TEST-3
Syllabus:

(Ch# 5,6,16, (Theorem #-1,2,3) SQ-13,15,16 Define of these chapter.

MATHEMATICS (SCIENCE) -019 (9TH CLASS) PAPER: II (OBJECTIVE TYPE)
TIME ALLOWED: 20 Min **Marks: 15**

Note: Four possible answers A, B, C and D to each question are given. The choice which you think is correct fill that circle in front of that question with marker or Pen ink in the answer-book. Cutting or filling two or more circle will result in zero mark in that question.

1.1 What will be added to complete the square of $9a^2-12ab$?
A. $-16b^2$ B. $16b^2$ C. $4b^2$ D. $-4b^2$

2. Find m so that x^2+4x+m is a complete square.
A. 8 B. -8 C. 4 D. 16

3. There are _____ methods (s) to find H.C.F.
A. 1 B. 2 C. 3 D. 4

4. Which of the following sets of lengths can be lengths of the sides of a triangle?
A. 1cm,2cm,3cm B. 2cm,3cm,5cm C. 2cm,4cm,7cm D. 3cm,4cm,5cm

5. Two sides of a triangle measure 10cm and 15cm. Which measure is possible for third side?
A. 5cm B. 20cm C. 25cm D. 30cm

6. Difference of two sides of a triangle is ________ than/to the third side.
A. ¿ B. ≅ C. ¿ D. ¿

7. From a point, outside a line, the _____ is the shortest distance from the point to the line.
A. Perpendicular B. Altitude C. Median D. Right Bisector

8. If 3cm and 4cm are two sides of a right-angle triangle, then hypotenuse is ______
A $25\,cm$ B. $7\,cm$ C. $6\,cm$ D. $5\,cm$

9. If hypotenuse of an isosceles right-angle triangle is $\sqrt{2}cm$ then each of the other side is of length________
A. 2cm B. 1cm C. 3cm D. 4cm

10. A diagonal of parallelogram divides it into ______ congruent triangles.
A. 4 B. 5 C. 3 D. 2

11. The line segment joining the mid points of opposite sides of a parallelogram, divides it into ______ equal parallelograms.
A 4 B. 5 C. 3 D. 2

12. Factors of x^2-5x+6 are ________
A. $(x-2)(x-3)$ B. $(x-2)(x+3)$ C. $(x+2)(x+3)$ D. $(x+2)(x-3)$

13. If $(x-2)$ is a factor of $p(x)=x^2+2kx+8$, then $k=$ ¿ ________
A. 3 B. 2 C. 9 D. -3

14. Before division we arrange data in ______ order.
A. Ascending B. Descending C. Standard D. Simple

15. The product of two algebraic expressions is equal to _____ of their H.C.F and L.C.M.
A. Sum B. Difference C. Product D. Quotient

TEST-3
Syllabus:

(Ch# 5,6,16, (Theorem #-1,2,3) SQ-13,15,16 Define of these chapter.

MATHEMATICS (SCIENCE) 019-(9TH CLASS) Paper: (Essay Type)
Time Allowed: 2:10 hours Maximum. Marks:60

(PART - I)

2. Write short answers to any SIX (6) questions: **12**

(i) Define H.C.F.

(ii) Factorize $(x^2-y^2)z+(y^2-z^2)x$.

(iii) Factorize $3x-243x^3$.

(iv) Factorize $x^2-y^2-4xz+4z^2$.

(v) Find H.C.F $102xy^2z, 85x^2yz, 187xyz^2$.

(vi) Find square root by factorization. $(x^2+3x+2)(x^2+4x+3)(x^2+5x+6)$.

(vii) Find square root of $4x^2-12xy+9y^2$.

(viii) Find L.C.M of $x^2-25x+100$ and x^2-x-20 .

(ix) The sum of two numbers is 120 and their H.C.F is 12. Find the numbers.

3. Write short answers to any SIX (6) questions:
12

(i) 3cm, 4cm and 7cm are not the lengths of the triangle. Give reason.

(ii) If 3cm and 4cm are two sides of a right-angle triangle then what should be the third length of the triangle.

(iii) A plane is at height of 300m and is 500m away from the airport. How much distance will it travel to land at airport.

(iv) The three sides of a triangle are of measure 8, x and 17 respectively. For what value of 'x' will it become base of a right triangle.

(v) What is zero of a polynomials?

(vi) Find square root of $4x^4+12x^3+x^2-12x+4$.

(vii) Use remainder theorem to find remainder when $(2x-1)^3+6(3+4x)^2-10$ is divided by $(2x+1)$.

(viii) Find a polynomial $p(x)$ of degree 3 that has 2, -1 and 3 as zeros.

(ix) Determine if $(x-2)$ is a factor of x^3-4x^2+3x+2 .

4. Write short answers to any SIX (6) questions:

12

(i). Factorize $x^2-21x+108.$

(ii) Factorize $3x^2-38xy-13y^2$

(iii) Factorize $(x^2+5x+4)(x^2+5x+6)-3.$

(iv) Factorize $8x^3-125y^3-60x^2y+150xy^2.$

(v) Find remainder when $9x^2-6x+2$ is divided by $(x-3)$.

(vi) Find square root of $4+25x^2-12x-24x^3+16x^4$.

(vii) Define L.C.M.

(viii) Find L.C.M $39x^7y^3$ and $91x^5y^6z^7$

(ix) Simplify $\frac{x^2+x-6}{x^2-x-6}\times\frac{x^2-4}{x^2-9}$.

(PART - II)

Note: Attempt any THREE questions, but question 9 is compulsory.

5. **(a)** The expression $ax^3-9x^2+bx+3a$ is exactly divisible by $x^2-5x+6.$ Find **4**
values of 'a' and 'b'.

(b) Simplify $\frac{x^4-8x}{2x^2+5x-3}\times\frac{2x-1}{x^2+2x+4}\times\frac{x+3}{x^2-2x}.$

4

6. **(a)** Factorize $(x+1)(x+2)(x+3)(x+6)-3x^2$.
4

(b) For what value of 'm' and 'l' the expression $49x^4-70x^3+109x^2+lx-m$ will **4** become a perfect square.

7. **(a)** Factorize the cubic polynomial $3x^3-x^2-12x+4$ by factor theorem.
4

(b) Simplify $\left(\frac{x^2+y^2}{x^2-y^2}-\frac{x^2-y^2}{x^2+y^2}\right)\div\left(\frac{x+y}{x-y}-\frac{x-y}{x+y}\right)$.

4

8. **(a)** For what value of 'k' is $(x+4)$ the H.C.F of $x^2+x-(2k+2)$ and $2x^2+kx-12$. **4**

(b) In a parallelogram ABCD $m\overline{AB}=10cm$. The altitudes corresponding to sides $m\overline{AB}$ **4**
and $m\overline{AD}$ are respectively 7cm and 8cm. Find $m\overline{AD}$.

9 **Prove that parallelograms on the same base and between the same parallel lines are equal in area.**
8

OR

Prove that triangles on the same base and of the same altitudes are equal in area.

MATHMATICS (COMPULSORY)

(PART- I)

Q2. Write short answer to any six questions:

(i) Define H.C.F.

H.C.F. :-

If two or more algebraic expressions are given then their common factor of highest power is called the H.C.F. of the expressions.

(ii) Factorize $(x^2-y^2)z+(y^2-z^2)x$

$= x^2z - y^2z + xy^2 - xz^2$

$= x^2z - xz^2 + xy^2 - y^2z$

$= xz(x-z) + y^2(x-z)$

$= (xz+y^2)(x-z)$

(iii) Factorize $3x - 243x^3$

$= x(3-243x^2)$

$= 3x(1-81x^2)$

$= 3x[1^2-(9x)^2]$

$= 3x(1+9x)(1-9x)$

(iv) Factorize $x^2 - y^2 - 4xz + 4z^2$

$= (x^2 - 4xz + 4z^2) - y^2$

$= (x-2z)^2 - y^2$

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

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

(v) Find H.C.F $102xy^2z$, $85x^2yz$, $187xyz^2$

$102xy^2z = 2 \times 3 \times 17\ xy^2z$

$187xyz^2 = 17 \times 11\ xyz^2$

$85x^2yz = 5 \times 17\ x^2yz$

$H.C.F. = 17xyz$

(vi) Find Square root by factorization.

$(x^2+3x+2)(x^2+4x+3)(x^2+5x+6)$

$x^2+3x+2 = x(x+2)(x+1)$

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

$x^2+5x+6 = (x+2)(x+3)$

$\sqrt{(x^2+3x+2)(x^2+4x+3)(x^2+5x+6)} = \sqrt{(x+2)^2(x+1)^2(x+3)^2}$

$= \sqrt{(x+2)^2} + \sqrt{(x+1)^2} + \sqrt{(x+3)^2}$

$= (x+2)(x+1)(x+3)$

(viii) Find L.C.M of $x^2-25x+100$ and x^2-x-20

$$x^2-25x+100 = x^2-5x-20x+100$$
$$= x(x-5)-20(x-5)$$
$$= (x-20)(x-5)$$

$$x^2-x-20 = x^2+4x-5x-20$$
$$= x(x+4)-5(x+4)$$
$$= (x+4)(x-5)$$

$$L.C.M. = (x+4)(x-5)(x-20)$$

(ix) The sum of two number is 120 and their H.C.F is 12. Find the numbers.

Let the number be $12x$ and $12y$.

$$12x+12y = 120 \Rightarrow x+y = 10$$

Possible pairs of numbers are (1,9) (2, 8), (3, 7), (4, 6), (5, 5)

The pairs of numbers which are prime to each other are (1, 9) and (3, 7)

Thus the required numbers are

1×12, 9×12 ; 3×12, 7×12

12, 108 and 36, 84.

(Vii) Find square root of

$4x^2 - 12xy + 9y^2$

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

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

$\sqrt{4x^2 - 12xy + 9y^2} = \sqrt{(2x+3y)^2}$

$= 2x+3y$

Question : 3

Write short answers to any six questions:

(i) 3cm, 4cm and 7cm are not the lengths of the triangle. Give reason.

$3 + 7 > 4$

$4 + 7 > 3$

But

$3 + 4 \ngtr 7$

Thats why 3cm, 4cm and 7cm are not the lengths of the triangle.

(ii) If 3cm and 4cm are two sides of a right angle triangle, then what should be the third length of the triangle.

Let third side $= x$

Using Pythagoras theorem

$$x^2 = 3^2 + 4^2$$

$$x^2 = 9 + 16$$

$$x^2 = 25$$

$$\sqrt{x^2} = \sqrt{5^2}$$

$$\boxed{x = 5cm}$$

(iii) A plane is at height of 300m and is 500m away from the airport. How much distance will it travel to land at airport.

Let x = distance to land at airport

Using Pythagoras theorem

$$(\overline{AB})^2 = (\overline{AC})^2 + (\overline{BC})^2$$

$$x^2 = (500)^2 + (300)^2$$

$$x^2 = 250000 + 90000$$

$$x^2 = 340000$$

Taking square root on both sides

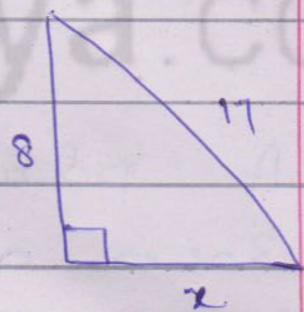
$$\sqrt{x^2} = \sqrt{340000}$$

$$x = \sqrt{10^2 \times 10^2 \times 34}$$

$$x = 10 \times 10\sqrt{34}$$

$$\boxed{x = 100\sqrt{34}\ m}$$ Ans.

(iv) The three sides of a triangle are of measure 8, x and 17 respectively. For what value of x will it become base of a right triangle.



Using Pythagoras theorem

$(17)^2 = x^2 + 8^2$

$289 = x^2 + 64$

$289 - 64 = x^2$

$225 = x^2$

$\sqrt{(15)^2} = \sqrt{x^2}$

$15 = x$

$\Rightarrow \boxed{x = 15}$

(v) What is zero of a polynomials?

Zero of a Polynomial:-

If a specific number $x = a$ is substituted for the variable x in a polynomial $p(x)$ so that the value $p(a)$ is zero, then $x = a$ is called a zero of the polynomial $p(x)$.

(vi) Find square root of

$4x^4 + 12x^3 + x^2 - 12x + 4$

$$
\begin{array}{r|l}
 & 2x^2 + 3x - 2 \\
\hline
2x^2 & 4x^4 + 12x^3 + x^2 - 12x + 4 \\
 & \pm 4x^4 \\
\hline
4x^2 + 3x & 12x^3 + x^2 - 12x + 4 \\
 & \pm 12x^3 \pm 9x^2 \\
\hline
4x^2 + 6x - 2 & -8x^2 - 12x + 4 \\
 & \mp 8x^2 \mp 12x \pm 4 \\
\hline
 & 0 \\
\hline
\end{array}
$$

The square root of given expression is

$\pm (2x^2 + 3x - 2)$.

(vii) Use remainder theorem to ~~find~~ remainder when

$(2x-1)^3 + 6(3+4x)^2 - 10$ is divided by $(2x+1)$

$p(x) = (2x-1)^3 + 6(3+4x)^2 - 10$

Let $2x + 1 = 0$

$2x = -1$

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

$R = P\left(-\frac{1}{2}\right) = (\cancel{2}x - \frac{1}{\cancel{2}} - 1)^3 + 6\left(3 + \overset{2}{\cancel{4}}x - \frac{1}{\cancel{2}}\right)^2 - 10$

$= (-1-1)^3 + 6(3+(-2))^2 - 10$

(viii) Find L.C.M $39x^7y^3$ and $91x^5y^6z^7$

$$39x^7y^3 = 3\times 13\, x^7 y^3$$
$$91x^5y^6z^7 = 7\times 13\, x^5y^6z^7$$
$$L.C.M. = 3\times 7 \times 13\, x^5 y^3 z^7$$
$$= 13\, x^5 y^3 z$$

(ix) Simplify $\dfrac{x^2+x-6}{x^2-x-6} \times \dfrac{x^2-4}{x^2-9}$

$$= \frac{(x^2-4)(x^2+x-6)}{(x^2-9)(x^2-x-6)}$$

$$= \frac{(x+2)(x-2)(x^2-2x+3x-6)}{(x+3)(x-3)(x^2-x-6)}$$

$$= \frac{(x+2)(x-2)[x(x-2)+3(x-2)]}{(x+3)(x-3)(x^2-x-6)}$$

$$= \frac{(x+2)(x-2)(x-2)(x+3)}{(x+3)(x-3)(x^2-x-6)}$$

$$= \frac{(x+2)(x-2)(x-2)(x+3)}{(x+3)(x-3)(x+2)(x-3)}$$

$$= \frac{\cancel{(x+2)}(x-2)^2\cancel{(x+3)}}{\cancel{(x+3)}(x-3)^2\cancel{(x+2)}}$$

$$= \frac{(x-2)^2}{(x-3)^2}$$

(PART - II)

Attempt any three but Question 9 is compulsory.

Question : 5(a)

$$x^2 - 5x + 6 = x^2 - 2x - 3x + 6$$
$$= x(x-2) - 3(x-2)$$
$$= (x-2)(x-3)$$

let $x - 2 = 0$

$$x = 2$$

$$P(x) = ax^3 - 9x^2 + bx + 3a$$
$$P(2) = a(2^3) - 9(2^2) + b(2) + 3a$$
$$= 8a - 36 + 2b + 3a$$
$$= 11a + 2b - 36$$
$$P(2) = 0$$
$$11a + 2b - 36 = 0 \quad \text{——— (1)}$$

Again let

$$x - 3 = 0$$
$$x = 3$$

$$p(x) = ax^3 - 9x^2 + bx + 3a$$
$$P(3) = a(3^3) - 9(3^2) + b(3) + 3a$$
$$= 27a - 81 + 3b + 3a$$
$$= 30a - 81 + 3b$$
$$P(3) = 0$$

$30a + 3b - 81 = 0$ —— (2)

Multiply eq (1) by 3

$33a + 6b - 108 = 0$ —— (3)

Multiply eq (2) by 2

$60a + 6b - 162 = 0$ —— (4)

Subtract (3) from (4)

$60a + \cancel{6b} - 162 = 0$

$\pm 33a \pm \cancel{6b} \mp 108 = 0$

$27a - 54 = 0$

$27a = 54$

$a = \frac{54}{27}$

$\boxed{a = 2}$

put $a=2$ in eq (1)

$11(2) + 2b - 36 = 0$

$22 + 2b - 36 = 0$

$-14 + 2b = 0$

$2b = 14$

$b = \frac{14}{2}$

$\boxed{b = 7}$ Ans

Question : 5(b)

$$= \frac{x^4 - 8x}{2x^2 + 5x - 3} \times \frac{2x - 1}{x^2 + 2x + 4} \times \frac{x + 3}{x^2 - 2x}$$

$$= \frac{x(x^3-2^3)}{2x^2-x+6x-3} \times \frac{(2x-1)}{(x^2+2x+4)^2} \times \frac{(x+3)}{x(x-2)}$$

$$= \frac{x(x-2)(x^2+4+2x)}{x(2x-1)+3(2x-1)} \times \frac{(2x-1)}{(x^2+2x+4)} \times \frac{(x+3)}{x(x-2)}$$

$$= \frac{x\cancel{(x-2)}(x^2+2x+4)}{(x+3)\cancel{(2x-1)}} \times \frac{\cancel{(2x-1)}}{(x^2+2x+4)} \times \frac{(x+3)}{\cancel{x(x-2)}}$$

$$= \frac{(x^2+2x+4)\cancel{(x+3)}}{\cancel{(x+3)}(x^2+2x+4)}$$

$$= \frac{\cancel{(x^2+2x+4)}}{\cancel{(x^2+2x+4)}} = 1 \quad \text{Ans}$$

Question : 6(a)

$= (x+1)(x+2)(x+3)(x+6) - 3x^2$

$= [(x+1)(x+6)][(x+2)(x+3)] - 3x^2$

$= (x^2+6+7x)(x^2+6+5x) - 3x^2$

Let $x^2+6 = y$

$= (y+7x)(y+5x) - 3x^2$

$= y^2+35x^2+12x - 3x^2$

$= y^2+32x^2+12xy$

$= (x^2+6)^2 - 32x^2 + 12xy$

$= x^4+36+12x^2+32x^2+12xy$

$= x^4 + 12x^2 + 12xy + 36 + 32x^2$

$= x^4 + 12x^2 + 12x(x^2+6) + 36 + 32x^2$

$= x^4 + 12x^2 + 12x^3 + 72x + 36 + 32x^2$

$= x^4 + 44x^2 + 12x^3 + 72x + 36$ Ans

Question : 6(b)

$$
\begin{array}{r|l}
 & 7x^2 - 5x + 6 \\
7x^2 & 49x^4 - 70x^3 + 109x^2 + lx - m \\
 & \pm 49x^4 \\
14x^2 - 5x & -70x^3 + 109x^2 + lx - m \\
 & \pm 70x^3 \pm 25x^2 \\
14x^2 - 10x + 6 & 84x^2 + lx - m \\
 & \pm 84x^2 \mp 60x \pm 36 \\
 & (lx + 60x) - m - 36
\end{array}
$$

$\Rightarrow lx + 60x = 0 \quad , \quad -m - 36 = 0$

$lx = -60x \quad , \quad -m = 36$

$\boxed{l = -60} \quad , \quad \boxed{m = -36}$

Question : 7(a)

we have

$P(x) = 3x^3 - x^2 - 12x + 4$

Possible factors

$P = 6$ are $\pm 1, \pm 2, \pm 3$ and ± 6

and of leading coefficient $q = 1$ and are ± 1.

We use hit and trial method

$$P(2) = 3(2)^3 - 2^2 - 12 \times 2 + 4$$

$$= 3(8) - 4 - 24 + 4$$

$$= 28 - 28 = 0$$

Hence $x = 2$ is a zero of $p(x)$ and therefore $(x-2)$ is a factor of $p(x)$.

Now

$$P(-2) = 3(-2)^3 - (-2)^2 - 12(-2) + 4$$

$$= 3(-8) - 4 + 24 + 4$$

$$= -24 - 4 - 24 + 4$$

$$= 0$$

Hence $(x+2)$ is also a factor of $p(x)$

Now

$$P\left(\frac{1}{3}\right) = 3\left(\frac{1}{3}\right)^3 - \left(\frac{1}{3}\right)^2 - 12\left(\frac{1}{3}\right) + 4$$

$$= 3\left(\frac{1}{27}\right) - \frac{1}{9} - (4) + 4$$

$$= \frac{1}{9} - \frac{1}{9} - 4 + 4 = 0$$

Hence $(3x-1)$ is the third factor of $p(x)$

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Hence the factorized form of

$$p(x) = 3x^3 - x^2 - 12x + 4 \text{ is}$$

$$(x+2)(x-2)(3x-1) \quad \text{Ans.}$$

Question : 7(b)

$$= \left(\frac{x^2+y^2}{x^2-y^2} - \frac{x^2-y^2}{x^2+y^2}\right) \div \left(\frac{x+y}{x-y} - \frac{x-y}{x+y}\right)$$

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

$$= \left[\frac{\cancel{x^4}+\cancel{y^4}+2x^2y^2-\cancel{x^4}-\cancel{y^4}+2x^2y^2}{(x^2-y^2)(x^2+y^2)}\right] \div \left[\frac{\cancel{x^2}+\cancel{y^2}+2xy-\cancel{x^2}-\cancel{y^2}+2xy}{(x^2-y^2)}\right]$$

$$= \frac{\cancel{4}x^{\cancel{2}}y^{\cancel{2}}}{\cancel{(x^2-y^2)}(x^2+y^2)} \times \frac{\cancel{x^2-y^2}}{\cancel{4xy}}$$

$$= \frac{xy}{x^2+y^2} \quad \text{Ans.}$$

Question : 8(a)

$$x+4 \overline{\smash{)}\, x^2 + x - (2k+2)}\quad \text{quotient } x-3$$

$$\pm x^2 \pm 4x$$

$$-3x - (2k+2)$$

$$\mp 3x \mp 12$$

$$(-2k-2)+12$$

$$\Rightarrow \quad -2k - 2 + 12 = 0$$

$$-2k + 10 = 0$$

$$-2k = -10$$

$$\boxed{k = 5}$$

So

$$2x^2 + kx - 12 = 2x^2 + 5x - 12$$

$$x+4 \overline{\smash{)}\, 2x^2 + 5x - 12}\quad \text{quotient } 2x-3$$

$$\pm 2x^2 \pm 8x$$

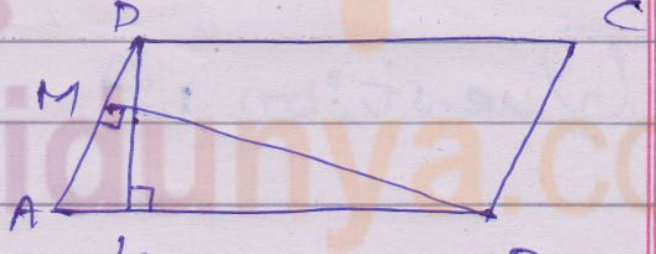
$$-3x - 12$$

$$\mp 3x \mp 12$$

$$0$$

Hence $k = 5$ Ans.

Question : 8(b)



Given:

ABCD is a parallelogram

$m\overline{AB} = 10cm$

$\overline{DL}$ and $\overline{BM}$ are altitudes

$m\overline{DL} = 7cm$, $m\overline{BM} = 6cm$

To Find:

$m\overline{AD} = ?$

Construction:

Place the parallelogram so that the bases $\overline{BC}$, $\overline{FG}$ are in the straight line BCFO Join $\overline{BE}$ and $\overline{CH}$

Proof:

Area of parallelogram = base × altitude

So

Area of $\|^{gm}$ ABCD = Area of $\|^{gm}$ ABCB

$$m\overline{AB} \times m\overline{DL} = m\overline{AD} \times m\overline{BM}$$

$$10 \times 7 = m\overline{AB} \times 8$$

$$m\overline{AD} = \frac{10 \times 7}{8}$$

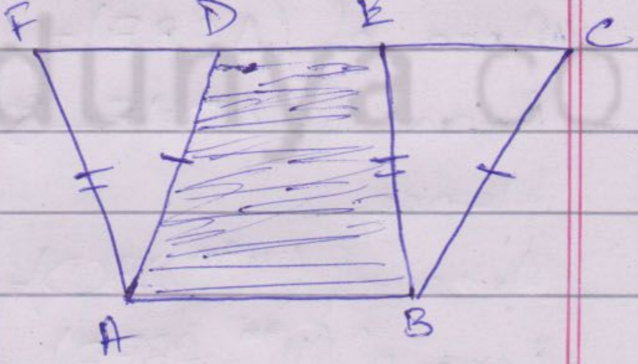
$$\boxed{m\overline{AD} = 8.75}$$ Ans.

Question: 9

Prove that parallelogram on the same base and between the same parallel lines are equal in area.

Given:-

Two parallelograms ABCD and ABEF having the same base $\overline{AB}$ and between the same lines $\overline{AB}$ and $\overline{DE}$



To Prove:-

Area of $\|^{gm}$ ABCD = Area of $\|^{gm}$ ABEF

Proof:-

Statements	Reasons
Area of $\|^{gm}$ ABCD = Area of (quad ABED) + Area of (ΔCBE) — ①	(Area Addition axiom)
Area of $\|^{gm}$ ABEF = Area of (quad. ABED) + Area of (ΔDAF) — ②	(Area Addition axiom)
In Δs CBE and DAF	
$m\overline{CB} = m\overline{DA}$	Opposite sides of $\|^{gm}$

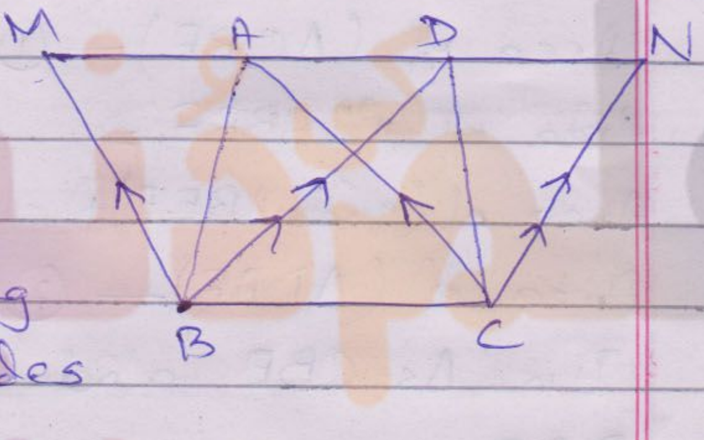
$m\overline{BE} = m\overline{AF}$	Opposite sides of a $\|^{gm}$
$\angle CBE = \angle DAF$	($\because BC \parallel AD$, $BE \parallel AF$)
$\therefore \triangle CBE \cong \triangle DAF$	(S.A.S cong. axiom)
$\therefore$ Area of $(\triangle CBE)$ = Area of $\triangle DAF$ — (3)	Cong. area axiom
Hence Area of ($\|^{gm}$ ABCD) = Area of ($\|^{gm}$ ABEF)	From (1), (2) and (3)

OR

Prove that triangles on the same base and of the same altitudes are equal in area.

Given :-

$\triangle$s ABC, DBC on the same base $\overline{BC}$ and having equal altitudes



To Prove :-

Area of (ΔABC) = Area of ΔDBC

Construction :-

Draw $\overline{BM} \parallel$ to $\overline{CA}$, $\overline{CN} \parallel \overline{BD}$ meeting $\overline{AD}$ produced in M, N.

Proof :-

Statements	Reasons
ΔABC and ΔDBC are between the same $\parallel^s$	Their altitudes are equal
Hence MADN is parallel to $\overline{BC}$	
Area($\parallel^{gm}$ BCAM) = Area($\parallel^{gm}$ BCND) —— (1)	These $\parallel^{gms}$ are on the same base
But	
$\Delta ABC = \frac{1}{2}(\parallel^{gm} BCAM)$ —— (2)	Each diagonal of a $\parallel^{gm}$ bisects it into two congruent triangles
and	
$\Delta DBC = \frac{1}{2}(\parallel^{gm} BCND)$ —— (3)	
Hence	
Area(ΔABC) = Area(ΔDBC)	From (1), (2) and (3)