SECOND TERM EXAMINATION

MATHEMATICS

(Class IX)

(Number System, Triangles, Quadrilateral, Heron's Formula and Statistics)

Solutions

1) b) $\Delta CBA \cong \Delta PRQ$

2) c) Non terminating and Non repeating

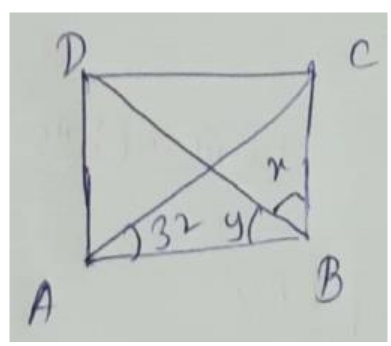
3) c) 95

4) b) 12

5) d) 27

6) $\frac{1}{2} \times 30 \times 30 = 450cm^2$

7)



y = 32
x + y = 90
x = 58
$\llcorner DBC = 58$

8) x = 4

9) $\llcorner ABC = \llcorner DEF$

10) $\frac{14}{11}$

11) $1176 = 2^a \times 3^b \times 7^c$

$= 2^3 \times 3^1 \times 7^2$

a = 3 b = 1 c = 2

$2^a \times 3^b \times 7^{-c} = 2^3 \times 3^1 \times 7^{-2}$

$= \frac{24}{49}$

12) $\llcorner BAD = \llcorner EAC$

$\llcorner BAD + \llcorner DAC = \llcorner EAC + \llcorner DAC$

$\llcorner BAC = \llcorner EAD$

$\Delta BAC \text{ and } \Delta EAD$

$AB = AD$

$\llcorner BAC = \llcorner EAD$

$AC = AE$

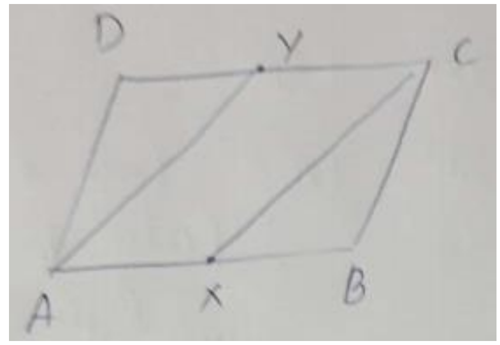
$by\ SAS\ \cong$

$\Delta BAC \cong \Delta EAD$

$by\ CPCT$

$BC = DE$

13) ABCD is a IIgm



AB II CD

AB = CD

∴ AX II CY

$$\frac{1}{2}AB = \frac{1}{2}CD$$

AX = CY

∴ AXCY is IIgm.

14) $\frac{\sum x}{70} = 150$

$$\sum x = 10500$$

New $\sum x$ = 10500 – 140 + 210

= 10570

Correct Mean = $\frac{10570}{70}$ = 151

15) $\angle DAP = \angle BAP$

$\angle DAP = \angle APB$

$\therefore \Delta BAP \text{ is isosceles } \Delta^{II}$

$\therefore AB = BP$

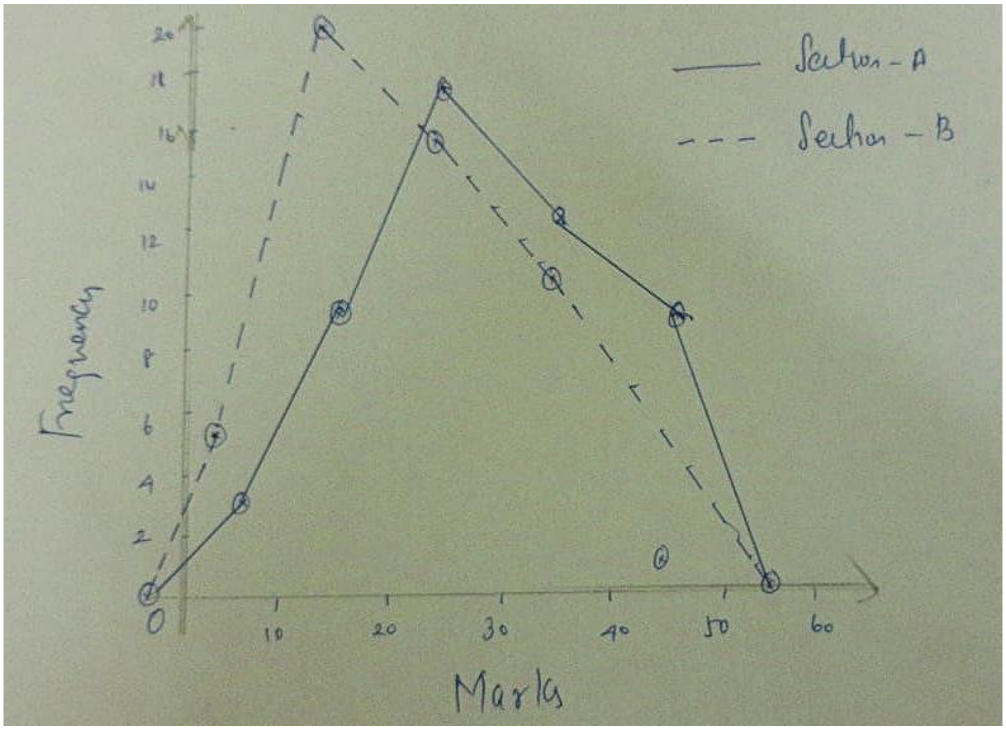
$CD = BP$

$CD = \frac{1}{2}BC$ (P is mid-point)

$CD = \frac{1}{2}AD$ (IIgm opposite sides are equal)

$2CD = AD$

16) Graph.



17) Draw DG II BF

$\Delta ADG,$

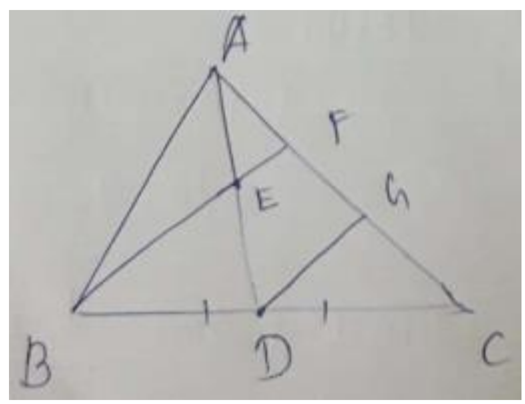
$EF \text{ II } DG$

$E \text{ is midpoint}$

$\therefore \text{ by Midpoint Theorem}$

$F \text{ is mid point of } AG$

$AF = GF$ (1)



$\Delta BCF,$

$D \text{ is midpoint of } BC$

$DG \text{ II } BF$

$G \text{ is midpoint of } CF$

$FG = GC$ (2)

$AF = GF = GC$

$$AF = \frac{1}{3} AC$$

18) $\Delta ABM \text{ and } \Delta DEN$

$AB = DE$

$AM = DN$

$BC = EF$

$\frac{1}{2}BC = \frac{1}{2}EF$

$BM = EN$

$by\ SSS \cong$

$\Delta ABM \cong \Delta DEN$

$by\ CPCT$

$\llcorner B = \llcorner E$

$\Delta ABC \text{ and } \Delta DEF$

$AB = DE$

$\llcorner B = \llcorner E$

$BC = EF$

$by\ SAS$

$\Delta ABC \cong \Delta DEF$

19) ΔBEC

a = 12cm b = 15cm c = 15cm

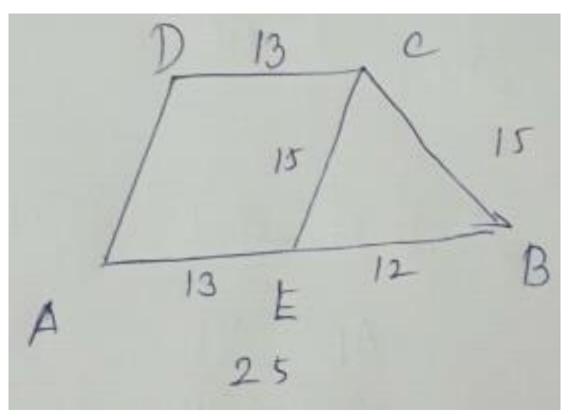
$S = \frac{15 + 15 + 12}{2} = \frac{42}{2} = 21cm$

$S = \sqrt{21 \times 9 \times 6 \times 6}$

$= \sqrt{3 \times 7 \times 3 \times 3 \times 2 \times 3 \times 2 \times 3}$

$= 18\sqrt{21}$

$area = \frac{1}{2} \times b \times h = 18\sqrt{21}$



$$= \frac{1}{2} \times 12 \times h = 18\sqrt{21}$$

$$h = 3\sqrt{21}$$

$$Area\ of\ IIgm = b \times h$$

$$= 13 \times 3\sqrt{21}$$

$$= 39\sqrt{21}$$

$$Area\ of\ trapezium = 39\sqrt{21} + 18\sqrt{21} = 57\sqrt{21}m^2$$

20) $x = 2 + 2^{\frac{1}{3}} + 2^{\frac{2}{3}}$

$$(x-2) = 2^{\frac{1}{3}}\left[1 + 2^{\frac{1}{3}}\right]$$

$$(x-2)^3 = 2\left[1 + 2^{\frac{1}{3}}\right]^3$$

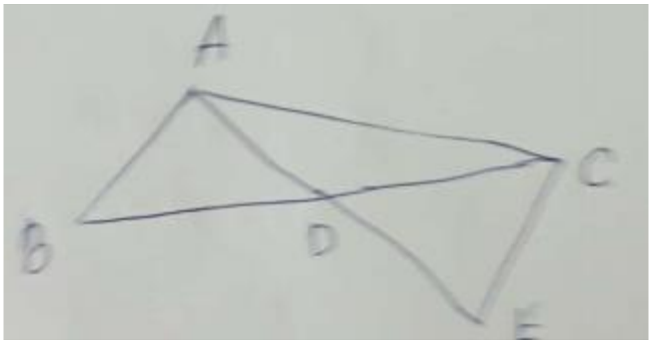
$$x^3 - 6x^2 + 12x - 8 = 2\left[3 + 3\,.\,2^{\frac{1}{3}} + 3\,.\;2^{\frac{2}{3}}\right]$$

$$= 6\left[1 + 2^{\frac{1}{3}} + 2^{\frac{2}{3}}\right]$$

$$= 6(x-1)$$

$$x^3 - 6x^2 + 6x - 2 = 0$$

21) Given ΔABC *in which* AD *is median*



To prove that:

AB + AC > 2AD

Construction

Produce AD to E, Such that
AD = DE
Join E C

Proof

ΔADB *and* ΔEDC
$AD = DE$
$BD = DC$
$\angle ADB = \angle EDC$
by $SAS \cong$
$\Delta ADB \cong \Delta EDC$
$AB = EC$ (by CPCT)

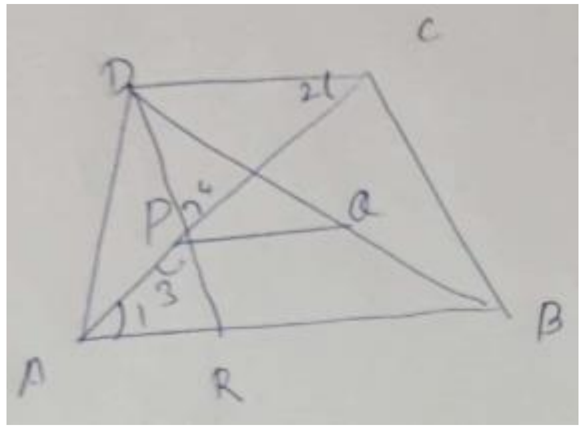
ΔAEC
$AC + EC > AE$
$AC + AB > 2AD$

Hence Proved.

22) Given $ABCD\ is\ a\ trapezium$

$AB\ II\ CD$

$P\ and\ Q\ are\ midpoint's$



<u>To prove that:</u>

PQ II AB

PQ = ½ (AB – DC)

<u>Proof</u>

$AB\ II\ CD$

$\llcorner 1 = \llcorner 2$

$\Delta APR \cong \Delta DPC$ (by ASA)

$AR = DC$

$PR = CP$ (by CPCT)

ΔDRB

$P\ and\ Q\ are\ midpoints\ of\ DR\ and\ DB$

$PQ\ II\ RB$

$PQ\ II\ AB$

$PQ = \frac{1}{2} RB$

$PQ = \frac{1}{2}(AB - AR)$

$= \frac{1}{2}(AB - DC)$

Hence Proved.

23) $x = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

$$= \frac{3 + 2 + 2\sqrt{6}}{3\,.\,2} = 5 + 2\sqrt{6}$$

$$y = 5 - 2\sqrt{6}$$

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

$$x + y = 5 + 2\sqrt{6} + 5 - 2\sqrt{6}$$

$$= 10$$

$$2xy = 2\left[\frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}\right]\left[\frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}\right]$$

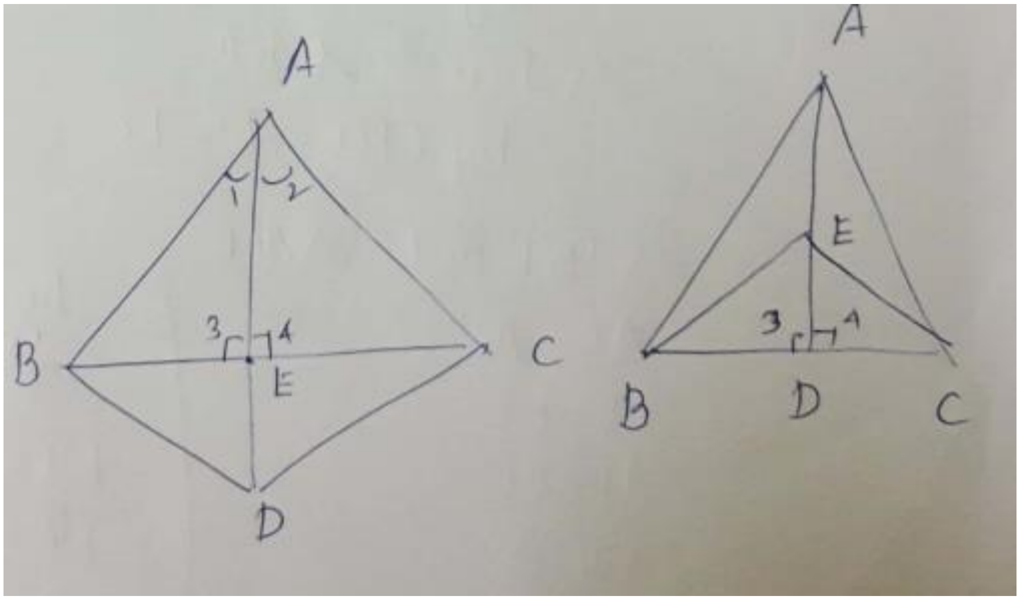
$$= 2(1)(1)$$

$$= 2$$

$$x^2 + y^2 = (10)^2 - 2$$

$$= 98$$

24)



Given: $\Delta ABC\ and\ \Delta DBC\ is\ isosceles\ \Delta^{II}$ with common base BC, such that
AB = AC
DB = DC

To prove that:

AD bisects BC at right angle.

Proof

$\Delta ABD\ and\ \Delta ACD$
$AB = AC$
$BD = CD$
$AD = AD$
$by\ SSS \cong$
$\Delta ABD \cong \Delta ACD$
$by\ CPCT\ \angle 1 = \angle 2$

$\Delta ABE\ anD\ \Delta ACE$
$AB = AC$
$\angle 1 = \angle 2$
$AE = AE$
$by\ SAS \cong$
$\Delta ABE \cong \Delta ACE$
$by\ CPCT$
$BE = CE$
$\angle 3 = \angle 4$
$\angle 3 + \angle 4 = 180$
$\angle 3 = \angle 4 = 90°$