SEE MODEL QUESTION -2078

Compulsory Mathematics

Time: 3 hrs. **F.M.: 100**

सबै प्रश्नहरु समाधान गर्नुहोस् । Attempt all the questions.

Group- A **6×1 = 6**

1. (a) वार्षिक चक्रिय व्याजदरमा मिश्रधन निकाल्ने सुत्र लेख्नुहोस् ।

Write the formula for finding the compound amount compounded yearly.

(b) अर्धव्यास r से.मि. भएको गोलाको आयतन आयतन कति हुन्छ?

What is the volume of a spherical object having radius r cm?

2. (a) $\sqrt{2m+3}$ को अनुपातिक गुणनखण्ड के हुन्छ?

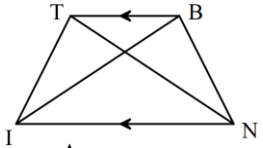
What is the rationalizing factor of $\sqrt{2m+3}$?

(b) निरन्तर श्रेणीमा मध्यक पत्ता लगाउने सुत्र लेख्नुहोस् ।

In a continuous data, write down the formula for finding the median.

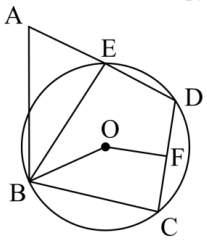
3. (a) दिईएको चित्रमा त्रिभुज BIT को क्षेत्रफलसँग बराबर हुने त्रिभुज कुन हो?

What triangle is equal in area to the triangle BIT in the given figure?



(b) दिइएको चित्रमा चक्रीय चतुर्भुज चिनेर नाम लेख्नुहोस् ।

Identify and name the cyclic quadrilateral from the given figure.



Group- B **17×2= 34**

4. (a) एउटा घरवालाले घरभाडा हरेक वर्ष 10% ले वृद्दि गर्ने गरी सम्झौता गर्दछ । यदि यो वर्ष सो घरको एउटा फ्ल्याटको भाडा रू. 16,000 भए 3 वर्षपछि सो फ्ल्याटको भाडा कति पुग्ला? पत्ता लगाउनुहोस् ।

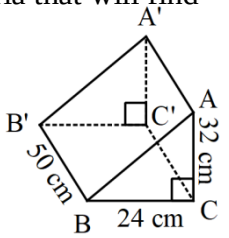
A house owner made an agreement to increase the house rent by 10% every year. If the rent of a flat of the house this year is Rs 16,000, what will be the rent of the flat after 3 years? Find it.

(b) एक व्यक्तिको संक्रमित घाउको बुधवार गरिएको ल्याव टेस्टमा जम्मा ब्याक्टेरिया सङ्ख्या 2.4×10^7 देखियो। यदि एन्टिबायटिक औषधीको सेवनबाट हरेक दिन ब्याक्टेरियाको सङ्ख्यामा 60% ले कमि आउँछ र वुधवार देखि नै औषधी सेवन गर्न थालियो भने शुक्रवारको ल्याब टेस्टमा सो घाउमा ब्याक्टेरियाको सङ्ख्या कति रहनेछ?

In a laboratory test of pus, the number of bacteria detected in the infected wound of a person on Wednesday is 2.4×10^7. If the antibiotic decreases the number of bacteria by 60% per day and it is started consuming since Wednesday, find the number of bacteria that will find in the laboratory test of coming Friday?

5. (a) दिइएको प्रिज्मको आयताकार सतहको क्षेत्रफल पत्ता लगाउनुहोस् ।

Find the area of rectangular faces of the given prism.



(b) सङ्गै दिइएको कराईको व्यास 21 से.मि. छ। यदि उक्त कराई पुर्ण रुपमा भैसीको दुधले भरिएको छ भने दुधको आयतन निकाल्नुहोस् ।

The diameter of the given hemispherical wok is 21 cm. what will be the volume of the milk when it is completely filled with buffalo milk?

(c) आधारको भुजाको लम्बाई 18 फिट र छड्के उचाई 15 फिट भएको आधार वर्गाकार भएको पिरामिड टेन्ट बनाउन कति वर्ग से.मि. कपडा चाहिएला? पत्ता लगाउनुहोस् ।
A tent in the shape of square based pyramid having base side 18 ft. and slant height 15 ft. is made with canvas. How much canvas is required to make tent?

6. (a) म.स. पत्ता लगाउनुहोस् । Find the H.C.F. of $4x^2 - 1$ and $8x^3 - 1$

(b) ल.स. पत्ता लगाउनुहोस् Find the L.C.M. of

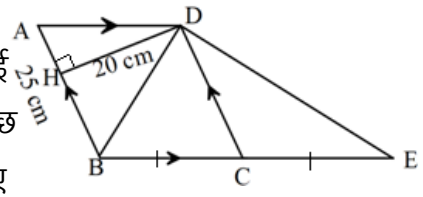
$$2a^3b + 4ab^2 + 2ab^2 \text{ and } 4a^2b + 4ab^2$$

7. (a) मान निकाल्नुहोस् । Evaluate: $\frac{9.2^{k+2} - 2^k}{2^{k+3} - 2^k}$

(b) सरल गर्नुहोस्। Simplify: $\frac{a^2 - a + 1}{a^2 - 1} + \frac{a^2 + 1}{a + 1}$

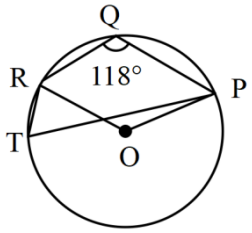
(c) सरल गर्नुहोस्। Simplify: $\frac{2}{x^2 - 1} + \frac{1}{x + 1}$

8. (a) दिइएको चित्रमा, ABCD एउटा समानान्तर चतुर्भुज हो जहाँ DH ⊥ AB छ र भुजा BC लाई BC = CE हुने गरी विन्दु E सम्म लम्ब्याइएको छ । यदि AB = 25 से.मि. र DH = 20 से.मि. भए ΔBED को क्षेत्रफल कति हुन्छ?

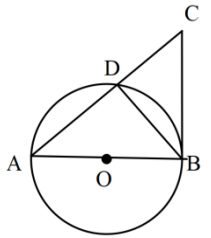


In the given figure, ABCD is a parallelogram in which DH ⊥ AB and side BC is produced to E so that BC = CE. If AB = 25 cm and DH = 20 cm, what is the area of ΔBED? Find it.

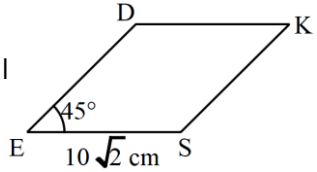
(b) दिइएको चित्रमा, O बृतको केन्द्रविन्दु हो । यदि ∠PQR = 118° भए ∠PTR र ∠POR का मान पत्ता लगाउनुहोस्।
In the given figure, O is the centre of circle. If ∠PQR = 118°, find the value of ∠PTR and ∠POR.



(c) दिइएको चित्रमा , O बृतको केन्द्रविन्दु र BC स्पर्शरिखा हो। यदि AB र BC का लम्बाई बराबर छन् भने ∠ABD को नाप पत्ता लगाउनुहोस्।
In the figure, O is centre of circle, BC is the tangent to the circle. If AB and BC are equal in length, find the measurement of ∠ABD.



9. (a) सँगैको समवाहु चतुर्भुज DESK को क्षेत्रफल निकाल्नुहोस्।
Find the area of adjoining rhombus DESK.



(b) एउटा वर्गिकृत श्रेणीमा, $\sum fm = 800 + 15p$, $N = 10 + p$ र मध्यक 20 भए p र N को मान निकाल्नुहोस्। In a continuous data $\sum fm = 800 + 15p$ and $N = 10 + p$ and mean is 20, find the value of p and N.

10. (a) 52 पत्ती भएको एक पाकेट तासबाट एउटा तास र 2 वटा राता र 3ओटा निला उत्रै र उस्तै गुच्चाहरू भएको एउटा झोलाबाट एउटा गुच्चा एकैसाथ थुल्दा निलो गुच्चा र राजा भएको तास आउने संभाव्यता निकाल्नुहोस् । A card is drawn at random from a pack of 52 cards and at the same time a marble is drawn at random from a bag containing 2 red marbles and 3 blue marbles of same shape and size. Find the probability of getting a blue marble and a king.

(b) 24 जना केटा र 16 जना केटी भएको एउटा कक्षाबाट गोलाप्रथाबाट दुई जना विद्यार्थीलाई कक्षाको क्याप्टेन र सहायक क्याप्टेन छान्दा केटा र केटी छानिने सम्भाव्यतालाई वृक्षचित्रमा देखाउनुहोस् । From a class having 24 boys and 16 girls, two students are selected randomly for the post of class captain and vice-captain. Show all the probabilities of being a boy and a girl on a tree diagram.

Group- C **10×4= 40**

11. एउटा क्लस्टरले संचालन गरेको एस.ई.ई. पूर्व-ल्याकत परीक्षामा, 20% विद्यार्थीले गणित विषयमा, 30% ले विज्ञान विषयमा र 40% ले अङ्ग्रेजी विषयमा A^+ ग्रेड प्राप्त गरे । त्यसैगरी, 13% ले गणित र विज्ञान विषयमा, 18% ले विज्ञान र अङ्ग्रेजी विषयमा, 15% ले अङ्ग्रेजी र गणित विषयमा र 10% ले यी तिनै विषयमा A^+ ग्रेड प्राप्त गरेको पाइयो । In the SEE Pre-Board examination conducted by a cluster it was found that, 20% students obtained A^+ grade in Mathematics, 30% in Science and 40% in English. Likewise, 13% students obtained A^+ grade in Mathematics and Science, 18% in Science and English, 15% in English and Mathematics and 10% in all three subjects.

(i) माथिको तथ्यलाई भेन-चित्रमा देखाउनुहोस् । Represent the above information in a Venn-diagram.

(ii) कति प्रतिशत विद्यार्थीले यी तिनै विषयमा A^+ ग्रेड प्राप्त गरेनन्? पत्ता लगाउनुहोस् । What percent of the students did not obtain A^+ grade in these three subjects? Find it.

12. कुनै धनको 2 वर्षको साधारण व्याज रू.1,600 र उहि धनको सोही समयावधि र व्याजदरले वार्षिक चक्रिय व्याज रू. 1,680 हुन्छ भने व्याजदर र उक्त धन पत्ता लगाउनुहोस् । The simple interest of a certain sum of money for 2 years is Rs 1,600 and the compound interest of the same sum at the same rate of interest for the same duration of times is Rs 1,680. Find the rate of interest and the sum.

13. एक जना जग्गा कारोवार गर्ने ब्यक्तिले भुजाहरूको नाप 50 मि., 85 मि. र 110 मि. भएको एउटा जग्गा बिक्रि गरेछ भने उक्त जग्गाको क्षेत्रफल पत्ता लगाउनुहोस् । 1 आना = 31.8 वर्ग मि. हुन्छ भने प्रति आना रू. 6,50,000 को दरले सो जग्गाको मूल्य कति हुन्छ? पत्ता लगाउनुहोस् । A real estate agent sold a triangular land of side lengths 50 m, 85 m and 110 m. Find the area of the land in Aana. Given that 1 Aana = 31.8 sq. m, find the cost of the land at Rs 6,50,000 per Aana.

14. यदि $x = a^{q+r} \times b^p$, $y = a^{r+p} \times b^q$ र $z = a^{p+q} \times b^r$ भए प्रमाणित गर्नुहोस् । $x^{q-r} \times y^{r-p} \times z^{p-q} = 1$. If $x = a^{q+r} \times b^p$, $y = a^{r+p} \times b^q$ and $z = a^{p+q} \times b^r$, prove that: $x^{q-r} \times y^{r-p} \times z^{p-q} = 1$

15. हल गर्नुहोस् (Solve): $\sqrt{x} + \sqrt{x+11} = \frac{66}{\sqrt{x+11}}$

16. दुई ओटा रेखाहरू XY र MN समानान्तर छन् । यदि विन्दुहरू P, Q र R रेखा XY मा PM//QN हुने गरी पर्दछन् भने त्रिभुज RMN को क्षेत्रफल समानान्तर चतुर्भुज PMNQ को क्षेत्रफलको आधा हुन्छन् भनी प्रमाणित गर्नुहोस् । Two lines XY and MN are parallel. If P, Q and R are the points on XY such that PM//QN, prove that the area of triangle RMN is half of the area of parallelogram PMNQ.

17. a = 4.9cm, b = 6.2cm र c = 5cm भएका त्रिभुज ABC को रचना गर्नुहोस् । साथै उक्त त्रिभुजको क्षेत्रफलसंग वरावर हुने एउटा कोण 60° भएको एउटा सामानान्तर चतुर्भुजको पनि रचना गर्नुहोस् ।Construct a triangle ABC in which a = 4.9cm, b = 6.2cm and c = 5cm. Also, construct a parallelogram equal in area to the ΔABC and having an angle of 60°.

18. केन्द्रविन्दु O भएको एउटा वृत्तमा एउटै चाप CT मा आधारित केन्द्रिय कोण COT र परिधी कोण CUT विचको सम्बन्ध प्रयोगद्वारा खोजि गर्नुहोस । (कम्तिमा 3 से.मि. अर्धव्यास भएको 2 वटा बृतहरु आवस्यक छन्। Explore experimentally the relationship between the angle COT at the centre of circle with centre O and the circumference angle CUT standing on the same arc CT. (Two circles with radii at least 3 cm are necessary)

19. 25 मिटर अग्लो घरको छतमा बसिरहेको एक जना केटाले घरको अगाडि रहेको 5 मिटर अग्लो रूखको टुप्पोमा बसिरहेको एउटा चरालाई हेर्दा 60^o को अवनति कोण पाउँछ भने उक्त घर र रूखबिचको दुरी पत्ता लगाउनुहोस्। A boy sitting on the roof of a house of height 25 m finds an angle of depression of 60^o while observing a bird sitting on the top of a tree 5 m high situated in front of the house. Find the distance between the foot of the house and the tree.

20. दिइएको तथ्याङ्कबाट माथिल्लो चतुर्थांश निकाल्नुहोस् ।

Find the upper quartile from the following data.

दैनिक ज्याला (रू. मा) Daily wages (In Rs.)	0-100	100-200	200-300	300-400	400-500	500-600
कामदारको सङ्ख्या No. of workers	6	8	12	10	4	2

Group- D **4×5 = 20**

21. एउटा डिलरले एउटा लुगाधुने मेसिन रू. 75,000 मा किनेर 10% नाफा गरी एउटा खुद्रा पसलेलाई बेचेछ । खुद्रा पसलेले उक्त मेसिनको ढुवानी खर्च रू. 2,400 र स्थानीय कर रू. 2,000 र रू. 6,600 नाफासहित एक जना ग्राहक राजनलाई बिक्री गरेछ । राजनसँग 670 पाउन्ड रहेछ र सो पाउन्ड सटही गरेको रुपैयाँले उक्त लुगाधुने मेसिन खुद्रा 13% भ्याटसहित किनेछ भने सो पाउन्डसँग साटेको पैसामध्ये ऊसँग कति रुपैयाँ बाँकि बसेछ? पत्ता लगाउनुहोस् ।

(खरिददर: £1 = Rs 159.38, बिक्रीदर: £1 = Rs 160.17)

A dealer purchased a washing machine for Rs 75,000 and sold it to a retailer at 10% profit. The retailer spent Rs 2,400 for transportation, Rs 2,000 for local tax and sold it at a profit of Rs 6,600 with 13% VAT. Rajan had £670 and he bought the same washing machine from the retailer after exchanging his pounds into rupees. How much amount was left with him from the exchanged amount after purchasing the washing machine? (Buying rate: £1 = Rs 159.38, Selling rate: £1 = Rs 160.17)

22. कपडाबाट बनाइएको एउटा बेलनाकार सर्कस टेन्टको माथि उहि आधार भएको सोली छ। बेलनाकार भागको आधारको अर्धव्यास 35 मि. र उचाई 4 मि. छ र उक्त टन्टको टुप्पदेखि भुईसम्मको उचाई 16 मि. छ । यदि पट्याउन र सिउन 2 % कपडा बढी लाग्दछ भने रू. 50 प्रति वर्ग मिटरको दरले सो टेन्ट बनाउन कति खर्च लाग्छ? पत्ता लगाउनुहोस् । A circus tent is made of canvas and is in the form of a right circular cylinder surmounted by a right circular cone. The radius and height of the cylindrical part of the tent are 70 m and 5 m respectively and height of tent from bottom to top of the tent is 19 m. If 2% extra

canvas is used for folding and stitching, find the cost of canvas at Rs. 50 per square metre.

23. एक हप्ता अगाडि दिपेशले रू. 4,650 मा केहि लिटर पेट्रोल किनेछ । यो हप्ता पेट्रोलको मूल्य प्रति लिटर रू. 5 ले वृद्दि भएकोले त्यति नै रकमबाट उसले 1 लिटर कम पेट्रोल किन्न सक्छन भनेः Dipesh bought a certain litres of petrol for Rs 4,650 last week. This week, the rate of cost of petrol is increased by Rs 5 per litre and he can buy 1 litre less petrol for the same amount of money.

(i) पेट्रोलको मूल्यदर कति प्रतिशतले बृद्दि भएछ? पत्ता लगाउनुहोस् ।
By what percentage is the rate of cost of petrol increased?

(ii) रू. 4,650 मा किन्न सकिने पेट्रोलको मात्रामा कति प्रतिशतले कमि आएछ?
By what percentage is the quantity of petrol decreased for Rs 4,650?

24. केन्द्रविन्दुहरू X र Y भएका दुई बराबर वृत्तहरू एक-अर्काको केन्द्रविन्दुभएर जान्छन् र ति वृत्तहरू विन्दुहरू A र Z मा प्रतिच्छेदन गर्दछन् । AB, केन्द्रविन्दु X हुने वृत्तको व्यास हो र AC, केन्द्रविन्दु Y हुने वृत्तको व्यास साथै BZC एउटा सिधा रेखा भए प्रमाणित गर्नुहोस् : Two equal circles with centers X and Y pass through the centre of each other and intersect each other at the points A and Z. AB is the diameter of the circle having centre X and AC the diameter of the circle having center Y so that BZC is a straight line. Prove that:

(i) ΔABC एउटा समवाहु त्रिभुज हो । (ΔABC is an equilateral triangle)

(ii) ΔABC को क्षेत्रफल = 4×ΔXAY को क्षेत्रफल
(Area of ΔABC) = 4×Area of ΔXAY

The End

Complete Solution ...

Group- A **6×1 = 6**

1. (a) वार्षिक चक्रिय व्याजदरमा मिश्रधन निकाल्ने सुत्र लेख्नुहोस् ।
Write the formula for finding the compound amount compounded yearly.

Solution:

Here, $CA = P\left(1+\frac{R}{100}\right)^T$ where P = principal, R = rate of interest and T = time in years.

(b) अर्धव्यास r से.मि. भएको गोलाको आयतन आयतन कति हुन्छ?
What is the volume of a spherical object having radius r cm?

Solution:

Here, volume of spherical object (V) = $\frac{4}{3}\pi r^3$ cm^3

2. (a) $\sqrt{2m+3}$ को अनुपातिक गुणनखण्ड के हुन्छ?
What is the rationalizing factor of $\sqrt{2m+3}$?

Solution:

Here, $\sqrt{2m+3}\times\sqrt{2m+3} = 2m+3$

$\therefore$ The rationalizing factor of $\sqrt{2m+3}$ is $\sqrt{2m+3}$.

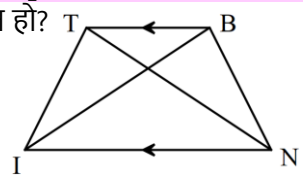
(b) निरन्तर श्रेणीमा मध्यक पत्ता लगाउने सुत्र लेख्नुहोस् ।
In a continuous data, write down the formula for finding the median.

Solution:

Here, median = $L+\frac{\frac{N}{2}-c.f.}{f}\times i$

(a) दिईएको चित्रमा त्रिभुज BIT को क्षेत्रफलसँग बराबर हुने त्रिभुज कुन हो?

What triangle is equal in area to the triangle BIT in the given figure?

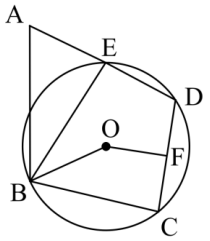


Solution:

Here, the triangle BNT has the area equal the area of triangle BIT.

(b) दिइएको चित्रमा चक्रीय चतुर्भुज चिनेर नाम लेख्नुहोस् ।

Identify and name the cyclic quadrilateral from the given figure.



Solution:

Here, in the given figure, BCDE is a cyclic quadrilateral.

Group- B **17×2= 34**

3. (a) एउटा घरको घरवालाले घरभाडा हरेक वर्ष 10% ले वृद्दि गर्ने गरी सम्झौता गर्दछ । यदि यो वर्ष सो घरको एउटा फ्ल्याटको भाडा रू. 16,000 भए वर्षपछि सो फ्ल्याटको भाडा कति पुग्ला? पत्ता लगाउनुहोस् ।

A house owner made an agreement to increase the house rent by 10% every year. If the rent of a flat of the house this year is Rs 16,000, what will be the rent of the flat after 3 years? Find it.

Solution:

Here,

The present rent of a flat (P) = Rs 16,000

Annual increment of the rent (R) = 10%

Time (T) = 3 years

The rent after 3 years (P_T) =?

Now, $P_T = P\left(1+\frac{R}{100}\right)^T$

$= \text{Rs. } 16{,}000\left(1+\frac{10}{100}\right)^3$

$= \text{Rs. } 16{,}000\times 1.331$

$= \text{Rs. } 21{,}296$

Hence, the rent of the flat after 3 years will be Rs. 21,296.

(b) एक व्यक्तिको संक्रमित घाउको बुधवार गरिएको ल्याव टेस्टमा जम्मा ब्याक्टेरिया सङ्ख्या 2.4×10^7 देखियो। यदि एन्टिबायटिक औषधीको सेवनबाट हरेक दिन ब्याक्टेरियाको सङ्ख्यामा 60% ले कमि आउँछ र वुधवार देखि नै औषधी सेवन गर्न थालियो भने शुक्रवारको ल्याब टेस्टमा सो घाउमा ब्याक्टेरियाको सङ्ख्या कति रहनेछ?

In a laboratory test, the number of bacteria detected in the infected wound of a person on Wednesday is 2.4×10^7. If the antibiotic decreases the number of bacteria by 60% per day and it is started consuming since Wednesday, find the number of bacteria that will find in the laboratory test of coming Friday?

Solution:

Here, no. of bacteria on Wednesday (P) = 2.4×10^7

Daily decrease rate (R) = 60%

Time (T) = 3 days

No. of on Friday (P_T) =?

Now, $D_T = P\left(1 - \frac{R}{100}\right)T$

$= 2.4 \times 10^7 \times \left(1 - \frac{60}{100}\right)^3$

$= 2.4 \times 10^7 \times 0.064$

$= 0.1536 \times 10^7$

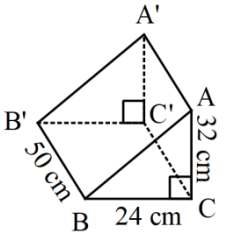
$= 1.536 \times 10^{-1} \times 10^7$

$= 1.536 \times 10^6$

Hence, the number of bacteria on Friday test will be 3×10^6.

5. (a) दिइएको प्रिज्मको आयताकार सतहको क्षेत्रफल पत्ता लगाउनुहोस् ।

Find the area of rectangular faces of the given prism.



Solution:

Here,

The base of the prism is right angled triangle.

In right angled Δ ABC; BC = 24 cm and AC = 32 cm, AB =?

By using Pythagoras theorem, AB $= \sqrt{BC^2 + AC^2}$

$= \sqrt{24^2 + 32^2}$

$= \sqrt{1600}$

$= 40$ cm

Now, the perimeter of the base (P) = AB + BC + AC

= (40 + 24 + 32) cm = 96 cm

Again,

The area of rectangular faces (L.S.A.) = Perimeter of base (P) × Length (l)

= 96 cm × 50 cm

= 4800 cm^2

Hence, the area of the rectangular faces of the prism is 4,800 cm^2.

(b) सङ्गै दिइएको कराईको भित्री व्यास 21 से.मि. छ। यदि उक्त कराई पुर्ण रुपमा भैसीको दुधले भरिएको छ भने दुधको आयतन निकाल्नुहोस् । The internal diameter of the given hemispherical wok is 21 cm. what will be the volume of the milk when it is completely filled with buffalo milk?

Solution:

Here,

The diameter of the hemispherical wok (d) = 21 cm.

$\therefore$ The radius (r) $= \frac{d}{2} = \frac{21 \text{ cm}}{2} = 10.5$ cm

Volume (V) =?

Now, volume (V) $= \frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \frac{22}{7} \times (10.5 \text{ cm})^3$

$= 2425.5$

Hence, the volume of the milk is 2,425.5 cm^3.

(c) आधारको भुजाको लम्बाई 18 फिट र छड्के उचाई 15 फिट भएको आधार वर्गाकार भएको पिरामिड टेन्ट बनाउन कति वर्ग से.मि. कपडा चाहिएला? पत्ता लगाउनुहोस् ।

A tent in the shape of square based pyramid having base side 18 ft. and

slant height 15 ft. is made with canvas. How much canvas is required to make tent?

Solution:

Here,

In the given square based pyramid;

Length of side of base (a) = 18 ft.

Slant height (l) = 15 ft.

L.S.A. =?

Now,

L.S.A. = $2al$

= 2× 18 ft. × 15 ft.

= 540 sq. ft

Hence, 540 sq. ft. of canvas is required to make the tent.

6. (a) म.स. पत्ता लगाउनुहोस् । Find the H.C.F. of $4x^2 - 1$ and $8x^3 - 1$

Solution:

Here,

The first expression $= 4x^2 - 1$

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

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

The second expression $= 8x^3 - 1$

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

$= (2x - 1)[(2x)^2 + 2x.\ 1 + 1^2]$

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

Hence, the H.C.F. = Common Factor = $(2x - 1)$

(b) ल.स. पत्ता लगाउनुहोस् । Find the L.C.M. of:

$2a^3b + 4a^2b^2 + 2ab^2$ and $4a^2b + 4ab^2$

Solution:

Here,

The first expression $= 2a^3b + 4a^2b^2 + 2ab^2$

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

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

The second expression $= 4a^2b + 4ab^2$

$= 4ab(a + b)$

$= 2\times 2\ ab(a + b)$

Hence, the L.C.M = Common Factors × Remaining Factors

$= 2ab(a + b) \times 2(a + b)$

$= 4ab(a + b)^2$

7. (a) मान निकाल्नुहोस् । Evaluate: $\dfrac{9.2^{k+2} - 2^k}{2^{k+3} - 2^k}$

Solution:

Here, $\dfrac{9.2^{k+2} - 2^k}{2^{k+3} - 2^k}$

$= \dfrac{9\times 2^k \times 2^2 - 2^k}{2^k \times 2^3 - 2^k}$

$= \dfrac{2^k(9\times 4 - 1)}{2^k(8 - 1)}$

$= \dfrac{35}{7}$ (5 over 1)

$= 5$

(b) सरल गर्नुहोस्। Simplify: $\frac{a^2-a+1}{a^2-1}+\frac{a^2+1}{a+1}$

Solution:

Here, $\frac{a^2-a+1}{a^2-1}+\frac{a^2+1}{a+1}$

$=\frac{a^2-a+1}{(a+1)(a-1)}+\frac{a^2+1}{a+1}$

$=\frac{a^2-a+1+(a-1)(a^2+1)}{(a+1)(a-1)}$

$=\frac{\cancel{a^2}-\cancel{a}+\cancel{1}+a^3+\cancel{a}-\cancel{a^2}-\cancel{1}}{(a+1)(a-1)}$

$=\frac{a^3}{a^2-1}$

(c) सरल गर्नुहोस्। Simplify: $\frac{2}{x^2-1}+\frac{1}{x+1}$

Solution:

Here, $\frac{2}{x^2-1}+\frac{1}{x+1}$

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

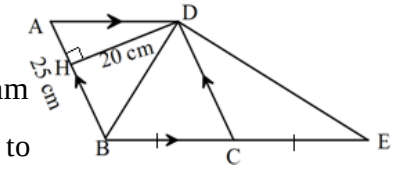
$=\frac{2+1(x-1)}{(x+1)(x-1)}$

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

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

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

8. (a) दिइएको चित्रमा, ABCD एउटा समानान्तर चतुर्भुज हो जहाँ DH ⊥ AB छ र भुजा BC लाई BC = CE हुने गरी विन्दु E सम्म लम्ब्याइएको छ । यदि AB = 25 से.मि. र DH = 20 से.मि. भए ΔBED को क्षेत्रफल कति हुन्छ?



In the given figure, ABCD is a parallelogram in which DH ⊥ AB and side BC is produced to E so that BC = CE. If AB = 25 cm and DH = 20 cm, what is the area of ΔBED? Find it.

Solution:

Here, in parallelogram ABCD; AB (b) = 25 cm and DH (h) = 20 cm

The area of ΔBED =?

Now,

(i) Area of parallelogram ABCD $= b \times h$

$= 25 \text{ cm} \times 20 \text{ cm}$

$= 500 \text{ cm}^2$

(ii) Area of ΔBCD $= \frac{1}{2} \times$ Area of ▱ABCD [Diagonal bisects the parallelogram]

$= \frac{1}{2} \times \cancel{500}^{250} \text{ cm}^2$

$= 250 \text{ cm}^2$

(iii) Area of ΔBED = 2 × Area of ΔBCD [The median bisects the triangle]

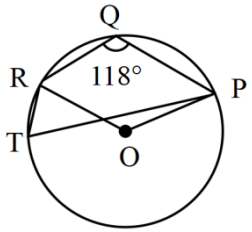
$= 2 \times 250 \text{ cm}^2$

$= 500 \text{ cm}^2$

Hence, the area of ΔBED is 500 cm^2.

(b) दिइएको चित्रमा, O बृतको केन्द्रविन्दु हो । यदि ∠PQR = 118^o भए ∠PTR र ∠POR का मान पत्ता लगाउनुहोस्।

In the given figure, O is the centre of circle. If ∠PQR = 118^o, find the value of ∠PTR and ∠POR.



Solution:

Here, O is the centre of circle. ∠PQR = 118^o

∠PTR =? , ∠POR =?

Now,

(i) ∠PTR + ∠PTR = 180^o [The sum of opposite angles of cyclic quadrilateral]

or, ∠PTR + 118^o = 180^o

∴∠PTR = 62^o

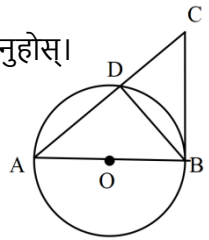
(ii) ∠POR = 2×∠PTR [The central angle is twice the inscribed angle on arc PQR]

= 2 × 62^o

= 124^o

(c) दिइएको चित्रमा , O बृतको केन्द्रविन्दु र BC स्पर्शरेखा हो। यदि AB र BC का लम्बाई बराबर छन् भने ∠ABD को नाप पत्ता लगाउनुहोस्।

In the figure, O is centre of circle, BC is the tangent to the circle. If AB and BC are equal in length, find the measurement of ∠ABD.



Solution:

Here, O is the centre of circle, BC is the tangent to the circle and AB = BC

∠ABD =?

Now,

(i) ∠ABC = 90^o [The diameter is perpendicular to the tangent]

(ii) ∠BAC = ∠BCA [As AB = BC]

Also, ∠BAC + ∠BCA + ∠ABC = 180^o

or, ∠BAC + ∠BAC + 90^o = 180^o

or, 2∠BAC = 90^o

or, ∠BAC = 45^o

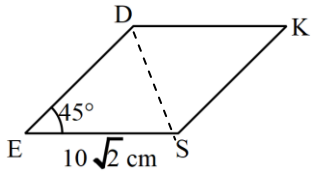
Again, ∠BAD + ∠BDA + ∠ABD = 180^o

or, 45^o + ∠BDA + 90^o = 180^o [∠ABD = 90^o]

or, ∠BDA = 45^o

9. (a) सँगैको समवाहु चतुर्भुज DESK को क्षेत्रफल निकाल्नुहोस्।

Find the area of adjoining rhombus DESK.



Solution:

Here, DESK is a rhombus. DE = ES = $10\sqrt{2}$ cm and ∠DES = 45^o

Now, area of ΔDES = $\frac{1}{2}\times DE\times ES\times \sin 45^o$

$= \frac{1}{2}\times 10\sqrt{2}\times 10\sqrt{2}\times \frac{1}{\sqrt{2}}$

$= 50\sqrt{2}\ \text{cm}^2$

Again,

Area of rhombus DESK = 2×Area of ΔDES [The diagonal of rhombus bisects it]

$= 2\times 50\sqrt{2}\ \text{cm}^2$

$= 100\sqrt{2}\ \text{cm}^2$

Hence, the area of the rhombus DESK is $100\sqrt{2}$ cm^2.

(b) एउटा वर्गिकृत श्रेणीमा, $\sum fm = 800 + 15p$, N = $10 + p$ र मध्यक 20 भए p र N को मान निकाल्नुहोस्।

In a continuous data $\sum fm = 800 + 15p$ and $N = 10 + p$ and mean is 20, find the value of p and N.

Solution:

Here, $\sum fm = 800 + 15p$, $N = 10 + p$ and mean $(\bar{x}) = 20$

Now, $\bar{x} = \dfrac{\sum fm}{N}$

or, $20 = \dfrac{800 + 15p}{10 + p}$

or, $200 + 20p = 800 + 15p$

or, $5p = 600$

or, $p = 120$

Again, $N = 10 + p = 10 + 120 = 130$

Hence, the value of p is 120 and N is 130.

10. (a) 52 पत्ती भएको एक पाकेट तासबाट एउटा तास र 2 वटा राता र 3ओटा निला उत्रै र उस्तै गुच्चाहरू भएको एउटा झोलाबाट एउटा गुच्चा एकैसाथ थुल्दा निलो गुच्चा र राजा भएको तास आउने संभाव्यता निकाल्नुहोस् ।

A card is drawn at random from a pack of 52 cards and at the same time a marble is drawn at random from a bag containing 2 red marbles and 3 blue marbles of same shape and size. Find the probability of getting a blue marble and a king.

Solution:

In a pack of playing cards; total no. of cards, n (S) = 52

Number of king, n (K) = 4

Now, probability of getting king, $P(K) = \dfrac{n(K)}{n(S)}$

$= \dfrac{\cancel{4}^{\,1}}{\cancel{52}_{\,13}}$

$= \dfrac{1}{13}$

Also,

In a bag; no. of red marbles, n (R) = 2 and no. of blue marbles, n (B) = 3

Total no. of marbles, n (S) = 2 + 3 = 5

Probability of getting blue marbles, $P(B) = \dfrac{n(B)}{n(S)}$

$= \dfrac{3}{5}$

Hence, the probability of getting a blue marble and a king, P (B and K)

$= \dfrac{3}{5} \times \dfrac{1}{13} = \dfrac{3}{65}$

(b) 24 जना केटा र 16 जना केटी भएको एउटा कक्षाबाट गोलाप्रथाबाट दुई जना विद्यार्थीलाई कक्षाको क्याप्टेन र सहायक क्याप्टेन बनाउन छान्दा केटा र केटी छानिने सम्भाव्यतालाई वृक्षचित्रमा देखाउनुहोस् ।

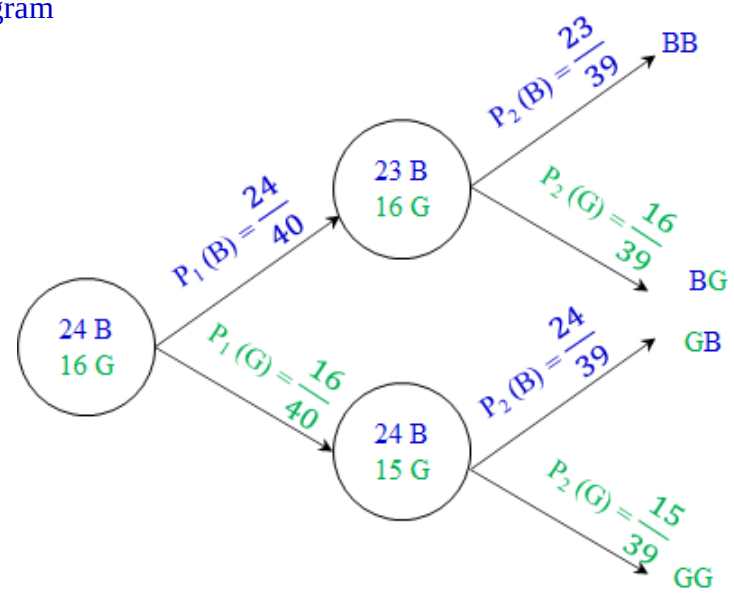
From a class having 24 boys and 16 girls, two students are selected randomly for the post of class captain and vice-captain. Show all the probabilities of being a boy and a girl on a tree diagram.

Solution:

Let, B and G denote the events of choosing the boy and girl respectively.

Then, n (B) = 24, n (G) = 16 and n (S) = 24 + 16 = 40

Now, showing the probabilities of selecting the boys and girls in tree-diagram



Group- C **10×4= 40**

11. एउटा क्लस्टरले संचालन गरेको एस.ई.ई. पूर्व-ल्याकत परीक्षामा, 20% विद्यार्थीले गणित विषयमा, 30% ले विज्ञान विषयमा र 40% ले अङ्ग्रेजी विषयमा A^+ ग्रेड प्राप्त गरे । त्यसैगरी, 13% ले गणित र विज्ञान विषयमा, 18% ले विज्ञान र अङ्ग्रेजी विषयमा, 15% ले अङ्ग्रेजी र गणित विषयमा र 10% ले यी तिनै विषयमा A^+ ग्रेड प्राप्त गरेको पाइयो ।

In the SEE Pre-Board examination conducted by a cluster it was found that, 20% students obtained A^+ grade in Mathematics, 30% in Science and 40% in English. Likewise, 13% students obtained A^+ grade in Mathematics and Science, 18% in Science and English, 15% in English and Mathematics and 10% in all three subjects.

(iii) माथिको तथ्यलाई भेन-चित्रमा देखाउनुहोस् । Represent the above information in a Venn-diagram.

(iv) कति प्रतिशत विद्यार्थीले यी तिनै विषयमा A^+ ग्रेड प्राप्त गरेनन्? पत्ता लगाउनुहोस् । What percent of the students did not obtain A^+ grade in these three subjects? Find it.

Solution:

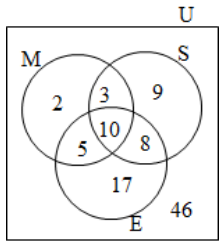
Let, M, S and E denote the sets of students who obtained A^+ in Mathematics, Science and English respectively.

Then, n (U) = 100, n (M) = 20, n (S) = 30, n (E) = 40, n (M ∩ S) = 13,

n (S ∩ E) = 18,

n (E ∩ M) = 15, n (M ∩ S ∩ E) = 10

(i) Showing the above information in Venn-diagram



(ii) We know,

$$n(A \cup B \cup C) = n(M) + n(S) + n(E) - n(M \cap S) - n(S \cap E) - n(E \cap M) + n(M \cap S \cap E)$$
$$= 20 + 30 + 40 - 13 - 18 - 15 + 10$$
$$= 54$$

Again, $n(\overline{M \cup S \cup E}) = n(U) - n(A \cup B \cup C)$
$$= 100 - 54$$
$$= 46$$

Hence, 46% students didn't obtain A^+ grade in Mathematics, Science and English.

12. कुनै धनको 2 वर्षको साधारण व्याज रू.1,600 र उहि धनको सोही समयावधि र व्याजदरले वार्षिक चक्रिय व्याज रू. 1,680 हुन्छ भने व्याजदर र उक्त धन पत्ता लगाउनुहोस् ।

The simple interest of a certain sum of money for 2 years is Rs 1,600 and the compound interest of the same sum at the same rate of interest for the same duration of times is Rs 1,680. Find the rate of interest and the sum.

Solution:

Let, P be the required sum and R% p.a. be the rate of interest.

For simple interest:

Time (T) = 2 years

S.I. = Rs 1600

We have,

$$\text{S.I.} = \frac{PTR}{100}$$

or, Rs 1600 $= \frac{P \times 2 \times R}{100}$

or, $PR = 80000$ … (i)

For compound interest:

Time (T) = 2 years

C.I. = Rs 1680

We have,

$$\text{C.I.} = P\left[\left(1 + \frac{R}{100}\right)^T - 1\right]$$

or, Rs 1680 $= P\left[\left(1 + \frac{R}{100}\right)^2 - 1\right]$

or, $1680 = P\left(1 + \frac{R}{100} + 1\right)\left(1 + \frac{R}{100} - 1\right)$

or, $1680 = P \times \frac{200 + R}{100} \times \frac{R}{100}$

or, $PR(R + 200) = 16800000$ … (ii)

Dividing (ii) by (i), we get

$$\frac{PR(R+200)}{PR} = \frac{16800000}{80000}$$

or, $R + 200 = 210$

or, $R = 10\%$ p.a.

Again, putting the value of R in equation (i), we get

$P \times 10 = 80000$

$\therefore P = 8000$

Hence, the required sum is Rs 8,000 and the rate of interest is 10% p.a.

13. एक जना जग्गा कारोवार गर्ने ब्यक्तिले भुजाहरूको नाप 35 मि., 75 मि. र 100 मि. भएको एउटा जग्गा बिक्रि गरेछ भने उक्त जग्गाको क्षेत्रफल पत्ता लगाउनुहोस् । 1 आना = 31.8 वर्ग मि. हुन्छ भने प्रति आना रू. 6,50,000 को दरले सो जग्गाको मूल्य कति हुन्छ? पत्ता लगाउनुहोस् ।

A real estate agent sold a triangular land of side lengths 50 m, 85 m and 110 m. Find the area of the land in Aana. Given that 1 Aana = 31.8 sq. m, find the cost of the land at Rs 6,50,000 per Aana.

Solution:

Let, the side length of the land are; a = 35 m, b = 75 m and c = 100 m

Now, semi-perimeter (s) $= \frac{a+b+c}{2}$

$= \frac{35+75+100}{2}$ m

$= 105$ m

Also, area of the land (A) $= \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{105\,(105-35)\,(105-75)\,(105-100)}$

$= \sqrt{105\times70\times30\times5}$

$= \sqrt{1102500}$

$= 1050$ m^2

We know, 31.8 m^2 = 1 Aana

or, 1 m^2 $= \frac{1}{31.8}$ Aana

or, 1050 m^2 $= \frac{1}{31.8} \times 1050$ Aana $= 33.0188679$ Aana

Again, the cost of 1 Aana = Rs 6,50,000

∴The cost of 33.0188679 Aanas of land = 33.0188679 × Rs 6,50,000

= Rs 21462264.14

Hence, the cost of the land is Rs 2,14,62,264.14

14. यदि $x = a^{q+r} \times b^p$, $y = a^{r+p} \times b^q$ र $z = a^{p+q} \times b^r$ भए प्रमाणित गर्नुहोस् ।

If $x = a^{q+r} \times b^p$, $y = a^{r+p} \times b^q$ and $z = a^{p+q} \times b^r$, prove that:

$x^{q-r} \times y^{r-p} \times z^{p-q} = 1$

Solution: Here, $x = a^{q+r} \times b^p$, $y = a^{r+p} \times b^q$ and $z = a^{p+q} \times b^r$

Now,

LHS $= x^{q-r} \times y^{r-p} \times z^{p-q}$

$= (a^{q+r} \times b^p)^{q-r} \times (a^{r+p} \times b^q)^{r-p} \times (a^{p+q} \times b^r)^{p-q}$

$= a^{q^2-r^2} \times b^{pq-pr} \times a^{r^2-p^2} \times b^{qr-pq} \times a^{p^2-q^2} \times b^{pr-qr}$

$= a^{q^2-r^2+r^2-q^2+p^2-q^2} \times b^{pq-pr+qr-pq+pr-qr}$

$= a^o \times b^o$

$= 1 \times 1$

$= 1$

$=$ RHS

15. हल गर्नुहोस् (Solve): $\sqrt{x} + \sqrt{x+11} = \frac{66}{\sqrt{x+11}}$

Solution:

Here, $\sqrt{x} + \sqrt{x+11} = \frac{66}{\sqrt{x+11}}$

or, $\sqrt{x^2+11x} + (\sqrt{x+11})^2 = 66$

or, $\sqrt{x^2+11x} + x + 11 = 66$

or, $\sqrt{x^2+11x} = 55 - x$

Squaring on both sides, we get

$(\sqrt{x^2+11x})^2 = (55-x)^2$

or, $x^2 + 11x = 3025 - 110x + x^2$

or, $121x = 3025$

or, $x = \frac{3025}{121}$

$\therefore x = 25$

Checking:

Putting $x = 25$ in the given equation, we get

$$\sqrt{25} + \sqrt{25 + 11} = \frac{66}{\sqrt{25+11}}$$

or, $5 + \sqrt{36} = \frac{66}{\sqrt{36}}$

or, $5 + 6 = \frac{66}{6} \quad \frac{11}{1}$

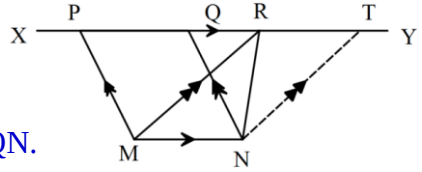
or, $11 = 11$ which is true.

Hence, the required value of x is 25.

16. दुई ओटा रेखाहरू XY र MN समानान्तर छन् । यदि विन्दुहरू P, Q र R रेखा XY मा PM//QN हुने गरी पर्दछन् भने त्रिभुज RMN को क्षेत्रफल समानान्तर चतुर्भुज PMNQ को क्षेत्रफलको आधा हुन्छन् भनी प्रमाणित गर्नुहोस् ।

Two lines XY and MN are parallel. If P, Q and R are the points on XY such that PM//QN, prove that the area of triangle RMN is half of the area of parallelogram PMNQ.

Solution:



Here,

Given: XY// MN. P, Q and R are the points on XY such that PM//QN.

To prove: Area of $\Delta RMN = \frac{1}{2}$ Area of parallelogram PMNQ

Construction: NT//MR is drawn to T on XY.

Proof:

S.N.	***Statements***	***S.N.***	***Reasons***
1.	RMNT is a parallelogram.	1.	Being opposite sides parallel by construction.
2.	$\Delta RMN = \frac{1}{2} \square RMNT$	2.	Being the parallelogram bisected by the diagonal RN.
3.	$\square PMNQ = \square RMNT$	3.	Being both standing on the same base MN and between the same parallel lines XY and MN.
4.	$\Delta RMN = \frac{1}{2} \square PMNQ$	4.	From statements (2) and (3)

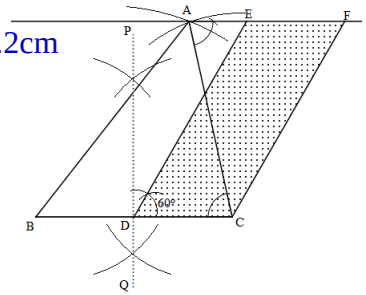
17. *a* = 4.9cm, *b* = 6.2cm र *c* = 5cm भएका त्रिभुज ABC को रचना गर्नुहोस् । साथै उक्त त्रिभुजको क्षेत्रफलसंग वरावर हुने एउटा कोण 60° भएको एउटा सामानान्तर चतुर्भुजको पनि रचना गर्नुहोस् ।

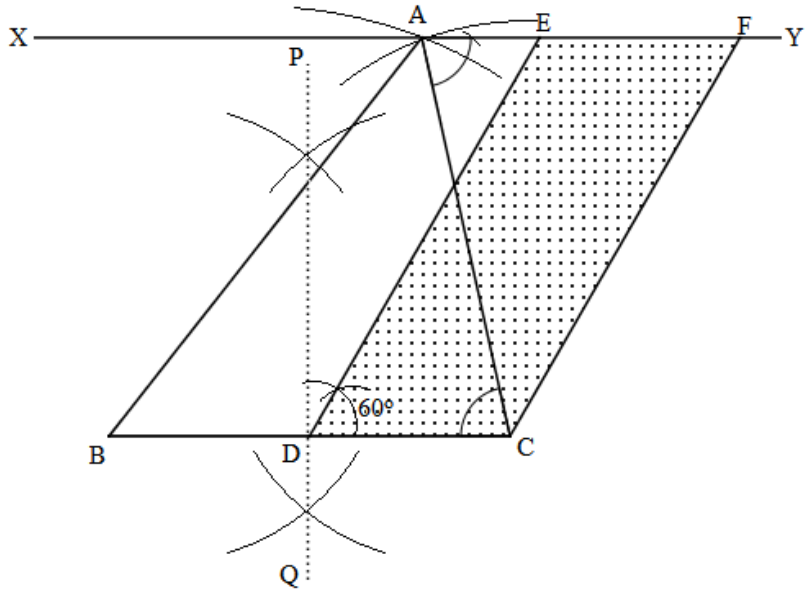
Construct a triangle ABC in which a = 4.9cm, b = 6.2cm and c = 5cm. Also, construct a parallelogram equal in area to the ΔABC and having an angle of 60°.

Solution:

Here,

Given: In triangle ABC, *a* = 4.9cm, *b* = 6.2cm and *c* = 5cm





Hence, the parallelogram CDEF is the required parallelogram whose area is equal to area of triangle ABC.

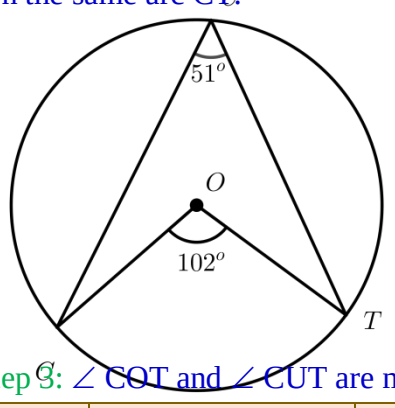
18. केन्द्रविन्दु O भएको एउटा वृत्तमा एउटै चाप CT मा आधारित केन्द्रिय कोण COT र परिधी कोण CUT विचको सम्बन्ध प्रयोगद्वारा खोजि गर्नुहोस । (कम्तिमा 3 से.मि. अर्धव्यास भएको 2 वटा बृतहरु आवस्यक छन्। Explore experimentally the relationship between the angle COT at the centre of circle with centre O and the circumference angle CUT standing on the same arc CT. (Two circles with radii at least 3 cm are necessary)

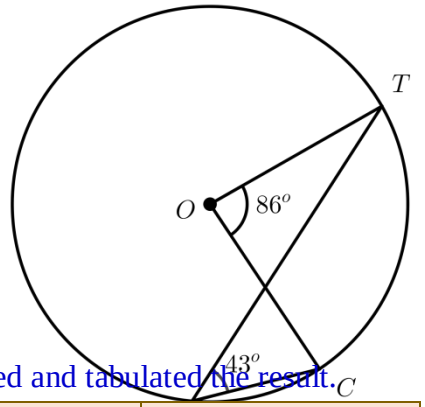
Solution:

Here,

Step 1: Two circles with centre O and radii more than 3 cm are drawn.

Step 2: ∠ COT at the centre O and ∠ CUT on the circumference area drawn on the same arc CT.





Step 3: ∠ COT and ∠ CUT are measured and tabulated the result.

Fig. no.	∠ COT	∠ CUT	Remarks
(i)	102^o	86^o	∠ COT = 2∠ CUT
(ii)	51^o	43^o	∠ COT = 2∠ CUT

Conclusion: From the above experiment, we came to know that the ∠ COT at the centre O is twice the ∠ CUT at the circumference on the same arc CT.

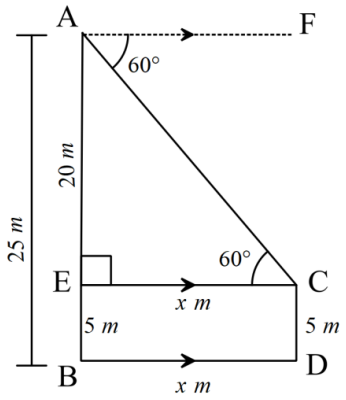
19. 25 मिटर अग्लो घरको छतमा बसिरहेको एक जना केटाले घरको अगाडि रहेको 5 मिटर अग्लो रूखको टुप्पोमा बसिरहेको एउटा चरालाई हेर्दा 60^o को अवनति कोण पाउँछ भने उक्त घर र रूखबिचको दुरी पत्ता लगाउनुहोस्।

A boy sitting on the roof of a house of height 25 m finds an angle of depression of 60^o while observing a bird sitting on the top of a tree 5 m high situated in front of the house. Find the distance between the foot of the house and the tree.

Solution:

Let, AB be the height of the house,

CD the height of the tree, ∠FAC be the angle of depression of the top of the tree from the top of the house.



Then, AB = 25 m, CD = EB = 5 m

$\therefore$ AE = 20 m

$\angle FAC = \angle ACE = 60^o$

BD = EC = x m (say)

Now,

From right angled triangle AEC, $\tan 60^o = \frac{AE}{EC}$

$$\text{or, } \sqrt{3} = \frac{20 \text{ m}}{x}$$

$$\text{or, } x = \frac{20 \text{ m}}{\sqrt{3}}$$

$$\text{or, } x = 11.55 \text{ m}$$

Hence, the distance between the house and the tree is 11.55 m

20. दिइएको तथ्याङ्कबाट माथिल्लो चतुर्थांश निकाल्नुहोस् । Find the upper quartile from the following data.

दैनिक ज्याला (रू. मा) Daily wages (In Rs.)	0-100	100-200	200-300	300-400	400-500	500-600
कामदारको सङ्ख्या No. of workers	6	8	12	10	4	2

Solution:

Here,

Daily wages (in Rs.)	***No. of workers (f)***	***c.f.***
0-100	6	6
100-200	8	14
200-300	12	26
300-400	10	36
400-500	4	40
500-600	2	42
	N = 42	

Now,

Position of upper quartile (Q_3) = $\left(\frac{3N}{4}\right)^{th}$ term

$$= \left(\frac{3\times 42}{4}\right)^{th} \text{term}$$

$$= 31.5^{th} \text{term}$$

From *c.f.* column, the *c.f.* which is just greater than 31.5 is 36 and its corresponding class is (300 – 400) where L = 300, *c.f.* = 26, f = 10 and h = 100

Again, $Q_3 = L + \left(\frac{\frac{3N}{4} - c.f.}{f}\right)\times h$

$$= 300 + \left(\frac{31.5 - 26}{10}\right)\times 100$$

$$= 355$$

Hence, the upper quartile is Rs 355.

Group- D **4×5 = 20**

21. एउटा डिलरले एउटा लुगाधुने मेसिन रू. 75,000 मा किनेर 10% नाफा गरी एउटा खुद्रा पसलेलाई बेचेछ । खुद्रा पसलेले उक्त मेसिनको ढुवानी खर्च रू. 2,400 र स्थानीय कर रू. 2,000 र रू. 6,600 नाफासहित एक जना ग्राहक राजनलाई बिक्री गरेछ । राजनसँग 670 पाउन्ड रहेछ र सो पाउन्ड सटही गरेको रुपैयाँले उक्त लुगाधुने मेसिन खुद्रा 13% भ्याटसहित किनेछ भने सो पाउन्डसँग साटेको पैसामध्ये ऊसँग कति रुपैयाँ बाँकि बसेछ? पत्ता लगाउनुहोस् ।
(खरिददर: £1 = Rs 159.38, बिक्रीदर: £1 = Rs 160.17)
A dealer purchased a washing machine for Rs 75,000 and sold it to a retailer at 10% profit. The retailer spent Rs 2,400 for transportation, Rs 2,000 for local tax and sold it at a profit of Rs 6,600 with 13% VAT. Rajan had £670 and he bought the same washing machine from the retailer after exchanging his pounds into rupees. How much amount was left with him from the exchanged amount after purchasing the washing machine? (Buying rate: £1 = Rs 159.38, Selling rate: £1 = Rs 160.17)

Solution:

Here,

For dealer:

C.P. of a washing machine = Rs 75,000 and profit percent = 10%

$\therefore$ S.P. = C.P. + P% of C.P.
= Rs 75,000 + 10% of Rs 75,000
= Rs 82,500

For retailer:

C.P. of a washing machine = Rs 82,500

VAT eligible cost = C.P. + Transportation cost + Local Tax + Profit
= Rs 82,500 + Rs 2,400 + Rs 2,000 + Rs 6,600
= Rs 93,500

$\therefore$ S.P. with 13% VAT = S.P. + 13% of S.P.
= Rs 93,500 + 13% of Rs 93,500
= Rs 1,05,655

Again,

For Rajan:

Buying rate: £1 = Rs 159.38, Selling rate: £1 = Rs 160.17

£670 = 670 × Rs 159.38 = Rs 1,06,784.60

Hence, after buying the washing machine with the retailer, the amount of money that was left with him = Rs 106,784.6 – Rs 1,05,655 = Rs 1,129.60

22. कपडाबाट बनाइएको एउटा बेलनाकार सर्कस टेन्टको माथि उहि आधार भएको सोली छ। बेलनाकार भागको आधारको अर्धव्यास 35 मि. र उचाई 4 मि. छ र उक्त टन्टको टुप्पदेखि भुईसम्मको उचाई 16 मि. छ । यदि पत्याउन र सिउन 2 % कपडा बढी लाग्दछ भने रू. 50 प्रति वर्ग मिटरको दरले सो टेन्ट बनाउन कति खर्च लाग्छ? पत्ता लगाउनुहोस् ।
A circus tent is made of canvas and is in the form of a right circular cylinder surmounted by a right circular cone. The radius and height of the cylindrical part of the tent are 35 m and 4 m respectively and height of tent from bottom to top of the tent is 16 m. If 2% extra canvas is used for folding and stitching, find the cost of canvas at Rs. 50 per square metre.

Solution:

Here, tent is the combination of a cylinder and a cone.

For cylindrical part:

Radius of base (r) = 35 m and height (h) = 4 m

Now, $(C.S.A.)_1 = 2\pi rh = 2\times\frac{22}{7}\times35\times4\ m^2 = 880\ m^2$

For conical part:

Radius of base (r) = 35 m and height (h) = 16 m – 4 m = 12 m

We know, $l = \sqrt{r^2 + h^2} = \sqrt{35^2 + 12^2} = \sqrt{1369}\ m = 37\ m$

$(C.S.A.)_2 = \pi rl = \frac{22}{7}\times35\times37\ m^2 = 4070\ m^2$

Also, $(C.S.A.)_1 + (C.S.A.)_2 = (880 + 4070)\ m^2 = 4950\ m^2$

T.S.A. of canvas required for the tent with folding and stitching

$= 102\%$ of $4950\ m^2$

$= 5049\ m^2$

Again, rate of canvas = Rs 50 per m^2

$\therefore$ Total cost of canvas = $5049 \times$ Rs 50 = Rs 2,52,450

Hence, the cost of the canvas for making the tent is Rs 2,52,450

23. एक हप्ता अगाडि दिपेशले रू. 4,650 मा केहि लिटर पेट्रोल किनेछ । यो हप्ता पेट्रोलको मूल्य प्रति लिटर रू. 5 ले वृद्दि भएकोले त्यति नै रकमबाट उसले 1 लिटर कम पेट्रोल किन्न सक्छन भनेः

Dipesh bought a certain litres of petrol for Rs 4,650 last week. This week, the rate of cost of petrol is increased by Rs 5 per litre and he can buy 1 litre less petrol for the same amount of money.

(iii) पेट्रोलको मूल्यदर कति प्रतिशतले बृद्दि भएछ? पत्ता लगाउनुहोस् ।
By what percentage is the rate of cost of petrol increased?

(iv) रू. 4,650 मा किन्न सकिने पेट्रोलको मात्रामा कति प्रतिशतले कमि आएछ?
By what percentage is the quantity of petrol decreased for Rs 4,650?

Solution:

Let the rate of cost of petrol in last week be Rs x per litre.

Then, the quantity of petrol purchased in last week = $\frac{4650}{x}$ litres

In this week, the rate of cost of petrol = Rs $(x + 5)$ per litre

Then, the quantity of petrol purchased in this week = $\frac{4650}{x+5}$ litres

According to the question,

$$\frac{4650}{x} - \frac{4650}{x+5} = 1$$

$$\text{or, } \frac{4650(x+5) - 4650x}{x(x+5)} = 1$$

$$\text{or, } x^2 + 5x = 23250$$

$$\text{or, } x^2 + 5x - 23250 = 0$$

$$\text{or, } x^2 + (155 - 150)\,x - 23250 = 0$$

$$\text{or, } x^2 + 155x - 150x - 23250 = 0$$

$$\text{or, } x(x + 155) - 150(x + 155) = 0$$

$$\text{or, } (x + 155)(x - 150) = 0$$

Either, $x + 155 = 0 \quad \therefore x = -155$

OR, $x - 150 = 0 \quad \therefore x = 150$

But, rate of cost cannot be negative. So, the rate of cost of petrol in last week was Rs 150 per litre.

(i) Percentage of increased amount of rate of cost = $\frac{\text{Rs } 5}{\text{Rs}150} \times 100\% = 3.33\%$

(ii) Quantity of petrol in last week = $\frac{4650}{150}$ litres = 31 litres

$\therefore$ Percentage of decreased quantity of petrol = $\frac{1}{31} \times 100\% = 3.23\%$

24. केन्द्रविन्दुहरू X र Y भएका दुई बराबर वृत्तहरू एक-अर्काको केन्द्रविन्दुभएर जान्छन् र ति वृत्तहरू विन्दुहरू A र Z मा प्रतिच्छेदन गर्दछन् । AB, केन्द्रविन्दु X हुने वृत्तको व्यास हो र AC, केन्द्रविन्दु Y हुने वृत्तको व्यास साथै BZC एउटा सिधा रेखा भए प्रमाणित गर्नुहोस् :

Two equal circles with centers X and Y pass through the centre of each other and intersect each other at the points A and Z. AB is the diameter of the circle having centre X and AC the diameter of the circle having center Y so that BZC is a straight line. Prove that:

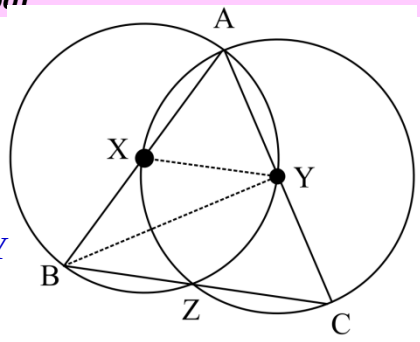
(iii) ΔABC एउटा समवाहु त्रिभुज हो । (ΔABC is an equilateral triangle)

(iv) ΔABC को क्षेत्रफल $= 4 \times \Delta XAY$ को क्षेत्रफल (Area of ΔABC = $4 \times$ Area of ΔXAY)

Solution:

Given: AX = XY = AY, AB is the diameter of the circle having centre X

and AC the diameter of the circle having center Y. BZC is a straight line.



To prove: (i) ΔABC is an equilateral triangle.

(ii) Area of $\Delta ABC = 4 \times$ Area of ΔXAY

Construction: X and B are joined to Y.

Proof:

S.N.	*Statements*	*S.N.*	*Reasons*
1.	$\angle AXY = \angle AYX = \angle XAY = 60^o$	1.	AX = XY = AY
2.	XY // BC	2.	By mid-point theorem in ΔABC
3.	$\angle ABC = \angle AXY$ and $\angle AYX = \angle ACB$	3.	XY//BC and corresponding angles.
4.	$\angle ABC = \angle ACB = \angle CAB = 60^o$	4.	From statements (2) and (4)
5.	ABC is an equilateral triangle	5.	From statement (5)
6.	$\Delta ABC = 2\Delta XBY$ and $\Delta XBY = 2\Delta XAY$	6.	Medians bisects the triangles
7.	Area of $\Delta ABC = 4 \times$ Area of ΔXAY	7.	From statement (6)

The End