KENDRIYA VIDYALAYA SANGATHAN

CLASS- X SESSION- 2022- 23

SUBJECT- MATHEMATICS (STANDARD) 041

PRE BOARD- 1

TIME ALLOWED : 3 Hrs. MAXIMUM MARKS : 80

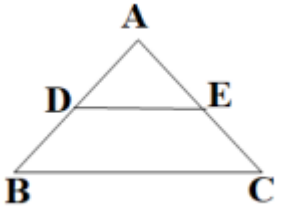
General Instructions:

1. This Question Paper has 5 Sections *A-E.*
2. Section *A* has 20 MCQs carrying 1 mark each.
3. Section *B* has 5 questions carrying 02 marks each.
4. Section *C* has 6 questions carrying 03 marks each.
5. Section *D* has 4 questions carrying 05 marks each.
6. Section *E* has 3 case based integrated units of assessment (04 marks each) with sub parts of the values of 1,1 and 2 marks each respectively.
7. Question 34 optional has two part. Part (a) carry 2 marks and (b) carry 3 marks.
8. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided.
9. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION A

Section A consists of 20 questions of 1 mark each.

1. Let a and b be two positive integers such that $a = p^3 q^4$ and $b = p^2 q^3$, where p and q are prime numbers. If HCF(a,b) = $p^m q^n$ and LCM(a,b) = $p^r q^s$, then (m+n)(r+s)=
   (a) 15 (b) 30 (c) 35 (d) 72
2. Let p be a prime number. The quadratic equation having its roots as factors of p is
   (a) $x^2 – px + p=0$ (b) $x^2 – (p+1)x + p=0$ (c) $x^2+(p+1)x + p=0$ (d) $x^2 – px+p+1=0$
3. If α and β are the zeros of a polynomial $f(x) = px^2 – 2x + 3p$ and $\alpha + \beta = \alpha\beta$, then p is
   (a) -2/3 (b) 2/3 (c) 1/3 (d) -1/3
4. If the system of equations 3x+y =1 and (2k-1)x +(k-1)y =2k+1 is inconsistent, then k =
   (a) -1 (b) 0 (c) 1 (d) 2
5. If the vertices of a parallelogram PQRS taken in order are P(3,4), Q(-2,3) and R(-3,-2), then the coordinates of its fourth vertex S are
   (a) (-2,-1) (b) (-2,-3) (c) (2,-1) (d) (1,2)
6. The prime factorisation of 3825 is
   (a) $3 \times 5^2 \times 21$ (b) $3^2 \times 5^2 \times 35$ (c) $3^2 \times 25 \times 17$ (d) $3^2 \times 5^2 \times 17$
7. If $x \tan 60° \cos 60° = \sin 60° \cot 60°$, then x =
   (a) cos30° (b) tan30° (c) sin30° (d) cot30°
8. If $\sin\theta + \cos\theta = \sqrt{2}$, then $\tan\theta + \cot\theta$ =
   (a) 1 (b) 2 (c) 3 (d) 4
9. In the given figure, DE ‖ BC, AE = a units, EC =b units, DE =x units and BC = y units. Which of the following is true?



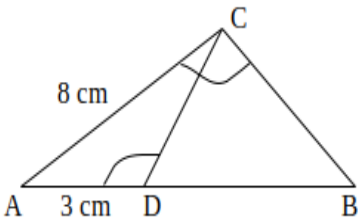
(a) x= (a + b)/ay (b) y= ax(a + b) (c) x= ay (a + b) (d) x/y = a/b

10. ABCD is a trapezium with AD ‖ BC and AD = 4cm. If the diagonals AC and BD intersect each other at O such that AO/OC = DO/OB =1/2, then BC =
    (a) 6cm (b) 7cm (c) 8cm (d) 9cm

11. If two tangents inclined at an angle of 60^o are drawn to a circle of radius 3cm, then the length of each tangent is equal to
    (a) $3\sqrt{3}/2$ cm (b) 3cm (c) 6cm (d) $3\sqrt{3}$cm
12. The area of the circle that can be inscribed in a square of 6cm is
    (a) 36π cm^2 (b) 18π cm^2 (c) 12π cm^2 (d) 9π cm^2

13. The Sum of first n even natural number is
(a) n^2 (b) n^2 - n (c) n^2 + n (d) $2n^2$

14. In the following fig ∠ACB = ∠CDA. If AD = 3 cm and AC = 8 cm, then BD is
(a) 55/3 cm (b) 26/3 cm
(c) 22/3 cm (d) 64/3 cm



15. The number of revolutions made by a circular wheel of radius 0.25m in rolling a distance of 11km is
(a) 2800 (b) 4000 (c) 5500 (d) 7000

16. If $a_2 + a_{28} = 120$ in an AP, then $a_1 + a_{29}$ is equal to
(a) 120 (b) 122 (c) 118 (d) 130

17. A pair of linear equations y = 0 and y = - 5 has
(a) one solution (b) two solutions (c) infinite many solutions (d) no solution

18. For the AP 6, 9, 12, 15,..... $t_{25} - t_{15}$ is
(a) 10 (b) 11 (c) 30 (d) 33

DIRECTION: In the question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct option.

19. *Statement A (Assertion)*: If product of two numbers is 5780 and their HCF is 17, then their LCM is 340.
Statement R(Reason) : HCF is always a factor of LCM
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. *Statement A (Assertion)*: If the co-ordinates of the mid-points of the sides AB and AC of ΔABC are D(3,5) and E(-3,-3) respectively, then BC = 20 units.
Statement R(Reason) : The line joining the mid points of two sides of a triangle is parallel to the third side and equal to half of it.
(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correct explanation of assertion (A)
(c) Assertion (A) is true but reason(R) is false.
(d) Assertion (A) is false but reason(R) is true.

SECTION B

Section B consists of 5 questions of 2 marks each.

21. E and F are the points on the sides PQ and PR respectively of a triangle PQR. For each of the following cases state whether EF || QR
i) PE=3.9cm, EQ=3 cm, PF=3.6 cm and FR=2.4 cm
(ii) PE=4 cm, QE=4.5 cm, PF=8.0 cm and RF=9 cm

22. Check whether 6n can end with the digit 0 for any natural number n.

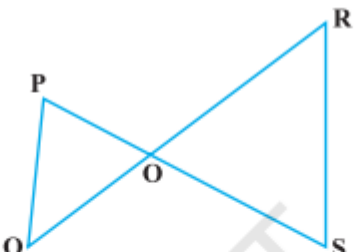
23. Find the coordinates of the point which divides the join of (–1, 7) and (4, –3) in the ratio 2 : 3.

24. The length of the minute hand of a clock is 6cm. Find the area swept by it when it moves from 7:05 p.m. to 7:10 p.m.

OR

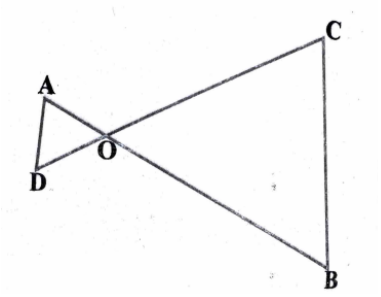
A round table cover has six equal designs as shown in the figure. If the radius of the cover is 28 cm, find the cost of making the designs at the rate of ₹ 0.3 5per cm^2. (use √3 =1.7)

25. In given fig. if PQ || RS, prove that Δ POQ ~ Δ SOR



OR

In given fig, OA . OB = OC . OD.
Show that ∠ A = ∠ C and
∠ B = ∠ D.



SECTION C

Section C consists of 6 questions of 3 marks each.

26. Given that √3 is irrational, prove that 5 + 2√3 is irrational.

27. Determine the AP whose third term is 16 and the 7th term exceeds the 5th term by 12.

28. Prove that

$$\frac{cotA-cosA}{cotA+cosA} = \frac{CosecA-1}{CosecA+1}$$

OR

Using trigonometric identities, write the expression as an integer:

$$\frac{sinA-sinB}{cosA+cosB} + \frac{cosA-cosB}{sinA+sinB}$$

29. Express the ratios cos A, tan A and sec A in terms of sin A.

30. The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower, is 30^0. Find the height of the tower.

OR

Two sides of a triangle are of length 2a, 2b and contain an angle of 120^0. If the angle opposite to the side of length 2a is θ, then prove that

$$\text{Tan } \theta = \sqrt{3}\ a/(a + 2b)$$

31. A chord of a circle of radius 12 cm subtends an angle of 60° at the centre. Find the area of the corresponding segment of the circle. (Use π = 3.14 and $\sqrt{3}$ = 1.73)

SECTION D

Section D consists of 4 questions of 5 marks each.

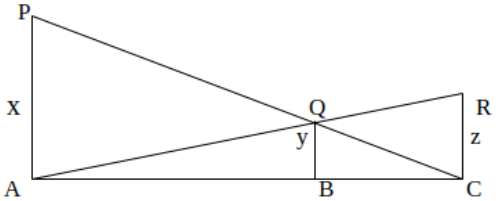
32. To fill a swimming pool two pipes are used. If the pipe of larger diameter used for 4 hours and the pipe of smaller diameter for 9 hours, only half of the pool can be filled. Find, how long it would take for each pipe to fill the pool separately, if the pipe of smaller diameter takes 10 hours more than the pipe of larger diameter to fill the pool?

OR

A pole has to be erected at a point on the boundary of a circular park of diameter 13 metres in such a way that the differences of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 metres. Is it possible to do so? If yes, at what distances from the two gates should the pole be erected?

33. Prove that if a line is drawn parallel to one side of a triangle intersecting the other two sides in distinct points, then the other two sides are divided in the same ratio.

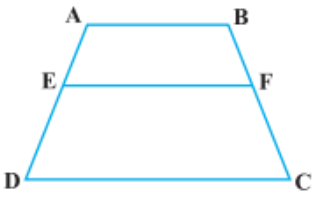
34. In the given fig PA, QB and RC are perpendicular to AC.
Prove that, $\frac{1}{x} + \frac{1}{z} = \frac{1}{y}$



OR

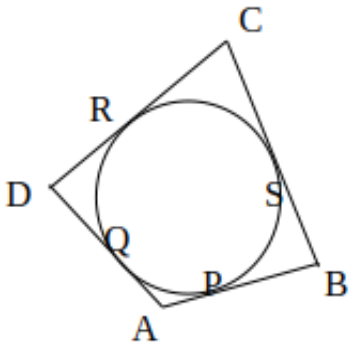
(a) ABCD is a trapezium with AB || DC. E and F are points on non-parallel sides AD and BC respectively such that EF is parallel to AB. Show that

$$\frac{AE}{ED} = \frac{BF}{FC}$$



(b) A girl of height 90 cm is walking away from the base of a lamp-post at a speed of 1.2 m/s. If the lamp is 3.6 m above the ground, find the length of her shadow after 4 seconds.

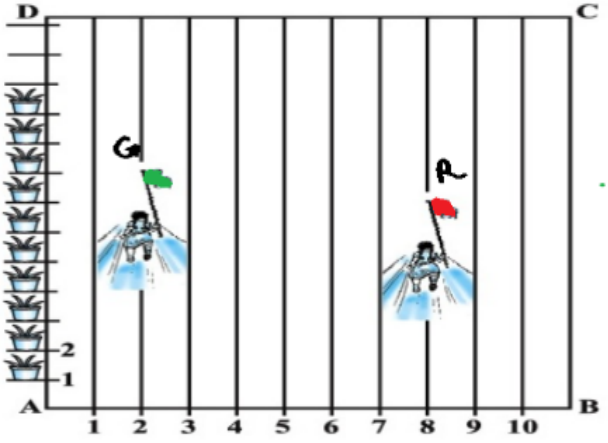
35.(a) Prove that, The lengths of tangents drawn from an external point to a circle are equal.
(b) A quadrilateral ABCD is drawn to circumscribe a circle (see Fig).
Prove that AB + CD = AD + BC



SECTION E
Case study based questions are compulsory.

36. CASE STUDY 1:

In order to conduct Sports Day activities in your School, lines have been drawn with chalk powder at a distance of 1 m each, in a rectangular shaped ground ABCD, 100 flowerpots have been placed at a distance of 1 m from each other along AD, as shown in given figure below. Niharika runs 1/4 the distance AD on the 2nd line and posts a green flag. Preet runs 1/5 the distance AD on the eighth line and posts a red flag.



1. Find the position of green flag
   a) (2,25) b) (2,0.25) c) (25,2) d) (0, -25)
2 . Find the position of red flag
   a) (8,0) b) (20,8) c) (8,20) d) (8,0.2)
3. What is the distance between both the flags?
   a) √41 b) √11 c) √61 d) √51

37. CASE STUDY 2:

Vijay is trying to find the average height of a tower near his house. He is using the properties of similar

triangles. The height of Vijay's house if 20m when Vijay's house casts a shadow 10m long on the ground. At the same time, the tower casts a shadow 50m long on the ground and the house of Vijay casts 20m shadow on the ground.

1. What is the height of the tower?

a) 20m b) 50m c) 100m d) 200m

2. What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12m?

a) 75m b) 50m c) 45m d) 60m

3. When the tower casts a shadow of 40m, same time what will be the length of the shadow of Vijay's house?

a) 15m b) 32m c) 16m d) 8m

38. CASE STUDY 3:

It is common that Governments revise travel fares from time to time based on various factors such as inflation (a general increase in prices and fall in the purchasing value of money) on different types of vehicles like auto, Rickshaws, taxis, Radio cab etc.

The auto charges in a city comprise of a fixed charge together with the charge for the distance covered. Study the following situations

Name of the city	Distance travelled (Km)	Amount paid (Rs.)
City A	10	75
	15	110
City B	8	91
	14	145

Situation 1: In city A, for a journey of 10 km, the charge paid is Rs 75 and for a journey of 15 km, the charge paid is Rs 110.

Situation 2: In a city B, for a journey of 8km, the charge paid is Rs91 and for a journey of 14km, the charge paid is Rs 145.

Refer situation 1

1. If the fixed charges of auto rickshaw be Rs x and the running charges be Rs y km/hr, the pair of linear equations representing the situation is

a) x + 10y =110, x + 15y = 75 b x + 10y =75, x + 15y = 110

c) 10x + y =110, 15x + y = 75 d) 10x + y = 75, 15 x + y =110

2. A person travels a distance of 50km. The amount he has to pay is

a) Rs.155 b) Rs.255 c) Rs.355 d) Rs.455

Refer situation 2

3. What will a person have to pay for travelling a distance of 30km?

a) Rs.185 b) Rs.289 c) Rs.275 d) Rs.305