

# काठमाडौं महानगरपालिका

## द्वितीय त्रैमासिक परीक्षा-२०८१

गणित (Mathematics)

कक्षा : १०

समय : ३ घण्टा

पूर्णाङ्क : ७५

सबै प्रश्न अनिवार्य छन्। (Attempt all questions)

1. कक्षा १० मा अध्ययनरत विद्यार्थीलाई साहित्य र संगीत कुन मनपर्छ भनी गरिएको एक सर्वेक्षणमा 40% विद्यार्थीहरूले साहित्य मन पराएको, 65% ले संगीत मनपराएको र 10% ले ती दुवै मध्ये कुनै पनि मन नपराएको पाइयो भने

**In a survey conducted among the students studying in grade 10 at to explore whichever School among literature and music they like, it was found that 40% of them liked literature, 65% of them liked music and 10% of them liked none:**

- (क) उक्त सर्वेक्षणमा कुनै पनि मन नपराउने विद्यार्थीको समूहलाई गणनात्मकता संकेतमा लेख्नुहोस्।  
Write the cardinality notation of students who did not like any option in that survey. [1]
- (ख) यदि त्यो समूहबाट 30 जनाले साहित्य र संगीत दुवै मन पराउने पाइयो भने उक्त सर्वेक्षणमा कति जनाले भाग लिएका थिए, पत्ता लगाउनुहोस्।  
If there were 30 students liked both of them, find the number of students participated in the survey. [3]
- (ग) माथिको जानकारीलाई भेनचित्रमा चित्रण गर्नुहोस्। Show the above information in a Venn diagram. [1]
- (घ) कुनै पनि मन नपराउने विद्यार्थीहरूमध्ये 10 जना विद्यार्थीहरूले यदि संगीत मनपर्छ भनी उत्तर दिएको अवस्थामा साहित्य मन पराउने र संगीत मन पराउने विद्यार्थीहरूको अनुपात कति हुन्छ? हिसाब गर्नुहोस्।  
Find the ratio of students who like literature and music if 10 students out of none like students answer that they like music. Calculate. [1]

### Solution:

Let, L and M denote the set of students who liked literature and music respectively and  $n(U) = x$ .

Then,  $n(L) = 40\%$  of  $x = 0.4x$ ,  $n(M) = 65\%$  of  $x = 0.65x$ ,  $n(\overline{L \cup M}) = 10\%$  of  $x = 0.1x$ .

- (a) The cardinality notation of students who did not like any option in that survey is given by  
 $n(\overline{L \cup M}) = 0.1x$ .
- (b)  $n(L \cap M) = 30$

We have,  $n(U) = n(L) + n(M) - n(L \cap M) + n(\overline{L \cup M})$

$$\text{or, } x = 0.4x + 0.65x - 30 + 0.1x$$

$$\text{or, } x = 1.15x - 30$$

$$\text{or, } 30 = 0.15x$$

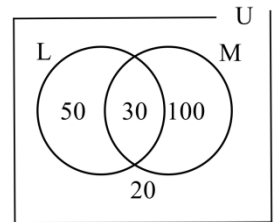
$$\text{or, } x = \frac{30}{0.15}$$

$$\therefore x = 200$$

Hence, 200 students were participated in the survey.

**NB: Give full marks for other relevant process with correct answer.**

- (c) Showing the above information in a Venn diagram,



- (d)  $n(L) = 80$ ,  $n(M) = 130 + 10 = 140$ ,  $n(\overline{L \cup M}) = 20 - 10 = 10$

$$\text{Ratio} = \frac{n(L)}{n(M)} = \frac{80}{140} = 4:7$$

Thus, if 10 students out of none liked students answer that they like music, the ratio of students who like literature and music would be 4: 7.

2. प्रकाशले अर्णिमा र एलिना दुवैलाई 1 वर्षको निम्ति रु. 6000 जम्मा रकम ऋण दिएछ । अर्णिमाले 12% अर्धवार्षिक चक्रिय व्याजदरले र एलिनाले 10% त्रैमासिक चक्रिय व्याजदरले व्याज तिर्न मञ्जुर भएछन् । अर्णिमाले रु. 89.40 व्याज एलिना भन्दा बढी तिर्छिन ।

**Prakash lent altogether Rs. 6000 to Arnima and Elina for 1 year. Arnima agreed to pay half-yearly compound interest at 12% p.a. and Elina agreed to pay quarterly compound interest at the rate of 10% p.a. Arnima paid Rs. 89.40 more than Elina as the interest:**

- (क) P धनको T वर्षमा R% अर्धवार्षिक व्याजदरले हुन आउने चक्रिय व्याज CI भए P, T, R र CI को सम्बन्ध लेख्नुहोस् ।  
The half- yearly compound interest on a sum P in T years at R% per annum is CI, write down the relation among P, T, R and CI. [1]
- (ख) प्रकाशले दुवैलाई कति कति रकम ऋणमा दिइएका थिए ? पत्ता लगाउनुहोस् ।  
How much amount did Prakash lent to each? Find. [2]
- (ग) प्रकाशले उक्त रकम आधाआधा गरी पहिलेकै व्याजदरमा अर्धवार्षिक चक्रिय व्याजदर र त्रैमासिक चक्रिय व्याजदरले उनीहरूलाई दिएको भए कसको व्याज कतिले धेरै हुने थियो ? पत्ता लगाउनुहोस् ।  
Whose interest would be more by how much if Prakash gave half-half amount to them in previous condition? Find it. [2]

**Solution:**

Suppose, the money lent to Arnima =  $P_1 = \text{Rs } x$ . Then the money lent to Elina =  $P_2 = \text{Rs } (6,000 - x)$   
Time (T) = 1 years

(a) Half yearly C.I. =  $P \left[ \left( 1 + \frac{R}{200} \right)^{2T} - 1 \right]$

(b) For Arnima Half-yearly compound interest rate (R) = 12% p.a.

$$\begin{aligned} \therefore \text{C.I. (Arnima)} &= P_1 \left[ \left( 1 + \frac{R}{200} \right)^{2T} - 1 \right] \\ &= x \left[ \left( 1 + \frac{12}{200} \right)^{2 \times 1} - 1 \right] \\ &= 0.1236x \end{aligned}$$

For Elina Quarterly compound interest rate (R) = 10% p.a.

$$\begin{aligned} \therefore \text{C.I. (Elina)} &= P_2 \left[ \left( 1 + \frac{R}{400} \right)^{4T} - 1 \right] \\ &= (6,000 - x) \left[ \left( 1 + \frac{10}{400} \right)^{4 \times 1} - 1 \right] \\ &= 0.1038128906 (6,000 - x) \\ &= 622.8773436 - 0.1038128906x \end{aligned}$$

According to question,

$$\begin{aligned} \text{C.I. (Arnima)} - \text{C.I. (Elina)} &= \text{Rs } 89.40 \\ \text{or, } 0.1236x - (622.8773436 - 0.1038128906x) &= 89.40 \\ \text{or, } 0.1236x - 622.8773436 + 0.1038128906x &= 89.40 \\ \text{or, } 0.2274128906x &= 712.2773436 \\ \text{or, } x &= 3132.09 \end{aligned}$$

Also,  $6000 - x = 6000 - 3132.09 = 2867.91$

Hence, Prakash lent Rs 3,132.09 to Arnima and Rs 2,867.91 to Elina.

- (c) For Arnima Principal ( $P_1$ ) = Rs 3,000 and half-yearly compound interest rate (R) = 12% p.a.

$$\begin{aligned} \text{So, C.I. (Arnima)} &= P_1 \left[ \left( 1 + \frac{R}{200} \right)^{2T} - 1 \right] \\ &= 3,000 \left[ \left( 1 + \frac{12}{200} \right)^{2 \times 1} - 1 \right] \\ &= \text{Rs. } 370.80 \end{aligned}$$

For Elina Principal ( $P_1$ ) = Rs 3,000 and quarterly compound interest rate (R) = 10% p.a.

$$\text{So, C.I. (Elina)} = P_2 \left[ \left( 1 + \frac{R}{400} \right)^{4T} - 1 \right]$$

$$= 3,000 \left[ \left( 1 + \frac{10}{400} \right)^4 \times 1 - 1 \right]$$

$$= \text{Rs. } 311.44$$

Difference between the interests = 370.80 – 311.44 = 59.36

Thus, Arnima's interest would be more by Rs 59.36 if Prakash lent half-half amount to them in previous condition.

3. माध्यमिक तहको एक गणित शिक्षकले आफूसँग भएको रु 80,00,000 बाट रु. 20,00,000 को कार र रु. 60,00,000 को जग्गा किनेछन् । 2 वर्षसम्म कारको मूल्य वार्षिक 6% का दरले चकीय हास हुँदै गएछ भने जग्गाको मूल्य 10% का दरले चक्रीय वृद्धि हुँदै गएछ ।

**A secondary level Mathematics teacher purchased a car for Rs. 20,00,000 and land for Rs. 60,00,000 from the amount Rs. 80,00,000 which he had. In 2 years, the price of the car has been decreasing at a compound rate of 6% per annum, while the price of land has been increasing at the rate of 10% per annum.**

- (क) यस्तो अवस्थामा कारको मूल्य निकाल्ने सूत्र लेख्नुहोस् ।  
In such condition, write the formula to calculate the price of car. [1]
- (ख) 2 वर्षपछि उक्त जग्गाको मूल्य कति पुग्छ, पत्ता लगाउनुहोस् ।  
What will be the price of land after 2 years? Find it. [1]
- (ग) 2 वर्षपछि कार र जग्गाको जम्मा मूल्य कति प्रतिशतले बढेछ वा घटेछ? गणना गर्नुहोस् ।  
Calculate the percentage by which the total value of the car and the land will increase or decrease after two years. [2]

**Solution:**

Here,

Cost price of car ( $V_o$ ) = Rs 20,00,000

Cost price of land ( $P_o$ ) = Rs 60,00,000

Time (T) = 2 years

Rate of depreciation on car (R) = 6% p.a.

Increased rate on price of land (R) = 10% p.a.

(a) The formula to calculate the price of car is  $V_T = V_o \left( 1 - \frac{R}{100} \right)^T$

(b) For land

Cost price of land ( $P_o$ ) = Rs 60,00,000

Time (T) = 2 years

Increased rate (R) = 10% p.a.

Price of land after 2 year ( $P_T$ ) = ?

We have,  $P_T = P_o \left( 1 + \frac{R}{100} \right)^T$

$$= 60,00,000 \left( 1 + \frac{10}{100} \right)^2$$

$$= \text{Rs } 72,60,000$$

Hence, the price of land will be Rs 72,60,000 after 2 years.

(c) For car

Cost price of car ( $V_o$ ) = Rs 20,00,000

Time (T) = 2 years

Rate of depreciation (R) = 6% p.a.

Price of car after 2 year ( $V_T$ ) = ?

We have,  $V_T = V_o \left( 1 - \frac{R}{100} \right)^T$

$$= 20,00,000 \left( 1 - \frac{6}{100} \right)^2$$

$$= \text{Rs. } 17,67,200$$

Hence, the price of car will be Rs 17,67,200 after 2 years.

Again, total cost price of the car and the land = Rs 80,00,000

After 2 years, total valuation of the car and the land = Rs 17,67,200 + Rs 72,60,000  
= Rs 90,27,200

Difference between the total costs = Rs. 90,27,200 – Rs. 80,00,000 = Rs. 10,27,200

Increased percentage =  $\frac{\text{Difference}}{\text{Less total amount}} \times 100\% = \frac{1027200}{8000000} \times 100\% = 12.84\%$

Hence, the total value of the car and the land will be increased by 12.84% after 2 years.

4. कक्षा 12 मा अध्यायन गर्ने विद्यार्थी विधाताले अस्ट्रेलियन डलर (AUDS) एक बराबर नेपाली रुपैयाँ 90 का दरले केही नेपाली रुपैयाँको अस्ट्रेलियन डलर खरिद गरिछन्। आठ दिनपछि अस्ट्रेलियन डलरको तुलनामा नेपाली रुपैयाँ 10% अधिमूल्यन भएछ र उनले उक्त डलरलाई फेरि नेपाली मुद्रामा साट्टा उनलाई रु 1,20,000 नोक्सान भएछ भने,

The student Bidhata who studies in class 12 exchange some Nepali rupees into Australian dollars (AUD\$). One AUD\$ is equal to NRs 90. After 8 days, Nepali currency is revaluated by 10% in comparison to Australian dollars and he exchange those dollars into Nepali rupees bearing a loss of NRs.1,20,000.

(क) नयाँ विनिमय दर कति हुन्छ? What is the new exchange rate? [1]

(ख) विधाताले सुरुमा कति नेपाली मुद्राको अस्ट्रेलियन डलर साटेकी रहिछन्। पत्ता लगाउनुहोस्।  
How much Nepali currency was exchange into Australian Dollar by Bidhata in the beginning?  
Find it. [1]

(ग) नेपाली मुद्रा 10% अधिमूल्यन हुनुको सट्टा 10% अवमूल्यन भएको भए विधातालाई कति नाफा वा नोक्सान हुन्थ्यो पत्ता लगाउनुहोस्।  
Find how much profit or loss would have been made to Bidhata if the Nepalese currency had devaluated by 10% instead of 10% revaluation. [2]

#### Solution:

Here, exchange rate: 1 AUD \$ = Rs 90

Rate of revaluation = 10%

(a) New exchange rate: 1 AUD \$ = Rs 90 – 10% of Rs 90 = Rs 81

(b) Let, Bidhata exchanged  $x$  AUD \$ with Nepali rupees.

Then, C.P. of  $x$  AUD \$ = Rs.  $90x$

S.P. of  $x$  AUD \$ = Rs.  $81x$

According to question,

$$\text{Loss} = \text{Rs. } 1,20,000$$

$$\text{or, C.P.} - \text{S.P.} = 1,20,000$$

$$\text{or, } 90x - 81x = 1,20,000$$

$$\text{or, } 9x = 1,20,000$$

$$\text{or, } x = \frac{120000}{9}$$

$$\text{or, } x = \frac{40000}{3}$$

She exchanged  $\frac{40000}{3}$  AUD \$.

So, exchanged money in rupees =  $\frac{40000}{3} \times \text{Rs } 90 = \text{Rs. } 12,00,000$

Thus, Rs 12,00,000 was exchanged into Australian Dollar by Bidhata in the beginning.

(c) When AUD \$ was devaluated by 10%

New exchange rate: 1 AUD \$ = Rs 90 + 10% of Rs 90 = Rs 99

Exchange of AUD \$  $\frac{40000}{3} = \frac{40000}{3} \times \text{Rs } 99 = \text{Rs. } 13,20,000$

Again, difference between Nepali currency in the transaction = Rs 13,20,000 – Rs 12,00,000  
= Rs 1,20,000

Thus, she would make Rs 1,20,000 profit if the NPR was devaluated instead of revaluated by 10%.

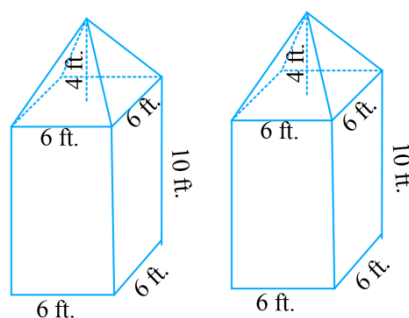
5. एउटा रङ्गशालाको गेटमा चारओटा सतह देखिने 10 फिट अग्ला दुईओटा पिल्लरहरू माथि उही आकारका एक एक वटा चार फिट उचाइ भएका पिरामिडहरू राखिएका छन्। प्रत्येक पिल्लरको आधार 6 फिट × 6 फिट छ।

There are two pillars with a base 6 feet × 6 feet and height 10 feet of each in a stadium. A pyramid of height 4 feet is placed on the top of each pillar.

- (क) पिरामिडको उचाइ  $a$  र आधारको लम्बाई  $b$  भए छड्के उचाइ पत्ता लगाउने सूत्र लेख्नुहोस्।  
Write the formula to find the slant height of the pyramid if the height is  $a$  and length of base is  $b$ . [1]
- (ख) पिरामिडहरूको छड्के सतहको क्षेत्रफल कति हुन्छ पत्ता लगाउनुहोस्।  
What is the lateral surface area of the pyramid? Find. [1]
- (ग) पिरामिड आकार पिल्लरहरूमा रङ्ग लगाउन मिल्ने सतहको क्षेत्रफल हिसाब गरी पत्ता लगाउनुहोस्।  
Find the surface area of pyramid shape pillars that need to be calculated for the painting purpose. [2]

**Solution:**

Here, length of the base of each pillar ( $L$ ) = 6 ft.  
Breadth of the base of each pillar ( $B$ ) = 6 ft.  
Height of each pillar ( $H$ ) = 10 ft.  
Length of base of each pyramid ( $a$ ) = 6 ft.  
Height of pyramid ( $h$ ) = 4 ft.



- (a) Height ( $h$ ) =  $a$  and length of base ( $a$ ) =  $b$ .  
So, slant height of pyramid ( $l$ ) =  $\sqrt{\left(\frac{a}{2}\right)^2 + h^2}$  i.e.,  $l = \sqrt{\left(\frac{b}{2}\right)^2 + a^2}$
- (b) For a pyramid, slant height of pyramid ( $l$ ) =  $\sqrt{\left(\frac{a}{2}\right)^2 + h^2} = \sqrt{\left(\frac{6}{2}\right)^2 + 4^2} = \sqrt{25} = 5$  ft.

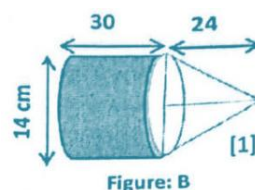
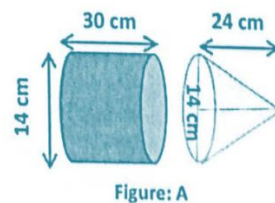
We have, L.S.A. =  $2al = 2 \times 6 \times 5 = 60$  sq. ft.

So, the lateral surface area of the pyramids =  $2 \times 60$  sq.ft. = 120 sq. ft.

- (c) Now, the lateral surface area of each pillar =  $2H(L + B) = 2 \times 10(6 + 6) = 240$  sq.ft.  
Also, the total area of a combined structures =  $(60 + 240)$  sq. ft. = 300 sq. ft.  
Ans, the total area of 2 combined structures =  $2 \times 300$  sq. ft. = 600 sq. ft.  
Hence, the total surface area surface area of pyramid shape pillars that need to be calculated for the painting purpose is 600 sq. ft.

6. चित्र A मा रामद्वारा बनाइएको बराबर आधार भएका बेलना र सोली देखाइएको छ। चित्र B मा सोही बेलना र सोली जोडेर एउटा संयुक्त ठोस वस्तु सिताद्वारा बनाइएको छ।

There is a cylinder and a cone with the equal base in the figure A which is made by Ram. A solid shown in the figure B is formed combining the cylinder and a cone of the figure A made by Sita.



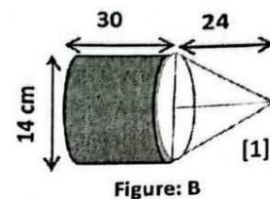
- (क) सीताले बनाएको संयुक्त ठोस वस्तुको वक्र सतहको क्षेत्रफलको सूत्र लेख्नुहोस्।  
What is the formula of the curved surface area of the combined solid figure made by Sita? [1]
- (ख) चित्र नम्बर A मा देखाइएको दुवै ठोस वस्तुहरूको छुट्टाछुट्टै पूरासतहको क्षेत्रफल पत्ता लगाई तिनीहरूको क्षेत्रफलको योगफल कति हुन्छ पत्ता लगाउनुहोस्।  
Find the separate total surface area of solid objects of the first figure and calculate their sum. [2]

- (ग) चित्र नम्बर A मा देखाइएका ठोस वस्तुहरूको क्षेत्रफलको योगफल र चित्र नम्बर B को संयुक्त ठोस वस्तुको क्षेत्रफल बराबर हुन्छ ? हुँदैन भने कतिको फरक हुन्छ पत्ता लगाउनुहोस् ।

Is the sum of the area of solid in the figure A equal to the total surface area of the combined solid of the figure B? If not, find the difference. [1]

**Solution:**

- (a) Here, the solid figure made by Sita is composed up of a cylinder and a cone.  
Thus, curved surface area of the combined solid figure made by Sita = C.S.A. of cylinder + C.S.A. of cone  
=  $2\pi rh + \pi rl$   
=  $\pi r(2h + l)$



- (b) Here, the solid figures made by Ram are a cylinder and a cone.

For cylindrical shape

Diameter (d) = 14 cm  $\therefore r = 7$  cm

Height (h) = 30 cm

Now, T.S.A. =  $2\pi r(r + h)$

$$= 2 \times \frac{22}{7} \times 7 (7 + 30)$$

$$= 1628 \text{ cm}^2$$

For conical shape

Diameter (d) = 14 cm  $\therefore r = 7$  cm

Height (h) = 24 cm

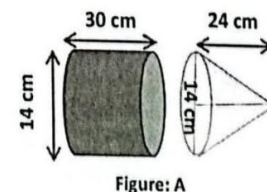
Slant height (l) =  $\sqrt{r^2 + h^2} = \sqrt{7^2 + 24^2} = 25$  cm

Also, T.S.A. =  $\pi r(r + l)$

$$= \frac{22}{7} \times 7 (7 + 25)$$

$$= 704 \text{ cm}^2$$

Again, total surface area of figure-A =  $1628 \text{ cm}^2 + 704 \text{ cm}^2 = 2332 \text{ cm}^2$



- (c) For cylindrical shape

Diameter (d) = 14 cm  $\therefore r = 7$  cm

Height (h) = 30 cm

Now, C.S.A. (cylinder) =  $2\pi rh$

$$= 2 \times \frac{22}{7} \times 7 \times 30$$

$$= 1320 \text{ cm}^2$$

For conical shape

Diameter (d) = 14 cm  $\therefore r = 7$  cm

Height (h) = 24 cm

Slant height (l) =  $\sqrt{r^2 + h^2} = \sqrt{7^2 + 24^2} = 25$  cm

Also, C.S.A. (cone) =  $\pi rl$

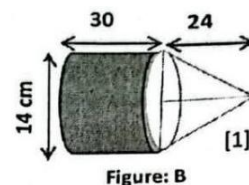
$$= \frac{22}{7} \times 7 \times 25$$

$$= 550 \text{ cm}^2$$

Area of base ( $A_{\text{base}}$ ) =  $\pi r^2 = \frac{22}{7} \times 7^2 = 154 \text{ cm}^2$

Again, total surface area of figure-B =  $1320 \text{ cm}^2 + 550 \text{ cm}^2 + 154 \text{ cm}^2 = 2024 \text{ cm}^2$

We observed that the total surface area of figure-A and figure-B are not same because the total surface area of figure-A is  $308 \text{ cm}^2$  more than that of figure-B



**Matured logic for 1 mark**

By comparing the surfaces of figure-A and figure-B, two circular bases are not observed and cannot even touch in figure-B. So, its total surface area is less than the area of two circular bases

in comparison to figure-A. i.e., T.S.A. of figure-A is more than  $2\pi r^2 = \frac{22}{7} \times 7^2 = 308 \text{ cm}^2$ .

Hence, the total surface area of figure-A is more by  $308 \text{ cm}^2$ .

7. बराबर साइजका आठवटा त्रिभुज आकार कपडाका टुक्राहरू मिलेर एउटा सोली आकारको टेन्ट निर्माण गरिएको छ । एउटा त्रिभुजाकार टुक्राको तीनवटा भुजाहरूको लम्बाई क्रमश 6 मिटर 8 मिटर र 10 मिटर छन् ।

**A cone shaped tent is constructed from eight triangular pieces of cloth of equal size. The lengths of the three sides of each triangular pieces of cloth are 6 m, 8 m and 10 m.**

- (क) टेन्ट बनाउन चाहिने आवश्यक कपडाको क्षेत्रफल पत्ता लगाउनुहोस् ।

Find the total area of clothes required for the tent. [3]

- (ख) प्रति वर्गमिटर कपडाको मूल्य रु 500 र प्रति वर्गमिटर कपडाको बनाएबापतको ज्याला रु 20 भए उक्त टेन्ट बनाउन जम्मा खर्च कति लाग्छ पत्ता लगाउनुहोस् ।

If the cost of cloth for square meter is Rs 500 and wages per square meter is Rs 20, find the total cost of the tent construction. [2]

**Solution:**

Here, sides of each triangular piece of cloth are:  $a = 6 \text{ m}$ ,  $b = 8 \text{ m}$  and  $c = 10 \text{ m}$

(a) For a piece of cloth, semi-perimeter (s)  $= \frac{a + b + c}{2}$   
 $= \frac{6 + 8 + 10}{2} \text{ m}$   
 $= 12 \text{ m}$

Now, area of each triangular piece (A)  $= \sqrt{s(s-a)(s-b)(s-c)}$   
 $= \sqrt{12(12-6)(12-8)(12-10)}$   
 $= \sqrt{12 \times 6 \times 4 \times 2}$   
 $= \sqrt{576}$   
 $= 24 \text{ m}^2$

Again, area of 8 pieces of cloth  $= 8 \times 24 \text{ m}^2 = 192 \text{ m}^2$

Hence, the total area of clothes required for the tent is  $192 \text{ m}^2$ .

- (b) Rate of cloth = Rs 500 per  $\text{m}^2$  and wages = Rs 20 per  $\text{m}^2$

Now, cost of cloth =  $192 \times \text{Rs } 500 = \text{Rs } 96,000$

Wages cost =  $192 \times \text{Rs } 20 = \text{Rs } 3840$

Thus, total cost of tent construction =  $\text{Rs } 96,000 + \text{Rs } 3840 = \text{Rs } 99,840$



8. दुई फरक कम्पनीका तलब योजनाहरू तल दिएका छन् ।

**The salary scheme of two different companies is given below.**

वर्ष (year)	पहिलो वर्ष (1 <sup>st</sup> year)	दोश्रो वर्ष (2 <sup>nd</sup> year)	तेश्रो वर्ष (3 <sup>rd</sup> year)
Company A	Rs. 10,000/month	Rs. 15,000/month	Rs. 20,000/month
Company B	Rs. 5,000/month	Rs. 10,000/month	Rs. 20,000/month

यही योजनाले यदि सम्झौतामा 6 वर्षको व्यवस्था भएमा तलका प्रश्नहरूको उत्तर दिनुहोस् ।

**If there is a provision in a contract for 6 years in this plan, answer the following questions.**

- (क) कम्पनी A को तलब कुन अनुक्रममा छ? Which sequence is in the salary of company-A? [1]

- (ख) छैटौँ वर्षमा कम्पनी B को प्रति महिनाको तलब कति हुन्छ?

What is the salary per month in the 6<sup>th</sup> year in company B? [2]

- (ग) कम्पनी A ले कम्पनी B भन्दा छैटौँ वर्षमा प्रति महिना कति रुपैयाँ बढी वा कम तलब तिर्छ ?

How many rupees more or less salary does company A pays per month in 6<sup>th</sup> year than company B?

[2]

**Solution:**

(a) The salary of company-A is in arithmetic sequence because the salary is increased by Rs 5,000 in each successive years i.e., the common difference is Rs 5,000.

(b) For company-B

The monthly salary of the first year (a) = Rs 5,000

$$\text{Common ratio (r)} = \frac{10000}{5000} = 2$$

The month salary of the 6<sup>th</sup> year ( $t_6$ ) = ?

$$\begin{aligned}\text{We have, } t_n &= ar^{n-1} \\ t_6 &= 5000 \times 2^{6-1} \\ &= 5000 \times 32 \\ &= 1,60,000\end{aligned}$$

Hence, the monthly salary of company-B in the 6<sup>th</sup> year will be Rs. 1,60,000.

(c) For company-A

The monthly salary of the first year (a) = Rs 10,000

Common difference (d) = 10000 – 5000 = Rs 5,000

The month salary of the 6<sup>th</sup> year ( $t_6$ ) = ?

$$\begin{aligned}\text{We have, } t_n &= a + (n - 1)d \\ t_6 &= 10,000 + (6 - 1)5000 \\ &= 10,000 + 5 \times 5,000 \\ &= 35,000\end{aligned}$$

Hence, the monthly salary of company-A in the 6<sup>th</sup> year will be Rs 35,000.

Difference between the salaries paid by the companies in 6<sup>th</sup> year = 160000 – 35000 = 125000

Hence, the company-A pays Rs. 1,25,000 less salary per month than company-B in the 6<sup>th</sup> year.

9. एउटा आयताकार खेतको लम्बाइ चौडाइको तेव्वर छ र त्यसको क्षेत्रफल 48 वर्ग मिटर छ ।

**The length of a rectangular field is thrice the width and its area is 48 square meter.**

(क) वर्ग समीकरणको स्तरीय स्वरूप लेख्नुहोस् । Write the standard form of the quadratic equation. [1]

(ख) उक्त खेतको लम्बाइ र चौडाइ पत्ता लगाउनुहोस् । Find the length and breadth of that rectangular field. [3]

(ग) उक्त आयताकार खेतमा  $(4 \times 3)$  वर्गमिटरका कतिओटा टुक्राहरू तयार गर्न सकिएला, गणना गर्नुहोस्।

How many pieces of land can be made with dimension  $(4 \times 3)$  square metre in that rectangular field? Calculate it [1]

**Solution:**

(a) The standard form of the quadratic equation is  $ax^2 + bx + c = 0$ ,  $a \neq 0$

(b) Let, the breadth of the rectangular field (b) =  $x$  m.

Then, its length ( $l$ ) =  $3x$  m

Now, area of the field (A) =  $l \times b$

$$\begin{aligned}\text{or, } 48 &= 3x \times x \\ \text{or, } 16 &= x^2 \\ \therefore x &= 4\end{aligned}$$

Also,  $l = 3x = 3 \times 4 = 12$

Hence, the breadth of the field is 4 m and length is 12 m.

(c) Area of the rectangular field (A) =  $48 \text{ m}^2$

Area of each smaller pieces of plots (a) =  $(4 \times 3)$  square metre =  $12 \text{ m}^2$

$$\text{Now, no. of pieces of plots (N)} = \frac{\text{Area of the rectangular field (A)}}{\text{Area of each smaller pieces of plots (a)}} = \frac{48}{12} = 4$$

Hence, 4 smaller pieces of plots can be made in that rectangular field.

10. (क) हल गर्नुहोस् (Solve):  $4^x + \frac{1}{4^x} = 16\frac{1}{16}$  [2]

(ख) सरल गर्नुहोस् (Simplify):  $\frac{a-5}{a^2-5a+25} + \frac{a+5}{a^2+5a+25} - \frac{250}{a^4+25a^2+625}$  [3]



**Solution:**

(a) Here,  $4^x + \frac{1}{4^x} = 16 \frac{1}{16}$   
 or,  $4^x + \frac{1}{4^x} = \frac{257}{16}$  ... (i)

Let  $4^x = a$ , then equation (i) becomes  $a + \frac{1}{a} = \frac{257}{16}$

Now,  $a + \frac{1}{a} = \frac{257}{16}$

or,  $\frac{a^2 + 1}{a} = \frac{257}{16}$

or,  $16a^2 + 16 = 257a$

or,  $16a^2 - 257a + 16 = 0$

or,  $16a^2 - (256 + 1)a + 16 = 0$

or,  $16a^2 - 256a - a + 16 = 0$

or,  $16a(a - 16) - 1(a - 16) = 0$

or,  $(a - 16)(16a - 1) = 0$

Either  $a - 16 = 0$  i.e.  $a = 16$  or,  $4^x = 4^2 \therefore x = 2$

or,  $16a - 1 = 0$  i.e.  $a = \frac{1}{16}$  or,  $4^x = \frac{1}{4^2} = 4^{-2} \therefore x = -2$

Hence,  $x = \pm 2$ .

(b) Here,  $\frac{a-5}{a^2-5a+25} + \frac{a+5}{a^2+5a+25} - \frac{250}{a^4+25a^2+625}$   
 $= \frac{(a-5)(a^2+5a+25) + (a+5)(a^2-5a+25)}{(a^2-5a+25)(a^2+5a+25)} - \frac{250}{(a^2+25)^2 - 2 \cdot a^2 \cdot 25 + 25a^2}$   
 $= \frac{a^3 - 5^3 + a^3 + 5^3}{(a^2-5a+25)(a^2+5a+25)} - \frac{250}{(a^2+25)^2 - (5a)^2}$   
 $= \frac{2a^3}{(a^2-5a+25)(a^2+5a+25)} - \frac{250}{(a^2+5a+25)(a^2-5a+25)}$   
 $= \frac{2a^3 - 250}{(a^2-5a+25)(a^2+5a+25)}$   
 $= \frac{2(a^3 - 125)}{(a^2-5a+25)(a^2+5a+25)}$   
 $= \frac{2(a-5)(a^2+5a+25)}{(a^2-5a+25)(a^2+5a+25)}$   
 $= \frac{2(a-5)}{a^2-5a+25}$

11. यदि एउटा समानान्तर चतुर्भुज ANOB र एउटा आयत XNOY एउटै आधार NO र उही समानान्तर रेखाहरू NO र AY बीच बनेका छन्। If a parallelogram ANOB and a rectangle XNOY are standing on the same base between the same parallel lines.

(क) समानान्तर चतुर्भुजको क्षेत्रफल पत्ता लगाउने सूत्र लेख्नुहोस् ?

Write the formula to calculate the area of parallelogram. [1]

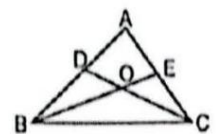
(ख) समानान्तर चतुर्भुज ANOB को क्षेत्रफल बराबर आयत XNOY हुन्छ भनी प्रमाणित गर्नुहोस्।

Prove that area of parallelogram ANOB is equal to area of rectangle XNOY. [2]

(ग) दिइएको त्रिभुज ABC मा, BE र CD दुई मध्यिकाहरू बिन्दु O मा प्रतिच्छेदित छन्। सिद्ध गर्नुहोस् :

$\Delta BOC$  को क्षेत्रफल = चतुर्भुज ADOE को क्षेत्रफल।

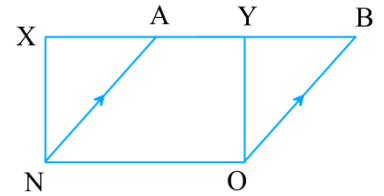
In the given triangle ABC, two medians BE and CD are intersect at O. Prove that area of  $\Delta BOC =$  area of quadrilateral ADOE. [2]



**Solution:**

(a) Area of parallelogram = Base (b)  $\times$  Height (h)

- (b) Given: Parallelogram ANOB and rectangle XNOY are standing on the same base NO and between the same parallel lines XB and NO.



To prove: Area of  $\square$  ANOB = Area of rectangle XNOY

Proof:

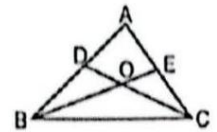
S.N.	Statements	S.N.	Reasons
1.	In $\triangle NAX$ and $\triangle OBY$ (i) $\angle NAX = \angle OBY$ (A) (ii) $\angle AXN = \angle BYO$ (A) (iii) $XN = YO$ (S)	1.	(i) $AN \parallel BO$ and corresponding angles. (ii) Both are right angles. (iii) Being the opposite sides of rectangle.
2.	$\triangle NAX \cong \triangle OBY$	2.	By A.A.S. axiom
3.	$\triangle NAX = \triangle OBY$	3.	Being the area of congruent triangles equal.
4.	$\triangle NAX + \text{Trapezium ANOY}$ $= \triangle OBY + \text{Trapezium ANOY}$	4.	Adding the same Trapezium ANOY to both sides of statement (3).
5.	Rectangle XNOY = $\square$ ANOB	5.	By whole part axiom

Alternatively

Proof:

S.N.	Statements	S.N.	Reasons
1.	Area of $\square$ ANOB = $NO \times YO$	1.	Area of parallelogram = base $\times$ height.
2.	Area of rectangle XNOY = $NO \times YO$	2.	Area of rectangle = length $\times$ breadth.
3.	$\square$ ANOB = Rectangle XNOY	3.	From statements (1) and (2).

- (c) Given: In triangle ABC, two medians BE and CD are intersect at O.  
To prove: Area of  $\triangle BOC$  = area of quadrilateral ADOE.

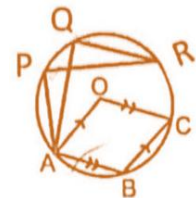


Proof:

S.N.	Statements	S.N.	Reasons
1.	$\triangle BCE = \frac{1}{2} \triangle ABC$	1.	Median BE bisects $\triangle ABC$
2.	$\triangle ADC = \frac{1}{2} \triangle ABC$	2.	Median DC bisects $\triangle ABC$
3.	$\triangle BCE = \triangle ADC$	3.	From statements (1) and (2).
4.	$\triangle BOC + \triangle COE = \text{Quad. ADOE} + \triangle COE$	4.	By whole part axiom, from (3)
5.	$\triangle BOC = \text{Quad. ADOE}$	5.	From statement (4)

12. केन्द्रबिन्दु O भएको दिइएको वृत्तमा एउटै चापमा आधारित परिधिका कोणहरू APR र AQR छन् साथै  $AO \parallel BC$  र  $OC \parallel AB$  छन्।

O is the center of the given circle. Inscribed angles APR and AQR are standing on the same arc and  $AO \parallel BC$  and  $OC \parallel AB$ .



- (क) एउटा परिधि कोण APR,  $168^\circ$  को आधा भए अर्को परिधि कोण AQR कति डिग्री हुन्छ ?

One inscribed angle APR is half of  $168^\circ$ , find the other inscribed angle AQR. [1]

- (ख) यदि OABC एउटा समानान्तर चतुर्भुज हो भने  $\angle ABC$  को मान निकाल्नुहोस्।

If OABC is a parallelogram, find the value of  $\angle ABC$ . [1]

- (ग) वृत्तको एउटै चापमा आधारित परिधिका कोणहरू  $\angle APR$  र  $\angle AQR$  विचको सम्बन्ध प्रयोगात्मक रूपमा पुष्टि गर्नुहोस्। (कम्तीमा 3 cm अर्धव्यास भएका दुईओटा वृत्तहरू आवश्यक छन्।)

Experimentally verify the relationship between the inscribed angles  $\angle APR$  and  $\angle AQR$  standing on the same arc. (At least two circles with radii 3cm are necessary.) [2]

Solution:

Here, O is the center of the given circle. Inscribed angles APR and AQR are standing on the same arc and AO//BC and OC//AB.

- (a)  $\angle APR = \angle AQR = \text{half of } 168^\circ = 84^\circ$  [Inscribed angles on the same arc are equal]  
 (b) (i)  $\angle ABC = \text{Obtuse } \angle AOC$  [The opposite angles of parallelogram are equal.]  
 (ii) Reflex  $\angle AOC = 2 \times \angle ABC$  [The centre angle is twice the inscribed angle]

Now, Reflex  $\angle AOC + \text{Obtuse } \angle AOC = 360^\circ$  [Being the complete turn]

$$\text{or, } 2\angle ABC + \angle ABC = 360^\circ$$

$$\text{or, } 3\angle ABC = 360^\circ$$

$$\therefore \angle ABC = 120^\circ$$

Hence, the value of  $\angle ABC$  is  $120^\circ$

(c) **Experimental verification**

Step 1: Two circles with centre O and different radii are drawn.

Step 2: Inscribed angles  $\angle APR$  and  $\angle AQR$  are drawn in the same arc AR.

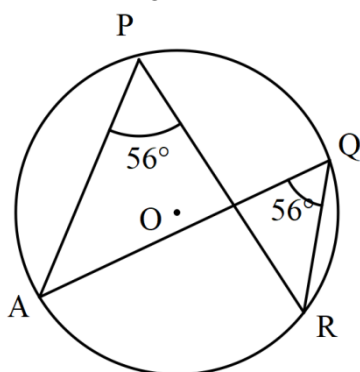


Fig. (i)

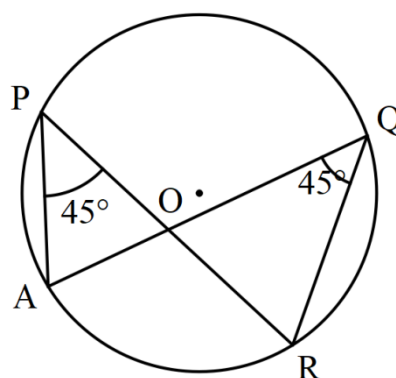


Fig. (ii)

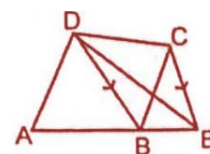
Step 3:  $\angle APR$  and  $\angle AQR$  are measured and the results are tabulated.

Figure	$\angle APR$	$\angle AQR$	Result
(i)	$56^\circ$	$56^\circ$	$\angle APR = \angle AQR$
(ii)	$45^\circ$	$45^\circ$	$\angle APR = \angle AQR$

Conclusion: From the above experiment, we came to know that the inscribed angles  $\angle APR$  and  $\angle AQR$  standing on the same arc AR are equal.

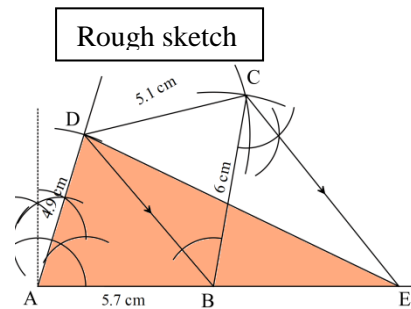
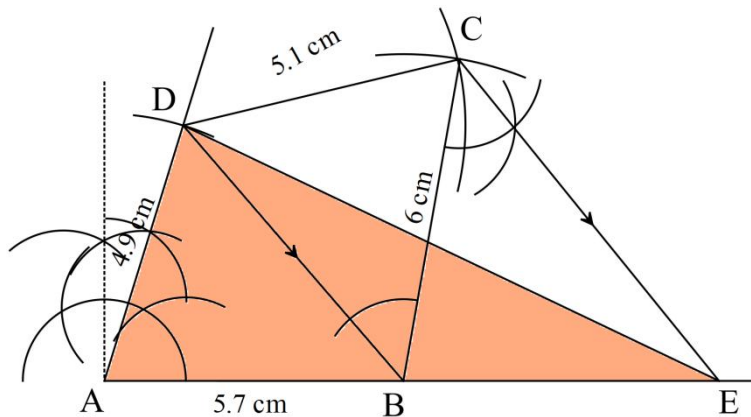
13. (क) चतुर्भुज ABCD को रचना गर्नुहोस्। जसमा  $AB = 5.7 \text{ cm}$ ,  $BC = 6 \text{ cm}$ ,  $CD = 5.1 \text{ cm}$ ,  $AD = 4.9 \text{ cm}$  र  $\angle BAD = 75^\circ$  छन् उक्त चतुर्भुजको क्षेत्रफल सँगै बराबर हुने त्रिभुज ADE को रचना गर्नुहोस्। [3]  
 Construct a quadrilateral ABCD in which  $AB = 5.7 \text{ cm}$ ,  $BC = 6.1 \text{ cm}$ ,  $CD = 5.1 \text{ cm}$ ,  $AD = 4.9 \text{ cm}$  and  $\angle BAD = 75^\circ$ , Also construct a triangle ADE equal in area to the quadrilateral ABCD.

- (ख) चतुर्भुज ABCD को शिर्षविन्दु C बाट विकर्ण DB सँग समानान्तर हुने गरी खिचीएको रेखाले AB लाई लम्बाइएको रेखाको विन्दु E मा छोएको छ भने चतुर्भुज ABCD को क्षेत्रफल र  $\triangle DAE$  को क्षेत्रफल बराबर हुनुको कारण सहित स्पष्ट पार्नुहोस्। The line drawn through the vertex C of the quadrilateral ABCD parallel to the diagonal DB meets AB produced at E. Clarify with reasons that area of quadrilateral ABCD is equal to the area of  $\triangle DAE$ . [1]



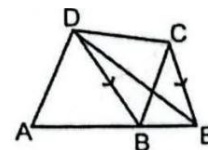
**Solution:**

- (a) Given: In quadrilateral ABCD; AB = 5.7 cm, BC = 6.1 cm CD = 5.1 cm, AD = 4.9 cm and  $\angle BAD = 75^\circ$



Thus,  $\triangle ADE$  is the required triangle.

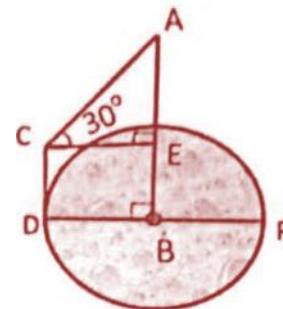
- (b) To prove: Area of quadrilateral ABCD = Area of  $\triangle ADE$   
Proof:



S.N.	Statements	S.N.	Reasons
1.	$\triangle BCD = \triangle BED$	1.	Both are standing on the same base BD and between $CE \parallel DB$ .
2.	$\triangle ABCD + \triangle ABD = \triangle BED + \triangle ABD$	2.	Adding $\triangle ABD$ in statement (1).
3.	Quad. ABCD = $\triangle ADE$	3.	By whole part axiom

14. दिइएको वृत्ताकार पोखरीको केन्द्र B मा पानीको सतहदेखि माथि 11.62 मि. अग्लो AB खम्बा छ। पोखरीको किनाराबाट 1.62 मि. अग्लो CD मानिसले खम्बाको टुप्पो A अवलोकन गर्दा उन्नतांश कोण  $30^\circ$  पायो।

At the centre of circular pond, there is a pole of 11.62m height above the surface of the water. From a point of the edge of the pond, a man of 1.62 m height observed the angle of elevation of the top of the pole found to be  $30^\circ$ .



- (क) BE को नाप लेख्नुहोस्। Write the measure of BE. [1]  
 (ख) CE को नाप पत्ता लगाउनुहोस्। Find the measure of CE. [1]  
 (ग) सो पोखरीको परिधि पत्ता लगाउनुहोस्। Find the circumference of the pond. [1]  
 (घ) सो पोखरीको किनाराबाट उक्त मानिसले खम्बाको टुप्पो अवलोकन गर्दा उन्नतांश कोण  $30^\circ$  को सट्टा  $45^\circ$  पाएको भए पोखरीको परिधीमा कति अन्तर पर्थ्यो होला? पत्ता लगाउनुहोस्।

From a point of the edge of that pond, If that man observes the angle of elevation of the top of the pole found to be  $45^\circ$  instead of  $30^\circ$ . What will be the difference in circumference? Find. [1]

**Solution:**

Here, AB = 11.62 m, CD = 1.62 m and  $\angle ECA = 30^\circ$

- (a) The length of BE = CD = 1.62 m  
 (b) AE = AB - BE = 11.62 m - 1.62 m = 10 m

In triangle ACE;  $\tan 30^\circ = \frac{AE}{CE}$

or,  $\frac{1}{\sqrt{3}} = \frac{10}{CE}$

or, CE =  $10\sqrt{3}$

Hence, the length of CE is  $10\sqrt{3}$  m.

- (c) Radius of the pond,  $r = BD = CE = 10\sqrt{3}$  m

Now, circumference of the pond =  $2\pi r = 2 \times \frac{22}{7} \times 10\sqrt{3} \text{ m} = 108.87 \text{ m}$

(d)  $\angle ECA = 45^\circ$

In triangle ACE;  $\tan 45^\circ = \frac{AE}{CE}$

$$\text{or, } 1 = \frac{10}{CE}$$

$$\text{or, } CE = 10$$

Radius of the pond,  $r = BD = CE = 10 \text{ m}$

Now, circumference of the pond =  $2\pi r = 2 \times \frac{22}{7} \times 10 \text{ m} = 62.86 \text{ m}$

Difference between the circumference =  $108.87 \text{ m} - 62.86 \text{ m} = 46.01 \text{ m}$

Hence, the circumference of the pond would be 46.01 m less if the angle elevation of the top of the pole be  $45^\circ$ .

15. जनसङ्ख्या तथा वातावरण सरोकार समाज नामक संस्थामा कार्यरत कर्मचारीहरूले प्राप्त गर्ने मासिक तलब तथा कर्मचारी सङ्ख्या तलको तालिकामा दिइएको छ। उक्त तालिकाको तल्लो चतुर्थासं 25 भए,

**Monthly income and number of employers of society for population and environment concern institution is given in the following table. The lower quartile of the table is 25.**

मासिक तलब Monthly salary (in thousands)	10-20	20-30	30-40	40-50	50-60
कर्मचारी सङ्ख्या No. of employers	3	4	p	4	3

(क) तल्लो चतुर्थासंको लागि कुन सूत्र प्रयोग गर्नुहुन्छ ? लेख्नुहोस्।

Which formula can you use for the lower quartile? Write it.

[1]

(ख) p को मान पत्ता लगाउनुहोस्। Find the value of p.

[2]

(ग) उक्त संस्थामा कार्यरत कर्मचारीको मासिक औसत तलब कति हुन्छ? पत्ता लगाउनुहोस्।

What is the monthly average salary of the employees in that organization? Find it.

[2]

(ग) तल्लो र माथिल्लो चतुर्थाशमा माथिल्लो चतुर्थास तल्लो चतुर्थास भन्दा कति प्रतिशतले बढी छ तुलना गर्नुहोस्।

In the lower and upper quartiles, compare the percentage by which the upper quartile is greater than the lower quartile.

[1]

**Solution:**

Here, lower quartile ( $Q_1$ ) = 25

(a) The formula for calculating the lower quartile ( $Q_1$ ) is  $Q_1 = L + \frac{i}{f} \left( \frac{N}{4} - c.f \right)$

(b) Cumulative frequency table.

Monthly salary (in thousands)	No. of employers (f)	c.f.
10-20	3	3
20-30	4	7
30-40	p	7 + p
40-50	4	11 + p
50-60	3	14 + p
<b>Total</b>	<b>N = 14 + p</b>	

Since,  $Q_1 = 25$ . So,  $Q_1$  class = 20-30

Also,  $L = 20$ ,  $\frac{N}{4} = \frac{14+p}{4}$ ,  $c.f. = 3$ ,  $f = 4$  and  $i = 10$

We know,  $Q_1 = L + \frac{i}{f} \left( \frac{N}{4} - c.f \right)$

$$\text{or, } 25 = 20 + \frac{10}{4} \left( \frac{14+p}{4} - 3 \right)$$

$$\text{or, } 5 = \frac{5}{2} \left( \frac{14+p-12}{4} \right)$$

$$\text{or, } 40 = 5(2 + p)$$

$$\text{or, } 8 = 2 + p$$

$$\text{or, } p = 6$$

Hence, the required value of  $p$  is 6.

(c) Calculation of average monthly salary

Monthly salary (in thousands)	Mid-value (m)	No. of employers (f)	$fm$
10-20	15	3	45
20-30	25	4	100
30-40	35	6	210
40-50	45	4	180
50-60	55	3	165
<b>Total</b>		<b>N = 20</b>	$\Sigma fm = 700$

$$\text{Now, average salary } (\bar{X}) = \frac{\Sigma fm}{N} = \frac{700}{20} \times \text{Rs } 1,000 = \text{Rs. } 35,000$$

Hence, the average monthly salary of the employees of the organization is Rs 35,000.

(d) Calculation of upper quartile ( $Q_3$ ):

Monthly salary (in thousands)	No. of employers (f)	$c.f.$
10-20	3	3
20-30	4	7
30-40	6	13
40-50	4	17
50-60	3	20
<b>Total</b>	<b>N = 20</b>	

$$\text{The position of upper quartile } (Q_3) \text{ class} = \left(\frac{3N}{4}\right)^{\text{th}} \text{ class} = \left(\frac{3 \times 20}{4}\right)^{\text{th}} \text{ class} = 15^{\text{th}} \text{ class}$$

In  $c.f.$  column, the  $c.f.$  just greater than 15 is 17 and its corresponding class is 40-50  
 $\therefore Q_3$  class is (40-50)

$$\text{Here, } L = 40, \frac{3N}{4} = 15, c.f. = 13, f = 4 \text{ and } i = 4$$

$$\begin{aligned} \text{We have, upper quartile } (Q_3) &= L + \frac{i}{f} \left( \frac{3N}{4} - c.f. \right) \\ &= 40 + \frac{10}{4} (15 - 13) \\ &= 40 + 5 \\ &= 45 \end{aligned}$$

$$\text{Difference between } Q_3 \text{ and } Q_1 = 45 - 25 = 20$$

$$\text{Hence, } Q_3 \text{ is more than } Q_1 \text{ by } \frac{20}{25} \times 100\% = 80\%.$$

## 16. 52 पत्ती भएको तासको एक प्याकमा In a pack of 52 cards

(क) यदि A र B दुईवटा पारस्परिक निषेधक घटनाहरू हुन भने  $P(A \cup B)$  पत्ता लगाउने सूत्र लेख्नुहोस्।

If A and B are two mutually exclusive events then write down the formula to find the probability of  $P(A \cup B)$ . [1]

(ख) सो तासको प्याकबाट एउटा तास नहेरिक्न झिक्दा एक्का वा बादशाह आउने सम्भाव्यता कति हुन्छ ?

If a card is drawn at random, find the probability of getting an ace or king card. [1]

(घ) सो तासको प्याकबाट दुईवटा तास नहेरिक्न एकपछि अर्को गरी पुन नराखिक्न झिक्दा अनुहार भएको तास पर्ने र नपर्ने सम्भावित परिणामहरूको सम्भाव्यतालाई एउटै वृक्ष चित्रमा देखाउनुहोस्।

Two cards are drawn randomly one after another from that deck of cards in succession without replacement. Show the probability of possible outcomes of getting and not getting face card in a tree diagram. [2]

- (घ) सो प्याकबाट एकपछि अर्को गरी दुईओटा तासहरू पुन नराखीकन झिक्दा दुवै तास रातो अनुहार भएको पर्ने सम्भाव्यता एक भन्दा कति कम होला पत्ता लगाउनुहोस् । Two cards are drawn randomly one after another from that deck of cards in succession without replacement. By how much is the probability of getting both the red face card less than 1? [1]

**Solution:**

- (a) When A and B are two mutually exclusive events,  $P(A \cup B) = P(A) + P(B)$   
 (b) Let, A and K denote the events of getting an ace and king respectively.  
 Then,  $n(A) = 4$ ,  $n(K) = 4$  and  $n(S) = 52$   
 Since, the events of getting an ace and a king are mutually exclusive events.  
 Now, probability of getting an ace or a king card,  $P(A \text{ or } K) = P(A \cup K) = P(A) + P(K)$

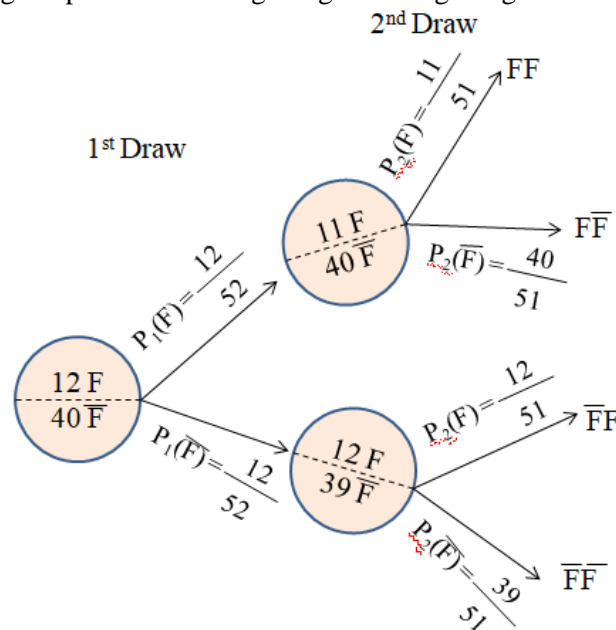
$$\begin{aligned} &= \frac{n(A)}{n(S)} + \frac{n(K)}{n(S)} \\ &= \frac{4}{52} + \frac{4}{52} \\ &= \frac{2}{13} \end{aligned}$$

- (c) Let, F and  $\bar{F}$  denote the events of getting and not getting faced cards respectively.

Then,  $n(F) = 12$ ,  $n(\bar{F}) = 40$  and  $n(S) = 52$

*Case: Without replacement*

Showing the probabilities of getting and not getting faced cards in a tree-diagram;



- (d) Let,  $R_1$  and  $R_2$  be the events of getting red faced cards in the first and second trials respectively.

Then,  $n(R_1) = 6$  and  $n(R_2) = 5$

Now, probability of getting both red faced cards,  $P(R_1 R_2)$

$$\begin{aligned} &= P(R_1) \times P(R_2) \\ &= \frac{n(R_1)}{n(S)} \times \frac{n(R_2)}{n(S)} \\ &= \frac{6}{52} \times \frac{5}{51} \\ &= \frac{5}{442} \end{aligned}$$

Difference between 1 and  $\frac{5}{442} = 1 - \frac{5}{442} = \frac{437}{442}$

**THE END**