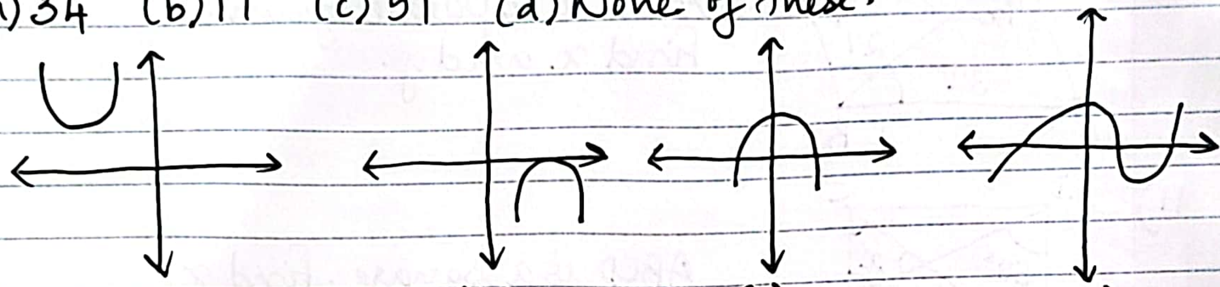
X | H.W - 18 (Sample Paper - 2) [For 12^{th} October]

SECTION - A

1) Two equilateral triangles have the sides of length 34 and 85 respectively. The greatest length of tape that can measure the sides of both of them exactly is
(a) 34 (b) 17 (c) 51 (d) None of these.

2) 

(a) (b) (c) (d)

Which of the following is not the graph of quadratic polynomial?

3) The graph of $y = x^3 - 4x$ cuts x-axis at $(-2,0)$, $(0,0)$ and $(2,0)$. The zeroes of $x^3 - 4x$ are
(a) 0, 0, 0 (b) -2, 2, 2 (c) -2, 0, 2 (d) -2, -2, 2

4) The equations $\frac{xy}{x+y} = \frac{1}{9}$ and $\frac{xy}{x-y} = \frac{1}{4}$ are equivalent to the equations:

(a) $-\frac{1}{x} + \frac{1}{y} = 9$; $-\frac{1}{x} + \frac{1}{y} = 4$

(b) $\frac{1}{x} - \frac{1}{y} = 9$; $-\frac{1}{x} - \frac{1}{y} = 4$

(c) $\frac{1}{x} + \frac{1}{y} = -4$; $\frac{1}{x} + \frac{1}{y} = -9$

(d) $\frac{1}{x} + \frac{1}{y} = 9$; $-\frac{1}{x} + \frac{1}{y} = 4$

5) The ratio in which the line segment joining the points $(1,-3)$ and $(4,5)$ divided by x-axis is
(a) 3:5 (b) 5:3 (c) 1:5 (d) 5:1

6) On MG road, three consecutive traffic lights change after every 36, 42 and 72 seconds. If the lights are first switched on at 9:00 am, at what time will they change simultaneously?
(a) 9:08:04 (b) 9:08:24 (c) 9:08:44 (d) none of these.

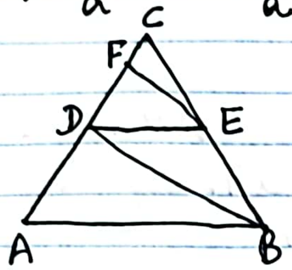
7) $3\cot\theta = 2$, the value of $\tan\theta =$ ___

(a) $\frac{2}{3}$ (b) $\frac{3}{2}$ (c) $\frac{3}{\sqrt{13}}$ (d) $\frac{2}{\sqrt{13}}$

8) If $p(x) = ax^2+bx+c$ and $a+c=b$, then one of the zeroes is

(a) $\frac{b}{a}$ (b) $\frac{c}{a}$ (c) $-\frac{c}{a}$ (d) $-\frac{b}{a}$

9)



$AB \parallel DE$, $BD \parallel EF$, then $DC^2 =$ ___

(a) $CF \times AC$ (b) $CF \times CE$

(c) $CF \times EF$ (d) $CF \times AD$

10) A circle is inscribed in a triangle with sides 8cm, 15cm and 17cm, then the radius of circle is

(a) 6cm (b) 5cm (c) 4cm (d) 3cm

11) Three vertices of a parallelogram, taken in order, are (1, 2), (0, 4) and (3, 7), then the fourth vertex is

(a) (4, 5) (b) (5, 4) (c) (6, 3) (d) (9, 5)

12) The mean age of combined group of men and women is 30 years. If the mean of the age of men and women are respectively 32 and 27, then the percentage of women in the group is

(a) 30 (b) 20 (c) 50 (d) 40

13) The mean of 5 numbers is 18. One number is excluded, their mean becomes 16. Then the excluded number is

(a) 15 (b) 25 (c) 26 (d) 30

14) If $A = 2n+13$, $B = n+7$, where n is a natural number, then HCF of A and B is

(a) 2 (b) 1 (c) 3 (d) 4

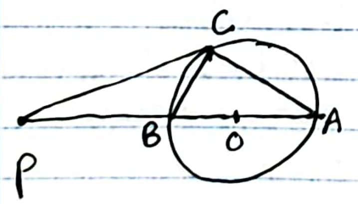
15) If $\sin\theta + \sin^2\theta + \sin^3\theta = 1$, then $\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta =$

(a) 1 (b) 2 (c) 3 (d) 4

16) Area of the largest Δ that can be inscribed in a semi-circle of radius r units is

(a) r^2 sq. units (b) $\frac{1}{2}r^2$ sq. units (c) $2r^2$ sq. units (d) $\sqrt{2}r^2$ sq. units

17)



The tangent at C of a circle and a diameter AB when extended, intersect at P. If $\angle PCA = 110°$, $\angle CBA =$ ___

(a) 80° (b) 60° (c) 40° (d) 70°

18) The angle of depression of a car standing on the ground, from the top of a 75 m high tower is 30°. The distance of the car from the base of the tower (in m) is
(a) $25\sqrt{3}$ m (b) $50\sqrt{3}$ m (c) $75\sqrt{3}$ m (d) 150 m

19) If $\operatorname{cosec}\theta - \cot\theta = \frac{1}{4}$, then $\operatorname{cosec}\theta + \cot\theta =$ —
(a) 1 (b) 2 (c) 3 (d) 4

20) The greatest number of 5 digits, that will give us remainder of 5, when divided by 8 and 9 respectively is
(a) 99921 (b) 99931 (c) 99941 (d) 99951

SECTION-B

21) If S_n denotes the sum of n terms of an AP whose common difference is d and first term is a, find $S_n - 2S_{n-1} + S_{n-2}$

22) Evaluate : $\dfrac{\tan^2 60° + 4\sin^2 45° + 3\sec^2 30° + 5\cos^2 90°}{\operatorname{cosec} 30° + \sec 60° - \cot^2 90°}$

23) Find the value of $\dfrac{\cot\theta}{\operatorname{cosec}\theta + 1} + \dfrac{\operatorname{cosec}\theta + 1}{\cot\theta}$

24) Two tangents AB and AC are drawn to a circle with Centre O so that $\angle BAC = 120°$. Prove that $OA = 2AB$

25) Solve for x and y: $\dfrac{2x}{y+1} = 1$; $\dfrac{x+4}{2y} = \dfrac{1}{2}$
Hence, find m where $m = 2x - 3y$.

SECTION-C

26) Given $\sec\theta = \frac{13}{12}$, Calculate all other trigonometric ratios

27) If $2\sin\theta - 1 = 0$, then prove that $\sin 3\theta = 3\sin\theta - 4\sin^3\theta$

28) Prove that the tangents drawn at the end points of a chord of a circle make equal angles with the chord.

29) Three years ago, Ram was thrice as old as Nazma. Ten years later, Ram will be twice as old as Nazma. How old are Ram and Nazma now?

30) Prove that $\frac{\cot\theta + \csc\theta - 1}{\cot\theta - \csc\theta + 1} = \frac{1+\cos\theta}{\sin\theta}$

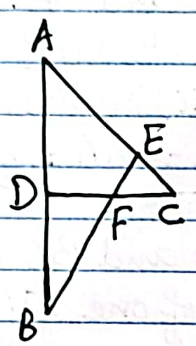
31) Which term of the AP 65, 61, 57, 53, ... is the first negative term?

SECTION-D

32) If the median of the following frequency distribution is 32·5, find the values of f_1 and f_2

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
frequency	f_1	5	9	12	f_2	3	2	40

33)



$\angle CEF = \angle CFE$.

F is the mid-point of DC

Prove that $\frac{AB}{BD} = \frac{AE}{FD}$

34) A bird is sitting on the top of a 80m high tree. From a point on the ground, the angle of elevation of the bird is 45°. The bird flies away horizontally in such a way that it remained at a constant height from the ground. After 2 seconds, the angle of elevation of the bird from the same point is 30°. Find the speed of the bird ($\sqrt{3} = 1{\cdot}732$).

35) Find the value of x, when in the A.P

$2+6+10+\dots+x = 1800$

36) If $\sec\theta + \tan\theta = m$, show that $\frac{m^2-1}{m^2+1} = \sin\theta$

37) Show that $\frac{2+3\sqrt{2}}{7}$ is not a rational number, given that $\sqrt{2}$ is an irrational number.

38) Sum of the areas of two squares is $157m^2$. If the sum of their perimeters is 68 m, find the sides of the two squares.

X H.W-18 (answers)

SECTION-A

1) $34 = 2 \times 17$

$85 = 5 \times 17$

HCF = 17 (b)

2) (d)

3) $-2, 0, 2$ (c)

4) $\frac{xy}{x+y} = \frac{1}{9} \Rightarrow \frac{x+y}{xy} = 9$

$\Rightarrow \frac{1}{y} + \frac{1}{x} = 9 \rightarrow (1)$

$\frac{xy}{x-y} = \frac{1}{4} \Rightarrow \frac{x-y}{xy} = 4$

$\Rightarrow \frac{1}{y} - \frac{1}{x} = 4 \rightarrow (2)$ (d)

5) (1, -3) —k— P(x, 0) —1— (4, 5)

$(x, 0) = \left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$

$(x, 0) = \left(\frac{4k+1}{k+1}, \frac{5k-3}{k+1}\right)$

On equating the y-coordinates, $0 = \frac{5k-3}{k+1}$

$\Rightarrow 5k - 3 = 0$

$\Rightarrow 5k = 3$

$k = \frac{3}{5}$ (a)

6) $36 = 3^2 \times 2^2$

$42 = 2 \times 3 \times 7$

$72 = 3^2 \times 2^3$

LCM $= 3^2 \times 2^3 \times 7 = 504$ seconds $= 8$ min 24 sec

$$\begin{array}{r} 8 \\ 60 \overline{)504} \\ 480 \\ \hline 24 \end{array}$$

9:08:24 am (b)

7) $3\cot\theta = 2$

$\cot\theta = \frac{2}{3}$

$\tan\theta = \frac{3}{2}$ (b)

8) when -1 is one of the zeroes, $p(-1) = 0$

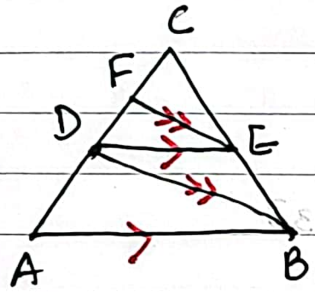
$\Rightarrow a - b + c = 0$

$\Rightarrow a + c = b$

Then, product of zeroes $\Rightarrow -1 \times \beta = \frac{c}{a}$

$\therefore \beta = -\frac{c}{a}$ (c)

9)



Using similarity of Δs,

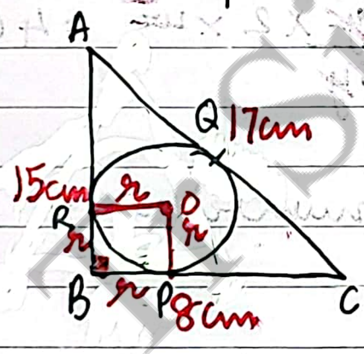
Since $DE \parallel AB$, $\frac{CD}{AC} = \frac{CE}{BC}$ $\rightarrow$ (1)

Since $EF \parallel BD$, $\frac{CF}{CD} = \frac{CE}{BC}$ $\rightarrow$ (2)

From eq:s (1) and (2), $\frac{CD}{AC} = \frac{CF}{CD}$

$\Rightarrow DC^2 = CF \times AC$ (a)

10)



ORBP is a square

$AR = AQ = 15 - r$

$PC = CQ = 8 - r$

$\therefore AC = AQ + CQ = 17\text{cm}$

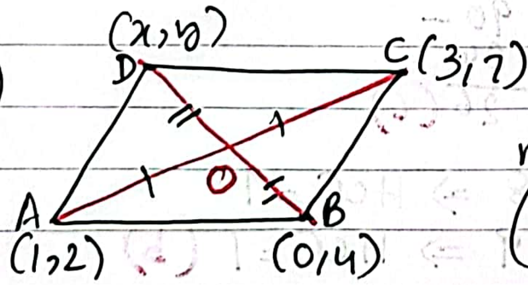
$\Rightarrow 15 - r + 8 - r = 17$

$\Rightarrow 23 - 2r = 17$

$2r = 6$

$r = 3\text{cm}$ (d)

11)



mid-point of AC = mid-point of BD

$\left(\frac{1+3}{2}, \frac{2+7}{2}\right) = \left(\frac{0+x}{2}, \frac{4+y}{2}\right)$

$\therefore x = 4 ; y = 5$ (c)

Let the no. of men and women be x and y respectively.

12) mean age of men = 32

$$\Rightarrow \frac{\text{total age}}{\text{no. of men}} = 32$$

$$\Rightarrow \text{total age} = 32x \rightarrow (1)$$

mean age of women = 27

$$\Rightarrow \frac{\text{total age}}{\text{no. of women}} = 27$$

$$\Rightarrow \text{total age} = 27y \rightarrow (2)$$

Combined mean = 30

$$\Rightarrow \frac{32x + 27y}{x+y} = 30$$

$$\Rightarrow 32x + 27y = 30x + 30y$$

$$\Rightarrow 2x = 3y \Rightarrow x = \frac{3y}{2} \rightarrow (3)$$

$$\% \text{ of women} = \frac{y}{x+y} \times 100$$

$$= \frac{y}{\frac{3y}{2} + y} \times 100 = \frac{\cancel{y}}{\cancel{5y}_{1}} \times 2 \times \cancel{100}^{20} = 40\% \text{ (d)}$$

13) $\frac{\text{Sum of 5 nos}}{5} = 18$. Let the excluded number be x

$\Rightarrow$ Sum of 5 nos = $18 \times 5 = 90$

New Sum = $90 - x$

New mean = $\frac{90 - x}{4} = 16$

$$\Rightarrow 90 - x = 64$$

$$x = 90 - 64 = 26 \text{ (c)}$$

14) when $n = 1$, $A = 15$; $B = 8$ $\Rightarrow$ HCF = 1

when $n = 2$, $A = 17$; $B = 9$ $\Rightarrow$ HCF (b)

15) $\sin\theta + \sin^2\theta + \sin^3\theta = 1$

$\Rightarrow \sin\theta + \sin^3\theta = 1 - \sin^2\theta$

$\Rightarrow \sin\theta + \sin^3\theta = \cos^2\theta$

$\Rightarrow \sin\theta(1+\sin^2\theta) = \cos^2\theta$

Squaring on both sides,

$\sin^2\theta(1+\sin^2\theta)^2 = \cos^4\theta$

$\sin^2\theta(1+2\sin^2\theta+\sin^4\theta) = \cos^4\theta$

$(1-\cos^2\theta)(1+2(1-\cos^2\theta)+(1-\cos^2\theta)^2) = \cos^4\theta$

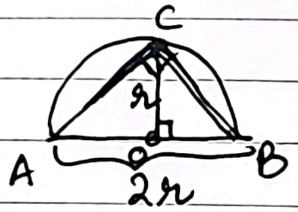
$(1-\cos^2\theta)(1+2-2\cos^2\theta+1+\cos^4\theta-2\cos^2\theta) = \cos^4\theta$

$(1-\cos^2\theta)(4-4\cos^2\theta+\cos^4\theta) = \cos^4\theta$

$4-4\cos^2\theta+\cancel{\cos^4\theta}-4\cos^2\theta+4\cos^4\theta-\cos^6\theta = \cancel{\cos^4\theta}$

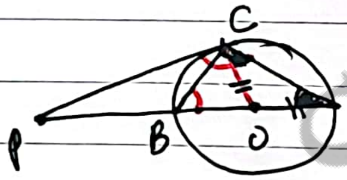
$\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta = 4$ (d)

16)



area $(\triangle ACB) = \frac{1}{2} \times 2r \times r = r^2$ sq. units (a)

17)



$\angle OCP = 90^\circ$ (radius $OC \perp$ tangent PC at C)

$\therefore \angle OCA = 110^\circ - 90^\circ = 20^\circ$

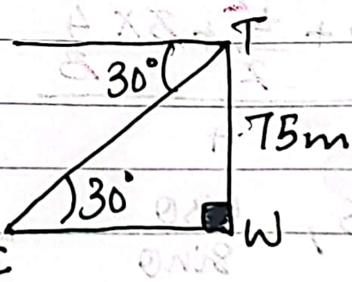
Since $OC = OA$, $\angle OCA = \angle OAC = 20^\circ$

$\therefore$ In $\triangle BCA$, $\angle CBA = 180^\circ - (90^\circ + 20^\circ)$

$= 180^\circ - 110^\circ$

$= 70^\circ$ (d)

18) $\tan 30^\circ = \frac{75}{CW}$



$\frac{1}{\sqrt{3}} = \frac{75}{CW}$

$CW = 75\sqrt{3}$ m (c)

19) $\operatorname{cosec}^2\theta - \cot^2\theta = 1$

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

$\therefore \operatorname{cosec}\theta + \cot\theta = \frac{1}{\frac{1}{4}} = 4$ (d

20) $LCM(8,9) = 72$

$$\begin{array}{r} 1388 \\ 72\,\overline{)\,99999} \\ \underline{72} \\ 279 \\ \underline{216} \\ 639 \\ \underline{576} \\ 639 \\ \underline{576} \\ 63 \end{array}$$

$\therefore$ Required no. is
$99999 - 63 + 5 = 99941$ (c)

SECTION - B

21) $S_n - 2S_{n-1} + S_{n-2}$

$= S_n - S_{n-1} - S_{n-1} + S_{n-2}$

$= (S_n - S_{n-1}) - (S_{n-1} - S_{n-2})$

$= a_n - a_{n-1} = \underline{\underline{d}}$

22) $\dfrac{(\sqrt{3})^2 + 4 \times \left(\frac{1}{\sqrt{2}}\right)^2 + 3 \times \left(\frac{2}{\sqrt{3}}\right)^2 + 5 \times 0}{2 + 2 - 0}$

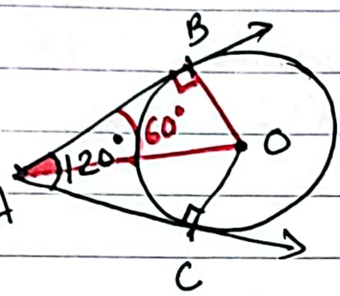
$= \dfrac{3 + \frac{\cancel{4}^{2}}{\cancel{2}_{1}} + \cancel{3} \times \frac{4}{\cancel{3}}}{4} = \underline{\underline{\dfrac{9}{4}}}$

23) LHS, $\dfrac{\frac{\cos\theta}{\sin\theta}}{\frac{1}{\sin\theta} + 1} + \dfrac{\frac{1}{\sin\theta} + 1}{\frac{\cos\theta}{\sin\theta}} = \dfrac{\frac{\cos\theta}{\sin\theta}}{\frac{1+\sin\theta}{\sin\theta}} + \dfrac{\frac{1+\sin\theta}{\sin\theta}}{\frac{\cos\theta}{\sin\theta}}$

$= \dfrac{\cos^2\theta + (1+\sin\theta)^2}{\cos\theta(1+\sin\theta)} = \dfrac{\cos^2\theta + 1 + \sin^2\theta + \ldots}{\cos\theta(1+\sin\theta)}$

$$= \frac{1+1+2\sin\theta}{\cos\theta(1+\sin\theta)} = \frac{2(1+\sin\theta)}{\cos\theta(1+\sin\theta)} = \underline{\underline{2\sec\theta}}$$

24)



Given :- AB and AC are tangents at B and C drawn from external point A.

To prove :- $OA = 2AB$

Proof :- In ΔABO and ΔACO, $\angle OBA = \angle OCA$ (each 90°; radius ⊥ tangent through the point of contact)

$OA = OA$ (Common side)

$OB = OC$ (Radii of the same circle)

$\therefore \Delta ABO \cong \Delta ACO$ (RHS congruency)

Thus, $\angle BAO = \angle CAO = \frac{120°}{2} = 60°$ (by cpct)

In rt. ΔABO, $\cos 60° = \frac{AB}{OA}$

$$\Rightarrow \frac{1}{2} = \frac{AB}{OA}$$

$\therefore OA = 2AB$. Hence Proved

25. $\frac{2x}{y+1} = 1 \Rightarrow 2x = y+1$

$\Rightarrow 2x - y = 1 \longrightarrow (1)$

$\frac{x+4}{2y} = \frac{1}{2} \Rightarrow 2x + 8 = 2y$

$\Rightarrow \cancel{x+4 = y}$

$\Rightarrow 2x - 2y = -8 \rightarrow (2)$

(1) − (2), $y = 9$

From eq: (1), $2x - 9 = 1$

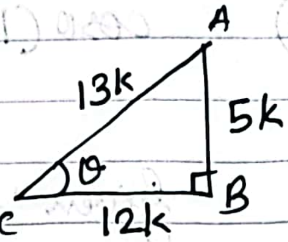
$2x = 10$

$x = 5$

$\therefore m = 10 - 27 = \underline{\underline{-17}}$

Section-C

26) $\sec\theta = \frac{13}{12}$



Using Pythagoras Theorem in rt. $\triangle ABC$,

$AB^2 = 169k^2 - 144k^2 = 25k^2$

$AB = 5k$

$\sin\theta = \frac{AB}{AC} = \frac{5k}{13k} = \frac{5}{13}$

$\cos\theta = \frac{BC}{AC} = \frac{12k}{13k} = \frac{12}{13}$

$\tan\theta = \frac{AB}{BC} = \frac{5k}{12k} = \frac{5}{12}$

$\operatorname{cosec}\theta = \frac{AC}{AB} = \frac{13k}{5k} = \frac{13}{5}$

$\cot\theta = \frac{BC}{AB} = \frac{12k}{5k} = \frac{12}{5}$

27) $2\sin\theta - 1 = 0$

$\sin\theta = \frac{1}{2}$

$\therefore \theta = 30^\circ$

LHS, $\sin 3\theta = \sin 90^\circ = 1$

RHS, $3\sin\theta - 4\sin^3\theta = 3\sin 30^\circ - 4\sin^3 30^\circ$

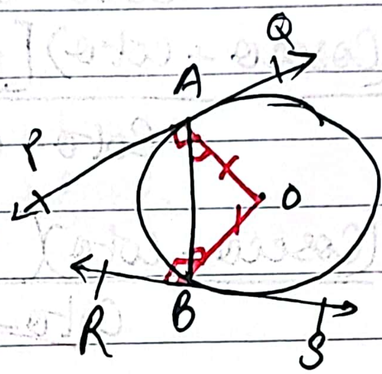
$= 3 \times \frac{1}{2} - 4 \times \frac{1}{8}$

$= \frac{3}{2} - \frac{1}{2} = 1$

$\therefore$ LHS = RHS

Hence Proved.

28) Given:- PQ and RS are two tangents at A and B. AB is the chord of a circle with centre O.



To prove:- $\angle PAO = \angle RBO$.

Construction:- Join OA and OB.

Proof:- In $\triangle OAB$, since $OA = OB$ (radii of same circle)

$\Rightarrow \angle OAB = \angle OBA$ (angles opposite to equal sides) $\to$ (1)

Since radius $\perp$ tangent through the point of contact,

$\angle BAP = \angle ABR = 90^\circ \to (2)$

(1) + (2), $\angle OAB + \angle BAP = \angle OBA + \angle ABR$

$\Rightarrow \underline{\underline{\angle OAP = \angle OBR}}$ Hence Proved.

29) Let the age of Nazma three years ago be x yrs.
Then, Ram's age is 3x yrs.

	Ram	Nazma
3 yrs ago $\Rightarrow$	$3x$	x
Present age $\Rightarrow$	$3x+3$	$x+3$
Ten yrs later $\Rightarrow$	$3x+13$	$x+13$

ATQ, $3x+13 = 2(x+13)$

$3x+13 = 2x+26$

$x = 13$

Hence, present ages of Ram and Nazma are 42 yrs and 16 yrs.

30) LHS, $\dfrac{\cot\theta + \operatorname{cosec}\theta - 1}{\cot\theta - \operatorname{cosec}\theta + 1}$

$= \dfrac{(\operatorname{cosec}\theta + \cot\theta) - (\operatorname{cosec}^2\theta - \cot^2\theta)}{\cot\theta - \operatorname{cosec}\theta + 1}$ $[\because \operatorname{cosec}^2\theta - \cot^2\theta = 1]$

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

$= \dfrac{(\operatorname{cosec}\theta + \cot\theta)[1 - (\operatorname{cosec}\theta - \cot\theta)]}{\cot\theta - \operatorname{cosec}\theta + 1}$

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

$= \operatorname{cosec}\theta + \cot\theta = \dfrac{1}{\sin\theta} + \dfrac{\cos\theta}{\sin\theta}$

$= \dfrac{1 + \cos\theta}{\sin\theta}$, RHS

31) $a = 65$, $d = 61 - 65 = -4$

For the first negative term,

$a_n < 0$

$\Rightarrow a + (n-1)d < 0$

$\Rightarrow 65 - 4(n-1) < 0$

$\Rightarrow 65 - 4n + 4 < 0$

$\Rightarrow 69 - 4n < 0$

$\Rightarrow 69 < 4n$

$\Rightarrow n > \dfrac{69}{4}$

$\therefore n > 17.25$

Hence, the first negative term is 18^{th} term.

SECTION-D

32)

C.I	f	c.f
0 – 10	f_1	f_1
10 – 20	5	$5+f_1$
20 – 30	9	$14+f_1$ c.f
$\boxed{30-40}$	12 f	$26+f_1$
40 – 50	f_2	$26+f_1+f_2$
50 – 60	3	$29+f_1+f_2$
60 – 70	2	$31+f_1+f_2$
	$\Sigma f_i = 40$	

$31+f_1+f_2 = 40$

$f_1+f_2 = 9$

median class is 30–40

$l=30,\ h=10,\ f=12,\ c.f = 14+f_1,\ \frac{n}{2} = \frac{40}{2} = 20$

$$\text{median} = l + \frac{\frac{n}{2} - c.f}{f} \times h$$

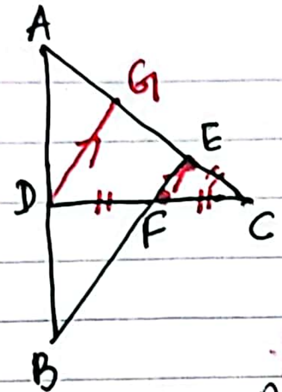
$$32.5 = 30 + \left(\frac{20-14-f_1}{\cancel{12}\,6}\right) \times \cancel{10}\,5$$

$$\frac{2.5 \times 6}{5} = 6 - f_1$$

$$3 = 6 - f_1$$

$\boxed{f_1 = 3}$

$\boxed{f_2 = 6}$

33) 

Given :- $\angle CEF = \angle CFE \rightarrow (1)$

$DF = FC \rightarrow (2)$

To prove :- $\frac{AB}{BD} = \frac{AE}{FD}$

Construction :- draw $DG \parallel BE$ to meet AC at G

Proof :- Since $\angle CFE = \angle CEF$,

$CF = CE \rightarrow (3)$

(Sides opposite to equal angles)

Using converse of mid-point theorem in $\triangle CDG$, since F is the mid-point of CD and $FE \parallel DG$, E is also the mid-point of CG, thus $CE = EG \rightarrow (4)$

From eq:s (2), (3) and (4), $CF = FD = CE = EG \rightarrow (5)$

In $\triangle ABE$, since $DG \parallel BE$, using Thales theorem

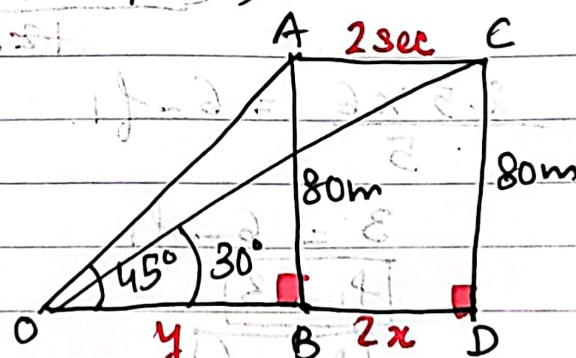
$$\frac{AD}{DB} = \frac{AG}{GE}$$

$$\Rightarrow \frac{AD}{BD} + 1 = \frac{AG}{GE} + 1$$

$$\Rightarrow \frac{AB}{BD} = \frac{AE}{GE}$$

$$\Rightarrow \frac{AB}{BD} = \frac{AE}{FD}$$ (from eq: (5))

Hence Proved



34) Let the speed of the bird be x m/sec.

D = Speed × time

$BD = 2x$ metres

In rt. $\triangle OAB$,

$$\tan 45° = \frac{AB}{OB}$$

$$\Rightarrow 1 = \frac{80}{y}$$

$$\boxed{y = 80m}$$

In rt. $\triangle OCD$, $\tan 30° = \frac{CD}{OD}$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{80}{2x+y}$$

$$\Rightarrow 2x + y = 80\sqrt{3}$$

$$\Rightarrow 2x = 80\sqrt{3} - 80$$

$\Rightarrow x = \frac{80(\sqrt{3}-1)}{2} = 40 \times 0.732 \approx 29.28$ m/s

Hence, the speed of the bird is 29.28 m/s

35) $a = 2, d = 6-2 = 4, a_n = x, S_n = 1800$

$a_n = a+(n-1)d$

$x = 2+(n-1)4$

$x = 2+4n-4$

$x = 4n-2$

$4n = x+2$

$n = \frac{x+2}{4} \rightarrow (1)$

$S_n = \frac{n}{2}[a+a_n]$

$\Rightarrow 1800 = \frac{(x+2)}{8}[2+x]$

$\Rightarrow 14400 = (x+2)^2$

$\Rightarrow x+2 = \pm 120$

$x = 120-2 = 118$ or $x = -120-2 = -122$

x cannot be -ve, $\therefore$ required value of x is $\underline{\underline{118}}$

36) $\sec\theta + \tan\theta = m \rightarrow (1)$

we know that $\sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

$\therefore \sec\theta - \tan\theta = \frac{1}{m} \rightarrow (2)$

$(1)-(2), \; 2\tan\theta = m - \frac{1}{m} = \frac{m^2-1}{m}$

$\tan\theta = \frac{m^2-1}{2m} \rightarrow (3)$

$(1)+(2), \; 2\sec\theta = m + \frac{1}{m} = \frac{m^2+1}{m}$

$\sec\theta = \frac{m^2+1}{2m} \rightarrow (4)$

$\frac{(3)}{(4)}, \; \frac{\tan\theta}{\sec\theta} = \frac{\frac{m^2-1}{\cancel{2m}}}{\frac{m^2+1}{\cancel{2m}}}$

$\Rightarrow \frac{\sin\theta}{\cancel{\cos\theta}} \times \frac{\cancel{\cos\theta}}{1} = \frac{m^2-1}{m^2+1}$

$\therefore \frac{m^2-1}{m^2+1} = \sin\theta$

37) do by yourself.

38) Let the sides of the squares be x m and y m.

ATQ, $4x+4y=68$

$x+y=17$

$x=17-y \rightarrow (1)$

Also, $x^2+y^2=157$

$(17-y)^2+y^2=157$

$289-34y+y^2+y^2=157$

$2y^2-34y+132=0$

$y^2-17y+66=0$

$(y-11)(y-6)=0$

$y=6, 11$

When $y=6$, $x=17-6=11$

When $y=11$, $x=17-11=6$

Hence, the sides of the squares are 11 m and 6 m.