Grade 09

Name : .....

06. Factors of Algebraic expression.

(01) Factorise.

(i) $2k - 12$

(ii) $3x^2 - 5xy$

(iii) $2ab - 8a + 4a^2$

(iv) $5x^2 - 15xy - 20xy^2$

(v) $30y^2 - 6y - 6$

(vi) $8c^2 - 6cd + 2c$

(vii) $12a^3 - 36a^2b - 24ab^2$

(viii) $6p - 24p^2 + 30p^3$

(02) Find the Factors.

(i) $ab + ac + 2b + 2c$

(ii) $p^2 - pq + 3pr - 3qr$

(iii) $ax - ay - bx + by$

(iv) $pr + pt - qr - qt$

(v) $2pq + 6ps - 5q - 15s$

(vi) $x^2 + 2xy - 3x - 6y$

(vii) $2ab - 2ac + b - c$

(viii) $x^2 - 3xy - 6x + 18y$

(ix) $4 - 4a + c - ac$

(x) $k - kl - l + l^2$

(03) Write as a product of two factors.

(i) $a^2 + 8a + 12$

(ii) $y^2 + 3y - 18$

(iii) $p^2 - 3p - 40$

(iv) $q^2 - 11q + 24$

(v) $r^2 - r - 30$

(vi) $l^2 - 19l + 18$

(vii) $s^2 + 3s - 70$

(viii) $c^2 + 9c + 20$

(ix) $36 + 15k + k^2$

(x) $16 + 6x - x^2$

(xi) $30 - 7c - c^2$

(xii) $45 - 18y + y^2$

(xiii) $24 + 23x - x^2$

(xiv) $42 - 11z - z^2$

(xv) $54 + 15d - d^2$

(xvi) $54 - 15f + f^2$

(xvii) $3x^2 - 24x + 36$ (xviii) $45 + 30y + 5y^2$

(xix) $72 - z - z^2$ (xx) $48 - 14g + g^2$

(04) Factorise.

(i) $y^2 - 9$ (ii) $p^2 - 36$ (iii) $25 - a^2$

(iv) $4 - 9k^2$ (v) $4x^2 - 36y^2$ (vi) $a^2b^2 - 1$

(vii) $18c^2 - 2$ (viii) $4z^2 - 100$ (ix) $125k^2 - 5$

(x) $27d^2 - 48$ (xi) $3x^3 - 243x$ (xii) $5m^2 - 3125n^2$

(05) Find the factors.

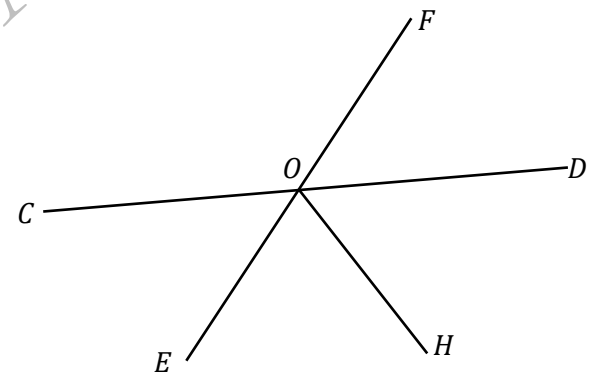
(i) $px^2 - 1 - x^2 + p$ (ii) $4 - k^2 - 3k$

(iii) $ax - by + ay - bx$ (iv) $3y - 28 + y^2$

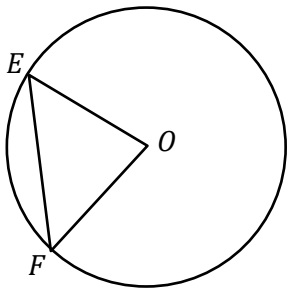
(v) $x^3 + 2 + 2x^2 + x$ (vi) $x^3 + 1 + x^2 + x$

07. Axioms.

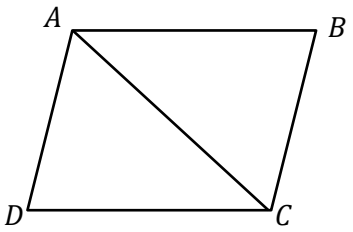
(01) The straight lines CD and EF intersect at O.
If $F\hat{O}D = D\hat{O}H$ and $C\hat{O}E = 70°$, Find the magnitude of $D\hat{O}H$.



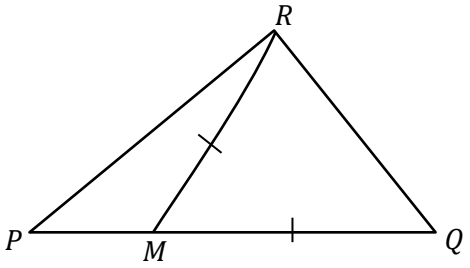
02) The point E and F are located on the circle with centre O such that $OE = EF$. Based on its sides, mention what type of triangle is EFO.



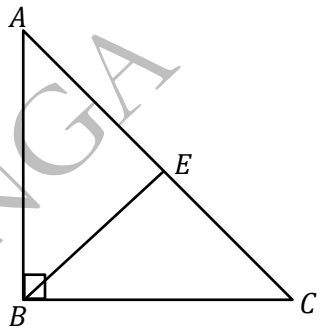
03) In the parallelogram $ABCD, AB = AC$ and $AB = AD$. Based on its sides, mention what type of triangle is ADC .



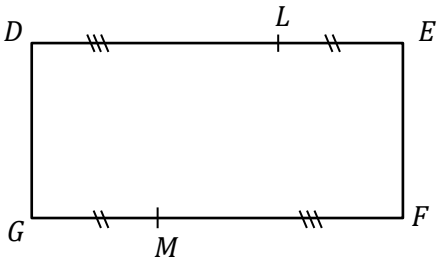
04) The point M is located on the side PQ of triangle PQR such that $MR = MQ$. Show that $PQ = MR + MP$.



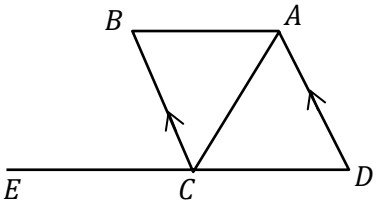
05) The point E is on side BC of triangle ABC . If $A\hat{E}B = B\hat{C}E$ and $B\hat{E}C = B\hat{A}E$. Show that $B\hat{A}E + B\hat{C}E = A\hat{B}C$.



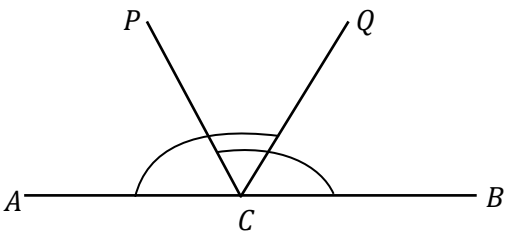
06) The point L and M are located on sides DE and FG respectively of the quadrilateral $DEFG$, such that $DL = MF$ and $EL = GM$.
Show that $DE = GF$.



07) In the quadrilateral $ABCD$ in the figure, $BC//AD$.
If $B\hat{A}D = A\hat{C}E$ and $D\hat{A}C = B\hat{C}E$,
Show that $B\hat{A}C = B\hat{C}E$.



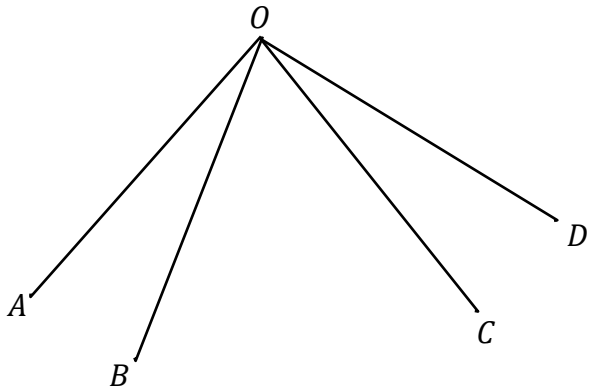
08) The point C is located on the line AB. If $A\hat{C}Q = B\hat{C}P$,
Show that $A\hat{C}P = B\hat{C}Q$.



09) In the figure given here $A\hat{O}C = B\hat{O}D$. If $A\hat{O}D = 100°$ and $A\hat{O}B = 20°$,

(i) Find the magnitude of $C\hat{O}D$.

(ii) Find the magnitude of $B\hat{O}C$.

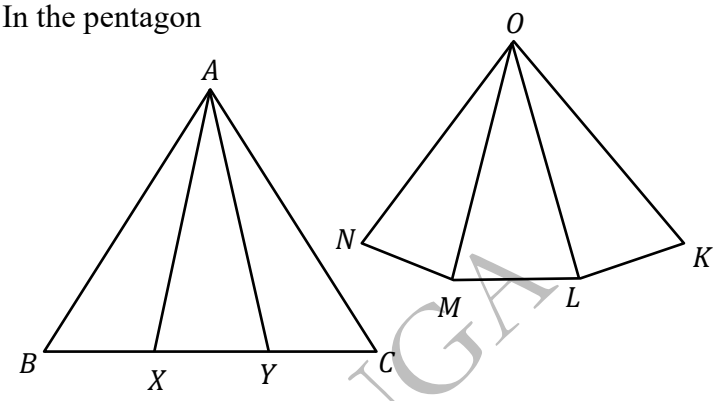


(10) In the triangle $ABC, B\hat{A}X = X\hat{A}Y = C\hat{A}Y$. In the pentagon $KLMNO, M\hat{O}N = L\hat{O}M = K\hat{O}L$.

If $B\hat{A}C = K\hat{O}N$,

(i) Show that $X\hat{A}Y = M\hat{O}L$.

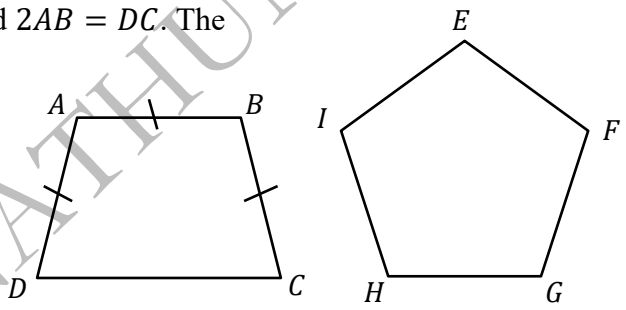
(ii) If $X\hat{A}Y = 30°$, determine the magnitude of $K\hat{O}N$.



(11) In the quadrilateral $ABCD$, $AB = AD = BC$ and $2AB = DC$. The perimeter of the regular pentagon $EFGHI$ is equal to that of the quadrilateral $ABCD$.

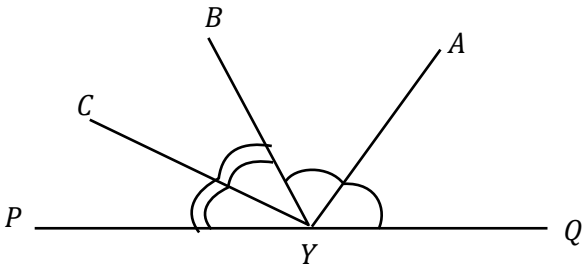
(i) Find the relationship between AB and EF.

(ii) If $EF = 6\ cm$, find the perimeter of the quadrilateral $ABCD$.



(12) The point Y lies on the straight line PQ .

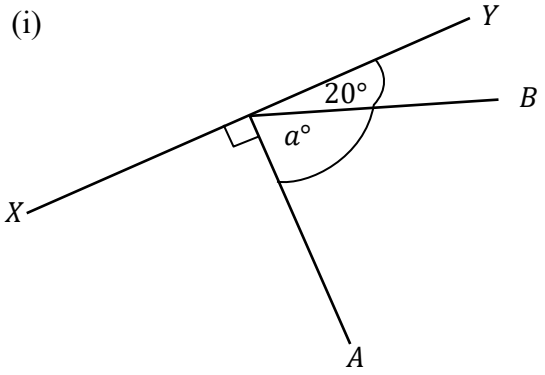
$Q\hat{Y}A = A\hat{Y}B$ and $B\hat{Y}C = C\hat{Y}P$. Determine the magnitude of $A\hat{Y}C$.



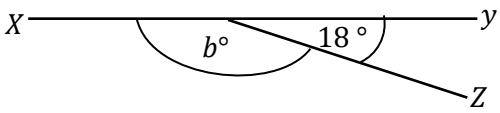
08. Angles related to straight lines and parallel lines.

(01) In each of the following figures, XY is a straight line. Based on the information in each figure, find the value of the angle denoted by the lower-case letter.

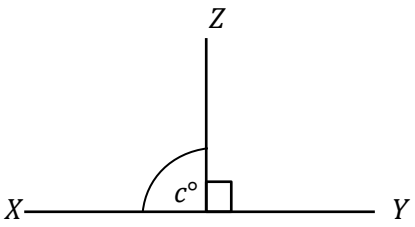
(i)



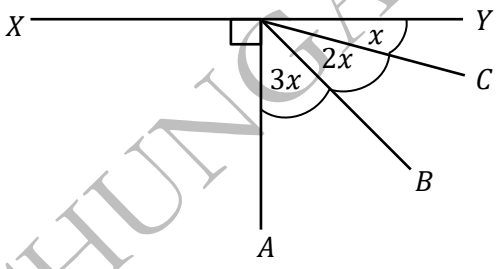
(ii)



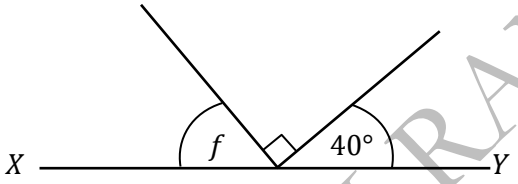
(iii)



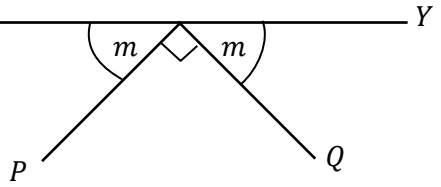
(iv)



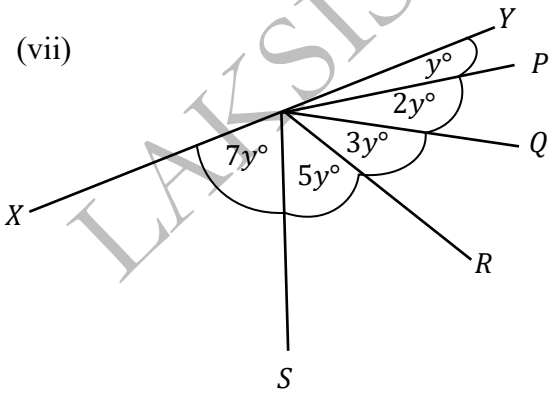
(v)



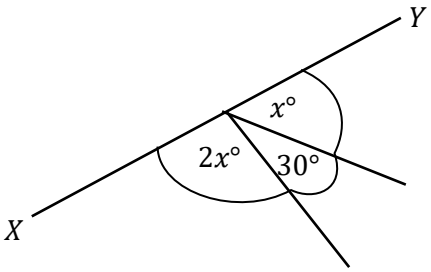
(vi)



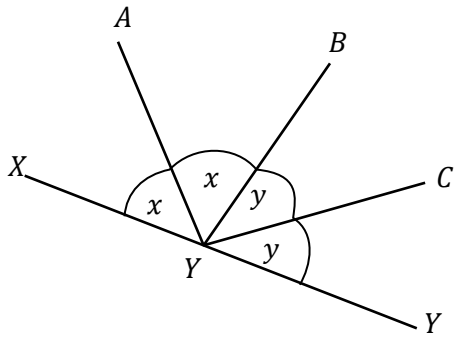
(vii)



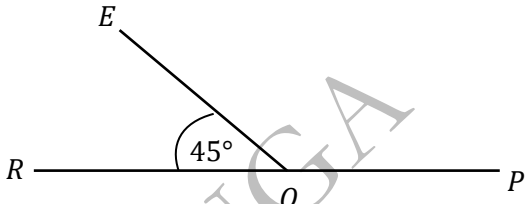
(viii)



(02) In the figure, XYZ is a straight line. Based on the information given in the figure, show that $A\hat{Y}C$ is a right angle.



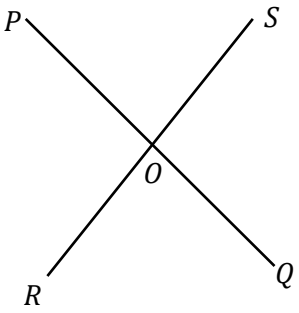
(03) In the figure, PQR is a straight line. If $E\hat{Q}R = 45°$, Show that the magnitude of $P\hat{Q}E$ is three times the magnitude of $E\hat{Q}R$.



(04) In the figure , the straight lines PQ and RS intersect each other at O.

(i) If $P\hat{O}R = 100°$, Find the magnitude of $S\hat{O}Q$.

(ii) Name an angle which is equal in magnitude to $R\hat{O}Q$.

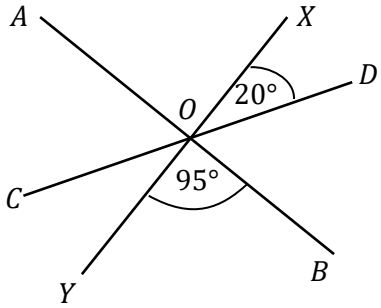


(05) In the figure, the straight lines AB, CD and XY interact at O. Based on the information provided in the figure, Find the magnitude of each of the following angles.

(i) $C\hat{O}Y$

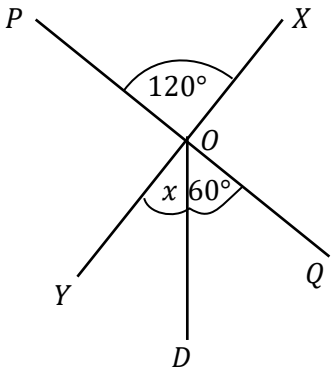
(ii) $A\hat{O}X$

(iii) $A\hat{O}C$

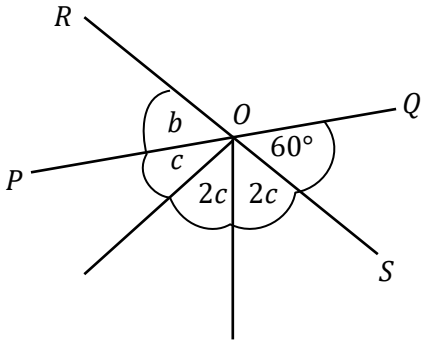


(06) based on the information given in each of the figures shown below, find the value of each English letter representing an angle.

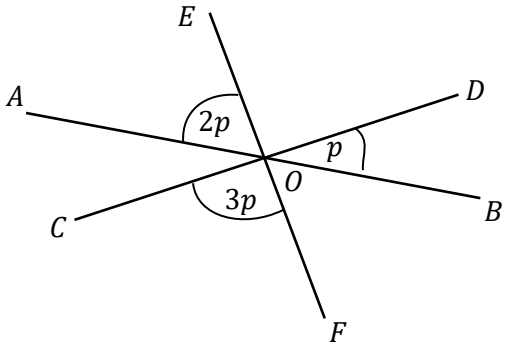
- In the figure, XY and PQ are straight line



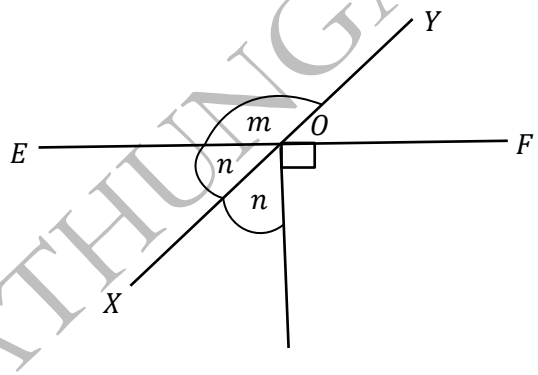
- In the figure, RS and PQ are straight line



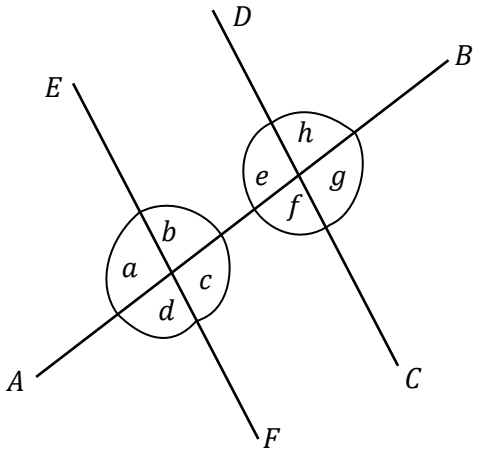
- In the figure, the straight lines AB , CD and EF intersect at O.



- In the figure, XY and EF are straight line



(07) Consider the figure given below of two straight lines intersected by a transversal. Its angles are indicated by lowercase English letters.



(i) Name the line which can be considered as the transversal.

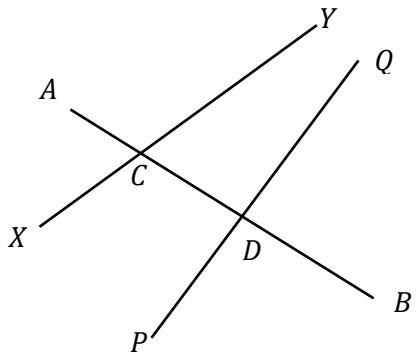
(ii) Name the two straight lines which are intersected by the transversal.

(iii) One pair of corresponding angles is the pair of angles b and f . Write the other pairs of corresponding angles in a similar manner.

(iv) Write the two pair of alternate angles in terms of the lower case English letters.

(v) Write the two pairs of allied angles in terms of the lower case English letters.

(08) Answer the questions given below in relation to the given figure of two straight lines intersected by a transversal.



(i) Name the angle which together with $P\hat{D}B$ forms a pair of corresponding angles.

(ii) Name the angle which together $Y\hat{C}D$ forms the following,

a) Pair of allied angles.

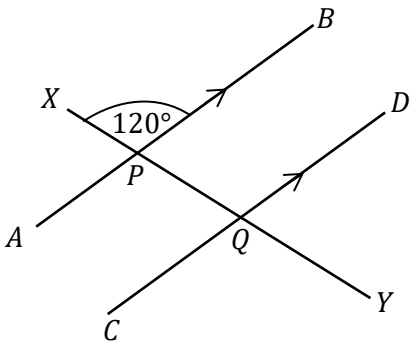
b) Pair of alternate angles.

c) Pair of corresponding angles.

(iii) What type of angle is the pair $Q\hat{D}B$ and $Y\hat{C}D$?

(iv) What type of angle is the pair $X\hat{C}D$ and $C\hat{D}P$?

(09) In the figure $AB//CD$. If $X\hat{P}B = 120°$, find the magnitude of each of the following angles.

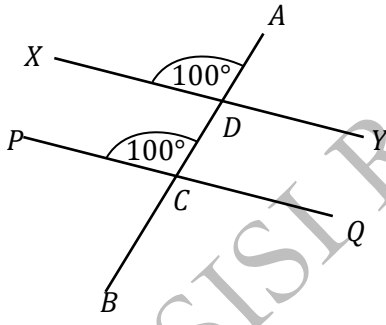


(i) $D\hat{Q}Y$ (ii) $P\hat{Q}C$

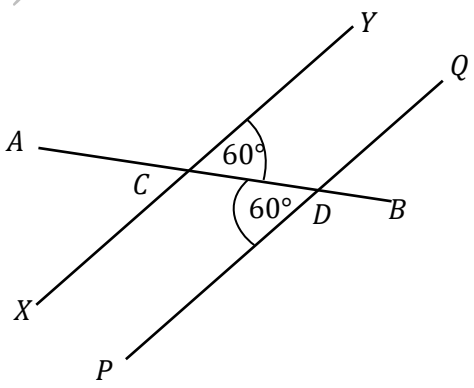
(iii) $A\hat{P}Q$ (iv) $D\hat{Q}Y$

(10) Based on the information in each of the following figures, giving reasons, state whether $XY//PQ$.

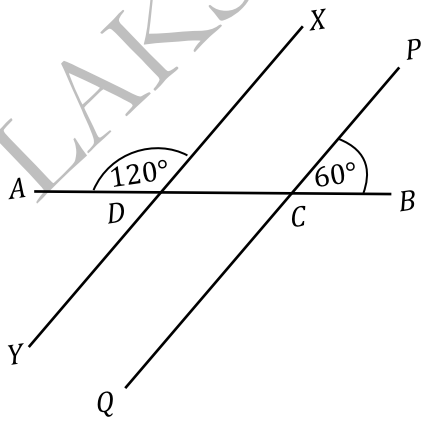
(i)



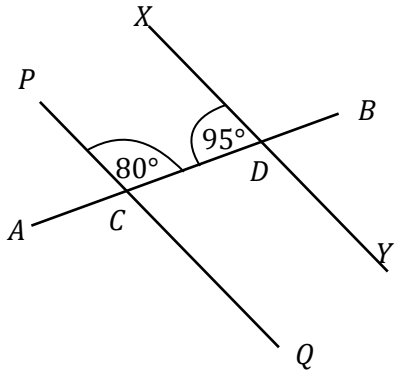
(ii)



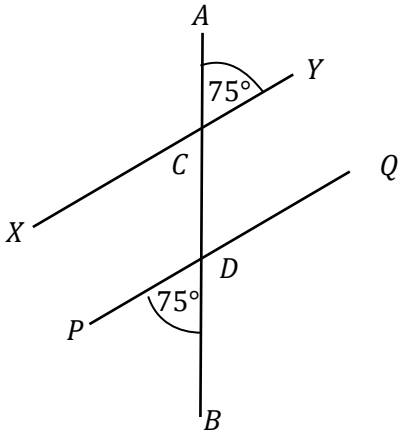
(iii)



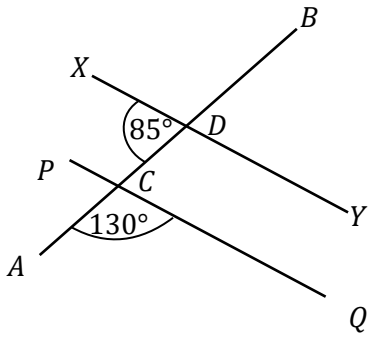
(iv)



(v)

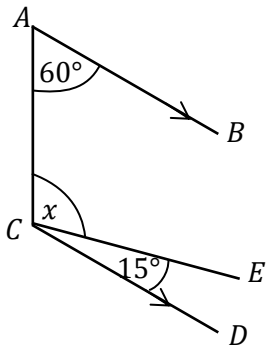


(vi)

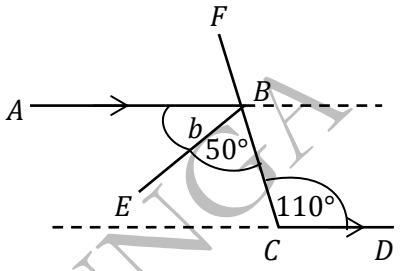


(11) Find the value of each angle denoted by a lower case English letter in the figures given below.

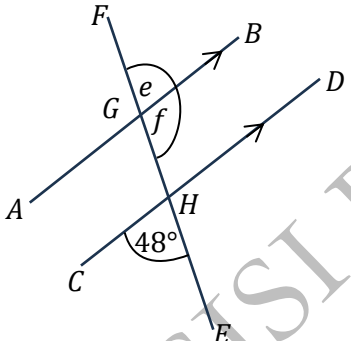
(i)



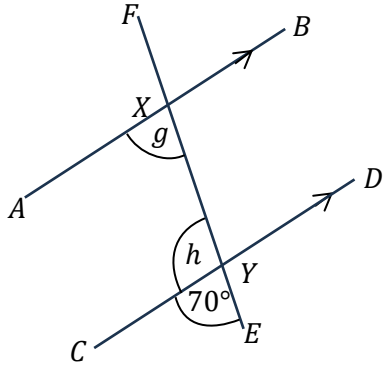
(ii)



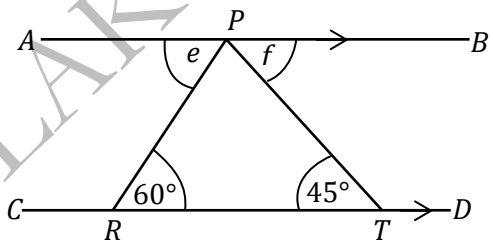
(iii)



(iv)

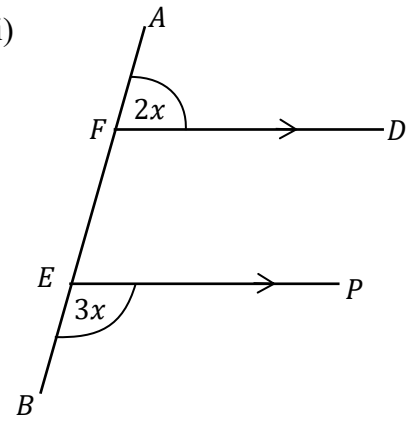


(v)

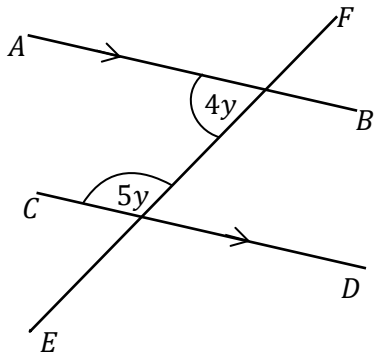


(12) Find the magnitude of each of the angles denoted using lowercase English letters in the following figures.

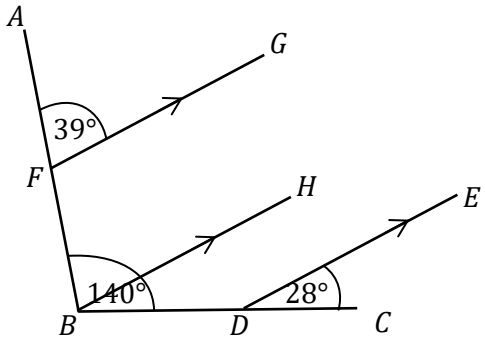
(i)



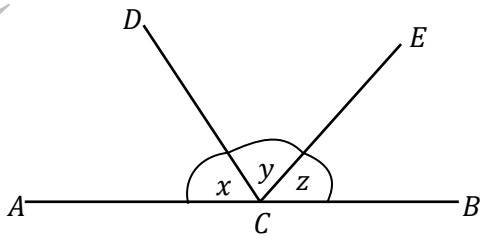
(ii)



(iii)



(13) In the figure $x, y,$ and z denoted the magnitude of the relevant angles. If $x + z = y$, Find the value of y.

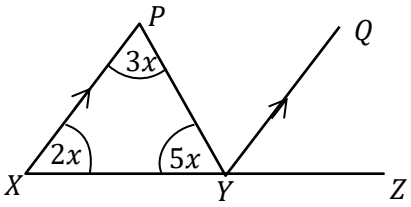


(14) Based on the information in the figure,

(i) Write the values of $Z\hat{Y}Q$ and $P\hat{Y}Q$ in terms of x.

(ii) Find the value of x.

(iii) Find the magnitude of each angle in the triangle.



09. Liquid Measurements.

(01) Join each of the volume in box A with the volume in box B which is equal to it.

A
2000 cm^3
500 cm^3
15000 cm^3
250cm^3
7500 cm^3
50 cm^3

B
15 l
50 ml
2 l
500 ml
250 ml
7.5 l

(02) The dimensions (in cm) of several cuboid shaped containers are given in the following table. Complete this table.

Length	Width	Height	Capacity		
			cm^3	ml	l
22	11	6			
45	22	11			
36	14	9			
52	34	13			
40	35	25			
25	20	18			

(03) A cuboid shaped container has a square base of area 400 cm^2 . An amount of 4.8 l of water has been filled in to this container.

(i) Find the height of the water in the container.

(ii) If the height of the container is 24 cm, show that the water is filled to $\frac{2}{5}$ of its capacity.

(04) A cuboid shaped tank of base area 300 cm^2 is filled up to a height of 15 cm with water. Find the volume of water in the tank in,

(i) Cubic Centimetres

(ii) Mililiters

(iii) Litres

(05) Show that a barrel of capacity 20 l can be filled completely by pouring water 20 times using a completely filled cube shaped container of side length 10 cm.

(06) Complete the table.

Length(m)	Width(m)	Height(m)	The capacity of the tank	
			m^3	l
1	1	0.5	……..	……..
1	……..	1	2.5	……..
2.5	3	1	……..	……..
4	5	2	……..	……..
4	1	……..	8	……..
1	0.5	0.5	……..	……..

(07) The length, width and depth of a swimming pool are 50 m, 30 m and 3.5 m respectively.

(i) Find the capacity of the swimming pool.

(ii) If the swimming pool is filled with water up to a height of 1.8 m, what is the volume of water in the swimming pool in litres?

(iii) How much more water is required to fill the swimming pool completely?

(08) A bowser of capasity 7.2 m^3 is filled completely with oil. This bowser is supposed to distribute 900 l of oil each to 8 filling stations. Is the oil in the bowser sufficient for all 8 filling stations? Give reasons for your answer.

(09) A person requires on average 120 l of water daily. If a cuboid shaped tank of length 2 m, width 1.5 m and height 1 m is completely filled with water, for how many people in total will this quantity of water be sufficient for a day?

(10) The length of an interior side of a cube shaped tank is 1.2 m. The tank is completely filled with water. When a tap from which the water flows out at a constant rate of 60 l per minute, Find how long after the tap is opened the tank becomes empty , if the water flows out at this constant rate.

10. Direct proportion.

(01) Are the two quantities in each of the following situations directly proportional or not?

(i) The number of metres of cloth and its value.

(ii) The number of days a daily paid employee works and the salary that should be paid.

(iii) The area and the length of a side of a square.

(iv) The number of boxes of coloured pencil of the same brand and the number of pencils in the boxes.

(v) The time taken to pay an amount of money borrowed at a certain rate of interest and the interest that has to be paid.

(vi) The speed of a motor vehicle and the time taken to cover a certain distance.

(vii) The number of persons engaged in a certain job of work and the time taken to complete it.

Solve the following problems using the unitary method.

(02) The price of 3 m of shirting is Rs 675. Find the price of 5 m of shirting of the same kind.

(03) A motor vehicle travels a distance of 48 km with 4 litres of petrol. Find the distance it will travel with 10 litres of petrol.

(04) If a motorcycle travelling at a uniform speed covers a distance of 1.5 km in 5 minutes, find the distance it covers in 12 minutes.

(05) If the price of a bag of 25 apples is Rs 300, what is the price of 10 apples of the same kind?

(06) If a discount of Rs 40 is given for an item, the marked price of which is Rs 500, what is the discount that will be given for an item, whose marked price is Rs 750?

(07) The weight of a steel rod of length 6 m is 1.08 kg. Find the weight of a steel rod of the same brand of length 5 m.

(08) A train takes 24 minutes to travel 32 km. Find the speed of the train in kilometres per hour.

(09) A train covers 96 km in one hour. Find the time the train takes to travel 288 km.

(10) A motor vehicle travels 120 km in 12 hours. What is its speed in kilometres per hour?

Solve the following problems applying direct proportions.

(11) If the wages for 8 masons for one day is Rs 4 800, what will be the wages for 5 masons for one day?

(12) An article is bought for Rs 400 and is sold keeping a profit of 12% .What is its selling price?

(13) By selling an article for Rs 565 , a trader makes a profit of 13%. What is its cost price?

(14) The monthly instalment for a loan of Rs 36000 obtained from a bank at 12% simple interest to be paid in 3 years is Rs 1 360. If from the same bank for the same simple annual interest rate another loan of Rs 108 000 is obtained to be paid in 3 years, what will be the value of an instalment?

(15) The weight of 16 cm^3 of' a metal is 24 g. Find the weight of 20 cm^3 of' the same metal.

(16) When the height of the mast of a ship is 12 m, the height of the mast of a model of the ship made to a scale is 9 cm. Accordingly, if the length of the ship is 24 m, find the length of the model of the ship.

(17) The spring of a spring balance extends to a length of 2.6 cm when a weight of 8 Newtons is upheld. Find the length to which the spring extends when the weight is 3.6 Newtons.

(18) A machine in a factory which produces aerated water can fill 840 bottles in 6 hours. If the machine operates for 5 hours, find the number of bottles that will be filled with aerated water.

(19) When a weight of 5 kg is placed on a coil , it contracts by 25 mm. By how many 'mm' will the coil contracts, if a weight of 12.5 kg is placed on it?

(20) For each of the proportions given below, write the suitable value in the blank space.

(i) $5 : 3 = 40 :$ ... ...
(ii) $2 : 8 = 16 :$ ... ...
(iii) $4 : 5 =$ ... ... : 10
(iv) $8 :$ ... ... $= 24 : 15$
(v) $12 : 3 =$ ... ... : 9
(vi) $11 : 7 =$ ... ... : 21
(vii) $2 : 9 =$ ... ... : 27
(viii) $14 : 20 = 28 :$ ... ...

(21) Solve each problem given below using proportions.

(i) A car travels 300 km in 5 hours at a constant speed. Find the distance it travels in 3 hour.

(ii) A train moves at a constant speed and covers 480 km is 8 hours. Find how far it travels in 5 hours.

(iii) If a shop offer a 5% discount on an item worth Rs. 2000. Find the amount to be paid after the discount.

(iv) If the price of 5 pens is Rs. 250 , Find how many pens can be bought for Rs. 600.

(v) The price of 8 mangoes is Rs. 560 , Find the number of mangoes that can be bought for Rs. 980.

(vi) If 10 note books cost Rs. 1200 , Find the cost of 16 books.

(vii) If a commission of 12% is given when an item is sold, what is the commission give for an item worth R. 20 000 ?

(viii) The cost of 15 apples is Rs. 900. Find how many apples can be bought for Rs. 1680.

(ix) If the price of 20 kg of dhal is Rs. 2500, find the price of 6 kg of dhal.

(x) If the mass of 8 cm^3 of a certain type of metal is 64g, Find the mass of 13 cm^3 of this metal.

(22) If the monthly salary of a person working in Australia is 2200 Australian dollars, What is his salary in Sri Lanka rupess? (1 A:D: = 198 SL rupees)

(23) If the price of a mobile phone imported from Japan in 18000 yen, what is its valuein in Sri Lankan rupees? (1 J:Y: = 1.80 SL rupees)

(24) A university student studying in the United kingdom receives a monthly allowance of 1800 sterling pounds. How nuch is this amount in Sri Lankan rupees? (1S:P: = 400 SL rupees)

(25) A swimming equipments in a duty free shop is worth 750 euros. How many Sri Lankan rupees have to be paid to purchase it ? (1 euro = 352 SL rupees)

(26) How many singapore dollars are received when textiles worth Rs. 819 000 are exported from Sri Lanka to Singapore. (1 S:D: = 234 SL rupees)

(27) A tourist going to America exchanges 167 200 Sri Lankan rupees in to American dollars. How many American dollars does he receive? (1 A:D: = 304 SL rupees)