Design of Sample Question Paper
Mathematics, SA-I
Class IX

Type of Question	Marks per question	Total No. of Questions	Total Marks
M.C.Q.	1	10	10
SA-I	2	8	16
SA-II	3	10	30
LA	4	6	24
TOTAL		**34**	**80**

Blue Print
Sample Question Paper
Mathematics, SA-I
SA-1

Topic / Unit	MCQ	SA(I)	SA(II)	LA	Total
Number System	2(2)	2(4)	3(9)	-	7(15)
Algebra	2(2)	1(2)	2(6)	3(12)	8(22)
Geometry	6(6)	4(8)	3(9)	3(12)	16(35)
Coordinate Geometry	-	1(2)	1(3)	-	2(5)
Mensuration	-	-	1(3)	-	1(3)
TOTAL	**10(10)**	**8(16)**	**10(30)**	**6(24)**	**34(80)**

Note : Marks are within brackets.

Sample Question Paper
Mathematics
Class IX (SA-I)

Time: 3 to 3½ hours **M.M.: 80**

General Instructions

i) All questions are compulsory.

ii) The questions paper consists of 34 questions divided into four sections A, B, C and D. Section A comprises of 10 questions of 1 mark each, Section B comprises of 8 questions of 2 marks each section C comprises of 10 questions of 3 marks each and section D comprises of 6 questions of 4 marks each.

iii) Question numbers 1 to 10 in section A are multiple choice questions where you are to select one correct option out of the given four.

iv) There is no overall choice. However, internal choice has been provided in 1 question of two marks, 3 questions of three marks each and 2 questions of four 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 10 carry 1 mark each.

1. Decimal expansion of a rational number cannot be

   (a) non-terminating (B) non-terminating and recurring

   (C) terminating (D) non-terminating and non-recurring

2. One of the factors of $(9x^2-1) - (1+3x)^2$ is

   (A) 3+x (B) 3-x (C) 3x-1 (D) 3x+1

3. Which of the following needs a proof?

   (A) Theorem (B) Axiom (C) Definition (D) Postulate

4. An exterior angle of a triangle is 110° and the two interior opposite angles are equal. Each of these angles is

   (A) 70° (B) 55° (C) 35° (D) 110°

5. In ΔPQR, if $\angle R > \angle Q$, then

   (A) QR>PR (B) PQ>PR (C) PQ<PR (D) QR<PR

6. Two sides of a triangle are of lengths 7 cm and 3.5 cm. The length of the third side of the triangle cannot be

   (A) 3.6 cm (B) 4.1 cm (C) 3.4 cm (D) 3.8 cm.

7. A rational number between 2 and 3 is

(A) 2.010010001... (B) $\sqrt{6}$ (C) 5/2 (D) $4-\sqrt{2}$

8. The coefficient of x^2 in $(2x^2-5)(4+3x^2)$ is

(A) 2 (B) 3 (C) 8 (D) -7

9. In triangles ABC and DEF, $\angle A = \angle D$, $\angle B = \angle E$ and AB=EF, then are the two triangles congruent? If yes, by which congruency criterion?

(A) Yes, by AAS (B) No (C) Yes, by ASA (D) Yes, by RHS

10. Two lines are respectively perpendicular to two parallel lines. Then these lines to each other are

(A) Perpendicular (B) Parallel

(C) Intersecting (D) incllined at some acute angle

SECTION - B

Question numbers 11 to 18 carry 2 marks each.

11. x is an irrational number. What can you say about the number x^2? Support your answer with examples.

12. Let OA, OB, OC and OD be the rays in the anticlock wise direction starting from OA, such that $\angle AOB = \angle COD = 100°$, $\angle BOC = 82°$ and $\angle AOD = 78°$. Is it true that AOC and BOD are straight lines? Justify your answer.

OR

In ΔPQR, $\angle P=70°$, $\angle R=30°$. Which side of this triangle is the longest? Give reasons for your answer.

13. In Fig. 2, it is given that $\angle 1=\angle 4$ and $\angle 3=\angle 2$. By which Euclid's axiom, it can be shown that if $\angle 2 = \angle 4$ then $\angle 1 = \angle 3$.

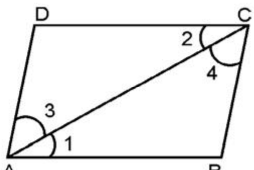


Fig. 2

14. Is $\left(\frac{8}{15}\right)^3 - \left(\frac{1}{3}\right)^3 - \left(\frac{1}{5}\right)^3 = \frac{8}{75}$?

How will you justify your answer, without actually calculating the cubes?

15. Evaluate $\left(\frac{-1}{27}\right)^{\frac{-2}{3}}$.

16. In Fig. 3, if AB||CD then find the measure of x.

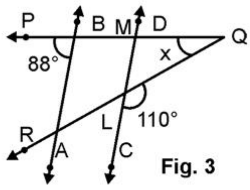


Fig. 3

17. In an isosceles triangle, prove that the altitude from the vertex bisects the base.

18. Write down the co-ordinates of the points A, B, C and D as shown in Fig. 4.

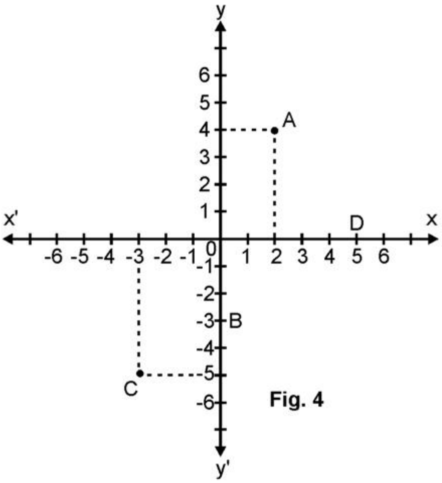


Fig. 4

SECTION C

Question numbers 19 to 28 carry 3 marks each.

19. Simplify the following by rationalising the denominators

$$\frac{2\sqrt{6}}{\sqrt{2}+\sqrt{3}}+\frac{6\sqrt{2}}{\sqrt{6}+\sqrt{3}}$$

OR

If $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}=a-\sqrt{15}b$, find the values of a and b.

20. If $a=9-4\sqrt{5}$, find the value of $a-\frac{1}{a}$.

OR

If $x = 3+2\sqrt{2}$, find the value of $x^2+\frac{1}{x^2}$

21. Represent $\sqrt{3.5}$ on the number line.

22. If (x-3) and $x-\frac{1}{3}$ are both factors of ax^2+5x+b, show that a=b.

23. Find the value of $x^3+y^3+15xy-125$ when x+y=5.

OR

If a+b+c=6, find the value of $(2-a)^3+(2-b)^3+(2-c)^3-3(2-a)(2-b)(2-c)$

24. In Fig. 5. ABC is an equilateral triangle with coordinates of B and C as B(-3, 0) and C (3, 0)
Find the coordinates of the vertex A.

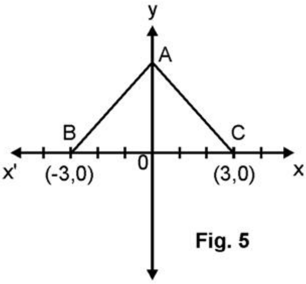
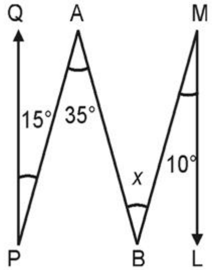


Fig. 5

25. In Fig. 6 QP||ML and other angles are shown . Find the values of *x*.



26. In Fig. 7, $QT \perp PR$, $\angle TQR=40°$ and $\angle SPR=30°$. Find the values of *x* and *y*.

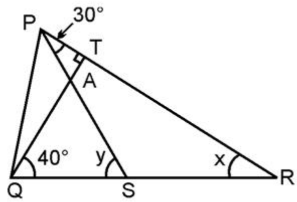


Fig. 7

27. In Fig. 8, D and E are points on the base BC of a ΔABC such that BD=CE and AD=AE. Prove that $\Delta ABE \cong \Delta ACD$.

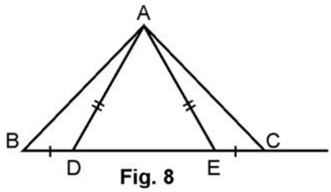


Fig. 8

28. Find the area of a triangle, two sides of which are 18 cm and 10 cm and the perimeter is 42 cm.

SECTION D

Question numbers 29 to 34 carry 4 marks each.

29. Let p and q be the remainders, when the polynomials $x^3+2x^2-5ax-7$ and $x^3+ax^2-12x+6$ are divided by (x+1) and (x-2) respectively. If 2p+q=6, find the value of a.

OR

Without actual division prove that $x^4-5x^3+8x^2-10x+12$ is divisible by x^2-5x+6.

30. Prove that :

$$(x+y)^3 + (y+z)^3 + (z+x)^3 - 3(x+y)(y+z)(z+x) = 2(x^3+y^3+z^3-3xyz)$$

31. Factorize $x^{12}-y^{12}$.

32. In Fig. 9, PS is bisector of $\angle QPR$; $PT \perp RQ$ and $\angle Q > \angle R$. Show that

$$\angle TPS = \frac{1}{2}(\angle Q - \angle R).$$

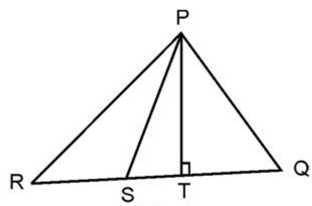


Fig. 9

OR

In ΔABC, right angled at A, (Fig. 10), AL is drawn perpendicular to BC. Prove that $\angle BAL = \angle ACB$.

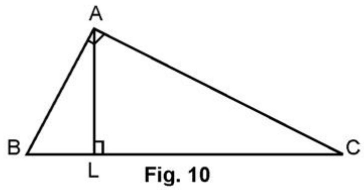
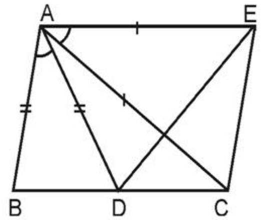


Fig. 10

33. In Fig. 11, AB=AD, AC=AE and $\angle BAD = \angle CAE$. Prove that BC = DE.



34. In Fig. 12, if $\angle x = \angle y$ and AB = BC, prove that AE = CD.

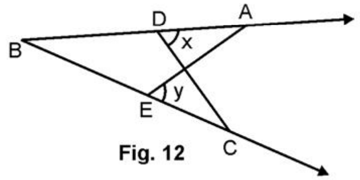


Fig. 12

Marking Scheme
Mathematics
Class IX (SA-I)

Section A

1.	(D)	2.	(D)	3.	(A)	4.	(B)	5.	(B)
6.	(C)	7.	(C)	8.	(D)	9.	(B)	10.	(B)

1x10=10

SECTION B

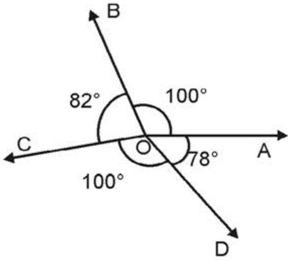
11. x^2 may be irrational or may not be. 1

For example ; if $x=\sqrt{3}$, $x^2=3 \rightarrow$ rational ; if $x=2+\sqrt{3}$, $x^2=7+4\sqrt{3} \rightarrow$ irrational ½+½

12. No, AOC and BOD are not straight lines

$\because$ i) $\angle AOC = 182° \neq 180°$ ½

ii) $\angle BOD = 178° \neq 180°$ ½



OR

$\angle Q = 180° - [70° + 30°] = 80°$ which is largest 1

$\therefore$ Longest side is PR 1

13. By Euclid's I Axiom, which states.

["Things which are equal to the same thing are equal to one another"] 2

14. The LHS can be written as

$$\left(\frac{8}{15}\right)^3 + \left(\frac{-1}{3}\right)^3 + \left(\frac{-1}{5}\right)^3 \quad \text{--------------(i)}$$ ½

As $\frac{8}{15} - \frac{1}{3} - \frac{1}{5} = \frac{8-5-3}{15} = 0$ ½

$\therefore$ (i) $= 3\left(\frac{8}{15}\right)\left(\frac{-1}{3}\right)\left(\frac{-1}{5}\right) = \frac{8}{75} = \text{RHS}$ ½

Justification : By the formula : If a+b+c=0, then $a^3+b^3+c^3=3abc$ ½

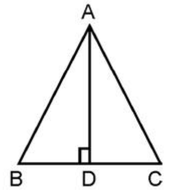
15. $\left[\left(\frac{-1}{27}\right)^{\frac{1}{3}}\right]^{-2}=\left(\frac{-1}{3}\right)^{-2}$ 1

$= \frac{1}{\left(\frac{-1}{3}\right)^2}=\frac{1}{\frac{1}{9}}=9$ 1

16. $\angle x=-70°+88°=18°$ 1

$\left(\because \angle QLM=180°-110°=70° \text{ and } AB \parallel CD \Rightarrow \angle PML=88°\right)$ 1

17. Let ABC be isosceles Δ in which AB=AC



Draw $AD \perp BC$ ½

Δ's ADB and ADC are congruent by RHS ½

$\therefore$ BD=DC (cpct)

i.e, Altitude AD bisects the base BC 1

18. The coordinates of the points are :

A(2, 4), B(0, -3), C(-3, -5) and D(5, 0) ½+½+½+½

SECTON-C

19. $\frac{2\sqrt{6}}{\sqrt{2}+\sqrt{3}}+\frac{6\sqrt{2}}{\sqrt{6}+\sqrt{3}}=\frac{2\sqrt{6}\left(\sqrt{2}-\sqrt{3}\right)}{(2)-(3)}+\frac{6\sqrt{2}\left(\sqrt{6}-\sqrt{3}\right)}{6-3}$ 1+½

$= 2\sqrt{18}-2\sqrt{12}+2\sqrt{12}-2\sqrt{6}=6\sqrt{2}-2\sqrt{6}$ 1+½

OR

LHS = $\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}=\frac{\left(\sqrt{5}+\sqrt{3}\right)\left(\sqrt{5}+\sqrt{3}\right)}{5-3}$ 1

$=\frac{8+2\sqrt{15}}{2}$ = 4+$\sqrt{15}$ = a-$\sqrt{15}$ b 1

$\Rightarrow$ a=4, b=-1 1

20. $a=9-4\sqrt{5}\Rightarrow\frac{1}{a}=\frac{1}{9-4\sqrt{5}}=\frac{9+4\sqrt{5}}{81-80}=9+4\sqrt{5}$ 2

$\therefore$ a-$\frac{1}{a}=9-4\sqrt{5}-9-4\sqrt{5}=-8\sqrt{5}$ 1

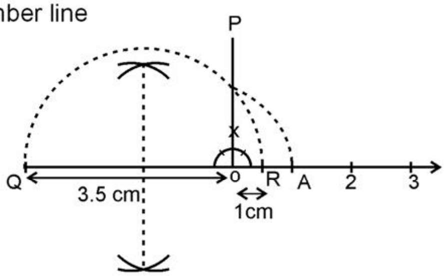
OR

$x=3+2\sqrt{2} \Rightarrow x^2=9+8+12\sqrt{2}=17+12\sqrt{2}$ 1

$\frac{1}{x^2}=\frac{1}{17+12\sqrt{2}}=\frac{17-12\sqrt{2}}{289-288}=17-12\sqrt{2}$ 1

$\therefore\ x^2+\frac{1}{x^2}=17+12\sqrt{2}+17-12\sqrt{2}=34$ 1

21. 'A' respresents $\sqrt{3\cdot 5}$ on the number line



3

22. Let $f(x) = ax^2+5x+b$

$f(3) = 0 \Rightarrow 9a+15+b=0 \Rightarrow 9a+b=-15$ ----------(i) 1

$f\left(\frac{1}{3}\right)=0 \Rightarrow \frac{a}{9}+\frac{5}{3}+b=0 \Rightarrow a+9b=-15$ (ii) 1

(i) = (ii) $\Rightarrow a=b$ 1

23. If $x+y=5 \Rightarrow x+y+(-5)=0$ ½+½

$\therefore (x)^3+(y)^3+(-5)^3 = 3(x)(y)(-5)$ 1

$\Rightarrow \quad x^3+y^3+15xy = 125$

$\Rightarrow \quad x^3+y^3+15xy-125=0$ 1

OR $a+b+c=6 \Rightarrow (2-a)+(2-b)+(2-c)=0$ 1½

$\therefore (2-a)^3+(2-b)^3+(2-c)^3 = 3(2-a)(2-b)(2-c)$

$\therefore (2-a)^3+(2-b)^3+(2-c)^3-3(2-a)(2-b)(2-c)=0$ 1½

24. AB=BC=AC=6 units as ΔABC is equilateral ½

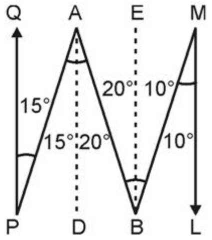
AO bisects base BC

$\Rightarrow$ OB=3 units 1

$\therefore OA^2=AB^2-OB^2=6^2-3^2 = 27 \Rightarrow OA=3\sqrt{3}$ 1

$\therefore$ Coordinates of A are $\left(0,\ 3\sqrt{3}\right)$ ½

25. Draw AD∥PQ, BE∥LM∥PQ ½



$\Rightarrow \angle PAD=15° \Rightarrow \angle DAB=20°$ 1

$\Rightarrow \angle DAB=\angle ABE=20°$ and $\angle EBM=\angle BML=10°$ 1

$\Rightarrow x=30°$ ½

26. In right triangle QTR, $x=90°-40°=50°$ 1½

Again y is the exterior angle of ΔPSR

$\Rightarrow y=30°+x=50°+30°=80°$ 1½

27. $BD+DE = CE+DE \Rightarrow BE=CD$ 1

In Δ's ABE and ACD

$BE=CD$, $AE=AD$, $\angle ADE=\angle AED$

$\therefore \Delta ABE \cong \Delta ACD$ (SAS) 2

28. $S=\frac{42}{2}=21$, let a=18cm, b=10cm, c=42-(28)=14cm 1

$Ar(\Delta) = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{21(3)(11)(7)}$ 1

$= 21\sqrt{11}cm^2$ 1

SECTION-D

29. Let $P(x) = x^3+2x^2-5ax-7$ and $Q(x) = x^3+ax^2-12x+6$ 1

$P(-1) = p$ and $Q(2) = q$

$\therefore p=-1+2+5a-7 \Rightarrow p=5a-6$

$q=8+4a-24+6 \Rightarrow q=4a-10$ 1+½

$2p+q=6 \Rightarrow 10a-12+4a-10=6$

$\Rightarrow 14a=28 \Rightarrow a=2$ 1+½

OR

$x^2-5x+6 = (x-2)(x-3)$ ½+½

$P(x) = x^4-5x^3+8x-10x+12$

$P(2) = 16-40+32-20+12=0$ 1

$P(3) = 81-135+72-30+12=0$ 1

$\therefore (x-2)(x-3)$ divides P(x) completely 1

30. Let $x+y=p, y+z=q, z+x=r$

$\therefore LHS = p^3+q^3+r^3-3pqr$

$= (p+q+r)(p^2+q^2+r^2-pq-qr-rp)$ 1

Now $p+q+r=2(x+y+z)$ ½

$p^2+q^2+r^2-pq-qr-rp = (x+y)^2+(y+z)^2+(z+x)^2-(x+y)(y+z)-(y+z)(z+x)-(z+x)(x+y)$ ½

$$= \begin{bmatrix} x^2+y^2+2xy+z^2+2yz+2zx \\ x^2+y^2 \ -xy \ +z^2 \ \ -yz \ -xz \\ -y^2 \ -xy \ -z^2 \ -yz \ -xz \\ x^2 \ \ -xy \ \ \ \ -yz \ -xz \end{bmatrix} = x^2+y^2+z^2-xy-yz-zx$$ 1

$\therefore (p+q+r)(p^2+q^2+r^2-pq-qr-rp) = 2(x+y+z)(x^2+y^2+z^2-xy-yz-zx)$

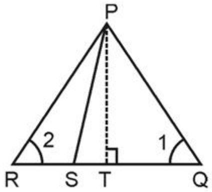
$= 2(x^3+y^3+z^3-3xyz)$ 1

31. $x^{12}-y^{12} = (x^6-y^6)(x^6+y^6)$ 1

$= (x^3-y^3)(x^3+y^3)(x^2+y^2)(x^4+y^4-x^2y^2)$ 1½

$= (x-y)(x^2+y^2+xy)(x+y)(x^2+y^2-xy)(x^2+y^2)(x^4+y^4-x^2y^2)$ 1½

32. $\angle Q+\angle R=180°-2\angle QPS=180°-2[\angle QPT+\angle TPS]$ 1



$=180° - 2[90° - \angle 1 + \angle TPS]$ 1

$\Rightarrow \angle 1 + \angle 2 = 2\angle 1 - 2\angle TPS$ 1

$\Rightarrow \angle TPS = \frac{1}{2}(\angle 1 - \angle 2) = \frac{1}{2}(\angle Q - \angle R)$ 1

OR

$\angle B+\angle C=90° \Rightarrow \angle B=90°-\angle C$ 1

$\angle BAL=90°-\angle B=90°-(90° - \angle C) = \angle C$ 1+1

$\therefore \angle BAL = \angle ACB$ 1

33. $\angle BAD+\angle DAC = \angle CAE+\angle CAD \Rightarrow \angle BAC=\angle DAE$ 1

In Δ's ABC and ADE

AB=AD, AC=AE and $\angle BAC=\angle DAE$

$\therefore$ Δ's are congruent 2

$\therefore$ BC = DE (cpct) 1

34. $\angle x=\angle y \Rightarrow \angle BDC=\angle AEB$ 1

In Δ's ABE and CBD 1

AB=BC, $\angle B=\angle B$, $\angle BDC=\angle AED$

$\therefore \Delta ABE \cong \Delta CBD$ [AAS] 2

$\therefore$ AE=CD

Design of Sample Question Paper
Mathematics, SA-I
Class X

Type of Question	Marks per question	Total No. of Questions	Total Marks
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Mathematics, SA-I
Class X

Topic / Unit	MCQ	SA(I)	SA(II)	LA	Total
Number System	2(2)	1(2)	2(6)	-	5(10)
Algebra	2(2)	2(4)	2(6)	2(8)	8(20)
Geometry	1(1)	2(4)	2(6)	1(4)	6(15)
Trigonometry	4(4)	1(2)	2(6)	2(8)	9(20)
Statistics	1(1)	2(4)	2(6)	1(4)	6(15)
TOTAL	**10(10)**	**8(16)**	**10(30)**	**6(24)**	**34(80)**

Note : Marks are within brackets.

Sample Question Paper
Mathematics
Class X (SA-I)

Time: 3 to 3½ hours **M.M.: 80**

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ii) The questions paper consists of 34 questions divided into four sections A, B, C and D. Section A comprises of 10 questions of 1 mark each, Section B comprises of 8 questions of 2 marks each, Section C comprises of 10 questions of 3 marks each and Section D comprises of 6 questions of 4 marks each.

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v) Use of calculators is not permitted.

Section-A

Question numbers 1 to 10 are of one mark each.

1. Euclid's Division Lemma states that for any two postive integers a and b, there exist unique integres q and r such that a=bq+r, where r must satisfy.

(A) $l<r<b$ (B) $0<r<b$ (C) $0 \leq r<b$ (D) $0 < r \leq b$

2. In Fig.1, the graph of a polynomial p(x) is shown. The number of zeroes of p(x) is

(A) 4 (B) 1 (C) 2 (D) 3

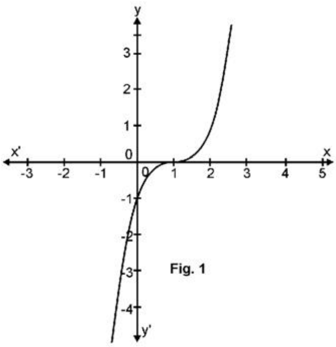


Fig. 1

3. In Fig. 2, if DE BC, then x equals

(A) 6 cm ∥ (B) 8 cm

(C) 10 cm (D) 12.5 cm

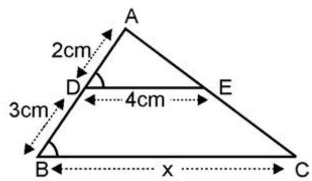


Fig. 2

4. If $\sin 3\theta = \cos(\theta - 6°)$, where (3θ) and $(\theta - 6°)$ are both acute angles, then the value of θ is

(A) 18° (B) 24° (C) 36° (D) 30°

5. Given that $\tan\theta = \frac{1}{\sqrt{3}}$, the value of $\frac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2 + \sec^2\theta}$ is

(A) -1 (B) 1 (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

6. In Fig. 3, AD=4 cm, BD = 3 cm and CB = 12 cm, then $\cot\theta$ equals

(A) $\frac{3}{4}$ (B) $\frac{5}{12}$

(C) $\frac{4}{3}$ (D) $\frac{12}{5}$

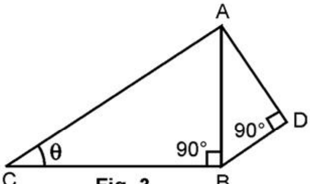


Fig. 3

7. The decimal expansion of $\frac{147}{120}$ will terminate after how many places of decimal?

(A) 1 (B) 2 (C) 3 (D) will not terminate

8. The pair of linear equations 3x+2y=5; 2x-3y=7 have

(A) One solution (B) Two solutions
(C) Many Solutions (D) No solution

9. If $\sec A = \text{cosec } B = \frac{15}{7}$, then A+B is equal to

(A) Zero (B) 90° (C) <90° (D) >90°

10. For a given data with 70 observations the 'less then ogive' and the 'more than ogive' intersect at (20.5, 35). The median of the data is

(A) 20 (B) 35 (C) 70 (D) 20.5

SECTION-B

Question numbers 11 to 18 carry 2 marks each.

11. Is 7x5x3x2+3 a composite number? Justify your answer.

12. Can (x-2) be the remainder on division of a polynomial p(x) by (2x+3)? Justify your answer.

13. In Fig. 4, ABCD is a rectangle.

Find the values of x and y.

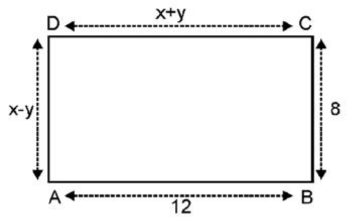


Fig. 4

14. If $7\sin^2\theta + 3\cos^2\theta = 4$, show that $\tan\theta = \frac{1}{\sqrt{3}}$

OR

If $\cot\theta = \frac{15}{8}$, evaluate $\frac{(2+2\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(2-2\cos\theta)}$

15. In Fig. 5, DE||AC and DF||AE. Prove that

$\frac{FE}{BF} = \frac{EC}{BE}$

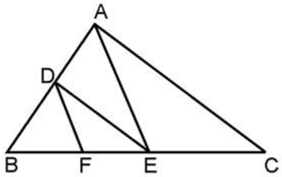


Fig. 5

16. In Fig. 6, $AD \perp BC$ and $BD = \frac{1}{3}CD$.

Prove that $2CA^2 = 2AB^2 + BC^2$

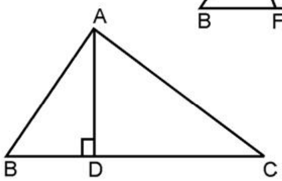


Fig. 6

17. The following distribution gives the daily income of 50 workers of a factory:

Daily income (in rupees)	100-120	120-140	140-160	160-180	180-200
Number of Workers	12	14	8	6	10

Write the above distribution as less than type cumulative frequency distribution.

18. Find the mode of the following distribution of marks obtained by 80 students:

Marks obtained	0-10	10-20	20-30	30-40	40-50
Number of students	6	10	12	32	20

SECTION C

Question numbers 19-28 carry 3 marks each.

19. Show that any positive odd integer is of the form 4q+1 or 4q+3 where q is a positive integer.

20. Prove that $\frac{2\sqrt{3}}{5}$ is irrational.

OR

Prove that $(5-\sqrt{2})$ is irrational.

21. A person can row a boat at the rate of 5km/hour in still water. He takes thrice as much time in going 40 km upstream as in going 40 km downstream. Find the speed of the stream.

OR

In a competitive examination, one mark is awarded for each correct answer while $\frac{1}{2}$ mark is deducted for each wrong answer. Jayanti answered 120 questions and got 90 marks. How many questions did she answer correctly?

22. If α, β are zeroes of the polynomial $x^2-2x-15$, then form a quadratic polynomial whose zeroes are (2α) and (2β).

23. Prove that $(\text{cosec}\theta-\sin\theta)(\sec\theta-\cos\theta) = \frac{1}{\tan\theta+\cot\theta}$.

24. If $\cos\theta+\sin\theta = \sqrt{2}\cos\theta$, show that $\cos\theta-\sin\theta=\sqrt{2}\sin\theta$

25. In Fig. 7, $AB \perp BC$, $FG \perp BC$ and $DE \perp AC$. Prove that $\Delta ADE \sim \Delta GCF$

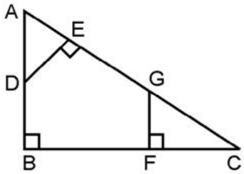


Fig. 7

26. ΔABC and ΔDBC are on the same base BC and on opposite sides of BC and O is the point of intersections of AD and BC.

Prove that $\frac{\text{area}(\Delta ABC)}{\text{area}(\Delta DBC)} = \frac{AO}{DO}$

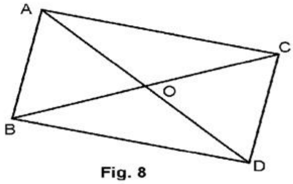


Fig. 8

27. Find mean of the following frequency distribution, using step-deviation method:

Class	0-10	10-20	20-30	30-40	40-50
Frequency	7	12	13	10	8

OR

The mean of the following frequency distribution is 25. Find the value of p.

Class	0-10	10-20	20-30	30-40	40-50
Frequency	2	3	5	3	p

28. Find the median of the following data

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	5	3	4	3	3	4	7	9	7	8

SECTION D

Question numbers 29 to 34 carry 4 marks each

29. Find other zeroes of the polynomial $p(x) = 2x^4+7x^3-19x^2-14x+30$ if two of its zeroes are $\sqrt{2}$ and $-\sqrt{2}$.

30 Prove that the ratio of the areas of two similar triangles is equal to the ratio of the squares of their corresponding sides.

OR

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

31. Prove that $\frac{\sec\theta+\tan\theta-1}{\tan\theta-\sec\theta+1}=\frac{\cos\theta}{1-\sin\theta}$

OR

Evaluate $\frac{\sec\theta\ \mathrm{cosec}(90°-\theta)-\tan\theta\ \cot(90°-\theta)+\sin^2 55°+\sin^2 35°}{\tan 10°\ \tan 20°\ \tan 60°\ \tan 70°\ \tan 80°}$

32. If $\sec\theta+\tan\theta=p$, prove that $\sin\theta=\frac{p^2-1}{p^2+1}$

33. Draw the graphs of following equations :

$2x-y=1$, $x+2y=13$ and

(i) find the solution of the equations from the graph.

(ii) shade the triangular region formed by the lines and the y-axis

34. The following table gives the production yield per hectare of wheat of 100 farms of a village :

Production yield in kg/hectare	50-55	55-60	60-65	65-70	70-75	75-80
Number of farms	2	8	12	24	38	16

Change the above distribution to more than type distribution and draw its ogive.

Marking Scheme
Mathematics
Class X (SA-I)

Section A

1.	(C)	2.	(B)	3.	(C)	4.	(B)	5.	(C)
6.	(D)	7.	(C)	8.	(A)	9.	(B)	10.	(D)

1x10=10

SECTION B

11. 7x5x3x2+3 = 3(7x5x2+1)

= 3x71 ..... (i) 1

By Fundamental Theorem of Arithmetic, every composite number can be expressed as product of primes in a unique way, apart from the order of factors.

$\therefore$ (i) is a composite number 1

12. In case of division of a polynomial by another polynomial the degree of remainder (polynomial) is always less than that of divisor 1

$\therefore$ (x-2) can not be the remainder when p(x) is divided by (2x+3) as degree is same 1

13. opposite sides of a rectangle are equal

$\therefore$ x+y=12 ...(i) and x-y= 8 ...(ii) 1

Adding (i) and (ii), we get 2x=20 or x=10 ½

and y=2

$\therefore$ x=10, y=2 ½

14. $7\sin^2\theta+3\cos^2\theta=4$ or $3(\sin^2\theta+\cos^2\theta)+4\sin^2\theta=4$ 1

$\Rightarrow \sin^2\theta=\frac{1}{4} \Rightarrow \sin\theta=\frac{1}{2} \Rightarrow \theta=30^\circ$ ½

$\therefore \tan\theta = \tan 30^\circ=\frac{1}{\sqrt{3}}$ ½

OR

$\cot\theta=\frac{15}{8}$ (given)

Given expression = $\frac{2(1+\sin\theta)(1-\sin\theta)}{2(1+\cos\theta)(1-\cos\theta)} = \cot^2\theta$ 1

$= \left(\frac{15}{8}\right)^2 = \frac{225}{64}$ 1

15. DE‖AC $\Rightarrow \frac{BE}{EC} = \frac{BD}{DA}$ ....(i) ½

DF‖AE $\Rightarrow \frac{BF}{EF} = \frac{BD}{DA}$ ....(ii) ½

From (i) and (ii) $\frac{BE}{EC} = \frac{BF}{EF}$ or $\frac{CE}{BE} = \frac{FE}{BF}$ 1

16. Let BD=x $\Rightarrow$ CD=3x, In right triangle ADC

$CA^2=CD^2+AD^2$ ....(i)

and $AB^2 = AD^2+BD^2$

$\Rightarrow AD^2 = AB^2 - BD^2$ ....(ii) ½+½

Substituting (ii) in (i),

$CA^2 = CD^2+AB^2-BD^2$

OR $2CA^2 = 2AB^2+2(9x^2-x^2) = 2AB^2+BC^2$ ($\because$ BC=4x) 1

$\Rightarrow$ $2CA^2=2AB^2+BC^2$

17.

	Less than				
Daily income	120	140	160	180	200
Number of works	12	26	34	40	50

2

18. Modal Class = 30-40 ½

$\therefore$ Mode = $30+\frac{32-12}{64-32}\times 10 = 30+6.25 = 36.25$ 1+½

SECTION C

19. Let a be a positive odd integer

By Euclid's Division algorithm a=4q+r

Where q, r are positive integes and $0 \le r < 4$ 1

$\therefore$ a = 4q or 4q+1 or 4q+2 or 4q+3 ½

But 4q and 4q+2 are both even ½

$\Rightarrow$ a is of the form 4q+1 or 4q+3 1

20. Let $\frac{2\sqrt{3}}{5} = x$ where x is a rational number

$\Rightarrow 2\sqrt{3} = 5x$ or $\sqrt{3} = \frac{5x}{2}$ ... (i) 1

As x is a rational number, so is $\frac{5x}{2}$ ½

$\therefore$ $\sqrt{3}$ is also rational which is a contradiction
as $\sqrt{3}$ is an irrational 1

$\therefore$ $\frac{2\sqrt{3}}{5}$ is irrational ½

OR Let $5-\sqrt{2} = y$, where y is a rational number
$\therefore$ $5-y = \sqrt{2}$ .....(i) 1

As y is a rational number, so is 5-y ½

$\therefore$ from (i), $\sqrt{2}$ is also rational which
is a contradiction as $\sqrt{2}$ is irrational 1

$\therefore$ $5-\sqrt{2}$ is irrational ½

21. Let the speed of stream be x km/hour

$\therefore$ Speed of the boat rowing

upstream = (5-x) km/hour
downstream = (5+x) km/hour 1

$\therefore$ According to the question,

$\frac{40}{5-x} = \frac{3x40}{5+x} \Rightarrow x = 2.5$ 1+½

$\therefore$ Speed of the stream = 2.5 km/hour ½

OR

Let the number of correct answers be x
$\therefore$ wrong answers are (120-x) in number ½

$\therefore$ $x-\frac{1}{2}(120-x) = 90$ 1

$\Rightarrow \dfrac{3x}{2} = 150 \Rightarrow x = 100$ 1

$\therefore$ The number of correctly answered questions = 100 ½

22. $p(x) = x^2 - 2x - 15$ ...(i)

As α, β are zeroes of (i), $\Rightarrow \alpha + \beta = 2$ and $\alpha\beta = -15$ ½

zeroes of the required polynomial are 2α and 2β ½

$\therefore$ sum of zeroes = $2(\alpha+\beta) = 4$
Product of zeroes = $4(-15) = -60$ 1

$\therefore$ The required polynomial is $x^2 - 4x - 60$. 1

23. LHS can be written as $\left(\dfrac{1}{\sin\theta} - \sin\theta\right)\left(\dfrac{1}{\cos\theta} - \cos\theta\right)$ ½

$$= \frac{(1-\sin^2\theta)(1-\cos^2\theta)}{\sin\theta\cos\theta} = \sin\theta\cos\theta$$ 1

$$= \frac{\sin\theta\cos\theta}{\sin^2\theta + \cos^2\theta} = \frac{1}{\dfrac{\sin^2\theta}{\sin\theta\cos\theta} + \dfrac{\cos^2\theta}{\sin\theta\cos\theta}}$$ 1

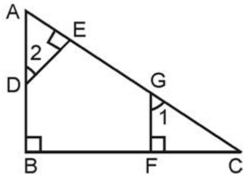
$$= \frac{1}{\tan\theta + \cot\theta}$$ ½

24. $\sin\theta + \cos\theta = \sqrt{2}\cos\theta \Rightarrow \sin\theta = \left(\sqrt{2}-1\right)\cos\theta$ 1

or $\sin\theta = \dfrac{\left(\sqrt{2}-1\right)\left(\sqrt{2}+1\right)}{\left(\sqrt{2}+1\right)}\cos\theta$ 1

or $\sin\theta = \dfrac{\cos\theta}{\sqrt{2}+1} \Rightarrow \cos\theta - \sin\theta = \sqrt{2}\sin\theta$ 1

25.



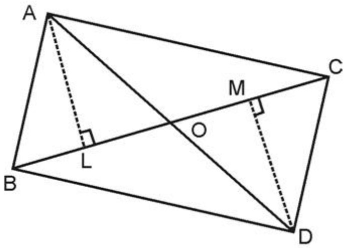
$\angle A + \angle C = 90°$
Also $\angle A + \angle 2 = 90° \Rightarrow \angle C = \angle 2$ 1

Similarly, $\angle A = \angle 1$ ½

$\therefore$ Δ's ADE and GCF are equiangular ½

$\therefore$ Δ ADE ~ Δ GCF 1

26. Draw AL ⊥ BC and DM ⊥ BC ½



Δ's AOL and DOM are similar ½

$\therefore \dfrac{AO}{DO} = \dfrac{AL}{DM}$ 1

$\dfrac{\text{Area}(\Delta ABC)}{\text{Area}(\Delta BCD)} = \dfrac{\frac{1}{2}\,\cancel{BC} \cdot AL}{\frac{1}{2}\,\cancel{BC}\ DM} = \dfrac{AO}{DO}$ 1

27.

Class	0-10	10-20	20-30	30-40	40-50
Class marks (x_i)	5	15	25	35	45
Frequency (f_i)	7	12	13	10	8
$d_i = \dfrac{x_i - 25}{10}$	-2	-1	0	1	2
$f_i d_i$	-14	-12	0	10	16

1

$\sum f_i = 50,\ \sum f_i d_i = 0$ ½

$\overline{x} = \text{A.M} + \dfrac{\sum f_i d_i}{\sum f_i} \text{x} 10 = 25 + 0 = 25.0$ ½+1

OR

Class	0-10	10-20	20-30	30-40	40-50
Frequency (fi)	2	3	5	3	p
Class mark (x_i)	5	15	25	35	45
fixi	10	45	125	105	45p

1

$\sum f_i = 13 + p,\ \sum f_i x_i = 285 + 45p$
Mean = 25 (given) 1

$\therefore 25\text{x}(13+p) = 285 + 45p$
$\Rightarrow 20p = 40 \Rightarrow p = 2$ 1

28.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	5	3	4	3	3	4	7	9	7	8
Cum. Frequency	5	8	12	15	18	22	29	38	45	53

½

Median Class is 60-70 ½

$$\text{Median} = l + \frac{\left(\frac{n}{2} - cf\right)}{f} \times h$$ ½

$$= 60 + \left(\frac{26.5 - 22}{7}\right) \times 10 = 66.43$$ 1+½

SECTION D

29. $p(x) = 2x^4 + 7x^3 - 19x^2 - 14x + 30$

If two zeroes of p(x) are $\sqrt{2}$ and $-\sqrt{2}$

$\therefore$ $\left(x+\sqrt{2}\right)\left(x-\sqrt{2}\right)$ or x^2-2 is a factor of p(x) 1

$p(x) \div (x^2-2) = \left[2x^4+7x^3-19x^2-14x+30\right] \div (x^2-2) = 2x^2+7x-15$ 1½

Now $2x^2+7x-15 = 2x^2+10x-3x-15$ ½

$= (2x-3)(x+5)$ ½

$\therefore$ other two zeroes of p(x) are $\frac{3}{2}$ and -5 ½

30. Correctly stated given, to prove, construction and correct figure $4 \times \frac{1}{2}$ 2

Correct proof 2

OR

Correctly stated given, to prove, construction and correct figure $4 \times \frac{1}{2}$ 2

correct proof 2

31. LHS = $\frac{\sec\theta + \tan\theta - 1}{\tan\theta - \sec\theta + 1} = \frac{\sec\theta + \tan\theta - \left(\sec^2\theta - \tan^2\theta\right)}{\tan\theta - \sec\theta + 1}$ 1

$$= \frac{(\sec\theta + \tan\theta)\left[1 - \sec\theta + \tan\theta\right]}{(1 - \sec\theta + \tan\theta)} = \sec\theta + \tan\theta = \frac{1 + \sin\theta}{\cos\theta}$$ 1+1

$$= \frac{(1 + \sin\theta)(1 - \sin\theta)}{(1 - \sin\theta)\cos\theta} = \frac{\cos\theta}{1 - \sin\theta}$$ 1

OR

$\left.\begin{array}{l} \text{cosec}\,(90^\circ - \theta) = \sec\theta,\ \cot(90^\circ - \theta) = \tan\theta,\ \sin 55^\circ = \cos 35^\circ \\ \tan 80^\circ = \cot 10^\circ,\ \tan 70^\circ = \cot 20^\circ,\ \tan 60^\circ = \sqrt{3} \end{array}\right\}$ 2

Given Expression becomes $\dfrac{(\sec^2\theta-\tan^2\theta)+(\sin^2 35^\circ+\cos^2 35^\circ)}{\tan 10^\circ \cot 10^\circ \tan 20^\circ \cot 20^\circ \sqrt{3}}$ 1

$= \dfrac{1+1}{\sqrt{3}} = \dfrac{2}{\sqrt{3}}$ 1

32. $\sec\theta + \tan\theta = p \Rightarrow \dfrac{1+\sin\theta}{\cos\theta} = p$ ½

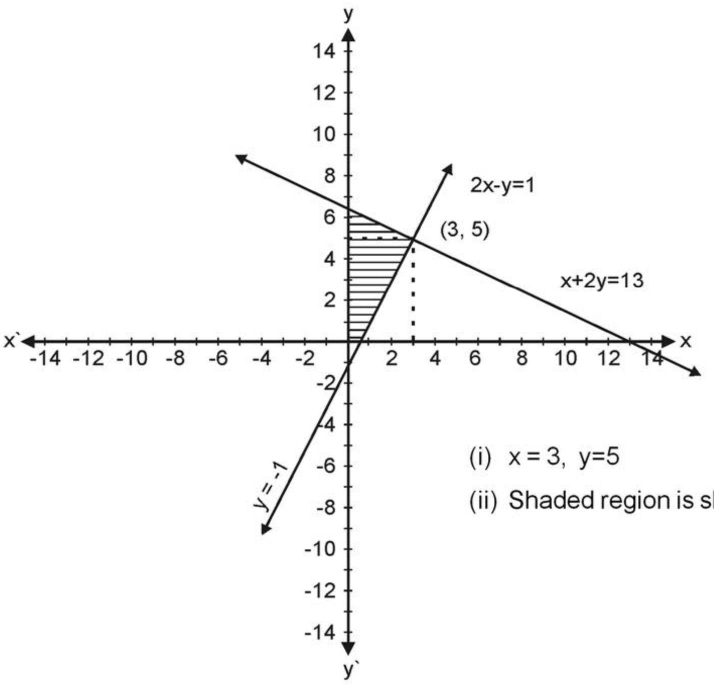
$\Rightarrow \left(\dfrac{1+\sin\theta}{\cos\theta}\right)^2 = p^2 \Rightarrow \dfrac{(1+\sin\theta)^2 - \cos^2\theta}{(1+\sin\theta)^2 + \cos^2\theta} = \dfrac{p^2-1}{p^2+1}$ 1

or $\dfrac{(1-\cos^2\theta)+\sin^2\theta+2\sin\theta}{2+2\sin\theta} = \dfrac{p^2-1}{p^2+1}$ 1

or $\dfrac{2\sin\theta(1+\sin\theta)}{2(1+\sin\theta)} = \dfrac{p^2-1}{p^2+1}$ 1

or $\sin\theta = \dfrac{p^2-1}{p^2+1}$ ½

33.

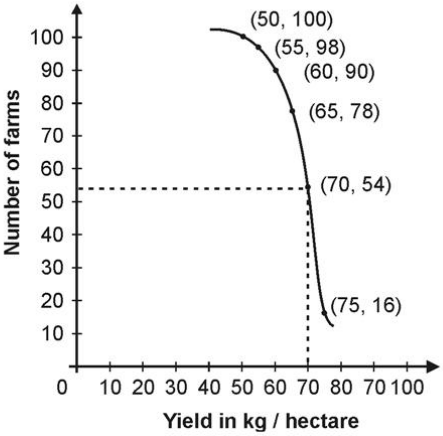


Graph 2

(i) $x = 3$, $y=5$ 1

(ii) Shaded region is shown in figure 1

34.	Classes	Frequency	Cumulative Frequency	(More than type)	
	50-55	2	50 or more than 50	100	
	55-60	8	55 or more than 55	98	
	60-65	12	60 or more than 60	90	
	65-70	24	65 or more than 65	78	
	70-75	38	70 or more than 70	54	
	75-80	16	75 or more than 75	16	1



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