

माध्यमिक शिक्षा परीक्षा
(Secondary Education Examinations - SEE)
अनिवार्य गणित

समय : 3:00 घण्टा

पूर्णाङ्क : 100

सबै प्रश्नहरू हल गर्नुहोस् । Attempt all the Questions.

समूह 'क' (Group 'A') [3 x 2 = 6]

1. (a) मूल्यअभिवृद्धि करको परिभाषा लेख्नुहोस् ।

Write down the definition of Value Added Tax (VAT).

- (b). कुनै त्रिभुजका तिन ओटा भुजाहरू क्रमशः a , b र c छन् भने सो त्रिभुजको अर्धपरिमिति कति हुन्छ, लेख्नुहोस् ।

If three sides of a triangle are a , b and c respectively, what is the semi perimeter of the triangle? Write it.

2. (a) सरल गर्नुहोस् (Simplify):

$$x^{a-b} \times x^{b-a}$$

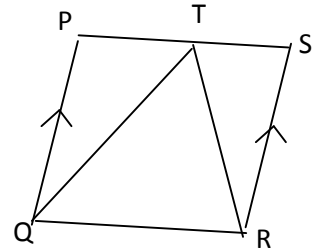
- (b). वर्गीकृत तथ्याङ्कमातल्लो चतुर्थांशको मान (Q_1) पत्ता लगाउने सूत्र लेख्नुहोस् ।

Write the formula to find the value of lower quartile (Q_1) of a continuous data.

3. (a) दिइएको चित्रमा समानान्तर चतुर्भुज PQRS र

ΔQTR को क्षेत्रफल बीच के सम्बन्ध हुन्छ, लेख्नुहोस् ।

In the given figure, what is the relation between the area of the parallelogram PQRS and the ΔQTR ? Write it.

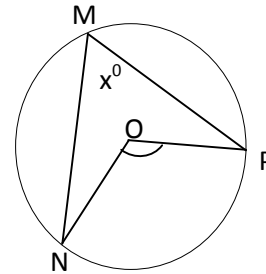


- (b). सँगैको चित्रमा O वृत्तको केन्द्रबिन्दु हो । यदि $\angle NMP = x^\circ$

भए $\angle NOP$ को मान पत्ता लगाउनुहोस् ।

In the adjoining figure, O is the center

of a circle. If $\angle NMP = x^\circ$, find the value of $\angle NOP$.



समूह 'ख' (Group 'B') [7 x (2+2) + 3 x (2+2+2) = 34]

4. (a) एउटा वस्तुको 13% मूल्यअभिवृद्धि करसहितको मूल्य रु. 5763 छ भने मूल्यअभिवृद्धि कर रकम कति होला ? पत्ता लगाउनुहोस् ।

The price of an object with 13% value added tax is Rs. 5763. What will be the value added tax amount? Find it.

- (b). एउटा मोटरसाइकलको हालको मूल्य रु. 2,25,000 छ । यदि सो मूल्यमा प्रतिवर्ष 8% का दरले वार्षिक ह्रास हुन्छ भने, कति वर्षपछि मोटरसाइकलको मूल्य रु. 1,75,204.80 होला ? पत्ता लगाउनुहोस् ।

The present price of a motorcycle is Rs. 2,25,000. If its price is depreciated per year by 8%, after how many years will be the price of the motorcycle be Rs. 1,75,204.80? Find it.

5. (a) आधार भुजाको लम्बाइ 10 मिटर भएको एउटा समद्विबाहु त्रिभुजाकार जग्गाको क्षेत्रफल 60 वर्ग मिटर भए सो जग्गाको बाँकी भुजाहरूको नाप पत्ता लगाउनुहोस् ।

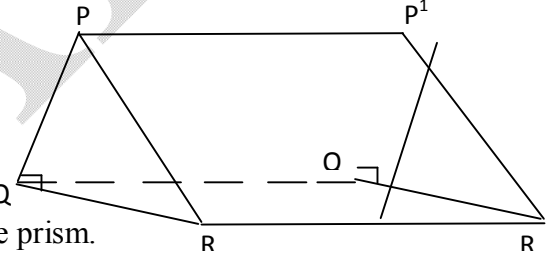
The area of an isosceles triangular land whose base side length 10 meter is 60 square meter. Find the measure of its remaining sides.

- (b). आधारको व्यास 14 से.मि. भएको एउटा बेलनाको आयतन 2156 घन से.मि. छ भने सो बेलनाको उचाइ पत्ता लगाउनुहोस् ।

The volume of a cylinder with diameter of its base 14 cm is 2156 cubic cm. Find the height of the cylinder.

- (c). दिइएको ठोस त्रिभुजाकार प्रिज्ममा यदि $PQ \perp QR$, $PQ = 8$ से.मि., $QR = 6$ से.मि. र $RR' = 15$ से.मि. छन् भने सो प्रिज्मको छड्के सतहको क्षेत्रफल पत्ता लगाउनुहोस् ।

In the given solid triangular prism, if $PQ \perp QR$, $PQ = 8$ cm, $QR = 6$ cm and $RR' = 15$ cm, find the lateral surface area of the prism.



6. (a) सरल गर्नुहोस् (Simplify):

$$2\sqrt{98} - 8\sqrt{32} + 3\sqrt{72}$$

- (b). हल गर्नुहोस् (Solve):

$$9 - \sqrt{x} - 4 = 5$$

7. (a) मान निकाल्नुहोस् (Evaluate) : $\frac{3 \times 4^x + 4^{x-1}}{13 \times 4^x}$

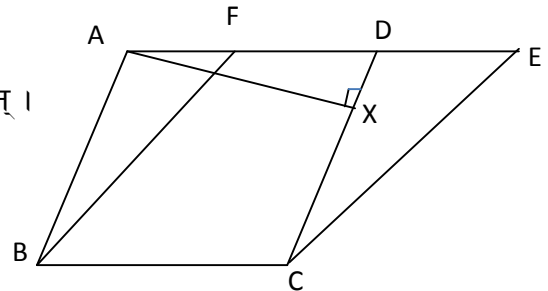
- (b). कुनै घनात्मक सङ्ख्याको वर्गमा 5 जोडदा योगफल 69 हुन्छ भने उक्त सङ्ख्या पत्ता लगाउनुहोस् ।

If 5 is added to the square of a positive number, the sum is 69. Find the number.

- (c). सरल गर्नुहोस् (Simplify):

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

8. (a) दिइएको चित्रमा $BC \parallel AE$, $BA \parallel CD$, $BF \parallel CE$ / $AX \perp CD$ छन् ।



समूह 'ग' (Group 'C') [10x4=40]

11. 180 जना विद्यार्थीहरूको समूहमा सर्वेक्षण गर्दा 50 जनाले क्रिकेट खेलमात्र मन पराउँछु भने, 30 जनाले बास्केट बल खेलमात्र मन पराउँछु भने र 50 जनाले दुवै खेल मन पराउँदैनौं भन्थे भने,
In a survey of a group of 180 students, 50 students say to like cricket game only, 30 students say to like basketball game only and 50 students say do not like both games.
- i) माथिको भनाइलाई भेन चित्रमा प्रस्तुत गर्नुहोस् ।
Represent the above information in a Venn diagram.
- ii) क्रिकेट खेल मन पराउने र बास्केट बल खेल मन पराउने विद्यार्थीहरूको अनुपात पत्ता लगाउनुहोस् ।
Find the ratio of the students who like cricket game and basketball game.
12. मनिषले रु. 2,00,000 मा केही अमेरिकी डलर किने । तर चार दिनपछि अमेरिकी डलरको तुलनामा नेपाली मुद्रा 5% ले अवमूल्यन भयो । नेपाली मुद्रा अवमूल्यन भएको दिन मनिषले फेरी नेपाली रुपियाँ साट्टा उसलाई कति नाफा वा नोक्सान हुन्छ ? पत्ता लगाउनुहोस् । (\$1 = NRs. 104.28)
Manish bought some American dollar for Rs. 2,00,000. But after four days, the Nepalese currency was devaluated in the comparison of American dollar by 5%. Again Manish exchanged the Nepali currency by giving American dollar in the day of devaluation of Nepalese currency. How much does he gain or loss? Find it. - \$1 = NRs. 104.28
13. छड्के उचाइ 10 से.मी. र ठाडो उचाइ 8 से.मी. भएको एउटा वर्गाकार आधार भएको पिरामिडको पूरा सतहको क्षेत्रफल पत्ता लगाउनुहोस् ।
Find the total surface area of a square based pyramid having the slant height 10 cm and vertical height 8cm.
14. म.स.निकाल्नुहोस् (Find the H.C.F. of):
 a^3+1+2a^2+2a , a^3-1 and a^4+a^2+1
15. सरल गर्नुहोस् (Simplify):
$$\frac{x}{(x-y)(x-z)} + \frac{y}{(y-z)(y-x)} + \frac{x}{(z-x)(z-y)}$$
16. एउटै आधार MN र उही समानान्तर रेखाहरू MN र PQ बीचमा बनेका त्रिभुज PMN र समानान्तर चतुर्भुज RMNQ हुन् भने सिद्ध गर्नुहोस् :
 ΔPMN को क्षेत्रफल = $\frac{1}{2}$ $\square RMNQ$ को क्षेत्रफल ।
A triangle PMN and a parallelogram RMNQ are constructed on the same base MN and between the same parallel lines MN and PQ. Prove that: area of $\Delta PMN = \frac{1}{2}$ area of $\square RMNQ$.
17. PQ = 5 से.मी, QR=5.6 से.मी, Rs=5.4 से.मी. SP= 6.8 से.मी र $\angle PQR=75^\circ$ भएको एउटा चतुर्भुज PQRS को रचना गरी उक्त चतुर्भुजको क्षेत्रफलसँग बराबर हुने गरी एउटा त्रिभुज PSM को रचना गर्नुहोस् ।

Construct a quadrilateral PQRS in which $PQ=5\text{cm}$, $QR=5.6\text{cm}$, $RS=5.4\text{cm}$, $SP=6.8\text{cm}$, and $\angle PQR=75^\circ$. Then construct a triangle PSM equal in area to the quadrilateral PQRS.

18. वृत्त ABC को एउटै चाप AC मा आधारित केन्द्रीयकोण APC र परिधिकोण ABC बीचको सम्बन्ध प्रयोगद्वारा परीक्षण गरी पत्ता लगाउनुहोस् । कम्तीमा 3 से.मी. अर्धव्यास भएका दुईवटा वृत्तहरू आवश्यक छन् ।)

Explore experimentally the relation between the central angle APC and the circumference angle ABC standing on the same arc AC of a circle ABC. (Two circles of radii not less than 3cm are necessary.)

19. 1.5 मिटर अग्लो मानिसले 41.5 मिटर अग्लो एउटा रुखको ठीक अगाडि उभिएर रुखको टुप्पोमा हेर्दा आँखमा 45° को कोण बनेछ भने, उक्त रुख र मानिस बीचको दूरी पत्ता लगाउनुहोस् ।

A 1.5 meters tall person is standing in front of 41.5 meters high tree. When observing the top of the tree an angle of 45° is formed with the eyes. Find the distance between the tree and the person.

20. यदि तल दिएको आँकडाको मध्यिका 19 भए P को मान पत्ता लगाउनुहोस् ।

If the median of the following given data is 19, find the value of P.

उमेर वर्षमा (Age in Year)	6-12	12-18	18-24	24-30	30-36	36-42
विद्यार्थी संख्या (Number Of Students)	4	10	P	4	3	3

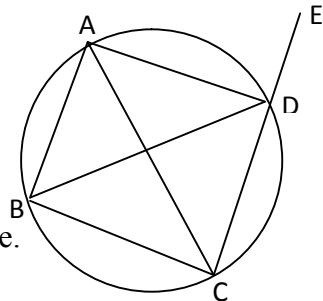
समूह 'घ' (Group D) [4x5 =20]

21. एउटा बैंकले खाता A मा 10% प्रति वर्ष अर्धवार्षिक चक्रीय व्याजदर र खाता B मा 12% प्रति वर्ष वार्षिक चक्रीय व्याजदर कायम गरेको छ । यदि तपाईं 2 वर्षका लागि रु. 25,000 सो बैंकमा जम्मा गर्दै हुनुहुन्छ भने कुन खातामा जम्मा गर्नु हुन्छ र किन ? गणनागरी कारणसहित उल्लेख गर्नुहोस् ।
A bank has fixed the rate of interest 10% per annum semiannually compound interest in account A and 12% per annum annually compound interest in account B. If you are going to deposit Rs. 25,000 for 2 years in the same bank, in which account will you deposit and why? Give your reason with calculation.
22. एक जना मानिसले आफ्नो घरको प्रयोजनको लागि 1.05 मिटर अर्धव्यास र 3.5 मिटर उचाइ भएको एउटा वृताकार आधार भएको पानी ट्याङ्की पसलबाट किनेर ल्याउनु भयो । यदि उक्त ट्याङ्कीको माथिल्लो भाग अर्धगोलाकार छ भने सो ट्याङ्कीमा कति लिटर पानी अटाउँछ होला ? पत्ता लगाउनुहोस् ।
A person bought a water tank of circular base having the radius 1.05 meter and height 3.5 meter for the use of own house from the shop. If the upper part of the tank is semi spherical, how many liters of water will be contained in the tank? Find it.
23. यदि तिन वर्ष अघि बाबु र छोराको उमेरको योगफल 48 वर्ष थियो । अबको 3 वर्ष पछि बाबु र छोराको उमेरको अनुपात 3:1 हुन्छ भने छोरा भन्दा बाबु कति वर्षले जेठो हुनुहुन्छ ? पत्ता लगाउनुहोस् ।

Three years ago, the sum of the ages of the father and son was 48 years. After three years the ratio of the ages of the father and son will be 3: 1, then how much old is the father from his son? Find it.

24. दिइएको चित्रमा ABCD एउटा चक्रीय चतुर्भुज हो । भुजा CD लाई लम्ब्याएर E सम्म पुऱ्याइएको छ । यदि AD ले $\angle BDE$ लाई आधा गरेको छ भने $\triangle ABC$ एउटा समद्विबाहु त्रिभुज हो भनी प्रमाणित गर्नुहोस् ।

In the given figure, ABCD is a cyclic quadrilateral. The side CD is produced to E. If AD bisects $\angle BDE$, prove that $\triangle ABC$ is an isosceles triangle.



DRAFT

Marking Scheme

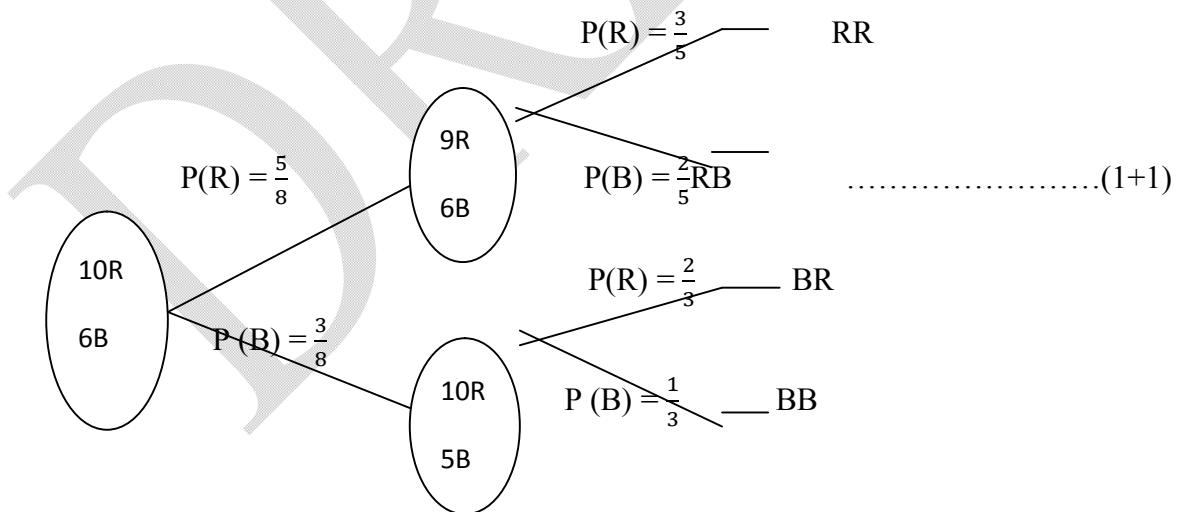
Group 'A' [3 x (1+1)= 6]

1. a. Correct definition of VAT..... (1)
- b. Semi perimeter of a triangle $=\frac{a+b+c}{2}$ (1)
2. a. $x^{a-b+b-a} = x^0=1$(1)
- b. Value of $Q_1 = L + \frac{N-c.f.}{f} \times i$ (1)
3. a. Area of $\Delta QTR = \frac{1}{2}$ area of PQRS..... (1)
- b. $\angle NOP = 2x^0$ (1)

Group 'B' [4x (2+2) +3x (2+2+2) =34]

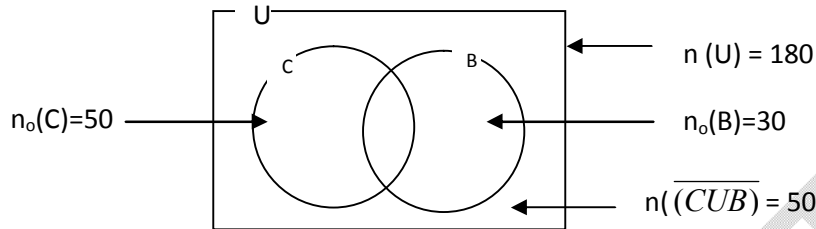
4. a. i. Let the price of the object with VAT be Rs. x .
Then, $\frac{113x}{100} = 5763$
 $\therefore x = \text{Rs. } 5100$ (1)
- ii. VAT amount = Rs. 5763-Rs. 5100
= Rs. 663..... (1)
- b. i. $175204.80 = 225000 \left(1 - \frac{8}{100}\right)^T$ (1)
- ii. $T = 3$ years..... (1)
5. a. i. $\frac{1}{2} \times 10 \times \frac{\sqrt{4a^2-100}}{2} = 60$ (1)
- ii. $a = 13\text{m}$ (1)
- b. i. $r = 7\text{cm}$
 $2156 = \pi (7)^2 \times h$ (1)
- ii. $h = 14 \text{ cm}$ (1)
- c. i. $PR = \sqrt{(8)^2 - (6)^2} = 10 \text{ cm}$ (1)
- ii. Area of the lateral surface of the prism = $(8+6+10) \text{ cm} \times 15 \text{ cm}$
= 360 sq. cm. (1)
6. a. i. $14\sqrt{12} - 32\sqrt{2} + 18\sqrt{2}$ (1)
- ii. 0..... (1)
- b. i. $16 = x - 4$ (1)
- ii. $x = 20$ (1)
7. a. i. $\frac{4^x(3+1/4)}{13 \times 4^x}$ (1)
- ii. $\frac{1}{4}$ (1)
- b. i. Let a positive number be x .
 $x^2 + 5 = 69$ (1)
- ii. $x = 8$ (1)

- c. i. $\frac{2y}{x^2-y^2} + \frac{2x}{x^2-y^2}$ (1)
 ii. $\frac{2}{x-y}$ (1)
8. a. i. Area of ABCD = Area of BCEF = 84 sq. cm. (1)
 ii. $12 \text{ cm} \times AX = 84 \text{ sq. cm.}$
 $\therefore AX = 7 \text{ cm.}$ (1)
- b. i. $\angle NPR = 65^\circ$ (1)
 ii. $\angle NMQ = 65^\circ$
 Obtuse $\angle NOQ = 130^\circ$ (1)
- c. i. $\angle OCB = 90^\circ$
 $OB = \sqrt{(5\text{cm})^2 - (12\text{cm})^2} = 13\text{cm.}$ (1)
 ii. $BE = 13\text{cm} - 5 \text{ cm} = 8 \text{ cm.}$ (1)
9. a. i. $\frac{1}{2} \times 8 \text{ cm} \times 12 \text{ cm} \times \sin \angle XYZ = 24 \text{ sq. cm.}$ (1)
 ii. $\angle XYZ = 36^\circ$ (1)
- b. i. $7 = 350 / 9b + 5$
 $\therefore b = 5$ (1)
- ii) $N = 9 \times 5 + 5 = 50$ (1)
- 10.a)i) $p(3) = \frac{2}{6}$ and $p(s) = \frac{2}{6}$ (1)
 ii) $p(3 \text{ or } s) = \frac{2}{6} + \frac{2}{6} = \frac{2}{3}$ (1)
- b) i) let R and B denote red balls and black balls respectively.



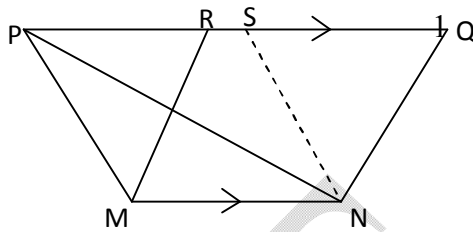
Group - 'C'

11. Let C and B represent sets of students who like cricket game and basketball game respectively, x be number of students who like both and U be the universal set.



- I. Representation of the information Venn-diagram 1
- II. $n(C \cup B) = n(U) - n(\overline{C \cup B}) = 180 - 50 = 130$ 1
- III. $n(C \cap B) = x = n(C \cup B) - n(C) - n(B) = 130 - 50 - 30 = 50$ 1
- IV. $n(C) = 50 + 50 = 100$ and $n(B) = 30 + 50 = 80$ 1
 $n(C) : n(B) = 100 : 80 = 5 : 4$
12. i) Rs 104.28 = \$1 1
 Therefore Rs 200000 = \$1917.91 1
 ii) \$1 = Rs 104.28 + 5% of Rs 104.28 1
 = Rs 109.49 1
 iii) \$1917.91 = Rs 109.49 * 1917.91 1
 = Rs 209991.96 1
 iv) manish makes profit 1
 profit = Rs 9991.96 1
13. i) slant height (l) = 10 cm, vertical height (h) = 8 cm.
 Let the length of the side of the base of the square based pyramid be a cm. Then
 $10^2 = 8^2 + (a/2)^2$ (1)
 ii) a = 12cm(1)
 iii) T.S.A of the pyramid = $a^2 + 2al$
 = $12^2 + 2 * 12 * 10$ (1)
 iv.) = 384 sq.cm (1).
14. i.) 1st exp. = $a^3 + 1 = (a+1)(a^2 - a + 1)$ (1)
 ii.) 2nd exp. = $a^3 - 1 = (a-1)(a^2 + a + 1)$ (1)
 iii.) 3rd exp. = $a^4 + a^2 + 1 = (a^2 + a + 1)(a^2 - a + 1)$ (1)
 iv.) L. C. M. = $(a+1)(a-1)(a^2 + a + 1)(a^2 - a + 1)$ (1)
15. I. $\frac{x}{(x-y)(z-x)} - \frac{y}{(y-z)(x-y)} - \frac{z}{(z-x)(y-z)}$ 1
 II. $-\frac{x(y-z) + y(z-x) + z(x-y)}{(x-y)(z-x)(y-z)}$ 1
 III. $-\frac{x(y-z) + zx - xy}{(x-y)(y-z)(z-x)}$ 1
 IV. 0 1

16. i. Correct figure, Given and To prove.
 ii. Construction: Draw NS//MP
 iii. Area of $\square MNS$ = area of $\square MNQ$
 iv. Area of $\triangle PMN$ = $\frac{1}{2}$ area of $\square MNQ$



1
1
1

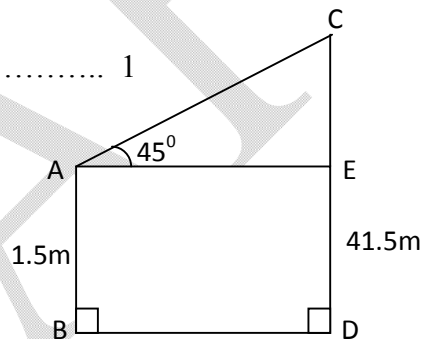
17. I. For correct construction of angle $\angle PQR = 75^\circ$ 1
 II. For correct construction of quadrilateral PQRS 1
 III. For construction of a line RM parallel to a diagonal SQ. 1
 IV. For construction of $\triangle PSM$ 1

18. I. Two correct figures 1
 II. Table with correct measurements 1 + 1
 III. Correct conclusion 1

19. I. Appropriate figure with correct description 1
 II. $CE = 41.5\text{m} - 1.5\text{m} = 40\text{m}$ 1
 III. In right angled $\triangle AEC$,

$$\tan 45^\circ = \frac{CE}{AE}$$

or, $1 = 40\text{m} / AE$ 1



- IV. The distance between the tree and the person = $BD = AE = 40\text{m}$ 1

20. I. Frequency table

Age in years	No. of students (f)	C.F.
6-12	4	4
12-18	10	14
18-24	p	14+p
24-30	4	18+p
30-36	3	21+p
36-42	3	24+p

$N = 24 + p$ 1

- II. Here, Median (Md) = 19, so median class = 18 – 24 1

III. Median (md) = $L + \frac{\frac{N}{2} - c.f.}{f} \times i$

or $19 = 18 + \frac{(24+p) - 14}{p} \times 6$ 1

Group 'D' (4x5=20)

<p>21.</p>	<p>Interest in account A</p> <p>(i) $CI_1 = P[(1 + \frac{10}{200})^{2 \times 2} - 1] = \dots\dots\dots$</p> <p style="padding-left: 40px;">= Rs. 5387.65</p> <p>Interest in account B</p> <p>(ii) $CI_2 = P[(1 + \frac{12}{100})^2 - 1] = \dots\dots\dots$</p> <p style="padding-left: 40px;">= Rs. 6360</p> <p>(iii) Here it is more convinient to deposit Rs.25000 in account B. Because the interest in account B is more than the interest in account A by, Rs. 6360 - Rs. 5387.65 = Rs. 972.35</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
<p>22.</p>	<p>(i) Here, radius of base (r) = 1.05 m</p> <p>Total height of the tank (H) = 3.5 m</p> <p>Radius of the hemi-spherical part of the tank = r = 1.05m (fig)</p> <p>Hence the height of the cylindrical part of the tank (h) = 3.5m-1.05m = 3.45m</p> <p>(ii) Volume of the cylindrical part = $\pi r^2 h = \dots\dots$</p> <p style="padding-left: 40px;">= 11.955 m³</p> <p>(iii) Volume of hemispherical part = $\frac{2}{3} \pi r^3 = \dots\dots\dots$</p> <p style="padding-left: 40px;">= 2.427m³</p> <p>(iv) Total volume of water tank = 11.955m³ + 2.427m³</p> <p style="padding-left: 40px;">= 14.382m³</p> <p>(v) Volume of water = volume of the tank = 14.382m³</p> <p style="padding-left: 40px;">= 14.382X 1000l</p> <p style="padding-left: 40px;">= 14 382 liters</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
<p>23.</p>	<p>(i) Let present ages of the father and his son be x years and y years respectively.</p> <p>Then, three years ago, (x - 3) + (y - 3) = 48</p> <p style="padding-left: 40px;">or, x + y = 54</p> <p>(ii) Again, after three years, (x + 3) : (y+3) = 3:1</p> <p style="padding-left: 40px;">or, x - 3y = 6</p> <p>(iii) solving the above equation we get,</p> <p style="padding-left: 40px;">y = 12</p>	<p>1</p> <p>1</p> <p>1</p>

	(iv) Again putting the value of y, in any of the above equation we get, $x = 42$	1 1
	(v) Hence the difference between their ages = $42 - 12 = 30$, Hence the father is 30 years older than his son.	1
24.	(i) $\angle ADE = \angle ADB$with reason (ii) $\angle ADE = \angle ABC$ with reason (iii) $\angle ADB = \angle ACB$ with reason (iv) $\angle ABC = \angle ACB$with reason (v) ΔABC is an isosceles triangle, with reason	1 1 1 1 1



DRAFT