edges passing through the origin coincides with the positive direction of the axes through the origin? 3

20) If the function f(x) satisfies $\lim_{x\rightarrow 1}\frac{f(x)-2}{x^2-1} = \pi$, then evaluate $\lim_{x\rightarrow 1}f(x)$. 3

Use the theorem $\lim_{x\rightarrow a}\frac{f(x)}{g(x)} = \frac{\lim_{x\rightarrow a}f(x)}{\lim_{x\rightarrow a}g(x)}$ and simplify it.

21) Evaluate $limx\rightarrow 0\frac{sin(2+x)-sin(2-x)}{x}$. 3

First use the formula,

sinC-sinD=2cos$\left(\frac{C+D}{2}\right)sin\left(\frac{C-D}{2}\right)$and then apply the limit to get the required value.

22) Write down the truth bvalue of each of the following statements. 3

(i) Delhi is in India

(ii) Chennai is in Pakistan

(iii) 5 + 6 = 11

23) Find the mean deviation about the mean for the following data 3

| | | | | | | |
|---|---|---|---|---|---|---|
| **$x_i$** | 2 | 5 | 6 | 8 | 10 | 12 |
| **$f_i$** | 2 | 8 | 10 | 7 | 8 | 5 |

24) A bag contains 4 identical red balls 3 identical black balls. The experiment consists of drawing one ball, then putting it into the bag again drawing a ball. What are the possible outcomes of the experiment? 3

25) An experiment consists of recording boy-girl composition of families with 2 children 3

(i) What is the sample space, if we are interested in knowing whether it is a boy or girl in the order of their births?

## Section-C

26) Draw the shape of $\frac{x^2}{64} + \frac{y^2}{25} = 1$and find their vertices, major axis, minor axis, eccentricity, foci, and length of latusrectum. 4

27) Draw the shape of ellipse $\frac{x^2}{49} + \frac{y^2}{16} = 1$and find the major axis. 4

28) Show that $\Delta ABC$ with vertices **4**

A(0,4,1), B(2,3,-1), and C(4,5,0) is right angled.

29) Suppose $f(x) = \{4, x = 1, \quad and \quad if \quad \lim_{x\to 1} f(x) \begin{matrix} a+bx, x<1 \\ b-ax, x>1 \end{matrix} = f(1)$, then what are the possible values of a and b? **4**

30) $lim_{x\to 0}\frac{sec4x-sec2x}{sec3x-secx}$ **4**

31) $lim_{x\to 2}\left[\frac{1}{x-2}-\frac{2(2x-3)}{x^3-3x^2+2x}\right]$ **4**

32) Write down the negation **4**

$\Delta ABC$ is isosceles, if and only if $\angle B = \angle C$

33) Find the mean and standard deviation of the following frequency distribution **4**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $x_i$ | 6 | 10 | 14 | 18 | 24 | 28 | 30 |
| $f_i$ | 2 | 4 | 7 | 12 | 8 | 4 | 3 |

34) A bag contains 6 discs of which 4 red,3 are blue and 2 are yellow.The discs are similar in shape and size.A disc is drawn at random from the bag.Calculate the probability that it will be **4**

**not blue**

35) One card is drawn from a well-shuffled deck of 52 cards.Calculate the probability that the card will be **4**

**a black card**

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## Section-A

1) Given parabola is $y^2 - 3x - 2y + 7 = 0$ **2**

$\Rightarrow \quad y^2 - 2y + 1 - 1 = 3x - 7 \Rightarrow \quad (y-1)^2 = 3(x - )$

which is of the form $Y^2 = 4aX$, where Y = y-1, X=x-2

**Ans** (2, 1) 4x - 5 = 0

2) Centre of circle is mid-point of end point of diameter. **2**

Here, centre = (2,3)

Let the other end be (x,y)

Then, $\frac{x+3}{2} = 2, \frac{y+4}{2} = 3$

= (1, 2)

3) Given,lx +my =1 touches the circle $x^2+y^2 = a^2$ **2**

Then, length of perpendicular distance from the centre of the given circle i.e. (0,0) on ix +my +1 = 0 is equal to radius

Then, a = $\left|\frac{0-0+1}{\sqrt{l^2+m^2}}\right| \Rightarrow a^2 = \frac{1}{l^2+m^2} \Rightarrow l^2 + m^2 = a^{-2}$

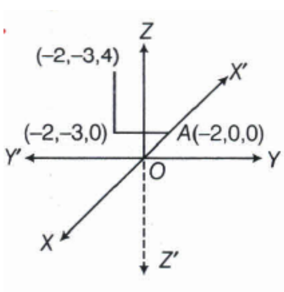
4) L(3,0,0), M(0,4,0) and N(0,0,5) **2**

5) The centroid of a triangle is equal to the centroid of the triangle formed by mid-points of its sides. (1, 1, -2) **2**

6) $AB = \sqrt{(a-0)^2 + (0-1)^2 + (1-2)^2} \Rightarrow \sqrt{27} = \sqrt{a^2 + 1 + 1} Ans.\ a = +-5$ **2**

7) Show that AB+BC=CA. **2**

8) **2**




9) $Given \quad limit \quad lim_{x\to 0}\left[\frac{tanx}{x}-\frac{sinx}{x}\right]$ **2**

=0

10) $f'(x) = lim_{h\to 0}\frac{[(x+h)-27]-(x-27)}{h} \quad [\because f(x) = x^3 - 27] \quad = lim_{h\to 0}\frac{(x+h)^3-x^3}{h} = lim_{h\to 0}\frac{h^3+3xh(x+h)}{h} \quad = \quad lim_{h\to 0}\frac{h[h^2+3x(x+h)]}{h}$ **2**

$=3x^2$

11) Let x= $\infty + h$, then as $x \to a, h \to 0$ **2**

Now, $\lim_{x\to 0}\frac{x \quad sin\infty - \infty sin \quad x}{x-\infty}$

$= \lim_{x\to 0}\frac{(\infty+h)sin\infty - \infty sin(\infty+h)}{\infty+h-a} = \lim_{x\to 0}\frac{\infty sin\infty + hsin\infty - \infty sin(\infty+h)}{h} = \lim_{x\to 0}\frac{\infty.2cos\left(\frac{2\infty+h}{2}\right)sin\left(-\frac{h}{2}\right)}{h} + \frac{h \quad sin\infty}{h} = \lim_{x\to 0}\frac{\infty.2cos\left(\frac{2\infty+h}{2}\right)\frac{sin\frac{-h}{2}}{\frac{-h}{2}}.\left(\frac{-h}{2}\right)}{h} + sin\infty$

**Ans** $sin\infty - \infty cos\infty$

12) The component statements are 2

p :Number 3 is prime

q :Number 3 is odd

Both p and q are true. So $p \vee q$ is true.

13) Here, $\bar{x} = \frac{8+9+11+13+14+15+21}{7} = \frac{91}{7} = 13 marks$ 2

We make the table from the given data

| Marks($x_i$)$^2$ | $x_i - \bar{x}$ | $(x_i - \bar{x})^2$ |
|---|---|---|
| 8 | -5 | 25 |
| 9 | -4 | 16 |
| 11 | -2 | 4 |
| 13 | 0 | 0 |
| 14 | 1 | 1 |
| 15 | 2 | 4 |
| 21 | 8 | 64 |
| Total | | 114 |

Here, n=7, $\sum (x_i - \bar{x})^2 = 114$

$\therefore \quad \sigma^2 = \frac{1}{n}\sum (x_i - \bar{x})^2 = \frac{114}{7} = 16.29$

Also, standard deviation of marks, $\sigma = \sqrt{16.29} = 4.04$

Hence, variance is 16.29 and standard deviation is 4.04

14) Let the balls in the box be represented by $R_1$,$R_2$ , and $B_1$ ,$B_2$, $B_3$ 2

{(H,1), (H, 2), (H, 3), (H, 4), (H, 5), (H, 6), (T, $R_1$), (T, $R_2$), (T, $B_1$), (T, $B_2$), (T, $B_2$), (T, $B_3$)}

15) Favourable outcomes = {HT,TH} 2

$= \frac{1}{4}$

## Section-B

16) Given, center (h,k)=(1,2) and circle touches on X-axis 3

Radius(r)=y-coordinate of centre=2 so, equation of circle is

$(x-1)^2 + (y-2)^2=2^2$ $[(x-h)^2+(y-k)^2=r^2]$

$\Rightarrow x^2-2x+1+y^2-4y+4=4$

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

$\Rightarrow x^2+y^2-2x-4y+1=0$

which is the required equations of circle.

17) 3

*Given equation of line is* $lx + my + n = 0. \Rightarrow \quad y = \frac{-lx-n}{m}$ $.....(i)$*and equation of parabola is* $y^2$

18) 3

*Given points are* $A(3,4,5)$ *and* $B(-1,3,-7)$. *Let the coordinates of point P be* $(x,y,z)$. *Then,* $PA^2 = (x-3)^2 + (y-4)^2 + (z-5)^2$ $\Big[\because$ *distance* =

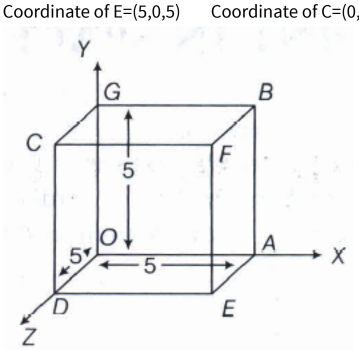
19) Given, edge of a cube is 5 unit. It is clear that 3

Coordinate of O=(0,0,0) Coordinate of A=(5,0,0)

Coordinate of G=(0,5,0) Coordinate of D=(0,0,5)

Coordinate of B=(5,5,0) Coordinate of F=(5,5,5)

Coordinate of E=(5,0,5) Coordinate of C=(0,5,5)




20) 3

Given, $\lim_{x\to 1}\frac{f(x)-2}{x^2-1} = \pi \Rightarrow \frac{\lim_{x\to 1}[f(x)-2]}{\lim_{x\to 1}(x^2-1)} = \pi \Rightarrow \lim_{x\to 1}[f(x)-2] = \pi \quad \lim_{x\to 1}(x^2-1) \Rightarrow \lim_{x\to 1}f(x)-2 = \pi(1^2-1) \quad \Rightarrow \lim_{x\to 1}f(x)-2 = \pi\times 0 \Rightarrow \lim_{x\to 1}f(x)-2 = 0$

21) **3**

$\lim_{x\to 0}\frac{\sin(2+x)-\sin(2-x)}{x} = \lim_{x\to 0x}\frac{2\cos\left(\frac{2+x+2-x}{2}\right)\sin\left(\frac{2+x-2+x}{2}\right)}{x}$ $\left[\because \sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right).\sin\left(\frac{C-D}{2}\right)\right] = \lim_{x\to 0}\frac{2\cos 2 \sin x}{x} = 2\cos 2\lim_{x\to 0}\frac{\sin x}{x}$

22) (i) T, because statement 'Delhi is in India' is true **3**

(ii) F, because statement 'Chennai is in pakistan' is false

(iii) T, becuse statement '5 + 6 = 11' is true

23) Let us make the following table from the given data. **3**

| $x_i$ | $f_i$ | $f_ix_i$ | $\lvert x_i-\bar{x}\rvert$ | $f_i\lvert x_i-\bar{x}\rvert$ |
|---|---|---|---|---|
| 2 | 2 | 4 | 5.5 | 11 |
| 5 | 8 | 40 | 2.5 | 20 |
| 6 | 10 | 60 | 1.5 | 15 |
| 8 | 7 | 56 | 0.5 | 3.5 |
| 10 | 8 | 80 | 2.5 | 20 |
| 12 | 5 | 60 | 4.5 | 22.5 |
| **Total** | 40 | 300 | | 92 |

Here, N = $\Sigma f_i = 40, \Sigma f_ix_i = 300$

Now, mean

$$(\bar{x}) = \frac{1}{N}\Sigma f_ix_i = \frac{1}{40}\times 300 = 7.5$$

Mean deviation about the mean,

MD

$$(\bar{x}) = \frac{1}{N}\Sigma f_i\left|x_i-\bar{x}\right| = \frac{1}{40}\times 92 = 2.3$$

Hence, the mean deviation about mean is 2.3.

24) Let R denotes a red ball and B denotes a black ball. Then, possible outcomes of the experiment are RR, RB, BR and BB **3**

25) Let B denotes a boy and G denotes a girl. **3**

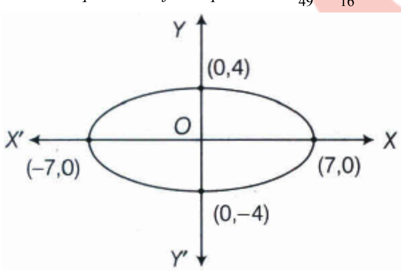
Then,

Required sample space ={BB, BG, GB, GG}

**Section-C**

26) $Vertices = (\pm 8, 0),\quad Major\quad axis = 16, Minor\quad axis = 10,\quad Eccentricity = \frac{\sqrt{39}}{8} Foci = (\pm\sqrt{39}, 0),\quad Latusrectum = \frac{25}{4}$ **4**

27) $Given\quad equation\quad of\quad ellipse\quad is\quad \frac{x^2}{49}+\frac{y^2}{16} = 1. On\quad comparing\quad with\quad \frac{x^2}{a^2}+\frac{y^2}{b^2} = 1, we\quad get\quad a = 7, b = 4$ **4**




Here, a>b, so major axis is along X-axis.

Major axis, 2a = 2*7 = 14

28) $Show\quad that\quad AB^2 + BC^2 = AC^2$ **4**

29) $LHL = \lim_{x\to 1^-}a + bx) = \lim_{h\to 0}[a + b(1-h)] = a + bRHL = \lim_{x\to 1^+}(b - ax) = \lim_{h\to 0}[b - a(1+h)] = b - a \because LHL = RHL = f(1) \Rightarrow A + B = B - A = 4$ **4**

**Ans. A=0, B=4**

30) **4**

$Given\quad limit = \lim_{x\to 0}\left(\frac{\frac{Cos\quad 2x-\cos\quad 4x}{\cos 2x\cos 4x}}{\frac{\cos x-\cos 3x}{\cos x\cos 3x}}\right)$ $= \lim_{x\to 0}\left(\frac{\cos\quad 2x-\cos\quad 4x}{\cos x-\cos\quad 3x}\times\frac{\cos x\cos 3x}{\cos 2x\cos 4x}\right)$ $= \lim_{x\to 0}\left(\frac{2\sin 3x\sin x}{2\sin 2x\sin x x}\times\frac{\cos x\cos 3x}{\cos 2x\cos 4x}\right)$

31) Given limit **4**

$= \lim_{x\to 2}\left[\frac{1}{x-2}-\frac{2(2x-3)}{x(x-1)(x-2)}\right] = \lim_{x\to 2}\left[\frac{x^2-5x+6}{x(x-1)(x-2)}\right] = \lim_{x\to 2}\left[\frac{(x-2)(x-3)}{x(x-1)(x-2)}\right]\ \frac{-1}{2}$

32) Either $\triangle ABC$ is isosceles and $\angle B \neq \angle C$ or $\triangle ABC$ is not isosceles and $\angle B = \angle C$ **4**

33) Let us make the following table from the given data. **4**

| $x_i$ | $f_i$ | $f_ix_i$ | $\left(x_i-\bar{x}\right)=\left(x_i-19\right)$ | $\left(x_i-\bar{x}\right)^2$ | $f_i(x_i-\bar{x})^2$ |
|---|---|---|---|---|---|
| 6 | 2 | 12 | -13 | 169 | 338 |
| 10 | 4 | 40 | -9 | 81 | 324 |
| 14 | 7 | 98 | -5 | 25 | 175 |
| 18 | 12 | 216 | -1 | 1 | 12 |
| 24 | 8 | 192 | 5 | 25 | 200 |
| 28 | 4 | 112 | 9 | 81 | 324 |
| 30 | 3 | 90 | 11 | 121 | 363 |
| | $\sum f_i=40$ | $\sum f_ix_i=760$ | | | $\sum f_i(x_i-\bar{x})^2=1736$ |

$\therefore \quad (\bar{x})=\frac{\sum f_ix_i}{N}=\frac{760}{40}=19 and \quad standard \quad deviation=\sqrt{\frac{1}{N}[\sum f_i(x_i-\bar{x})^2]}$ $=\sqrt{\frac{1736}{40}}=\sqrt{434}=6.59$

Ans.19,6.59

34) $\frac{2}{3}$ **4**

35) $\frac{1}{2}$ **4**