HALF YEARLY EXAMINATION: 2020 – 2021
Mathematics
(Two hours and a half)

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Answers to this paper must be written on the paper separately.
*You will **not** be allowed to write during the first **15** minutes.*
This time is to be spent in reading the question paper.
The time given at the head of this paper is the time allowed for writing the answers.
*Attempt **all** questions from Section A and **any four** questions from Section B.*
All working including rough work, must be clearly shown and must be done on the same sheet as
the rest of the answer. Omission of essential working will result in the loss of marks. The intended
marks for questions or parts are given in brackets [ ].

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SECTION- A [40 marks]
(Attempt all questions from this section)

Question 1

a)   Solve the following inequation. Also graph the solution set on the number line.

$$-2 \leq \frac{1}{2} - \frac{2x}{3} < 1\frac{5}{6} \text{ , x } \in \text{R} \quad\quad\quad [3]$$

b)   The sum of three numbers in A.P. is –3 and their product is 8 . Find the numbers.   [3]

c)   A plane from Delhi to Kolkata got delayed due to bad weather. It left 30 minutes later
      than the scheduled time and in order to reach its destination 1500 km away in time, it
      had to increase its speed by 250 km/hr from its usual speed. Find its usual speed.   [4]

Question 2

a)   A shopkeeper buys MRF car tyres whose printed price is ₹5000 from a wholesaler at a
      discount of 10% and sells it to the consumer at the printed price. If the sales are intra-state
      and the rate of GST is 12 %, find:
      (i) The amount of tax (under GST) paid by the shopkeeper to the State Government.
      (ii) The amount of tax (under GST) received by the Central Government.
      (iii) The amount which the consumer pays for those tyres inclusive of GST.   [3]

b)   Calculate the ratio in which the line joining A (6 , 5) and B (4 , –3) is divided by the
      line y = 2.   [3]

c)   When divided by x –3 the polynomials $x^3 – px^2 + x + 6$ and $2x^3 – x^2 – (p+3) x –6$ leave
      the same remainder. Find the value of p .   [4]

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Question 3

a) Find the matrix B, if $2\begin{bmatrix} 3 & 4 \\ 5 & 2 \end{bmatrix} + B = \begin{bmatrix} 7 & 8 \\ 10 & 5 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$. [3]

b) Using properties of proportion, solve for x : $\dfrac{3x+\sqrt{9x^2-5}}{3x-\sqrt{9x^2-5}} = 5$. [3]

c) Point (4,0) is invariant point under reflection in the line L_1.
   i) Name or write equation for the line L_1.
   ii) Write down the image of P (3, – 4) on the reflection in L_1. Name the image P'
   iii) Write down the image of P on the reflection in origin . Name the image P''.
   iv) State a single transformation that maps P' to P''. [4]

Question 4

a) Solve the following using formula upto two significant figure.
   $2x^2 - 10x - 25 = 0$ [3]

b) Mr. Raut deposited ₹1500 per month in a Bank of Baroda for 2 years under recurring deposit scheme. What will be the maturity value of his deposits, if the rate of interest is 12 % p.a. [3]

c) A(–1, 3), B(4,2) and C(3, –2) are the vertices of a triangle. Find:
   i) the coordinates of the centroid G of the triangle
   ii) the equation of the line passing through G and A. [4]

<u>SECTION B [40 marks]</u>

(Attempt any four questions from this Section)

Question 5

a) If $\dfrac{a}{b} = \dfrac{c}{d}$, prove that: $\dfrac{3a+5b}{3a-5b} = \dfrac{3c+5d}{3c-5d}$. [3]

b) If $A = \begin{bmatrix} 2 & 3 \\ 0 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & k \\ 0 & -5 \end{bmatrix}$,
   find the value of k such that AB = BA. [3]

c) The line segment joining A(2, 3)and B(6, –5) is intersected by X-axis at a point K.
   i) Write down the ordinate of point K.
   ii) Hence find the ratio in which K divides AB.
   iii) Also find abscissa of K. [4]

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Question 6

a)   Given that A = {x: 2x − 9 ≤ 7, x ∈ N} and B = {x: 3x + 9 > 25, x ∈ N}.
      Solve and represent on different number lines.
        i) A ∩ B
        ii) A − B.   [3]
b)   Find the value(s) of ' p' so that the quadratic equation $(4 + p) x^2 + (p+1)x +1 = 0$ has
      real and equal roots.   [3]
c)   A shopkeeper buys a certain number of books for ₹ 720. If the cost per book was ₹ 5 less,
      the number of books that could be bought for ₹720 would be 2 more. Taking the
      original cost of each book to ₹ x : write an equation in x and solve it.   [4]

Question 7

a)   Ramesh has a recurring deposit account in a HDFC bank for 5 years at 9% p.a. At the
      time of maturity he gets ₹ 51,607.50. Find the monthly deposit.   [3]
b)   Which term of A.P : 21,18,15,…… is − 81?
      Also, is any term be 0? Give reason for your answer.   [3]
c)   In the following figure, find the slope
      of the line AB. Hence obtain it's equation.
      Given OA = 3.   [4]
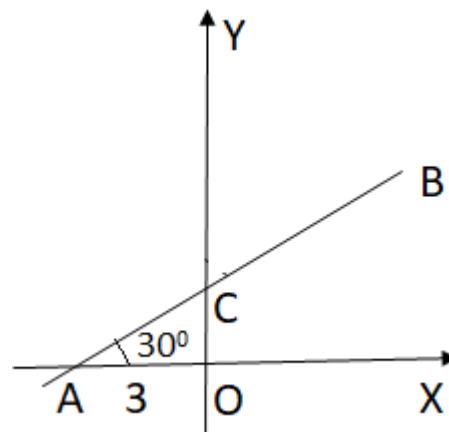
Question 8

a)   The price of a bicycle is ₹ 3136 inclusive of tax (under GST) at the rate of 12% on its
      listed price. A buyer asks for a discount on the listed price so that after charging GST,
      the selling price becomes equal to the listed price. Find the amount of discount which
      the seller has to allow for the deal.   [3]
b)   What number should be subtracted from $2x^3 −5x^2 + 5x + 8$ so that the resulting polynomial
      has a factor $2x−3$.   [3]
c)   The equations of the lines AB and AC are $3x−4y+1=0$ and $x+y =2$ respectively.
      Find the equation of the line AP if the co-ordinates of P are (−2, 5).   [4]

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Question 9

a) Find the matrix X which satisfies the equation :

$$\begin{bmatrix} 3 & 7 \\ 2 & 4 \end{bmatrix}\begin{bmatrix} 0 & 2 \\ 5 & 3 \end{bmatrix} + 2X = \begin{bmatrix} 1 & -5 \\ -4 & 6 \end{bmatrix}$$ [4]

b) Use the graph paper for this question:
    A point P is reflected to P' in the Y-axis. The co-ordinates of its image are (–2, 3)
    i)   Find the co-ordinates of P.
    ii) Find the co-ordinates of the image P''of P under reflection in X-axis .
    iii) Find the co-ordinates of the image Q' of the point Q (–1, 2) under reflection
         in the line PP'' .
    iv) Assign the special name to the figure PP'QQ'. Hence find its area.   [6]

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