QUESTION PAPER CODE 30/1/1

EXPECTED ANSWER/VALUE POINTS

SECTION – A

Q. No. 1 to 10 are multiple choice type question of 1 mark each.
Select the correct option.

Q.No.		Marks
1.	If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is **(a)** 10 **(b)** –10 **(c)** –7 **(d)** –2 **Ans:** (b) –10	1
2.	The total number of factors of a prime number is **(a)** 1 **(b)** 0 **(c)** 2 **(d)** 3 **Ans:** (c) 2	1
3.	The quadratic polynomial, the sum of whose zeroes is –5 and their product is 6, is **(a)** $x^2 + 5x + 6$ **(b)** $x^2 – 5x + 6$ **(c)** $x^2 – 5x – 6$ **(d)** $–x^2 + 5x + 6$ **Ans:** (a) $x^2 + 5x + 6$	1
4.	The value of k for which the system of equations $x + y – 4 = 0$ and $2x + ky = 3$ has no solution, is **(a)** –2 **(b)** $\neq 2$ **(c)** 3 **(d)** 2 **Ans:** (d) 2	1
5.	The HCF and the LCM of 12, 21, 15 respectively are **(a)** 3,140 **(b)** 12,420 **(c)** 3,420 **(d)** 420,3 **Ans:** (c) 3,420	1
6.	The value of x for which 2x,(x + 10) and (3x + 2) are the three consecutive terms of an AP, is **(a)** 6 **(b)** –6 **(c)** 18 **(d)** –18 **Ans:** (a) 6	1
7.	The first term of an AP is p and the common difference is q, then its 10th term is **(a)** q + 9p **(b)** p – 9q **(c)** p + 9q **(d)** 2p + 9q **Ans:** (c) p + 9q	1
8.	The distance between the points $(a \cos \theta + b \sin \theta, 0)$ and $(0, a \sin \theta – b \cos \theta)$, is **(a)** $a^2 + b^2$ **(b)** $a^2 – b^2$ **(c)** $\sqrt{a^2+b^2}$ **(d)** $\sqrt{a^2 – b^2}$ **Ans:** (c) $\sqrt{a^2 + b^2}$	1
9.	If the point P(k, 0) divides the line segment joining the points A(2, –2) and B(–7, 4) in the ratio 1 : 2, then the value of k is, **(a)** 1 **(b)** 2 **(c)** –2 **(d)** –1 **Ans:** (d) –1	1
10.	The value of p, for which the points A(3, 1), B(5, p) and C(7, –5) are collinear, is **(a)** –2 **(b)** 2 **(c)** –1 **(d)** 1 **Ans:** (a) –2	1

In Q. Nos. 11 to 15, fill in the blanks. Each question is of 1 mark.

11. In Fig. 1, ΔABC is circumscribing a circle, the length of BC is _______cm.

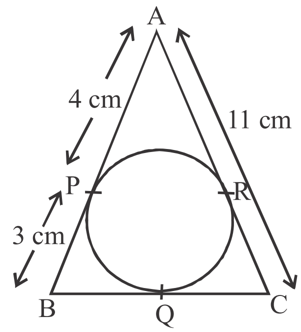


Fig. 1

Ans: 10 — **1**

12. Given $\Delta ABC \sim \Delta PQR$, if $\frac{AB}{PQ} = \frac{1}{3}$, then $\frac{ar(\Delta ABC)}{ar(\Delta PQR)} =$ __________.

Ans: $\frac{1}{9}$ — **1**

13. ABC is an equilateral triangle of side 2a, then length of one of its altitude is _______.

Ans: $\sqrt{3}$ a — **1**

14. $\frac{\cos 80°}{\sin 10°} + \cos 59° \text{ cosec } 31° =$ _______.

Ans: 2 — **1**

15. The value of $\left(\sin^2\theta + \frac{1}{1+\tan^2\theta}\right) =$ _________.

Ans: 1 — **1**

OR

The value of $(1 + \tan^2\theta)(1 - \sin\theta)(1 + \sin\theta) =$_______.

Ans: 1 — **1**

Q. Nos. 16 to 20 are short answer type questions of 1 mark each.

16. The ratio of the length of a vertical rod and the length of its shadow is $1 : \sqrt{3}$. Find the angle of elevation of the sun at that moment?

Ans: $\tan\theta = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30°$ — **1/2+1/2**

17. Two cones have their heights in the ratio 1:3 and radii in the ratio 3:1. What is the ratio of their volumes?

Ans: $\frac{r_1}{r_2} = \frac{3}{1}, \frac{h_1}{h_2} = \frac{1}{3}$ — **1/2**

$\therefore$ Ratio of volumes $= \dfrac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = 3:1$ **1/2**

18. A letter of English alphabet is chosen at random. What is the probability that the chosen letter is a consonant.

Ans: P (consonant) $= \dfrac{21}{26}$ **1**

19. A die is thrown once. What is the probability of getting a number less than 3?

Ans: P (number less than 3) $= \dfrac{2}{6}$ or $\dfrac{1}{3}$ **1**

OR

If the probability of winning a game is 0.07, what is the probability of losing it?

Ans: P (losing) = 1 – 0.07 **1/2**

= 0.93 **1/2**

20. If the mean of first n natural number is 15, then find n.

Ans: $\dfrac{\frac{n(n+1)}{2}}{n} = 15$ **1/2**

$\therefore$ n = 29 **1/2**

SECTION – B

Q. Nos. 21 to 26 carry 2 marks each.

21. Show that $(a-b)^2$, (a^2+b^2) and $(a+b)^2$ are in AP.

Ans: $(a^2+b^2)-(a-b)^2 = 2ab$ **1**

$(a+b)^2-(a^2+b^2) = 2ab$ **1**

Common difference is same. $\therefore$ given terms are in AP

22. In Fig. 2 DE||AC and DC||AP. Prove that $\dfrac{BE}{EC} = \dfrac{BC}{CP}$.

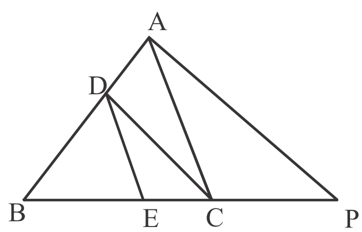
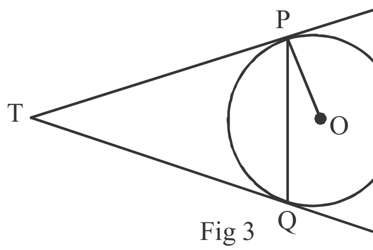
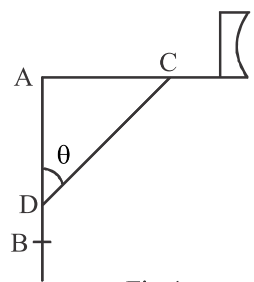


Fig 2

Ans: In ΔABC, DE || AC, $\therefore \dfrac{BD}{DA} = \dfrac{BE}{EC}$ ... (i) **1**

In ΔABP, DC || AP, $\therefore \dfrac{BD}{DA} = \dfrac{BC}{CP}$ ... (ii) **1/2**

From (i) & (ii), $\dfrac{BE}{EC} = \dfrac{BC}{CP}$ **1/2**

	OR	
	In Fig. 3, two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.	
	 Fig 3	
	Ans: Let $\angle OPQ = \theta$	
	$\therefore \angle TPQ = \angle TQP = 90° - \theta$	1/2
	In ΔTPQ, $2(90° - \theta) + \angle PTQ = 180°$	1
	$\therefore \angle PTQ = 2\theta$	1/2
	$= 2\angle OPQ$	
23.	The rod AC of a TV disc antenna is fixed at right angle to the wall AB and a rod CD is supporting the disc as shown in Fig. 4. If AC = 1.5m long and CD = 3m, find (i) $\tan\theta$ (ii) $\sec\theta + \mathrm{cosec}\theta$.  Fig 4	
	Ans: $\frac{AC}{CD} = \sin\theta \Rightarrow \sin\theta = \frac{1}{2} \Rightarrow \theta = 30°$	1/2
	(i) $\tan\theta = \tan 30° = \frac{1}{\sqrt{3}}$	1/2
	(ii) $\sec\theta + \mathrm{cosec}\theta = \sec 30° + \mathrm{cosec} 30°$	
	$= \frac{2}{\sqrt{3}} + 2$ or $\frac{2(3+\sqrt{3})}{3}$	1
24.	A piece of wire 22 cm long is bent into the form of an arc of circle subtending an angle of 60° at its centre. Find the radius of the circle. $\left(Use\ \pi = \frac{22}{7}\right)$	
	Ans: $2 \times \frac{22}{7} \times r \times \frac{60°}{360°} = 22$	1
	$\therefore r = 21$ cm	1
25.	If a number x is chosen at random from the numbers –3, –2, –1, 0, 1, 2, 3. What is the probability that $x^2 \le 4$?	
	Ans: Total number of outcomes = 7	
	Favourable outcomes are –2, –1, 0, 1, 2, i.e., 5	1
	$\therefore P(x^2 \le 4) = \frac{5}{7}$	1

26.	Find the mean of the following distribution:	

Class:	3-5	5-7	7-9	9-11	11-13
Frequency:	5	10	10	7	8

Ans:

Classes	x_i	f_i	$f_x x_i$
3 – 5	4	5	20
5 – 7	6	10	60
7 – 9	8	10	80
9 – 11	10	7	70
11 – 13	12	8	96
Total		40	326

1½

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i} = \frac{326}{40} = 8.15$$ 1/2

OR

Find the mode of the following data:

Class:	0-20	20-40	40-60	60-80	80-100	110-120	120-140
Frequency:	6	8	10	12	6	5	3

Ans: Modal class : 60 – 80 1/2

$$\text{Mode} = \ell + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h = 60 + \frac{12 - 10}{24 - 10 - 6} \times 20$$ 1

$= 60 + 5 = 65$ 1/2

SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. Find the quadratic polynomial whose zeroes are reciprocal of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$.

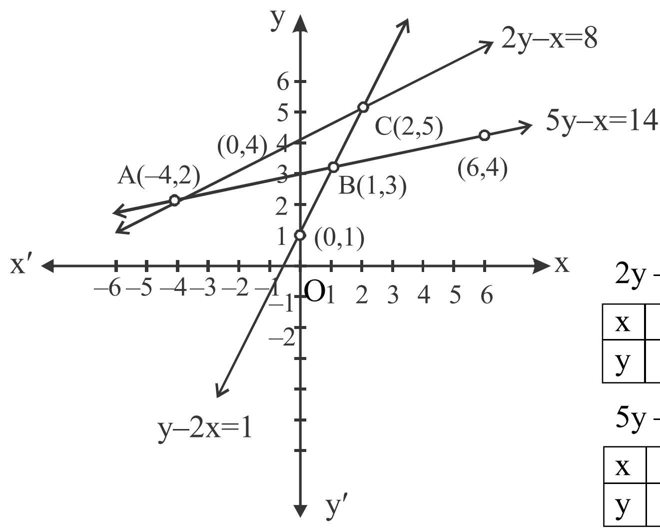
Ans: $f(x) = ax^2 + bx + c$

$$\alpha + \beta = -\frac{b}{a},\ \alpha\beta = \frac{c}{a}$$ 1/2

New sum of zeroes $= \frac{1}{\alpha} + \frac{1}{\beta} = -\frac{b}{c}$ 1

New product of zeroes $= \frac{1}{\alpha} \times \frac{1}{\beta} = \frac{a}{c}$ 1

$\therefore$ Required quardratic polynomial $= x^2 + \frac{b}{c}x + \frac{a}{c}$ or $\left(cx^2 + bx + a\right)$ 1/2

	OR	
	Divide the polynomial $f(x) = 3x^2 - x^3 - 3x + 5$ by the polynomial $g(x) = x - 1 - x^2$ and verify the division algorithm.	
	Ans: $-x^2 + x - 1 \overline{)\, -x^3 + 3x^2 - 3x + 5 \,(} \; x - 2$ $-x^3 + x^2 - x$ $+ \quad - \quad +$ $2x^2 - 2x + 5$ $2x^2 - 2x + 2$ $- \quad + \quad -$ 3	2
	Divisor × Quotient + Remainder $= (-x^2 + x - 1)(x - 2) + 3$ $= -x^3 + 3x^2 - 3x + 5 = \text{Dividend}$	1
28.	Determine graphically the coordinates of the vertices of a triangle, the equations of whose sides are given by $2y - x = 8$, $5y - x = 14$ and $y - 2x = 1$.	
	Ans: 	
	$2y - x = 8$	

x	0	2	−4
y	4	5	2

$5y - x = 14$

x	1	6	−4
y	3	4	2

$y - 2x = 1$

x	1	2	0
y	3	5	1

Drawing 3 lines — $1\frac{1}{2}$

Coordinates of the vertices of the triangle are A(−4, 2), B(1, 3) and C(2, 5) — $1\frac{1}{2}$

OR

If 4 is the zero of the cubic polynomial $x^3 - 3x^2 - 10x + 24$, find its other two zeroes.

Ans: $x - 4$ is a factor of given polynomial.

$$
\begin{array}{r|l}
x-4 & x^3 - 3x^2 - 10x + 24 \; (x^2 + x - 6 \\
 & \underline{x^3 - 4x^2} \\
 & \quad \; -\;\; + \\
 & \quad x^2 - 10x + 24 \\
 & \quad \underline{x^2 - 4x} \\
 & \quad -\;\; + \\
 & \qquad -6x + 24 \\
 & \qquad \underline{-6x + 24} \\
 & \qquad +\;\; - \\
 & \qquad\quad 0
\end{array}
$$

2

$x^2 + x - 6 = (x + 3)(x - 2)$

$\therefore$ Other than zeroes are –3 and 2. **1**

29. In a flight of 600 km, an aircraft was slowed due to bad weather. Its average speed for the trip was reduced to 200 km/hr and time of flight increased by 30 minutes. Find the original duration of flight.

Ans: Let the speed of aircraft be x km/hr

$\therefore \dfrac{600}{x-200} - \dfrac{600}{x} = \dfrac{30}{60}$ **1**

$\Rightarrow x^2 - 200x - 240000 = 0$ **1**

$(x - 600)\,(x + 400) = 0$

$x = 600, -400$ (Rejected) **1/2**

Speed of aircraft = 600 km/hr

$\therefore$ Duration of flight = 1 hr **1/2**

30. Find the area of triangle PQR formed by the points P(–5, 7), Q(–4, –5) and R(4, 5).

Ans: $\text{ar}(PQR) = \frac{1}{2}\left[-5(-5-5) - 4(5-7) + 4(7+5)\right]$ sq. units **2**

$= \frac{1}{2}[50 + 8 + 48]$ sq. units

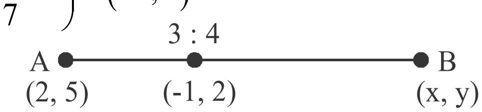
= 53 sq. units **1**

OR

If the point C(–1, 2) divides internally the line segment joining A(2, 5) and B(x, y) in the ratio 3 : 4, find the coordinates of B.

Ans: Coordinates of C arc $\left(\dfrac{3x+8}{7}, \dfrac{3y+20}{7}\right) = (-1, 2)$ **$1\frac{1}{2}$**

$\Rightarrow x = -5,\ y = -2$ **1**



$\therefore$ Coordinates of B are (–5, –2) **1/2**

31. In Fig.5, $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$, prove that BAC is an isosceles triangle.

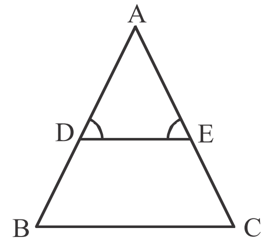


Fig 5

Ans: $\angle D = \angle E \Rightarrow AE = AD$ — **1**

$\therefore \frac{AD}{DB} = \frac{AE}{EC} \Rightarrow DB = EC$ — **1/2**

$\Rightarrow AD + DB = AE + EC$ — **1**

$\therefore AB = AC$ — **1/2**

Hence ΔBAC is an isosceles triangle.

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

Ans: For correct given, To prove, construction and figure. — $1\frac{1}{2}$

For correct proof. — $1\frac{1}{2}$

33. If $\sin\theta + \cos\theta = \sqrt{3}$, then prove that $\tan\theta + \cot\theta = 1$.

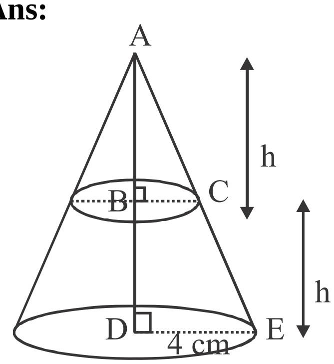
Ans: $\sin\theta + \cos\theta = \sqrt{3} \Rightarrow (\sin\theta + \cos\theta)^2 = \left(\sqrt{3}\right)^2$ — **1**

$\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3 \Rightarrow \sin\theta\cos\theta = 1$ — **1**

$\text{L.H.S} = \tan\theta + \cot\theta = \frac{\sin\theta}{\cos\theta} + \frac{\cos\theta}{\sin\theta} = \frac{1}{\cos\theta\sin\theta} = 1 = \text{R.H.S}$ — **1**

34. A cone of base radius 4 cm is divided into two parts by drawing a plane through the mid-point of its height and parallel to its base. Compare the volume of the two parts.

Ans:



$\Delta ABC \sim \Delta ADE$, $\frac{h}{2h} = \frac{BC}{4}$ — **cor. fig 1/2**

$\therefore BC = 2$ cm — **1**

Ratio of volumes of two parts

$$= \frac{\frac{1}{3}\pi \times 2^2 \times h}{\frac{1}{3}\pi \times (2^2 + 4^2 + 2\times 4) \times h}$$ — **1**

$= \frac{4}{28} = \frac{1}{7}$ or 1 : 7 (accept 7 : 1 also) — **1/2**

	SECTION – D	
	Question numbers 35 to 40 carry 4 marks each.	
35.	Show that the square of any positive integer cannot be of form $(5q + 2)$ or $(5q + 3)$ for any integer q.	
	Ans: Let a be any positive integer. Take b = 5 as the divisor.	
	$\therefore\ a = 5m + r,\ r = 0,1,2,3,4$	1
	Case-1 : $a = 5m \Rightarrow a^2 = 25m^2 = 5(5m^2) = 5q$	1/2
	Case-2 : $a = 5m+1 \Rightarrow a^2 = 5(5m^2 + 2m) + 1 = 5q + 1$	for
	Case-3 : $a = 5m+2 \Rightarrow a^2 = 5(5m^2 + 4m) + 4 = 5q + 4$	each
	Case-4 : $a = 5m+3 \Rightarrow a^2 = 5(5m^2 + 6m + 1) + 4 = 5q + 4$	case
	Case-5 : $a = 5m+4 \Rightarrow a^2 = 5(5m^2 + 8m + 3) + 1 = 5q + 1$	$= 2\frac{1}{2}$
	Hence square of any positive integer cannot be of the form $(5q + 2)$ or $(5q + 3)$ for any integer q.	1/2
	OR	
	Prove that one of every three consecutive positive integers is divisible by 3.	
	Ans: Let n be any positive integer. Divide it by 3.	
	$\therefore\ n = 3q + r,\ r = 0, 1, 2$	1
	Case-1 : $n = 3q$ (divisible by 3)	
	$n + 1 = 3q + 1,\ n + 2 = 3q + 2$	1 for
	Case-2 : $n = 3q + 1 \Rightarrow n + 1 = 3q + 2,\ n + 2 = 3q + 3$ (divisible by 3)	each
	Case-3 : $n = 3q + 2 \Rightarrow n + 1 = 3q + 3$ (divisible by 3), $n + 2 = 3q + 4$	case = 3
36.	The sum of four consecutive numbers in AP is 32 and the ratio of product of the first and last terms to the product of two middle terms is 7:15. Find the numbers.	
	Ans: Let four consecutive number be $a - 3d,\ a - d,\ a + d,\ a + 3d$	1/2
	Sum = 32 $\therefore\ 4a = 32 \Rightarrow a = 8$	1/2
	$\frac{(a-3d)(a+3d)}{(a-d)(a+d)} = \frac{7}{15} \Rightarrow 15(64 - 9d^2) = 7(64 - d^2)$	1
	$\therefore\ d^2 = 4 \Rightarrow d = \pm 2$	1
	Four numbers are 2, 6, 10, 14.	1
	OR	
	Solve: $1 + 4 + 7 + 10 + \ldots + x = 287$	
	Ans: $x = a_n = 1 + 3n - 3 = 3n - 2$	1
	$S_n = 287 \Rightarrow \frac{n}{2}[1 + 3n - 2] = 287$	1
	$\therefore\ 3n^2 - n - 574 = 0$	1/2
	$(n - 14)(3n + 41) = 0 \Rightarrow n = 14$	1
	$\therefore\ x = 3n - 2 = 40$	1/2

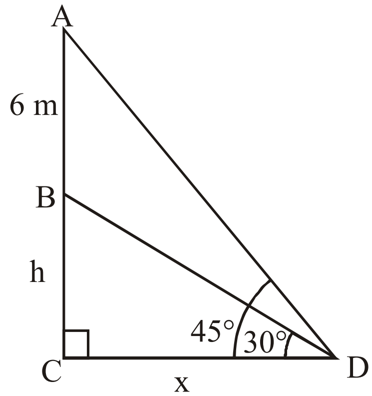
37. Draw a line segment AB of length 7 cm. Taking A as centre, draw a circle of radius 3 cm and taking B as centre, draw another circle of radius 2 cm. Construct tangents to each circle from the centre of the other circle.

Ans: Constructing the circles of radii 3 cm and 2 cm. **1**

Constructing the tangents. **3**

38. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag-staff of height 6 m. At a point on the plane, the angle of elevation of the bottom and top of the flag-staff are 30° and 45° respectively. Find the height of the tower. (Take $\sqrt{3}$ = 1.73)

Ans: **cor. fig 1**



$$\frac{h}{x} = \tan 30°$$ **1**

$$\Rightarrow x = h\sqrt{3}$$

$$\frac{6+h}{x} = \tan 45° \Rightarrow 6 + h = x$$ **1**

$$\therefore h = \frac{6}{\sqrt{3}-1} = 3(\sqrt{3}+1) = 3 \times 2.73 \text{ m}$$

$$= 8.19 \text{ m}$$ **1**

39. A bucket in the form of a frustum of a cone of height 30 cm with radii of its lower and upper ends as 10 cm and 20 cm respectively. Find the capacity of the bucket. Also find the total cost of milk that can completely fill the bucket at the rate of ₹ 40 per litre. $\left(\text{Use } \pi = \frac{22}{7}\right)$

Ans: Capacity of bucket $= \frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right)$

$$= \frac{1}{3} \times \frac{22}{7} \times 30\left(10^2 + 20^2 + 10 \times 20\right)\text{cm}^3$$ **1**

$$= 22000 \text{ cm}^3$$ **$1\frac{1}{2}$**

$$= 22 l$$ **1/2**

Cost of milk = ₹ 40 × 22 = ₹ 880 **1**

40. The following table gives production yield per hectare (in quintals) of wheat of 100 farms of a village:

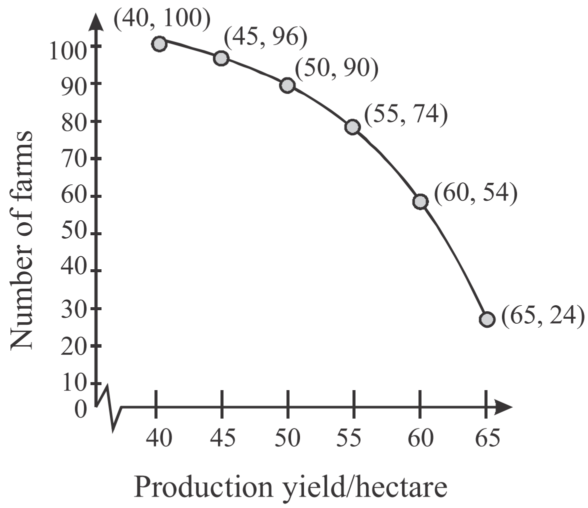
Production yield/hect.	40-45	45-50	50-55	55-60	60-65	65-70
No. of farms	4	6	16	20	30	24

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

Ans:

Production yield/hectare	No. of forms
More than or equal to 40	100
More than or equal to 45	96
More than or equal to 50	90
More than or equal to 55	74
More than or equal to 60	54
More than or equal to 65	24
Total	

2



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OR

The median of the following data is 525. Find the values of x and y, if total frequency is 100:

Class :	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
Frequency:	2	5	x	12	17	20	y	9	7	4

Ans:

Classes	Frequency	Cumulative frequency
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 → Median class
600-700	y	56 + x + y
700-800	9	65 + x+ y
800-900	7	72 + x+ y
900-1000	4	76 + x+ y
Total	100	

2

$76 + x + y = 100 \Rightarrow x + y = 24$ ... (i) **1/2**

500 – 600 is the median class

Median = $\ell + \dfrac{\frac{n}{2} - cf}{f} \times h$

$\Rightarrow 525 = 500 + \dfrac{50 - 36 - x}{20} \times 100$

Solving we get, x = 9 **1**

From (i), y = 15 **1/2**