

TEST NO.3**(Ch.3,4, 9 (Th#5)12,(Theorum.#-1). (Def. of Ch-3,4)**

Mathematics (Science)	Tenth Class	Paper: III
Time: 15 Minutes	OBJECTIVE	Marks: 15

Note: For possible answer 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 cutting of filling two or more circle will Result in zero mark in that questions.

- 1.1 A relation between two quantities of the same kind is called:
 (A) Proportion (B) ☒ Ratio (C) Variation (D) Variables
2. The ratio of 1Km to 600 m is:
 (A) 8 : 3 (B) 3 : 5 (C) ☒ 5 : 3 (D) 2 : 7
3. Find x in proportion 4 : x :: 5 : 15:
 (A) $\frac{75}{4}$ (B) $\frac{4}{3}$ (C) $\frac{3}{4}$ (D) ☒ 12
4. If y directly proportional to x then this is written as:
 (A) ☒ $y \propto x$ (B) $y \propto \frac{1}{x}$ (C) $y = \frac{k}{x}$ (D) None of these
5. If three quantities a, b and c are related as a : b :: b : c. Then b is called:
 (A) ☒ Third Proportional (B) Second Proportional
 (C) ☒ Mean Proportional (D) Continued Proportional
6. The third proportion of x + y and $x^2 - y^2$ is:
 (A) ☒ $(x + y)(x - y)^2$ (B) $(x + y)^2(x - y)$ (C) $(x + y)(x - y)$ (D) $(x^2 + y^2)(x - y)$
7. If four quantities a, b, c and d are related as a : b :: c : d. Then d is called:
 (A) First Proportional (B) ☒ Second Proportional
 (C) Third Proportional (D) ☒ Fourth Proportional
8. In proportion 12: P :: P : 3. The value of P is:
 (A) ☒ 6 (B) -6 (C) 36 (D) Both a and b
9. If a : b = c : d then theorem of componendo-dividendo is:
 (A) a : c = b : d (B) ☒ b : d = d : a
 (C) a : a + b = c : c + d (D) ☒ a + b : a + b = c + d : c + d
10. Joint variation of $y \propto x$ and $y \propto \frac{1}{z}$ is:
 (A) ☒ $y \propto \frac{x}{z}$ (B) $y \propto \frac{z}{x}$ (C) $y = k \frac{z}{x}$ (D) None of these
11. The quotient of two numbers or algebraic expression is called a:
 (A) Proportional (B) Rational (C) ☒ Fraction (D) None of these
12. Which fraction is improper fraction?
 (A) $\frac{2x-3}{x^2+4}$ (B) $\frac{6x^4}{x^3+1}$ (C) $\frac{3x^2+2}{x^2+7x+12}$ (D) ☒ Both b and c
13. Partial fractions of $\frac{x^2 + 1}{(x+1)(x-1)}$ are of the form:
 (A) ☒ $\frac{A}{x+1} + \frac{B}{x-1}$ (B) $1 + \frac{A}{x+1} + \frac{Bx+C}{x-1}$
 (C) $1 + \frac{A}{x+1} + \frac{B}{x-1}$ (D) $\frac{Ax+B}{x+1} + \frac{C}{x-1}$
14. y in ratio x: y is called:
 (A) Relation (B) Precedent (C) Antecedent (D) ☒ None of them
15. $\frac{2x+1}{(x+1)(x-1)}$ is a/an _____
 (A) Improper fraction (B) Equation (C) ☒ Proper fraction (D) None of these

Mathematics (Science)	Tenth Class	Paper: III
Time : 2:10 Hrs	SUBJECTIVE	Marks: 60

(PART – I)

2. Write short answer to any SIX (6) questions:

12

- Differentiate between ratio and proportion.
- If the ratios $3x + 1 : 6 + 4x$ and $2 : 5$ are equal. Find the value of x .
- Find the ratio $3a + 4b : 5a + 7b$ if $a : b = 5 : 8$.
- If $\frac{9pq}{2m} = \frac{18p}{5m}$, then $5q =$ _____.
- Find x in $\frac{x-3}{2} : \frac{5}{x-1} :: \frac{x-1}{3} : \frac{4}{x+4}$.
- What is meant by inverse variation?
- If y varies jointly as x^2 and z and $y=6$ when $x=4$, $z=9$. write y as function of x and z determine

the

value of y , when $x=-8$ and $z=12$

- If y varies inversely as x and $y = 8$, when $x = 4$. Find y , when $x = 16$.
- Find fourth proportional of $a^3 - b^3$, $a + b$ and $a^2 + ab + b^2$

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

12

- Resolve into partial fractions $\frac{x-11}{(x-4)(x+3)}$.
- Differentiate between improper and proper fraction.
- Define rational fraction and give examples.
- If 7 kg sugar costs Rs.560 then find cost of 15 kg sugar.
- Differentiate between continuous proportion and mean proportion.
- Find the value of the letter involved in 12, $3p - 6$, 27 continued proportions.
- Prove that $a : b = c : d$, if $\frac{ac^2 + bd^2}{ac^2 - bd^2} = \frac{c^3 + d^3}{c^3 - d^3}$.
- The surface area S of the sphere varies directly as the square of radius r , and $S = 16\pi$ when $r = 2$. Find r when $S = 36\pi$.
- Prove that $a : b = c : d$, if $pa + qb : pa - qb = pc + qd : pc - qd$.

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

12

- Find a mean proportional between $20x^3y^5$, $5x^7y$
- Resolve $\frac{1}{3+x-2x^2}$ into partial fractions.
- State theorem of componendo-dividendo.
- $V \propto \frac{1}{r^3}$ and $V = 5$ when $r = 3$, find V when $r = 6$ and r when $V = 320$.
- Find fourth proportional of 5, 8 and 15.
- If $3(4x-5y)=2x-7y$, find the ratio $x:y$
- Find the ratio of 27 min. 30 sec, 1 hour
- Resolve $\frac{x-5}{x^2+2x-3}$ into partial fractions
- Convert into proper fraction. $\frac{x^3+x^2+1}{x^3-1}$

(PART – II)

Note: Attempt THREE questions in all. But question No.9 is compulsory.

- P varies jointly as q and r^2 and inversely as s and t^2 , $p = 40$, when $q = 8$, $r = 5$, $s = 3$, $t = 2$. Find p in terms of q, r, s and t . also find the value of p when $q = -2$, $r = 4$, $s = 3$ and $t = -1$. 4
 - Prove that $a : b = c : d$, if $\frac{a+b+c+d}{a+b-c-d} = \frac{a-b+c-d}{a-b-c+d}$. 4
- If w varies jointly as x , y^2 and z and $w = 5$ when $x = 2$, $y = 3$, $z = 10$. Find w when $x = 4$, $y = 7$ and $z = 3$. 4
 - Using the theorem of componendo-dividendo. Find the value of $\frac{x+2y}{x-2y} = \frac{x+2z}{x-2z}$, if $x = \frac{4yz}{y+z}$ 4
- The supporting load c of a pillar varies as the fourth power of its diameter d and inversely as the square of its length l . A pillar of diameter 6 inches and height 30 feet will support a load of 63 tons. How high a 4 inch pillar must be to support a load of 28 tons? 4
 - Resolve into partial fractions $\frac{x^2+2x+1}{(x-2)(x+3)}$. 4
- Resolve into partial fractions $\frac{3x+7}{(x^2+1)(x+3)}$. 4
 - solve $\frac{(x-2)2-(x-4)2}{(x-2)2+(x-4)2} = \frac{12}{13}$ 4

- Prove that Two chords of a circle which are equidistant from the centre, are congruent. 8

OR

Prove that the measure of a central angle of a minor arc of a circle, is double that of the angle subtended by the corresponding major arc.

MATHEMATICS (COMPULSORY)

(PART - I)

Question No. 2:

Write short answer to any

(6) question:

(i)

Different between ratio and proportion?

Ratio

A relation between two quantities of the same kind is called ratio

Proportion.

A proportion is a statement which is expressed as equivalence of two ratios.

(ii)

If the ratio $3n+1 : 6+4n$ and $2:5$ are equal find the value of n

$$3n+1 : 6+4n = 2:5$$

$$\Rightarrow \frac{3n+1}{6+4n} = \frac{2}{5}$$

$$\Rightarrow 5(3n+1) = 2(6+4n)$$

$$15n+5 = 12+8n$$

$$15n-8n = 12-5$$

$$7n = 7 \Rightarrow n = 1$$

(iii)

Find the ratio $3a+4b:5a+7b$ $a:b=5:8$

Solution:

$$a:b = 5:8 \quad \text{or} \quad \frac{a}{b} = \frac{5}{8}$$

$$3a+4b:5a+7b = \frac{3a+4b}{5a+7b}$$

$$= \frac{\frac{3a+4b}{b}}{\frac{5a+7b}{b}} = \frac{3\left[\frac{a}{b}\right] + 4\left[\frac{b}{b}\right]}{5\left[\frac{a}{b}\right] + 7\left[\frac{b}{b}\right]}$$

$$= \frac{3\left[\frac{5}{8}\right] + 4(1)}{5\left[\frac{5}{8}\right] + 7(1)}$$

$$= \frac{15}{8} + 4$$

$$= \frac{\frac{15}{8} + 4}{\frac{25}{8} + 7} = \frac{15+32}{25+56} = \frac{47}{81}$$

Hence

$$3a+4b:5a+7b = 47:81$$

(iv)

$$\text{If } \frac{9pq}{21m} = \frac{18p}{5m}, \text{ then } 5q = \underline{\hspace{2cm}}$$

$$\frac{9pq}{21m} = \frac{18p}{5m}$$

Dividing by $9p$

$$\frac{q}{21m} = \frac{2}{5m}$$

$$q = \frac{2(21m)}{5m}$$

$$q = \frac{42}{5}$$

$$\text{Thus, } 5q = 42$$

(v)

$$\text{find } x \text{ in } \frac{n-3}{2} : \frac{5}{n-1} :: \frac{n-1}{3} : \frac{4}{n+4}$$

Solution:

$$P.O.E = P.O.M$$

$$\left[\frac{n-3}{2} \right] \left[\frac{4}{n+4} \right] = \left[\frac{5}{n-1} \right] \left[\frac{n-1}{3} \right]$$

$$\frac{2(n-3)}{n+4} = \frac{5}{3}$$

$$2 \times 3(n-3) = 5(n+4)$$

$$6n - 18 = 5n + 20$$

$$6n - 5n = 20 + 18$$

$$n = 38$$

(vi)

What is meant by inverse variation?
If two quantities are related in such a way that when one quantity increases the other decreases is called inverse variation.

(vii)

If y varies jointly as u^2 and z and $y=6$ when $u=4$, $z=9$ write y as function of u and z determine value of y when $u=8$ and $z=12$

$$y \propto u^2 z$$

$$y = k u^2 z \quad (i)$$

$$y = 6, u = 4, z = 9$$

$$6 = k (4)^2 (9)$$

$$\frac{6}{16 \times 9} = k$$

$$k = \frac{1}{24}$$

$$k = \frac{1}{24}$$

$$k = \frac{1}{24}$$

$$\text{Put } k = \frac{1}{24} \text{ in eq (i), } y = \frac{1}{24} u^2 z$$

Now put $u = 8$, $z = 12$ in the above equation

$$y = \frac{1}{24} (-8)^2 (12) = 32$$

(viii)

If y varies inversely as x and $y = 8$ when $x = 4$ find y when $x = 16$:

$$y \propto \frac{1}{x}$$

$$y = \frac{k}{x} \quad \text{--- (i)}$$

$$xy = k \quad \text{--- ii}$$

Put $y = 8$ and $x = 4$ in (ii)

$$k = (x)(y)$$

$$k = (4)(8)$$

$$k = 32$$

Now put $k = 32$ and $x = 16$ in (i)

$$y = \frac{32}{16} = 2$$

(ix)

Fourth proportional

$a^3 - b^3$, $a + b$ and $a^2 + ab + b^2$

$$(a^3 - b^3) : (a + b) :: (a^2 + ab + b^2) : x$$

$$x(a^3 - b^3) = (a + b)(a^2 + ab + b^2)$$

$$x = \frac{(a + b)(a^2 + ab + b^2)}{a^3 - b^3}$$

$$x = \frac{(a + b)(a^2 + ab + b^2)}{(a - b)(a^2 + ab + b^2)}$$

$$x = \frac{a + b}{a - b}$$

Question no 3

write short answer to any (6) question.

Partial Fractions⁽ⁱ⁾

$$\frac{n-11}{(n-4)(n+3)}$$

$$\text{Let } \frac{n-11}{(n-4)(n+3)} = \frac{A}{n-4} + \frac{B}{n+3} \quad \text{--- (i)}$$

Multiplying by $(n-4)(n+3)$ we get

$$n-11 = A(n+3) + B(n-4)$$

$$n-11 = An + 3A + Bn - 4B$$

$$n-11 = An + Bn + 3A - 4B$$

$$n-11 = (A+B)n + (3A-4B)$$

Comparing coefficients of n and constant terms.

$$A+B = 1 \quad \text{--- (ii)}$$

$$3A - 4B = -11 \quad \text{--- (iii)}$$

$$3A + 3B = 3 \quad \text{--- (iv)}$$

Subtracting (iii) from (iv)

$$7B = 14$$

$$B = 2$$

Put $B = 2$ in (ii)

$$A + 2 = 1$$

$$A = 1 - 2 = -1$$

$$\frac{n-11}{(n+3)(n-4)} = \frac{2}{n+3} - \frac{1}{n-4}$$

(ii)

Different between improper and proper fraction?

Improper fraction

A rational fraction $\frac{N(u)}{D(u)}$, with $D(u) \neq 0$ is called an improper fraction.

Proper fraction.

A rational fraction $\frac{N(u)}{D(u)}$ with $D(u) \neq 0$ is called proper fraction.

$D(u) \neq 0$ is called proper fraction.

(iii)

Define rational fraction give examples?

An expression of the form $\frac{N(u)}{D(u)}$

where $N(u)$ and $D(u)$ are polynomials in u with real coefficient is called an rational fractional.

(iv)
If 7kg sugar cost Rs. 560 then
find cost of 15kg sugar.

$$15\text{kg} : 7\text{kg} :: \text{Rs. } x : \text{Rs. } 560$$

$$15 : 7 = x : 560$$

$$P.O.M = P.O.E$$

$$15x = 15 \times 560$$

$$x = \frac{15 \times 560}{15}$$

$$x = 1200 \text{ Rs.}$$

(v)
Difference between continuous proportion and mean proportion.
Continuous proportion:

If three quantities a, b and c are related as $a:b::b:c$

where a is first b is the mean and c is the third proportional then a, b and c

are in continued proportion.

Mean proportion:

If three quantities a, b and c are related as $a:b::b:c$ then b is called the mean proportional.

(vi)

Find the value of the letter involved in $12, 3p-6, 27$
Continue the proportion.

$$12 : (3p-6) :: (3p-6) : 27$$

$$P.O.M = P.O.E$$

$$(3p-6)(3p-6) = 12 \times 27$$

$$9p^2 - 36p + 36 = 324$$

$$9p^2 - 36p + 36 - 324 = 0$$

$$9p^2 - 36p - 288 = 0$$

$$p^2 - 4p - 32 = 0$$

$$p^2 - 8p + 4p - 32 = 0$$

$$p(p-8) + 4(p-8) = 0$$

$$(p-8)(p+4) = 0$$

$$p-8=0 \text{ gives } p=8$$

$$p+4=0 \text{ gives } p=-4$$

Vii, Prove that: $a:b = c:d$ if

$$\frac{ac^2 + bd^2}{ac^2 - bd^2} = \frac{c^3 + d^3}{c^3 - d^3}$$

By componendo-dividendo

$$(ac^2 + bd^2) + (ac^2 - bd^2) = (c^3 + d^3)(c^3 - d^3)$$

$$(ac^2 + bd^2) - (ac^2 - bd^2) = (c^3 + d^3) - (c^3 - d^3)$$

$$\frac{2ac^2}{2bd^2} = \frac{2c^3}{2d^3}$$

$$\frac{ac^2}{bd^2} = \frac{c^3}{d^3}$$

$$\frac{a}{b} = \frac{c}{d}$$

$$a:b = c:d$$

(Viii)

The surface area S of the sphere varies directly as the square of radius r , and $S = 16\pi$ when $r = 2$, find r when $S = 36\pi$

$$S \propto r^2$$

$$S = kr^2 \dots (A)$$

$$\text{Put } S = 16\pi, r = 2 \text{ in (A)}$$

$$16\pi = k(2)^2$$

$$16\pi = 4k$$

$$k = \frac{16\pi}{4} = 4\pi$$

$$4$$

$$\text{Putting } k = 4\pi \text{ in (A)}$$

$$S = 4\pi r^2 \dots (B)$$

$$\text{Put } S = 36\pi \text{ in (B)}$$

$$36\pi = 4\pi r^2$$

$$r^2 = \frac{36\pi}{4\pi}$$

$$9\pi$$

$$r^2 = 9$$

$$r = \sqrt{9}$$

$$r = 3$$

(ix)

Prove that:

$a:b = c:d$ if

$$pa + qb : pa - qb = pc + qd$$

$$: pc - qd.$$

$$\frac{pa + qb}{pa - qb} = \frac{pc + qd}{pc - qd}$$

By componendo-dividendo

$$\frac{pa + qb - pa - qb}{pa + qb + pa - qb} = \frac{pc + qd + pc - qd}{pc + qd - pc + qd}$$

$$\frac{2qa}{2qb} = \frac{2pc}{2qd}$$

$$\frac{qa}{qb} = \frac{pc}{qd}$$

$$\frac{a}{b} = \frac{c}{d}$$

$$a:b = c:d$$

Question No 4:

Write any 6 short questions:

(i)

Mean proportion.

$$20x^3y^5, 5x^7y$$

Let z be the mean proportional

$$20x^3y^5 : z :: z : 5x^7y$$

Product of means = P.O.E

$$z^2 = 20x^3y^5 \times 5x^7y$$

$$= 100x^{10}y^6$$

$$z^2 = (10x^5y^3)^2$$

$$z = \pm 10x^5y^3$$

(ii)

Partial fraction.

$$\frac{1}{3+x-2x^2}$$

$$\text{Let } \frac{1}{(x+1)(2x-3)} = \frac{A}{x+1} + \frac{B}{2x-3}$$

Multiplying both side $(x+1)(2x-3)$

$$-1 = A(2x-3) + B(x+1)$$

$$2A+B=0 \text{ (i)}$$

$$-3A+B=-1 \text{ (ii)}$$

$$A = \frac{1}{5} \text{ and } B = \frac{-2}{5}$$

$$\frac{1}{3+x-2x^2} = \frac{1}{5(x+1)} - \frac{2}{5(2x-3)}$$

State theorem of Componendo-dividendo.

If $a:b = c:d$, then

(i) $a+b : a-b = c+d : c-d$

(ii) $a-b : a+b = c-d : c+d$

(iv)

$V \propto \frac{1}{r^3}$ and $V=5$ when $r=3$, find V

when $r=6$ and r when $V=320$

soln

$$V \propto \frac{1}{r^3}$$

$$V = \frac{k}{r^3}$$

$$V_1 = \frac{k}{r_1^3} \quad V_2 = \frac{k}{r_2^3}$$

$$V_1 - V_2 = \frac{k}{r_1^3} - \frac{k}{r_2^3}$$

$$5 - 320 = \frac{k}{(3)^3} - \frac{k}{(6)^3}$$

$$-315 = \frac{k}{27} - \frac{k}{216}$$

$$-315 = \frac{8k - k}{216}$$

$$-315 = \frac{7k}{216}$$

$$V = \frac{135}{8}$$

$$V = 320 \text{ in B}$$

$$320r^3 = 135$$

$$r^3 = \frac{135}{320} = \frac{27}{64}$$

$$r = \frac{3}{4}$$

(v)
fourth proportional

5, 8 and 15

$$5:8 :: 15:n$$

$$P.O.E = P.O.M$$

$$5n = 8 \times 15$$

$$n = \frac{8 \times 15}{5}$$

$$n = 8 \times 3$$

$$n = 24$$

(vi),
 $3(4u - 5y) = 2u - 7y$ find the ratio $u:y$

$$3(4u - 5y) = 2u - 7y$$

$$12u - 15y = 2u - 7y$$

$$12u - 2u = 15y - 7y$$

$$10u = 8y$$

$$\frac{10u}{10} = \frac{8y}{10}$$

$$u = \frac{8y}{10}$$

$$\frac{10u}{10} = 8$$

$$u = 8$$

$$\frac{10}{10} \times \frac{u}{y} = \frac{8}{10}$$

$$\frac{u}{y} = \frac{4}{5}$$

$$u:y = 4:5$$

(vii)
Find the ratio of 27 min, 30 sec
1 hour.

27 min 30 sec, 1 hour

$$27 \times 60 + 30 \text{ sec}, 1 \times 60 \times 60 \text{ sec}$$

$$1620 + 30$$

$$= 1650 \text{ sec}, 3600 \text{ sec}$$

Ratio is. 1650 : 3600

$$165 : 360$$

$$33 : 72$$

$$(viii) 11 : 24$$

Resolve $\frac{n-5}{n^2+2n+3}$ partial fraction.

$$\frac{n-5}{n^2+2n+3}$$

$$\frac{n^2 - n + 3n - 3}{n^2 + 2n + 3}$$

$$= \frac{n-5}{n^2+2n+3}$$

$$= \frac{n-5}{n(n-1)+3(n-1)}$$

$$= \frac{n-5}{(n-1)(n+3)}$$

$$(n-1)(n+3)$$

$$\text{Let } \frac{n-5}{(n-1)(n+3)} = \frac{A}{n-1} + \frac{B}{n+3} \quad \text{--- (i)}$$

$$(n-1)(n+3) \quad n-1 \quad n+3$$

Multiplying by $(n-1)(n+3)$ we get

$$n-5 = A(n+3) + B(n-1)$$

$$n-5 = An + 3A + Bn - B$$

$$n-5 = (A+B)n + (3A-B)$$

Comparing n of constant

$$A + B = 1 \quad \text{--- (i)}$$

$$3A - B = -5 \quad \text{--- (ii)}$$

$$4A = -4$$

$$A = -1$$

$$\text{Put } A = -1 \text{ in (i)}$$

$$-1 + B = 1$$

$$B = 1 + 1$$

$$B = 2$$

$$\frac{x-5}{(x-1)(x+3)} = \frac{-1}{x-1} + \frac{2}{x+3}$$

(ix)

Convert proper fraction

$$\frac{x^3 + x^2 + 1}{x^3 - 1}$$

$$\begin{array}{r} 1 \\ x^3 - 1 \overline{) x^3 + x^2 + 1} \\ \underline{+ x^3} \\ x^2 + 1 \end{array}$$

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

(Part - II)
Attempt Three question
in all
5 (a)

P varies jointly as q and r^2 and
inversely as s and t^2 , $p=40$
when $q=8$, $r=5$, $s=3$, $t=2$
find p in terms of q, r, s and t.
also find the value of p when
 $q=-2$, $r=4$, $s=3$ and $t=-1$

Given that $p \propto \frac{qr^2}{st^2}$

$$p = k \frac{qr^2}{st^2}$$

$$p=40, q=8, r=5, s=3 \text{ and } t=2$$

$$40 = k \frac{(8)(5)^2}{3(2)^2}$$

$$40 \times 3 \times 4 = k$$

$$8 \times 25$$

$$k = \frac{12}{5}$$

Then eq. (i) becomes.

$$p = \frac{12}{5} \frac{qr^2}{st^2}$$

$$\text{Now for } q=-2, r=4, s=3 \text{ and } t=-1$$

$$p = \frac{12}{5} \frac{(-2)(4)^2}{(3)(-1)^2} = -\frac{128}{5}$$

5 (B)

Prove that $a:b = c:d$ if

$$\frac{a+b+c+d}{a+b-c-d} = \frac{a-b+c-d}{a-b-c+d}$$

$$\frac{a+b+c+d}{a+b-c-d} = \frac{a-b+c-d}{a-b-c+d}$$

$$\frac{a+b+c+d}{a+b-c-d} = \frac{a-b+c-d}{a-b-c+d}$$

$$\frac{a+b+c+d}{a+b-c-d} = \frac{a-b+c-d}{a-b-c+d}$$

$$\frac{a+b+c+d}{a+b-c-d} = \frac{a-b+c-d}{a-b-c+d}$$

$$\frac{a+b+c+d}{a+b-c-d} = \frac{a-b+c-d}{a-b-c+d}$$

$$\frac{a+b+c+d}{a+b-c-d} = \frac{a-b+c-d}{a-b-c+d}$$

By alternando

$$\frac{a+b}{a-b} = \frac{c+d}{c-d}$$

$$\frac{a+b}{a-b} = \frac{c+d}{c-d}$$

$$\frac{a+b}{a-b} = \frac{c+d}{c-d}$$

$$\frac{a+b}{a-b} = \frac{c+d}{c-d}$$

$$\frac{a+b}{a-b} = \frac{c+d}{c-d}$$

$$\frac{a+b}{a-b} = \frac{c+d}{c-d}$$

$$\frac{a}{b} = \frac{c}{d}$$

$$\frac{a}{b} = \frac{c}{d}$$

$$a:b = c:d$$

6 (a)

If w varies jointly as x, y^2 and z and

$w = 5$ when $x = 2, y = 3, z = 10$

Find w when $x = 4, y = 7$ and $z = 3$

$$w \propto x y^2 z$$

$$w = k x y^2 z \quad \text{--- (A)}$$

$$5 = k(2)(3)^2(10)$$

$$5 = 180k$$

$$k = \frac{5}{180} = \frac{1}{36}$$

$$k = \frac{1}{36} \quad \text{in (A)}$$

$$w = \frac{1}{36} x y^2 z \quad \text{--- (B)}$$

$$x = 4, y = 7, z = 3 \text{ in (B)}$$

$$w = \frac{1}{36} (4)(7)^2(3)$$

$$= \frac{1}{36} \times 4 \times 49 \times 3$$

$$w = \frac{49}{3}$$

6 (b)

theorem componendo-dividendo.

$$\frac{u+2y}{u-2y} = \frac{u+2z}{u-2z} \quad \text{if } u = \frac{4yz}{y+2}$$

$$u = \frac{4yz}{y+2}, \quad u = \frac{2y(2z)}{y+2}$$

$$\underline{u = 2z}$$

$$2y \quad y+2$$

Componendo-dividendo

$$\frac{u+2y}{u-2y} = \frac{2z-y+2}{2z-y-2}$$

$$\frac{u+2y}{u-2y} = \frac{3z+y}{2-y}$$

$$u = \frac{4zy}{y+2}$$

$$y+2$$

$$u = \frac{2z(2y)}{y+2}$$

$$\underline{u = 2y}$$

$$2z \quad y+2$$

Componendo-dividendo

$$\frac{u+2z}{u-2z} = \frac{2y+y+2}{2y-y-2}$$

From A+B

$$= \frac{3z+y}{2-y} \ominus \frac{3y+2}{2-y}$$

$$= \frac{3z-y-3y-2}{2-2y} = \frac{3z-4y-2}{2-2y}$$

$$\frac{2z-2y}{2-2y} = 2 \text{ Answer}$$

7(a)

$$C \propto \frac{d^4}{l^2}$$

$$C = k \frac{d^4}{l^2}$$

$$k = \frac{Cl^2}{d^4} \quad \text{--- (A)}$$

$$k = \frac{63 \times (30)^2}{6^4}$$

$$\frac{63 \times (30)^2}{6^4} = \frac{Cl^2}{d^4} \quad \text{--- (B)}$$

$$\frac{63 \times (30)^2}{6^4} = \frac{28 \times l^2}{4^4}$$

$$l^2 = \frac{63 \times (30)^2 \times 4^4}{6^4 \times 28}$$

$$l^2 = \frac{63 \times 30 \times 30 \times 4 \times 4 \times 4 \times 4}{6 \times 6 \times 6 \times 6 \times 28}$$

$$l^2 = 400$$

$$l = \sqrt{400}$$

$$l = 20 \text{ ft}$$

7 (b)

$$\frac{n^2 + 2n + 1}{(n-2)(n+3)}$$

$$n^2 + n - 6$$

$$\begin{array}{r} 1 \\ n^2 + 2n + 1 \\ + n^2 + n - 6 \\ \hline n + 7 \end{array}$$

Let:

$$\frac{n+7}{(n-2)(n+3)} = \frac{A}{n-2} + \frac{B}{n+3} \quad \text{--- (i)}$$

Multiplying by $(n-2)(n+3)$

$$n+7 = A(n+3) + B(n-2)$$

$$n+7 = An + 3A + Bn - 2B$$

$$n+7 = An + Bn + 3A - 2B$$

$$n+7 = (A+B)n + (3A-2B)$$

Comparing n and constant terms

$$A+B = 1 \quad \text{--- (ii)}$$

$$3A - 2B = 7 \quad \text{--- (iii)}$$

Multiplying (ii) by 2

$$2A + 2B = 2 \quad \text{(iv)}$$

$$A5 = 9 \quad \text{(from iii + iv)}$$

$$A = \frac{9}{5}$$

$$\frac{9}{5} + B = 1$$

$$B = 1 - \frac{9}{5}$$

$$B = \frac{5-9}{5} = -\frac{4}{5}$$

$$\frac{n+7}{(n-2)(n+3)} = \frac{9}{5(n-2)} - \frac{4}{5(n+3)}$$

Q No 8 (a)

Partial fraction

$$\frac{3n+7}{(n^2+1)(n+3)}$$

Let:

$$\frac{3n+7}{(n+3)(n^2+1)} = \frac{A}{n+3} + \frac{Bn+C}{n^2+1} \quad \dots (i)$$

Multiplying by $(n+3)(n^2+1)$

$$3n+7 = A(n^2+1) + (Bn+C)(n+3) \quad \dots (ii)$$

$$3n+7 = An^2 + A + Bn^2 + 3Bn + Cn + 3C$$

$$3n+7 = An^2 + Bn^2 + 3Bn + Cn + A + 3C$$

$$3n+7 = (A+B)n^2 + (3B+C)n + A+3C \quad \dots (iii)$$

Put $n+3=0$ i.e; $n=-3$ in (ii)

$$3(-3)+7 = A\{(-3)^2+1\}$$

$$-9+7 = A(9+1)$$

$$-2 = A(10)$$

$$A = \frac{-2}{10}$$

$$A = -\frac{1}{5}$$

Comparing coefficients of n^2 in (iii)

$$A+B=0$$

Put $A = -\frac{1}{5}$ in it

$$-\frac{1}{5} + B = 0$$

$$B = \frac{1}{5}$$

Comparing coefficient of x

$$3 = 3B + C$$

Put $B = \frac{1}{5}$ in it

$$3 = 3 \left[\frac{1}{5} \right] + C$$

$$3 = \frac{3}{5} + C$$

$$3 - \frac{3}{5} = C$$

$$C = \frac{12}{5}$$

Putting value of A, B, C in (i)

Partial fraction are

$$\frac{1}{5(n+3)} + \frac{n+12}{5n^2+1}$$

$$= \frac{1}{5(n+3)} + \frac{n+12}{5n^2+1}$$

Qno 8 (b)

$$\frac{(n-2)^2 - (n-4)^2}{(n-2)^2 + (n+4)^2} = \frac{12}{13}$$

Apply componendo - dividendo

$$\frac{(n-2)^2 - (n-4)^2 + (n-2)^2 + (n-4)^2}{(n-2)^2 - (n-4)^2 - (n-2)^2 - (n-4)^2} = \frac{12+13}{12-13}$$

$$\frac{2(n-2)^2}{-2(n-4)^2} = \frac{25}{-1}$$

$$\frac{2(n-2)^2}{-2(n-4)^2} = \frac{25}{-1}$$

$$\frac{(n-2)^2}{(n-4)^2} = \frac{25}{1}$$

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$$\frac{(n-2)^2}{(n-4)^2} = \frac{25}{1}$$

Taking sq. root

$$\frac{n-2}{n-4} = \pm 5$$

$$\frac{n-2}{n-4} = 5$$

$$\frac{n-2}{n-4} = 5, \quad \frac{n-2}{n-4} = -5$$

$$n-2 = 5n-20, \quad n-2 = -5n+20$$

$$n-5n = -20+2, \quad n+5n = 20+2$$

$$-4n = -18, \quad 6n = 22$$

$$n = \frac{-18}{-4}, \quad n = \frac{22}{6}$$

$$n = \frac{9}{2}, \quad n = \frac{11}{3}$$

Q (a)
Prove that two chords of a circle which are equidistant from the centre are congruent.

(To prove)

Given:

$\overline{AB}$ and $\overline{CD}$ are two chords of a circle with centre at O .

$OH \perp AB$ and $OK \perp CD$, So that

$$OH = OK$$

To prove,

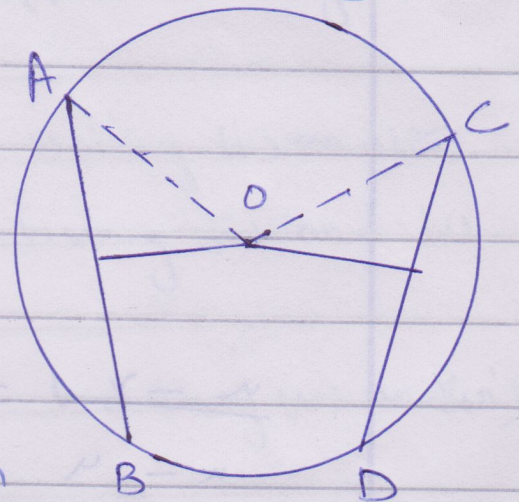
$$m\overline{AB} = m\overline{CD}$$

Construction:

Join A and C with O

So that we can form

$\triangle OAH$ and $\triangle OKC$.



Proof

Statement	Reasons
IN $\triangle OAH \rightarrow \triangle OKC$.	
$\because$ hyp $\overline{OA} = \text{hyp } \overline{OC}$	Radii of same circle
$m\overline{OH} = m\overline{OK}$	Given
$\therefore \triangle OAH \cong \triangle OKC$	H.S Postulate
So $m\overline{AH} = m\overline{CK}$ (i)	Corresponding sides of congruent triangles
$m\overline{AH} = \frac{1}{2} m\overline{AB}$	$\overline{OH} \perp \overline{AB}$ chord

$$m\overline{CK} = \frac{1}{2} m\overline{CD}$$

$$m\overline{AK} = m\overline{CK}$$

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

$$m\overline{AB} = m\overline{CD}$$

$\overline{OK} \perp$ chord $\overline{CD}$

Already proved (i),
Using (i) & (ii)

OR

Prove that the measure of a central angle of a minor arc of a circle is double that of the angle subtended by the corresponding major arc,

Given :

AC is an arc of a circle with centre O

where $\angle AOC$ is the central angle and $\angle ABC$ is circum angle

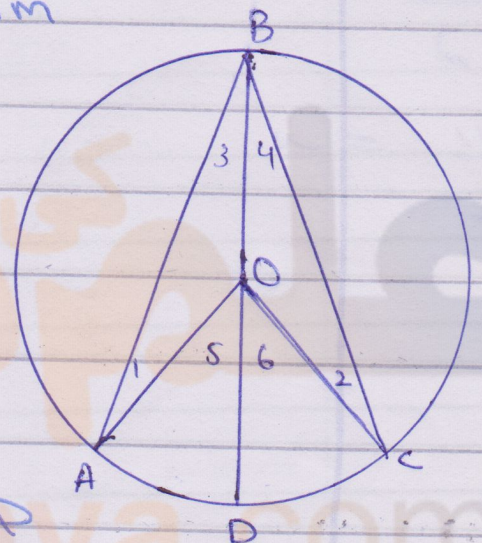
To prove,

$$m\angle AOC = 2m\angle ABC$$

Construction:

Join B with O and produce

it to meet the circle at D



Statement	Reasons
$m\angle 1 = m\angle 3$ (i)	Angles opposite to equal sides in $\triangle OAB$
$m\angle 2 = m\angle 4$ (ii)	Angles opposite to equal sides in $\triangle OBC$
$m\angle 5 = m\angle 1 + m\angle 3$ (iii)	External angle is sum of internal opposite angles.
Similarly $m\angle 6 = m\angle 2 + m\angle 4$ (iv)	
$m\angle 5 = m\angle 3 + m\angle 3 = 2m\angle 3$ (v)	Using (i) and (iii)
$m\angle 6 = m\angle 4 + m\angle 4 = 2m\angle 4$ (vi)	Using (ii) and (iv)
Then from Figure	
$m\angle 5 + m\angle 6 = 2m\angle 3 + 2m\angle 4$	Adding (v) and (vi)
$m\angle AOC = 2(m\angle 3 + m\angle 4) = 2m\angle ABC$	