नीलकण्ठ नगरपालिका स्तरीय

द्वितीय आन्तरिक परीक्षा-२०८२

(अनिवार्य तथा निःशुल्क शिक्षा कार्यान्वयनका लागि निर्मित)

कक्षा : ९ विषय : ऐ. प्रथम (गणित)

समय : ३ घण्टा (Opt. I-Mathematics) पूर्णाङ्क : ७५

Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.

Attempt all the questions.

Group 'A' [11x1=11]

Multiple choice questions (MCQ)

Rewrite the correct option of each questions in your answer sheet.

1.A. लेखाचित्रमा कुनै सम्बन्ध फलन हो वा होइन भनी जाँच्न कुन परीक्षण गरिन्छ?
Which test is used to determine if a relation is a function from its graph?

a) Horizontal Line Test (तेस्रो रेखा परीक्षण)

b) Vertical Line Test (ठाडो रेखा परीक्षण)

c) Diagonal Line Test (विकर्ण रेखा परीक्षण)

d) Origin Test (उद्गम बिन्दु परीक्षण)

B. सङ्क्षिप्त भाग विधि (Synthetic Division) मा भाजक (x–a) ले भाग गर्दा कुन मान प्रयोग गरिन्छ ?
In Synthetic Division, which value is used for dividing by the divisor (x–a)?

a) –a b) a c) x=a d) $\frac{1}{a}$

C. $(1+\tan A)^2-2\tan A$ लाई सरल गर्दा के परिणाम प्राप्त हुन्छ ?
What is the result of simplifying $(1+\tan A)^2-2\tan A$?

a) $\sec^2 A$ b) $\cos^2 A$ c) $\cot^2 A$ d) 1

D. $\cos(\theta-90°)$ लाई $\cos[-(90°-\theta)]$ को रुपमा विश्लेषण गर्दा यसको मान के हुन्छ ?

a) $\cos\theta$ b) $-\cos\theta$ c) $\sin\theta$ d) $-\sin\theta$

E. अभिव्यञ्जक $\operatorname{cosec}\theta-\cot\theta$ र $\operatorname{cosec}\theta+\cot\theta$ लाई एक अर्काको के भनिन्छ ?

If the first quartile (Q_1) of employee salaries in a company is Rs. 20,000. What dos this signify?

a) सबै कर्मचारीहरुले रू. 20,000 कमाउँछ ।
All employees earns Rs. 20,000.

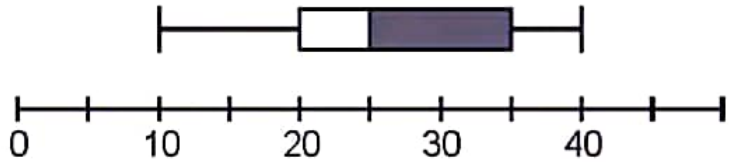
b) 75% कर्मचारीहरुले रू. 20,000 वा सो भन्दा कम कमाउँछन् ।
75% of employees earns Rs. 20,000 or less.

c) 25% कर्मचारीहरुले रू. 20,000 वा सो भन्दा कम कमाउँछन् ।
25% of employees earn Rs. 20,000 or less

d) औसत तलब रू. 20,000 हो ।
The average salary is Rs. 20,000.

L. तलको ह्विस्कर बक्स प्लटको आधारमा, सो तथ्याङ्कको चतुर्थांशीय विस्तार (IQR) कति होला ?
Based on the whisker box plot below, what is the inter quartile range (IQR) of the data?

a) 40 b) 30 c) 15 d) 10



Group 'B' Within Content Area (विषय क्षेत्रगत) [40]

2. सायाले एउटा हाइकिङ ट्रेलको नक्सा बनाउँछिन् जसलाई समीकरण x–4y+8=0 ले जनाउँदछ । ट्रेलमा विश्राम स्थलहरु (a, 3) र (8, b) छन् ।
Saya maps a hiking trail represented by the equation x–4y+8=0. There are two rest stops on the trail at (a, 3) and (8, b).

a) बराबर क्रमजोडाहरुलाई परिभाषित गर्नुहोस् ।
Define equal ordered pairs. 1

b) सायाले a–b=0 हुन्छ भनी पत्ता लगाइन् । उनको खोजलाई गणनाद्वारा पुष्टी गर्नुहोस् । 2
Saya discovers that a–b=0. Justify her finding with calculations.

c) यदि $p(x)=x^2-(a+b)x+15$ भए p(x) को मूलहरु पत्ता लगाउनुहोस् ।
If $p(x)=x^2-(a+b)x+15$, then find the roots of p(x). 1

3 x वटा वस्तुहरु बेच्दा हुने नाफा f(x)=50x–200 रुपैयाँ हो ।

The profit from selling x items is f(x)=50x–200 rupees.

a) एक-एक फलन (one-to-one function) भनेको के हो ?
What is a one-to-one function? 1

b) कम्पनीले {10, 20, 30} वटा वस्तुहरु बेच्दाको नाफा f={(10, 300), (20, 800), (30, 1200)} भनी सूची तयार गर्छ । यस सूचीमा भएको गलत क्रमजोडा पहिचान गरी सही नाफा गणना गर्नुहोस् र सही क्रमजोडा लेख्नुहोस् ।
The company lists its profit for selling {10, 20, 30} items as f={(10, 300), (20, 800), (30, 1200)}. Identify the incorrect ordered pair in this list. Calculate the correct profit and write the correct ordered pair. 2

c) यदि $p(x)=x^3-3x^2-4x+12$ भए p(x) लाई g(x)=x+2 ले भाग गर्दा आउने शेष संक्षिप्त भाग विधि प्रयोग गरी पत्ता लगाउनुहोस् ।
If $p(x)=x^3-3x^2-4x+12$, find the remainder using synthetic division when p(x) is divided by g(x)=x+2. 2

4. मेट्रिक्सहरु A, B र C दिइएको छ । Given matrices A, B and C:

$$A=\begin{pmatrix}2 & 2 & 2\\ 2 & 2 & 2\end{pmatrix},\ B=\begin{pmatrix}3 & 3 & 3\\ 3 & 3 & 3\end{pmatrix},\ C=\begin{pmatrix}5 & 5\\ 5 & 5\end{pmatrix}$$

a) म्याट्रिक्स C को क्रम लेख्नुहोस् ।
Write the ordered of matrix C. 1

b) के मेट्रिक्स A र C जोड्न सकिन्छ, कारण दिनुहोस् ।
Can we add A and C? Give reason. 1

c) A+B पत्ता लगाउनुहोस् । Find A+B. 1

5. तलका प्रश्नहरुको उत्तर दिनुहोस् । Answer the following questions.

a) सरल गर्नुहोस् । Simplify
$\cos(90+\theta).\sec(-\theta).\tan(180°-\theta)$ 1

b) सितु विश्वास गर्छिन् कि $\frac{\cos(90°+\theta).\sec(-\theta).\tan(180°-\theta).\cos 180°}{\sec(360°-\theta).\sin(180°+\theta).\cot(90°-\theta)}=1$ हुन्छ । उनको दाबी प्रमाणित गर्नुहोस् ।
Situ believes $\frac{\cos(90°+\theta).\sec(-\theta).\tan(180°-\theta).\cos 180°}{\sec(360°-\theta).\sin(180°+\theta).\cot(90°-\theta)}=1$ validate her claim. 1

6. तलका प्रश्नहरुको उत्तर दिनुहोस् । Answer the following questions.

a) SinA र CosecA बीचको व्युत्क्रम सम्बन्ध सूत्र लेख्नुहोस् । 1
Write the reciprocal relation formula between sinA and cosecA.

b) cosecA+cotA लाई sinA र cosA को रुपमा व्यक्त गर्नुहोस् ।
Express cosecA+cotA interms of sinA and cosA. 1

c) प्रमाणित गर्नुहोस् । Prove that 2

$$\frac{1}{\text{cosec}A+\cot A} = \text{cosec}A - \cot A$$

7. $3\sin^2\theta - \cos^2\theta = 1$ समीकरणबाट [From the equation $3\sin^2\theta - \cos^2\theta = 1$]

a) $\cos^2\theta$ लाई $1-\sin^2\theta$ ले प्रतिस्थापन गर्नुहोस् ।
Replace $\cos^2\theta$ with $1-\sin^2\theta$ 1

b) $\sin\theta$ को मान पत्ता लगाउनुहोस् । Find the value of $\sin\theta$ 2

8. एउटा विन्दु यसरी चल्छ कि यसको विन्दु (1, 0) देखिको दुरी र विन्दु (0, –2) देखिको दुरी बराबर हुन्छन् ।
A point moves so that its distance from the point (1, 0) is double its distance from the point (0, –2)

a) मानौं P(x, y) चल विन्दु हो । आवश्यक दुई दुरीहिरुको लागि अभिव्यञ्जकहरु लेख्नुहोस् ।
Let P(x, y) be the moving point. Write the expressions for the two required distances. 2

b) दिइएको शर्तबाट विन्दुपथको समीकरण निर्धारण गर्नुहोस् । 2
From the given condition to determine the equation of the locus.

9. Y-अक्षले विन्दुहरु (–4, –2) र (10, 5) जोड्ने रेखाखण्डलाई विभाजन गर्छ ।
The y-axis divides the line segments joining the points (–4, –2) and (10, 5)

a) Y-अक्षले रेखाखण्डलाई कुन अनुपातमा विभाजन गर्छ पत्ता लगाउनुहोस् ।
Find the ratio in which the Y-axis divides the line segment. 2

b) अनुपात प्रयोग गरेर Y-अक्षमा रहेको विभाजन विन्दुको निर्देशाङ्क पत्ता लगाउनुहोस् ।
Using the ratio, find the co-ordinates of the point of division on the Y-axis. 2

A student, Rima, calculated the coefficient of M.D. from median as 0.150. Examine her calculation. 1

13. एक तथ्याङ्ककको पाँच सङ्ख्या सारांश यस प्रकार छ, न्यूनतम मान=10, Q_1=15, मध्यिका =21, Q_3=28, अधिकतम मान=35

The five-number summery of a data set is as follows:
Minimum =10, Q_1=15, Median=21, Q_3=28, Maximum=35

a) पहिलो र तेस्रो चतुर्थांशको बिचमा कति प्रतिशत तथ्याङ्क पर्दछ ? 1

What percent of the data lies between the first and third quartiles?

b) यो तथ्याङ्कलाई प्रतिनिधित्व गर्न ह्विस्कर बक्स प्लट बनाउनुहोस् ।

Draw a whisker box plot to represent this data. 1

Group 'C' Cross Content Area (अन्तर विषय क्षेत्रगत) 24

14. रेखा y=2x+1र विन्दु p(1, 3) दिइएका छन् ।

The line y=2x+1 and the point (1, 3) are given below.

a) दिइएको रेखासँग बराबर झुकाव हुने र विन्दु P भएर जाने रेखाको समीकरण पत्ता लगाउनुहोस् ।

Find the equation of a line that has equal slope to the given line and passes through P. 2

b) (a) मा प्राप्त रेखाको समीकरणलाई लेखाचित्रमा देखाउनुहोस् ।

Draw the graph of the line with equation so obtained in (a) 2

c) यदि f(x)=2x+1, x∈{1, 2, 3, 4} भए फलन f(x) लाई मिलान चित्रमा देखाउनुहोस् ।

If (x)=2x+1, x∈{1, 2, 3, 4} then show the function f(x) in the arrow-diagram. 2

15. इनपुट x=1, 2, 3, 4, 5 का लागि प्रिन्टर मेसिन फलन $f(x)=x^2-2x-3$ द्वारा परिभारिषत गरिएको छ ।

The printer paper used the input x=1, 2, 3, 4, 5 is defined by the function $f(x)=x^2-2x-3$.

a) यदि फलनको क्षेत्र {1, 2, 3, 4, 5} भए विस्तार (range) पत्ता लगाउनुहोस्।

If the domain of the function is {1, 2, 3, 4, 5}, find the range. 2

b) बहुपदीय $P(x)=8x^2-12x+m$ का मूलहरु 1 र $\frac{1}{2}$ छन् । हरि भन्छन् कि m को मान 7 भन्दा कम छैन । के यो सही हो ?

10. एउटा सीधा रेखा $y=mx+c$ विन्दुहरु (1, 4) र (–2, –5) भएर जान्छ ।

A straight line $y=mx+c$ passes through the points (1, 4) and (–2, –5).

a) दुई विन्दुहरु (x_1, y_1) र (x_2, y_2) भएर जाने रेखाको झुकाव (Slope) को सूत्र के हो ?

What is the formula for the slope of a line passing through two points (x_1, y_1) and (x_2, y_2)? 1

b) सो सीधा रेखाको समीकरण पत्ता लगाउनुहोस् ।

Determine the equation of the straight line. 2

11. विन्दु (3, –5) हुँदै जाने x-अक्षसँग 45° को कोण बनाउने गरी एउटा सीधा रेखा खिचिएको छ जसले $x+y-6=0$ लाई विन्दु B मा भेट्छ ।

A straight line is drawn through point A(3, –5) with an inclination of 45° to the x-axis, and it meets the line $x+y-6=0$ at point B.

a) झुकाव 'm' भएको र विन्दु (x_1, y_1) बाट जाने रेखाको समीकरण सूत्र के हो ?

What is the formula for the equation of a line with slope 'm' passing through the point (x_1, y_1)? 1

b) B को निर्देशाङ्क पत्ता लगाउनुहोस् । Find the co-ordinate of B. 2

12. एक कक्षाका विद्यार्थीहरुको गणितमा प्राप्त प्राप्ताङ्क निम्न तालिकमा दिइएको छ ।

The marks obtained in maths by students of a class are given in the table below.

Marks (x)	40	45	55	50	60	64	68
No. of student (f)	5	7	6	8	4	6	3

$N=39$, $md=50$, $\Sigma f|x-md|=293$

a) खण्डित श्रेणीको मध्यिकाबाट मध्यक भिन्नता पत्ता लगाउने पहिलो चरण के हो ?

What is the first step to find the mean deviation from the median of a discrete series? 1

b) मध्यिकाबाट मध्यक भिन्नता गणना गर्नुहोस् ।

Calculate the mean deviation from the median. 1

c) एक विद्यार्थी, रिमा, मध्यिकाबाट M.D. को गुणाङ्क 0.150 निकालिन् । उनको गणना परीक्षण गर्नुहोस् ।

सूर्यविनायक नगरपालिका
नगर परीक्षा समिति
दोस्रो त्रैमासिक परीक्षा – २०८२

विषय : ऐच्छिक गणित | पूर्णाङ्क : ७५
कक्षा : ९ | समय : ३ घण्टा

दिइएका निर्देशनका आधारमा आफ्नै शैलीमा सिर्जनात्मक उत्तर दिनुहोस्:

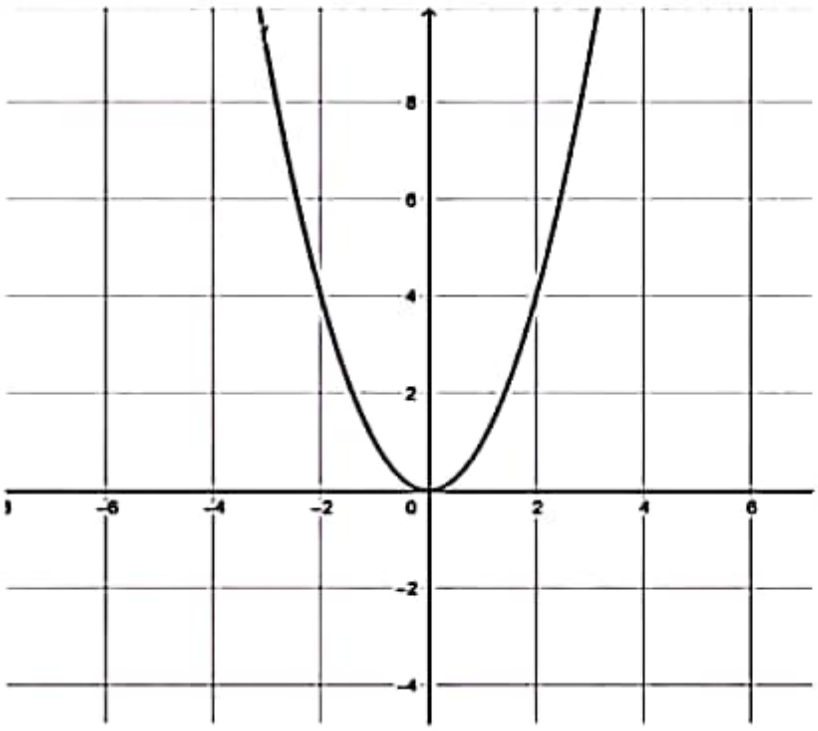
सबै प्रश्नहरु अनिवार्य छन् । (All questions are compulsory)

समूह 'क'
Group 'A'

1. वस्तुगत प्रश्नहरू (Objective Questions) **[11 × 1 = 11]**

A. बहुपदीय $5x^3 + 2x - 3$ को डिग्री कति हुन्छ ?
What is the degree of polynomial $5x^3 + 2x - 3$?
i. 1 ii. 2 iii. 3 iv. 4

B. दिइएको लेखाचित्रले तलका मध्ये कुन फलनलाई जनाउँछ ?
Which one of the following functions does the given graph represent?



i. $f(x) = x + 2$
ii. $f(x) = x^2$
iii. $f(x) = x^3$
iv. $f(x) = x^2 + 5$

C. 45^0 र ..... एकआपसमा बराबर हुन्छन् ?

45^0 and ..... are equal to each other.

i. 50^g ii. 60^g iii. π^c iv. $2\pi^c$

D. यदि $\sin\theta = \frac{1}{2}$ भए, $\cos\theta$ को मान कति हुन्छ?

If $\sin\theta = \frac{1}{2}$, then what is the value of $\cos\theta$?

i. $\frac{3}{2}$ ii. $\frac{1}{2}$ iii. 0 iv. $\frac{\sqrt{3}}{2}$

E. खण्डीकरण पछी $\cos^2A + 3\cos A + 2$ को मान ..... हुन्छ ।

The value of $\cos^2A + 3\cos A + 2$ is ..... after factorization.

i. (cosA+2)(cosA+1)

ii. (cosA–2)(cosA+1)

iii. cosA (cosA–1)

iv. (cosA+2)(cosA–1)

F. विन्दु (5,3) लाई उद्गम विन्दुको वरिपरि -180^0 मा परिक्रमण गर्दा प्रतिबिम्बको निर्देशाङ्क कति हुन्छ ?

What is the coordinate of image formed when point (5,3) is rotated by -180^0 about origin?

i. (3,5) ii. (-5,-3) iii. (-3,-5) iv. (5,3)

G. तलका मध्ये कुन विन्दु $x^2 + y^2 = 25$ भएको विन्दुपथमा पर्छन् ?

Which one of the following points lie on locus $x^2 + y^2 = 25$?

i. (1,4) ii. (5,-5) iii. (3, 6) iv. (2,3)

H. रेखा $y = 2x + 3$ को भुकाव कति हुन्छ?

What is the slope of line $y = 2x + 3$?

i. 2 ii. 3 iii. 4 iv. 5

I. $\overrightarrow{AB}$ र $\overrightarrow{BA}$ एकआपसमा ..... भेक्टरहरू हुन् ।

$\overrightarrow{AB}$ and $\overrightarrow{BA}$ are ..... vector to each other.

i. बराबर र ऋणात्मक Equal and Negative

ii. बराबर र धनात्मक Equal and Negative

iii. असमान Unlike

iv. कुनै पनि होइन None of the above

J. कुनै श्रेणीको तल्लो र माथिल्लो चतुर्थांशको मानहरू क्रमशः 30 र 40 छन् भने चतुर्थांशीय भिन्नता कति हुन्छ ?

If the value of lower quartile and upper quartile of a sequence are 30 and 40 respectively, the what is the value of quartile deviation?

i. 32 ii. 33 iii. 35 iv. 36

K. "θ" को मान कति हुदाँ फलन $f(\theta) = \frac{1}{tan\theta}$ अपरिभाषित हुन्छ ?

At what value of "θ", function $f(\theta) = \frac{1}{tan\theta}$ becomes undefined?

i. 30^0 ii. 45^0 iii. 60^0 iv. 90^0

समूह 'ख' (विषय क्षेत्रगत प्रश्नहरू)

Group 'B' (Within Content Area Questions)

2. सम्बन्ध R: $\{(x, y): y = x^2 + 3, x < 4 \text{ र } x \in N\}$ दिइएको छ।

   A relation R: $\{(x, y): y = x^2 + 3, x < 4 \text{ and } x \in N\}$ is given:

   a) फलन $f(x) = x^2 + 3$ को डिग्री लेख्नुहोस्।

      Write down the degree of the function $f(x) = x^2 + 3$. [1]

   b) दिइएको सन्दर्भको आधारमा सम्बन्ध (R) पत्ता लगाउनुहोस्।

      Find the relation (R) from the given context. [2]

   c) अन्तराल [–2, 3) लाई सङ्ख्या रेखामा देखाउनुहोस्।

      Represent interval [–2, 3) in number line. [1]

3. मेट्रिक्स $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ र $C = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ दिइएको छ।

   Given matrices: $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $C = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$.

   a) C कस्तो प्रकारको मेट्रिक्स हो ? [1]

      What type of matrix is matrix C?

   b) के मेट्रिक्स A र C जोड्न सकिन्छ ? किन ?

      Can we add matrices A and C? Why? [1]

   c) यदि $A + B = I$ भए, मेट्रिक्स B पत्ता लगाउनुहोस्, जहाँ I भनेको 2 × 2 क्रमको एकाइ मेट्रिक्स हो। [1]

      If A + B = I, then find the matrix B, where I is an identity matrix of order 2 × 2.

4. दुई बहुपदीयहरू $A(x) = x^3 + 4x^2 - cx + 8$ र $B(x) = x - 2$ छन्।

   Two polynomials are $A(x) = x^3 + 4x^2 - cx + 8$ and $B(x) = x - 2$.

   a) यदि A(x) लाई B(x) ले निशेष भाग जान्छ भने, 'c' को मान पत्ता लगाउनुहोस्।

      Find the value of 'c' if A(x) is exactly divisible by B(x). [2]

b) हरलाई अनुपातीकरण गर्नुहोस् ।

Rationalize the denominator: $\frac{3}{\sqrt{7}-\sqrt{4}}$ [1]

5. $\sin\phi = \frac{3}{5}$ दिइएको छ ।

Given: $\sin\phi = \frac{3}{5}$

a) $\cos\phi$ को मान पत्ता लगाउनुहोस् ।

Find the value of $\cos\phi$. [1]

b) $5\cos\phi + 4\tan\phi$ को मान पत्ता लगाउनुहोस् ।

Find the value of $5\cos\phi + 4\tan\phi$. [1]

6. θ को मान 0^0 छ ।

The value of θ is 0^0.

a) $\tan\theta$ को मान कति हुन्छ ?

What is the value of $\tan\theta$? [1]

b) θ को मानको प्रयोग गरी प्रमाणित गर्नुहोस् :

Prove that using the value of θ: [2]

$$4\cos^3\theta - 3\cos\theta = \cos 3\theta$$

7. अभिव्यञ्जक $\frac{sin^3A - cos^3A}{1 + sinA.cosA}$ दिइएको छ ।

An expression $\frac{sin^3A - cos^3A}{1 + sinA.cosA}$ is given:

a) $\tan\theta$ लाई $\sin\theta$ र $\cos\theta$ को रूपमा लेख्नुहोस् ।

Write $\tan\theta$ in terms of $\sin\theta$ and $\cos\theta$. [1]

b) खण्डिकरण गर्नुहोस् ।

Factorise: $sin^3A - cos^3A$ [1]

c) प्रमाणित गर्नुहोस्:

Prove that: $\frac{sin^3A - cos^3A}{1 + sinA.cosA} = sinA - \cos A$ [2]

8. विन्दु P(x, y) ले विन्दुहरू (2, 1) र (3, 2) लाई 3:2 को अनुपातमा विभाजन गर्दछ ।

A coordinate P(x, y) divides points (2, 1) and (3, 2) in the ratio of 3:2.

a) P(x, y) को निर्देशाङ्क पत्ता लगाउनुहोस् ।
Find the coordinate of P(x, y). [2]

b) विन्दुहरू (a, b) र (c, d) बिचको मध्यविन्दु कति हुन्छ ?
What is the mid-point between two points (a, b) and (c, d)? [1]

9. विन्दुहरू A(4, 0), B(r, 3) र C(8, –6) दिइएका छन् ।

Points A(4, 0), B(r, 3) and C(8, –6) are given:

a) यदि रेखा AB को झुकाव $\frac{-3}{2}$ भए, 'r' को मान पत्ता लगाउनुहोस् ।
If the slope of line AB is $\frac{-3}{2}$, then find the value of 'r'. [2]

b) विन्दुहरू A,B र C एउटै सिधारेखामा पर्छन् भनि प्रमाणित गर्नुहोस्।
Show that the points A, B and C are collinear. [2]

10. वर्गका शिर्षविन्दुहरू O(0, 0), B(5, 0), C(5, 5) र D(0, 5) उद्गम विन्दुको वरिपरि $+270^0$ मा परिक्रमण गरिएको छ ।

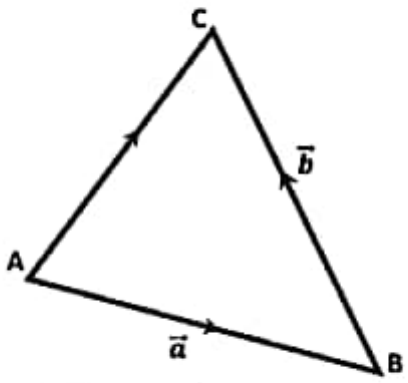
The vertices of square O(0, 0), B(5, 0), C(5, 5) and D(0, 5) is rotated by $+270^0$ about origin.

a) परिक्रमण पछि बन्ने प्रतिबिम्बको शिर्षविन्दुहरू पत्ता लगाउनुहोस् ।
Find the coordinates of image after rotation. [2]

b) वर्ग OBCD र त्यसको प्रतिबिम्बलाई एउटै लेखा चित्रमा प्रस्तुत गर्नुहोस् ।
Show both square OBCD and its image on the same graph. [2]

11. चित्रमा $\overrightarrow{AB} = \vec{a}$ र $\overrightarrow{BC} = \vec{b}$ देखाइएको छ।

In the given figure, $\overrightarrow{AB} = \vec{a}$ *and* $\overrightarrow{BC} = \vec{b}$.



a) के क्रिया $\overrightarrow{AC} = \overrightarrow{CB} + \overrightarrow{BA}$ भेक्टर जोडको त्रिभुज नियम अनुसार सहि छ ? यदि छैन भने सहि क्रिया लेख्नुहोस्।

Is the operation $\overrightarrow{AC} = \overrightarrow{CB} + \overrightarrow{BA}$ correct according to triangle law of vector addition? If not then write the correct operation. [1]

b) $\vec{a}$ र $\vec{b}$ को रूपमा $\overrightarrow{AC}$ को मान निकाल्नुहोस्।

Find the value of $\overrightarrow{AC}$ in terms of $\vec{a}$ and $\vec{b}$. [1]

c) यदि $\vec{a} = \begin{pmatrix}2\\3\end{pmatrix}$ र $\vec{b} = \begin{pmatrix}1\\0\end{pmatrix}$ भए, $\vec{a} - \vec{b}$ पत्ता लगाउनुहोस्।

If $\vec{a} = \begin{pmatrix}2\\3\end{pmatrix}$ and $\vec{b} = \begin{pmatrix}1\\0\end{pmatrix}$, find $\vec{a} - \vec{b}$. [1]

12. ट्युसन कक्षाका विद्यार्थीहरूको उमेर तल दिइएका छन्।

The age of students in a tuition classes are given as:
15, 17, 10, 13, 7, 18, 9, 6, 14, 11

a) दिइएको तथ्याङ्कको मध्यक निकाल्नुहोस्। [1]

Calculate the mean of the data.

b) माथि दिइएको तथ्याङ्कबाट $\sum|x - \bar{x}|$ को 34 मान भए, मध्यक भिन्नता पत्ता लगाउनुहोस्। [1]

If the value of $\sum|x - \bar{x}|$ of the above data is 34 then find the mean deviation of the data.

c) रामलखनले माथिको तथ्याङ्कबाट मध्यक भिन्नताको गुणाङ्क 0.283 निकालेछन्। उसको परिणाम मूल्याङ्कन गर्नुहोस्।

Ramlakhan finds the coefficient of mean deviation of the above data to be 0.283. Evaluate his accuracy. [1]

13. फलन $f(x) = \frac{x^2-1}{x+1}$ दिइएको छ ।

Function $f(x) = \frac{x^2-1}{x+1}$ is given:

a) फलनको सीमान्तमानलाई परिभाषित गर्नुहोस् ।

Define limit of a function. [1]

b) $x = 0$ र 2 हुदाँ $f(x)$ को मान पत्ता लगाउनुहोस् ।

Find the value of $f(x)$ when $x = 0$ and 2. [1]

c) मनमायाले $x = 1$ हुदाँ $f(x)$ अपरिभाषित हुन्छ, भन्छिन् । के ऊनी सहि छिन् ? यदि गलत छिन् भने कति मानमा फलन $f(x)$ अपरिभषित हुन्छ ?

Manmaya says $f(x)$ is undefined at $x = 1$. Is she correct? If not then at what value the function $f(x)$ becomes undefined? [1]

d) अनुक्रम 3.1, 3.01, 3.001,..... को सीमान्तमान कति हो ?

What is the limit of sequence 3.1, 3.01, 3.001,..... [1]

समूह 'ग' (अन्तरविषय क्षेत्रगत प्रश्नहरू)

Group 'C' (Cross Content Area Questions)

14. रेखा(l) को समिकरण यस प्रकार दिइएको छ ।

The equation of line(l) is given as: $y = \frac{ab+bx}{a}$:

a) यदि रेखा(l) विन्दु (3, 4) भएर जान्छ भने, प्रमाणित गर्नुहोस:

If the line(l) passes through point (3, 4), prove that: $b = \frac{4a}{a+3}$ [2]

b) $a \to 1$ हुदाँ, 'b' को सीमान्तमान पत्ता लगाउनुहोस् ।

If $a \to 1$, find the limiting value of 'b'. [1]

c) यदि $a = 1$ भए, रेखा(l) को वास्तविक समिकरण $y = mx + c$ को रूपमा पत्ता लगाउनुहोस् ।

If $a = 1$, find the exact equation of line(l) in the form of $y = mx + c$. [1]

d) सम्बन्ध R: {(x, y): y = f(x), 0 < x < 3} छ, जहाँ y = f(x) माथि प्रश्न (c) को उत्तरमा आएको रेखाको समिकरण हो भने, सम्बन्ध लाई मिलान चित्रमा देखाउनुहोस् ।

A relation R is defined as R: {(x, y): y = f(x), 0 < x < 3}, where y = f(x) is an equation of line of answer in above question (c), then show the relation R in mapping diagram. [2]

15. निर्देशाङ्कहरू P(2, 3), Q(-4, 3) र R(-2, -3) सूचीबद्ध गरीएका छन्।

Coordinates P(2, 3), Q(-4, 3) and R(-2, -3) are listed:

a) यदि निर्देशाङ्कहरू P, Q र R लाई भेक्टरको रूपमा क्रमशः $\vec{P}$,$\vec{Q}$ र $\vec{R}$ लेखिएका भए कुन दुई भेक्टरहरू एकआपसमा ऋणात्मक छन्?

If above coordinates P, Q and R are written as vectors $\vec{P}$, $\vec{Q}$ and $\vec{R}$ respectively then which two vectors are negative to each other? [1]

b) भेकटर $\overrightarrow{QR}$ पत्ता लगाउनुहोस् ।

Find the vector $\overrightarrow{QR}$. [2]

c) यदि दिइएका निर्देशाङ्कहरू ΔPQR को शिर्षविन्दुहरू हुन् र शिर्षविन्दु P(2, 3) को प्रतिबिम्ब P'(-2, 3) भए, परावर्तनको अक्ष पत्ता लगाउनुहोस् । त्यस्तै अन्य शिर्षविनदुहरूलाई पनि सोहि अक्षमा परावर्तन गरेर ΔPQR र ΔP'Q'R' लाई एउटै लेखा चित्रमा प्रस्तुत गर्नुहोस् ।

If the given coordinates are the vertices of ΔPQR and also the image of vertex P(2, 3) is P'(-2, 3) then find the axis of reflection. Also reflect other vertices of triangle on same axis of reflection and plot ΔPQR and ΔP'Q'R' on same graph. [3]

16. फलन $f(x) = 5x + 7$ दिइएको छ, जहाँ $x = [0, 7)$ छ ।

A function $f(x) = 5x + 7$ is given where $x = [0, 7)$.

a) x का सदस्यहरू सूचिकरण गर्नुहोस् । [1]

List out the elements of x.

b) दिइएको फलनको विस्तारक्षेत्र पत्ता लगाउनुहोस् ।

Find out the range of given function. [2]

c) एउटा तथ्याङ्क समूहमा माथिका विस्तारक्षेत्रहरू समावेश गरिएका छन् भने, त्यस तथ्याङ्क समूहको मध्यक भिन्नता र त्यसको गुणाङ्क पत्ता लगाउनुहोस् ।

A data set contains the set of range obtained above, then find the mean deviation and its coefficient from that data set. [3]

17. फलन $f(\theta) = \frac{1+sin\theta}{tan\theta}$ दिइएको छ ।

A function $f(\theta) = \frac{1+sin\theta}{tan\theta}$ is given;

a) 'θ' को मान कति हुदाँ फलन f(θ) अपरिभाषित हुन्छ ?

At what value of 'θ' function f(θ) becomes undefined? [1]

b) प्रमाणित गर्नुहोस:

Prove that: $f(45^0) = \frac{2+\sqrt{2}}{2}$ [2]

c) मान निकाल्नुहोस्:

Find the value of: $f(\theta) \times \frac{\tan\theta}{1-sin\theta}$ [1]

d) प्रमाणित गर्नुहोस:

Prove that: $\frac{1+sin\theta}{tan\theta} = \cos\theta + \cot\theta$ [2]

त्रिपुरासुन्दरी गाउँपालिका स्तरीय परीक्षा

Set 5

दोस्रो त्रैमासिक परीक्षा (२०८२)

विषय: ऐच्छिक गणित | पूर्णाङ्क : ७५

कक्षा: ९ | समय: ३ घण्टा

सबै प्रश्नहरू अनिवार्य छन् । (Attempt all the questions.)

समूह 'क' Group 'A' वस्तुगत प्रश्नहरू (Objective Questions) (MCQ) [11 × 1 = 11]

1. सही उत्तर पहिचान गरी उत्तर पुस्तिकामा लेख्नुहोस् । (Write the correct options of each questions in your answer sheet.)

A. सम्बन्ध $y = 4x$ लाई मान्य हुने क्रमजोडा कुन हो ? (Which is the order pair satisfying the relation $y = 4x$?)

(a) (4, 1) (b) (1, 4)
(c) (4, 4) (d) (1, 1)

B. एउटा बहुपदीय $f(x) = x^3 - x^2 + 1$ लाई $(x-2)$ ले भाग गर्दा कति शेष सहन्छ ? (Remainder when a polynomial $f(x) = x^3 - x^2 + 1$ is divided by $(x-2)$?

(a) 1 (b) 4
(c) 5 (d) 6

C. 4 किलो आँप र 5 किलो सुन्तला किन्दा रू.1300 भन्दा कम पर्छ भने यो सम्बन्धलाई असमानतामा व्यक्त गर्दा कति हुन्छ ? (To buy 4 kg mangos and 5 kg oranges the cost is less than Rs.1300. What is the inequality relation to express this relation?)

(a) $4x + 5y < 1300$ (b) $4x + 5y \leq 1300$
(c) $4x + 5y > 1300$ (d) $4x + 5y \geq 1300$

D. $68°$ लाई रेडियनमा बदल्ने सही तरिका कुन हो ? (Which of the following is the correct method convert $68°$ to radian?)

(a) $68 + \frac{180}{\pi^c}$ (b) $68 \times \frac{180}{\pi^c}$
(c) $68 + \frac{\pi^c}{180}$ (d) $68 \times \frac{\pi^c}{180}$

E. तलका मध्ये कुन चाहिं सत्य छैन ? (Which one of the following is not true?)

(a) $\sin^2\theta + \cos^2\theta = 1$ (b) $\sec^2\theta + \tan^2\theta = 1$
(c) $\sec^2\theta - \tan^2\theta = 1$ (d) $\text{cosec}^2\theta - \cot^2\theta = 1$

F. एउटा समकोण त्रिभुजमा $\sin\theta = \frac{12}{13}$ भए $\cos\theta$ को मान कति होला ? (In a right angled triangle, if $\sin\theta = \frac{12}{13}$, what is the value of $\cos\theta$?)

(a) $\frac{5}{12}$ (b) $\frac{12}{5}$
(c) $\frac{5}{13}$ (d) $\frac{13}{5}$

G. विन्दुपथ भनेको के हो ? (What is mean by locus?)
(a) एक स्थानमा रहेको स्थिर विन्दु । (A fixed point in a space.)
(b) सिधा रेखामा मात्रै चल्ने वस्तुको बाटो । (A path of moving object only on a straight line.)
(c) एउटा निश्चित ज्यामितीय सर्त पूरा गर्ने सबै विन्दुहरुको समूह । (A set of all points that satisfy a particular geometric condition.
(d) विना कुनै नियमको विन्दुहरू जोडेर बनेको आकृति । (A figure formed by joining points randomly.)

H. विन्दु P (3, −4) लाई y−x = 0 रेखामा परावर्तन गर्दा बन्ने प्रतिविम्ब तलका मध्ये कुन विन्दु हुन्छ ? (Which one of the following points is the point ofter reflection of point P (3, −4) in the line y−x = 0?
(a) P' (3, 4) (b) P' (4, 3)
(c) P' (−4, 3) (d) P' (−3, 4)

I. तलका विन्दुहरु मध्ये कुन विन्दु समीकरण 3x + 2y = 1 भएको विन्दुपथमा पर्छ ? (Which one of the following points the locus whose equation is 3x + 2y = 1?)
(a) (0, 0) (b) (1, 1)
(c) (1, 2) (d) (−1, 2)

J. यदि $A = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$ र $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ भए A + B को मान कति हुन्छ ? (If $A = \begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then what is the value of A + B?)
(a) $\begin{bmatrix} 2 & 4 \\ 5 & 5 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & 0 \\ 0 & 6 \end{bmatrix}$
(c) $\begin{bmatrix} 4 & 4 \\ 5 & 7 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}$

K. cos (90°+θ) सँग बराबर हुने त्रिकोणमितीय अनुपात तलका मध्ये कुन हुन्छ ? (Which one of the following trigonometric ratios is equal to cos (90°+θ)?)
(a) cosθ (b) −sinθ
(c) sinθ (d) secθ

समुह 'ख' (Group 'B') विषय क्षेत्रगत (Within content Area) [40]

2. यदि फलन f : A → B जहाँ, A = {x : 2 ≤ x ≤ 5, x ∈ N} मा f (x) = 3x + 1 द्वारा परिभाषित गरिएको छ । (If function f : A → B where A = {x : 2 ≤ x ≤ 5, x ∈ N} by f (x) = 3x + 1.)
(a) फलनको क्षेत्र र विस्तार क्षेत्र पत्ता लगाउनुहोस् । (Find the domain and range of the function.) [2]
(b) यो कस्तो प्रकारको फलन हो ? पहिचान गर्नुहोस् । (Which type of function is this? Identity.) [1]
(c) फलनलाई मिलान चित्रमा प्रस्तुत गर्नुहोस् । (Represent the function by arrow diagram.) [1]

3. मेट्रिक्सहरु P, Q र R दिइएको छ । (Given matrices P, Q and R.)

$P = \begin{bmatrix} 3 & -1 & 4 \\ 2 & 0 & 5 \end{bmatrix}, Q = \begin{bmatrix} 1 & 2 & -3 \\ -1 & 0 & 4 \end{bmatrix}, R = \begin{bmatrix} 4 & 1 \\ 2 & -3 \end{bmatrix}$

(a) मेट्रिक्स P को क्रम लेख्नुहोस् । (Write the order of matrix P.) [1]

(b) के मेट्रिक्स P र R जोड्न सकिन्छ, कारण दिनुहोस् । (Can we add P and R? Give reason.) [1]

(c) P−Q पत्ता लगाउनुहोस् । (Find P−Q.) [1]

4. रमेशले सरोजलाई $\frac{x-5}{\sqrt{x+5}}$ लाई सरल गर्न भन्यो । (Ramesh said to Saroj to Simplify $\frac{x-5}{\sqrt{x+5}}$)

(a) हरको आनुपातिक गुणनखण्ड लेख्नुहोस् । (Write the rationalizing factor of divisor.) [1]

(b) असमानता $2x + 3y \leq 12$ लाई लेखाचित्रमा प्रस्तुत गर्नुहोस् । (Represent the inequality $2x + 3y \leq 12$ by graph.) [2]

5. त्रिकोणमितिय अभिव्यञ्जक $\frac{\cos^2 A - \sin^2 A}{\sin A(\cos^2 A - \sin A.\cos A)}$ दिएको छ । (Trigonometric expression $\frac{\cos^2 A - \sin^2 A}{\sin A(\cos^2 A - \sin A.\cos A)}$ is given.)

(a) $(\cos^2\theta - \sin^2\theta$ लाई $a^2 - b^2$ को सुत्र अनुसार लेख्नुहोस् । Write $(\cos^2\theta - \sin^2\theta)$ by using formula $a^2 - b^2$.) [1]

(b) SecA र CosecA लाई क्रमशः cosine र sine को रुपमा लेख्नुहोस् । (Write SecA and CosecA in terms of cosine and sine respectively.) [1]

(c) प्रमाणित गर्नुहोस् । (Prove that) : $\frac{\cos^2 A - \sin^2 A}{\sin A(\cos^2 A - \sin A.\cos A)} = \text{cosec}A + \sec A$ [2]

6. यदि $\tan\theta = \frac{2}{3}$ दिइएको छ । (If $\tan\theta = \frac{2}{3}$ given.)

(a) $\sin\theta$ को मान निकाल्नुहोस् । (Calculate the value of $\sin\theta$.) [2]

(b) मान पत्ता लगाउनुहोस् । (Find the value of): $\frac{\sin\theta - \cos\theta}{\sin\theta + \cos\theta}$ [1]

7. त्रिकोणमितीय अभिव्यञ्जक $\sin(180° + \theta) + \sec(270° + \theta)$ दिइएको छ । (Trigonometric expression $\sin(180° + \theta) + \sec(270° + \theta)$ is given.)

(a) $\sin(180° + \theta)$ को त्रिकोणमितीय अनुपात लेख्नुहोस् । (Find the Trigonometric ratio of $\sin(180° + \theta)$.) [1]

(b) $\sec(270° + \theta)$ को मान संग बराबर हुने पहिलो चतुर्थांशको त्रिकोणमितीय अनुपात पत्ता लगाउनुहोस् । (Find the Trigonometrie ratio of the first quadrant which is equal to $\sec(270° + \theta)$.) [1]

8. एउटा सरल रेखा $6x + 8y = 24$ दिइएको छ । (Given a straight line $6x + 8y = 24$.)

(a) यदि रेखाको झुकाव m भए m को मान पत्ता लगाउनुहोस् । (If m is the slope of line, fine the value of m.) [1]

(b) x-खण्ड र y-खण्ड पत्ता लगाउनुहोस् । (Find x- intercept and y- intercept.) [2]

9. A (3, 2) र B (−4, 0) दिइएका बिन्दुहरू र P (x, y) चल बिन्दु हो । (A (3, 2) and B (−4, 0) are two given points and P (x, y) is a moving point.)

(a) यदि P (x, y) रेखा AB को लम्बार्धक बिन्दु भए, बिन्दु P को बिन्दुपथ पत्ता लगाउनुहोस् । (If P (x, y) is perpendicular bisector of the line joining A and B, find the locus of the point P.) [2]

(b) यदि बिन्दु P ले बिन्दुहरू A (6, −10) र B (−4, 14) जोड्दा हुने रेखालाई 3 : 4 को अनुपातमा भित्र पट्टिवाट विभाजन गर्छ भने बिन्दु P को निर्देशाङ्क पत्ता लगाउनुहोस् । (If the point divides the line joining A (6, −10) and B (−4, 14) internally in the ratio 3 : 4. Find the coordinates of the point P.) [2]

10. शीर्षबिन्दुहरु A (3, 0), B (4, 2), C (2, 4) र D (1, 2) भएको चतुर्भुज ABCD दिइएको छ । (Quadrilateral ABCD with vertices A (3, 0), B (4, 2), C (2, 4) and D (1, 2) is given.)

(a) स्थानान्तरण P (x, y) → P' (−y, −x) द्वारा A', B', C' र D' निर्देशाङ्कहरु पत्ता लगाउनुहोस् । (Find the coordinates of A', B', C' and D' by the transformation P (x, y) → P' (−y, −x). [1]

(b) यो कुन प्रकारको स्थानान्तरण हो ? नाम लेख्नुहोस् । (What type of transformation is this? Write its name.) [1]

(c) चतुर्भुज ABCD र यसको प्रतिबिम्ब चतुर्भुज A'B'C'D' लाई एउटै लेखाचित्रमा प्रस्तुत गर्नुहोस् । (Show the quadrilateral ABCD and image of quadrilateral A'B'C'D' in the same graph.) [2]

11. यदि फलन $f(x+1) = x^2 - 1$ र $g(x+1) = x^2 + 1$ भए, (If function $f(x+1) = x^2 - 1$ and $g(x+1) = x^2 + 1$ then,)

(a) फलन g (x) को डिग्रीमा पत्ता लेख्नुहोस् । (Write the degree of the function g (x).) [1]

(b) f (x) + g (x) को मान कति हुन्छ ? पत्ता लगाउनुहोस् । (What is the value of f (x) + g (x)? Find it.) [2]

(c) f (−2) को मान पत्ता लगाउनुहोस् । (Find the value of f (−2).) [1]

12. दुई कोणको योगफल 100° ती कोणहरुको फरक 20^g छ । (The sum of the two angles is 100° and the difference of those angle is 20^g.)

(a) दुई कोणहरुको मान डिग्रीमा पत्ता लेख्नुहोस् । (Find the value of two angles ion degrees.) [2]

(b) उक्त कोणहरुको ग्रेडमा बदल्नुहोस् । (Convert the angles into grades.) [1]

13. यदि बिन्दुहरु A (2, 3), B (3, −1) र C (x, −5) समरेखीय भए, (If the points A (2, 3), B (3, −1) and C (x, −5) are collinear then.)

(a) AB को झुकाव पत्ता लगाउनुहोस् । (Find the slope of AB.) [1]

(b) 'x' को मान पत्ता लगाउनुहोस् । (Find the value of 'x'.) [1]

समुह 'ग' (Group 'C') अन्तरविषय क्षेत्रगत (Cross content Area) [24]

14. तीनओटा बहुपदीयहरु $f(x) = 8x^3 + 4x^2 - 20x + 15$, $g(x) = 2x-1$ र $h(x) = 5x + 3y$ दिइएको छन् । (Three polynomials $f(x) = 8x^3 + 4x^2 - 20x + 15$, $g(x) = 2x-1$ and $h(x) = 5x + 3y$ are given.)
    (a) यदि $H(6) = 15$ भए y को मान पत्ता लगाउनुहोस् । (If $H(6) = 15$ then, find the value of y.) [1]
    (b) $F(x)$ लाई $G(x)$ ले भाग गदां आउने भागफल र शेष पत्ता लगाउनुहोस् । (Find the quotient and remainder when $F(x)$ is divided by $G(x)$.) [3]
    (c) असमानता $H(x) \leq 15$ लाई लेखाचित्रमा प्रस्तुत गर्नुहोस् । (Represent the inequality $H(x) \leq 15$ in a graph.) [2]
15. शिर्षबिन्दुहरुको निर्देशांक P (0, 0), Q (4, 0) र R (0, 4) भएको त्रिभुज PQR छ । (P (0, 0), Q (4, 0) and R (0, 4) are the vertices of the triangles PQR.)
    (a) PQ, QR र PR को दूरी पत्ता लगाउनुहोस् । (Find the distance of PQ, QR and PR.) [3]
    (b) ΔPQR कस्तो प्रकारको त्रिभुज हुन्छ ? लेख्नुहोस् । (Write which type of triangle of ΔPQR.) [1]
    (c) ∡PQR को नापलाई ग्रेड रेडियनमा रूपान्तरण गर्नुहोस् । (Convert into grades and radian of ∡PQR.) [2]
16. $P(x) = x^2 + 3x + 2$ दिइएको छ । ($P(x) = x^2 + 3x + 2$ is given.)
    (a) P (x) लाई खण्डीकरण गर्नुहोस् । (Factorize P (x).) [1]
    (b) $x = -1$ र $x = -2$ मा P (x) को मान पत्ता लगाउनुहोस् । (Find the value of P (x) when $x = -1$ and $x = -2$.) [2]
    (c) मेट्रिक्स $M_{3\times2}$ तयार गर्नुहोस् जहां लहर 1 = P (0), P (1), P (2) र लहर 2 $=\{(P(0))^2, (P(1))^2, (P(2))^2\}$ छन् । (Write $M_{3\times2}$ where column 1 is P (0), P (1), P (2) and column 2 is $\{(P(0))^2, (P(1))^2, (P(2))^2\}$.) [3]
17. यदि फलन $f(x) = 2x + 1$ छ । (If function $f(x) = 2x + 1$.)
    (a) $P(-2, f(-2))$, $Q(0, f(0))$, $R(2, f(2))$ र $S(4, f(4))$ पत्ता लगाउनुहोस् । (Find $P(-2, f(-2))$, $Q(0, f(0))$, $R(2, f(2))$ and $S(4, f(4))$. [2]
    (b) बिन्दु PQ र RS को मध्यबिन्दु पत्ता लगाउनुहोस् । (Find the midpoint of points PQ and RS.) [2]
    (c) बिन्दु P, Q, R र S लाई 90° धनात्मक दिशामा परिक्रमण गरी प्रतिबिम्बको निर्देशाङ्क लेख्नुहोस् । (Find the coordinates of the imaged obtained by rotating the points P, Q, R and S by 90° in the positive direction.) [2]

Best of Luck

Test Your Best **Set 6**

First Terminal Examination – 2082

Subject: Optional Mathematics FM: 75

Grade: Nine Time: 3 hrs.

Attempt all the questions.

Group 'A' Objective Questions (MCQ) [11 × 1 = 11]

1. Re-write the correct option of each question in your same answer sheet.

A. For any two non-empty sets A and B, which one of the following defines the Cartesian product A × B. [1K]

(a) $\{(x, y) : x \in A, y \notin B$ (b) $\{(x, y) : x \in B, y \notin A\}$

(c) $\{(x, y) : x \in A, y \in B\}$ (d) $\{(x, y) : x \notin A, y \notin B\}$

B. If n (A × B) = 6 and n (B) = 3, what is the value of n (A)? [1A]

(a) 2 (b) 3

(c) 9 (d) 18

C. What type of function is $f : R \to N$ defined as $f(x) = x^2 + 1$? [1HA]

(a) One to one and onto both (b) One to one and into both

(c) Many to one and onto both (d) Many to one and into both

D. What is the order of the matrix $\begin{bmatrix} 2 & 0 & 2 & 5 \\ 2 & 0 & 8 & 2 \end{bmatrix}$? [1K]

(a) 4 × 2 (b) 2 × 4

(c) 1 × 8 (d) 8 × 1

E. Which of the following relations is true? [1K]

(a) sinA+cosA = 1 (b) secA × cos A = 1

(c) secA−tanA = 1 (d) $\frac{\sin A}{\cos A} = \cot A$

F. In a right angles triangle, if $\sin\theta = \frac{4}{5}$, what is the value of cosθ? [1A]

(a) $\frac{3}{5}$ (b) $\frac{5}{4}$

(c) $\frac{3}{4}$ (d) $\frac{5}{3}$

G. If $\tan\alpha + \cot\alpha = 2$, what is the value of $\tan^{100}\alpha + \cot^{100}\alpha$? [1HA]

(a) 1 (b) 2^{100}

(c) 2 (d) 2^{200}

H. Which locus will be at a distance of 7 units from the point (2, 3)? [1A]

(a) a straight line (b) a circle

(c) a triangle (d) a perpendicular bisector

I. The coordinates of the mid-point of a line segment joining the points A (-3, 3) and B (3, −3)? [1U]

(a) (3, 3) (b) (−3, −3)
(c) Origin (d) (0, 3)

J. Which percentile is equal to the 1^{st} quartile in a data set? [1U]
(a) 1^{st} percentile (b) 50^{th} percentile
(c) 75^{th} percentile (d) 25^{th} percentile

K. 31 students are taking optional mathematics in class IX in a school. The marks obtained by Ram, Shyam, Sita and Gita are respectively 40, 48, 50 and 60 and in the 8^{th}, 16^{th}, $20^{th}$and 24^{th} positions according to the arrangement in ascending order, whose marks represents the first quartile mark in the data? [1U]
(a) Shyam (b) Sita
(c) Gita (d) Ram

Group 'B' Within Content Area (WCA) 12 Questions [40 Marks]

2. Given sets are A = {1, 2} and B = {2, 3, 4}
   (a) Define Cartesian product A × B. [1K]
   (b) Find A × B and write the relation R = {(x, y) : x + y < 5} defined from A to B in the set of ordered pair form. [2A]
3. A function f(x) = 2x + 3 is given with domain A = {−2, −1, 0, 1}.
   (a) How do you define domain of a function? [1K]
   (b) Urbi writes this function as f = {(−2, −1), (−1, 1), (0, 0), (5, 1)}. Identify the incorrect ordered pair and replace it with correctordered pair. [2HA]
   (c) Show the function in an arrow-diagram. [1A]
4. Given matrices are and $A = \begin{bmatrix}1 & 2\\3 & 4\end{bmatrix}$, $B = \begin{bmatrix}3 & 0 & 2\\1 & 7 & 8\end{bmatrix}$ and $C = \begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$.
   (a) Identify and write the identity matrix. [1K]
   (b) Can we add the matrices A and B? Give reason. [1U]
   (c) Find A + C. [1A]
5. $P = \begin{bmatrix}6 & 0\\0 & 6\end{bmatrix}$, $Q = \begin{bmatrix}1 & 6\\9 & 0\end{bmatrix}$ and $R = \begin{bmatrix}1 & 2\\3 & 0\end{bmatrix}$ are given matrices.
   (a) Identify and write the scalar matrix. [1K]
   (b) Find 3R. [1A]
   (c) Can $\frac{1}{2}P + Q - 3R$ be an identity matrix? Justify. [1HA]
6. Given a trigonometric expression $(\sin A - \cos A)^2$.
   (a) Use $\sin^2\theta + \cos^2\theta = 1$ to simplify $(\sin A - \cos A)^2$. [1U]
   (b) Gopal said that $\sin^4 A - \cos^4 A$ and $\sin^2 A - \cos^2 A$ are equal. Justify his statement. [1HA]
7. Given trigonometric expression is $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}}$.
   (a) What is the rationalizing factor of $\sqrt{1+\cos\theta}$? [1K]

(b) Write the trigonometric ratio of $\sqrt{1-\cos^2\theta}$. [1K]

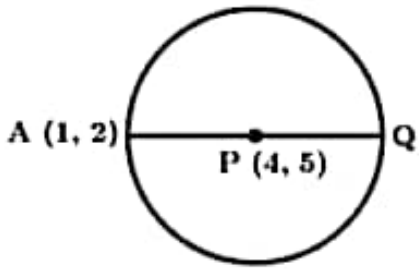
(c) Prove that: $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \text{cosec}\theta - \cot\theta$ [2A]

8. Given that $12\sec A = 13$

(a) Calculate the value of tanA. [2A]

(b) Find the value of $5\sin A + 12\cos A$. [1U]

9. In the given circle, P (4, 5) is the centre and A (1, 2) is one end of the diameter AB.



(a) Write coordinates of mid-point of segment joining the points (x_1, y_1) and (x_2, y_2). [1K]

(b) Find the coordinates of other end B of the diameter AB. [2A]

10. Given that A (0, 2), B (3, 1), C (1, 1), D (7, 4) are four fixed points and P (x, y) is the moving point.

(a) The distance of PA is equal to the distance of PB. Find the equation of locus of the point P that satisfies the condition. [2U]

(b) If the point P divides the segment CD in the ratio 1: 2, find the coordinates of point P. [2A]

11. Given that A (6, 10), B (−2, 12) and C (−6, 4) are three vertices of a parallelogram in order.

(a) Write the property of parallelogram based on its diagonals. [1K]

(b) Find the coordinates of mid-point of diagonal AC. [1U]

(c) Find the coordinates of its fourth vertex D. [2A]

12. The marks obtained by 11 students in optional mathematic in a mock test are listes as: 20, 18, 25, 10, 16, 5, 24, 8, 22, 19,3

(a) Write the formula to calculate the lower quartile (Q_1). [1K]

(b) Find the lower quartile (Q_1). [1A]

(c) Compare the 40^{th} percentile and the 1^{st} quartile. [1HA]

13. The record of temeperature of a place of a week is given below.

Temperature (in °C)	20	22	25	28
No. of days	1	2	3	1

(a) Write the mean deviation of a discrete data from median. [1K]

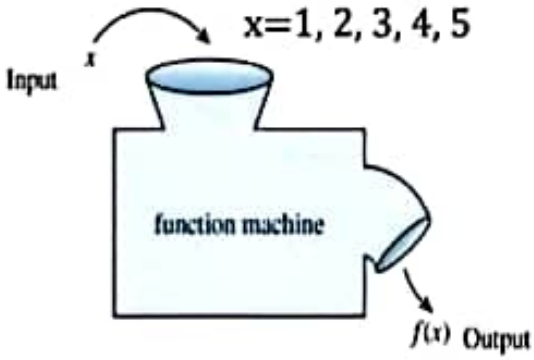
(b) Calculate the median. [1U]

(c) Find the M.D. of the given data from the median. [1A]

(d) Can the standard deviation of this data be a negative number? Justify. [1HA]

Group 'C' Cross Content Area (CCA) 4 Questions [24 Marks]

14. A data set consists of 5 numbers. These numbers are obtained by the function f(x) = 2x + 1 for x = 1, 2, 3, 4, 5



(a) List out the data set obtained from the function. [2U]

(b) Explain why 10 cannot be a number in the data set. [1HA]

(c) Find the standard deviation of the given data set. [3A]

15. A = −1, 2, 3} and B = {−1, 2, 4} are two given sets.

(a) Find the B × A and represent it in an arrow-diagram. [2U]

(b) Write the relation 'equal to to as the set of ordered pairs. [1A]

(c) Find the domain and range of the relation. [1A]

(d) In what ratio does X-axis divide the line joining the points obtained from the relation (b)? [2A]

16. Given trigonometric expression is $\frac{1}{\sec x - \tan x} - \frac{1}{\cos x}$

(a) Express $\frac{1}{\cos x}$ in terms of secx. [1U]

(b) Simplify: $\frac{1}{\sec x - \tan x}$ [2U]

(c) Prove that: $\frac{1}{\sec x - \tan x} - \frac{1}{\cos x} = \frac{1}{\cos x} - \frac{1}{\sec x + \tan x}$ [2A]

(d) What domain element has the image 1 in the range under the function $f(x) = \frac{1}{\sec x - \tan x} - \frac{1}{\cos x}$? [1HA]

17. Suppose you are drawing the graph of a function f(x) = y = x^2

(a) Draw the graph the function $y = x^2$ [2A]

(b) Consider three points A (0,...), B (1, ...) and C (2 ,...) as the vertices of a triangle ABC from the given function then find the length of median drawn from vertex B to the side AC. [3HA]

(c) Does the point $\left(\frac{1}{2}, \frac{1}{3}\right)$ lie on the graph of $y = x^2$? [1HA]

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Model Question

By Tara Bdr. Magar sir

Second Terminal Examination – 2082 **Set 7**

Subject: Optional Mathematics FM: 75

Grade: IX Time: 3 hrs.

Attempt all the questions.

Group 'A' Objective Questions (MCQ) [11 × 1 = 11]

1. Choose the best answer from the list of choices:

A. If matrix A is 2 × 2 matrix and its elements are given by $a_{ij} = 2i + j$ then matrix A is...

(a) $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & 4 \\ 5 & 6 \end{bmatrix}$

(c) $\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

B. If $(a-1, 3) = (2, 3)$ then the value of a is.....

(a) -1 (b) 3

(c) 2 (d) 5

C. How is the radical form of $c^{\frac{1}{3}}$ written?

(a) $\sqrt{c^3}$ (b) $\sqrt[3]{c^2}$

(c) $\sqrt[3]{c}$ (d) $\sqrt[3]{c^3}$

D. Which of the following algebraic expression is polynomial?

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

(c) $-x^2 - 3x + 5$ (d) $\sqrt{x+2}$

E. How many sides does quin-decagon have?

(a) 10 (b) 13

(c) 15 (d) 18

F. Which of the following point lie on the locus $x^2 + y = 4$?

(a) $(3, -5)$ (b) $(2, 1)$

(c) $(2, 2)$ (d) $(3, -1)$

G. Rotating by 90° clockwise of (1, 2) gives.....

(a) $(-2, 1)$ (b) $(1, -2)$

(c) $(-1, 2)$ (d) $(2, -1)$

H. Which of the following is pure surd?

(a) $\sqrt{3}$ (b) $3\sqrt{5}$

(c) $4\sqrt[3]{7}$ (d) $2\sqrt{10}$

I. The slope intercept form of straight line is represented by.....

(a) $y = mx + c$ (b) $x + y = c$

(c) $\frac{x}{a} + \frac{y}{b} = 1$ (d) $mx + ny = 1$

J. If $f(x) = 2x + 3$ then $f(5)$ is.....

(a) 10 (b) 11

(c) 12 (d) 13

K. The value of $\cos 90°$ is:

(a) 0 (b) $\frac{1}{2}$

(c) $\frac{\sqrt{3}}{2}$ (d) 1

Group 'B' Within Content Area (WCA) 12 Questions [40 Marks]

2. Let $f: R \to R$ be given by $f(x) = \frac{2x+3}{5x-2}$,

(a) Find the value of $f(2) + f(3)$. [2]

(b) If one of the image of the given function is 1, find the pre-image. [1]

3. Given $A = \{2, 3\}$, $B = \{4, 5\}$ and $C = \{5, 6\}$,

(a) Find the relation R from A to B satisfying $x < y$, $x \in A$, $y \in B$. [1]

(b) Find $(B \times C)$ and show them in arrow diagram. [2]

(c) Find the inverse of the relation $R = \{(x, y) \in A \times C : x > y\}$. [1]

4. If $p(x) = 4x^3 - 3x^2 - 7x$ and $q(x) = 2x^2 - 5x + 7$,

(a) Write the degree of the polynomial $p(x)$. [1]

(b) Find $p(x) + q(x)$. [1]

(c) Find the quotient and the remainder of $[q(x) \div (x + 2)]$ by using synthetic division. [2]

5. The surds are given: $4\sqrt{2}, \sqrt{32}$ and $5\sqrt{72}$.

(a) Arrange the above surds into ascending order. [1]

(b) Find the sum of the above surds. [2]

6. If $P + Q = \begin{bmatrix} 2 & 1 \\ 6 & 2 \end{bmatrix}$ and $P - Q = \begin{bmatrix} 2 & 3 \\ 4 & -4 \end{bmatrix}$.

(a) What is the necessary condition for the addition of matrices? Write it. [1]

(b) Find the matrices P and Q. [2]

7. If the angles of the triangle are $\left(\frac{2x}{3}\right)^g$, $\left(\frac{3x}{2}\right)^\circ$ and $\left(\frac{\pi x}{75}\right)^c$

(a) Write the relation between degree and grade. [1]

(b) Find each angles of the triangle in degree. [2]

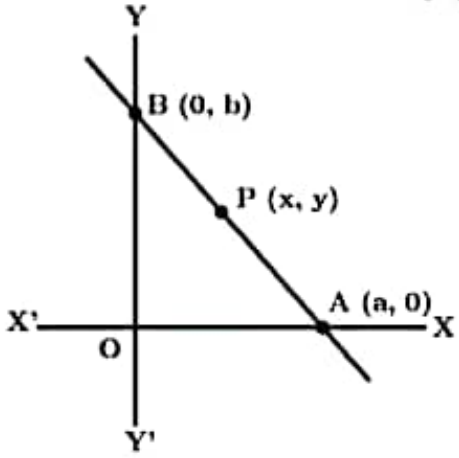
8. Given a trigonometric expression: $\frac{1+\cos\theta}{1-\cos\theta} + \frac{1-\cos\theta}{1+\cos\theta}$

(a) According to the Pythagorean $1 - \cos^2\theta$ is equal to the square of which trigonometric ratio? [1]

(b) Prove that: $\frac{1+\cos\theta}{1-\cos\theta} + \frac{1-\cos\theta}{1+\cos\theta} = 2(1 + 2\cot^2\theta)$ [3]

9. If $\sin\beta = \frac{12}{13}$ then,
   (a) Find the value of $\cos\beta$. [1]
   (b) Find the value of $\tan\beta + \cot\beta$. [2]

10. In the given figure, a straight line is given. The line cuts the y-axis at point B (0, b) and the x-axis at point A (a, 0).



   (a) In the equation $\frac{x}{a} + \frac{y}{b} = 1$, what does a and b represents. [1]
   (b) If A(a, 0)→A (4, 0) and B (0, b)→B (0, −3) then what would the equation be? Find it. [1]

11. A point P (x, y) is such that it is equidistant from two fixed points A (5, 6) and B (3, 5) where p is moving point.
   (a) Find the equation of the locus that satisfies this condition. [2]
   (b) If P divides the line joining points C (2, 4) and D (4, 8) in the ratio 1 : 2, find the coordinates of point P. [2]

12. Siya transforms triangle ABC with vertices A (1, 2), B (6, 3) and C (4, 6) by P (x, y) → P (x + 5, y−3)
   (a) Find the coordinates of the image of points A, B and C. [1]
   (b) Write the name of the transformation that Siya performed. [1]
   (c) Show triangle ABC and its image A'B'C' in the same graph paper. [2]

13. The daily number of customers served by a coffee shop for 7 days is given: 15, 22, 18, 25, 20, 16, 23
   (a) Write the formula to calculate the position of upper quartile (Q_3). [1]
   (b) Find quartile deviation. [2]

Group 'C' Cross Content Area (CCA) 4 Questions [24 Marks]

14. A data set consists of five numbers. These numbers were obtained by the function $f(x) = 4x-3$ for $\{1 \leq x \leq 5\}$.
   (a) List out the data five obtained numbers. [2]
   (b) Find the standard deviation, coefficient of standard deviation and variance from the obtained data set. [3]
   (c) Can standard deviation of the above data be a negative number? Justify. [1]

15. While solving problems, Sayan needs to evaluate trigonometric ratios of standard angles.
   (a) Find the value of $\tan 60° + 2\sqrt{3} - \cot 30°$. [1]
   (b) If $q(x) = x^2 - 5x + 6$ evaluate: $\frac{q(\sqrt{3})}{\sin 60°}$. [2]

(c) If $A = 45°$ and $B = 15°$, prove that: $\frac{\cot A}{2\cot A - \tan 3B} + \frac{\tan A}{3\tan A - \tan 3B} = \frac{3}{2}$ [3]

16. The normal form of straight line is $x\cos\alpha + y\sin\alpha = p$.

(a) If line passes through the point $(\sqrt{2}, \sqrt{3})$ with $\alpha = \frac{\pi}{4}$.

Show that: $p = \frac{\sqrt{6}+\sqrt{2}}{2}$ [2]

(b) For $\alpha = \frac{\pi}{3}$ and $p = 2$ write the equation of the line. [2]

(c) Suppose [m c] is stored in a matrix M represented by the line $y = mx + c$, find the matrix M in which the line passes through (1, 2) and (2, 5). [2]

17. A (6, 2), B (4, 2), C (3, 3) and D (5, 3) are the vertices of a quadrilateral.

(a) Find the coordinates of image of the quadrilateral ABCD when it rotates through 270° in clockwise direction about center (4, 5) and draw both the object and image on the same graph. [3]

(b) Find the distance between vertices A and B'. [1]

(c) Arrange the coordinates of the vertices of the quadrilateral and calculate the mean deviation from mean for the x-coordinates and y-coordinates separately. [2]

Best of Luck

CQE CLUSTER, LAMJUNG **Set 8**

Second Terminal Examination – 2082

Subject: Optional Mathematics FM: 75

Grade: 9 Time: 3 hrs.

Attempt all the questions.

Group 'A' Objective Questions (MCQ) [11 × 1 = 11]

1. Re-write the correct option of each question in your same answer sheet.

A. If f is a function and (m, n) be in f, then what is the value of f (m)?

(a) m (b) n

(c) m + n (d) m × n

B. Which of the following are the roots of the polynomial $2x^2 - 8$?

(a) ± 2 (b) ± 4

(c) ± 8 (d) ± 1

C. Which of the following equations represent a line with the slope (m) and y-intercept (c)?

(a) y = mx – c (b) x = my – c

(c) y = mx + c (d) x = my + c

D. What is the slope of a straight line that makes an angle of 60° with the positive direction of the X-axis?

(a) $\sqrt{3}$ (b) 1

(c) $\frac{\sqrt{3}}{2}$ (d) $\frac{1}{\sqrt{3}}$

E. If the points $A(x_1, y_1)$, $B(x_2, y_2)$ and $C(x_3, y_3)$ are the vertices of triangle ABC then how can you find the centroid of triangle ABC?

(a) $(x, y) = \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$ (b) $(x, y) = \left(\frac{x_1+x_2+x_3}{2}, \frac{y_1+y_2+y_3}{2}\right)$

(c) $(x, y) = \left(\frac{x_1+x_2+x_3}{x_1+x_2}, \frac{y_1+y_2+y_3}{y_1+y_2}\right)$ (d) $(x, y) = \left(\frac{x_1+x_2+x_3}{m+n}, \frac{y_1+y_2+y_3}{m+n}\right)$

F. What is the measure of 60° in radians?

(a) $\frac{\pi^c}{6}$ (b) $\frac{\pi^c}{3}$

(c) $\frac{2\pi^c}{3}$ (d) $\frac{3\pi^c}{4}$

G. If 3cotA = 4 then what is the value of tanA?

(a) $\frac{3}{4}$ (b) $\frac{4}{3}$

(c) $\frac{9}{16}$ (d) $\frac{1}{4}$

H. One angle of a right-angle triangle is 37°, what is the third angle in grade?

(a) 53^g (b) $\left(58\frac{8}{9}\right)^g$

(c) $\left(53\frac{8}{9}\right)^g$ (d) 45^g

I. The image of (1, 9) after rotation about the origin is (−9, 1). Which of the following rotations has been applied?

(a) 90° clockwise (b) 90° Anticlockwise

(c) 180° (d) 270° clockwise

J. What is the fourth term of the sequence $1, \frac{1}{4}, \frac{1}{9}$.....

(a) $\frac{1}{12}$ (b) $\frac{1}{25}$

(c) $\frac{1}{16}$ (d) $\frac{1}{36}$

K. What are the four main elements of a box plot?

(a) Minimum, Q_1, Median, Q_3, Maximum

(b) Mean, Mode, Median, Range

(c) Mean, Q_1, Median, Q_3

(d) Minimum, Mode, Range, Maximum

Group 'B' Within Content Area (WCA) 12 Questions [40 Marks]

2. (a) If $f = \{x, x^2 + 1\}$ is a function, then find the pre image of 2. [1]

   (b) If $f(x + 5) = f(x) + f(5)$ prove that $f(0) = 0$ and $f(-5) = -f(5)$ [2]

3. If $f(x) = 4x^3 - 2x^2 + 5$ and $g(x) = x + 2$

   (a) Write the constant term of the polynomial f (x). [1]

   (b) Find the quotient and remainder when f (x) is divisible by g (x). [2]

4. The polynomial $f(x) = 2x^3 - 4x^3 + cx + 2$ is exactly divided by $g(x) = x + 2$.

   (a) Find the degree of the polynomial f(x). [1]

   (b) Find the value of c. [2]

   (c) Find the solution set of the inequality $2x + y \leq 4$ [2]

5. One angle of a triangle is 30^g. If the ratio of the remaining two angle is 3:7,

   (a) Convert 30^g into degree and radian. [1]

   (b) Find all angles of the triangle in degree. [1]

6. If $\text{Cos}\gamma = \frac{a-1}{a+1}$

   (a) Find $\sin\gamma$. [2]

   (b) By using the value of $\sin\gamma$ and $\cos\gamma$ prove that: $\sin^2\gamma + \cos^2\gamma = 1$ [2]

7. (a) Write the tanA in terms of sinA. [1]

   (b) What is the value of $1 - \sin^2\theta$. [1]

(c) If $\tan A + \cot A = 3$ then prove that $\tan^2 A + \cot^2 A = 7$. [2]

8. If the equation of the straight line passing through the point (1, 2) and cutting equal intercepts on the axes but in opposite sign.
   (a) Find the slope of the line. [1]
   (b) Find the equation of the line. [2]
9. (a) Find the centroid of triangle having the vertices A (4, 5), B (1, 2) and C (4, −1). [2]
   (b) Find the equation of the straight line having slope $\frac{1}{3}$ and passing through (2, 5). [2]
10. The points A (2, 4), B (−3, 5) and C (0, 1) are the vertices of triangle ABC.
   (a) Define reflection. [1]
   (b) Reflect the vertices of triangle ABC in the line $y = x$ and write down the coordinates of the vertices of the image triangle A' B' C'. [2]
   (c) Show triangle ABC and its image triangle A'B'C' in the same graph paper. [2]
11. If the values of the first quartile and inter quartile range are 95 and 90 respectively.
   (a) Write the formula to calculate the QD. [1]
   (b) Find the value of the third quartile. [1]
   (c) Find the CQD. [1]
12. (a) What is the limiting values of the sequence 1.01, 1.001, 1.0001,..... [1]
   (b) Find the general term of the sequence −25, −18, −11,..... [1]
   (c) Find the sequence of the sides of the triangles obtained by joining the midpoints of the successive sides of the equilateral triangle ABC having 16 cm. write the limit. [2]

Group 'C' Cross Content Area (CCA) 4 Questions [24 Marks]

13. (a) Write the section formula for internal division. [1]
   (b) Prove that the points A (2, 3), B (5, 6) and C (8, 9) are Collinear. [2]
   (c) A straight line makes 60° with positive x-axis in anticlockwise direction and passed through the point $(\sqrt{3}, 0)$ prove that the line also passes through the point $(-\sqrt{3}, 2)$. [3]
14. Let $f(x) = |2x - 5|$ the domain, $D = \{-2, 0, 1, 3, 4, 6\}$.
   (a) Find the range of the function f(x). [2]
   (b) Find the difference between the maximum and minimum range values. [1]
   (c) Calculate the mean deviation about the median from the range values. [3]
15. A horse is tied to as take by a rope. If the horse moves along a circular path of length 15 m always keeping the rope tight and describes when it has traced out 65° at the centre.

(a) Convert 65° into grade and radian. [2]
(b) Find the length of the rope. [2]
(c) Find the remaining angle for a full circle in radian. [1]
(d) A rope of length r is cut in half repeatedly. What is the limit of the rope length as the number of cuts goes to infinity? [1]

16. P (4, 5), Q (1, 1) and R (5, 1) are the vertices of triangle PQR.
(a) Write the co-ordinates of the images of a point A (x, y) when it is rotated around the origin through 90°. [1]
(b) Rotate the triangle PQR about the point (0, 0) through negative quarter turn and write the coordinate of the image triangle P'Q'R'. [2]
(c) Rotate it about the point (3, 2) through negative quarter turn and write the coordinates of the image triangle P'Q'R'. [3]

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प्रथम त्रैमासिक परीक्षा २०८२

Set 9

समुन्द्रा मा.वि., समुन्द्रादेवी-६, नुवाकोट

कक्षा : ०९ | पूर्णाङ्क : ७५

विषय : ऐच्छिक गणित | समय : ३ घण्टा

Attempt all the questions.

Group 'A' Objective Questions (MCQ) [11 × 1 = 11]

1. Re-write the correct option of each question in your same answer sheet.

A. How is the radical form of $x^{\frac{2}{3}}$ written?

(a) $2\sqrt{x^3}$ (b) $\sqrt[3]{x^2}$

(c) $3\sqrt{x}$ (d) $-3\sqrt{x}$

B. A polynomial $f(x) = -x^3 + 6x - 7$ is divided by $(x + 1)$. Which of the following is the remainder?

(a) -14 (b) -12

(c) -10 (d) -8

C. Which of the followings is the correct method to convert 56° into radian?

(a) $56 + \left(\frac{180}{\pi}\right)^c$ (b) $56 \times \left(\frac{180}{\pi}\right)^c$

(c) $56 + \left(\frac{\pi}{180}\right)^c$ (d) $56 \times \left(\frac{\pi}{180}\right)^c$

D. In a right-angled triangle, if $\sin\theta = \frac{3}{5}$, what is the value of $\cos\theta$?

(a) $\frac{4}{5}$ (b) $\frac{5}{4}$

(c) $\frac{3}{4}$ (d) $\frac{5}{3}$

E. Which of the following ordered pairs are equal?

(a) (2, 3) and (4, 2) (b) (1, 2) and (2, 1)

(c) (6, 4) and (6, 5−1) (d) (1+3, 7) and (5, 3+4)

F. Which of the following relations is a symmetric relation?

(a) $R_1 = \{(1, 2), (2, 1)\}$ (b) $R_2 = \{(4, 3), (3, 4)\}$

(c) $R_3 = \{(7, 5)$ and $(5, 7)\}$ (d) All of the above

G. Which of the following is a function?

(a) $R_1 = \{(1, 2), (1, 3), (2, 4)\}$ (b) $R_2 = \{(4, 5), (6, 7), (6, 9)\}$

(c) $R_3 = \{(a, 1), (a, 2), (a, 3)\}$ (d) $R_4 = \{(2, 3), (4, 3), (5, 3)\}$

H. What is/are the root/roots of the polynomial $p(x) = x^2 - 4$?

(a) 2 (b) -2

(c) ± 2 (d) 4

I. Which of the following is a surd?

(a) $\sqrt{2}$ (b) $0.3\overline{3}$

(c) $\frac{2}{5}$ (d) $\sqrt{4}$

J. What is the rationalizing factor of $(\sqrt{5}-\sqrt{3})$?

(a) $(\sqrt{5}+\sqrt{3})$ (b) $(\sqrt{5}-\sqrt{3})$

(c) $(5+\sqrt{3})$ (d) $(\sqrt{5}-\sqrt{3})$

K. Which of the following matrices is compatible for addition of matrices?

(a) $\begin{bmatrix}2 & 3\\1 & 0\end{bmatrix}$ and $\begin{bmatrix}5\\6\end{bmatrix}$ (b) $\begin{bmatrix}7 & 2\end{bmatrix}$ and $\begin{bmatrix}8\\1\end{bmatrix}$

(c) $\begin{bmatrix}1 & 3 & 5\\7 & 9 & 0\end{bmatrix}$ and $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$ (d) $\begin{bmatrix}2 & 3\\4 & 5\\6 & 7\end{bmatrix}$ and $\begin{bmatrix}7 & 8\\5 & 6\\8 & 9\end{bmatrix}$

Group 'B' Within Content Area (WCA) 12 Questions [40 Marks]

2. A function $f(x) = 2x + 3$ is given with the domain $A = \{-2, 0, 2, 4\}$.
   (a) Write the degree of function f (x). [1]
   (b) Sunita Tamang writes a function as: $f(x) = \{(-2, 1), (4, 11), (0, 3), (7, 2)\}$. Identify incorrect ordered pair and replace it with the correct one.) [2]
   (c) Represent inequality $2x + 3 \geq 0$ in graph. [1]
3. If function $f(x) = px + q$ and $f(1) = 4$ and $f(3) = 6$ then
   (a) Find the values of p and q. [2]
   (b) Find the function f (x). [1]
   (c) Find the value of $f(-3) + f(0)$. [1]
4. Given an expression is $\frac{\sqrt{x}+\sqrt{a}}{\sqrt{x}-\sqrt{a}} - \frac{\sqrt{x}-\sqrt{a}}{\sqrt{x}+\sqrt{a}}$
   (a) What makes $(\sqrt{x}-\sqrt{a})$ a rational expression? [1]
   (b) Prove that: $\frac{\sqrt{x}+\sqrt{a}}{\sqrt{x}-\sqrt{a}} - \frac{\sqrt{x}-\sqrt{a}}{\sqrt{x}+\sqrt{a}} = \frac{4\sqrt{ax}}{x-a}$ [3]
5. Given matrices $A = \begin{bmatrix}3 & -1 & 4\\2 & 0 & 5\end{bmatrix}$, $B = \begin{bmatrix}1 & 2 & 3\\-1 & 0 & 4\end{bmatrix}$, $C = \begin{bmatrix}4 & 1\\2 & -3\end{bmatrix}$
   (a) Write the order of matrix A. [1]
   (b) Can we add A and C? Give reason. [1]
   (c) Find A−B. [1]
6. If $A = \begin{bmatrix}2 & 4\\3 & 5\end{bmatrix}$ and $2A + B = \begin{bmatrix}3 & 11\\11 & 12\end{bmatrix}$ then,
   (a) Find 2A. [1]
   (b) Find matrix B. [2]
7. A horse is tied to a pole with a rope of length 22 m. It moves along a circular path and subtends an angle of 70° at the pole.

(a) Convert 70° into sexagesimal seconds. [1]
(b) Write the relation between θ, l, and r. [1]
(c) Find the distance moved by the horse? [2]

8. Shubham Tamang is sitting in his study room and looks at the wall clock. The time is exactly 2:30 PM. He wonders about the angle formed between the hour hand and the minute hand of the clock.
(a) How many degrees does the minute hand move in one minute? [1]
(b) Calculate the angle formed between the two hands of the clock at 2:30 PM in radian measure. [2]

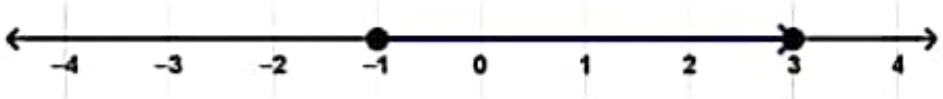
9. Given a trigonometric expression is $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$
(a) Write the rationalizing factor of $\sqrt{1+\sin\theta}$ [1]
(b) Write the trigonometric ratio of $\sqrt{1-\sin^2\theta}$. [1]
(c) Prove that: $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$ [2]

10. Answer the following
(a) Express $\cot\theta$ in terms of $\sin\theta$ and $\cos\theta$. [1]
(b) Prove that: $\frac{1-\cos^4 A}{\sin^4 A} = 1 + 2\cot^2 A$ [2]

11. Answer the following questions:
(a) What is the degree of divisor in synthetic division method? [1]
(b) If $2x^3 - 7x^2 + x + 10 = (x-1).Q(x) + R$ then find Q (x) and R. [2]

12. Answer the following questions:
(a) What is the sum of interior angles of a triangle in radian? [1]
(b) Three angles of a right-angled triangle are in the ratio of 2:3:5. Express all angles in radian. [2]

13. Answer the following questions:
(a) How many real numbers are there between any two distinct real numbers? Write it. [1]
(b) Represent the given number line in interval notation. [1]

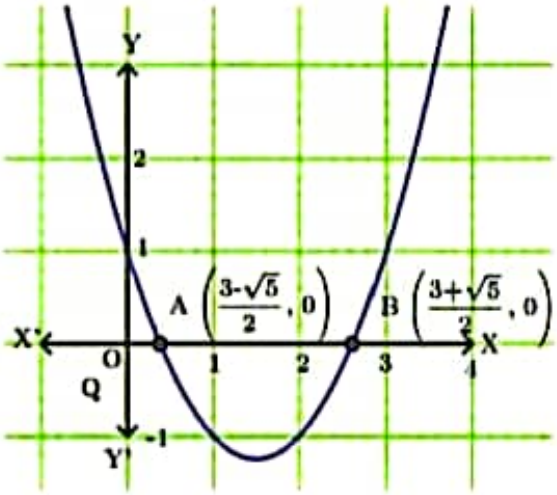


Group 'C' Cross Content Area (CCA) 4 Questions [24 Marks]

14. A data set consist of five numbers. These numbers were obtained by the function f (x) = 3x−2 for x = 1, 2, 3, 4, 5.
(a) List out the data set of five obtained numbers. [2]
(b) Explain why 15 cannot be a number in the obtained data set. [1]

(c) If $f(x) = \begin{cases} 3x + 2 & x \leq 1 \\ 4x - 1, & 1 < x \leq 3 \\ x^2 - 4 & x \geq 4 \end{cases}$ then find the values of f (3), f (4) and f (1).[3]

15. Given matrices are $P = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $Q = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$ and $R = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
    (a) Write the type of matrix R. [1]
    (b) Prove that: $P + Q = Q + R$ [2]
    (c) Construct a matrix A having order 2×2 and whose elements are given by: $a_{ij} = (-1)^{i+j}$ [2]
    (d) If matrix P is multiplied by scalar 2, will it be equal to matrix Q? Write it. [1]
16. If $A = \{x : x \leq 5, x \in N\}$ and $B = \{x: (x^2 - 4 = 0, x \in Z\}$ then,
    (a) Define Cartesian product. [1]
    (b) Write the relation between n (A × B), n (A) and n (B). [1]
    (c) Represent A × B in: [4]
        (i) Tabulation Method
        (ii) Mapping Diagram
        (iii) Tree Diagram
        (iv) Graphical Method
17. Manisha Shrestha draws a graph of a polynomial as shown on the right.
    (a) Define root/zero of a polynomial.[1]
    (b) Write the roots of the polynomial g(x). [1]
    (c) Sajindra Tamang has scored 30 and 85 runs respectively in the first two matches of T20 cricket. Now, how many runs does he need in the third match to average at least 50 runs? Express the given statement in inequality and solve it. [2]



    (d) If D, G and C are the number of degrees, grades and radians of an angle, prove that: $\frac{D}{180} = \frac{G}{200} = \frac{C}{\pi}$ [2]

Best of Luck!

Name:_____ Symbol no.: _____

APEX
Class - IX
Second Terminal Examination
Optional Mathematics
2082

Time: 3 hrs **Full Marks: 75**

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.
(Attempt All Questions.)

Group A
Objective Questions

Rewrite the correct option in your answer sheet.

1. Which of the following is an identity matrix? [1K]

   (a) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

2. Which of the following is the pre-image of 16 in the function $f(x) = 4x$. [1A]

   (a) 64 (b) 12 (c) 4 (d) 20

3. If $n(A) = x, n(B) = y$ and $n(A \times B) = z$ then which of of the following is the relation among x , y and z. [1U]

   (a) $x = y \times z$ (b) $y = z \times x$ (c) $z = x \times y$ (d) $z = x + y$

4. Which of the following is not equal to $\sin\theta$? [1K]

   (a) $\sqrt{1 - \cos^2\theta}$ (b) $1 - \cos^2\theta$ (c) $\frac{p}{h}$ (d) $\frac{1}{\text{cosec }\theta}$

5. If $\tan\theta = \frac{3}{4}$, then what is the value of $\cos\theta$? [1A]

   (a) $\frac{4}{5}$ (b) $\frac{5}{4}$ (c) $\frac{3}{5}$ (d) $\frac{5}{3}$

6. Which of the following is equal to the expression $\tan\theta + \cot\theta$? [1HA]

   (a) $\sec\theta + \text{cosec}\theta$ (b) $\sec\theta - \text{cosec}\theta$ (c) $\sec\theta \times \text{cosec}\theta$ (d) $\frac{\sec\theta}{\text{cosec}\theta}$

7. Which of the following is the equation of x-axis? [1K]

(a) $x = 0$ (b) $y = 0$ (c) $x = y$ (d) $x = -y$

8. What is the midpoint of the line segment joining the points $(3, 2)$ and $(5, 4)$? [1A]

(a) $(2, 2)$ (b) $(8, 6)$ (c) $(1, 1)$ (d) $(4, 3)$

9. What is the slope of a line which makes an inclination of $60°$ with y-axis? [1HA]

(a) $\frac{1}{\sqrt{3}}$ (b) $\frac{-1}{\sqrt{3}}$ (c) $\sqrt{3}$ (d) $-\sqrt{3}$

10. Which of the following is not the correct statement? [1U]

(a) $\overrightarrow{OP}$ is the position vector of point P.

(b) Negative vector of $\overrightarrow{AB}$ is $\overrightarrow{BA}$.

(c) Two vectors having opposite direction are unlike vectors.

(d) Two vectors having same direction are equal vectors.

11. From an individual data, Kritisha calculated $\Sigma x = 120$, $\Sigma|x - \bar{x}| = 34$, $N = 10$ and $\bar{x} = 12$. What is the mean deviation of the data? [1U]

(a) 3.4 (b) 1.2 (c) 3.52 (d) 2.83

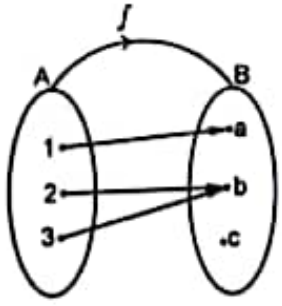
Group B
Within Content Area

12. Given $A = \{2, 3\}$ and $B = \{a, b\}$

(a) Define Cartesian product. [1K]

(b) Show $A \times B$ in a table. [2A]

13. A function from A to B is given in the diagram.



A function from A to B is given in the diagram.

(a) Write the image of of a. [1K]

(b) Whether f is function or not . Write with reason. [1U]

(c) How can we make f an onto function ? [1A]

14. Given Matrices

$$A = \begin{bmatrix} 1 & -2 \\ -3 & 5 \end{bmatrix}, \quad B = \begin{bmatrix} 4 & 3a-6 \\ 2b-8 & 4 \end{bmatrix}, \quad C = \begin{bmatrix} 2 & 5 & 8 \\ 7 & 0 & 4 \end{bmatrix}$$

(a) Write the order of matrix A. [1K]

(b) If matrix B is a scalar matrix, then find the values of a and b. [2HA]

(c) Find the value of $C_{21} + C_{23}$ from matrix C. [1A]

15. Given a trigonometric expression $\dfrac{1-\sin^4 A}{\cos^4 A}$

(a) What is the value of $\operatorname{cosec}^2\theta - \cot^2\theta$? [1K]

(b) Which trigonometric ratio is the reciprocal of $\tan\theta$? [1K]

(c) Reduce the given expression to $1 + 2\tan^2 A$. [2A]

16. Given a trigonometric expression $3\sin\theta + 4\cos\theta = 5$,

(a) Prove that $\sin\theta = \dfrac{3}{5}$ using the given expression. [2A]

(b) Express $\tan\theta$ in terms of $\cos\theta$. [1U]

17. Given $\sin A = m$ and $\tan A = n$,

(a) Prove that: $m^{-2} - n^{-2} = 1$. [1HA]

(b) Define the trigonometric ratio *sine* in a right angled triangle. [1U]

18. (a) Mention any one trigonometric identity. [1K]

(b) If $x\cos A = 1$ and $y = \tan A$, then find the value of $x^2 - y^2$. [1HA]

(c) What is the image of a point $(3, 2)$ after reflecting it on the line $y = x$? [1A]

(d) What is the equation of a line parallel to x-axis and passing through $(2, 3)$? [1U]

19. Given that $A(-2, 3)$ and $B(0, 2)$ are two fixed points, $P(x, y)$ is a moving point.

(a) If the distance of A is three times the distance of B from moving point P, find the equation of the locus of the point P. [2U]

(b) If the points $A(1, 2)$, $B(3, 0)$, $C(x, 4)$ and $D(5, y)$ represent the vertices of a parallelogram, then find the values of x and y. [2A]

20. Lakpa transformed a triangle PEN with vertices $P(3, 4)$, $E(7, 6)$ and $N(9, 2)$ by a translation vector $\overrightarrow{PE}$.

(a) Find the translation vector $\overrightarrow{PE}$. [1U]

(b) Show both object and image in a same graph paper. [2A]

(c) Name a non-isometric transformation. [1K]

21. An equation of a straight line is given as: $y = 5x + 6$.

(a) What is the y-intercept of the given line? [1K]

(b) If the points $P(3, 2)$, $Q(0, -4)$ and $R(-3, x)$ are collinear, then find the value of x. [2A]

22. Given $\overrightarrow{AB} = \begin{pmatrix} -4 \\ 5 \end{pmatrix}$.

(a) Write the horizontal component of $\overrightarrow{AB}$. [1K]

(b) Show $\overrightarrow{AB}$ in a graph. [1A]

(c) If the co-ordinate of A is (1,2), find the co-ordinate of B. [1HA]

23. The marks obtained by 7 students in a unit test is given below:

$$1, 2, 9, 8, 17, 16, 11$$

(a) Write the formula to calculate 76^{th} percentile. [1K]

(b) Calculate upper quartile from given data. [1A]

(c) Can mean deviation of above data be negative number? Give your logic. [1HA]

Group C
Cross Content Area

24. Rambilash prepared a range set of data by using a function $f(x) = 2x + 3$ for $0 \leq x \leq 4$, $x \in \mathbb{W}$.

(a) List out the range set of data. [2U]

(b) Find the Mean Deviation from median from the obtained range set of data. [3A]

(c) Explain why the mean deviation cannot be a number in the range data set. [1HA]

25. In a class of co-ordinate geometry Teacher asked Pratriti to plot the points $(-1, 8)$ and $(5, 2)$ on the graph paper and to join them.

(a) Which special type of function does the line segment drawn by Pratriti represent? [1HA]

(b) In what ratio does the point $(3, 2)$ divide the given line segment? [2U]

(c) If $f(x) = 5x^2 - 2x + 4$, then find the value of $f(2)$. [2A]

(d) Find the slope of the given line segment. [1A]

26. Given $\sqrt{\frac{1-\cos\theta}{1+\cos\theta}} = \text{cosec}\theta - \cot\theta$.

(a) Prove the above trigonometric identity. [2A]

(b) If $a^2\sec^2 x - b^2\tan^2 x = c^2$, find the value of $\sin x$. [2U]

(c) Simplify: $(1+\sin\theta)(1-\sin\theta)$ [1A]

(d) If $\cos A = \frac{m}{n}$ then what is the value of $\tan A$? [1HA]

27. A train move towards east from a point; and covers a distance of 5 km. Another train move from the same point towards south and covers a distance of 8 km.

(a) Represent the distance travelled by a train towards south in a vector form. [1HA]

(b) If $A(a,2), B(6,b)$ and $\overrightarrow{AB} = \begin{pmatrix}4\\2\end{pmatrix}$. Find the values of a and b. [2A]

(c) Determine the vertices of the image $\Delta A'B'C'$ formed when ΔABC with vertices $A(1,3), B(4,5)$ and $C(6,2)$ is reflected in the line $x+2=0$. Also, draw both the triangles on the same graph paper. [3HA]

♠ All the Best ♠

Name:_____ Symbol no.: _____

APEX
Class - IX
Model Question
Second Terminal Examination
Optional Mathematics
2082

Time: 3 hrs **Full Marks: 75**

Candidates are required to give their answers in their own words as far as practicable. The figures in the margin indicate full marks.
(Attempt All Questions.)

Group A
Objective Questions

Rewrite the correct option in your answer sheet.

1. Which of the following is an upper triangular matrix? [1K]
   (a) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 0 \\ 4 & 5 \end{bmatrix}$

2. If $A = \{1, 2, 3, 4\}$ and $B = \{5, 6, 7\}$, then what is the value of $n(A \times B)$? [1A]
   (a) 4 (b) 3 (c) 7 (d) 12

3. How can we express the area (A) of a circle as a function of its circumference (C)? [1U]
   (a) $f(c) = 2\sqrt{\pi A}$ (b) $f(c) = \frac{c^2}{4\pi}$ (c) $f(A) = \frac{c^2}{4\pi}$ (d) $f(A) = 2\sqrt{\pi A}$

4. Which of the following is **not** equal to $\tan\theta$ for all θ? [1K]
   (a) 1 (b) $\frac{p}{b}$ (c) $\frac{1}{\cot\theta}$ (d) $\sqrt{\sec^2\theta - 1}$

5. If $\sec\theta = \frac{5}{3}$, then what is the value of $\csc\theta$? [1A]
   (a) $\frac{5}{4}$ (b) $\frac{4}{5}$ (c) $\frac{4}{3}$ (d) $\frac{3}{4}$

6. Which of the following is equal to the expression $\frac{\csc\theta}{\tan\theta + \cot\theta}$? [1HA]
   (a) $\csc\theta$ (b) $\sec\theta$ (c) $\sin\theta$ (d) $\cos\theta$

7. What is the equation of a line which is parallel to the y-axis and passing through the point $(2,3)$? [1A]
   (a) $x = 2$ (b) $x = 3$ (c) $y = 2$ (d) $y = 3$

8. What is the slope of the x-axis? [1K]
   (a) 0 (b) 1 (c) -1 (d) Undefined

9. If $(3,5)$ is the midpoint of the line segment joining the points $(a,2)$ and $(5,b)$, then what is the value of a? [1HA]
   (a) 8 (b) -8 (c) 1 (d) -1

10. Which of the following statements is correct? [1U]
   (a) Time is a vector quantity.
   (b) Two vectors having same direction are equal vectors.
   (c) Negative vector of $\overrightarrow{AB}$ is $-\overrightarrow{BA}$.
   (d) Opposite sides of a parallelogram are equal and like vectors.

11. From a discrete data, Pallavi calculated $\Sigma fx = 2400$, $\Sigma f|x - \bar{x}| = 448$ and $N = 100$. What is the mean deviation of the data? [1U]
   (a) 24 (b) 4.48 (c) 0.187 (d) 5.35

Group B
Within Content Area

12. Given $A = \{1,4,6,7\}$ and $B = \{1,2,3,4\}$:
   (a) Define a relation. [1K]
   (b) Show a relation $R : A \to B$ defined as "is double of" in a mapping diagram. [2A]

13. A function is defined by $f(x) = 2x - 5$.
   (a) State the special type of function that $f(x)$ represents. [1K]
   (b) Find $f(x + h)$. [1U]
   (c) Simplify $\dfrac{f(x+h) - f(x)}{h}$. [1A]

14. Given matrices

$$A = \begin{bmatrix} a-1 & b-1 \\ c-1 & d-1 \end{bmatrix}, \quad B = \begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}, \quad C = \begin{bmatrix} 5 & 7 & 8 \\ 9 & -2 & 4 \\ 0 & 1 & 6 \end{bmatrix}$$

   (a) What type of matrix is A? [1K]
   (b) If matrix B is a symmetric matrix, then find the value of x. [2HA]

(c) Find the value of $C_{21} - C_{32}$. [1A]

15. Given a trigonometric expression $\csc\theta + \cot\theta = x$:

(a) What is the value of $\sec^2\theta - \tan^2\theta$? [1K]

(b) Which trigonometric ratio is the reciprocal of $\csc\theta$? [1K]

(c) Prove that $\cos\theta = \dfrac{x^2-1}{x^2+1}$ using the given expression. [2A]

16. A trigonometric expression is given: $5\sin\theta + 12\cos\theta = 13$.

(a) Using the given expression, prove that $\tan\theta = \dfrac{5}{12}$. [2A]

(b) Express $\cot\theta$ in terms of $\sec\theta$. [1U]

17. Given $\csc\beta = p$ and $\sec\beta = q$:

(a) Prove that: $p^{-2} + q^{-2} = 1$. [1HA]

(b) Define a trigonometric ratio tan in a right-angled triangle. [1U]

18. (a) Mention any one Pythagorean relation of trigonometric ratios. [1K]

(b) Prove that: $\dfrac{\sin^3 A + \cos^3 A}{\sin A + \cos A} = 1 - \sin A\cos A$. [1HA]

(c) What is the image of a point (4,3) after reflectiong on the line $x = 2$? [1A]

(d) Does the point (3,4) lies on the locus $x^2 + y^2 = 25$? Verify it . [1U]

19. During the class of Locus, Ma'am wrote two points on the square grid: $A(5,4)$ and $B(0,-1)$.

(a) Find the equation of the locus of a point $P(x,y)$ which moves such that its distance from the point $A(5,4)$ is double of the distance from the point $B(0,-1)$. [2U]

(b) Prove that the points $(1,3),(3,1),(6,2),(4,4)$ taken in order are the vertices of a parallelogram. [2A]

20. Ambik transforms a triangle CAT with vertices $C(3,2)$, $A(5,6)$ and $T(1,5)$ by applying a translation vector $\overrightarrow{AT}$.

(a) Find the translation vector $\overrightarrow{AT}$. [1U]

(b) Show both object and image on the same graph paper. [2A]

(c) Write one example of an isometric transformation. [1K]

21. An equation of a straight line is given as

$$y = 4x - 3.$$

(a) What is the slope of the given line? [1K]

(b) If the slope of the line joining the points $(2, 4)$ and $(6, y)$ is $\frac{7}{3}$, find the value of y. [2A]

22. Given a column vector $\overrightarrow{AB} = \begin{pmatrix} 6 \\ -3 \end{pmatrix}$.

(a) Write the vertical component of $\overrightarrow{AB}$. [1K]

(b) Show $\overrightarrow{AB}$ in a graph. [1A]

(c) Mention a vector that lies in the second quadrant in column form. [1HA]

23. The marks obtained by 6 students in a monthly test is given below:

$$19, 14, 2, 5, 12, 7$$

(a) What is the formula to calculate the 55^{th} percentile? [1K]

(b) Calculate the lower quartile from the above data. [1A]

(c) Why is the value of the coefficient of quartile deviation always positive? Give your logic. [1HA]

Group C
Cross Content Area

24. Nirajan prepared a set of data by using a function $f(x) = 4x + 3, \quad 1 \leq x \leq 5, \quad x \in \mathbb{N}$.

(a) List out the set of data. [2U]

(b) Calculate the Mean Deviation from mean from the obtained data. [3A]

(c) Explain why 27 cannot be a number in the data set. [1HA]

25. During the preparation of the exam of optional maths, Ayush took a function in which he got the output 2 and 3 for the input -5 and 2 respectively.

(a) Mention the ordered pair that Ayush will get. [1HA]

(b) In what ratio does the Y-axis divides the line segment joining the ordered pairs? [2U]

(c) What will be the equation of a straight line whose slope is 2 and $y-$intercept is 3? [1A]

(d) If $f(x + 8) = f(x) + f(8)$ then prove that: [2A]

$$f(0) = 0 \text{ and} f(-8) = -f(8)$$

.

26. Given a trigonometric identity

$$\frac{1-\sin A}{1+\sin A} = (\sec A - \tan A)^2$$

(a) Prove the given identity. [2A]

(b) If $\csc\theta - \cot\theta = \frac{2}{3}$ then find the value of $\csc\theta + \cot\theta$. [2U]

(c) If $\sin A = \frac{x}{y}$, then what is the value of $\sec A$? [1HA]

(d) If $f(x^\circ) = 4\sin x^\circ$, find $f(30^\circ)$. [1A]

27. Utsav burn a fire cracker during Tihar festival which moves upward and bursts when it covers a distance of 0.8m.

(a) Represent the distance covered by the fire cracker in a vector form assuming it moves vertically upward from the ground. [1HA]

(b) Find the value of x and y from the given points $A(x, 6), B(4, 1), C(3, y)$ and $D(6, 1)$ if $\overrightarrow{AB} = \overrightarrow{CD}$. [2A]

(c) Determine the vertices of the image of $\triangle PQR$ with vertices $P(4, 3)$, $Q(3, 1)$, $R(1, 2)$ after reflecting on the line $y + x = 0$. Also draw both the object and image on the same graph paper. [3HA]

♠ All the Best ♠

Model Question -2082

Grade: IX **F.M : 75**

Sub: Opt.Maths

Attempt all the questions.

Group 'A' [11 ×1=11]

[1]Choose the correct answer.

A. If A = {1,2,3} and B = {a,b} then value of n(A×B) is ..

a) 0 b) 3 c) 5 d) 6

B. What element in domain has image 7 under the function $f(x) = \frac{2x-3}{5}$?

a) 15 b) 16 c) 19 d) 20

C. If a polynomial p(x) has a root 3 , at which point do its graph intersects the x-axis?

a) (3,0) b) (0,-3) c) (0,3) d) (-3,0)

D.The additive inverse of a 2×2 identity matrix is ..

a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ b) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ c) $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

E. A right angle is equal to ..

a) 100^0 b) 90^g c) $2\pi^c$ d) $\frac{\pi^c}{2}$

F. Statement 1: There is reciprocal relation between $\tan\theta$ and $\cot\theta$.
Statement 2: $\sin^2\theta = 1 + \cos^2\theta$
Which of the following statement is valid?

a) only 1 b) only 2 c) both 1 and 2 d) none

G. The equation of line parallel to y-axis which passes through (-3,4) is

a) x -3 =0 b) x+3=0 c)y-4=0 d) y+4=0

H. The mid point of the line segment divides the line segment in the ratio of …

a) 1:2 b) 1:1 c) 2:1 d) 1:3

[6] A trigonometric identity is given $\sqrt{\frac{1-CosA}{1+CosA}}$ = CosecA- CotA

a) Write trigonometric ratio of $\sqrt{1-Cos^2A}$. [1]

b) Prove above relation. [2]

[7] Given that $12Cot\theta = 5$

a) Find value of $Sin\theta$. [1]

b) Prove that : $\frac{2Sin\theta-3Cos\theta}{4Sin\theta-9Cos\theta} = 3$. [2]

[8] Two fixed points are A(3,2) and B(7,-4) .If P(x,y) is a variable point .

a) Define locus. [1]

b) Find equation of locus under the condition AP =BP. [2]

[9] A point P(5,k) divides the line segment joining the points A(3,7) and B(8,9) in a ratio $m_1:m_2$

a) Write internal section formula. [1]

b) Find the ratio $m_1:m_2$. [2]

c) Find the value of k. [1]

[10] An equation of a line MN is given y = mx+c

a) What does m and c represent? [1]

b) If the line makes an angle 45^0 with x-axis in positive direction , Find slope of the line. [1]

c)Find equation of line MN if it passes through the point (0,4).[[1]

[11] A(2,3) , B(5,4) and (3,-4) are vertices of triangle ABC.

a) Find the images when ΔABC is tranformed by the translation vector $\begin{bmatrix}-2\\3\end{bmatrix}$. [2]

b) If the image ΔA'B'C' is rotated by $+90^0$ about origin , find the final images. [1]

c) Show all triangles in same graph paper. [1]

[12] The marks obtained by 20 students are given below.

marks	10	20	30	40	50
No. of students	4	6	5	3	2

a) If you are given to find mean deviation , which will you choose from mean or median or mode ? Give reason. [1]

b) Find mean deviation of given data. [2]

[13] Given that a function $f(x) = \frac{x^2-9}{x-3}$.

a) Does f(3) represent a real number? [1]

b) Find value of f(x) at x = 2.9 ,2.99 , 3.01 ,3.001 . [2]

c) Find the value of $\lim_{x\to 3^-} f(x)$ and $\lim_{x\to 3^+} f(x)$. [1]

Group 'C' [4 ×6= 24]

[14] A data set consists of five numbers. These numbers were Obtained by the function f(x) = 5x+3 for x = 1,2,3,4,5

a) List out the data set of five obtained numbers. [2]

b) Explain why 27 cannot be a number in the obtained data set ? [1]

c) Find the standard deviation of obtained numbers. [3]

[15] A function is given f = {(1,3) , (2,3) ,(3,3) }

a) What type of function is this? [1]

b) Show the function in graph. [1]

c) Taking the line from graph of function as axis of reflection, transform ΔABC with vertices A(2,1) , B(3,-4) and C(6,2) show in same graph paper. [3]

d)Where does the line of above function meet the x-axis? [1]

[16] An equation of a straight line is given by $4x + 3y = 24$.

a) If the line cuts x-axis at point A and y-axis at point B , find the co-ordinates of A and B. [2]

b) Find slope of line . [1]

c) Find area of triangle made by line AB on co-ordinates axes. [1]

d) If $\measuredangle A = \theta$, the find the value of $\tan\theta$. Is the value of $\tan\theta$ equal to Slope of line AB ? Give reason. [2]

[17] A trigonometric expression is given by $\frac{CosecA+CotA+1}{1-CosecA+CotA}$

a) What is the value of $Cosec^2A - Cot^2A$? [1]

b) Prove that: $\frac{CosecA+CotA+1}{1-CosecA+CotA} = \frac{1+CosA}{SinA}$ [2]

c) If $CosecA - CotA = \frac{2}{3}$ Find the value of CosecA and CotA. [2]

d) For what value of A given expression $\frac{1+CosA}{SinA}$ is undefined? [1]

[The End]

Joint Examination Board

District PABSON, Bhaktapur

Half -Yearly Examination- 2082

Class: IX **F.M. : 75**

Subject: Optional Mathematics **Time: 3 hrs.**

Candidates are required to write creative answers rather than based on rote learning.

Attempt All Questions.

(Group A)

(Objective Questions)

1. **Choose the correct one:**

A. Which of the following is the correct ordered pair satisfying the condition $x + y > 9$? 1

(i) (1, 6) (ii) (3, 6) (iii) (4, 2) (iv) (4, 6)

B. What is the zero of the polynomial $f(x) = x^2 - 6x + 9$? 1

(i) 0 (ii) -3 (iii) -6 (iv) 3

C. How many number of grades are there in one right angle? 1

(i) 1 (ii) 90 (iii) 100 (iv) 10

D. What is the simplest form of $(\sin A + \cos A)^2 + (\sin A - \cos A)^2$? 1

(i) 2 (ii) -2 (iii) 0 (iv) $4\sin A\cos A$

E. In a right angled triangle, if $\cos\theta = \frac{4}{5}$ and base is 8cm, what is the hypotenuse? 1

(i) 10cm (ii) 6cm (iii) 5cm (iv) 3cm

F. What is the value of 'a' if the point (2, 4) lies on the locus $y^2 = 2ax$? 1

(i) 1 (ii) 4 (iii) $\frac{1}{2}$ (iv) 0

G. Which of the following is the equation of x-axis? 1

(i) $y = x$ (ii) $y = 0$ (iii) $x = 0$ (iv) $x + y = 0$

H. When a point A(4, 2) is reflected in the line $y = k$ to get the image A'(4,0), what is the value of k? 1

(i) 0 (ii) -2 (iii) -1 (iv) 1

I. Which of the following is the direction of a vector $\begin{pmatrix} 3 \\ \sqrt{3} \end{pmatrix}$? 1

(i) 60° (ii) 120° (iii) $\frac{1}{\sqrt{3}}$ (iv) 30°

J. If mean and mean deviation from mean of a data are 40 and 10 respectively, then which of the following is the coefficient of mean deviation? 1

(i) 4 (ii) $\frac{1}{3}$ (iii) $\frac{1}{4}$ (iv) 0.3

K. Which of the following is the limiting value of $\lim_{x \to 1} \frac{x^2-1}{x-1}$? 1

(i) 2 (ii) 0 (iii) ∞ (iv) 1

Group 'B'

2. If $A = \{x: 2 \leq x < 4\}$ and $B = \{8, 10\}$, then,
   a. Find set A. 1
   b. Find $A \times B$. 2
   c. Find the relation $R: A \to B$ satisfying the condition $y = 3x + 1$. 1

3. If $f(x + 2) = f(x) + f(2)$, find the value of :
   a. $f(0)$ and $f(2)$ 2
   b. Prove that: $f(-2) = -f(2)$ 1

4. $x^3 - 5x^2 - 2$ is divided by $x + 2$.
   a. Write down the degree of the quotient. 1
   b. Use synthetic division method to find quotient and remainder. 2

5. Two angles of a triangle are 80^g and $36°$.
   a. Express 80^g in to degree. 1
   b. Find the third angle of the triangle in degree. 1

6. x and y represent the number of degrees and the number of radians of an angle.
   a. Write the degree measure of the angle in terms of y. 1
   b. Express the angle in degree measure into radian. 1
   c. Prove that: $\pi x = 180y$. 2

7. a. Prove that : $\frac{1-\cos^4 A}{\sin^4 A} = \text{cosec}^2 A + \cot^2 A$ 2
   b. Express $\text{cosec}^2 A + \cot^2 A$ in term of $\cot^2 A$. 1

8. A(5, -1), B(1, 3) and C(12, 4) are the vertices of ΔABC.
   a. Write down the formula of centroid of triangle. 1
   b. Find the coordinates of centroid of ΔABC. 2

9. A(-1, 3) and B(4, -2) are two fixed points and P(x, y) is a moving point.
   a. Find the length of PA and PB. 2
   b. If PA = 2PB, find the equation of locus of the point 'P'. 2

10. A(3, 4), B(1, 4) and C(6, 2) are the vertices of ΔABC. The ΔABC is transformed to ΔA'B'C' by $P(x, y) \rightarrow P'(y, -x)$.
    a. Find the coordinates of A', B' and C', 1
    b. Represent ΔABC and ΔA'B'C' on the same graph paper. 2
    c. Write the type of given transformation. 1

11. $\vec{a} = \begin{pmatrix} -20 \\ -15 \end{pmatrix}$ and $\vec{b} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$
    a. Define parallel vectors. 1
    b. Prove that $\vec{a}$ and $\vec{b}$ are parallel. 1
    c. If two vectors $\begin{pmatrix} 4 \\ 3 \end{pmatrix}$ and $\begin{pmatrix} a \\ 15 \end{pmatrix}$ are parallel, find the value of a. 1

12. The marks obtained by 7 students in optional maths are as follow:
    30, 35, 45, 50, 52, 53, 65.
    a. Write the formula to calculate position of the first quartile. 1
    b. Find the first quartile. 1
    c. If third quartile of the data is 53, find the coefficient of quartile deviation. 1

13. If $f(x) = \frac{9x - x^3}{x^2 - 3x}$ is a function.
    a. Define limit of a function. 1
    b. What is the meaning of indeterminate form of a function? 1
    c. Find f(3) of the function. 1
    d. Find $\lim_{x \to 3} \frac{9x - x^3}{x^2 - 3x}$. 1

Group 'C'

14. $y = mx + c$ is the equation of straight line AB.
    a. If inclination of the line is 30° and Y-intercept is 3 units, find the equation of AB. 2
    b. If $x \rightarrow \sqrt{3}$, find the limiting value of y. 1
    c. Prove that AB doesn't pass through origin. 1
    d. Prove that 6 is the image of $3\sqrt{3}$ of the function represented by the equation of AB. 2

15. Input (value of x) of a function $f(x) = 2x - 3$ are 2, 3, 4, 5, 6.
    a. Find the output (value of y) according to the above information. 2
    b. Can the output of the function be 18 according to the above condition? Explain. 1
    c. From the input data given above, calculate the mean deviation from median. 3

16. If $f(\theta) = \frac{sec\theta+tan\theta-1}{tan\theta-sec\theta+1}$ and $g(\theta) = sec\theta + tan\theta$.

a. Prove that $f(\theta) = g(\theta)$. 2

b. Find the value of $f(45°)$ and $g(45°)$ 2

c. Are $f(60°)$ and $g(60°)$ equal? Write with reason. 1

d. For what value of θ, $g(\theta) = \frac{1+sin\theta}{cos\theta}$ will be undefined? 1

17. An ant goes from point A(2, 3) to point B(2, -3).

a. "B(2, -3) is the reflecting image of A(2, 3), line of reflection is y=0." Justify this statement. 1

b. What would be the image of A(2, 3) if the line of reflection is $x + y = 0$? 2

c. Find the magnitude of $\overrightarrow{AB}$ and prove that it is not a unit vector. 3

The End

नमुना प्रश्न २०८२
Model Question 2082

कक्षा: नौ	पुर्णाङ्क : ७५
Grade: 9	Full Marks: 75
विषय: ऐच्छिक गणित	समय: ३ घण्टा
Subject: Optional Mathematics	Time: 3 hrs.

सबै प्रश्न अनिवार्य छन् । (Attempt All Questions.)

समूह "क" (Group "A")

1. वस्तुगत प्रश्नहरू (Objective Questions.)

A. $x^{\frac{2}{3}}$ लाई सर्डका रुपमा लेख्दा कसरी लेखिन्छ? (How is the radical form of $x^{\frac{2}{3}}$ written?) [1K]

(a) $2\sqrt{x^3}$ (b) $\sqrt[3]{x^2}$

(c) $3\sqrt{x}$ (d) $-3\sqrt{x}$

B. एक बहुपदीय अभिव्यञ्जक $f(a) = -a^3 + 6a - 7$ लाई $(x + 1)$ ले भाग गर्दा कति शेष रहन्छ? (A polynomial $f(a) = -a^3 + 6a - 7$ is divided by $(x + 1)$. Which of the followings is the remainder?) [1A]

(a) -14 (b) -12

(c) 10 (d) -8

C. $56°$ लाई रेडियनमा बदल्ने सहि तरिका कुन हो? (Which of the followings is the correct method to convert $56°$ to radian?) [1K]

(a) $56 + \left(\frac{180}{\pi}\right)^c$ (b) $56 \times \left(\frac{180}{\pi}\right)^c$

(c) $56 + \left(\frac{\pi}{180}\right)^c$ (d) $56 \times \left(\frac{\pi}{180}\right)^c$

D. एउटा समकोण त्रिभुजमा $\sin\theta = \frac{3}{5}$ भए $\cos\theta$ को मान कति होला? (In a right-angled triangle, if $\sin\theta = \frac{3}{5}$ what is the value of $\cos\theta$?) [1A]

(a) $\frac{4}{5}$ (b) $\frac{5}{4}$

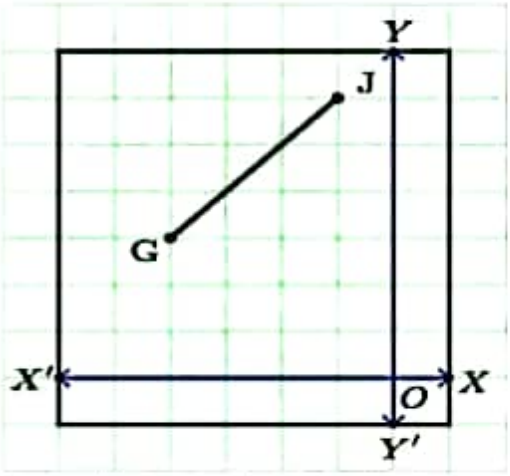
(c) $\frac{3}{4}$ (d) $\frac{5}{3}$

E. यदि $\sin(90+A)° = \frac{1}{2}$ भए A को मान कति होला? (If $\sin(90+A)° = \frac{1}{2}$ then what is the value of A?) [1HA]

(a) $30°$ (b) $60°$

(c) $120°$ (d) $150°$

F. दिइएको लेखाचित्रमा रेखाखण्ड GJ सँग समानान्तर हुने प्रतिबिम्ब बन्ने स्थानान्तरण कुन चाहिँ होला?(Which of the following transformations will result in a segment that is parallel to segment GJ in the graph?) [1HA]



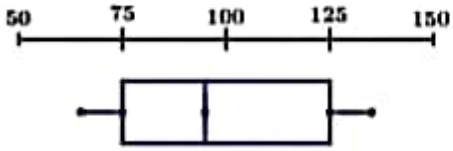
(a) X-अक्षमा परावर्तन (a reflection in the X-axis)
(b) Y-अक्षमा परावर्तन (a reflection in the Y-axis)
(c) उद्गम विन्दुवाट घडीको सुईको दिशामा 90° मा परिक्रमण (a 90° clockwise rotation about the origin)
(d) उद्गम विन्दुवाट घडीको सुईको दिशामा 180° मा परिक्रमण (a 180° clockwise rotation about the origin)

G. विन्दु (2, 3) वाट 5 एकाइको दुरीमा चल्ने विन्दुपथ कुन होला ? (Which locus will be at a distance of 5 units from the point (2, 3)?) [1A]
(a) सिधा रेखा (a straight line) (b) वृत्त (a circle)
(c) लम्वार्धक (a perpendicular bisector) (d) त्रिभुज (a triangle)

H. झुकाव (m) र y-खण्ड (c) भएको सिधा रेखाको समीकरण करण कुन हो ?(Which of the following equations represents a line with a slope (m) and a y-intercept (c)?) [1K]
(a) $y = mx - c$ (b) $y = mx + c$
(c) $x = my + c$ (d) $x = my - c$

I. यदि दिएको भेक्टर $\vec{a} = 3\vec{x} + 10\vec{y}$ को अन्तिम विन्दु (3, 10) हो भने सुरुको विन्दु कुन होला ?(If the terminal point of vector $\vec{a} = 3\vec{x} + 10\vec{y}$ is (3, 10), what is its initial point? [1U]
(a) (0, 0) (b) (3, 10)
(c) (6, 20) (d) $(\sqrt{109}, 0)$

J. डोल्माले आफ्ना सहपाठीहरूको तौललाई चित्रमा देखाए जस्तै वक्स प्लटमा प्रस्तुत गरिन् । वक्स र ह्विस्कर प्लटका अनुसार डोल्माका सहपाठीहरूको तौलको तल्लो चतुर्थांश कति होला ?



(Dolma collected the weights of her classmates and presented data using box plot. According to the box-and-whisker plot, what is the lower quartile weight of Dolma's classmates?) [1U]
(a) 65 (b) 95
(c) 75 (d) 125

K. एउटा अनुक्रमको n औं पद $\frac{1}{n+1}$ छ भने n को मान अनन्त हुँदा अनुक्रमको मान कति होला ?(If the n^{th} term of a sequence is $\frac{1}{n+1}$, what will be the value of sequence when 'n' tends to be infinity?) [1U]

(a) 0 (b) 1

(c) $\frac{1}{2}$ (d) ∞

समूह "ख"(Group "B")

2. एउटा फलन $f(x) = 2x + 3$ मा क्षेत्र $A = \{-2, 0, 2, 4\}$ छ । (A function $f(x) = 2x + 3$ is given $A = \{-2, 0, 2, 4\}$

(a) फलन f(x) को डिग्री लेख्नुहोस् । (Write the degree of the function f(x).) [1K]

(b) रामलखनले फलनलाई यसरी लेख्छन्, $f(x) = \{(-2, 1), (4, 11), (0, 3), (7, 2)\}$ भने नमिलेको क्रमजोडा सङ्या पहिचान गरी सच्याएर लेख्नुहोस् । (Ramlakhan writes function as: $f(x) = \{(-2, 1), (4, 11), (0, 3), (7, 2)\}$. Identify incorrect ordered pair and replace it with correct one.) [2HA]

(c) असमानता लाई लेखाचित्रमा प्रस्तुत गर्नुहोस् । (Represent inequality $2x + 3 \geq 0$ in graph.) [1A]

3. मेट्रिक्सहरू A, B र C दिइएको छ । (Given matrices A, B and C.)

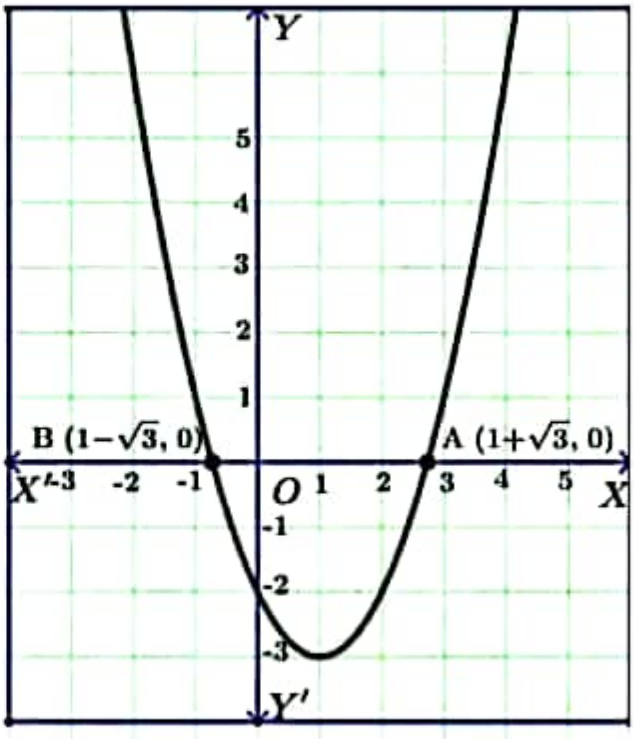
$$A = \begin{bmatrix} 3 & -1 & 4 \\ 2 & 0 & 5 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & 4 \end{bmatrix}, C = \begin{bmatrix} 4 & 1 \\ 2 & -3 \end{bmatrix}$$

(a) मेट्रिक्स A को क्रम लेख्नहोस् । (Write the order of matrix A.) [1U]

(b) के मेट्रिक्स A र C जोड्न सकिन्छ, कारण दिनुहोस् । (Can we add A and C? Give reason.) [1U]

(c) पत्ता लगाउनुहोस् । (Find A−B.) [1A]

4. एक जना विद्यार्थीले एउटा बहुपदीय अभिव्यञ्जकको लेखाचित्र दायाँ चित्रमा देखाए जस्तै बनाए । (A student draws a graph of a polynomial as shown on right.)



(a) लेखाचित्रले जनाउने धनात्मक मूल लेख्नुहोस् । (Write a positive root of the polynomial equation represented by the graph.) [1K]

(b) प्रमाणित गर्नुहोस् । (Prove that):

$$\frac{1}{1-\sqrt{3}} = -\frac{1}{2}\left(1+\sqrt{3}\right)$$ [2A]

5. एउटा त्रिकोणमितीय अभिव्यञ्जक $\sin112° + \cos74°$ दिइएको छ । (Given a trigonometric expression $\sin112° + \cos74°$.)
   (a) $\sin(90 + \theta)° = \cos\theta$ को प्रयोग गरी $\sin112°$ लाई न्यूनकोणीय त्रिकोणमिति अनुपातमा रूपान्तरण गर्नुहोस् । (Use $\sin(90 + \theta)° = \cos\theta$ to convert $\sin112°$ as trigonometric ratio of acute angle.) [1U]
   (b) $\cos74°$ को मानसँग समान मान हुने चौथो चतुर्थांशको cosine कोण पत्ता लगाउनुहोस् । (Find the fourth-quadrant angle that has the same cosine value as $\cos74°$.) [1HA]

6. त्रिकोणमितीय अभिव्यञ्जक $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$ दिइएको छ । (Given a trigonometric expression $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}}$.)
   (a) $\sqrt{1+\sin\theta}$ को आनुपातिक गुणनखण्ड लेख्नुहोस् । (Write the rationalizing factor of $\sqrt{1+\sin\theta}$.) [1K]
   (b) $\sqrt{1-\sin^2\theta}$ को त्रिकोणमितीय अनुपात लेख्नुहोस् । (Write the trigonometric ratio of $\sqrt{1-\sin^2\theta}$.) [1K]
   (c) प्रमाणित गर्नुहोस् । (Prove that): $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$ [2A]

7. $\cot\theta = \frac{12}{5}$ दिइएको छ, (Given that $\cot\theta = \frac{12}{5}$)
   (a) $\cos\theta$ को मान निकाल्नुहोस् । (Calculate the value of $\cos\theta$.) [2A]
   (b) मान पत्ता लगाउनुहोस् । (Find the value of): $13\cos\theta + 24\tan\theta$ [1U]

8. विन्दु (4, −3) भएर जाने सिधा रेखा l को x-खण्ड y-खण्ड भन्दा दोब्बर छ । (A line l passes through the point (4, −3) and makes x-intercept twice as long as its y-intercept.)
   (a) यदि y-खण्डको मान p भए x-खण्डको मान p को रूपमा पत्ता लगाउनुहोस् । (If y-intercept is p, find x intercept in terms of p.) [1K]
   (b) सिधा रेखा l को समीकरण $ax + by + c = 0$ रूपमा पत्ता लगाउनुहोस् । (Find equation of line l in the form $ax + by + c = 0$.) [2A]

9. A (1, 2) र B (3, 6) स्थिर विन्दुहरू हुन् । P (x, y) एउटा चल विन्दु भए, (Given that A (1, 2) and B (3, 6) are two fixed points. P (x, y) is a moving point),

(a) PA र PB को दुरी बराबर छन् । यो अवस्था मान्य हुने बिन्दु को बिन्दुपथको समीकरण पत्ता लगाउनुहोस् । (The distance PA is equal to the distance PB. Find the equation of the locus of point P that satisfies condition.) [2U]

(b) यदि P ले C (2, 4) र D (4, 8) जोड्ने रेखा लाई 1:2 को अनुपातमा विभाजन गर्छ भने बिन्दु P को निर्देशाङ्क पत्ता लगाउनुहोस् । (If P divides the line joining points C (2, 4) and D (4, 8) in the ratio 1:2, find the coordinates of point P.)[2A]

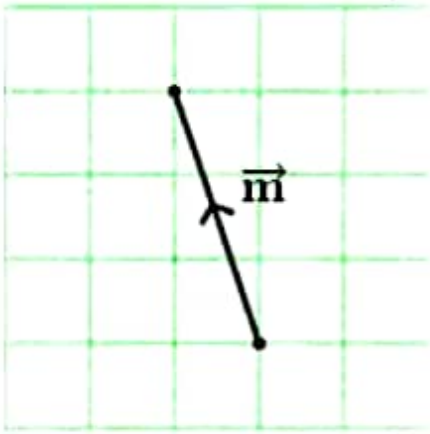
10. श्यामले शीर्षबिन्दुहरू A (4, 2), B (6, 3) र C (4, 6) भएको त्रिभुज ABC लाई $P(x, y) \rightarrow P'(x + 5, y-3)$ अनुसार स्थानान्तरण गर्छन् । (Shyam transforms triangle ABC with vertices A (4, 2), B (6, 3) and C (4, 6) by $P(x, y) \rightarrow P'(x + 5, y-3)$.

(a) शीर्षबिन्दुहरू A', B' र C' का निर्देशाङ्कहरू पत्ता लगाउनुहोस् । (Find the coordinates of the image points A', B' and C'.) [1U]

(b) त्रिभुज ABC र प्रतिबिम्ब त्रिभुज A'B'C' लाई एउटै लेखाचित्रमा देखाउनुहोस् । (Show triangle ABC and its image triangle A'B'C' in the same graph paper.) [2A]

(c) श्यामले गरेको स्थानान्तरणको नाम लेख्नुहोस् । (Write the name of transformation that Shyam performed.) [1K]

11. सँगैको लेखाचित्रमा $\vec{m}$ ले भेक्टर जनाउँछ । (The graph alongside represents vector $\vec{m}$.)



(a) भेक्टर $\vec{m}$ लाई लहर भेक्टर $\begin{pmatrix} a \\ b \end{pmatrix}$ का रूपमा लेख्नुहोस् । (Write vector $\vec{m}$ in column vector form $\begin{pmatrix} a \\ b \end{pmatrix}$.) [1K]

(b) भेक्टर $\vec{m}$ को परिमाण पत्ता लगाउनुहोस् । (Find magnitude of vector $\vec{m}$.) [1A]

(c) भेक्टर $\vec{m}$ सँग समान दिशामा रहेको अर्को भेक्टर $\vec{n}$ को परिमाण 2 छ । भेक्टर $\vec{n}$ लाई लहर भेक्टर $\begin{pmatrix} a \\ b \end{pmatrix}$ का रूपमा लेख्नुहोस् । (Another vector $\vec{n}$ is along the direction of vector $\vec{m}$ with magnitude 2. Write vector n in column vector form $\begin{pmatrix} a \\ b \end{pmatrix}$.) [1HA]

12. एउटा कफी पसलले दिनसम्म दैनिक सेवा उपलब्ध गराएको ग्राहक सङ्ख्या दिइएको छ । (The daily number of customers served by a coffees shop for 7 days is given.)

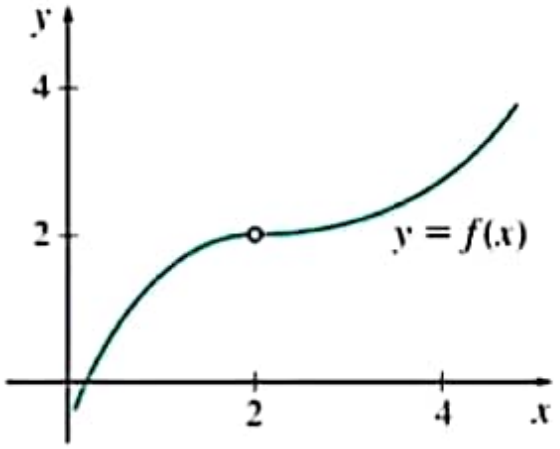
15	22	18	25	20	16	23

(a) माथिल्लो चतुर्थांश (Q_3) को स्थान पत्ता लगाउने सूत्र लेख्नुहोस् । (Write the formula to calculate the position of the upper quartile (Q_3).) [1K]

(b) माथिल्लो चतुर्थांश (Q_3) पत्ता लगाउनुहोस् । (Find upper quartile (Q_3).) [1A]

(c) के माथिको तथ्याङ्को स्तरीय भिन्नता ऋणात्मक हुन सक्छ पुष्टि गर्नुहोस् । (Can standard deviation of above data be a negative number? Justify.)[1HA]

13. फलन f(x) को लेखाचित्र संगै दिइएको छ । त्यसो भए(The graph of the function f(x) is given alongside. Then),



(a) फलनको सीमान्तमान परिभाषित गर्नुहोस् । (Define limit of a function.) [1K]

(b) धनबहादुरले मनमायालाई सोध्यो, "कुनै पूर्णांङ्क 'a' लाई अको पूर्णांङ्क 'b' ले भाग गर्दा के नतिजा सधैं पत्ता लगाउन सम्भव छ?" सविस्तार व्याख्या गर्नुहोस् । (Dhan Bahadur asked ManMaya, "Is it always possible to find the result when dividing any integer 'a' by any other integer 'b'?" Elaborate.) [1HA]

(c) सीमान्तमान पत्ता लगाउनुहोस् । (Find the limit): $\lim_{x\to 2^+} f(x)$ [1A]

(d) के $\lim_{x\to 2} f(x)$ को सीमान्तमान हुन्छ, कारण उल्लेख गर्नुहोस् । (Does limit of $\lim_{x\to 2} f(x)$ exist? Mention the reason.) [1U]

समूह "ग"(Group "C")

14. x-अक्षलाई A (a, 0) मा र y-अक्षलाई B (0, b) मा काट्ने दुई खण्ड स्वरूपको सिधा रेखा l को समीकरण $\frac{x}{a}+\frac{y}{b}=1$ छ । (The double intercept form of line l that crosses the x-axis at A (a, 0) and the y-axis at B (0, b) is $\frac{x}{a}+\frac{y}{b}=1$.)

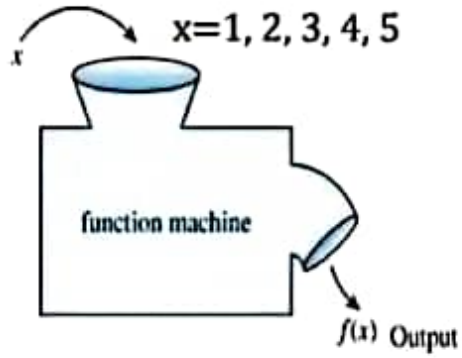
(a) यदि सीधारेखा l विन्दु (−3, 4) भएर जान्छ भने प्रमाणित गर्नुहोस् । (If line l passes through the point (−3, 4), prove that): $b=\frac{4a}{a+3}$ [2U]

(b) यदि $a \to 1$ छ भने 'b' को सीमान्तमान पत्ता लगाउनुहोस् । (If $a \to 1$ find the limiting value of 'b'?) [1A]

(c) यदि $a = 1$ छ भने l को वास्तविक समीकरण पत्ता लगाउनुहोस् । (If $a = 1$, find the exact equation of the line l.) [1A]

(d) सिधा रेखा l ले छुट्याएको उद्गम विन्दु पर्ने क्षेत्र जनाउने आमानता लेख्नुहोस् । (Write the inequality representing the region separated by line l that contains origin.) [2A]

15. एउटा तथ्याङ्क समूहमा पाँचओटा सङ्ख्याहरू छन् । ती सङ्ख्याहरू फलन $f(x) = 3x-2$ मा $x = 1, 2, 3, 4, 5$ राख्दा प्राप्त भएका हुन् । (A data set consists of five numbers. These numbers were obtained by the function $f(x) = 3x-2$ for $x = 1, 2, 3, 4, 5$.)

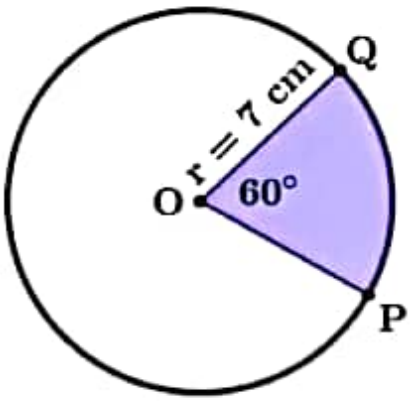


(a) प्राप्त भएका पाँचओटा सङ्ख्याहरुको सूची तयार पार्नुहोस् । (List out the data set of five obtained numbers.) [2U]

(b) प्राप्त भएका सङ्ख्याहरूमा 15 किन हुन सक्दैन, कारण दिनुहोस् । (Explain why 15 cannot be a number in the obtained data set.) [1HA]

(c) यसरी प्राप्त भएको तथ्याङ्कबाट स्तरीय भिन्नता पत्ता लगाउनुहोस् । (Find the standard deviation from the obtained data set.) [3A]

16. एउटा वृत्तको अर्धव्यास 7 से.मी. छ । उक्त वृत्तको चाप $\overset{\frown}{PQ}$ ले केन्द्रमा 60° को कोण बनाउँछ । (A circle has a radius of 7 cm. Arc $\overset{\frown}{PQ}$ on the circle subtends an angle of 60° at the center.)



(a) 60° लाई शतांशक र रेडियनमा रूपान्तरण गर्नुहोस् । (Convert 60° into Grades and Radians.) [2U]

(b) मानौं एक जना विद्यार्थीले सूत्रमा 60° लाई रेडियनमा रूपान्तरण नगरी हिसाब गरे । यसरी प्राप्त चापको लम्बाइ र वास्तविक चापको लम्बाइमा कति फरक पर्छ ?(Suppose a student used 60° directly in the formula without converting radian. What is the difference between arc length and the actual arc length?) [2A]

(c) $\sin\angle POQ$ को मान निकाल्नुहोस् । (Calculate the value of $\sin\angle POQ$.) [1U]

(d) $\angle POQ$ को मान 0° को नजिक हुँदा चाप $\overset{\frown}{PQ}$ को लम्बाइको सीमान्त मान कति हुन्छ, लेख्नुहोस् । (Write the limiting value of the length of arc $\overset{\frown}{PQ}$ when the $\angle POQ$ tends to be 0°.) [1HA]

17. दुई जना विद्यार्थी छिरिङ र पेम्वाले निर्देशाङ्हरू P (2, 3), Q (7, 3) र R (2, 7) का बारेमा छलफल गर्दै थिए ।

छिरिङले भने, "विन्दुहरू P र Q को दूरी भेक्टर $\overrightarrow{PQ}$ को परिमाण जति नै छ ।" पेम्वाले जवाफ फर्काए, "त्यो हुन सक्दैन । भेक्टरको दिशा हुन्छ तर दूरी हुदैन त्यसैले ती बराबर हुन सक्दैन ।"

(Two students, Tsering and Pemba, are discussing points P (2, 3), Q (7, 3) and R (2, 7) on a coordinate plane. Tsering says, "The straight-line distance between point P and Q is exactly the magnitude of the vector $\overrightarrow{PQ}$." Pemba replies, "That can't be true! Vectors have direction, but distance doesnt, so they can't be equal."

(a) तपाईं छ्रिरिङ वा पेम्वामध्ये कसको विचारसँग सहमत हुनुहुन्छ, किन ? (Whose opinion do you agree with, Tsering's or Pemba's? Why?) [1HA]

(b) भेक्टर $\overrightarrow{PQ}$ पत्ता लगाउनुहोस् । (Find the vector $\overrightarrow{PQ}$.) [2A]

(c) छ्रिरिङले P (2, 3), Q (7, 3) र R (2, 7 लाई कुनै निश्चित विन्दुको वरिपरि परिक्रमण गर्दा P' (−3, 2), Q' (−3, 7) र R' (−7, 2) पाए । उक्त परिक्रमणको केन्द्र, दिशा र कोण पत्ता लगाउनुहोस् । (Tsering finds new points P' (−3, 2), Q' (−3, 7) and R' (−7, 2) after rotating points P (2, 3), Q (7, 3) and R (2, 7) around a fixed point. Find out the center, angle and direction of the rotation.) [3HA]

शुभकामना (All the Best)