Model Paper -1 (2016-17)
SUMMATIVE ASSESSMENT - 1
CLASS X
MATHEMATICS

BLUE PRINT

S.No	Topic	VSA (1mark)	Short answer I (2marks)	Short answer II (3marks)	Long Answer (4marks)	TOTAL (90)
1	Number System			1	2	11
2	Algebra	1	2	2	3	23
3	Geometry	1	1	2	2	17
4	Trigonometry	1	2	3	2	22
5	Statistics	1	1	2	2	17
		4(4)	6(12)	10(30)	11(44)	90

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Time allowed: 3 hours **Max.Marks: 90**

General Instructions:

All Questions are compulsory

- The question paper consists of 31questions divided into four sections A,B,C,D Section **A** comprises of 4 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 11 questions of 4 marks each.
- Use of calculator is not permitted.

SECTION -A

1. Find the zeroes of polynomial $X^2 - 2X - 8$.

2. A ladder 10 m long reaches a window 8 m above the ground. Find the distance of the foot of the ladder from base of the wall .

3. If sin A = $\frac{3}{4}$, calculate cos A .

4. Find the class mark of 15.5 – 20.5

SECTION B (Q. No. 5 -10 each of 2marks)

5. If α and β are zeroes of the Polynomial $3x^2+5x+2$, Find the value of $\frac{1}{\alpha}+\frac{1}{\beta}$

6. For what value of a and b will the following system of linear equations have infinitely many solutions

$$2x + 3y = 7$$
$$(a-b)x + (a+b)y = 3a+b-2$$

7. If ΔABC ~ΔDEF and their areas be respectively 64 cm^2 and 121 cm^2.If EF = 15.4 cm, Find BC.

8. If sin4A = cos(A-20^0) , where 4A is an acute angle, find the value of A.

9. Convert the following frequency distribution table into a less than type cumulative frequency distribution table:

Marks	0-5	5-10	10-15	15-20	20-25	25-30
No. of students	4	7	12	18	6	3

10. Evaluate cos48°– sin42°

SECTION C (Q. No. 11 -20 each of 3 marks)

11. Given HCF (306, 657) = 9. Find the LCM (306, 657).

12. Find the zeroes of the quadratic polynomial $6x^2 – 7x – 3$ and verify the relationship between the zeroes and the coefficients.

13. Solve: $3x – 5y = 4$
$9x – 2y = 7$ by using Elimination method.

14. If the areas of two similar triangles are equal then show that the triangles are congruent.

15. ABC is an isosceles triangle right angled at C. Prove that $AB^2 = 2AC^2$

16. Prove that
$$(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$$

17. Without using trigonometric table evaluate the following
$$3\cos 68° \operatorname{cosec} 22° - \frac{1}{2} \tan 43° \tan 47° \tan 12° \tan 60° \tan 78°$$

18. If $\tan(A + B) = \sqrt{3}$ and $\tan(A – B) = \frac{1}{\sqrt{3}}$, Find A and B

19. Find the median of the following distribution

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	4	8	10	12	8	4

20. If the mean of the following distribution is 6 , find the value of p

x	2	4	6	10	P+5
f	3	2	3	1	2

SECTION D(Q. No. 21 -31 each of 4 marks)

21. Prove that $\sqrt{3}$ is irrational.

22 Find all the zeroes of the polynomial $2x^4 - 3x^3 - 3x^2 + 6x - 2$ if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$

23. 8 men and 12 boys can finish a piece of work in 10 days while 6 men and 8 boys can finish it in 14 days. Find the time taken by one man and by one boy alone to finish the Work. What value is depicted?

24. If tanA = 2 Evaluate secAsinA + $\tan^2$A – cosecA

The marks obtained by 30 students of class X of certain school in Mathematics paper Consisting of 100 marks are presented in the table below. Find the mode of this data

25.

Class Interval	10-25	25-40	40-55	55-70	70-85	85-100
No. of students	2	3	7	6	6	6

26. In an equilateral triangle ABC , D is a point on side BC such that BD = 1/3 BC
Prove that $9\,AD^2 = 7\,AB^2$

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

28. Divide : $2t^4 + 3t^3 - 2t^2 - 9t - 12$ by $t^2 - 3$

29. The median of the following data is 525 Find the values of x and y if the total Frequency is 100

Class	0-	100-	200-	300-	400-	500-	600-	700-	800-	900-

Interval	100	200	300	400	500	600	700	800	900	1000
Frequency	2	5	x	12	17	20	Y	9	7	4

30. Prove that

$$\frac{\cot A - \cos A}{\cot A + \cos A} = \frac{\operatorname{cosec} A - 1}{\operatorname{cosec} A + 1}$$

31. For a morning walk three persons step off together. There steps measure 80cm, 85cm, and 90cm respectively. What is the minimum distance each should walk so that they can cover the distance in complete steps?

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SUMMATIVE ASSESSMENT - 1
CLASS X
Marking Scheme

General Instructions:

1. The Marking Scheme provides general guidelines to reduce subjectivity and maintain uniformity. The answers given in the marking scheme are the best suggested answers.

2. Marking be done as per the instructions provided in the marking scheme. (It should not be done according to one's own interpretation or any other consideration). Marking Scheme be strictly adhered to and religiously followed.

3. Alternative methods be accepted. Proportional marks be awarded.

4. If a question is attempted twice and the candidate has not crossed any answer, only first attempt be evaluated and 'EXTRA' written with second attempt.

5. In case where no answers are given or answers are found wrong in this Marking Scheme, correct answers may be found and used for evaluation purpose.

SECTION – A

1) The given polynomial is

$P(x) = X^2 - 2X - 8$

Let $P(x)=0$

$X^2 - 2X - 8=0$

$X^2 - 4X + 2X - 8=0$ (By splitting middle term)

$X(X-4)+2(X-4)=0$

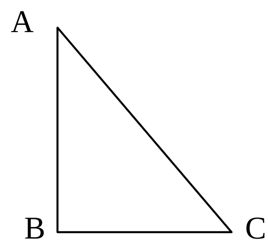
$(X-4)(X+2)=0$

Either X-4=0 or X+2=0

X=4,-2

(1 marks)

2) $AB^2+BC^2=AC^2$ (By PythagorasThm.)



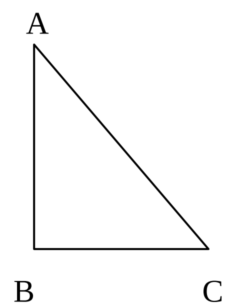
$8^2+BC^2=10^2$

$64+BC^2=100$

$BC^2=100-64=36=6^2$

BC=6m. (1marks)

3) Let ABC be any right triangle right angled at B.



Now $\sin A = \frac{3}{4}$, but $\sin A = \frac{BC}{AC}$

$\therefore \frac{BC}{AC} = \frac{3}{4}$

Let $BC = 3K$, $AC = 4K$,

By P.G.T $AC^2 = AB^2 + BC^2$

$(4K)^2 = AB^2 + (3K)^2$

$16K^2 = AB^2 + 9K^2$

$\Rightarrow AB = \sqrt{7}\,K$.

$\therefore \cos A = \frac{AB}{AC} = \frac{\sqrt{7}K}{4K} = \frac{\sqrt{7}}{4}$ (1marks)

4. The class mark of 15.5 – 20.5$=\frac{15.5+20.5}{2}=18$ (1)

SECTION – B

5. $3x^2+5x+2$

$\alpha+\beta = \frac{-5}{3} = \frac{-b}{a}$ ($\frac{1}{2}$marks)

$\alpha\beta = \frac{2}{3} = \frac{c}{a}$ ($\frac{1}{2}$marks)

$\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{-5}{2}$ (1marks)

6. Here $a_1 = 2$, $b_1 = 3$, $c_1 = -7$

$a_2 = a-b$, $b_2 = a+b$, $c_2 = -(3a+b-2)$

for infinitely many solutions,

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$,

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

I II III

From I and III we have

$a = 9b-4$ ....(1)

from II and III

$a-2b = 3$ ....(2)

by substituting the value of a from (1) in (2)

$9b-4-2b = 3$

$\Rightarrow b = 1$

Putting this value in (1) we get a = 5 . (1 marks)

1. Area ofΔ ABC/area of ΔDEF $= \frac{BC^2}{EF^2}$ (As $\Delta ABC \sim \Delta DEF$) (1marks)

$$\frac{64}{121} = \frac{BC^2}{EF^2}$$

$$\frac{64}{121} = \frac{BC^2}{(15.4)^2}$$

$\Rightarrow$ BC = 11.2 cm. (1)

8.Given that

Sin4A = cos(A-20^0)

Cos(90^o-4A) = cos(A-20^0) (1marks)

(90^o-4A) = (A-20^0)

5A = 110^0

A=22^0 (1 marks)

9. Less than type cumulative frequency table is

Marks	F	c.f.
Less than 5	4	4
Less than 10	7	11
Less than 15	12	23
Less than 20	18	41
Less than 25	6	47
Less than 30	3	50

(2 marks)

10. Cos 48° - sin 42°

Cos (90 – 42)° - sin 42° (1 marks)

Sin 42° - sin 42° = 0 (1 marks)

SECTION- C

11. HCF = 9, 1^{st} number = 306, 2^{nd} number = 657

We know that

HCFxLCM =Product of two numbers (1marks)

9 x LCM = 306 x 657

$$LCM = \frac{306x657}{9}$$

LCM = 22338. (2marks)

12. P(x) = $6x^2 - 7x - 3$

$6x^2 - 9x + 2x - 3$
3x(2x-3) +1(2x-3)
(2x – 3)(3x+ 1)
x = 3/2 , x = -1/3 (1 marks)

Now sum of zeroes = $\frac{3}{2} + (\frac{-1}{3}) = \frac{7}{6} = \frac{-b}{a}$

product of zeroes = $\frac{3}{2} x(\frac{-1}{3}) = \frac{-1}{2} = \frac{c}{a}$ (2 marks)

13. 3x – 5y = 4 ……..(i)

9x – 2y = 7 ………(ii)
Multiply eq. (i) by 3
9x – 15y = 12 ……..(iii) (1 marks)
Subtracting (ii) from (iii)
9x – 15y = 12
9x – 2y = 7
- + -

-13y = 5

$y = \frac{-5}{13}$ (1marks)

Putting value of y in (ii)

$9x - 2(\frac{-5}{13}) = 7$

$x = \frac{9}{13}$ (1marks)

14. Given that ΔABC ~ ΔPQR

Area (ΔABC) = area (ΔPQR)
OR area (ΔABC)/area(ΔPQR) = 1 (1marks)

$\frac{AB^2}{PQ^2} = \frac{BC^2}{QR^2} = \frac{AC^2}{PR^2} = 1$

AB = PQ, BC = QR, AC = PR
By SSS congruence condition
ΔABC ≅ΔPQR (2marks)

15. ΔABC is right angled at C.

$AB^2 = AC^2 + BC^2$ (By Pythagoras theorem.) (1 Mark)
$AB^2 = AC^2 + AC^2$ (AC = BC) (1mark)
$AB^2 = 2AC^2$ (1mark)

16. LHS $= (\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2$

$= \sin^2A + \operatorname{cosec}^2A + 2\sin A\operatorname{cosec}A + \cos^2A + \sec^2A + 2\cos A\sec A$ (1mark)
$= \sin^2A + \operatorname{cosec}^2A + 2 + \cos^2A + \sec^2A + 2$ (1mark)
$= \sin^2A + \cos^2A + \operatorname{cosec}^2A + \sec^2A + 4$
$= 1 + 1 + \cot^2A + 1 + \tan^2A + 4$ (1mark)
$= 7 + \tan^2A + \cot^2A$ = RHS

{ }

17. 3 cos(90 – 22). Cosec22 – $\frac{1}{2}$ tan43.Tan (90 – 43) tan12.tan(90 – 12).tan60(1)

3sin22.cosec22 – $\frac{1}{2}$ (tan43.cot43). (tan12.cot12). tan60 (1marks)

3 x 1 – $\frac{1}{2}$ x 1 x 1 x √3

3 - $\frac{\sqrt{3}}{2} = \frac{6-\sqrt{3}}{2}$ (1marks)

18. Tan(A + B) = √3

Tan (A + B) = tan60
A + B = 60 …………(i) (1marks)
Tan(A – B) = $\frac{1}{\sqrt{3}}$
Tan(A – B) = tan 30
A – B = 30 ………(ii) (1marks)
Adding (i) & (ii)
2A = 90
A = 45
Putting value of A in (i)
Putting the value of A in (i) we get 45 + B = 60
B = 15 (1marks)

19. cumulative frequency table is

Class	F	c.f.
0-10	4	4
10-20	4	8
20-30	8	16
30-40	10	26

40-50	12	38
50-60	8	46
60-70	4	50

N=$\frac{50}{2}$=25,f=10,cf=16,

And median class is 30-40

Now use the formula to find the median.

20.

x	F	fx
2	3	6
4	2	8
6	3	18
10	1	10
P+5	2	2p+10

$\sum\frac{fx}{f}$=mean

So $mean = \frac{52+2p}{11}$=6

2p=66-52

P=7

SECTION – D

21. Let us assume that √3 is rational. (1marks)

Then, there exit co-prime positive integers a and b such that

√3 = a/b, b ≠0

a = √3b

squaring both sides

$a^2 = 3b^2$ ……..(i) (1marks)

3divides a^2

3 divides a

a = 3c, (where c is any integer)

a = 3c in (i)

$9c^2 = 3b^2$

$3c^2 = b^2$

It means 3 divide b^2 and 3 divides b. (1marks)

3 is common factor of both a and b which is contradiction.

So, our assumption that √3 is rational is wrong (1 marks)

Hence √3 is irrational.

22. Given zeroes are √2 and - √2

So (x-√2)(x+√2)=x^2-2 is a factor of the given polynomial (1mark)

Now divide the given polynomial by x^2-2 to get other two zeroes

From quotient $2x^2-3x+1$ (1 mark)

$2x^2-2x-x+1$

$2x(x-1) -1(x-1)$

$(2x-1)(x-1)$

Either 2x-1 =0, or x-1 =0

$X=\frac{1}{2}$ or x= 1.

∴ other two zeros are $\frac{1}{2}$, 1 . (2marks)

23. Let the time taken by one man = x days

And time taken by one boy = y days

ATQ $\frac{8}{X}+\frac{12}{Y}=\frac{1}{10}$ and $\frac{6}{X}+\frac{8}{Y}=\frac{1}{14}$

Now solve the equations to find x and y

24. Hypotenuse = √5 (1marks)

SecA = √5, sinA = 2/√5, cosecA = √5/2 (1marks)

$(\sqrt{5} \times \frac{2}{\sqrt{5}}) + (2)^2 - \frac{\sqrt{5}}{2}$ (1marks)

$2 \quad +4 - \frac{\sqrt{5}}{2}$

$6 \quad - \frac{\sqrt{5}}{2} = \frac{12-\sqrt{5}}{2}$ (1marks)

25 **Class Interval**	**Number of Students**
10-25	2
25-40	3
40-55	7
55-70	6
70-85	6
85-100	6

Since highest frequency is 7

Therefore modal class is 40-55 (2marks)

Mode = l + ($\frac{f_1 - f_0}{2f_1 - f_0 - f_2}$) x h

= 40 + ($\frac{7-3}{14-3-6}$) x 15

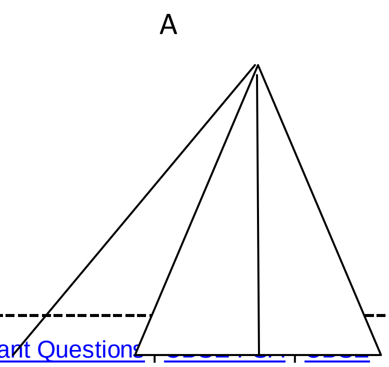
= 40 + ($\frac{4}{5}$) x 15

= 40 + 12

= 52. (2marks)

26. In an equilateral triangle ABC, D is a point on side BC such that

BD= 1/3 BC



To Prove:- $9AD^2=7AB^2$

Construction: Draw AP ⊥ BC

Proof: In right triangle APB,

$AB^2 = AP^2 + BP^2$ -(1)

(By Pythagoras theorem)

B D P C

In right triangle APD,

$AD^2 = AP^2 + DP^2$ -(2)

(By Pythagoras theorem)

From (2)

$AP^2 = AD^2 - DP^2$ -(3)

From (3) , putting the value of AP in (1) , we get

$AB^2 = AD^2 – DP^2 + BP^2$

$= AD^2 - DP^2 + (BC/2)^2$

In right triangle APB and APC,

Hyp. AB= Hyp. AC

AP = AP (Common side) (2marks)

Therefore ΔAPB ≡ΔABC

(RHS congruence criterion)

Therefore BP = CP (CPCT)

Therefore, BP = CP = BC/2

$AB^2 = AD^2 - DP^2 + BC^2/4$

$= AD^2 - (BP-BD)^2 + BC^2/4$

$= AD^2 - (BP^2 + BD^2 - 2BP.BD) + BC^2/4$

$= AD^2 - BP^2 - BD^2 + 2BP.BD + BC^2/4$

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$= AD^2-(BC/2)^2 – (BC/3)^2+2(BC/2)(BC/3)+BC^2/4$

Because BP=BC/2 and BD=BC/3

$= AD^2-BC^2/4 – BC^2/9 +BC^2/3 +BC^2/4$

$= AD^2 + 2/9\ BC^2$

$= AD^2+2/9AB^2$

Because AB=BC

$\Longrightarrow$ $AB^2(1-2/9)=AD^2$

$\Longrightarrow$ $7/9AB^2 =AD^2$

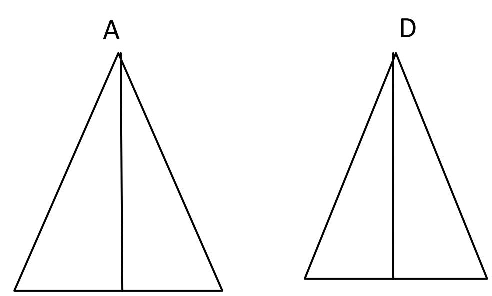
$\Longrightarrow$ $7\ AB^2 = 9\ AD^2$ (2marks)

27) Given two Triangles ΔABC and ΔDEF such that ΔABC is similar to ΔDEF

To prove

$$\frac{ar\Delta\ ABC}{ar\ \Delta DEF} = \frac{AB^2}{DE^2} = \frac{BC^2}{EF^2} = \frac{AC^2}{DF^2}$$

Construction Draw AL ⊥ BC and DM ⊥ EF



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B L C E M F

Proof: Since, similar triangles are equiangular and their corresponding sides are proportional. Therefore,

ΔABC is similar to ΔDEF

$\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$

And $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ -(1)

Thus, in ΔALB and ΔDME

$\angle ALB = \angle DME$ (each 90°)

$\angle B = \angle E$ (from eq.(1)(2marks)

By AA similarity, ALB is similar ΔDME

$\frac{AL}{DM} = \frac{AB}{DE}$ -(2)

From eq. (1) and (2), we get

$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} = \frac{AL}{DM}$ -(3)

Now,

$\frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{½ (BC \times AL)}{½ (EF \times DM)}$

[because Area of triangle= ½ x Base x Altitude]

$\Rightarrow$ ar(ΔABC) = (BC x AL)

$$\frac{ar(\Delta DEF)}{} \quad \frac{(EF \times DM)}{}$$

$$= \frac{BC}{EF} \times \frac{BC}{EF}$$

$$\Rightarrow \frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \frac{BC^2}{EF^2} \qquad -(4)$$

But $\frac{BC}{EF} = \frac{AB}{DE} = \frac{AC}{DF}$

(by similarity of ΔABC and ΔDEF)

$$\frac{BC^2}{EF^2} = \frac{AB^2}{DE^2} = \frac{AC^2}{DF^2} \qquad -(5)$$

Therefore eq. (4) and (5), we get

$$\frac{ar\Delta ABC}{ar \Delta DEF} = \frac{AB^2}{DE^2} = \frac{BC^2}{EF^2} = \frac{AC^2}{DF^2}$$ (2marks)

28) $t^2 - 3$) $2t^4 + 3t^3 - 2t^2 - 9t - 12$ ($2t^2 + 3t + 4$

$2t^4 \quad -6t^2$ (1)

- $\quad - \quad +$

- $3t^3 + 4t^2 - 9t - 12$

- $3t^3 \quad - 9t$

- $\quad - \quad +$ (1)

$4t^2 - 12$

$4t^2 - 12$

$-\quad +$ (1)

0 (1)

29).

Class	F	Cf
0-100	2	2
100-200	5	7
200-300	X	7+x
300-400	12	19+x
400-500	17	36+x
500-600	20	56+x
600-700	Y	56+x+y
700-800	9	65+x+y
800-900	7	72+x+y
900-1000	4	76+x+y

f=20,cf=36+x,total of frequency given is 100 (2marks)

And median class is 500-600

Use the median formula to find x and y

X=9 and y=15 (2marks)

30) LHS=

$$\frac{\cot A - \cos A}{\cot A + \cos A} = \frac{\frac{\cos A}{\sin A} - \cos A}{\frac{\cos A}{\sin A} + \cos A}$$

Taking cos A common from numerator and denominator

$\frac{\cos A(1-\sin A)}{\cos A(1+\sin A)}$ (2marks)

$$\frac{(1 - sinA)}{(1 + sinA)}$$

Dividing numerator and denominator by sinA, we get

$\frac{\text{cosec A} - 1}{\text{cosec A} + 1}$ =RHS (2marks)

31) Minimum distance = LCM of 80,85& 90

80 = 2 X 2 X 2 X 2 X 5 (1mark)
85 = 5 X 17 (1mark)
90= 2 X 3 X 3 X5 (1mark)
LCM= 2 X 2 X 2 X 2 X 3 X 3 X 5 X 17 = 12240 (1mark)

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