PT-2/HALF YEARLY EXAMINATION, 2022-23

MATHEMATICS

Time – 3 hrs.   Class – X   M.M. : 80

Name of the student _____ Section _____

General Instructions -

- The question paper consists of 26 questions divided into 4 sections A, B, C & D.
- All questions are compulsory.
- Section A comprises of 11 questions of 2 marks each. Internal choice has been provided in two questions. It contains two case study-based questions of 5 marks each.
- Section B comprises of 7 questions of 3 marks each. Internal choice has been provided in two questions.
- Section C comprises of 3 questions of 4 marks each. Internal choice has been provided in two questions.
- Section D comprises of 3 questions of 5 marks each. Internal choice has been provided in two questions.

Section - A (2 marks each)

Q1 The HCF of 45 and 105 is 15. Then their L.C. M. is:

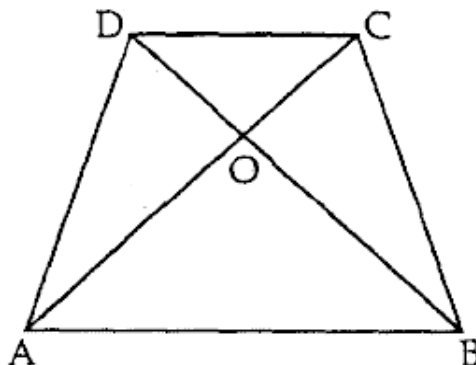a) 305   b) 315   c) 153   d) 113

OR

The L.C. M. of $2^3 \times 3^2$ and $2^2 \times 3^3$ is:

a) 36   b) 216   c) 156   d) 108

Q2 The value of k for which the pair of linear equations $4x - 1 = -6y$ and $2x + ky - 7 = 0$ represents intersecting lines is :

a) k ≠ 3/2   b) k ≠ 2   c) k ≠ 4   d) k ≠ 3

Q3 In the figure, AB is parallel to CD. If $OA = 3x - 19$, $OB = x - 4$, $OC = x - 3$ and OD = 4, determine x.

a) 5   b) 6   c) 7   d) 8

Q4 If A and B are the points $(-6, 7)$ and $(-1, -5)$ respectively, then the distance 2AB is equal to :

a) 13   b) 26   c) 169   d) 238

Q5 If $\sin \theta = \frac{1}{3}$, then the value of $(2 \cot^2 \theta + 2)$ is:

a) 18   b) 26   c) 20   d) 38

Q6 A number is selected at random from the numbers 5 to 35. Then the probability of selecting a prime number is:

a) 3/10   b) 5/29   c) 11/30   d) 9/31

Q7 Two tankers contain 850 litres and 680 litres of petrol respectively. The maximum capacity of a container which can measure the petrol of either tanker in exact number of times is :

a) 17   b) 160   c) 200   d) 170

Q8 If $37x + 43y = 123$ and $43x + 37y = 117$ are pair of linear equations then the value of $x - y$ is :

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

OR

The parallel line of 2x + 5y = −3 is:

a) – 4x + 10y = – 6   b) 2x – 5y = – 3

c) 2x + 5y – 3 = 0   d) 4x + 10y + 6 = 0

Q9 In a $\triangle LMN$, $\angle L = 50°$ and $\angle N = 60°$. If $\triangle LMN \sim \triangle PQR$, then $\angle Q$ is -

a) 70°   b) 50°   c) 30°   d) 60°

Q10 From the following statements, which one is correct ?

i) The value of tanA is always less than 1.

ii) sinA = cosA when A is half of right angle.

iii) The value of cosA decreases as A increases.

iv) cosA = 4/3 for some angle A

a) only i) and ii) correct   b) only ii) and iii) correct

c) only iii) and iv) correct   d) only i) and iv) correct

Q11 From the following statements, which one is correct ?

i) all circles are similar.

ii) all isosceles triangles are similar.

iii) all equilateral triangles are similar.

iv) all squares are similar.

a) only i) and ii) correct   b) only ii) and iii) correct

c) only i) , ii) iii) correct   d) only i), iii) and iv) correct

Q12 **Case Study 1 (1 mark each)**

Shadow's Similarity: During an afternoon of 15th August, Indian flag fluttering in air casted its shadow of length 400 m at 4:00 pm., whereas a girl of height 1.2 m casted a shadow of 4.8 m at the same time.
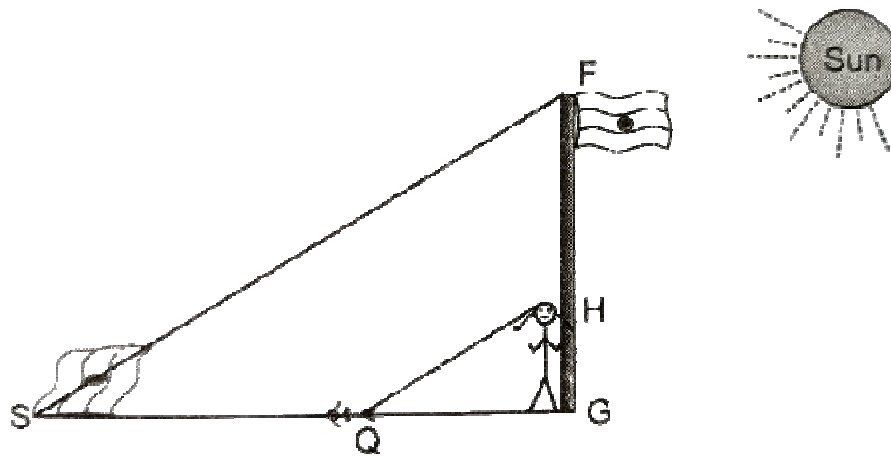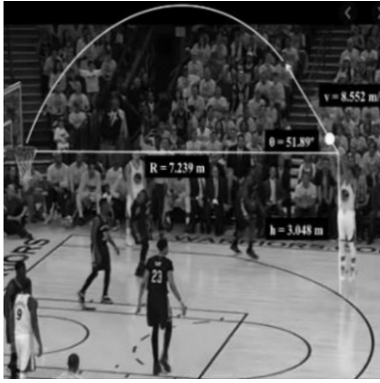

Based on the above information answer the following questions:

1. Which of the following is irrelevant in context of finding the height of the flag?

    a) Pythagoras theorem   b) Similarity

    c) Ratio and Proportion   d) Sun's elevation

2. Which criteria is applied for the similarity of $\triangle$ FGS and $\triangle$ HGQ ?

    a) RHS   b) AAA   c) SAS   d) SSS

3. Height of flag is:

    a) 50 m   b) 100 m   c) 150 m   d) 200 m

4. The length of FH is :

    a) 98.8 cm   b) 988 cm   c) 9880 cm   d) 9800 cm

5. Which of the following is not a criteria for the congruency of triangles?

   a) AAA   b) SSA   c) SSS   d) RHS

Q.13 **Case Study 2 (1 mark each)**

Basketball and Soccer are played with a spherical ball. Even though the athlete dribbles the ball in both the sports, a basketball player uses his hands and a soccer player uses his feet. Usually, soccer is played outdoors on a large field and basketball is played indoor on a court made out of wood. The projectile (path traced) of soccer ball and basketball are in the form of parabola representing quadratic polynomial.

Based on the above information, answer the following questions:

1. The shape of the path traced as shown in the figure is:

   a) Spiral   b) Ellipse   c) Linear   d) Parabola

2. The graph of parabola opens upwards, if:

   a) $a = 0$ b) $a < 0$ c) $a > 0$ d) $a \geq 0$

3. Observe the graph and answer the question.
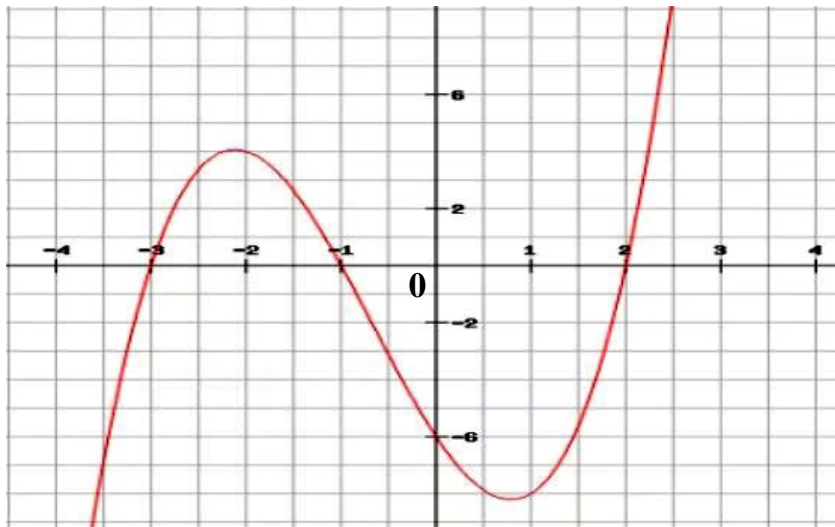
   How many zeroes are there for the polynomial w.r.t. horizontal axis?

   a) 0   b) 1   c) 2   d) 3

4. The three zeroes shown in the above graph are:

   a) 2, 3, –1   b) –2, 3, 1   c) –3, –1, 2   d) –2, –3, –1

5. What can be the expression of a quadratic polynomial in which the sum   and the product of the zeroes are 1 and 3 respectively?

   a) $x^2 + x + 3$ b) $x^2 - x + 3$ c) $x^2 - 3x - 1$ d) $x^2 + 3x - 1$

<u>Section - B</u> (3 Marks each)

Q14 Find the zeroes of the quadratic polynomial $6x^2 + 12 - 17x$ and verify the relationship between the zeroes and the coefficients of the polynomial.

Q15 Solve for x and y : $\dfrac{x}{2} + y = 4$; $x - \dfrac{y}{3} = 8$

<div style="text-align:center">OR</div>

Places A and B are 240 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 2 hours. What are the speeds of the two cars?

Q16   The point R divides the line segment AB, where A(–4, 0) and B(0, 6) such that $AR = \frac{3}{4} AB.$ Find the coordinates of R.

Q17   Show that : $\dfrac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$

Q18   In the given figure, $PQ \parallel AB$ and $PR \parallel AC$. Prove that $QR \parallel BC$.
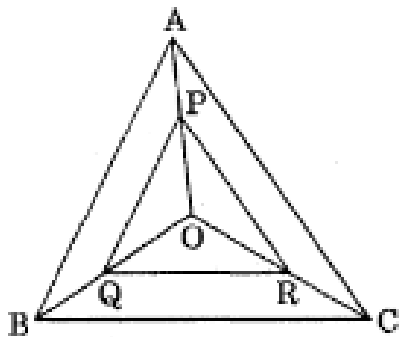
Q19   Find the point on y-axis which is equidistant from the points $(5, -2)$ and $(-3, 2)$.

Q20   Prove that : $(\sin A + \text{cosec} A)^2 + (\cos A + \sec A)^2 = \tan^2 A + \cot^2 A + 7$

<div style="text-align:center">OR</div>

Evaluate : $2\tan^2 60^0 + 3\cos^2 30^0 - 4\sin^2 45^0 + \sec^2 60^0$

<h2 style="text-align:center"><u>Section - C (4 Marks)</u></h2>
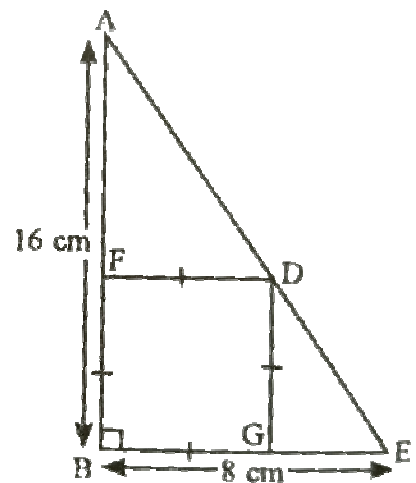
Q21   Prove that $2 - 3\sqrt{5}$ is an irrational number.

Q22   State and prove Basic proportionality theorem.

<div style="text-align:center">OR</div>

Side AB and BE of a right triangle, right angled at B are of the length 16 cm and 8 cm respectively. What will be the length of the sides of the largest square FDGB that can be inscribed in the triangle ABE.

Q23 A card is drawn at random from a well-shuffled deck of playing cards. Find the probability that the card drawn is (i) a card of spade or an ace (ii) a black king (iii) neither a jack nor a king (iv) either a king or a queen.

OR

A die is thrown once. Find the probability of getting -

a) a prime number
b) a composite number
c) a factor of 6
d) a multiple of 2

Section - D (5 marks)

Q24 If we add 1 to the numerator and subtract 1 from the denominator, a fraction reduces to 1. It becomes $\frac{1}{2}$ if we only add 1 to the denominator. What is the fraction?

OR

The area of a rectangle gets reduced by 9 square units, if its length is reduced by 5 units and breadth is increased by 3 units. If we increase the length by 3 units and the breadth by 2 units, the area increases by 67 square units. Find the dimensions of the rectangle.

Q25 Given tan A= $\frac{4}{3}$, find the other trigonometric ratios of angle A.

OR

Prove the following identity, where the angle involved is an acute angle for which the expression is defined as:

$$(cosec\ A - \sin A)\ (\sec A - \cos A) = \frac{1}{\tan A + \cot A}$$

Q26 A group consists of 12 persons of which 3 are extremely patient, other 6 are extremely honest and rest are extremely kind. A person is equally likely to be selected, find the probability of selecting a person who is:

a) Extremely patient
b) Extremely kind or honest
c) Extremely patient and kind.