Grade 10

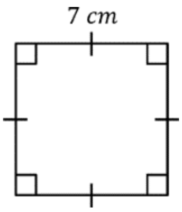
Mathematics

Unit – 01

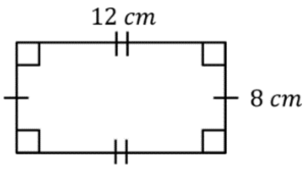
01.Perimeter

01. Find the perimeter of each of the following plane figures.

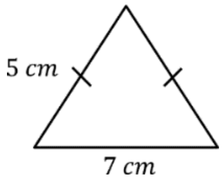
i.



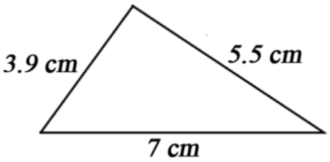
ii.



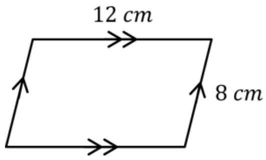
iii.



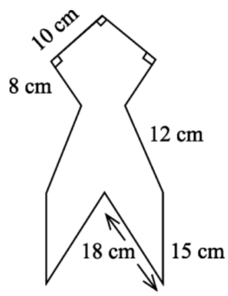
iv.



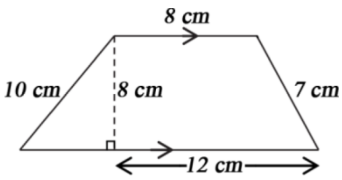
v.



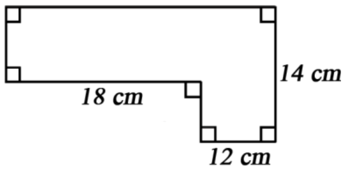
vi.



vii.



viii.

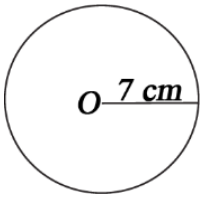


02. The ratio of length to width of a rectangular land is 4:3. If the perimeter of the land is 42 m, find the length and width of the land separately by taking the width as x and solving a simple equation in terms of x.

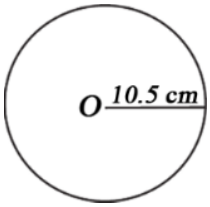
03. In an scalene triangle ABC whose perimeter is 75 cm, the lengths of the sides AB, BC and CA are (x+3) cm, (2x-9) cm and x cm respectively. Find the lengths of the three sides of the triangle separately by constructing a simple equation from this data and solving it.

04. Find the arc length of each of the circles and semi-circles given below

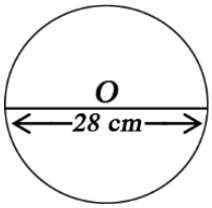
i.



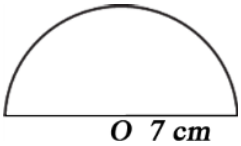
ii.



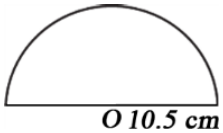
iii.



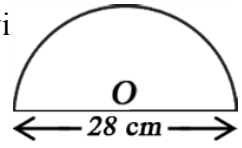
iv.



v.



vi



05. Find the diameter of a circle whose perimeter is equal to the perimeter of a square whose side length is 22 cm.

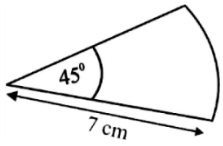
06. The radius of a semicircle is 28 cm. Find the width of a rectangle whose perimeter is equal to semicircle, if its length is 40 cm.

07. The perimeter of a semi-circular pond is 18 m. Calculate the diameter of the circular section.

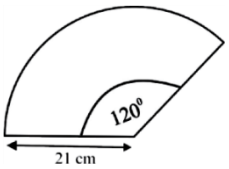
08. A child moves forward by pushing a cart wheel of radius 126 cm. Find the distance in meters covered by it when it travels 5 complete rounds.

09. Calculate the perimeter of each of the following sectors

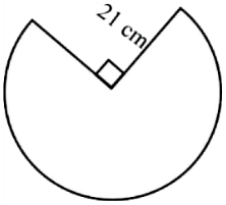
i.



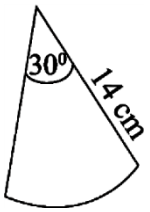
ii.



iii.

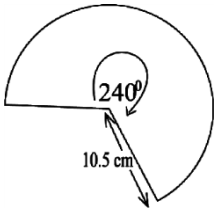


iv.

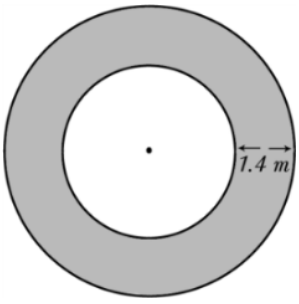


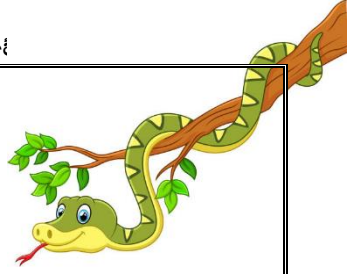
v.

vi.



10. If the circumference of the larger circle is 30.8 m, find the diameter of the smaller circle.





11. Find the radius of the sector in each of the following cases.

i. When $\theta=60^0$ and perimeter is 64 cm

ii. When $\theta=180^0$ and perimeter is 90 cm

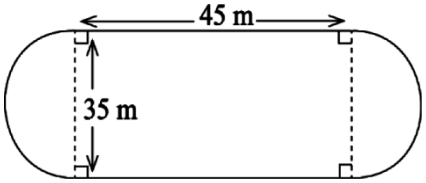
12. Find the central angle of the sector in each of the following cases.

i. When r=42 cm and perimeter is 216 cm

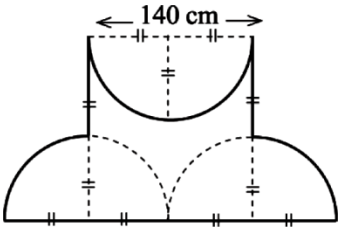
ii. When r=28 cm and perimeter is 78 cm

13. Find the perimeter of each of the following composite plane figures.

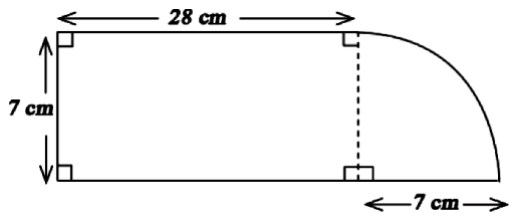
i.



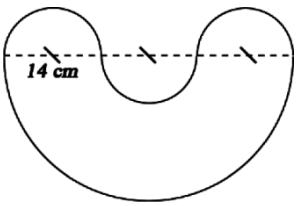
ii.



iii.

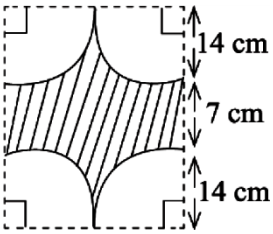


iv.

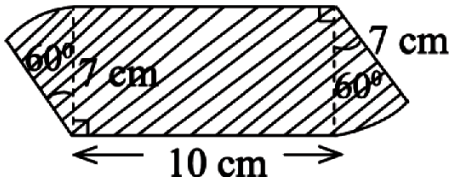


14. Find the perimeter of the shaded parts of each composite plane figure below.

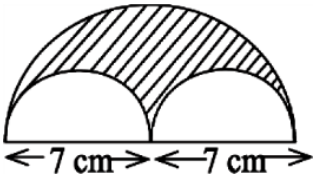
i.



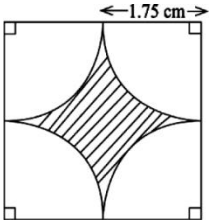
ii.



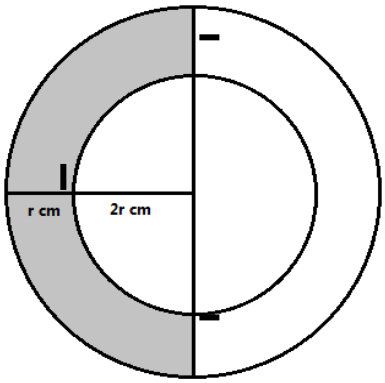
iii.



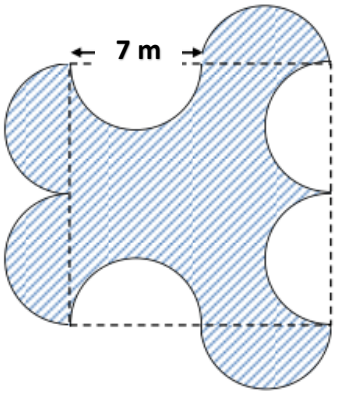
iv.



15. Show that the perimeter of the shaded part in the figure is $r(5\pi + 2)$



16. Observing the given figure, answer the questions.



i. How many semi-circles are used to make the figure?

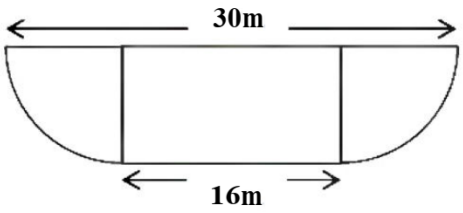
ii. Find the side length of the square found in the figure.

iii. How many semi-circles are removed from the square?

iv. How many semi-circles are added to the square outside?

v. Find the perimeter of the shaded region.

17. The diagram shows a stage which having a rectangular part and two equal sectors.

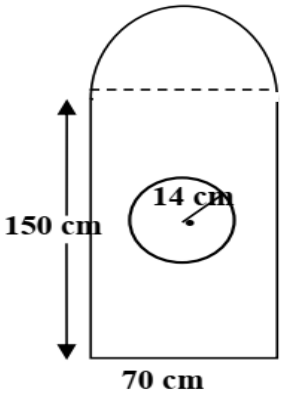


i. Find the radius of a sector.

ii. Find the arc length of the a sector.

iii. It is planned that to decorate with colour ribbon around the edge of stage twice. Find the length of the ribbon needed to decorate the stage.

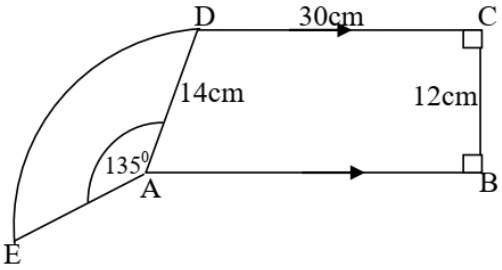
18. Shown in the diagram is a gate fixed at the entrance of a religious place. It is covered with metal plates and in the middle of the rectangular part there is a circular hole with the radius 14 cm. The hole is covered with a wire mesh.



i. Find the arc length of the semicircular part at the top of the gate

ii. Find the difference between the perimeters of the whole gate and the circular hole in the middle.

19. The sector ADE, which the centre A with angle 135^0 is joined with the trapezium ABCD. Its radius is 14cm. BC = 12cm and DC = 30cm.



i. Find the arc length of the sector

II. If the length of AB is 38 cm, Calculate the perimeter of the compound figure.

Grade 10

Mathematics

Unit – 02

02. Square Root

01. Complete the table

Number	How the square of the number is found	How the square of the number is written	The square of the number
4	4×4	4^2	16
4.1	4.1×4.1		16.81
4.2	4.2×4.2	4.2^2	
4.3			18.49
4.4	4.4×4.4	4.4^2	
4.5			
4.6	4.6×4.6	4.6^2	
4.7			
4.8	4.8×4.8	4.8^2	23.04
4.9			
5	5×5	5^2	25

02. Find the square of the following numbers by writing them as a product of prime factors

i. $\sqrt{100}$

ii. $\sqrt{144}$

iii. $\sqrt{324}$

iv. $\sqrt{625}$

03. Find the first approximation of each of the following numbers.

i. $\sqrt{12}$ ii. $\sqrt{38}$ iii. $\sqrt{108}$

iv. $\sqrt{220}$ v. $\sqrt{300}$ ii. $\sqrt{520}$

04. Find the value of the followings to two decimal places.

i. $\sqrt{27}$ ii. $\sqrt{325}$ iii. $\sqrt{850}$

iv. $\sqrt{1350}$ v. $\sqrt{27}$ vi. $\sqrt{325}$

05. Find the value of the followings to two decimal places.

i. $\sqrt{2227}$ ii. $\sqrt{3023}$ iii. $\sqrt{5040}$

06. Find the value of the followings to two decimal places.

i. $\sqrt{20.8}$ ii. $\sqrt{100.6}$ iii. $\sqrt{280.46}$

iv. $\sqrt{0.659}$ v. $\sqrt{0.0086}$ vi. $\sqrt{0.04599}$

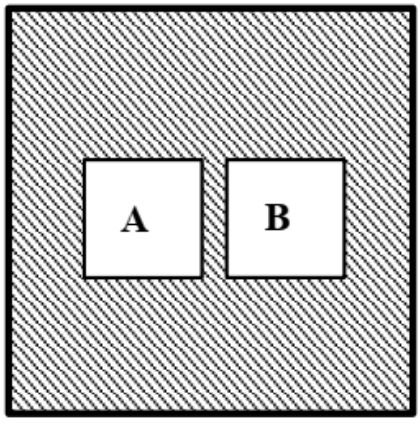
07. If $\sqrt{2}$ = 1.414, find the value of $\sqrt{200}$

08. In between which whole numbers does the value of $\sqrt{38}$ lie?

09. i. Show that the most suitable value for the $\sqrt{20}$ is 4.5 and it is not 4.5

ii. Teacher Wishwa prepared the board shown in this diagram for an activity of mathematic to be done with her students. It is prepared by removing two same size squares named A and B in the diagram, from a square shaped card board. The area of one small square 14 cm^2 .

a). Find the length of a side of the small square A ?



b). If the area of the shaded part of the figure is 41 cm^2, find the length of a side of the quare shaped board, correct to the 1st decimal place.

c). A square shaped piece of an oil paper in which the area is 100 cm^2 is pasted on this board, such that one vertex and two adjacent sides of the oil paper are to be coincide with one vertex and the two adjacent side of the board. Show this information by a rough sketch with relevant measurements on the given diagram.

❖ Square root

01. Using the information given in the table, find the first approximation of $\sqrt{90}$ **(2016 O/L)**

x	9.3	9.4	9.5	9.6
x^2	86.49	88.36	88.36	92.16

02. From the values given below, select the first approximation of $\sqrt{32}$ **(2017 OL)**

5.2 , 5.3 , 5.7 , 5.9

(2021 O/L)

03. For the statements given below, mark a ✓ in front of each of the correct statements and a 'x' in front of each of the incorrect statements.

$3 < \sqrt{14} < 4$	
$\sqrt{35} < 5.5$	
$\sqrt{3} + \sqrt{15} < 6$	

04. Underline the correct statement. **(2022 O/L)**

The value of $\sqrt{3} + \sqrt{12}$ is

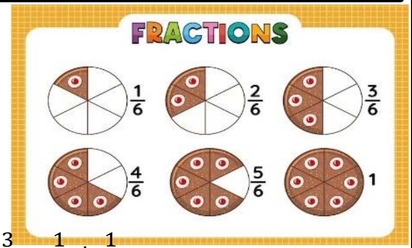
(i) Less than 5.

(ii) Equal to 5.

(iii) Greater than 5.

Grade 10 | Mathematics | Unit – 03

03. Fractions



01. Simplify.

i. $\frac{1}{3} - \frac{1}{2} \times \frac{1}{4}$ ii. $\frac{1}{2} - \frac{1}{5} \div \frac{4}{7}$ iii. $\frac{3}{4} \div \frac{1}{2} + \frac{1}{8}$

iv. $\frac{5}{8} \times 1\frac{1}{2} \div 2\frac{15}{16}$ v. $2\frac{2}{5} \times \frac{9}{10} \div \frac{27}{10}$ vi. $\frac{1}{2} \times 1\frac{3}{5} \div \frac{5}{9}$

02. Simplify.

i. $\frac{4}{5}$ of 100km ii. $\frac{9}{15}$ of Rs.75.00 iii. $\frac{4}{5}$ of $\frac{10}{28}$

03. Simplify.

i. $\frac{7}{15}$ of $\frac{5}{21}$ ii. $\frac{1}{12}$ of $\frac{3}{7}$

iii. $\frac{7}{15}$ of $\left(\frac{1}{5} + \frac{3}{7}\right)$ iv. . $\left(\frac{3}{7} - \frac{7}{8}\right)$ of 28

04. Simplify.

i. $\left(\frac{3}{3}\times\frac{2}{5}\right)\div\left(\frac{3}{5}+\frac{3}{10}\right)$ ii. $\left(\frac{3}{5}+\frac{7}{10}\right)\div\left(\frac{3}{10}+\frac{7}{20}\right)$ iii. $\left(\frac{3}{7}\times\frac{7}{8}\right)\div 15$

05. A person walks $\frac{1}{4}$ of the distance of his journey, and $\frac{2}{3}$ of the remaining distance by a three-wheeler.

a. Express the remaining distance after walking as a fraction of the whole distance.

b. Express the distance travelled by the three-wheeler as a fraction of the whole distance.

c. Express the remaining distance as a fraction of the whole distance.

d. If the remaining distance is 4km, what is the total distance of the journey?

06. A man decided to spend 3/5 of his salary for family requirements. 1/2 of the remaining amount for rent and the rest for his Saving

i. What fraction of the remain salary after spend for his family requirements.

ii. What fraction of the whole salary has been allocated for rent.

iii. What fraction of the whole salary has been saved

iv. If he saved Rs. 9000, find his whole salary

v. For an unexpected reason he saved only Rs. 2250. Find out the percentage he saved on that month

07. Nimal went $\frac{4}{5}$ of his journey by Train and $\frac{2}{3}$ of remaining by bus and he went the rest 2km by a three wheeler.

i. What fraction he travelled by bus out of the total distance he travelled.

ii. What fraction which he travelled by train and bus of his journey.

iii. What fraction which he travelled by three-wheeler of his journey.

iv. Find the total distance he travels in kilometers.

08. A farmer sells $\frac{1}{2}$ of his vegetable harvest at whole sale. From remaining $\frac{1}{4}$ is kept for his own consumption. The rest was sold at retail stalls. The income he got from that amount is Rs.9000.

i. What is the fraction of the total amount he kept for his own consumption?

ii. What is the total fraction of the farmer's own consumption and portion sold at whole sale?

iii. What is the fraction of the retail sale?

iv. If the retail sale is 300kg, what is the total production?

09. Out of tickets sold for a staging of stage drama $\frac{1}{6}$ was Rs. 200 tickets and $\frac{7}{12}$ was Rs. 500 tickets. The remaining tickets of Rs. 1000 and Rs. 2000 were sold equal quantities.

i. Write the total number of Rs. 200 and Rs. 500 as a fraction of total number of tickets sold.

ii. Find the number of Rs. 1000 tickets as a fraction of total number of tickets.

iii. If the number of Rs. 1000 tickets is 120, Find the total income gained by Rs. 500 tickets.

10. A seller bought some oranges. $\frac{2}{7}$ of them rotten and thrown away. $\frac{3}{5}$ of the remaining were sold for Rs. 40 each and the rest was sold for Rs. 50 each.

i. Write the number of oranges which was sold at Rs. 40 as the fraction of total oranges.

ii. If 24 oranges sold for Rs.50 each, find the total number of oranges which the trader bought.

iii. Find the total amount received by selling all the oranges.

iv. Write the ratio between the number of oranges which were rotten and number of oranges sold at Rs. 50 in the simplest form.

11. In a certain day of a filling station out of the whole fuel stock $\frac{3}{8}$ was petrol an $\frac{1}{4}$ was diesel. Half of the remaining fuel was kerosene.

a. What fraction of the whole fuel stock was filled with petrol and diesel.

b. What fraction of the whole fuel stock was filled with kerosene.

c. End of the day remaining amount of petrol was 400 ***l***. That was $\frac{1}{24}$ of the whole fuel stock. Find the amount of petrol, diesel and kerosene in the tank at the beginning of the day separately

12. From a stock of clothing materials which were bought to saw shirts and shorts, $\frac{3}{7}$ was used to saw shirts.

i. What fraction of the stock is remaining after sawing the shirts?

$\frac{2}{3}$ of the remaining is used to saw shorts.

ii. What fraction of the whole stock is used to saw shorts?

iii. What fraction of the whole stock is remaining, after sawing the shirts and the shorts?

iv. If the remaining stock of material is 6m, find the total length of the material bought.

v. If 1m of the material costs Rs. 200, find the value of the stock of clothing material bought.

13. $\frac{3}{5}$ of a household water tank was filled with water. When the water was used up, $\frac{1}{2}$ of the tank was remained.

a. What fraction of the whole tank was the used water?

b. If the amount of used water is $500l$, find the capacity of the tank.

c.. .Find the amount of remained water in the tank is litres.

c. If a pipe which water flows at a uniform rate, took 20 minutes to fill the tank completely, how long will it take to fill the amount of water which is equal to the amount of used water to the tank.

14. A man bought some mangoes for Rs. 30 each. $\frac{1}{5}$ of it was rotten.

a. What fraction of the whole lot is not rotten?

b. If he kept $\frac{1}{4}$ of the mangoes which are not rotten for his consumption, what fraction of the whole lot is kept for his consumption?

c. He sold the remaining mangoes. If the number of mangoes he sold is 60, how many mangoes did he buy?

d. If the number of mangoes he sold is used to manufacture jam, the manufacturing cost of a bottle of jam is Rs. 250. If a value added tax (VAT) of 15% is charged for a bottle of jam, what will be the selling price of a bottle of jam?

15. There are three bottles with same capacity and filled completely with fruit juice made for a function is kept in a refrigerator. It can fill 6 same size glasses completely from above one bottle.

i. Write the fraction of the fruit juice in one bottle as a fraction of total fruit juice made for the function.

ii. What is the fraction of fruit juice in one glass as a fraction of total fruit juice.

iii. If 300 ml of fruit juice in one glass find the total amount of fruit juice made for the function in litres.

iv. It is used one juice bottle and $\frac{2}{3}$ of the half of another bottle for the function find the remainingamount of fruit juice in litres.

16. On a day all the patients who came to a private hospital for residential treatments were performed to PCR test and $\frac{1}{8}$ of them were referred for quarantine. $\frac{5}{14}$ of the remaining patients referred for surgery.

    a. Find the number of patients who were not quarantine as a fraction of the total number patients.

    b. Find the number of patients referred for surgery as a fraction of the total number patients.

    c. If the remaining number of patients after referred to surgery is 18, find the total number of patients who came to the hospital on that day.

    d. It this hospital charges Rs. 3200 for a PCR test, find out how much the hospital will receive from PCR test only on that day

❖ Fractions

Structured (Part B)

(2016 O/L)

01. Mr. Kithsiri made a cash donation to a community center. $\frac{2}{9}$ of the total amount he donated was used to buy musical instruments and $\frac{1}{2}$ to buy sports equipment.

(i) Find what fraction of the total amount was used to buy the musical instruments and sports equipment.

$\frac{1}{5}$ of the remaining amount was used to buy books for the library.

(ii) Find what fraction of the total amount was used to buy books.

The amount remaining after purchasing the books was used to renovate the community center.

(iii) Find what fraction of the total amount was used for the renovation.

(iv) If the renovation cost was Rs 20 000, find the total amount Mr. Kithsiri donated.

(2017 O/L)

02. A household water tank is completely filled with water. $\frac{1}{10}$ of the water in the tank is used to water the garden and $\frac{1}{4}$ is used for bathing.

i. Find what fraction of the water in the tank is used to water the garden and for bathing.

Of the remaining water in the tank, $\frac{4}{13}$ is used to wash clothes.

ii. Find what fraction of the water in the completely filled tank is used to wash clothes.

iii. Find what fraction of the tank remains filled now.

When another 500 liters of water is used for kitchen requirements, the tank remains filled.

iv. Find the capacity of the tank in liters.

(2018 O/L)

03. A man intended to distribute a certain amount of money he had, by giving $\frac{2}{5}$ to his wife and the remaining amount equally to his three sons. However, he had to give $\frac{1}{6}$ this amount to his brother before he distributed it as intended. He distributed the remaining amount as originally intended.

i. What fraction of the initial amount that the man had, did the wife receive?

ii. What fraction of the initial amount did he have remaining after giving his brother and his wife?

iii. The amount a son received was 40 000 rupees less than the amount he was to receive originally. Find the amount the man had initially.

(2019 O/L)

04. $\frac{7}{15}$ of the total length of a drain was dug on the first day and $\frac{1}{4}$ of the remaining length was dug on the second day.

i. At the end of the first day, what fraction of the total length of the drain remained to be dug?

ii. What fraction of the total length of the drain was dug on the second day?

iii. At the end of the first two days, a further length of 600 metres of the total length of the drain remained to be dug. Find the total length of the drain.

iv. It has been estimated that 4 men will require 3 days to dig the remaining 600 metres of the drain. How many more men need to be engaged to dig this length in two days?

(2020 O/L)

05. A container of 5 litre capacity was completely filled with a soft drink. $\frac{3}{10}$ of this amount was used to serve drinks.

i. What fraction of the capacity of the container was the amount of soft drink remaining after using a portion to serve drinks?

ii. $\frac{5}{7}$ of the soft drink remaining in the container was poured into a bottle. What fraction of the capacity of the container was the amount of soft drink left in the container

iii. Now, more soft drink was added to the amount of soft drink in the container until the amount in the container was exactly half the capacity of the container. Express the amount of soft drink poured into the container in litres.

(2021 O/L)

06. a). From a stock of a type of cosmetics produced by a certain company, $\frac{2}{5}$ is allocated for shops and $\frac{3}{8}$ for export.

(i) What fraction of the total stock is the quantity allocated for shops and for export?

(ii) $\frac{1}{3}$ of the remaining quantity of cosmetics is kept for sale within the company itself. If the value of this quantity of cosmetics that is kept for sale is 6000 rupees, what is the value of the total stock of cosmetics?

(2022 O/L)

07. $\frac{2}{5}$ of a container is filled with fruit juice. After 700 millilitres of water is also added to this container, $\frac{3}{4}$ of the container is filled.

i. What fraction of the capacity of the container is the amount of water that was added?

ii. Now $\frac{4}{5}$ of the fruit drink in the container is separated out to serve. What fraction of the capacity of the container is this separated amount of drink?

iii. The separated amount of drink is poured out equally into 6 glasses. Find the amount of drink in one glass in millilitres.

iv. Find the amount of fruit drink remaining in the container now, in millilitres.

(2023 O/L)

08. It has been planned to construct a wall in three stages with the participation of a group of men. In the first stage, 10 of them worked together for 4 days and completed $\frac{4}{7}$ of the total length of the wall.

i. How many man days is the work done in the first stage of constructing the wall?

ii. If $\frac{1}{3}$ of the remaining length of the wall is completed in the second stage, what fraction of the total length of the wall is this amount?

iii.. If only two men engaged in constructing the wall in the second stage, how many days did the two of them take for it?

iv. If a length of 200 metres remains to be built in the third stage of building the wall, find the total length of the wall.

Grade 10 **Mathematics** Unit – 04

04. Binomial Expressions

01. simplify.

i. $3 \times 7a$ ii. $2 \times (-7x)$ iii. $-5 \times 4x$

iv. $a \times 3b$ v. $5x \times (-3y)$ vi. $-7p \times 5q$

vii. $(-3a) \times 12b$ viii. $3m \times (-8n)$ ix. $-p \times (-7q)$

02. . Expand and simplify the following algebraic expressions.

i. 5(a−2) ii. 7(b+4) iii. −3(x+5)

iv. −4(2a−3) v. 8(3a−2) vi. −3p(4p+6)

vii. −5a(2a+7) viii. 4m(3m−8) ix. −6p(2p−9)

03. . Expand and simplify the following algebraic expressions.

i. 3(a+5) + 6(a+3) ii. 7(b−3) − 4(b−6) iii. −4(x−2) − 3(x−5)

iv. −6(4a+3) − 3(2a−7) v. 5(2a+6)+3(4a+5) vi. −3p(4q−6)−5p(2q−8)

04. . Expand and simplify the following algebraic expressions.

i. $(x+4)(x+3)$ ii. $(a+5)(a+4)$ iii. $(y-4)(y+2)$

iv. $(x-9)(x+4)$ v. $(x+7)(x-3)$ vi. $(q+4)(q-2)$

vii. $(a-5)(a-6)$ viii. $(x-7)(x-3)$ ix. $(y-6)(y-5)$

05. . Expand and simplify the following algebraic expressions.

i. (5p+3q)(4p+2q) **ii.** (3a+5b)(4a+3b) **iii.** (6x+2y)(5x−3y)

iv. (4x+3y)(6x−5y) **v.** (5m−4n)(3m+2n) **vi.** (4x−3y)(6x+2y)

vii. (5a−4b)(3a−2b) **viii.** (6x−3y)(5x−4y) **ix.** (5p−4q)(7p−3q)

06. . Expand and simplify the following algebraic expressions.

i. $\left(\frac{1}{3}x+y\right)(3x+2y)$ ii. $\left(\frac{1}{2}a+b\right)(4a-3b)$

07. . Expand and simplify the following algebraic expressions.

i. $\left(\frac{1}{4}p - q\right)(5p + 3q)$

ii. $\left(\frac{1}{5}m - n\right)(4m - 3n)$

iii. $\left(\frac{1}{4}x + \frac{1}{3}y\right)\left(\frac{2}{3}x + \frac{3}{4}y\right)$

iv. $\left(\frac{3}{4}a + \frac{2}{3}b\right)\left(\frac{3}{5}a - \frac{1}{3}b\right)$

v. $\left(\frac{3}{5}p - \frac{2}{3}q\right)\left(\frac{2}{3}p + \frac{1}{2}q\right)$

vi. $\left(\frac{2}{5}x - \frac{1}{3}y\right)\left(\frac{3}{4}x - \frac{1}{2}y\right)$

08. . Expand and simplify the following algebraic expressions.

i. $(a + 5)^2$

ii. $(x - 8)^2$

iii. $(-y - 5)^2$

iv. $(5 + b)^2$

v. $(6 - y)^2$

vi. $(-4 - y)^2$

vii. $(5a - 2b)^2$

viii. $(-3x + 5y)^2$

ix. $(4x + 3y)^2$

09. Write each of the following as a square of a binomial expression and find the value.

i. 22^2 ii. 18^2 iii. 55^2

iv. 32^2 v. 39^2 vi. 21^2

vii. 99^2 viii. 31^2 ix. 34^2

10. Verify the following for the values $a = 3$ and $b = -2$

i. $(-a + b)^2 = a^2 - 2ab + b^2$,

ii. $(-a - b)^2 = a^2 + 2ab + b^2$

11. Verify that $(3x + 4y)(2x + 3y) = 6x^2 + 17xy + 12y^2$ for each of the following cases.

i. $x = 1\,, y = 2$

ii. $x = -2\,, y = -3$

iii. $x = -1\,, y = 0$

iv. $x = 2\,, y = -3$

12. Find the values of $a\,, b$ / $x\,, y$ for each of the following cases.

i. $2x^2 - 5x - 3 = (2x + a)(x + b)$

ii. $3x^2 + 7x + 4 = (3x - a)(x - b)$

iii. $2p^2 - 3p - 5 = (2p - x)(p - y)$

iv. $3p^2 + 10p + 8 = (3p + x)(p + y)$

12. For each of the following expressions, determine the term that should be added so that it can be written as a square of a binomial expression, add the relevant term to the given expression and then write it as a square of a binomial expression

i. $x^2 + 4x$ ii. $y^2 - 4y$ iii. $p^2 + 6p$

iv. $a^2 - 12a$ v. $m^2 - 2m$ vi. $a^2 - 8ab$

13. Find the value of $a^2 + b^2$ when $a + b = 12$ and $ab = 35$.

14. Find the value of $p^2 + q^2$ when $p - q = 7$ and $pq = 20$.

15. Find the value of $a^2 + b^2$ when $a + b = 10$ and $ab = 21$.

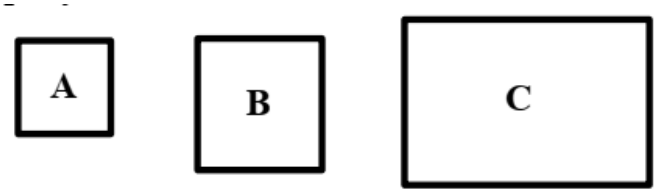
16. Find the value of $s^2 + t^2$ when $s - t = 6$ and $st = 18$.

17. Find the value of $p - q$ when $p^2 + q^2 = 34$ and $pq = 15$.

18. Find the value of $x^2 + \frac{1}{x^2}$ when $x + \frac{1}{x} = 5$

19. **(a)** Simplify (2x + 3) (3x + 2)

(b).



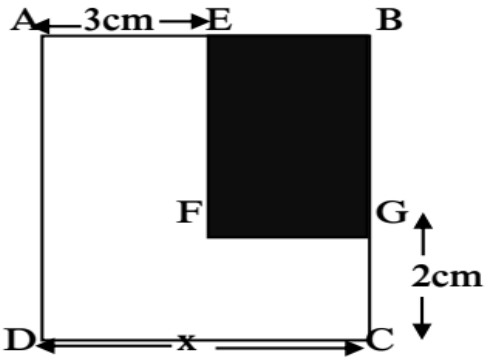
A, B and C are thin glass plates. A and B are square shaped and C is rectangular in shape.

i. The length of a side of B is one unit less than two times of the length of a side of A . If the length of a side of A is x units build up an algebraic expression for the area of the square B and simplify it.

ii. The length of the rectangle C is 9 units greater than the length of a side of A, and the breadth of C is one unit greater than the length of a side of A. Denote the area of C as a trinomial expression of x.

iii. Show that the sum of the areas of A and B is equal to the area of C. when the value of x is 4.

20. The figure represents a square lamina and the rectangular shaded part EFGB is cut out.



i. If x=6cm, find the area of the ABCD lamina.

ii. Write the length of BE in terms of x.

iii. Write the length of BG in terms of x.

iv. Write the area of the BEFG as a product of above expressions.

v. Find the area of the remaining part in terms of x.

English Medium Mathematics, English Medium Mathematics, English Medium Mathematics, English Medium Mathematics, English Medium

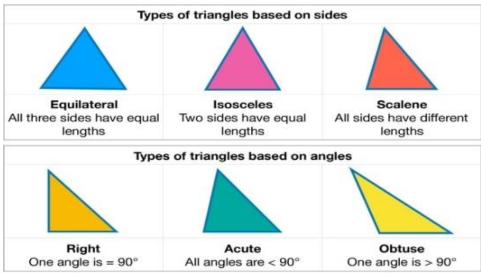
Grade 10

Mathematics

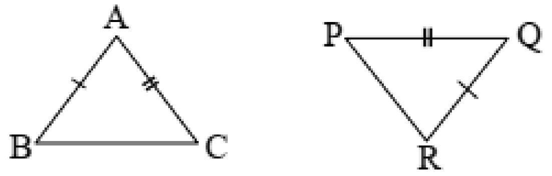
Unit – 05

English Medium Mathematics, English Medium Mathematics, English Medium Mathematics, English Medium Mathematics, English Medium

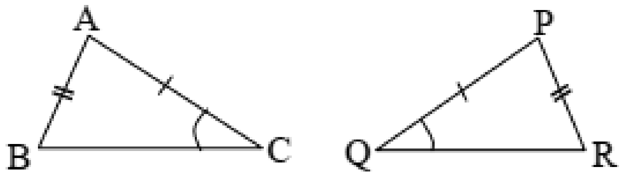
05. Congruence of Triangles



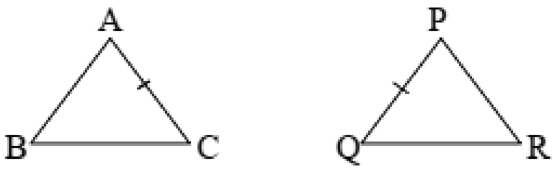
01. If these triangles are congruent in SSS case.
    What are the other sides to be equal?



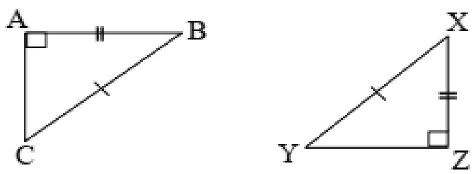
02. If these triangles are congruent in SAS case,
    What are the angles to be equal ?



03. Find the other angles to be equal.
    If these triangles are congruent in case AAS.



04. Show that Δ ABC and Δ XYZ are congruent.

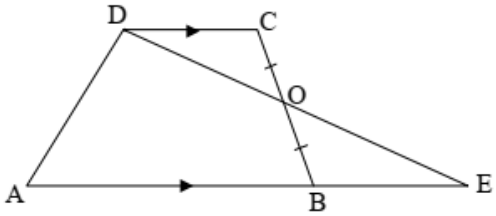


05. In ABC triangle AB = AC. Bisector of BAC meets BC at X. show that BX = XC

06. BD is the diagonal of ABCD parallelogram, show that $B\hat{A}D = B\hat{C}D$

07. ABCDE is a regular pentagon. Show that $A\hat{D}E \equiv B\hat{C}D$

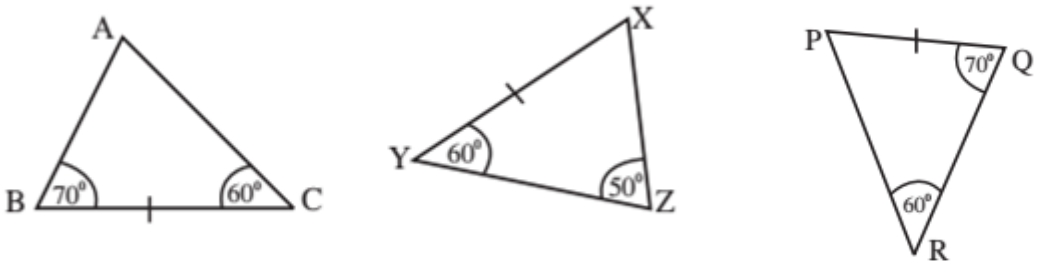
08. Show that $B\hat{O}E \equiv D\hat{O}C$



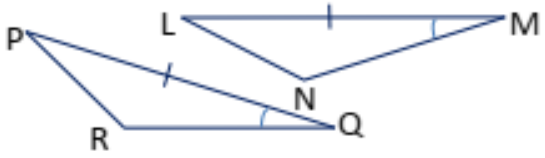
09. In the ABC triangle, X is the mid point of BC and AX is joined together. Also AB = AC. Prove that $A\hat{B}C \equiv A\hat{C}B$

10. In a circle, where O is the center, BC is a chord and X is the mid point of it. Join OX, OB and OC. Prove that angle BXO is a right angle.

11. Select and write a pair of congruent triangles from the following triangles

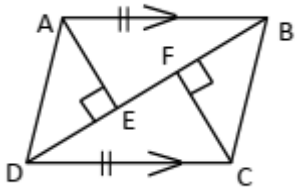


12. What is the third pair of elements for the given two triangles to become congruent?



What is the condition for the congruence?

13. Based on the information given in diagram,



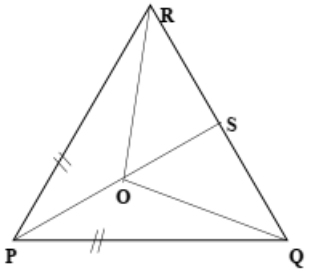
i. Prove that Δ ABE $\equiv \Delta$ DCF

ii. Prove that Δ ADE $\equiv \Delta$ BCF

iii. Prove that BE = DF

14. In the triangle PQR, PR=PQ, $P\hat{R}O = Q\hat{R}O$ and $P\hat{Q}O = P\hat{Q}O$

15. PO produced meets RQ at S.



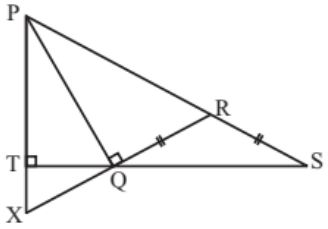
i. Prove that,
a) OR=OQ
b) R$\boldsymbol{O}$P=Q$\boldsymbol{O}$P

ii.

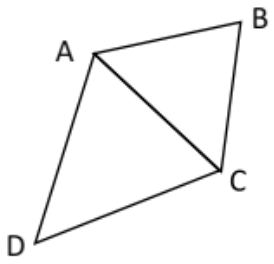
ii. If P$\mathbf{R}$Q is $\boldsymbol{x}$°, giving reasons find the value of the following angles in terms of $\boldsymbol{x}$.
a) Q$\boldsymbol{R}$O
b) R$\boldsymbol{O}$Q
c) R$\boldsymbol{P}$Q

16. In the triangle PQR, PR is produce to S, such that QR = RS. Produced PT and RQ are intersected at X

(i) If RSQ = *a* and QPR = *b*, show that TXQ = a + b
(ii) Show that triangle PRX is an isosceles triangle



17. ABCD is a quadrilateral. Here AB = AD and ACD is an equilateral triangle. And also AB and CD are parallel to each other. Show that, $\triangle ACD \equiv \triangle ABC$



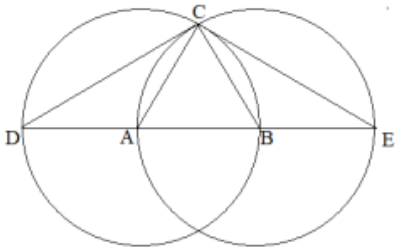
18. The following figure shows two circles of same radii of centers ‘A’ and ‘B’.

i. Show that ABC is an equilateral triangle.

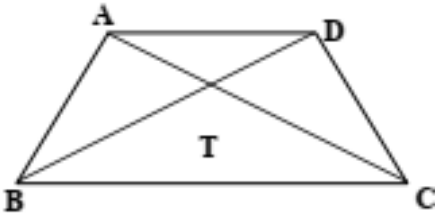
ii. Show that CD = CE.

iii. Find the magnitude of .ACD

iv. Find the magnitude of the angle .DCE



19. Diagonals AC and BD of the quadrilateral ABCD are intersecting a T



(i) If AB = DC and AC = BD show that Δ ABD ≡ Δ ACD

(ii) Prove that D$\hat{A}$T = A$\hat{D}$T

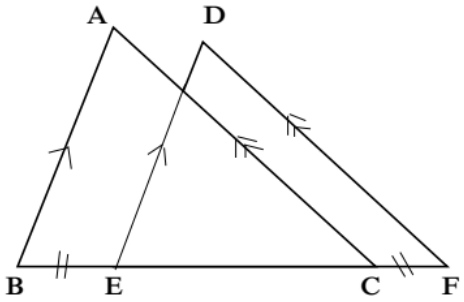
(iii) Prove that B$\hat{A}$D = C$\hat{D}$A

(iv) Prove that BT = TC

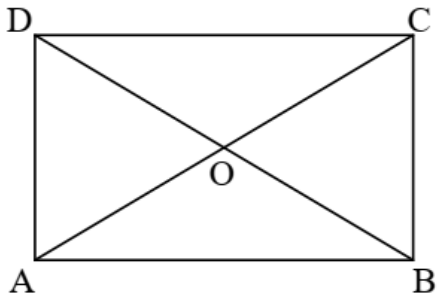
20. In the given figure AB//ED, AC//DF and BE=CF. prove that

i. BC = EF

ii. **ΔABC ≡ ΔDEF**



21. In the figure, ABCD is a rectangle. AC and BD diagonals meet at O.



i. Show that ABC Δ ≡ ABD Δ. Hence show that the diagonals AC and BD are equal in length.

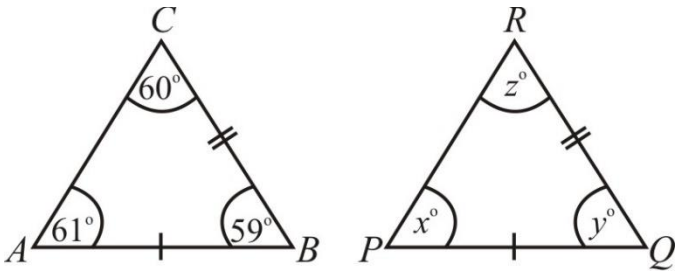
ii. The line drawn through O parallel to BC meets DC at X and AB at Y. Show that

Area of BCXO trapezium = Area of BCOY trapezium

❖ Congruence of Triangles

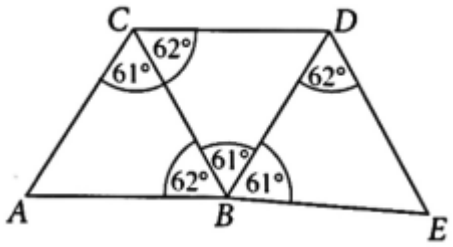
(2016 O/L)

01. The two triangles ABC and PQR in the figure are congruent. Find the values of x, y and z using the given information.



(2017 O/L)

02. Write the pair of triangles that are congruent from the triangles given in the figure, and from the following cases 1,2,and 3, select and underline the case you used to identify this pair.



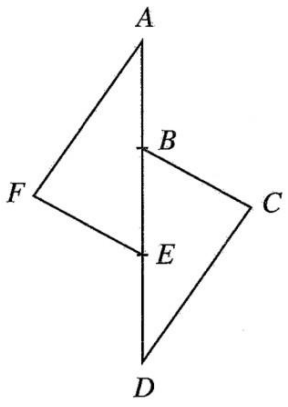
1. SAS **2. AAS** **3. SSS**

03. In the given figure, the points B and E lie on the straight line AD such that AB = ED. Moreover, AF = CD and AP // CD. Select under which of the following cases it can be shown that AFEΔ ≡ DCB Δ, and underline it. **(2022 O/L)**

i. A.A.S

ii. S.A.S

iii. S.S.S

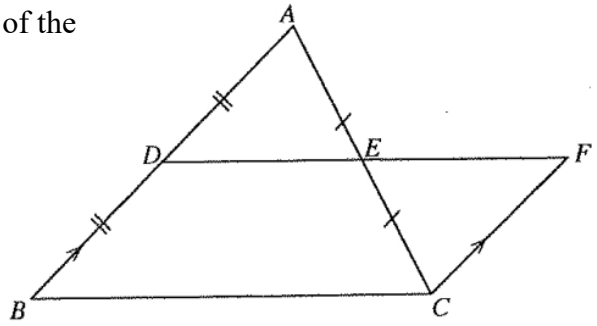


❖Congruence of Triangles

Essay (2nd Paper)

(2016 O/L)

01. In the triangle ABC shown in the figure, the midpoints of the sides AB and AC are D and E respectively. The line DE produced meets the line through C, drawn parallel to BA, at F.

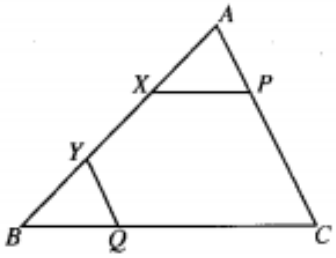


(i) Show that $\Delta ADE \equiv \Delta CFE$.

(2019 O/L)

01. In the given figure, ABC is a triangle. Points X and Y are located on AB such that AX = BY. Additionally, P is a point on AC such that XP // BC, and Q is a point on BC such that YQ // AC.

i. Prove that $\Delta AXP \equiv \Delta BYQ$.
ii. Draw the straight line PQ and demonstrate that PQ // AB.

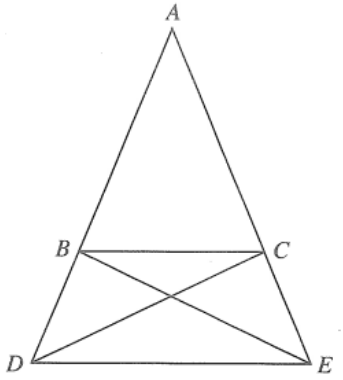


(2020 O/L)

02. In the triangle ABC shown in the figure, AB = AC. The side AB is extended to D, and the side AC is extended to E such that BD = CE.

i. Prove that $C\hat{B}D = B\hat{C}E$, and then show that the triangles CBD and BCE are congruent.

ii. Demonstrate that the triangle ADE is isosceles, and then establish that $A\hat{B}C = A\hat{D}E$.

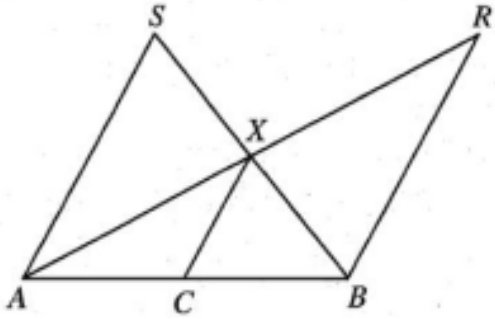


(2023 O/L)

03. The midpoint of the side AB of the triangle ABX in the given figure is C . The straight line through B drawn parallel to CX meets AX produced at R. The straight line through A drawn parallel to CX meets BX produced at S.

(i)Copy the given figure in your answer script and include the given information.

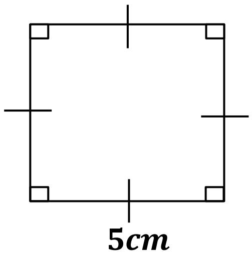
(ii)Show that the triangles AXS and BXR are congruent.



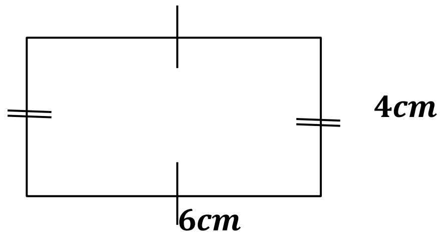
06 . Area

01. Find the area of each of the following plane figures.

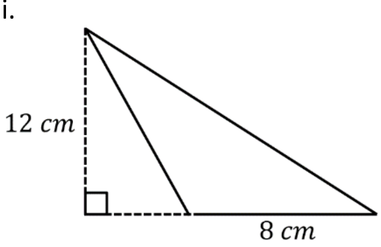
i.



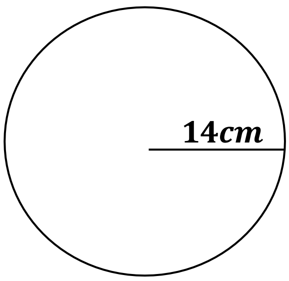
ii.



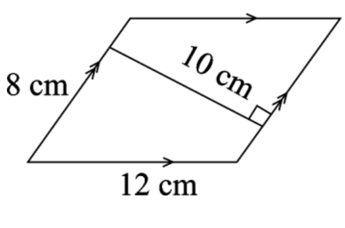
iii.



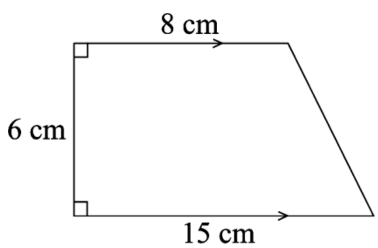
iv.



v.

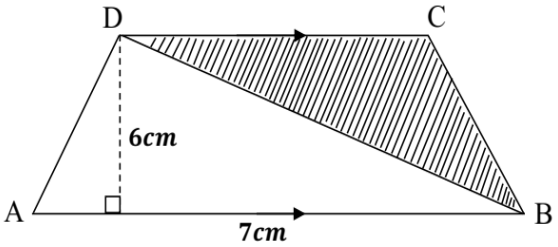


vi.



02. In the above figure ABCD is a trapezium with area $33cm^2$.

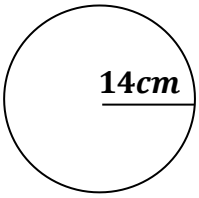
i. Find the area of Δ ABD



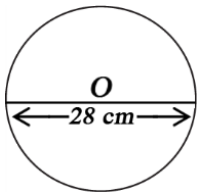
ii. Find the shaded area

03. Find the area of each circle

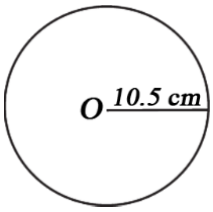
i.



ii.



iii.



04. If the area of the circle is 154 cm^2 , find the radios of the circle ?

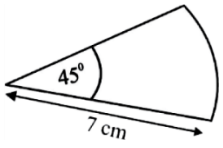
05. If the area of the circle is 38.5 cm^2 , find the radios of the circle ?

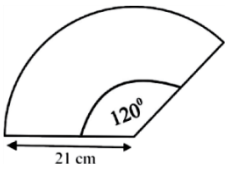
06. Find the radius of a circle whose area is equal to the area of a rectangle whose length is 28 cm and width is 22 cm.

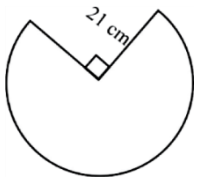
07. Find the radius of a circle whose area is equal to the area of a parallelogram whose base is 14 cm and the perpendicular height is 11 cm.

08. Find the radius of a circle whose area is equal to the area of a right triangle whose base is 14 cm and the perpendicular height is 22 cm.

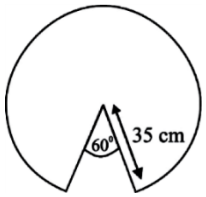
09. Find the area of each sector

i. 

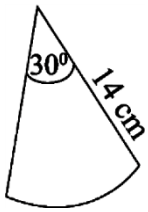
ii. 

iii. 

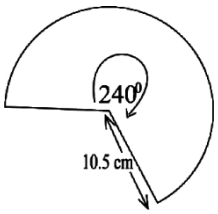
iv.



v.

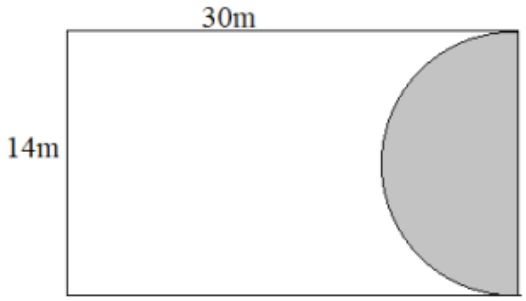


vi.



10. A rectangular theater with the length 30 *m* and breadth 14 *m* is shown in the diagram. The semi circular part is the stage and the remaining area is separated for the audience

i. Find the total area of the theater

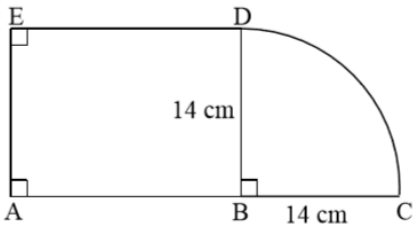


ii. If a iron pipe is fixed around the circular part of the stage, find the length of the pipe needed for it.

iii. If a floor mat is laid to cover the circular stage, find the area of the floor mat.

iv. If 6 400 *cm*2 area is needed for a seat in the audience, how many seats can be placed in the area for the audience.

11. Given combined figure is made using a rectangular shaped portion and a sector.



i. Find the area of the BDC sector.

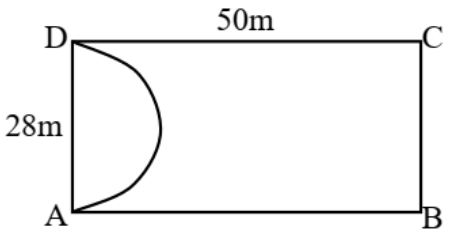
ii. If the area of ABDE portion is twice the area of the BCD sector, find the AB length.

iii. Find the DC arc length.

iv. Find the perimeter of the whole figure.

v. A right angle triangular portion which is equal to the area of the sector, is needed to fix along the produced BA and taking AE as a side. Find the lengths of the two sides of the triangle, in which the right angle is included and sketch it in the above given figure.

12. ABCD is a rectangular shaped land.



i. Find the area of the land.

ii. According to the figure, flower is planted on the semi-circular portion with the diameter AD. Find the perimeter of the flower bed.

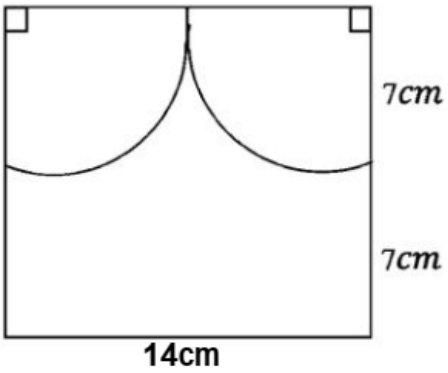
iii. A right angle triangular shaped pond with the area $70m^2$ is needed to be build inside the land, by taking BC and CD as borders. the base of the triangle should be BC. Draw the sketch of the pond with the relevant measurements on the diagram.

iv. Find the area of the remaining portion of land after reserving for the flower bed and for the pond.

13. The following diagram shows a part of a sketch of a crown prepared by Nimal using a square shaped piece of cardboard.

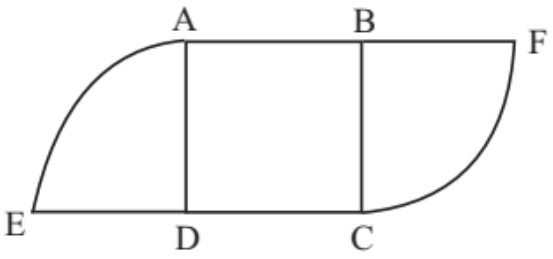
i. Find the area of the square shaped cardboard piece.

ii. If the above two sectors are cut and removed, find the area of the removed parts.



iii. Find the area of the remaining part

14. A flower bed constructed for the school mathematical park is given in the following figure. It is consists with a ABCD square part with the length of a side 7cm and two sectors.



(i) Find the radius of a sector.

(ii) Find the perimeter of the flower bed.

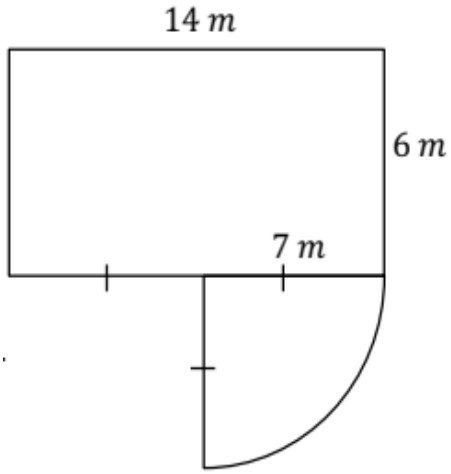
(iii) Find the area of the flower bed.

(iv) Find the area of the flower bed.

(v) The teacher is instructed to separate an isosceles triangular part in the square such that DC is a side of the isosceles triangle and with the area of 14 m^2. Draw a sketch with measurements in the figure how isosceles triangular part should be separated.

15. The following figure represents a rectangular compound. There is a pond in sector shape having the radius 7m.

i) Find the arc length of the sector.



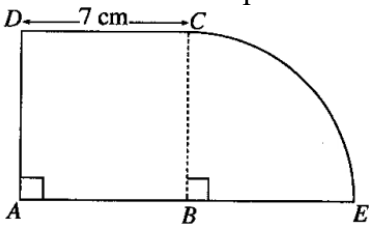
ii). 14 cm part of the compound is attached to the wall of the house.
It is decided to construct a iron fence around the remaining Margin of the compound.Find the length of the fence.

iii). If there is an intention of fixing cement blocks in the rectangular part.How many rectangular cement blocks having the length of 30cmand width of 20cm are needed?

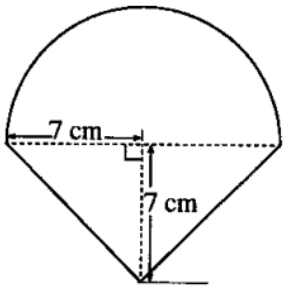
iv). What is the total area separated for the pond

❖ Perimeter and Area

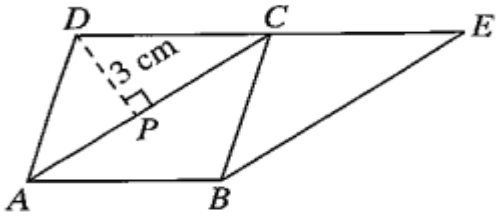
01. In the figure, ABCD is a square; BCE is a sector. Find D. the perimeter of the composite figure **(2018 O/L)**



02. A composite figure consisting of a semicircle of radius 7cm and a triangle is shown here. Find the area of the entire figure. **(2018 O/L)**



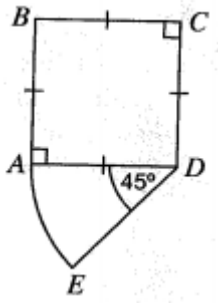
03. ABCD is a parallelogram. DC has been produced to E such that AC // BE. If BE = 6 cm and DP = 3 cm, find the area of the trapezium ABED. **(2021 O/L)**



04. The arc length of a sector of a circle of radius 7 cm is 11 cm. What fraction of the circle is the sector? **(2021 O/L)**

05. A sector of central angle 45° has been cut out from a circle of radius 14 cm. Find the area of this sector. **(2022 0/l)**

06. The diagram illustrates a composite figure composed of a sector of a circle with a radius of 14 cm and a central angle of 45°, along with a square. Determine the perimeter of this figure. **(2023 O/L)**

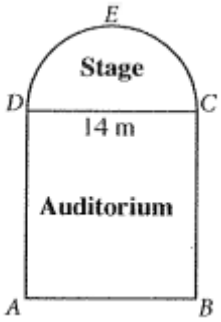


Structured (Part B)

01. A sketch of the floor of a theatre is shown in the figure. It consists of a semicircular part CED on which the stage is built and a rectangular part ABCD where the auditorium is built. The length of DC is 14 m.

In the following calculations, use $\frac{22}{7}$ for the value of when required. **(2016 O/L)**

i. Find the arc length of the semicircle CED.



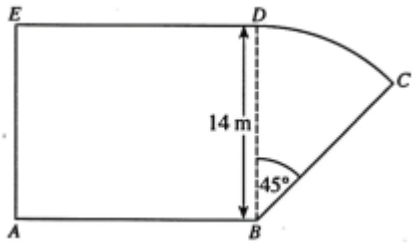
ii. Find the area of the floor on which the stage is built.

iii. If the floor area of the auditorium is three times the area of the floor on which the stage is built, find the length of AD.

iv. Light bulbs have been fixed around the floor on which the stage is built, with bulbs at C and D too. There is an equal gap of 1.4 meters between adjacent bulbs on the line CD. The bulbs on the arc CED are also fixed with an equal gap. The number of bulbs on the line CD and on the arc CED are equal. Calculate the distance along the arc between two adjacent bulbs on the arc CED.

(2017 O/L)

02. The given figure is a sketch of a garden consisting of a rectangular part ABDE and a part BCD in the shape of a sector of a circle with angle at the centre 45°. Here BD 14 m.



i. Find the area of the part BCD.

The area of the part ABDE is four times the area of the part BCD.

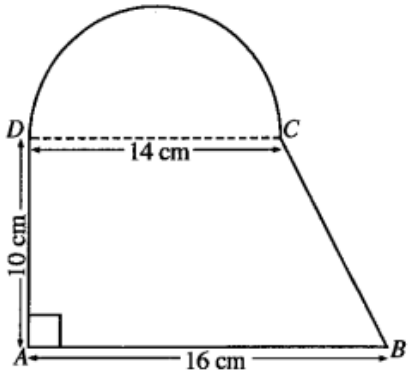
ii. Find the length of AB.

iii. Find the length of the arc DC.

iv. Find the perimeter of the garden.

---

03. A sheet consists of a portion ABCD in the shape of a trapezium and a semi-circular portion with diameter DC, as shown in the figure. (Take the value of π as $\frac{22}{7}$) **(2019 O/L)**



i. It has been decided to attach small buttons along the edge of the semi-circular portion, starting from D and ending at C, such that the distance between every two adjacent buttons is 2 cm.
How many buttons are required for this?

ii. Calculate the total area of the sheet.

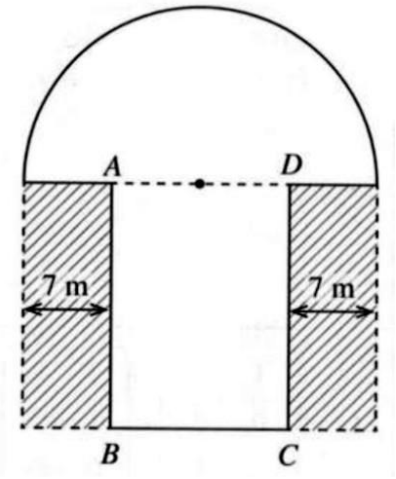
iii. If a rectangular sheet is made with its area equal to the area of the semi-circular portion and its length equal to the length of AD, then find its breadth.

04. The figure shows a flower bed consisting of a semicircular part of radius 14 m adjoining a rectangular part ABCD. Pebbles have been scattered in the two shaded rectangular parts outside the flower bed. (Take the value of π as $\frac{22}{7}$) **(2020 O/L)**

i. Find the length BC of the rectangular part of the flower bed.

ii. Find the area of the semicircular part of the flower bed.

iii. If the area of the semicircular part is equal to the sum of the areas of the two parts in which Pebbles have been scattered, finding the length AB of the rectangular part.

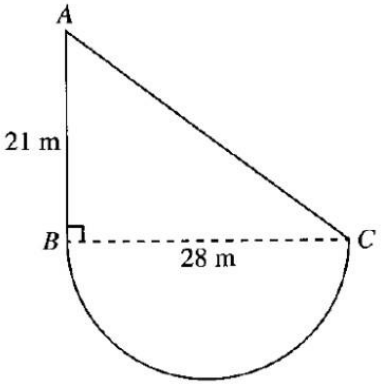


iv. Find the perimeter of the whole flower bed and then find the length of a rectangle that has the same perimeter as the flower bed and breadth equal to the diameter of the semicircle.

05. The figure shows a flower bed consisting of a right triangular plot of land ABC and a semicircular plot of land with BC as its diameter. (Take the value of π as $\frac{22}{7}$.) **(2021 O/L)**

i. Find the length of AC.
(Hint: 284x7, 21=3x7)

ii. It is required to build a fence around the whole flower bed. Find the length of this fence.



iii. Find the area of the semicircular portion.

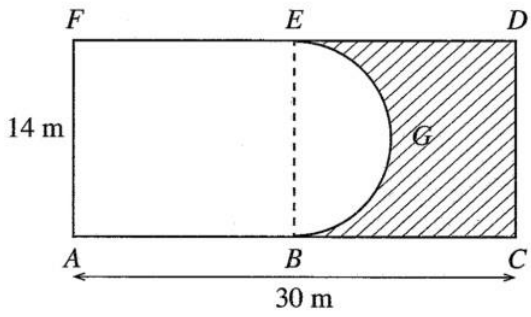
iv. It is required to add a rectangular plot that is of area equal to the area of the semicircular portion, with AB as a side, outside the triangular portion. Draw a sketch of this rectangle with its measurements, in the above figure.

---

06. The rectangular plot of land of length 30 m and breadth 14 m represented by ACDF in the figure is divided into two equal parts by the line BE. The portion denoted by 14 m ABGEF has been allocated for a swimming pool. BGE is a semicircular portion of it. The shaded region has been allocated for a lawn. **(2022 O/L)**

i. Find the radius of the semicircular portion.

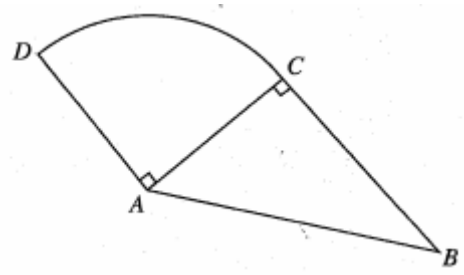
ii. Find the perimeter of the portion allocated for the swimming pool.



iii. Find the area of the portion allocated for the swimming pool.

iv. If it is required to adjoin a rectangular plot which is equal in area to the area of the portion allocated for the lawn, with DC as one side, sketch this plot with its measurements in the given figure itself.

07. The figure shows a vegetable plot consisting of a right angle triangular piece of land ABC and a piece of land ACD in the shape of a sector of a circle of central angle 90°.
(Take the value of π as $\frac{22}{7}$.) **(2023 O/L)**



i. AD=7m. If a fence is built along the boundary of the sector ACD from C to D, find the length of the fence.

ii. Find the area of the piece of land ACD.

iii. If the area of the piece of land ABC is 42 m², find the length of BC

iv. It is required to adjoin a rectangular piece of land outside the vegetable plot, with BC as one side, of area three times the area of the piece of land in the shape of the sector. Find the width of this rectangular piece of land and draw a sketch of it with its measurements on the above figure itself.

Grade 10 | Mathematics | Unit – 07

07. Factors of Quadratic Expressions

01. Write each of the following algebraic expressions as a product of its factors.

i. $12x + 9$ ii. $10p - 5q$ iii. $4a - 20a^2$

iv. $a - 12a^2$ v. $-3m^2 + 6m$ vi. $-9a^2 - 18ab$

vii. $-18xy - 12y^2$ viii. $5x^2 - 25xy$ ix. $5a^2b - 25ab$

x. $-x^2y - 5x^2y$ xi. $18p^2q - 6pq^2 - 3pq$

xii. $-8a^2 - 8a^2b + 4ab$ xiii. $5x^2 - 10y^2x - 25xy$

xiv. $-9m^2n - m^2n - 7n^2m$ xv. $4x^2yz - 8xy^2z - 12xyz^2$

xvi. $-a^2bc - 2ab^2c - 3abc^2$ xvi. $5x^2y^2 - 10xy^2 - 15xy^3$

02. Write each of the following algebraic expressions as a product of its factors

i. $b^2 + 5b + 2b + 10$

ii. $2x^2 - 6x + x - 3$

iii. $3y^2 + 9y - 2y - 6$

iv. $4z^2 - 8z + 3z - 6$

v. $5m^2 + 10m - m - 2$

vi. $6n^2 - 3n - 4n + 2$

03. Write each of the following algebraic expressions as a product of its factors.

i. $3x(5z + 4) - 7y(5z + 4)$

=(5z + 4) (3x -7y)

ii. $2a(3x + 2) + 5b(3x + 2)$

iii. $4m(2p - 3) - 6n(2p - 3)$

iv. $7r(4s - 5) + 3t(4s - 5)$

v. $5x(3y + 2) - 8z(3y + 2)$

vi. $2k(5m - 1) - 3j(5m - 1)$

vii. $x(2a - b) + y(b - 2a)$

viii. $a(2x - y) + b(y - 2x)$

ix. $f(7g - 3) - 2h(7g - 3)$

viii. $3u(2v + 1) + 5w(2v + 1)$

04. Factor each of the following trinomial quadratic expressions

i. $x^2 + 7x + 12$

=x² + 4x +3x + 12

=x(x+4) +3(x+4)

=(x+4) (x+3)

ii. $x^2 + 9x + 14$

iii. $b^2 + 11b + 18$

iv. $x^2 + 10x + 20$

v. $n^2 + 4n - 21$

vi. $a^2 + 2a - 3$

vii. $x^2 - 7x + 6$

viii. $m^2 - 8m + 12$

ix. $a^2 - 9a + 8$

x. $b^2 + 14b + 48$

xi. $n^2 + 2n - 8$

xii. $m^2 - 4m - 12$

xiii. $10 + 3q - q^2$

xiv. $15 + 2y - y^2$

xv. $28 + 3b - b^2$

xvi. $14 - 5x - x^2$

xvii. $18 - 3m - m^2$

xviii. $56 - y - y^2$

05. Factor each of the following trinomial quadratic expressions

i. $x^2 + 12kx + 32k^2$ ii. $x^2 + 8ax + 7a^2$

iii. $a^2 - 5ab + 6b^2$ iv. $x^2 - 8xy + 12y^2$

v. $a^2 + 6ab - 16b^2$ viii. $x^2 - 4xy - 32y^2$

06. Factor each of the following trinomial quadratic expressions

i. $2y^2 + 5y + 3$ ii. $2b^2 + 7b + 3$ iii. $3m^2 + 7m + 2$

iv. $12n^2 + 4n - 5$ v. $12a^2 + 17a - 14$ vi. $6y^2 + 5y - 4$

vii. $3q^2 - 12q + 9$ viii. $3y^2 - 16y + 5$ ix. $3x^2 - 11x + 10$

x. $3m^2 - 17m - 28$ xi. $8n^2 - 10n - 3$ xii. $2a^2 - 5a - 18$

07. Factor each of the following trinomial quadratic expressions

i. $2x^2 - 11ax + 5a^2$

ii. $10a^2 - 21ab + 11b^2$

iii. $6a^2 + ab - 15b^2$

iv. $10p^2 + 7pq - 12q^2$

v. $21x^2 - 16xy - 5y^2$

vi. . $2a^2 + 7ab + 5b^2$

08. Find the value of each of the following numerical expressions using the knowledge on the factors of trinomial quadratic expressions.

i. $25 \times 2 + 25 \times 3$

$\mathbf{=25(2+3)}$

$\mathbf{=25 \times 5}$

= 125

ii. $47 \times 103 - 97 \times 47$

iii. $17 \times 59 + 17 \times 41$

iv. $10^2 - 9^2$

v. $98^2 - 2^2$

vi. $10^2 - 4^2$

09. Factor the following expressions.

i. $x^2 - 1$ ii. $49 - a^2$ iii. $y^2 - 16$

iv. $4a^2 - 1$ vi. $25a^2 - 4$ vi. $100a^2 - 81$

vii. $4x^2 - 9y^2$ viii. $25x^2 - 81a^2$ ix. $36a^2 - 25b^2$

10. Factor the following expressions.

i. $(a + b)^2 - 25$ ii. $(x - 2y)^2 - 49$

iii. $16y^2 - (y + 1)^2$ iv. $(2a - b)^2 - 81c^2$

v. $(x - 3y)^2 - 49a^2b^2$ vi. $64x^2y^2 - (2x - 3y)^2$

vii. $(4m - n)^2 - (5x + y)^2$ viii. $(2x + 5)^2 - (3x + 4)^2$

11. Factor the following expressions. ($Consider,\ a^2 = x$.)

i. $a^4 + 9a^2 + 20$

ii. $a^4 - 3a^2 - 10$

iii. $1 - a^4$

iv. $2x^4 - 8$

12. i. Expand and simplify: (2a + 5)(3a – 1)

ii. Find the value of 96^2, by writing it as the square of a binomial expression.

iii. Expand (2a + 5)(3a – 1) , using the areas of rectangles.

iv. When X = 3 and y= 2, verify the equation,

$(3x - y)(5x + 2y) = 15x^2 + xy - 2y^2$

v. If $x^2 + y^2 = 11$ and $xy = 7$, find the value of (x + y) .

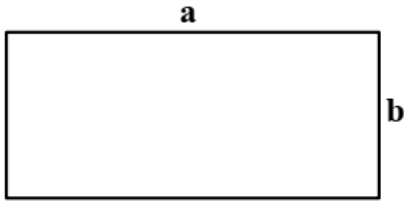
13. i. Expand $(x - y)^2$ and simplify. (Royal College – Colombo – 2019)

ii. By using the above expansion, find the value of 93^2.

iii. The area of a rectangle is given as $2x^2 + 7x - 15$. Express its length and breadth in terms of x

iv. Find the value of $(m + n)$ when $m^2 + n^2 = 18$ and $mn = 23$.

14. The area of the given rectangle is shown by $x^2 - 5x + 6$. If the length and breadth of it are a and b respectively, find two binomial expressions suitable for the values of a and b.



❖ Binomial Expressions and Factors of Quadratic Expressions

01. Factorize: $x^2 - 36$ **(2017 O/L)**

02. Factorize: $2x^2 + x - 6$ **(2018 O/L)**

03. Factorize: $x^2 + 3x - 10$ **(2019 O/L)**

04. One factor of the expression $2x^2 + 3x + 1$ is (x +1) **(2020 O/L)**
Find the other factor

05. Factorize: $9x^2 - 4$ **(2021 O/L)**

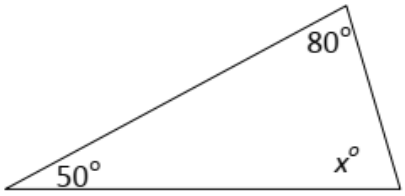
06. Factorize: $4x^2 + 5x - 6$ **(2022 O/L)**

07. One factor of the expression $3x^2 + 2x - 1$ is (x +1) **(2023 O/L)**
Find the other factor

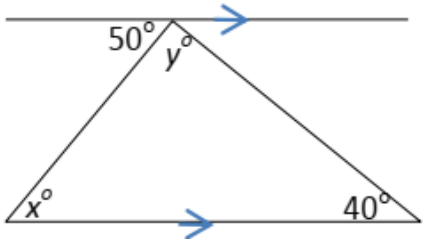
Triangles I & II

01. Find the magnitudes of the angles represented by the letters in each of the figures

i.

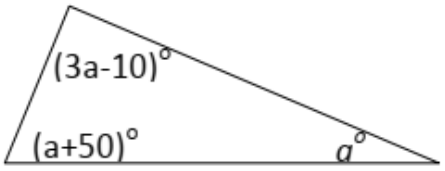


ii.

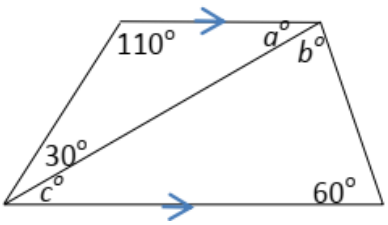


iii..

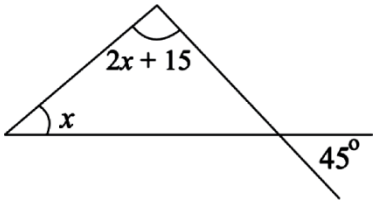
.



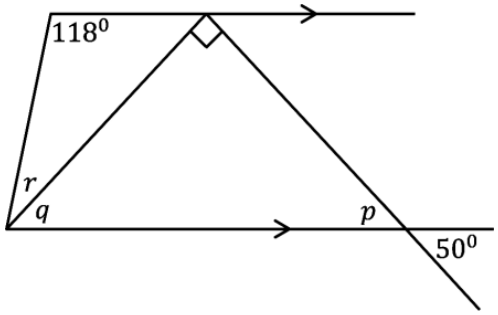
iv



v.



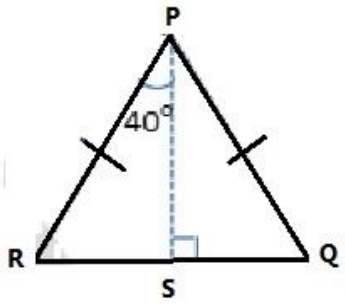
vi.



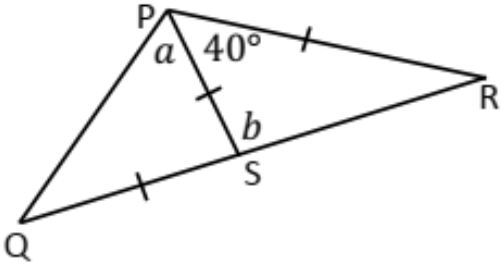
02. In the given figure,

i. What is the magnitude of $S\hat{P}Q$?

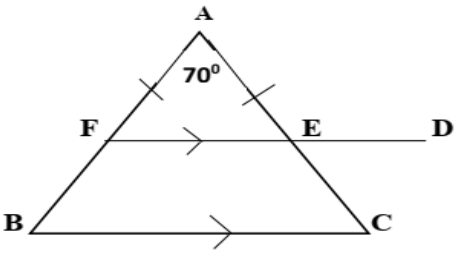
ii. What is the relationship between RS, SQ?



03. In given figure if PS = QS = PR , Find the value of **a** and **b**

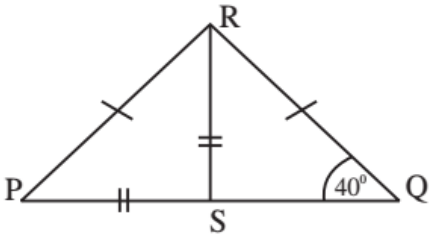


04. Find the magnitude of $A\hat{B}C$ based on the information marked on the given figure.

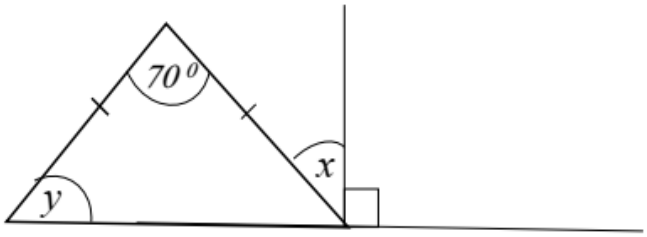


05. In the triangle PQR, PR = QR and in the triangle PSR, PS=RS

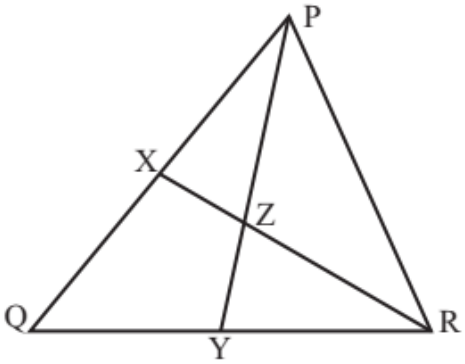
If $R\hat{Q}S = 40^0$ Find the value of $Q\hat{R}S$



06. Find the values of *x* and y based on the information given in the diagram.



07. In the triangle PQR, PQ = QR. X and Y are situated as QX = QY. XR and PY are intersected at Z.

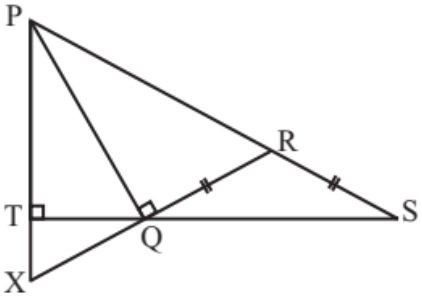


(i) Show that XR = PY

(ii) Show that $Z\hat{P}R = Z\hat{R}P$

(iii) If $Q\hat{P}Y = 40^0$ and $P\hat{R}X = 30^0$ find the value of $X\hat{Q}Z$

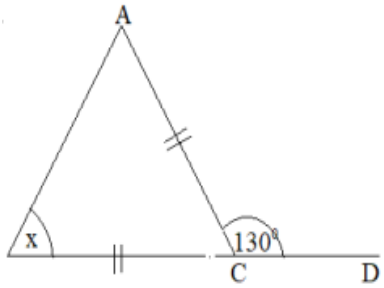
08. In the triangle PQR, PR is produced to S, such that QR = RS. Produced PT and RQ are intersected at X



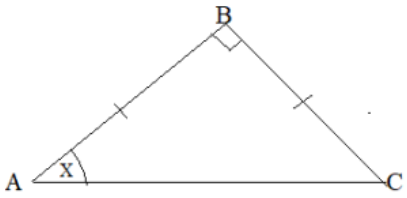
(i) If $R\hat{S}Q = a$ and $Q\hat{P}R = b$, show that $T\hat{X}Q = a + b$

(ii) Show that triangle PRX is an isosceles triangle

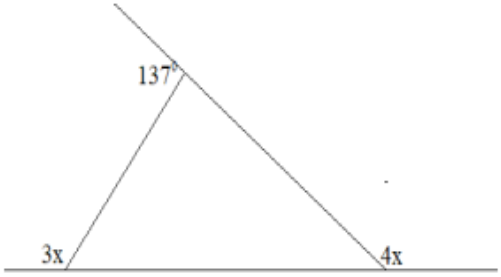
09. In the given figure AC = BC and BC produced D, find the value of x.



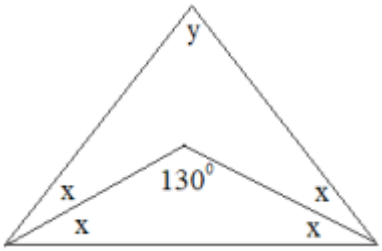
10. According to the information given , find the value of *x*.



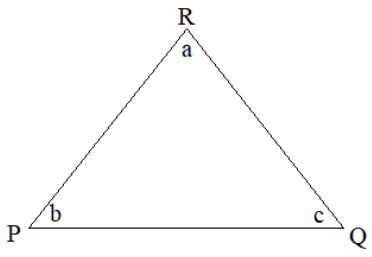
11. Using the information given in the figure, Find the value of x.



12. Find the value of y using the information given in the figure.



13. In the triangle PQR find the value of ***a,*** when $a + b = 120^0$ and $b + c = 130^0$



14. Of the triangle ABC, AB = BC and $A\hat{B}C = 90°$

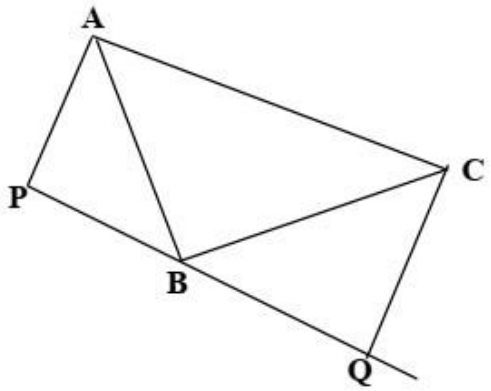
AP and CQ perpendiculars are drawn to the line passes through B, from A and C respectively.

(i) Copy the above diagram into your answer script and mark the given data on it.

(ii) Find the value of $B\hat{C}A$

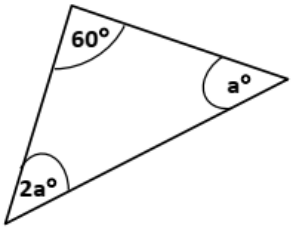
(iii) Show that $B\hat{C}Q = P\hat{B}A$

(iv) Prove that the triangle ABP and triangle BCQ are congruent

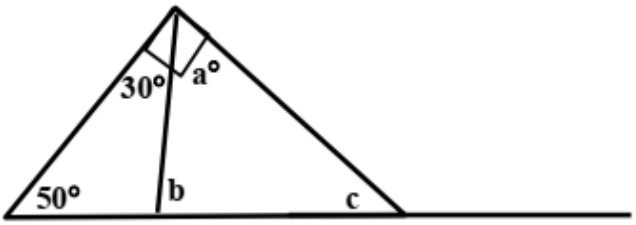


15. AB and AD sides of the quadrilateral ABCD are produced up to P and Q respectively. BD is joined, and AB = AD and $P\hat{B}C = Q\hat{D}C$. Denote this information an a diagram and prove that BC = DC.

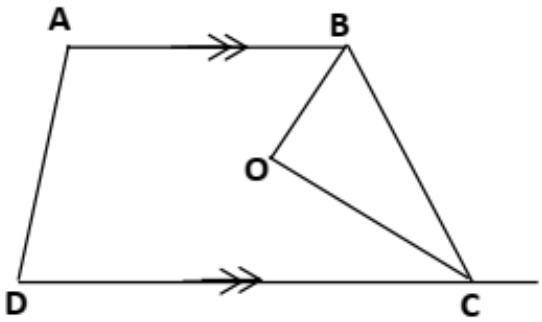
16. i. Find the value of a



ii. According to the data given on the diagram find the value of a, b and c.



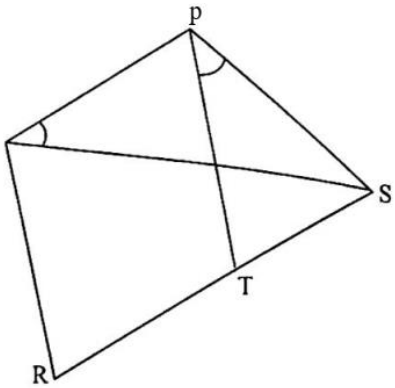
17. AB//DC of the quadrilateral ABCD Bisectors of the angles $A\hat{B}C$ and $B\hat{C}D$ are met at O, show that $B\hat{O}C = 90°$



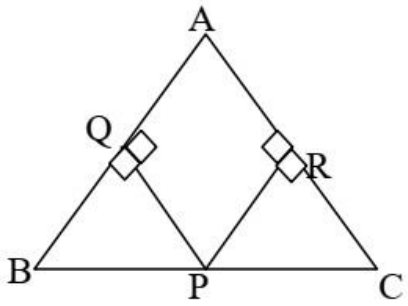
18. In the given Figure $P\hat{Q}S = T\hat{P}S$ and $Q\hat{P}S$ and $Q\hat{R}S$ are supplementary angles.

i. Prove that $P\hat{Q}R + P\hat{S}R = 180$

ii. Prove that $P\hat{T}S = R\hat{Q}S$

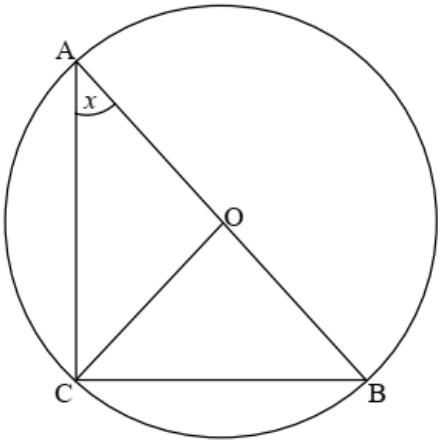


19. In the triangle ABC, AB = AC. The point P is located on BC such that PQ is perpendicular to AB and PR is perpendicular to AC. If PQ = PR , prove that the midpoint of BC is P.



20. Figure shows a circle with the centre O. $O\hat{A}C = x$.

(a) Giving reasons find the magnitudes of the following angles in terms of *x*.



i. $A\hat{C}O$

ii. $B\hat{O}C$

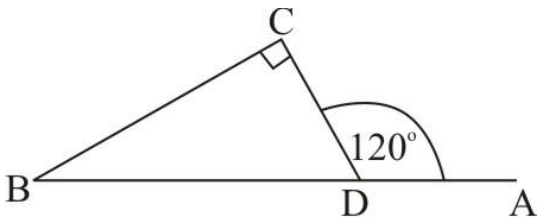
iii. $O\hat{B}C$

(b) What is the magnitude of $A\hat{C}B$ in degrees?

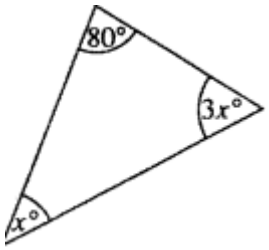
(c) If AC = 12cm and BC = 9cm, what is the length of AB?

❖ Triangles

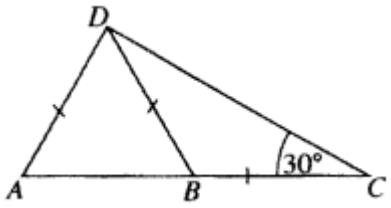
01. Find the magnitude of $D\hat{B}C$ using the information given in the figure. **(2017 O/L)**



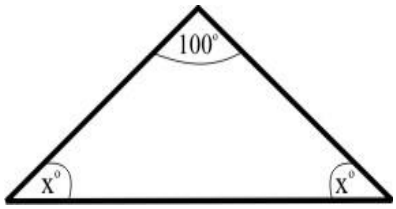
02. Find the value of x based on the information given in the figure. **(2018 O/L)**



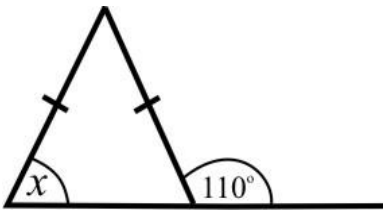
03. In the figure, ABC is a straight line. Find the magnitude of DAB based on the given information. **(2017 O/L)**



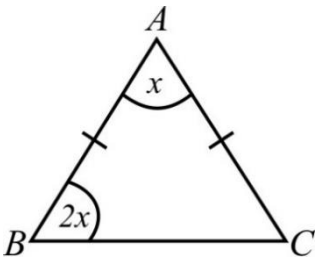
04. Find the value of x according to the information given in the figure. **(2019 O/L)**



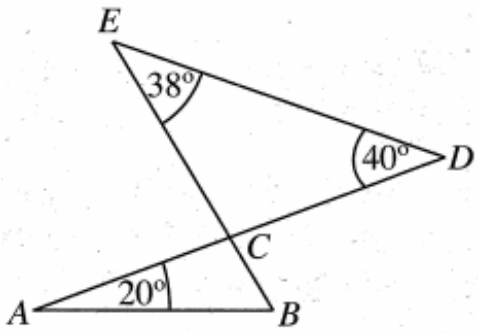
05. Find the value of x according to the information given in the figure. **(2020 O/L)**



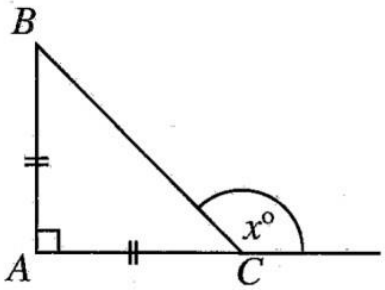
06. Find the value of x, based on the information in the figure. **(2019 O/L)**



07. Find the magnitude of ABC, based on the information in the figure. **(2021 O/L)**

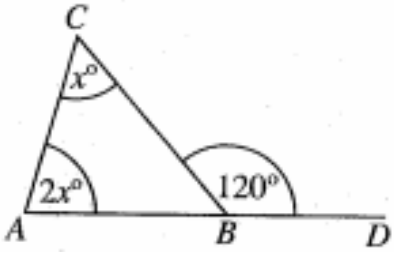


08. AB = AC in the given right triangle ABC. Find the value of x. **(2022 O/L)**



09. The side AB of the triangle ABC has been produced to D. Find the value of x based on the information given in the figure.

(2023 O/L)



Grade 10

Mathematics

Unit – 10

10. Inverse Proportions

01. If the cost of 5 kg of sugar is Rs. 250, what will be the cost of 12 kg of sugar?

02. A car travels 180 km in 4 hours. How far will it travel in 9 hours at the same speed?

03. If 8 pencils cost Rs. 72, what will be the cost of 15 pencils?

04. A worker earns Rs. 4500 for 10 days of work. How much will he earn for 24 days of work?

05. If 12 workers can complete a task in 15 days, how many days will 20 workers take to complete the same task?

06. A group of 6 men can complete a project in 18 days. How many men are needed to complete it in 9 days?

07. If 8 taps can fill a tank in 5 hours, how long will 4 taps take to fill the same tank?

08. A car traveling at 60 km/h takes 5 hours to cover a certain distance. How long will it take if the speed is increased to 75 km/h?

09. A team of 10 workers can complete a project in 12 days.

(i) How many days will it take one worker to complete the project?

(ii) What is the magnitude of the task in man-days?

(iii) If 15 workers are assigned the project, how many days will they take to complete it?

10. A factory with 20 machines produces a certain number of goods in 15 days.

(i) How many days will one machine take to produce the same amount?

(ii) What is the total work in machine-days?

(iii) If 25 machines are used, how many days will it take to produce the goods?

11. A construction crew of 16 workers builds a house in 30 days.

(i) How many days will it take one worker to build the house alone?

(ii) What is the total work in worker-days?

(iii) If the company doubles the workforce to 32 workers, how many days will the construction take?

12. A group of 5 water pumps fills a tank in 10 hours.

(i) How long would one pump take to fill the tank?

(ii) What is the total work in pump-hours?

(iii) If 8 pumps are used, how long will it take to fill the tank?

13. A team of 4 typists can complete typing a book in 18 days.

(i) How many days will one typist take to type the book alone?

(ii) What is the total work in typist-days?

(iii) If 6 typists are assigned the task, how many days will it take to complete the book

14. A building project can be completed in 10 days by 20 workers.
    If a new project is three times larger, how many workers are needed to finish it in 15 days?

15. A team of 15 workers can repair a road in 6 days, working 7 hours per day.
    How many workers are required to complete the same task in 9 days, working 5 hours per day?

16. A machine shop can produce 500 parts in 4 days using 8 machines.
    If production needs to be doubled, how many machines are required to complete the task in 6 days?

❖ Inverse proportions

01. It takes 6 hours to harvest a paddy field with a machine. How many hours will it take to harvest this paddy field with three such machines? **(2016 O/L)**

02. It has been estimated that 10 men will require 8 days to complete men should be engaged to complete this task in 5 days? **(2017 O/L)**

03. It has been estimated that it will take 10 men 6 days to complete a certain task. Find the number of days it will take 8 men to complete a job which is double that task. **(2018 O/L)**

04. It has been estimated that 4 men will require 3 days to dig a drain. How many more men need to be engaged to complete this work in 2 days? . **(2019 O/L)**

05. It has been estimated that four men will take 6 days to complete a certain task. If two more men joined this group after they had worked for 3 days, in how many more days can this task be completed? **(2020 O/L)**

06. It has been estimated that 12 employees will take 7 days to produce a stock of cosmetics. If twice the quantity of this stock needs to be produced in 8 days due to an urgent order, how many additional employees must be engaged? **(2021 O/L)**

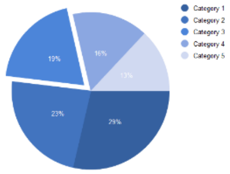
07. It has been estimated that 12 men need four days to complete a certain task. How many men are needed to complete this task in three days? **(2022 O/L)**

Grade 10

Mathematics

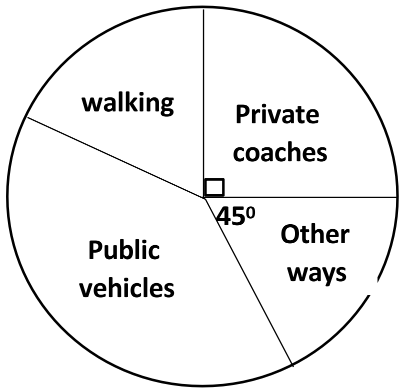
Unit – 11

11. Data Representation



01. The following table and pie chart provide information on how the teachers of a certain Maha Vidyalaya travel to school.

Mode of transport	Number of teachers
Public vehicles	110
Private coaches	a
Walking	_
Other ways	_



i. If the total number of teachers in the school is 240, find the value of a.

ii. What is the magnitude of the angle at the center of the sector which denotes public vehicles?

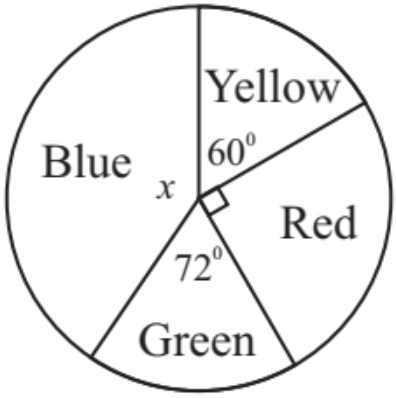
iii. Fill in the blanks of the table.

iv. What is the angle at the center which denotes the amount of the teachers by walking?

v. 60% of the teachers are women. How many male teachers are there in the school?

02. In a certain school, for a inter house meet, the houses were divided according to colours. While conducting the games marks were calculated until a certain day. Using the above results, the pie chart drawn by a student is given below.

i) Find the angle of the sector relevant to the 'Blue'House.

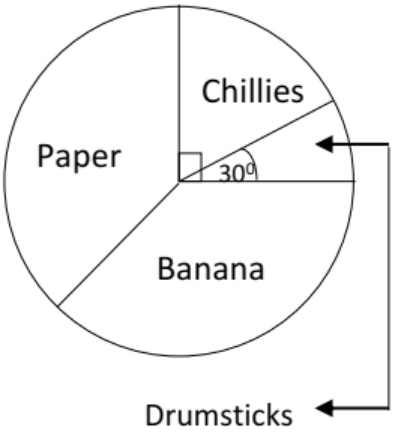


ii). If the marks obtained by 'Red'house was 180, find the total marks obtained by four houses.

iii) Write the marks obtained by the 'Green'house as a percentage of total marks.

iv) The marks obtained by all the events conducted only in the next day is 180. If on that day all games were won by only 'Blue' and 'Red' houses, find the angle of the sector relevant to the 'Yellow' houses at the end of this day.

03. The following pie – chart illustrates the information on the types of crops cultivated by 300 farmers.



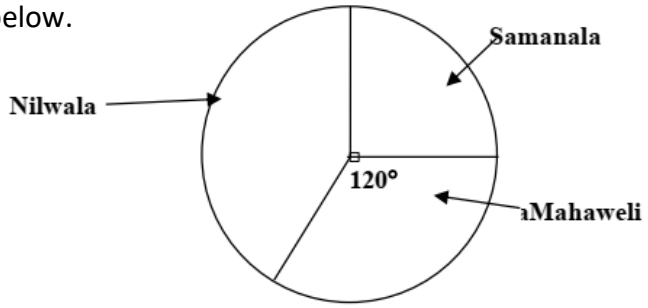
i. How many farmers were cultivated chilies?

ii. Number of farmers who cultivated banana is four times of farmers who cultivated drumsticks. Find the number of farmers who cultivate banana.

iii. What is the magnitude of the angle at the center of the sector which cultivate paper.

iv. If $\frac{1}{3}$ of, farmers who are cultivating paper shifted to crop chilies, find the magnitude of the angle at the center of the which represents the farmers growing chilies

04. A pie chart showing the information about the number of marks obtained by each house in the inter house sports meet of a certain school is given below.



(i) Which is the angle of the sector that shows the number of marks of the Nilwala house.

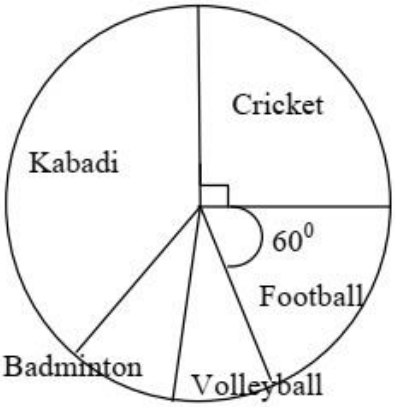
(ii) If the number of marks scored by the Samanala house is 336 what is the number of marks obtained by the winning house.

(iii) If $\frac{1}{4}$ of the marks of Mahaweli house and $\frac{1}{3}$ of the marks of Samanala house are obtained by team events, find a relation between the number of marks of team events of the two houses.

(iv) Because of an error happened in entering marks into mark sheets, 56 marks of Samanala house is added to the marks of Nilwala house marks. After correcting it the pie chart is to be changed. An incomplete table prepared to draw the new pie chart is given below. Complete the blanks of it with suitable values

	Samanala	Nilwala	Mahaweli
Center angle	.....	.....	120°
Total Marks	.....	504	448

05. A survey between 900 secondary students of our school about the game they like , given below



i) How many students like cricket

ii) If 275 students like kabadi, find the magnitude of angle at the center of the sector that denote kabadi in the above diagram.

iii) If the number of students who like volley ball and badminton are equal, find the angle at the center of the sector which denote badminton.

iv)How many students like to play volleyball

v) What is the ratio between the students who play kabadi and football, write the ratio in simplest form.

06. The information about the students who sat for mathematics paper for G.C.E O/L is given below.

- 540 students sat for the exam.
- 216 students obtained A passes.
- 96 students obtained B passes.
- 156 students obtained C passes.
- Others obtained S passes. None of them failed

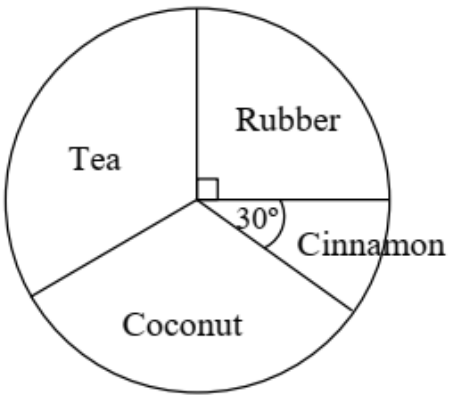
(i) Find the angle allocated for one student when representing data in a pie chart.

(ii) What are the angles allocated to represent the number of students in each category?

(iii) Indicate this data correctly in a pie chart using a protector.

(iv) If 6 students who failed, were categorized mistakenly as S passes. What is the angle allocated for them.

07. The given pie chart represents the information gathered from an agricultural organization, regarding 300 farmers.



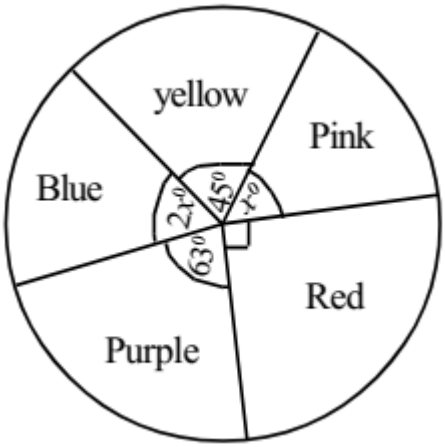
i. How many farmers grow rubber?

ii. If the number of farmers who grow coconut is four times the number of farmers who grow cinnamon, how many farmers grow coconut?

iii. What is the angle of the sector which represents the farmers who grow tea?

iv. If $\frac{1}{3}$ of the farmers who grow rubber decided to remove rubber and cultivate cinnamon, what is the angle of the sector which represents the farmers who grow cinnamon now?

08. The following pie chart represents the information about the favorite color of a group of grade 10 students in a certain school.



i. Find the angle of the sector which represents the students who like to blue colour.

ii. If the number of students like to yellow colour is 05, find the total number of students in grade 10 class.

iii. Find the ratio between the number of students who like to purple colour and rose colour.

iv. If two new students are joined to this class and they like to yellow colour, find the angle of the sector relevant for the yellow colour of the newly drawn pie chart including the two new students.

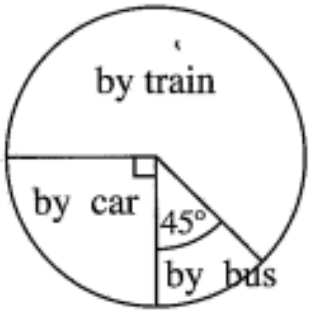
❖ Data representation and interpretation

(2019 O/L)

01. The students in a certain school who study the subjects Art, Dancing and Music are represented by the pie chart. If the number of students who study Music is 45, how many students study Dancing?

02. The three ways in which the employees arrive at an institute are shown in this pie chart. What multiple of the number of employees who arrive by bus, is the number of employees who arrive at the institute by train?

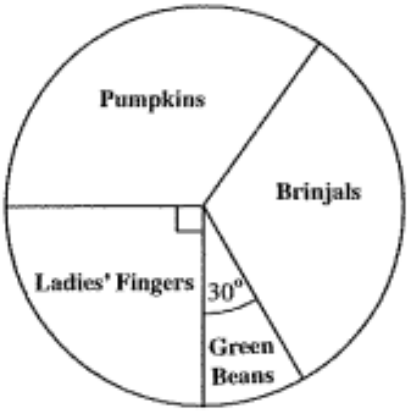
(2022 O/L)



Structured (Part B)

(2016 O/L)

01. The pie chart given in the figure shows how a certain group of farmers selected various types of vegetables for growing. Each farmer grew only one type of vegetable.



The number of farmers who selected pumpkins is equal to the number of farmers who selected brinjals.

i. Find the magnitude of the angle at the Centre of the sector that represents the farmers who selected brinjals.

The number of farmers who selected green beans is 15.

ii. Find the number of farmers who selected pumpkins.

iii. Find the total number of farmers represented in this pie chart.

After one year, 20 farmers who had been growing brinjals stopped growing vegetables.

iv. Find the magnitude of the angle at the centre of the sector which represents the farmers growing brinjals, in a new pie chart drawn considering the changed data.

(2017 O/L)

02. Each student in grade 6 of a certain school had to select exactly one of the three subjects Art, Dancing and Music as the aesthetic subject. How the students selected these subjects is given below.

Pie chart depicting how the students selected the aesthetic subjects

The number of students who selected Dancing is three times the number of students who selected Art and the number of students who selected Music is five times the number of students who selected Art.

i. Write the number of students who selected Art as a fraction of the total number of students.

ii. Calculate the magnitudes of the angles at the centers of the sectors corresponding to the three subjects, and write them on the relevant dotted lines in the given pie chart.

Pie chart depicting how the students selected the aesthetic subjects

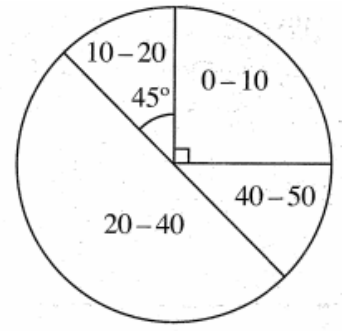
iii. If the number of students who selected Art is 30, find the total number of students in grade 6 of this school.

After two weeks, 15 of the students who had selected Music, changed their subject to Art.

iv. Find the angle at the center of the sector corresponding to the subject Art, in a new pie chart consisting of all three subjects, that is drawn based on the changed data.

03. The figure shows a pie chart indicating the intervals which contain the marks that a group of students in a class obtained from a total of 50, for a mathematics test. **(2021 O/L)**

i. The number of students who obtained marks in the intervals 10-20 and 40-50 are equal.



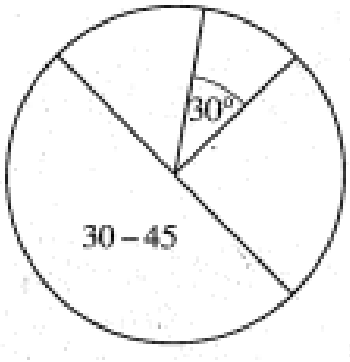
Interval of Marks	Number of Students
0 – 10	6
10 – 20	
20 – 40	
40 – 50	

ii. Find the magnitude of the central angle of the sector that represents the students who obtained marks in the interval 20-40.

iii. If 6 students have obtained marks in the interval 0-10, fill in the blanks in the given table.

---

04. An incomplete portion of the frequency table that was used to draw the cumulative frequency curve and an incomplete pie chart drawn using it are given below. Each sector of the pie chart represents the relevant number of students. **(2023 O/L)**



Interval of Marks	Number of Students
0 – 15	10
15 – 30	30
30 – 45	.....
45 – 60	20
	120

(In the table, the interval 15 – 30 denotes more than 15 and less than or equal to 30.)

i. Fill in the blanks in the table

ii. Which interval of marks is represented by the sector in the pie chart with a central angle of 30°?

iii. Find the central angle of the sector that represents the interval 45 – 60

12. Least Common Multiple of Algebraic Expressions

01. Find the least common multiple of each of the following triples, by writing each number as a product of its prime factors.

i. 8 , 10 , 16 ii. 24 , 36 , 45 iii. 15 , 20 , 60

iv. 100 , 125 , 300 v. 150 , 200 , 300 vi. 250 , 300 , 600

02. Three alarm clocks ring at intervals of 20 minutes, 25 minutes, and 30 minutes. If they ring together at 7:00 AM, at what time will they next ring together?

03. Three traffic lights change at intervals of 30 seconds, 45 seconds, and 60 seconds. If they all change at the same time now, after how many minutes will they change together again?

04. Three buses leave a station at intervals of 15 minutes, 20 minutes, and 25 minutes. If they all leave together at 6:00 AM, when will they next depart together?

05. Three water tanks are refilled at intervals of 8 hours, 12 hours, and 16 hours. If they were last refilled together at 6:00 AM, when will they be refilled together again?

06. Three pendulums swing at intervals of 6 seconds, 8 seconds, and 12 seconds. If they start swinging together now, after how many seconds will they swing together again?

07. Three trains blow their whistles every 9 minutes, 15 minutes, and 21 minutes. If they whistle together at 5:00 AM, at what time will they next whistle together?

08. Three employees take breaks at intervals of 45 minutes, 60 minutes, and 90 minutes. If they all take a break at 9:00 AM, when will they next take a break together?

09. For each of the following parts, find the LCM of the given terms.

i. xy , xy^2

ii. a^2 , a^2b^2

iii. $3mn^2$, m^2n^2

iv. a^2b , a^2b^2 , ab^2

v. $8x^2y^2$, $12xy^2$

vi. $6p^2q^2$, $12pq^2$, $20p^2q$

10. For each of the following parts, find the LCM of the given terms.

i. $2m^2n\ ,8mn^2\ ,20m^2n^2$

ii. $4x^2y^2\ ,16x^2y\ ,30xy^2$

iii. $8p^2q\ ,20pq^2\ ,30p^2q^2$

iv. $24ab\ ,48a^2b^2\ ,90ab^2$

11. Find the LCM of the algebraic expressions in each of the following parts

i. $4x-12\ ,2x+18$

ii. $6a+18\ ,12a-24$

iii. $m-5\ ,16+4m$

iv. $10(a+b), 25(a+b)^2$

v. $5m\,, 10(m-4), 15(m+4)$

vi. $p^2\,, (p-q), 2(q-p)$

vii. $3(x+y), 4(x-y), 5(y-x)(x-y)$

viii. $8a\,, 16(a+b), 32(a+b)^2$

ix. $3a^2, 3a(a-b), 9(b-a)^2$

x. $2x-8\,, 5x(x-3), 8(3-x)^2$

xi. $2(p+2)\,, 6(p-3), 12p(3-p)$

xii. $8m^2\,, m(m-2)^2\,, 3(2-m)$

xiii. $8a+16\,, 8a(a-b)^2, 4(b-a)(b+a)$

xiv. $6(x+y), (x-y)^2, (y-x)^2$

12. Find the LCM of the following algebraic expressions

i. $2x + 10\ , (x^2 - 25)$

ii. $5(x - 2), 3x(x^2 - 1)$

iii. $6a - 18\ , 2a(a - 1), (a^2 - 1)$

iv. $(a^2 - b^2)\ , (a - b), 3(a + b)$

v. $p(p - 4), pq^2(p^2 - 16)\ , p^2(p + 4)$

vi. $x^2 - 1\,, 3x + 3\,, (x-1)^2$

vii. $m^2 - 4\,, m^2 - 2m\,, (m+2)^2$

viii. $a^2 + 5a + 6\,, 3(a+3), 2(a+2)$

ix. $x^2 - 4x - 45\,, x^2 + 9x + 20$

x. $3y^2 - 5y - 2\,, 3y^2 - 2y - 1$

xi. $m^2 + 6m + 9\,, m^2 - 3m\,, m^2 - 9$

xii. $x^2 - 2ax + a^2\,, x^2 - a^2\,, x^2 - ax$

xiii. $2n^2 + 7n + 3\,, 3n^2 - 27\,, (n^2 - 9)$

xiv. $p^3 - 4p\,, p^2 - 5p + 6\,, p^2 + 4p + 4$

xv. $2x^2 - 5x - 7\,, 2x^2 - x - 21\,, x^2 + 4x + 3$

xvi. $2y^2 - 200\,, (y - 10)(y - 5), 2y^2 - 11y + 5$

❖ Least common multiple of algebraic expressions

01. Find the least common multiple of the two algebraic expressions xy and x^2. **(2016 O/L)**

02. Find the least common multiple of the two algebraic expressions 2xy and $4y^2$ **(2017 O/L)**

03. Find the least common multiple of the follow three algebraic terms: $3x^2$, 6xy, 2y **(2019 O/L)**

04. Find the least common multiple of the following expressions. 3x, 2xy, $4y^2$ **(2020 O/L)**

05. Find the least common multiple: $4x^2$ y, 6xy, $3y^2$ **(2021 O/L)**

06. Find the least common multiple of the following algebraic terms. $3x^2$, $9x^2$ y, $12xy^2$ **(2022 O/L)**

07. Find the least common multiple of the following algebraic terms. 8xy , $2xy^2$, 2y **(2023 O/L)**

08. Find the least common multiple of the following algebraic terms. $6x^2$, 5xy, $2y^2$ **(2024 O/L)**