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

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
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**

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. How ever, 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 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

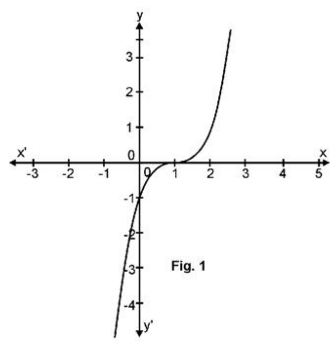


Fig. 1

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

   (A) 6 cm (B) 8 cm

   (C) 10 cm (D) 12.5 cm

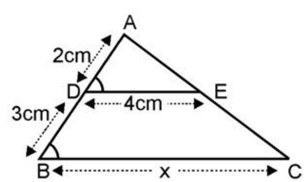


Fig. 2

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

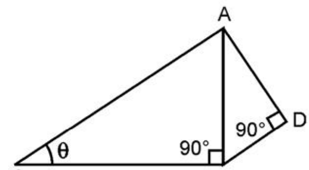


Fig. 3

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

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

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.

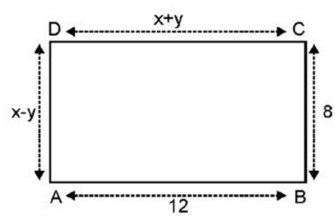


Fig. 4

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

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

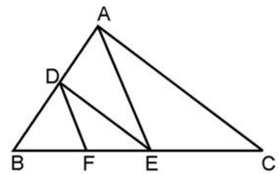


Fig. 5

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

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

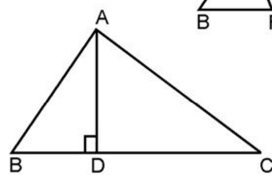


Fig. 6

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 $\Delta ADE \sim \Delta GCF$

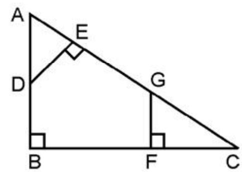


Fig. 7

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

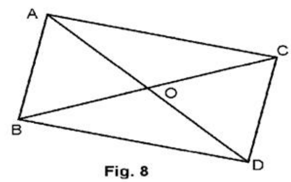


Fig. 8

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

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

$\Rightarrow \sin^2\theta=\frac{1}{4} \quad \Rightarrow \sin\theta=\frac{1}{2} \quad \Rightarrow \theta=30°$ — ½

$\therefore \tan\theta = \tan 30° = \frac{1}{\sqrt{3}}$ — 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

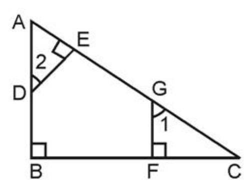
$$= \frac{1}{\tan\theta+\cot\theta}$$ ½

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.



$\angle A+\angle C = 90°$

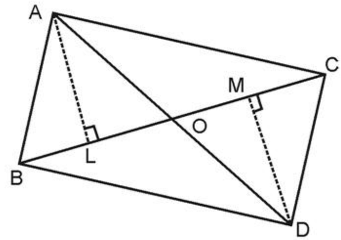
Also $\angle A+\angle 2=90° \Rightarrow \angle C=\angle 2$ 1

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

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

$$\frac{\text{Area}(\Delta ABC)}{\text{Area}(\Delta BCD)} = \frac{\frac{1}{2} BC \cdot AL}{\frac{1}{2} BC \ DM} = \frac{AO}{DO}$$ 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
$d_i = \frac{x_i - 25}{10}$	-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

$\overline{x} = \text{A.M} + \frac{\sum f_i d_i}{\sum f_i} \times 10 = 25 + 0 = 25.0$ 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

$\therefore \ 25 \times (13 + p) = 285 + 45p$

$\Rightarrow \ 20p = 40 \ \Rightarrow \ p = 2$ 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

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

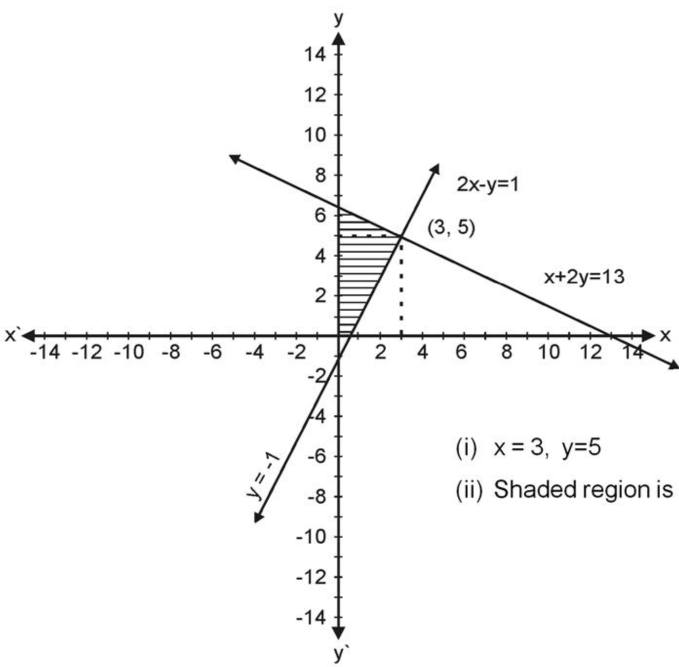
$\Rightarrow \left(\dfrac{1+\sin\theta}{\cos\theta}\right)^2 = p^2 \Rightarrow \dfrac{(1+\sin\theta)^2-\cos^2\theta}{(1+\sin\theta)^2+\cos^2\theta} = \dfrac{p^2-1}{p^2+1}$ 1

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

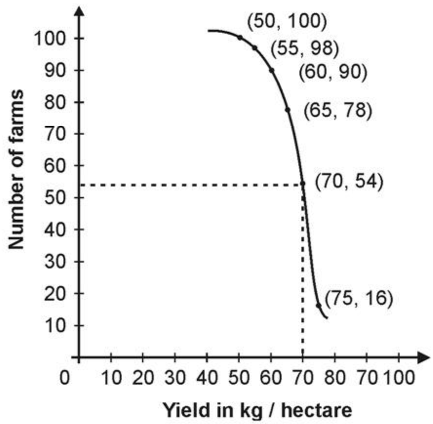
(i) $x = 3$, $y=5$ 1

(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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