

ICSE Board
Class X Mathematics
Board Paper
Semester 1 – 2021

Time: 90 minutes

Marks: 40

Maximum Marks: 40

Time allowed One and a half hours

You will not be allowed to write during the first 10 minutes

This time is to be spent in reading the question paper.

ALL QUESTIONS ARE COMPULSORY.

The marks intended for questions are given in brackets []

Select the correct option for each of the following questions.

Question 1

If $(x + 2)$ is a factor of the polynomial $x^3 - kx^2 - 5x + 6$ then the value of k is: [1]

- (a) 1
- (b) 2
- (c) 3
- (d) -2

Question 2

The solution set of the inequation $x - 3 \geq -5$, $x \in \mathbb{R}$ is: [1]

- (a) $\{x: x > -2, x \in \mathbb{R}\}$
- (b) $\{x: x \leq -2, x \in \mathbb{R}\}$
- (c) $\{x: x \geq -2, x \in \mathbb{R}\}$
- (d) $\{-2, -1, 0, 1, 2\}$

Question 3

The product AB of two matrices A and B is possible if: [1]

- (a) A and B have the same number of rows.
- (b) The number of columns of A is equal to the number of rows of B .
- (c) The number of rows of A is equal to the number of columns of B
- (d) A and B have the same number of columns

Question 4

If 70, 75, 80, 85 are the first four terms of an Arithmetic Progression. Then the 10th term is:[1]

- (a) 35
- (b) 25
- (c) 115
- (d) 105

Question 5

The selling price of a shirt excluding GST is Rs. 800. If the rate of GST is 12% then the total price of the shirt is: [1]

- (a) Rs. 704
- (b) Rs. 96
- (c) Rs. 896
- (d) Rs. 848

Question 6

Which of the following quadratic equations has 2 and 3 as its roots? [1]

- (a) $x^2 - 5x + 6 = 0$
- (b) $x^2 + 5x + 6 = 0$
- (c) $x^2 - 5x - 6 = 0$
- (d) $x^2 + 5x - 6 = 0$

Question 7

If $x, 5.4, 5, 9$ are in proportion then x is: [1]

- (a) 3
- (b) 9.72
- (c) 25
- (d) $25/3$

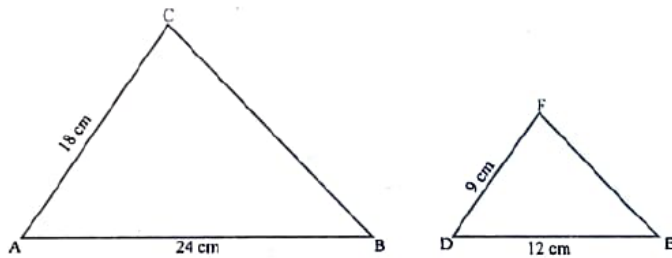
Question 8

Mohit opened a Recurring deposit account in a bank for 2 years. He deposits Rs. 1000 every month and receives Rs. 25500 on maturity. The interest he earned in 2 years is: [1]

- (a) Rs. 13500
- (b) Rs. 3000
- (c) Rs. 24000
- (d) Rs. 1500

Question 9

In the given figure $AB = 24$ cm, $AC = 18$ cm, $DE = 12$ cm, $DF = 9$ cm and $\angle BAC = \angle EDF$. Then $\triangle ABC \sim \triangle DEF$ by the condition: [1]



- (a) AAA
- (b) SAS
- (c) SSS
- (d) AAS

Question 10

If $A = \begin{bmatrix} 5 & 10 \\ 3 & -4 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then AI is equal to [1]

- (a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
- (b) $\begin{bmatrix} 5 & 10 \\ -3 & 4 \end{bmatrix}$
- (c) $\begin{bmatrix} 5 & 10 \\ 3 & -4 \end{bmatrix}$
- (d) $\begin{bmatrix} 15 & 15 \\ -1 & -1 \end{bmatrix}$

Question 11

The polynomial $x^3 - 2x^2 + ax + 12$ when divided by $(x + 1)$ leaves a remainder 20, then 'a' is equal to: [1]

- (a) - 31
- (b) 9
- (c) 11
- (d) - 11

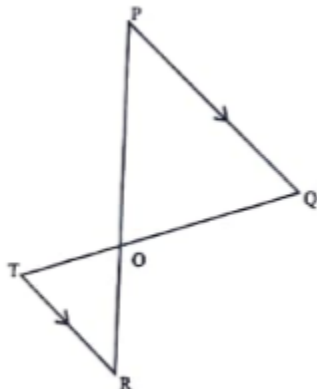
Question 12

In an Arithmetic Progression (A.P.) if, first term is 5, common difference is - 3 and then n^{th} term is - 7, then n is equal to: [1]

- (a) 5
- (b) 17
- (c) - 13
- (d) 7

Question 13

In the given figure PQ is parallel to TR, then by using condition of similarity: [1]



- (a) $\frac{PQ}{RT} = \frac{OP}{OT} = \frac{OQ}{OR}$

(b) $\frac{PQ}{RT} = \frac{OP}{OR} = \frac{OQ}{OT}$

(c) $\frac{PQ}{RT} = \frac{OR}{OP} = \frac{OQ}{OT}$

(d) $\frac{PQ}{RT} = \frac{OP}{OR} = \frac{OT}{OQ}$

Question 14

If a, b, c, and d are proportional then $\frac{a + b}{a - b}$ is equal to: [1]

(a) $\frac{c}{d}$

(b) $\frac{c - d}{c + d}$

(c) $\frac{d}{c}$

(d) $\frac{c + d}{c - d}$

Question 15

The first four terms of an Arithmetic Progression (A. P.), whose first term is 4 and common difference is -6, are: [1]

(a) 4, -10, -16, -22

(b) 4, 10, 16, 22

(c) 4, -2, -8, -14

(d) 4, 2, 8, 14

Question 16

One of the roots of the quadratic equation $x^2 - 8x + 5 = 0$ is 7.3166. The root of the equation correct to 4 significant figures is: [1]

(a) 7.3166

(b) 7.317

(c) 7.316

(d) 7.32

Question 17

$(x + 2)$ and $(x + 3)$ are two factors of the polynomial $x^3 + 6x^2 + 11x + 6$. If this polynomial is completely factorised the result is: [2]

(a) $(x - 2)(x + 3)(x + 1)$

(b) $(x + 2)(x - 3)(x - 1)$

(c) $(x + 2)(x + 3)(x - 1)$

(d) $(x + 2)(x + 3)(x + 1)$

Question 18

The sum of the first 20 terms of the Arithmetic Progression 2, 4, 6, 8,...is :

[2]

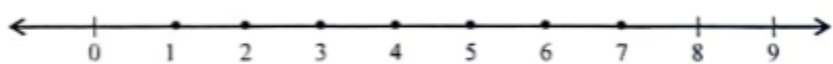

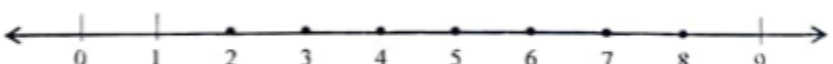

- (a) 400
- (b) 840
- (c) 420
- (d) 800

Question 19

The solution set on the number line of the linear inequation:

[2]

$$2y - 6 < y + 2 \leq 2y, y \in \mathbb{N}$$

(a)	
(b)	
(c)	
(d)	

Question 20

If x, y, z are in continued proportion then $(y^2 + z^2) : (x^2 + y^2)$ is equal to:

[2]

- (a) $z : x$
- (b) $x : z$
- (c) zx
- (d) $(y + z) : (x + y)$

Question 21

The marked price of an article is Rs. 5,000. The shopkeeper gives a discount of 10%. If the rate of GST is 12%, then the amount paid by the customer including GST is:

[2]

- (a) Rs. 5040
- (b) Rs. 6100
- (c) Rs. 6272
- (d) Rs. 6160

Question 22

If $A = \begin{bmatrix} 3 & 5 \\ 1 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 4 \\ 0 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}$, then $5A - BC$ is equal to: [2]

(a) $\begin{bmatrix} -5 & -23 \\ 1 & 17 \end{bmatrix}$

(b) $\begin{bmatrix} 5 & 23 \\ 1 & 17 \end{bmatrix}$

(c) $\begin{bmatrix} -2 & 8 \\ -3 & 3 \end{bmatrix}$

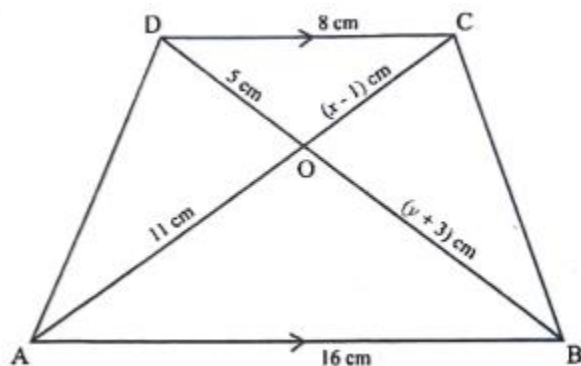
(d) $\begin{bmatrix} 5 & 23 \\ -1 & 17 \end{bmatrix}$

Question 23

In the given figure ABCD is a trapezium in which DC is parallel to AB.

AB = 16 cm and DC = 8 cm. OD = 5 cm, OB = (y + 3) cm, OA = 11 cm and OC = (x - 1) cm.

Using the given information answer the following questions.



i. From the given figure name the pair of similar triangles: [1]

(a) $\triangle OAB, \triangle OBC$

(b) $\triangle COD, \triangle AOB$

(c) $\triangle ADB, \triangle ACB$

(d) $\triangle COD, \triangle COB$

ii. The corresponding proportional sides with respect to the pair of similar triangles obtained in (i): [1]

(a) $\frac{CD}{AB} = \frac{OC}{OA} = \frac{OD}{OB}$

(b) $\frac{AD}{BC} = \frac{OC}{OA} = \frac{OD}{OB}$

(c) $\frac{AD}{BC} = \frac{BD}{AC} = \frac{AB}{DC}$

(d) $\frac{OD}{OB} = \frac{CD}{CB} = \frac{OC}{OA}$

iii. The ratio of the sides of the pair of similar triangles is: [1]

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

iv. Using the ratio of sides of the pair of similar triangles the values of x and y are respectively: [1]

- (a) $x = 4.6, y = 7$
- (b) $x = 7, y = 7$
- (c) $x = 6.5, y = 7$
- (d) $x = 6.5, y = 2$

Question 24

Two cars X and Y use 1 litre of diesel to travel x km and (x + 3) km respectively. If both the cars covered a distance of 72 km, then:

i. The number of litres of diesel used by car X is: [1]

- (a) $\frac{72}{x-3}$ litres
- (b) $\frac{72}{x+3}$ litres
- (c) $\frac{72}{x}$ litres
- (d) $\frac{12}{x}$ litres

ii. The number of litres of diesel used by car Y is: [1]

- (a) $\frac{72}{x-3}$ litres
- (b) $\frac{72}{x+3}$ litres
- (c) $\frac{72}{x}$ litres
- (d) $\frac{12}{x+3}$ litres

iii. If car X used 4 litres of diesel more than car Y in the journey, then: [1]

- (a) $\frac{72}{x-3} - \frac{12}{x} = 4$
- (b) $\frac{72}{x+3} - \frac{72}{x} = 4$
- (c) $\frac{72}{x} - \frac{72}{x+3} = 4$
- (d) $\frac{72}{x-3} - \frac{72}{x+3} = 4$

- iv. The amount of diesel used by the car X is: [1]
- (a) 6 litres
 - (b) 12 litres
 - (c) 18 litres
 - (d) 24 litres

Question 25

Joseph has a recurring deposit account in a bank for two years at the rate of 8% per annum simple interest

- i. If at the time of maturity Joseph receives Rs. 2000 as interest then the monthly instalment is: [1]

- (a) Rs. 1200
- (b) Rs. 600
- (c) Rs. 1000
- (d) Rs. 1600

- ii. The total amount deposited in the bank: [1]

- (a) Rs. 25000
- (b) Rs. 24000
- (c) Rs. 26000
- (d) Rs. 23000

- iii. The amount Joseph receives on maturity is: [1]

- (a) Rs. 27000
- (b) Rs. 25000
- (c) Rs. 26000
- (d) Rs. 28000

- iv. If the monthly instalment is Rs. 100 and the rate of interest is 8%, in how many months Joseph will receive Rs. 52 as interest? [1]

- (a) 18
- (b) 30
- (c) 12
- (d) 6

Solution

Solution 1

Correct option: (b) 2

If $(x + 2)$ is a factor of the polynomial $x^3 - kx^2 - 5x + 6$, then

$$(-2)^3 - k(-2)^2 - 5(-2) + 6 = 0$$

$$\therefore k = 2$$

Solution 2

Correct option: (c) $\{x: x \geq -2, x \in \mathbb{R}\}$

$$x - 3 \geq -5$$

$$\therefore x \geq -5 + 3$$

$$\therefore x \geq -2$$

Solution 3

Correct option: (b) The number of columns of A is equal to the number of rows of B.

Solution 4

Correct option: (c) 115

$$a = 70, d = 5$$

$$\therefore a_{10} = 70 + (9)5 = 115$$

Solution 5

Correct option: (c) ₹ 896

$$SP = ₹800$$

$$GST = 12\%$$

$$\text{Total} = 800 + 0.12 \times 800 = ₹896$$

Solution 6

Correct option: (a) $x^2 - 5x + 6 = 0$

Roots are 2 and 3

Then the quadratic equation will be given by

$$x^2 - (\text{sum of roots})x - (\text{product of roots}) = 0$$

$$\therefore x^2 - 5x + 6 = 0$$

Solution 7

Correct option: (a) 3

$$9 \times x = 5.4 \times 5$$

$$\therefore x = 3$$

Solution 8

Correct option: (d) ₹1500

Total deposit = $1000 \times 24 = ₹24,000$

Maturity amount = ₹25,500

∴ Interest = $25,500 - 24,000 = ₹1,500$

Solution 9

Correct option: (b) SAS

In $\triangle ABC$ and $\triangle DEF$

$$\frac{AB}{DE} = \frac{AC}{DF} = \frac{2}{1}$$

$$\angle BAC = \angle EDF$$

Hence, $\triangle ABC \sim \triangle DEF$...(SAS test)

Solution 10

Correct option: (c) $\begin{bmatrix} 5 & 10 \\ 3 & -4 \end{bmatrix}$

$AI = A$...any matrix multiplied to identity matrix gives the same matrix.

Solution 11

Correct option: (d) -11

By remainder theorem,

$$(-1)^3 - 2(-1)^2 + a(-1) + 12 = 20$$

$$\therefore a = -11$$

Solution 12

Correct option: (a) 5

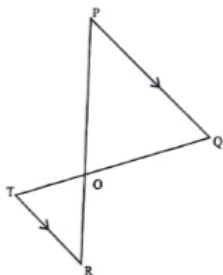
$$a = 5, d = -3, a_n = -7$$

$$\therefore 5 + (n-1)(-3) = -7$$

$$\therefore n = 5$$

Solution 13

Correct option: (b) $\frac{PQ}{RT} = \frac{OP}{OR} = \frac{OQ}{OT}$



PQ || TR

PR transversal, hence

$\angle P = \angle R$...(alternate angles)

QT transversal, hence

$\angle Q = \angle T$...(alternate angles)

$\therefore \Delta PQO \sim \Delta RTO$...(AA test)

$$\therefore \frac{PQ}{RT} = \frac{OP}{OR} = \frac{OQ}{OT} \dots (\text{c.p.c.t.})$$

Solution 14

Correct option: (d) $\frac{c+d}{c-d}$

If a, b, c, and d are proportional then,

$$\therefore \frac{a}{b} = \frac{c}{d}$$

by componendo-dividendo

$$\frac{a+b}{a-b} = \frac{c+d}{c-d}$$

Solution 15

Correct option: (c) 4, -2, -8, -14

a = 4 and d = -6, hence the AP is 4, (4-6), (4-6-6), (4-6-6-6), which is 4, -2, -8, -14.

Solution 16

Correct option: (b) 7.317

One of the roots of the quadratic equation $x^2 - 8x + 5 = 0$ is 7.3166.

Correct to 4 significant figures is 7.317.

Solution 17

Correct option: (d) $(x+2)(x+3)(x+1)$

Checking for $(x+1)$, i.e. $x = -1$,

$$P(x) = x^3 + 6x^2 + 11x + 6$$

$$P(-1) = (-1)^3 + 6(-1)^2 + 11(-1) + 6 = 0$$

Hence $(x+1)$ is the third factor.

Solution 18

Correct option: (c) 420

a = 2, d = 2

$$S_{20} = \frac{20}{2}(2 \times 2 + (20-1)2) = 420$$

Solution 19

Correct option: (b)

$$2y - 6 < y + 2 \leq 2y$$

Hence,

$$2y - 6 < y + 2$$

$$\therefore y < 8$$

Also,

$$y + 2 \leq 2y$$

$$\therefore 2 \leq y$$

So,

$$\therefore 2 \leq y < 8$$

Solution 20

Correct option: (a) $z:x$

If x, y, z are in continued proportion then,

$$y^2 = xz$$

$$\frac{(y^2 + z^2)}{(x^2 + y^2)} = \frac{(xz + z^2)}{(x^2 + xz)} = \frac{z(x + z)}{x(x + z)} = z : x$$

Solution 21

Correct option: (a) ₹5040

Marked price = ₹5,000

Discount = 10%

$$\therefore \text{SP} = 5,000 \times 0.90 = ₹4,500$$

GST = 12%

$$\text{Final amount paid} = 4,500 \times 1.12 = ₹5,040$$

Solution 22

Correct option: (d) $\begin{bmatrix} 5 & 23 \\ -1 & 17 \end{bmatrix}$

$$5A - BC$$

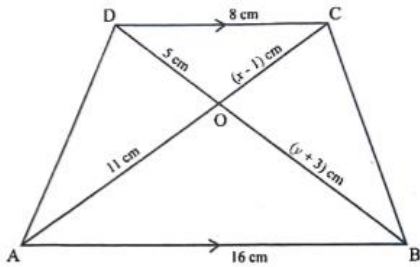
$$= 5 \begin{bmatrix} 3 & 5 \\ 1 & 4 \end{bmatrix} - \begin{bmatrix} 2 & 4 \\ 0 & 3 \end{bmatrix} \begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 15 & 25 \\ 5 & 20 \end{bmatrix} - \begin{bmatrix} 10 & 2 \\ 6 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} 5 & 23 \\ -1 & 17 \end{bmatrix}$$

Solution 23 (i)

Correct option: (b) $\triangle COD$, $\triangle AOB$



$DC \parallel AB$

Hence we get,

$\angle CDO = \angle ABO$... (alternate angles)

$\angle DCO = \angle BAO$... (alternate angles)

$\therefore \triangle COD \sim \triangle AOB$... (AA test)

Solution 23 (ii)

Correct option: (a) $\frac{CD}{AB} = \frac{OC}{OA} = \frac{OD}{OB}$

$\triangle COD \sim \triangle AOB$

$\therefore \frac{CD}{AB} = \frac{OC}{OA} = \frac{OD}{OB}$... (c.p.c.t.)

Solution 23 (iii)

Correct option: (b) 1:2

$$\frac{CD}{AB} = \frac{OC}{OA} = \frac{OD}{OB} = \frac{8}{16} = \frac{1}{2}$$

Solution 23 (iv)

Correct option: (c) $x = 6.5$, $y = 7$

$$\frac{CD}{AB} = \frac{OC}{OA} = \frac{OD}{OB} = \frac{1}{2}$$

$$\therefore \frac{x-1}{11} = \frac{5}{y+3} = \frac{1}{2}$$

$$\therefore \frac{x-1}{11} = \frac{1}{2}$$

$$\therefore x = 6.5$$

Also,

$$\frac{5}{y+3} = \frac{1}{2}$$

$$\therefore y = 7$$

Solution 24 (i)

Correct option: (c) $\frac{72}{x}$ liters

Car X

x kms = 1 litre

72 kms = $\frac{72}{x}$ liters

Solution 24 (ii)

Correct option: (b) $\frac{72}{x+3}$ liters

Car y

x+3 kms = 1 litre

72 kms = $\frac{72}{x+3}$ liters

Solution 24 (iii)

Correct option: (c) $\frac{72}{x} - \frac{72}{x+3} = 4$

Car X used 4 litres of diesel more than car Y, hence

$$\frac{72}{x} - \frac{72}{x+3} = 4$$

Solution 24 (iv)

Correct option: (b) 12 litres

$$\frac{72}{x} - \frac{72}{x+3} = 4$$

$$\therefore 72x + 216 - 72x = 4x^2 + 12x$$

$$\therefore 4x^2 + 12x - 216 = 0$$

$$\therefore x^2 + 3x - 54 = 0$$

$$\therefore (x - 6)(x + 9) = 0$$

$$\therefore x = 6 \dots (\text{km can't be negative})$$

$$\therefore \frac{72}{x} = 12 \text{ litres}$$

Solution 25 (i)

Correct option: (c) ₹1000

r = 8%, I = ₹2000, n = 24

$$I = P \times \frac{n(n+1)}{2} \times \frac{r}{1200}$$

$$\therefore 2000 = P \times \frac{24(25)}{2} \times \frac{8}{1200}$$

$$\therefore P = \text{Rs.}1000$$

Solution 25 (ii)

Correct option: (b) ₹24000

$$\text{Total amount deposited} = 1000 \times 24 = ₹24000$$

Solution 25 (iii)

Correct option: (c) ₹26000

$$\text{Maturity amount} = \text{Total amount deposited} + \text{Interest} = ₹26000$$

Solution 25 (iv)

Correct option: (c) 12

$$r = 8\%, I = ₹52, P = ₹100$$

$$I = P \times \frac{n(n+1)}{2} \times \frac{r}{1200}$$

$$\therefore 52 = 100 \times \frac{n(n+1)}{2} \times \frac{8}{1200}$$

$$\therefore n = 12$$