SA-1, X Class - Mathematics Paper-II. Valuation Key.

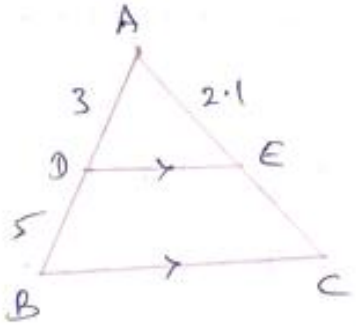
SECTION - I

1. For writing,

Given, In ΔABC,

$DE \parallel BC$ and $\frac{AD}{DB} = \frac{3}{5}$

and $AE = 2.1$ Cm



$\frac{1}{2}$ m

$\frac{AD}{DB} = \frac{AE}{EC}$

For Substituting and Simplifying,

$\Rightarrow \frac{3}{5} = \frac{2.1}{EC}$

$\Rightarrow EC = \frac{2.1 \times 5}{3} = 3.5$ Cm

$AC = AE + EC = 2.1\text{cm} + 3.5\text{ cm} = 5.6\text{ Cm}$

$\frac{1}{2}$ m

For writing the Statement,

2. Ratio of areas of two Similar triangles is equal to ratio of the squares of the Corresponding sides/altitudes/medians/bisector of angles — 1m

For writing

3. Number of observations $= x+y$

Mean $= x-y$

Sum of the observations = Number of observations $\times$ mean — $\frac{1}{2}$ m

For writing $= (x+y)(x-y) = x^2 - y^2$ — $\frac{1}{2}$ m

for writing

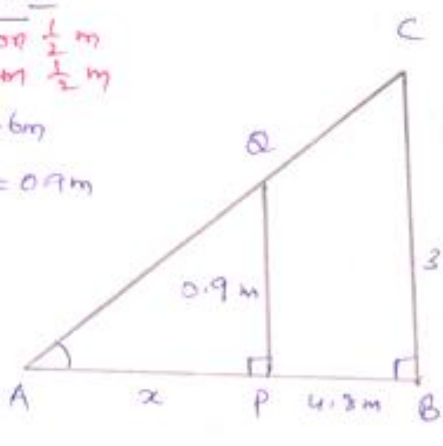
4. $\log_4 (1+\tan^2 45^\circ)^2 = \log_4 [1+(1)^2]^2$ $[\because \tan 45^\circ = 1]$ — $\frac{1}{2}$ m

For writing $= \log_4 (2)^2 = \log_4 4 = 1$ $[\because \log_a a = 1]$ — $\frac{1}{2}$ m

SECTION - II

5\. For writing description $\frac{1}{2}$ m
For drawing diagram $\frac{1}{2}$ m

BC = Height of the lamp Post = 3.6m
PQ = Height of the girl = 90 cm = 0.9m
BP = Distance travelled by the girl in 4 sec
= 1.2×4 = 4.8m
AP = length of shadow of the girl = 'x' m



1 m

For writing $\triangle APQ \sim \triangle ABC$ [∵ A A Similarity]

$$\frac{AP}{AB} = \frac{PQ}{BC} = \frac{AQ}{AC}$$

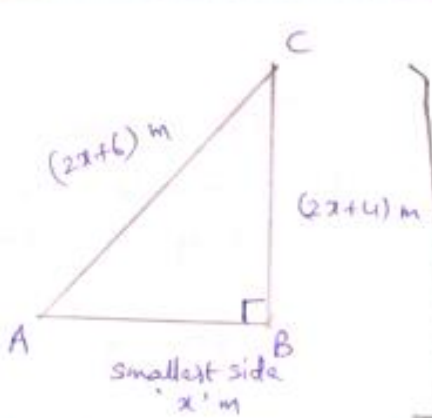
$$\Rightarrow \frac{AP}{AB} = \frac{PQ}{BC} \Rightarrow \frac{x}{x+4.8} = \frac{0.9}{3.6}$$ $\frac{1}{2}$ m

For writing $\Rightarrow \frac{x}{x+4.8} = \frac{1}{4} \Rightarrow 4x = x+4.8$

$\Rightarrow 3x = 4.8 \Rightarrow x = 1.6$ m $\frac{1}{2}$ m

6\. For drawing diagram and writing description

Let the Shortest side = 'x' m,
Then hypotenuse = (2x+6) m
and third side = (2x+4) m



$\frac{1}{2}$ m

for writing

By Pythagoras theorem, $AC^2 = AB^2 + BC^2$

$\Rightarrow (2x+6)^2 = x^2 + (2x+4)^2$

$\Rightarrow 4x^2 + 24x + 36 = x^2 + 4x^2 + 16x + 16$ 1 m

for Solving Q.E and finding roots $\Rightarrow x^2 - 8x - 20 = 0$

$\Rightarrow x = 10$ (or) $x = -2$

∴ $x = -2$ is not possible

∴ $x = 10$m

∴ the sides of the triangle are 10 m, 26 m and 24 m $\frac{1}{2}$ m

For writing

7. $LHS = \cos(60^\circ + 30^\circ) = \cos 90^\circ = 0$ - - - - - - $\frac{1}{2}$ m

For writing $RHS = \cos 60^\circ \cdot \cos 30^\circ + \sin 60^\circ \cdot \sin 30^\circ$
$= \frac{1}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2} \cdot \frac{1}{2} = \frac{\sqrt{3}}{4} + \frac{\sqrt{3}}{4} = \frac{2\sqrt{3}}{4} = \frac{\sqrt{3}}{2}$ } $\frac{1}{2}$ m

For writing $\therefore L.H.S \neq R.H.S$ - - - - - - $\frac{1}{2}$ m

For writing It is not Correct to Say that
$\cos(60^\circ + 30^\circ) = \cos 60^\circ \cos 30^\circ + \sin 60^\circ \cdot \sin 30^\circ$ } $\frac{1}{2}$ m

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For writing

8. Given observations are 12, 5, 9, 6, 14, 9, 8
Ascending order of the given observations is
5, 6, 8, 9, 9, 12, 14 } $\frac{1}{2}$ m

For writing $\therefore$ Median = Middle most item = 9 - - - - - 1m

For writing Mode = Mostly repeated item = 9
$\therefore$ Median = 9, Mode = 9 } $\frac{1}{2}$ m

For writing

9. formula for Arithmetic mean in step deviation method is
$$AM\ (\bar{x}) = a + \left[\frac{\Sigma f_i u_i}{\Sigma f_i}\right] \times h$$
} 1m

For writing Here, a = assumed arithmetic mean
f_i = frequency } $\frac{1}{2}$ m

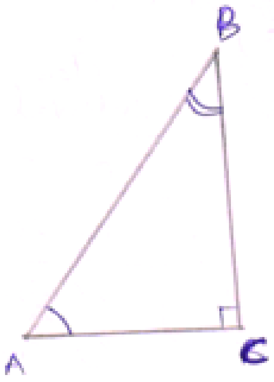
For writing $u_i = \frac{x_i - a}{h}$ where x_i is mid-value
h = length of the class. } $\frac{1}{2}$ m

$\therefore \Sigma$ = Sum

SECTION - III

For finding BC

10 (a) In ΔABC, $\angle C = 90°$



$$BC + CA = 17$$
$$BC - CA = 7$$

By +, $2BC = 24$

$\Rightarrow BC = \frac{24}{2} = 12$. — 1m

For finding CA and AB, $\because BC = 12$

Substituting $BC = 12$ in $BC + CA = 17$, we get

$12 + CA = 17 \Rightarrow CA = 5$

By Pythagorus theorem, $AB^2 = AC^2 + BC^2$

$\Rightarrow AB^2 = (5)^2 + (12)^2 = 25 + 144 = 169$

$\Rightarrow AB = 13$ cm — 1m

For finding SinA

(i) $\sin A = \frac{BC}{AB} = \frac{12}{13}$ — 1m

For finding SecB

(ii) $\sec B = \frac{AB}{BC} = \frac{13}{12}$ — 1m

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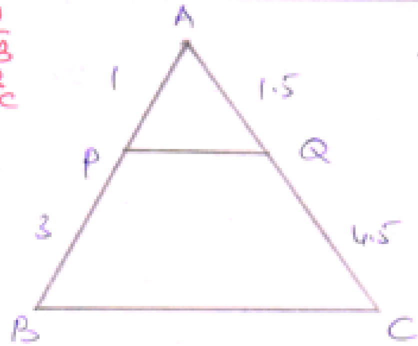
10 (b) For drawing diagram and finding $\frac{AP}{PB}$ and $\frac{AQ}{QC}$

Given, In ΔABC,



$\frac{AP}{PB} = \frac{1}{3}$

$\frac{AQ}{QC} = \frac{1.5}{4.5} = \frac{1}{3}$ — 1m

For proving PQ∥BC

$\because \frac{AP}{PB} = \frac{AQ}{QC}$

According to Converse of Thales theorem, PQ∥BC — 1m

For writing $\therefore \Delta APQ \sim \Delta ABC$ [$\because$ A.A.A. Similarity] — 1m

For writing $\frac{ar(\Delta APQ)}{ar(\Delta ABC)} = \frac{(AP)^2}{(AB)^2} = \frac{(1)^2}{(4)^2} = \frac{1}{16}$ — 1m

11 (a) For preparing table,

Class Interval	Frequency	Less than Cumulative Frequency
0 - 10	5	5
10 - 20	x	$5+x$
20 - 30	20	$25+x$
30 - 40	15	$40+x$
40 - 50	y	$40+x+y$
50 - 60	5	$45+x+y$
TOTAL	$n = 60$	

→ Median Class

2 m

For writing

Given, $n = 60$

$\Rightarrow 45 + x + y = 60$

$\Rightarrow x + y = 60 - 45 = 15$

$\therefore x + y = 15 \quad \ldots\ldots (1)$

$\frac{1}{2}$ m

For writing

Given, Median = 28.5

$\Rightarrow l + \left\{\frac{\frac{n}{2} - cf}{f}\right\} \times h = 28.5$

$\Rightarrow 20 + \left[\frac{30 - (5+x)}{20}\right] \times 10 = 28.5$

$\Rightarrow \frac{30 - 5 - x}{2} = 28.5 - 20 = 8.5$

$\Rightarrow 25 - x = 8.5 \times 2 = 17$

$\therefore x = 8$

1 m

For writing

Substituting $x = 8$ in equation (1),

$8 + y = 15$

$\Rightarrow y = 15 - 8 = 7$

$\therefore y = 7$

$\therefore x = 8, \ y = 7$

$\frac{1}{2}$ m

11(b) For writing

$\cos^2 1^\circ + \cos^2 2^\circ + \cos^2 3^\circ + \cdots\cdots + \cos^2 90^\circ$ [∵ Given] } ½m

$= \cos^2 1^\circ + \cos^2 2^\circ + \cos^2 3^\circ + \cdots + \cos^2 87^\circ + \cos^2 88^\circ + \cos^2 89^\circ + \cos^2 90^\circ$

For writing

$= \cos^2 1^\circ + \cos^2 2^\circ + \cos^2 3^\circ + \cdots + \sin^2 3^\circ + \sin^2 2^\circ + \sin^2 1^\circ + 0$ } ½m

[∵ $\cos 90^\circ = 0$ and $\sin(90-\theta) = \cos\theta$]

For writing

$= (\cos^2 1^\circ + \sin^2 1^\circ) + (\cos^2 2^\circ + \sin^2 2^\circ) + (\cos^2 3^\circ + \sin^2 3^\circ) + \cdots\cdots 44 \text{ terms} + \cos^2 45^\circ$ 1m

For writing

$= (1 + 1 + 1 + \cdots 44 \text{ term}) + \frac{1}{2}$ [∵ $\sin^2\theta + \cos^2\theta = 1$] } 1m

$= 44 + \frac{1}{2} = \frac{89}{2}$

Given: $\operatorname{cosec}\theta + \cot\theta = k$

RTP: $\cos\theta = \frac{k^2-1}{k^2+1}$

12. For writing

(a) Proof: Given, $\operatorname{cosec}\theta + \cot\theta = k \quad \cdots (1)$

We have $\operatorname{cosec}^2\theta - \cot^2\theta = 1$

$\Rightarrow (\operatorname{cosec}\theta + \cot\theta)(\operatorname{cosec}\theta - \cot\theta) = 1$

$\Rightarrow k \cdot (\operatorname{cosec}\theta - \cot\theta) = 1$

$\therefore \operatorname{cosec}\theta - \cot\theta = \frac{1}{k} \quad \cdots (2)$ } 1m

For writing

$(1) - (2) \Rightarrow$

$\operatorname{cosec}\theta + \cot\theta = k$

$\operatorname{cosec}\theta - \cot\theta = \frac{1}{k}$

By (−) $\quad 2\cot\theta = k - \frac{1}{k}$

$\Rightarrow 2\cdot\cot\theta = \frac{k^2-1}{k} \quad \cdots (3)$ } 1m

For writing

$(1) + (2) \Rightarrow$

$\operatorname{cosec}\theta + \cot\theta = k$

$\operatorname{cosec}\theta - \cot\theta = \frac{1}{k}$

By +, $\quad 2\operatorname{cosec}\theta = k + \frac{1}{k}$

$\Rightarrow 2\cdot\operatorname{cosec}\theta = \frac{k^2+1}{k} \quad \cdots (4)$ } 1m

For writing

7-8

$$(3) \div (4) \Rightarrow \frac{\cancel{2}\cot\theta}{\cancel{2}\csc\theta} = \frac{\frac{k^2-1}{k}}{\frac{k^2+1}{k}}$$

$$\Rightarrow \frac{\cot\theta}{\csc\theta} = \frac{k^2-1}{k^2+1}$$

$$\Rightarrow \frac{\frac{\cos\theta}{\sin\theta}}{\frac{1}{\sin\theta}} = \frac{k^2-1}{k^2+1}$$

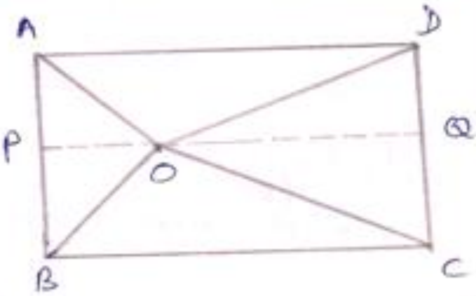
$$\therefore \cos\theta = \frac{k^2-1}{k^2+1}$$

1m

Hence proved.

12.(b) For writing

Given: ABCD is a Rectangle and O is any point inside it.



1m

RTP: $OB^2 + OD^2 = OA^2 + OC^2$

Construction: Through 'O' draw $PQ \parallel BC$ intersecting AB in P and DC in Q.

For writing

Proof: $PQ \perp AB$ and $PQ \perp DC$ [$\because \angle ABC = \angle BCD = 90°$]

$\therefore \angle BPQ = \angle CQP = 90°$

BPQC and APQD are two rectangles.

1m

For writing

In $\triangle OPB$, $\angle OPB = 90° \Rightarrow OB^2 = OP^2 + PB^2$ [$\because$ Pythagorus theorem] ----(1)

In $\triangle OQD$, $\angle OQD = 90° \Rightarrow OD^2 = OQ^2 + QD^2$ [$\because$ Pythagorus theorem] ---(2)

In $\triangle OPA$, $\angle OPA = 90° \Rightarrow OA^2 = AP^2 + OP^2$ [$\because$ Pythagorus theorem] ---(3)

In $\triangle OQC$, $\angle OQC = 90° \Rightarrow OC^2 = OQ^2 + QC^2$ [$\because$ Pythagorus theorem] ---(4)

1m

For writing

$(1) + (2) \Rightarrow OB^2 + OD^2 = (OP^2 + PB^2) + (OQ^2 + QD^2)$

$= (OP^2 + QC^2) + (OQ^2 + AP^2)$ [$\because PB = QC$, $QD = AP$]

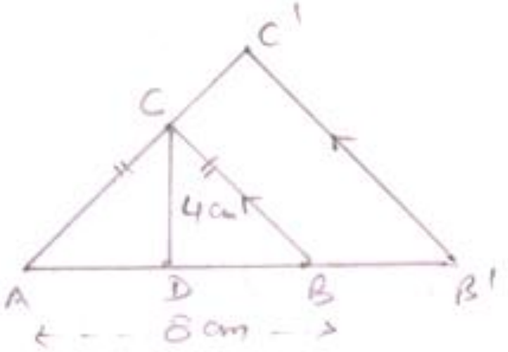
$= (AP^2 + OP^2) + (OQ^2 + QC^2)$ [$\because$ from (3), (4)]

$= OA^2 + OC^2$

$\therefore OB^2 + OD^2 = OA^2 + OC^2$ Hence proved.

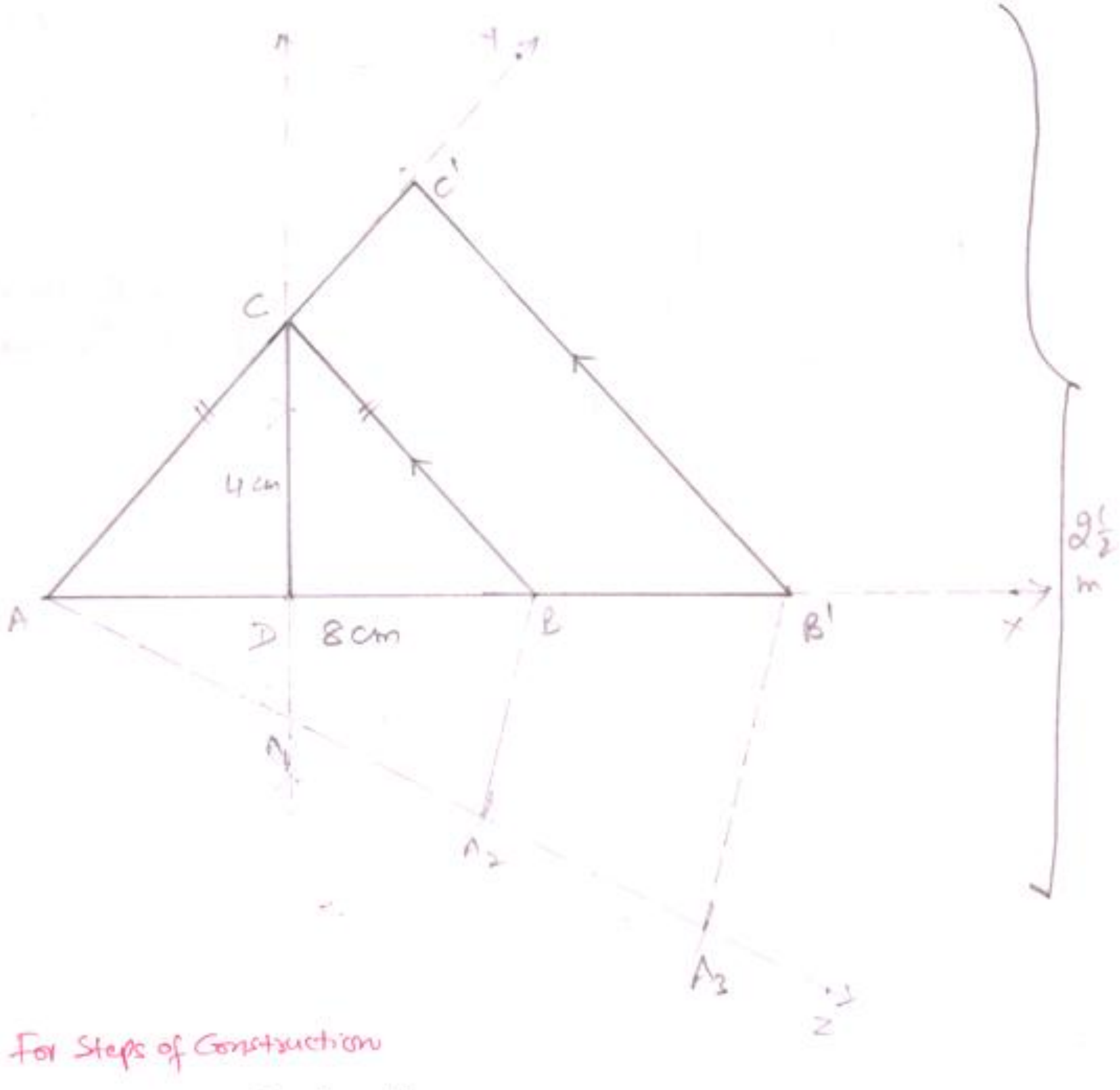
1m

Rough diagram



13. (a)

For diagramatic work,



$2\frac{1}{2}$ m

For Steps of Construction

Steps of Construction:

1. Construct isosceles $\triangle ABC$ such that base $AB = 8$ cm and altitude drawn on AB is $CD = 4$ cm.

2. On produce AB, mark the point B' Such that $AB' = 1\frac{1}{2}\ AB \Rightarrow \frac{AB'}{AB} = \frac{3}{2}$

3. Through B', draw $B'C' \parallel BC$ to intersect produced AC in C'

4. $\Delta\ AB'C'$ is required triangle Similar to the given triangle ABC Such that the Corresponding sides are $1\frac{1}{2}$ times to the Corresponding sides of the given triangle.

$1\frac{1}{2}$ m

NOTE: (i) Rough diagram is not Compulsary
(ii) If a student's diagramatic part is totally wrong, then rough work may be Considered for marks allottment (1 mark)

13 (b) Construction of ogive Curve (less than type):

For table

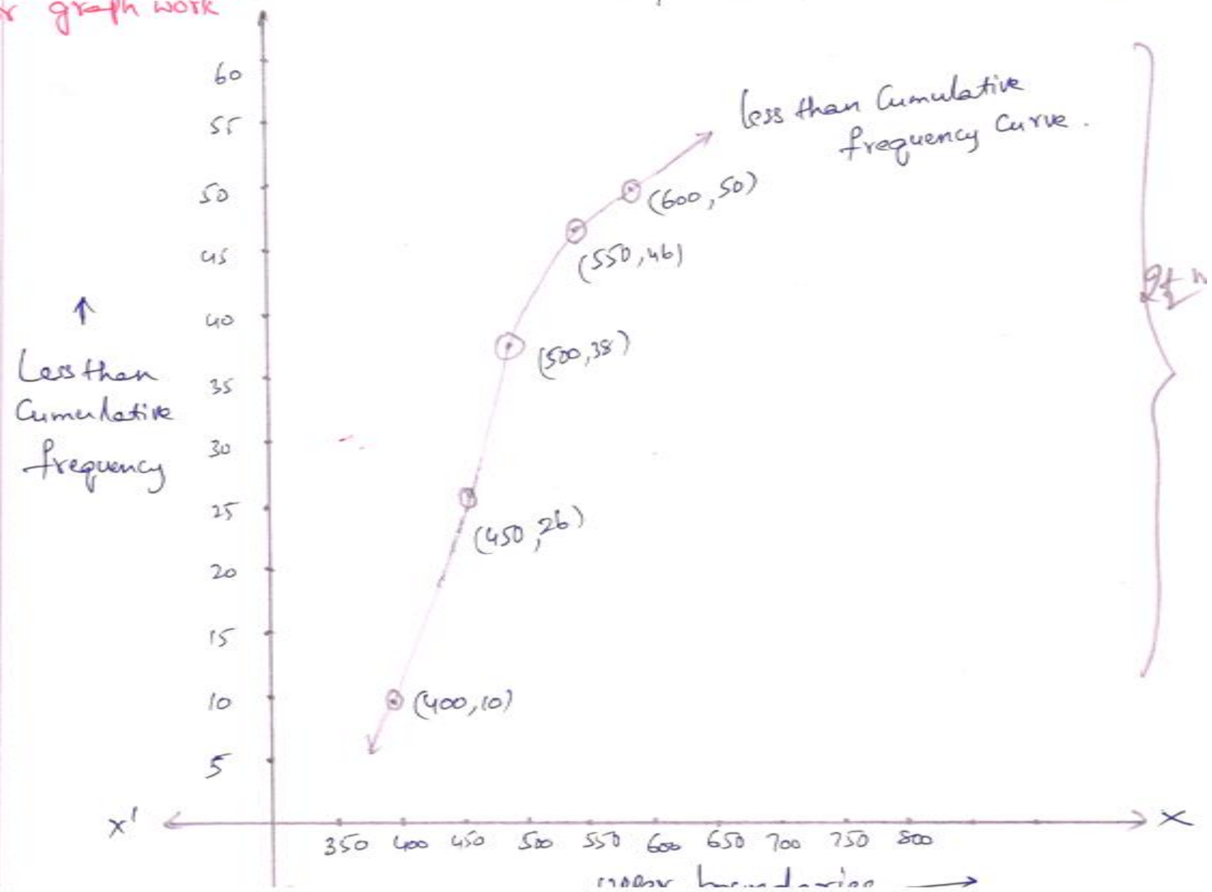
Dialy income (in rupees)	Number of workers	upper boundary	less than Cumulative frequency
350 – 400	10	400	10
400 – 450	16	450	26
450 - 500	12	500	38
500 – 550	8	550	44
550 - 600	4	600	50

1m

For writing Plotting the points (400, 10), (450, 26), (500, 38), (550, 44) and (600, 50) on the graph paper and joining them with a Smooth hand Curve, we get the graph of less than Cumulative frequency Curve. $\frac{1}{2}$ m

Scale: On x-axis 1 cm = 50 units
On y-axis 1 cm = 5 units.

For graph work



PART- B

KEY.

14. C
15. B
16. D
17. D
18. C
19. C
20. A
21. C
22. D
23. A
24. B
25. C
26. D
27. D
28. C
29. A
30. A
31. B
32. D
33. C