CBSE Sample Paper-04 (Solved)
SUMMATIVE ASSESSMENT –I
MATHEMATICS
Class – IX

Time allowed: 3 hours Maximum Marks: 90

General Instructions:

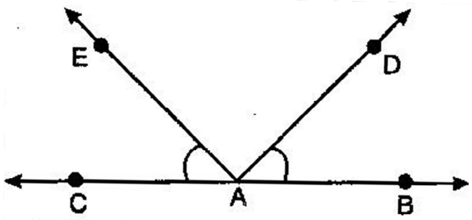
a) All questions are compulsory.
b) The question paper consists of 31 questions divided into four sections – A, B, C and D.
c) Section A contains 4 questions of 1 mark each which are multiple choice questions, Section B contains 6 questions of 2 marks each, Section C contains 10 questions of 3 marks each and Section D contains 11 questions of 4 marks each.
d) Use of calculator is not permitted.

Section A

1. The value of $4\sqrt{28}+3\sqrt{7}$ is:

(a) $\frac{4}{3}$ (b) $\frac{3}{4}$ (c) $\frac{8}{3}$ (d) $\frac{3}{8}$

2. In the figure, AB and AC are opposite rays. If $\angle$BAD + $\angle$CAE = 90°, then the value of $\angle$DAE is:



(a) 45° (b) 90° (c) 30° (d) 60°

3. In a triangle ABC, $\angle$B = $75°$ and $\angle$C = $32°$, then the value of $\angle$C is:

(a) 37° (b) 57° (c) 73° (d) 53°

4. Area of rhombus whose diagonals are 10 cm and 8 cm:

(a) 40 sq. cm (b) 20 sq. cm (c) 50 sq. cm (d) None of these

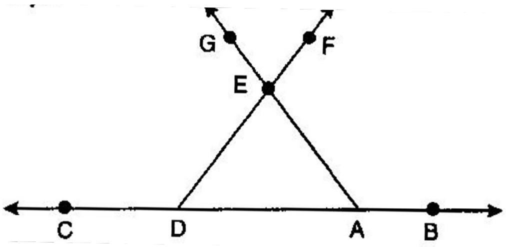
Section B

5. Express $0.\bar{7}$ in the form $\frac{m}{n}$.

6. Find the zeros of the polynomial $p(x)=cx+d$.

7. Find the remainder when $4x^3-3x^2+2x-4$ is divided by $(x-4)$.

8. In the figure, AB and AC are opposite rays and $\angle$DAE = $\angle$ADE. Prove that $\angle$BAE = $\angle$CDE.



9. The angles of a triangle are in the ratio 3 : 5 : 10. Find the measure of each angle.
10. Find out the quadrant in which the following points lie:
    (i) Point A = $(3,-4)$ (ii) Point B = $(-3,4)$
    (iii) Point C = $(-3,-4)$ (iv) Point D = (3, 4)

Section C

11. Find six rational numbers between 3 and 4.
12. Examine whether $\sqrt{2}$ is rational or irrational.

Or

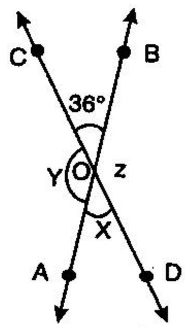
Represent $\sqrt{3}$ on number line.

13. Divide $f(x)=2x^3-x^2-2x-7$ by $g(x)=x-2$.
14. Find the remainder when $5x^3-x^2+6x-2$ is divided by $1-5x$.

Or

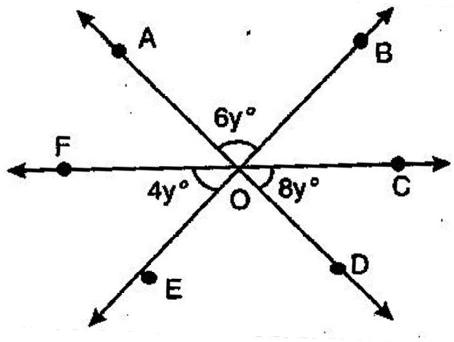
Find the value of p for which the polynomial $2x^4+3x^3+2px^2+3x+6$ is divisible by $x+2$.

15. Factorize: $4x^2+12xy+9y^2-6x-9y$
16. If a point C lies between two points A and B such that AC = BC, then prove that AC = $\frac{1}{2}$AB. Explain by drawing the figure.
17. In the figure, line AB and CD intersect at O and $\angle$BOC = 36°. Find $\angle$X, $\angle$Y and $\angle$Z.

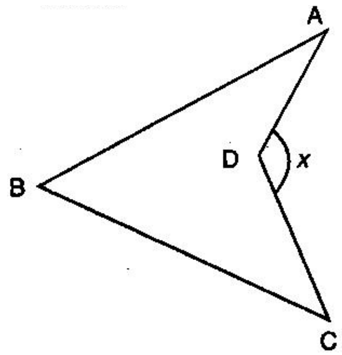


Or

In the figure, find the value of y.



18. Prove that two lines which are parallel to the same line are parallel to one another.
19. The sum and difference of two angles of a triangle are $128°$ and $22°$ respectively. Find all the angles of the triangle.
20. In the figure, prove that $\angle x = \angle A + \angle B + \angle C$



Section D

21. If $x = 2+\sqrt{3}$, then find the value of $x^2 + \dfrac{1}{x^2}$.

Or

Find the values of a and b, if $\dfrac{\sqrt{7}-1}{\sqrt{7}+1} - \dfrac{\sqrt{7}+1}{\sqrt{7}-1} = a + b\sqrt{7}$.

22. Gita told her classmate Radha that "$\sqrt{\dfrac{\sqrt{2}-1}{\sqrt{2}+1}}$ is an irrational number." Radha replied that "you are wrong" and further claimed that "If there is a number x such that x^3 is an irrational number, then x^5 is also irrational." Gita said, No Radha, you are wrong". Radha took some time and after verification accepted her mistakes and thanked Gita for pointing out the mistakes.
Read the above passage and answer the following questions:
(a) Justify both the statements.
(b) What value is depicted from this question?

[Value Based Question]

23. If the polynomials $\left(3x^3+ax^2+3x+5\right)$ and $\left(4x^3+x^2-2x+a\right)$ leave the same remainder when divided by $(x-2)$, then find the value of a. Also find the remainder in each case.

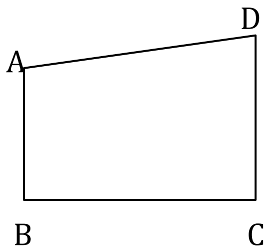
24. Without actual division, prove that $\left(2x^4-6x^3+3x^2+3x-2\right)$ is exactly divisible by $\left(x^2-3x+2\right)$.

25. Factorize: $81x^4-y^4$

Or

Factorize: $1+2ab-\left(a^2+b^2\right)$

26. In the figure, AB and CD are respectively the smallest and longest sides of a quadrilateral ABCD. Show that $\angle A > \angle C$.



27. If two lines intersect, then the vertically opposite angles are equal.
28. Prove that the angle bisectors of a triangle pass through the same point, i.e., they are concurrent.
29. If two parallel lines are intersected by a transversal, then prove that the bisectors of the two pairs of interior angles enclose a rectangle.
30. Draw the graph of linear equation $4x+y+1=0$.
31. Find the percentage increase in the area of a triangle and s be its perimeter.

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SUMMATIVE ASSESSMENT –II
MATHEMATICS
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(Solutions)

SECTION-A

1. (c)
2. (b)
3. (c)
4. (a)
5. Let $x = 0.\overline{7}$
   $\Rightarrow$ $x = 0.777......$ ....(i)
   Multiplying both sides by 10, we get
   $10x = 7.777......$ ....(ii)
   Subtracting eq.(i) from eq. (ii), we get
   $9x = 7$
   $\Rightarrow$ $x = \frac{7}{9}$
6. We have, $p(x) = cx + d$
   $\therefore$ $cx + d = 0$ $\Rightarrow$ $x = \frac{-d}{c}$
7. By remainder theorem,
   $f(4) = 4(4)^3 - 3(4)^2 + 2\times 4 - 4$ $\Rightarrow$ $f(4) = 4\times 64 - 3\times 16 + 2\times 4 - 4$
   $\Rightarrow$ $f(4) = 256 - 48 + 8 - 4 = 212$
8. $\angle$BAE + $\angle$EAC = 180° [Linear pair] ....(i)
   And $\angle$EDA + $\angle$EDC = 180° [Linear pair] ....(ii)
   From eq. (i) and (ii), we have
   $\angle$BAE + $\angle$EAC = $\angle$EDA + $\angle$EDC
   $\Rightarrow$ $\angle$BAE + $\angle$EAC = $\angle$DAE + $\angle$EDC [Given $\angle$DAE = $\angle$ADE]
   $\Rightarrow$ $\angle$BAE = $\angle$CDE
9. Let a triangle ABC and $\angle$A : $\angle$B : $\angle$C = 3 : 5 : 10
   Let the angles be $\angle$A = $3x$, $\angle$B = $5x$ and $\angle$C = $10x$
   $\because$ $\angle$A + $\angle$B + $\angle$C = 180°
   $\Rightarrow$ $3x + 5x + 10x = 180°$ $\Rightarrow$ $18x = 180°$ $\Rightarrow$ $x = 10$
   $\therefore$ Angles are $30°, 50°$ and $100°$.
10. (i) Point A lies in the fourth quadrant, since its abscissa is positive and ordinate is negative.

(ii) Point A lies in the second quadrant, since its abscissa is negative and ordinate is positive.

(iii) Point A lies in the third quadrant, since both abscissa and ordinate are negative.

(iv) Point A lies in the first quadrant, since both abscissa and ordinate are positive

11. A rational number between r and s is $\frac{r+s}{2}$.

Therefore a rational number between 3 and 4 = $\frac{3+4}{2}=\frac{7}{2}$.

A rational number between 3 and $\frac{7}{2}=\frac{1}{2}\left(\frac{6+7}{2}\right)=\frac{13}{4}$.

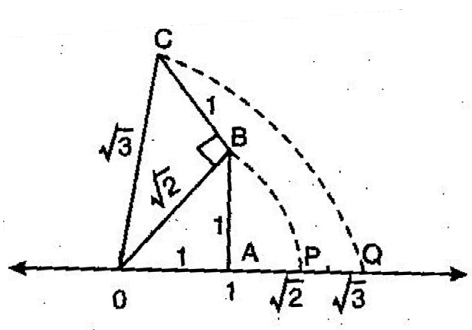
We can according proceed in this manner to find more rational numbers between 3 and 4.

Hence, six rational numbers between 3 and 4 are $\frac{15}{8},\frac{13}{4},\frac{27}{8},\frac{7}{2},\frac{29}{8},\frac{15}{4}$.

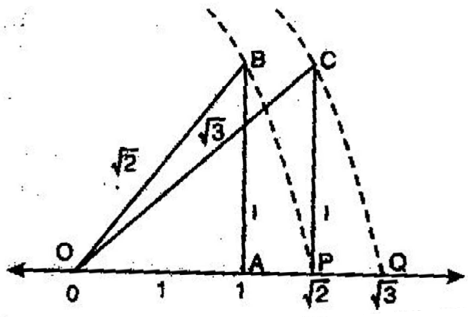
12. Let us find square root of 2 by division method.

	1.4142135
1	2.00000000
	1
24	100
	96
281	400
	281
2824	11900
	11296
28282	60400
	56564
282841	383600
	282841
2828423	10075900
	8485269
28284265	159063100
	141421325
	17641775

Or



or



13.

$$\begin{array}{r|l} & 2x^2+3x+4 \\ \hline x-2 & 2x^3-x^2-2x-7 \\ & 2x^3-4x^2 \\ & -\quad + \\ \hline & \quad 3x^2-2x-7 \\ & \quad 3x^2-6x \\ & \quad -\quad + \\ \hline & \qquad 4x-7 \\ & \qquad 4x-8 \\ & \qquad -\quad + \\ \hline & \qquad\quad 1 \end{array}$$

$2x^3-x^2-2x-7=(x-2)(2x^2+3x+4)+1$

Dividend = (Divisor x Quotient) + Remainder

Here the degree of $f(x)$, the degree of divisor $g(x)$ is 1 and the degree of remainder $r(x)$ is zero. The remainder = 1.

14. Divisor $1-5x=0 \quad \Rightarrow \quad x=\frac{1}{5}$

$\therefore \quad f\left(\frac{1}{5}\right)=5\left(\frac{1}{5}\right)^3-\left(\frac{1}{5}\right)^2+6\left(\frac{1}{5}\right)-2$

$= 5\times\frac{1}{125}-\frac{1}{25}+\frac{6}{5}-2 = \frac{-4}{5}$

$\therefore$ Remainder = $\frac{-4}{5}$

Or

The given polynomial is divisible by $(x+2)$ if the remainder = 0

$\Rightarrow \quad f(-2)=0$

$\Rightarrow \quad f(-2) = 2(-2)^4 + 3(-2)^3 + 2p(-2)^2 + 3(-2) + 6 = 0$

$\Rightarrow \quad 2\times16 + 3\times(-8) + 2\times p\times4 + 3\times(-2) + 6 = 0$

$\Rightarrow \quad 32 - 24 + 8p - 6 + 6 = 0$

$\Rightarrow \quad 8 + 8p = 0 \quad \Rightarrow \quad p = -1$

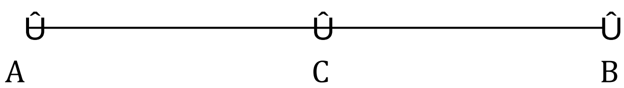
15. $4x^2 + 12xy + 9y^2 - 6x - 9y$ $= (4x^2 + 12xy + 9y^2) - 6x - 9y$

$= \left[(2x)^2 + (3y)^2 + 2(2x)(3y)\right] - 6x - 9y$

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

$= (2x+3y)(2x+3y-3)$

16. Given: AC = BC



So, AC + AC = AC + BC [Equals are added to equals]

$\Rightarrow$ 2AC = AB [$\because$ AC + CB concides with AB]

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

17. $\angle$Y = $\angle$Z ....(i) [Vertically opposite angles]

And $\angle$COB + $\angle$Y = 180° [Linear pair]

$\Rightarrow$ 36° + $\angle$Y = 180°

$\Rightarrow$ $\angle$Y = $180° - 36° = 144°$

From eq. (i),

$\angle$Y = $\angle$Z = 144°

Or

$\angle$EOF = $\angle$BOC [Vertically opposite angles]

$\Rightarrow$ $4y°$ = $\angle$BOC ....(i)

Since OA and OD are opposite rays,

$\therefore$ $\angle$AOB + $\angle$BOC + $\angle$COD = 180° [Linear pair]

$\Rightarrow$ $6y° + 4y° + 8y° = 180°$

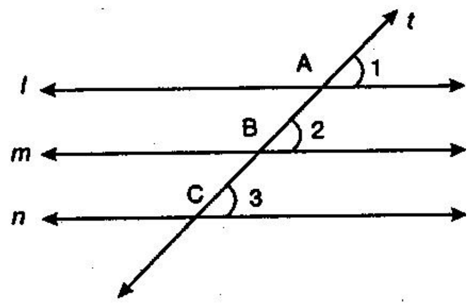
$\Rightarrow$ $y° = 10°$

18. Given : Three lines l, m, n are such that $l \parallel m$ and $m \parallel n$.

To prove: $l \parallel n$

Construction: Draw a transversal line 't' cutting l, m and n at A, B and C respectively.

Proof : Since $l \parallel m$ and 't' intersects them at A and B.



$\Rightarrow \quad \angle 1 = \angle 2$ .....(i) [Corresponding angles]

Again $m \parallel n$ and transversal $'t'$ intersects them B and C respectively.

$\Rightarrow \quad \angle 2 = \angle 3$ .....(ii) [Corresponding angles]

From eq. (i) and (ii), we get,

$\angle 1 = \angle 2 = \angle 3$

$\Rightarrow \quad \angle 1 = \angle 3$

But these are corresponding angles.

$\therefore \quad l \parallel n$ [Corresponding angles axiom]

19. In a triangle ABC, given, $\angle A + \angle B = 128°$ ....(i)

And $\angle A - \angle B = 22°$ ....(ii)

On adding eq. (i) and (ii), we get,

$2\angle A = 150° \quad \Rightarrow \quad \angle A = 75°$

On subtracting eq. (ii) from (i), we get,

$2\angle B = 106° \quad \Rightarrow \quad \angle B = 53°$

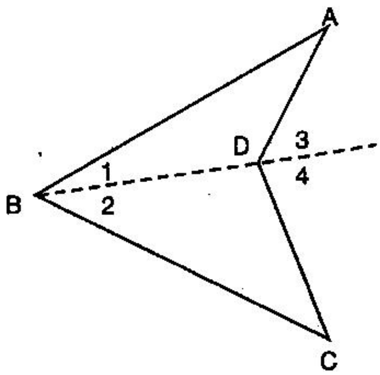
In triangle ABC,

$\angle A + \angle B + \angle C = 180°$ [Sum of all the angles of a triangle = $180°$]

$\Rightarrow \quad 75° + 53° + \angle C = 180°$

$\Rightarrow \quad \angle C = 52°$

20. Joined BD.



In triangle ABD,

$\angle A + \angle 1 = \angle 3$ [Exterior angles]

In triangle BCD,

$\angle C + \angle 2 = \angle 4$ [Exterior angles]

On adding, we get,

$\angle A + \angle C + \angle 1 + \angle 2 = \angle 3 + \angle 4$

$\Rightarrow \quad \angle A + \angle B + \angle C = \angle x$

21. $x = 2+\sqrt{3}$ and $\dfrac{1}{x} = \dfrac{1}{2+\sqrt{3}} = \dfrac{1}{2+\sqrt{3}} \times \dfrac{2-\sqrt{3}}{2-\sqrt{3}} = 2-\sqrt{3}$

$\therefore \quad x + \dfrac{1}{x} = 2+\sqrt{3}+2-\sqrt{3} = 4$

Now, $\quad x^2 + \dfrac{1}{x^2} = \left(x + \dfrac{1}{x}\right)^2 - 2$

$= (4)^2 - 2 = 16 - 2 = 14$

Or

$$\frac{\sqrt{7}-1}{\sqrt{7}+1}\times\frac{\sqrt{7}-1}{\sqrt{7}-1}-\frac{\sqrt{7}+1}{\sqrt{7}-1}\times\frac{\sqrt{7}+1}{\sqrt{7}+1} = \frac{\left(\sqrt{7}-1\right)^2}{\left(\sqrt{7}\right)^2-1^2}-\frac{\left(\sqrt{7}+1\right)^2}{\left(\sqrt{7}\right)^2-1^2}$$

$$= \frac{7+1-2\sqrt{7}}{7-1}-\frac{7+1+2\sqrt{7}}{7-1} = \frac{8-2\sqrt{7}}{6}-\frac{8-2\sqrt{7}}{6} = \frac{4\sqrt{7}}{6}$$

$$= \frac{-2\sqrt{7}}{3}$$

On comparing, $a+b\sqrt{7} = \frac{-2\sqrt{7}}{3}$

$a = 0, b = \frac{-2}{3}$

22. (a) $\sqrt{\frac{\sqrt{2}-1}{\sqrt{2}+1}}$ is an irrational number.

$$= \sqrt{\frac{\sqrt{2}-1}{\sqrt{2}+1}\times\frac{\sqrt{2}-1}{\sqrt{2}-1}} = \sqrt{\frac{\left(\sqrt{2}-1\right)^2}{2-1}} = \sqrt{2}-1$$

which is an irrational number.

Let there is a number x such that x^3 is an irrational but x^5 is a rational number.

Let $x = \sqrt[5]{7}$ is any number

$\Rightarrow \quad x^3 = \left(\sqrt[5]{7}\right)^3 = \left(7^{3/5}\right)$ is an irrational number.

$\Rightarrow \quad x^5 = \left(\sqrt[5]{7}\right)^5 = \left(7^{5/5}\right) = 7$ is a rational number.

(b) Accepting own mistakes gracefully, co-operative learning among the classmates.

23. Let $f(x) = 3x^3 + ax^2 + 3x + 5$ and $p(x) = 4x^3 + x^2 - 2x + a$

Divisor = $(x-2)$ then remainder = $f(2)$ and $p(2)$.

According to the question,

$f(2) = p(2)$

$\Rightarrow \quad 3(2)^3 + a(2)^2 + 3(2) + 5 = 4(2)^3 + (2)^2 - 2(2) + a$

$\Rightarrow \quad (3\times 8) + 4a + 6 + 5 = 4\times 8 + 4 - 4 + a$

$\Rightarrow \quad 24 + 4a + 11 = 32 + a$

$\Rightarrow \quad 35 + 4a = 32 + a$

$\Rightarrow \quad 3a = -3$

$\Rightarrow \quad a = -1$

24. Let $f(x) = 2x^4 - 6x^3 + 3x^2 + 3x - 2$ ....(i)

And $g(x) = x^2 - 3x + 2 = x^2 - 2x - x + 2$

$= x(x-2) - 1(x-2) = (x-1)(x-2)$

If $(x-2)$ divides eq. (i), then $f(2) = 0$

$\therefore \quad f(2) = 2(2)^4 - 6(2)^3 + 3(2)^2 + 3(2) - 2$

= 32 – 48 + 12 6 – 2 = 0

$\therefore$ eq. (i) is exactly divisibly by $(x-2)$.

If $(x-1)$ divides eq. (i), then $f(1) = 0$

$\therefore \quad f(1) = 2(1)^4 - 6(1)^3 + 3(1)^2 + 3(1) - 2$

= 2 – 6 + 3 + 3 – 2 = 0

$\therefore$ eq. (i) is exactly divisibly by $(x-1)$.

$\therefore \quad (x^2 - 3x + 2)$ divides eq. (i) exactly.

25. $81x^4 - y^4 = (9x^2)^2 - (y^2)^2$

$= (9x^2 + y^2)(9x^2 - y^2)$

$= (9x^2 - y^2)\left[(3x)^2 - (y)^2\right]$

$= (9x^2 - y^2)(3x + y)(3x - y)$

Or

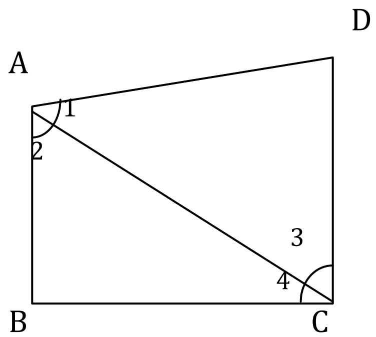
$1 + 2ab - (a^2 + b^2) = 1 - (a^2 + b^2 - 2ab)$

$= (1)^2 - (a-b)^2$

$= (1 + a - b)(1 - a + b)$

26. Given: A quadrilateral ABCD.

AB is the smallest and CD is the longest side.



To prove: $\angle A > \angle C$

Construction: Join AC.

Proof: In triangle DAC,

CD > AD

$\therefore \quad \angle 1 > \angle 3$ ....(i)

In triangle ABC,

BC > AB

$\therefore \quad \angle 2 > \angle 4$ ....(ii)

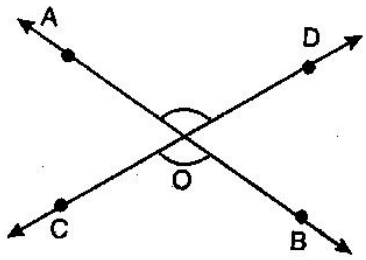
Adding eq. (i) and (ii), we get,

$\angle 1 + \angle 2 > \angle 3 + \angle 4$

$\therefore \quad \angle A > \angle C$

27. **Given**: Two lines AB and CD intersect at O.

To prove: (i) $\angle AOC = \angle BOD$, (ii) $\angle AOD = \angle BOC$



Proof: Since a ray OC stands on the line AB.

$\therefore \quad \angle AOC + \angle COB = 180°$ ……….(i) [Linear pair]

Since ray OA stands on the line CD, we have

$\angle AOC + \angle AOD = 180°$ ……….(ii) [Linear pair]

From eq. (i) and (ii), we have

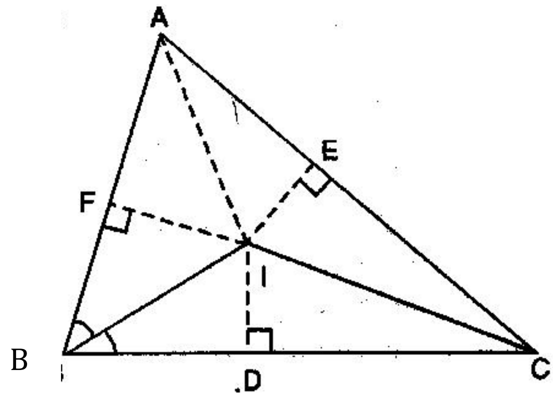
$\angle AOC + \angle COB = \angle AOC + \angle AOD$

$\Rightarrow \quad \angle COB = \angle AOD$

Similarly $\quad \angle AOC = \angle BOD$

28. **Given**: A triangle ABC, Bisectors of $\angle B$ and $\angle C$ intersect at I. AI is joined.

To prove: AI bisects $\angle A$.



Construction: Draw $ID \perp BC$, $IE \perp AC$ and $IF \perp AB$.

Proof: Since, I lies on the bisector of $\angle B$. (Given)

$\therefore \quad ID = IF$ ……….(i)

I lies on the bisector of $\angle C$.

$ID = IE$ ……….(ii)

From eq. (i) and (ii),

$IE = IF$

$\Rightarrow$ I is equidistant from AB and AC.

$\therefore$ AI bisects $\angle A$.

Hence AI, BI and CI are concurrent and the point of concurrency I is the incentre of triangle ABC.

29. Let two parallel lines be AB and CD and a transversal l intersects AB and CD at the points E and F respectively.

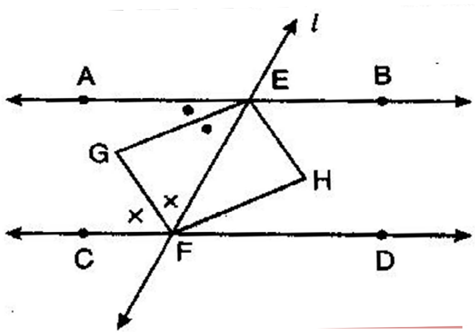
EG, FG, EH and FH be the bisectors of the interior angles.

$AB \parallel CD$ and l cuts them.

$\therefore \quad \angle AEF + \angle CFE = 180°$ [Interior angles]

$\Rightarrow \quad \frac{1}{2} \angle AEF + \sqrt{2} \angle CFE = 90^\circ$

$\Rightarrow \quad \angle GFE + \angle GFE = 90^\circ$



In triangle EFG,

$\angle G + \angle GEF + \angle GFE = 180°$

$\Rightarrow \quad \angle G + 90^\circ = 180° \quad \Rightarrow \quad \angle G = 90^\circ$

Similarly $\angle H = 90^\circ$

Again, $\angle AEF + \angle BEF = 180^\circ$

$\Rightarrow \quad \frac{1}{2}\angle AEF + \frac{1}{2}\angle BEF = 90^\circ$

$\Rightarrow \quad \angle GEF + \angle BEF = 90^\circ \quad \Rightarrow \quad \angle GEH = 90^\circ$

Similarly $\angle GFH = 90^\circ$

All the angles of GFHE are right angles.

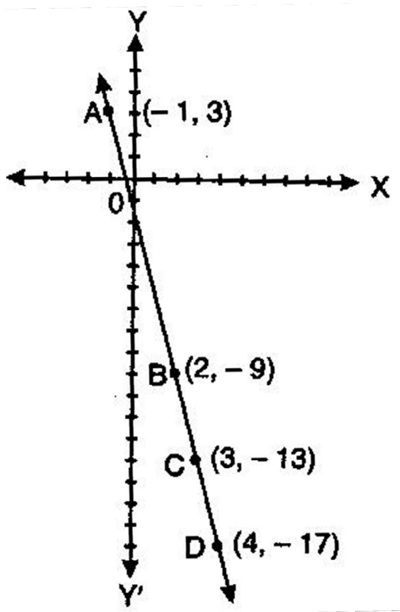
Hence GFHE is a rectangle.

30. We have $4x + y + 1 = 0$

$\Rightarrow \quad y = -4x - 1$

$\therefore$ The table of the coordinates of points is as under:

Graph of the linear equation is the straight line AD. X'



x	– 1	2	3	4
y	3	– 9	– 13	– 17
Points	*A*	*B*	*C*	*D*

31. Let a, b, c be the side of the given triangle and s be its perimeter.

$\therefore \quad s = \frac{1}{2}(a+b+c)$

The sides of the new triangle are: $2a, 2b$ and $2c$

Then $s' = \frac{1}{2}(2a+2b+2c) = a+b+c = 2s$

Now, Area of the given triangle $(\Delta) = \sqrt{s(s-a)(s-b)(s-c)}$

And Area of new triangle $(\Delta') = \sqrt{s'(s'-2a)(s'-2b)(s'2c)}$

$= \sqrt{2s(2s-2a)(2s-2b)(2s-2c)}$

$= \sqrt{16s(s-a)(s-b)(s-c)}$

$\therefore \ \Delta' = 4\Delta$

$\therefore$ Increase in the area of the triangle $= 4\Delta - \Delta$

$= 3\Delta$

$\therefore \quad$ % increase in area $= \frac{3\Delta}{\Delta} \times 100 = 300\%$