SAMPLE QUESTION PAPER CLASS-X (2017–18) MATHEMATICS

Time allowed: 3 Hours **Max. Marks:80**

General Instructions:

***(i) All questions are compulsory*.**

(ii) *The question paper consists of **30** questions divided into four sections **A, B, C** and **D.***

(iii)*Section **A** contains **6** questions of **1** mark each. Section **B** contains **6** questions of **2** marks each. Section **C** contains **10** questions **of 3** marks each. Section **D** contains **8** questions of **4** marks each.*

(iv) *There is no overall choice. However, an internal choice has been provided in four questions of 3 marks each and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.*

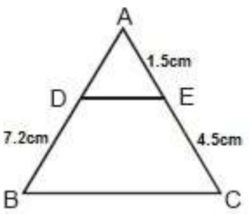
(v) *Use of **calculators** is not permitted.*

SECTION- A

Question numbers 1 to 6 carry 1 mark each.

1.If $a=2^3 x3$,$b=2x3x5$,$c=3^n x5$ and LCM(a,b,c)= 2^3 x 3^2 x5 ,then find n.

2. For what value of k are 2k, k+10 and 3k +2 in AP .



3. If in the given figure DE II BC ,then find the value of AD.

4. If sin α =1/2, cos β =1/2 , find degree measure of α + β .

5. Find the values of k if $2x^2 + kx + 3 = 0$ has two equal real roots.

6. If (2,p) is the mid point of line segment joining the points A(6,5) and B(-2,11),find value of p.

SECTION - B

Question numbers 7 to 12 carry 2 marks each.

7. If the H.C.F (90 ,144) = 18, find the L.C.M (90,144).

8. The 17th term of an AP exceeds its 10th term by 7. Find the common difference.

9. For what value of ‘k’ will the following system of linear equations have infinite number of solutions.

$$10x + 5y – (k-5)=0 \text{ and } \qquad 20x + 10y –k=0$$

10. Prove that the points (a,b+c) (b,c+a) and (c,a+b) are collinear .

11. A box contains cards numbered from 1 to 17. A card is drawn at random from the box. Find the probability that the number of the card is (i) a prime number (ii) a multiple of 3.

12 .One card is drawn from a well shuffled 52 playing cards. Find the probability of getting
(i) a non-face card (ii) a black king or (ii) red queen

SECTION- C

Question numbers 13 to 22 carry 3 marks each.

13 Prove that $5+\sqrt{3}$ is an irrational number

14. If two zeroes of the polynomial $x^4 + 3x^3 – 20x^2 – 6x + 36$ are $\sqrt{2}$ and $-\sqrt{2}$, find the other zeroes of the polynomial.

OR

Find the zeroes of the quadratic polynomial $5x^2 – 4 – 8x$ and verify the relationship between the zeroe and the coefficients of the polynomial .

15. Represent the following system of linear equations graphically. 4x -5y +16 = 0 and 2x + y -6 =0
Shade the triangular region enclosed by the lines with X –axis.

16. ABC is a right angle triangle, right angled at C. Let BC = a, CA = b, AB = c and let p be the length of perpendicular from C on AB. Prove that: cp = ab (ii) $\frac{1}{p^2} = \frac{1}{a^2} + \frac{1}{b^2}$

OR, In ΔABC, if AD is the median, then show that $AB^2 + AC^2 = 2(AD^2 + BD^2)$

17.Evaluate $\frac{\sin 25^\circ}{\cos 65^\circ} + \frac{\cot 15^\circ}{\tan 75^\circ} + \frac{2\cos 43^\circ \operatorname{cosec} 47^\circ}{\tan 10^\circ \tan 40^\circ \tan 50^\circ \tan 80^\circ}$

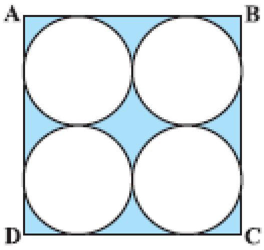
18.Show that the quadrilateral PQRS formed by P (22,5), Q(7,10), R(12,11) and S(3,24) is not a parallelogram.

OR, Find the point on x-axis which is equidistant from (2, -5) and (-2, 9)

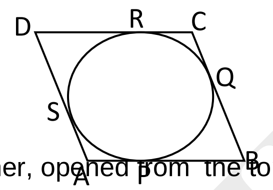
19. If the Mode of following distribution table is 54, find the value of p.

class	0-15	15-30	30-45	45-60	60-75	75-90
Frequency	3	5	p	16	12	7

20. Find the area of the shaded region in the given figure, where ABCD is square of side 14cm . (π=22/7)



21. A quadrilateral ABCD is drawn to circumscribe a circle as given in figure. Prove that AB + CD = AD + BC



22. A container, opened from the top and made up of metal sheet, is in the shape of a frustum of a cone of height 16 cm with radii of its lower and upper ends as 8 cm and 20 cm respectively . Find the cost of the container if the cost of metal sheet used is Rs 8 per 100 cm^2 .(π =3.14)

OR, A toy is in the form of a cone mounted on hemisphere of diameter 7 cm. The total height of the toy is 14.5 m. Find the volume of the toy. (π=22/7)

SECTION- D

Question numbers 23 to 30 carry 4 marks each.

23. Solve for x. $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$, $a + b \neq 0$

24. Which term of the sequence 20, $19\frac{1}{4}$, $18\frac{1}{2}$, $17\frac{3}{4}$,… is the first negative term?

25. . Draw a triangle ABC with side BC = 6 cm, AB = 5 cm and ∠ ABC = 60°. Then construct a triangle whose sides are $\frac{3}{4}$ of the corresponding sides of the triangle ABC.

26. Prove that, the ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.

OR, Prove that in a triangle, if square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle.

27. Prove that $\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}=1+\sec\theta.\operatorname{cosec}\theta$ where is an acute angle.

OR

If $\sec\theta+\tan\theta=p$ prove that $\sin\theta=\frac{p^2-1}{p^2+1}$ where is an acute angle .

28. From the top of a building 60m high the angles of depression of the top and the bottom of a tower are observed to be 30^0 and 60^0. Find the height of the tower.

29.Three sides of a triangular field are 15m,16m and 17m with the three corners of the field a cow,a buffalo and a horse are tied separately with ropes of length 7m each to graze the field.Find the area of the field which can not be grazed by the three animals. (π=22/7)

30.To highlight the child labour problem ,some students organized a javelin throw competition.50 students participated in this competition.The distance (in metres) thrown are recorded below.

Distance (in metres)	0-20	20-40	40-60	60-80	80-100
Number of students	6	11	17	12	4

Draw less than type Ogive for the given data .

Which value is depicted by the students ?

OR

Students of a locality decided to create an awareness about 'Save Electricity Campaign'.They recorded the monthly consumption of electricity of 68 consumers of that locality.The following frequency distribution table gives the monthly consumption of electricity of these consumers of that locality.

Monthly consumption(in units)	**Number of consumers**
65-85	**4**
85-105	**5**
105-125	**13**
125-145	**20**
145-165	**14**
165-185	**8**
185-205	**4**

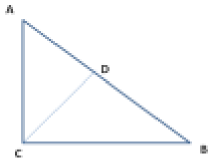
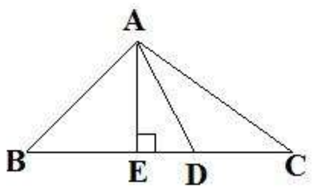
Find the median of the above data by using the formula.

Which value is depicted by the students ?

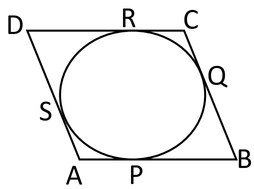
MARKING SCHEME(SAMPLE PAPER)

	SECTION -A	
1	n=2	1
2	Given numbers are in AP (k+10) - 2k = 3k +2 –(k +10) Or k = 6	1
3.	As DE II BC ,by BPT AD /DB = AE /EC Or AD = 2.4 cm	1
4.	sin 30° =1/2 and cos 60° =1/2 $\alpha + \beta = 90°$	1
5.	$k = \pm 2\sqrt{6}$	1
6.	p= $\frac{-5+11}{2}$ =3	1
	SECTION -B	
7.	HCF X LCM = 90x144 18 X LCM=90x144 LCM = 720	 1 1
8.	Let the first term=a and the common difference =d a+16d=a+9d+7 d=1	 1 1
9.	For Infinite solutions $\frac{a1}{a2} = \frac{b1}{b2} = \frac{c1}{c2}$ $\frac{k-5}{k} = \frac{1}{2}$ $\Rightarrow k = 10$	½ ½ 1
10.	$area = \frac{[a(c+a-a-b)+b(a+b-b-c)+c(b+c-c-a)]}{2}$ $= \frac{ac-ab+ab-bc+bc-ac}{2} = 0$ The given points are collinear.	1 ½ ½
11.	(i)P(a prime number)= $\frac{7}{17}$ (ii)P(a multiple of 3)= $\frac{5}{17}$	1+1

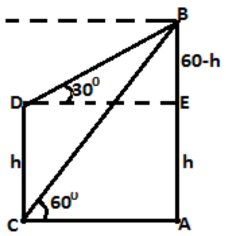
12.	P(a non face card)=10/13 P(a black king or red queen)=1/13	1+1
	SECTION C	
13	Let 5+√3 is a rational number .So 5+√3 = $\frac{a}{b}$ where a & b are co-prime integers and b≠0 After simplification √3=$\frac{a-5b}{b}$ Which contradicts the fact that √3 is an irrational number and hence 5+√3 is an irrational number.	1 1 1
14.	Let $f(x)=x^4 + 3x^3 - 20x^2 - 6x + 36$ Since $\sqrt{2}$ and $-\sqrt{2}$ are zeroes of f(x) ∴ $(x-\sqrt{2})(x+\sqrt{2}) = x^2 - 2$ is a factor of f(x) Division algorithm, we have $x^4 + 3x^3 - 20x^2 - 6x + 36$ $= (x^2 - 2)(x^2 + 3x - 16)$ $=(x^2 - 2)(x+6)(x-3)$ ∴ The other zeroes are -6 and 3 OR $5x^2 - 4 - 8x = 5x^2 - 8x - 4$ $= 5x^2 - 10x + 2x - 4$ $=(5x+2)(x-2)$ Zeroes are -2/5, 2 Sum of zeroes $2+\left(\frac{-2}{5}\right) = \frac{8}{5} = \frac{-coefficent\ of\ x}{coefficient\ of\ x^2}$ Product of zeres = $2\left(\frac{-2}{5}\right) = \left(\frac{-4}{5}\right) = \frac{constant\ term}{coefficient\ of\ x^2}$	1 $1\frac{1}{2}$ ½ 1 1+1
15.	Finding correct set of solutions for the pair of equations . Correct plotting of points on graph and joining of points. Shading of the triangular region enclosed with X –axis.	1 $1\frac{1}{2}$ ½

16	Given, To prove ,figure and construction Proving ΔACB ~ ΔCDB (by AA similarity)  $\frac{AB}{BC}=\frac{AC}{CD}$ $\Rightarrow \frac{c}{a}=\frac{b}{p}$ $\Rightarrow cp=ab$ (ii)$AB^2=BC^2+AC^2$ $c^2=a^2+b^2$ $\Rightarrow \frac{c^2}{a^2b^2}=\frac{a^2+b^2}{a^2b^2}$ $\Rightarrow \frac{c^2}{c^2p^2}=\frac{a^2}{a^2b^2}+\frac{b^2}{a^2b^2}$ $\Rightarrow \frac{1}{p^2}=\frac{1}{b^2}+\frac{1}{a^2}=\frac{1}{a^2}+\frac{1}{b^2}$ OR  Given, To prove, figure and construction In ΔADE, $AD^2=AE^2+ED^2$ (Pythagoras theorem) $AE^2=AD^2-DE^2$ In ΔABE, $AB^2=AE^2+BE^2$ ($\angle B=90^0$, Pythagoras theorem) $AB^2=AD^2-DE^2+(BD-DE)^2$ Using (I) $AB^2=AD^2+BD^2-2BD.DE$ .....(II) In ΔACE, $AC^2=AE^2+EC^2$ $AC^2 = AD^2 - DE^2+(CD+DE)^2$ $AC^2 = AD^2+CD^2+2CD.DE$ $AC^2 = AD^2+BD^2+2BD.DE$ (As BD=CD) .... (III) Adding (II) and (III) $AB^2+AC^2=2(AD^2+BD^2)$	1 1 1 1 1 1
17.	$\frac{\sin 25^\circ}{\cos 65^\circ}+\frac{\cot 15^\circ}{\tan 75^\circ}+\frac{2\cos 43^\circ \operatorname{cosec} 47^\circ}{\tan 10^\circ \tan 40^\circ \tan 50^\circ \tan 80^\circ}$	1

	$=\frac{\sin(90^\circ-65^\circ)}{\cos65^\circ}+\frac{\cot(90^\circ-75^\circ)}{\tan75^\circ}+\frac{2\cos43^\circ cosec(90^\circ-43^\circ)}{\tan(90^\circ-80^\circ)\tan(90^\circ-50^\circ)\tan50^\circ\tan80^\circ}$	
	$=\frac{\cos65^\circ}{\cos65^\circ}+\frac{\tan75^\circ}{\tan75^\circ}+\frac{2\cos43^\circ\sec43^\circ}{\cot80^\circ\cot50^\circ\tan50^\circ\tan80^\circ}$	1
	$=1+1+\frac{2}{1\times1}=4$	1
18.	PQ=5√10	
	QR=√26	4x½
	RS=5√10	
	SP=19√2	1
	Here QR≠ SP. So quadrilateral PQRS is not a parallelogram.	
	OR	½
	Let P(x,0) is equidistant from point A(2, -5) and B(-2, 9)	
	AP = BP	1
	$\sqrt{(x-2)^2+(0+5)^2}=\sqrt{(x+2)^2+(0-9)^2}$	1
	x= -7	½
	The point on the x-axis equidistant from the given points is (-7, 0)	
19.	Modal class is 45-60	½
	$l=45, f_1=16, f_0=p, f_2=12, h=15$	1
	$54=45+\frac{16-p}{32-p-12}\times15$ Or p=10	½+ 1
20.	Area of square ABCD = 14 X 14 = 196 cm^2	1
	Diameter = 7cm , r= 7/2 cm	
	Area of 4 circles = 4 X $\frac{22\times7\times7}{7\times2\times2}$ = 154 cm^2	1
	Area of shaded region = Area of square ABCD- Area of 4 circles = 196 – 154 = 42 cm^2	1
21.	We know that the tangents to a circle from an external point are equal in length.	
	AP = AS .....(i) BP = BQ ..... (ii)	
	CR = CQ .....(iii) DR = DS .....(iv)	4x½
	Adding (i), (ii), (iii) & (iv), we get	
	(AP + BP) + (CR + DR) = (AS + DS) + (BQ + CQ)	
	or, AB + CD = AD + BC	1



22.	Calculating l=20cm	½
	Area of metal sheet=$\prod(r_1+r_2)\, l + \prod r_1^2$	½
	=1959.36 cm^2	1
	Cost of metal sheet= $Rs\frac{8\times1959.36}{100} = Rs156.75$	1
	OR	
	Radius of hemisphere = $\frac{7}{2}$ = 3.5 cm	
	Height of cone = (14.5 – 3.5) = 11cm	
	Now, volume of toy = Volume of hemisphere + Volume of cone	
	$=\frac{2}{3}\pi r^3+\frac{1}{3}\pi r^2 h=\frac{1}{3}\pi r^2(2r+h)$	½
	$=\frac{1}{3}\times\frac{22}{7}\times\left(\frac{7}{2}\right)^2(2\times\frac{7}{2}+11)cm^3$	½
	$=231cm^3$	1+1
	SECTION D	
23.	$\frac{1}{a+b+x}-\frac{1}{x}=\frac{1}{a}+\frac{1}{b}$	
	$\frac{1}{a+b+x}-\frac{1}{x}=\frac{1}{a}+\frac{1}{b}$	1
	$\frac{-(a+b)}{x(a+b+x)}=\frac{a+b}{ab}$	
	or, x (a + b + x) + ab = 0	1
	x^2 + ax + bx + ab = 0	1
	x (x + a) + b (x + a) = 0 or, (x + a) (x + b) = 0 x = – a or x = – b	1
24	Let the n^{th} term of the given AP be the first negative term.	
	Then $a_n < 0$	
	or, a + (n – 1) d < 0	
	or, 20 + (n – 1) (– $\frac{3}{4}$) < 0	1
	or, 83 – 3n < 0 or, 3n > 83 or, n > $\frac{83}{3}$ or, n > $27\frac{2}{3}$	1
	$\therefore$ n $\geq$ 28	1
	Thus, 28^{th} term of the given sequence is the first negative term.	1

25	Construction of ΔABC Construction of similar triangle	1 3
26	Given, To prove ,figure and construction Correct proof	1 3
27	$\frac{\tan\theta}{1-\cot\theta}+\frac{\cot\theta}{1-\tan\theta}$ $=\frac{\frac{\sin\theta}{\cos\theta}}{1-\frac{\cos\theta}{\sin\theta}}+\frac{\frac{\cos\theta}{\sin\theta}}{1-\frac{\sin\theta}{\cos\theta}}$ $=\frac{(\sin\theta)^3-(\cos\theta)^3}{(\sin\theta-\cos\theta)\cos\theta.\sin\theta}$ $=\frac{1+\cos\theta.\sin\theta}{\cos\theta.\sin\theta}$ $=\frac{1}{\cos\theta.\sin\theta}+\frac{\cos\theta.\sin\theta}{\cos\theta.\sin\theta}$ $=\sec\theta.\mathrm{cosec}\theta+1$ OR $\sec\theta+\tan\theta=p$ $\Rightarrow\frac{1}{\cos\theta}+\frac{\sin\theta}{\cos\theta}=p$ $\Rightarrow\frac{(1+\sin\theta)^2}{1-\sin^2\theta}=p^2$ $\Rightarrow\frac{1+\sin\theta}{1-\sin\theta}=p^2$ $\Rightarrow\frac{p^2+1}{p^2-1}=\frac{1+\sin\theta+1-\sin\theta}{1+\sin\theta-1+\sin\theta}$ $\Rightarrow\frac{p^2+1}{p^2-1}=\frac{2}{2\sin\theta}=\frac{1}{\sin\theta}$ $\Rightarrow\frac{p^2-1}{p^2+1}=\sin\theta$	1 1 1 1 1 1 1 1
28		

	For correct figure Let AB = Building, CD = Tower ,AC=DE=x In, ΔDEB tan30^0= $\frac{BE}{DE}$ or, $\frac{1}{\sqrt{3}} = \frac{60-h}{x}$ or x = (60 – h) $\sqrt{3}$ ….. (i) In, Δ CAB, tan60^0= $\frac{AB}{CA}$ or $\sqrt{3} = \frac{60}{x}$ or $x = \frac{60}{\sqrt{3}}$ ……(ii) From (i) & (ii) $(60-h)\sqrt{3} = \frac{60}{\sqrt{3}}$ or h = 40m Thus, the height of the tower is 40m.	1 1 1 1
29	 Area of three sectors $= \frac{\alpha}{360^\circ} \times \pi r^2 + \frac{\beta}{360^\circ} \times \pi r^2 + \frac{\gamma}{360^\circ} \times \pi r^2 m^2$ $= \frac{(\alpha+\beta+\gamma)}{360^\circ} \times \frac{22}{7} \times 7^2 m^2$ $= 77m^2$ $s = \frac{15+16+17}{2} m = 24m$ Area of the triangle= $\sqrt{s(s-a)(s-b)(s-c)}$ $= 24\sqrt{21} m^2$ Area of the field which can not be grazed by the three animals = $(24\sqrt{21} - 77) m^2$	1 1 ½ 1 ½

30.

Distance (in metres)	Cumulative frequency
Less than 20	6
Less than 40	17
Less than 60	34
Less than 80	46
Less than 100	50

1

Drawing Ogive 2

Value-Social service (or any other value) 1

OR

Monthly consumption	Number of consumers	Cumulative frequency
65-85	4	4
85-105	5	9
105-125	13	22
125-145	20	42
145-165	14	56
165-185	8	64
185-205	4	68
Total	68	

1

Median class=125-145

L=125,n=68,f=20 ,cf=22,h=20 1

$$Median = l + \frac{(\frac{n}{2} - cf)}{f} \times h$$ 1

$$= 125 + \frac{(34 - 22)}{20} \times 20$$ 1

$$= 137$$

Value-Social service (or any other value) 1

Note- Proportionate marks are to be awarded for any alternate correct answers .