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Candidates must write the Set No. on the title page of the answer book.

DAV PUBLIC SCHOOLS, ODISHA ZONE
HALF YEARLY EXAMINATIONS, 2023-24

- Please check that this question paper contains 7 printed pages.
- Set number given on the right hand side of the question paper should be written on the title page of the answer book by the candidate.
- Check that this question paper contains 38 questions.
- Write down the Serial Number of the question in the left side of the margin before attempting it.
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed 15 minutes prior to the commencement of the examination. The students will read the question paper only and will not write any answer on the answer script during this period

CLASS – X
SUB: MATHEMATICS (041)

Time: 3 Hours

Maximum Marks: 80

General Instructions:

Read the following instructions carefully.

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 05 questions carrying 02 marks each.
4. Section C has 06 questions carrying 03 marks each.
5. Section D has 04 questions carrying 05 marks each.
6. Section E has 03 case based integrated units of assessment (04 marks) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 02 Question of 5 marks, 02 Question of 3 marks and 02 Question of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E.
8. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

SECTION -A

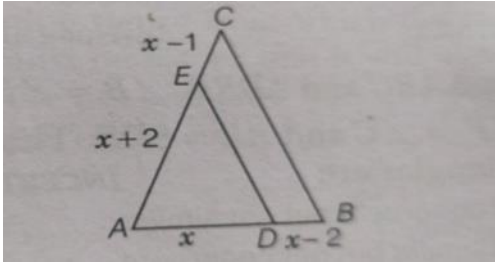
(Consists of 20 questions of one mark each)

1. If 2 positive integer a and b are written as $a = x^3y^2$ and $b = xy^3$, where x and y are prime numbers, then the result obtained by dividing the product of a and b by the HCF(a,b) is -

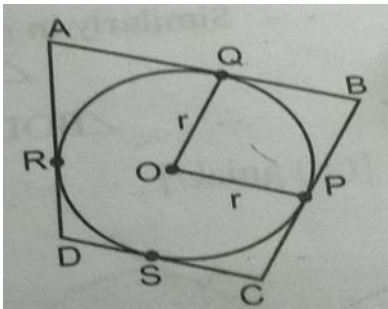
(a) xy (b) xy^2 (c) x^3y^3 (d) x^2y^2
2. The value of (x+y) on solving $19x + 17y = 55$ and $17x + 19y = 53$ is

(a) 3 (b) 6 (c) 8 (d) 9

3. In the above figure $DE \parallel BC$, $AD = x$, $DB = x-2$, $AE = x+2$ and $EC = x-1$. Then the value of x is –



- (a) 9 (b) 4 (c) 4.5 (d) 8
4. If 2 tangents inclined at an angle of 120° are drawn to a circle of radius 3cm, then the length of each tangent is equals to
 (a) $3\sqrt{3}$ cm (b) 3cm (c) 6cm (d) $\sqrt{3}$ cm
5. The value of k , for which the pair of linear equations $kx + y = k^2$ and $x + ky = 1$ have infinitely many solution is -
 (a) ± 1 (b) 1 (c) -1 (d) 2
6. In a $\triangle ABC$ and $\triangle DEF$, $\frac{AB}{DE} = \frac{BC}{FD}$, then they will be similar when
 (a) $\angle B = \angle E$ (b) $\angle A = \angle D$ (c) $\angle B = \angle D$ (d) $\angle A = \angle F$
7. An arc of a circle is of length 5π cm and the sector it bounds has an area of 20π cm², then radius of the circle is –
 (a) 4cm (b) 8cm (c) 12cm (d) 16cm
8. If mean of first n natural number is $\frac{5n}{9}$, then $n =$
 (a) 9 (b) 10 (c) 5 (d) 4
9. If α and β are the zeros of polynomial $2y^2+7y+5$, then the value of $\alpha+\beta+\alpha\beta$ is
 (a) -1 (b) 0 (c) 1 (d) 2
10. In the figure a circle is inscribed in a quadrilateral ABCD where $AB = 29$ cm, $AD = 23$ cm $\angle B = 90^\circ$ and $DS = 5$ cm. Then the radius of the circle is



- (a) 11cm (b) 18cm (c) 6cm (d) 15cm
11. If $\sin(A+B) = 1 = \cos(A-B)$, then
 (a) $A = B = 90^\circ$ (b) $A = B = 0^\circ$ (c) $A = B = 45^\circ$ (d) $A = 2B$
12. A pendulum swings through an angle 60° and describes an arc 8.8cm in length then the length of pendulum in cm is –
 (a) 8.4 (b) 16.8 (c) 4.2 (d) 8.9
13. It is proposed to build a single circular park equal in area to the sum of areas of 2 circular parks of diameter 16m and 12m in a locality, the radius of the new park is –
 (a) 10m (b) 15m (c) 20m (d) 24m
14. The median and mode of a frequency distribution are 26 and 29 respectively, then it's mean is-
 (a) 22.5 (b) 24.5 (c) 28.4 (d) 25.8

15. A number x is chosen at random from the numbers $-4, -3, -2, -1, 0, 1, 2, 3, 4$. What is the probability that $|x|$ less than 1.
- (a) 1 (b) 0 (c) $\frac{2}{9}$ (d) $\frac{1}{9}$
16. If $x = 2\sin^2\theta$, $y = 2\cos^2\theta + 1$, then $x+y$ is
- (a) 2 (b) 3 (c) $\frac{1}{2}$ (d) 1
17. A coin and a die is tossed simultaneously then the probability of the event that tail and a prime numbers turns up
- (a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) $\frac{1}{3}$ (d) $\frac{2}{3}$
18. If ΔABC is right angled at C , then the value of $\cos(A+B)$ is
- (a) 0 (b) $\frac{1}{2}$ (c) 1 (d) None
19. **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

Assertion (A) : \sqrt{a} is an irrational number where a is a prime number

Reason (R) : square root of any prime number is an irrational number

- a) Both A and R are true and R is the correct explanation of A.
 b) Both A and R are true but R is not the correct explanation of A.
 c) A is true but R is false.
 d) A is false but R is true.

20. **Assertion (A)** : If the sum of zeroes of quadratic polynomial $x^2 - 2kx + 8$ is 2, then value of k is 1.

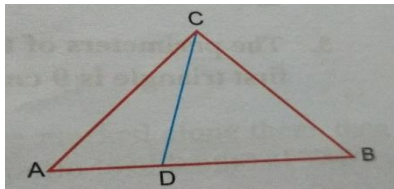
Reason (R) : Sum of zeros of a quadratic polynomial $ax^2 + bx + c$ is $-\frac{b}{a}$.

- a) Both A and R are true and R is the correct explanation of A.
 b) Both A and R are true but R is not the correct explanation of A.
 c) A is true but R is false.
 d) A is false but R is true.

SECTION-B

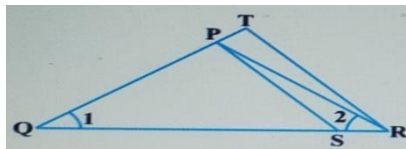
(Section – B consists of 5 questions of 2 mark each)

21. In the figure if $\angle ACB = \angle CDA$, $AC = 6\text{cm}$ and $AD = 3\text{cm}$ then find the length of AB .

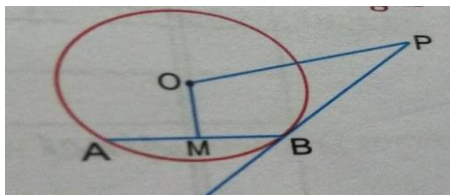


OR

In the given figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$. Show that $\Delta PQS \sim \Delta TQR$.



22. PB is a tangent to the circle with centre O to B. AB is a chord of length 24cm at a distance of 5cm from the centre. If the tangent is of length 20 cm. Find the length of PO.



23. Given that $\sin\theta = \frac{a}{b}$, find the value of $\tan\theta$.

OR

If $\tan A = \frac{3}{4}$, find the value of $\frac{1}{\sin A} + \frac{1}{\cos A}$.

24. Two dice are thrown at the same time and the product of numbers appearing on them is noted. Find the probability that the product is a prime number.
25. If $\sin x + \cos y = 1$, $x = 30^\circ$ and y is an acute angle, find the value of y .

SECTION-C

(Section-C consists of 6 questions of 3 marks each.)

26. Prove that $\sqrt{5}$ is an irrational number.
27. If α, β are the zeros of the polynomial $P(x) = x^2 - p(x+1) - c$ such that $(\alpha+1)(\beta+1) = 0$. Find the value of c .

OR

If α and β are the zeros of quadratic polynomial $4x^2 + 4x + 1$, then form a quadratic polynomial whose zeros are 2α and 2β .

28. In a cyclic quadrilateral ABCD, $\angle A = (2X+4)^\circ$, $\angle B = (Y+3)^\circ$, $\angle C = (2Y+10)^\circ$ and $\angle D = (4X-5)^\circ$. Find the angles.
29. Prove that length of two tangents drawn from an exterior point to a circle are equal.
30. Evaluate $\frac{5 \sin^2 30^\circ + \cos^2 45^\circ + 4 \tan^2 60^\circ}{2 \sin 30^\circ \cos 60^\circ + \tan 45^\circ}$

OR

Evaluate $\frac{4}{\cot^2 30^\circ} + \frac{1}{\sin^2 60^\circ} - \cos^2 45^\circ$.

31. Find the mode of the following frequency distribution.

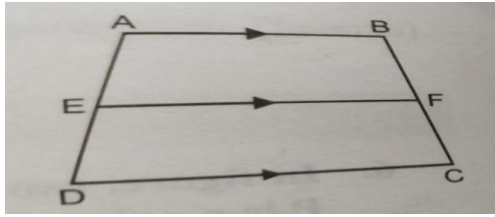
Classes	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	5	8	7	12	28	20	10

SECTION-D

(Section – D consists of 4 questions of 5 marks each)

32. In a seminar the number of participants in Mathematics, Physics and Biology are 336, 240 and 96 respectively. Find the minimum number of rooms required if in each room same number of participants will be seated and all of them must be of the same subject.
33. State and prove Basic proportionality theorem. Use this to prove the following-

If ABCD is a trapezium in which $AB \parallel DC \parallel EF$, then prove that $\frac{AE}{ED} = \frac{BF}{FC}$.



34. Sharmila sold a table and a chair for Rs.1050, thereby making a profit of 10% on a table and 25% on the chair. If she had taken a profit of 25% on the table and 10% on the chair she would have got Rs.1065. Find the cost price of each.

OR

A railway half ticket costs half the full fare, but the reservation charges are the same on a half ticket as on a full ticket. One reserved first-class ticket from the station A to B cost Rs.2530. Also, one reserved first-class ticket and one reserved first-class half ticket from A to B costs Rs.3810. Find the full first-class ticket fare from station A to B, and also the reservation charge for a ticket.

35. If the median of the following frequency distribution 32.5. Find the values of f_1 and f_2 .

Classes	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
Frequency	f_1	5	9	12	f_2	3	2	40

OR

Compute the mean of the following data by assumed mean method:

Marks	More than 0	More than 10	More than 20	More than 30	More than 40	More than 50	More than 60	More than 70	More than 80	More than 90
No. of students	80	77	72	65	55	43	28	16	10	8

SECTION-E

36. The figure given below shows the path of a diver when she takes a jump from the diving board. Annie was standing on a diving board, 48 feet above the water level, she took a dive into the pool. Her height (in feet) above the water level at any time "t" in seconds is given by the polynomial $h(t)$ such that $h(t) = -16t^2 + 8t + k$.



Based on the above information answer the following question:

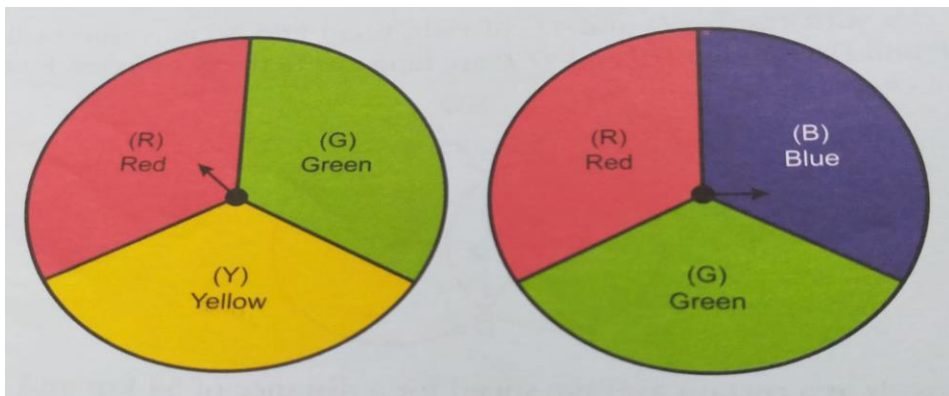
- a. The shape of the pose shown here is called – 1
- b. What is the value of k 2

OR

At what time will she touch the water in the pool.

- c. Find a polynomial $q(t)$ with sum of zeros as 1 and the product is -6. 1

37. A middle school decided to run the following spinner game as a fund-raiser on Christmas Carnival



Making purple :Spin each spinner once. Blue and red make purple. So, if one spinner shows red(R) and another blue (B) then you win. Once such outcome is written as “RB”.

Based on the above answer the following question

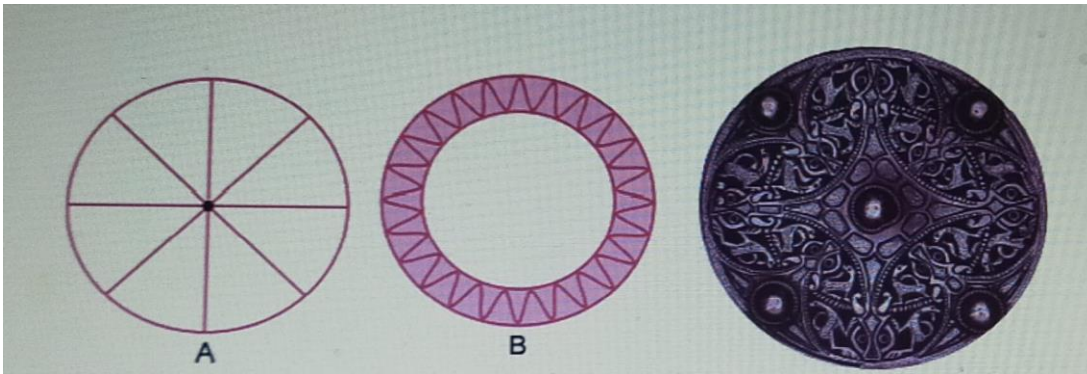
- a) List all possible outcomes of the game ? 1
- b) For each win, a participant gets Rs.10 , but if he/she losses, 2
 He/she has to pay Rs.5 to the school. If 99 participants played calculate how much fund could the school have collected.

OR

If the same amount of Rs.5 has been decided for winning or losing the game, then how much fund had been collected by school? (No. of participants = 99)

c) Find the probability of making purple. 1

38. A brooch is a small piece of jewellery which has a pin at the back so it can be fastened on a dress, blouse or coat. Design of some brooches are shown below. Observe them carefully.



Design A : Brooch A is made with silver wire in the form of a circle with diameter 28mm. A wire used for making 4 diameters which divide the circle into 8 equal parts.

Design B : Brooch B is made of two colours gold and silver. Outer part is made with gold. The circumference of silver part is 44mm and the gold part is 3mm wide everywhere.

Based on the above information, answer the following questions:

- a) Find the total length of silver wire used in design A. 1
- b) Find the area of each sector of the brooch in the design A. 2

OR

A boy is playing with brooch B. He makes revolution with it along its edge. How many complete revolutions must it take to cover 80π mm?

- c) Find the circumference of outer part (golden) in the design B. 1
