MOTION

SAMPLE PAPER – 5
CBSE BOARD
CLASS - X
MATHS

Time : 3 Hours   **Max. Marks : 80**

General Instructions:

1. This Question Paper has 5 Sections A, B, C, D, and E.
2. Section A has 20 MCQs carrying 1 mark each.
3. Section B has 5 questions carrying 2 marks each.
4. Section C has 6 questions carrying 3 marks each.
5. Section D has 4 questions carrying 5 marks each.
6. Section E has 3 Case Based integrated units of assessment (4 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 questions of 2 marks, 2 questions of 3 marks and 2 Questions of 5 marks has been provided. An internal choice has been provided in the 2 Questions of 2 marks of Section E.

SECTION – A

1. Let p be a prime number and k be a positive integer.
   If p divides k^2, then which of these is DEFINITELY divisible by p?

$\frac{k}{2}$	k	7k	K^3

    (A) Only k   (B) Only k and 7k

    (C) Only k, 7k and $7k^3$ (D) all $\frac{k}{2}$, k, 7k and k^3

2. In figure, the graph of a polynomial p(x) is shown. The number of zeroes of p(x) is –
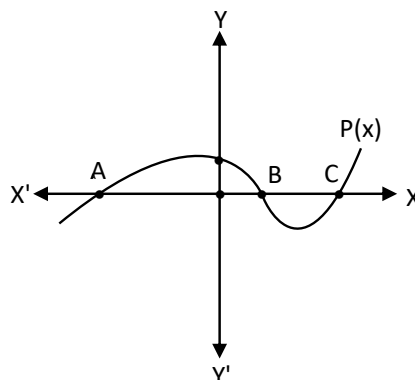
    (A) 1   (B) 2   (C) 3   (D) 4

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3. Which of these is a QUADRATIC equation having one of its roots as zero?
(i) $x^3 + x^2 = 0$ (ii) $x^2 - 2x = 0$ (iii) $x^2 - 9 = 0$
(A) only (i)   (B) only (ii)   (C) only (i) and (ii)   (D) only (ii) and (iii)

4. Digital images consist of pixels. A pixel can be considered as the smallest unit on a display screen in a mobile or a computer. The number of pixels, their size and colours depend on the display screen and it's graphic. Display screens are rectangular in shape and their size is defined as the length of the diagonal.
Anmol is designing a web page for a display on a screen whose size is 1000 pixels. The width of the screen is 800 pixels.
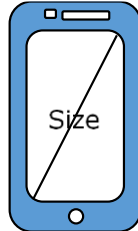

Which of the following equation can be used to calculate the height (h) of the screen?
(A) $h^2 + 200 \times 1800 = 0$ (B) $h^2 - 200 \times 1800 = 0$
(C) $h^2 - 200 = 0$ (D) $h^2 - 1800 = 0$

5. 4 groups in a class were asked to come up with an arithmetic progression (AP). Shown below are their responses:

| Group	Arithmetic progression
M	4, 2, 0, –2, ……
N	41, 38, 5, 36, 33.5, ……
O	–19, –21, –23, –25, ……
P	–3, –3, –3, –3, ……

Which of these groups correctly came up with an AP?
(A) only groups M and O   (B) only groups N and O
(C) only groups M,N and O   (D) all groups – M, N, O and P

6. $\triangle ABC$ is a triangle such that AB:BC = 1:2. Point A lies on the Y-axis and the coordinate of B and C are known. Which of the following formula can DEFINITELY be used to find the coordinates of A ?
(i) Section formula   (ii) Distance formula
(A) only (i)   (B) only (ii)   (C) both (i) and (ii)   (D) neither (i) or (ii)

7. If the vertices of a parallelogram PQRS taken in order are P(3, 4), Q(–2, 3) and R(–3, –2), then the co-ordinates of its fourth vertex S are -
(A) (–2, –1)   (B) (–2, –3)   (C) (2, –1)   (D) (1, 2)

8. In the figure below, DE||AC and DF||AE. Which of these is equal to $\dfrac{BE}{FE}$?
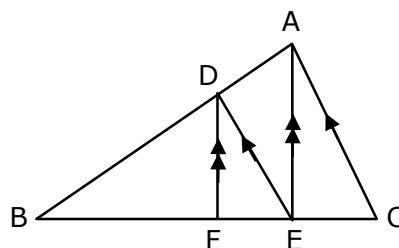

(A) $\dfrac{DF}{AE}$ (B) $\dfrac{BE}{EC}$ (C) $\dfrac{BA}{AC}$ (D) $\dfrac{FE}{EC}$

9. Ankit joins the centre of the two pulleys and observes line segments P_1S_1 and P_2S_2 when extended meet at a point X. Which line segment is equal to the length of P_1S_1?
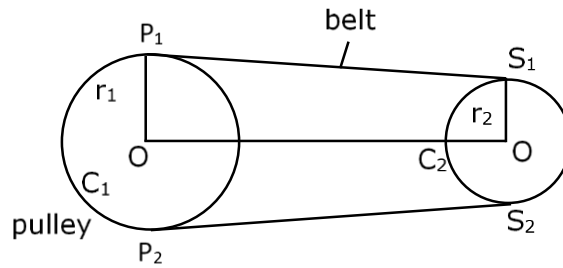
(A) OQ   (B) QX   (C) XS_2 (D) P_2S_2

10. The area of the circle that can be inscribed in a square of 6 cm is -
(A) 36π cm²   (B) 18π cm²   (C) 12π cm²   (D) 9π cm²

11. sec θ when expressed in terms of cot θ, is equal to:

(A) $\dfrac{1+\cos^2\theta}{\cot\theta}$ (B) $\sqrt{1+\cot^2\theta}$ (C) $\dfrac{\sqrt{1+\cot^2\theta}}{\cot\theta}$ (D) $\dfrac{\sqrt{1-\cot^2\theta}}{\cot\theta}$

12. If tan (5x+30°) = 1, then x is -
(A) 15°   (B) 5°   (C) 3°   (D) None of these

13. If sin A $= \dfrac{12}{13}$, the value of cos A is:

(A) $\dfrac{13}{4}$ (B) $\dfrac{13}{5}$ (C) $\dfrac{5}{13}$ (D) $\dfrac{4}{13}$

14. If k+2, 4k – 6 and 3k – 2, are three consecutive terms of A.P., then the value of k is:
(A) 3   (B) –3   (C) 4   (D) –4

15. If the sum of the first n terms of an A.P. be $3n^2+n$ and its common differences is 6, then its first term is:
(A) 2   (B) 3   (C) 1   (D) 4

16. Romy is blind folded and asked to pick one ball from each of the jars. The chance of Romy picking a red ball is same in
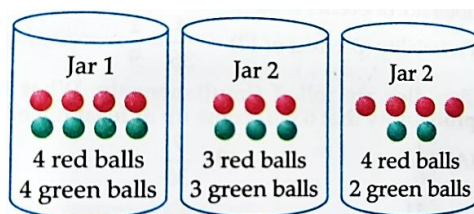
(A) jars 2 and 3   (B) jars 1 and 3   (C) jars 1 and 2   (D) all the three jars

17. Two dice are rolled simultaneously. What is the probability that 6 will come up at least once?

(A) $\dfrac{1}{6}$ (B) $\dfrac{7}{36}$ (C) $\dfrac{11}{36}$ (D) $\dfrac{13}{36}$

18. A survey was conducted on 80 gamers on how many games did they plan in a 6 day. The data is given below.

Number of games	Number of games
1–2	20
2–3	24
3–4	10
4–5	12
5–6	8
6–7	4
7–8	2

Which of the following is the modal class?
(A) 1–2   (B) 2–3   (C) 4–5   (D) 7–8

Directions (Q. Nos. 19 – 20) Each of these questions contains two statements.
Assertion (A) and Reason (R). Each of these question also has four alternative choices, any one of which is the correct answer. You have to select one of the codes (A), (B), (C) and (D) given below.
(A) A is true, R is true; R is a correct explanation for A.
(B) A is true, R is true; R is not a correct explanation for A.
(C) A is true; R is False.
(D) A is false; R is true.

19. **Assertion (A):** The volume of a right circular cylinder of base radius 7 cm and height 10 cm is 1540 cm^3.
**Reason(R):** According to assertion, the curved surface area of cylinder is 440 cm^2.

20. **Assertion (A):** If the second term of an A.P., is 13 and the fifth term is 25, then its 7th term is 33.
Reason(R): If the common difference of an A.P. is 5, then $a_{18} - a_{13}$ is 25.

SECTION – B

21. Show that $5 + 2\sqrt{7}$ is an irrational number, where $\sqrt{7}$ is given to be an irrational number.

22. In the below figure, QR = 4cm, RP = 8cm and ST = 6cm. (Note: The figure is not to scale.)
If the perimeter of ΔSTU is 27 cm, find the length of PQ. Show your steps.
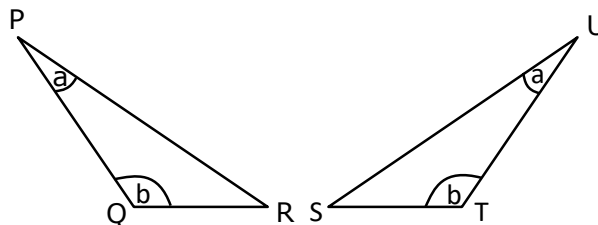
23. Show below is a ΔPQR inscribed in a semicircle. A circle is drawn such that QR is a tangent to it at the point R. How many such circles can be drawn? Justify your answer.

24. (A) If $\sqrt{3} \sin\theta - \cos\theta = 0$ and $0° < \theta < 90°$, find the value of θ.

<div align="center">**OR**</div>

(B) Find an acute angle θ when $\dfrac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta} = \dfrac{1 - \sqrt{3}}{1 + \sqrt{3}}$.

25. **(A)** Show below are two overlapping sectors of a circle. The radii of the sectors are 6 cm and 8cm. The figure is divided into three regions – I, II and III. (Note: The figure is not to scale)

Find the difference in the areas of regions I and III. Show your work. (Note: Take $\pi = \dfrac{22}{7}$)
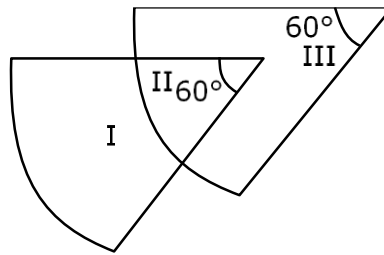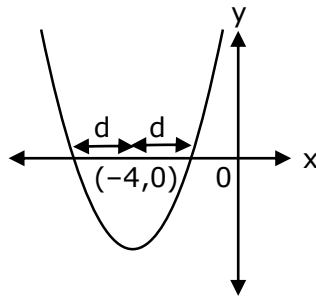

OR

(B) The length of the minute hand of a clock is 6 cm. Find the area swept by it when it moves from 7:05 p.m. to 7:40 p.m.

SECTION – C

26. Find all pairs of positive integers whose sum is 91 and HCF is 13. Show your work.

27. Shown below is the graph of a quadratic equation $y = (x^2 + kx + 12)$. Without finding the value of k, find the two roots of the given quadratic equation. Show your steps.

28. (A) Represent the following pair of linear equations graphically and hence comment on the condition of consistency of this pair.

$$x - 5y = 6, \quad 2x - 10y = 12$$

OR

(B) A fraction becomes $\dfrac{1}{3}$ when 2 is subtracted from the numerator and it becomes $\dfrac{1}{2}$ when 1 is subtracted from the denominator. Find the fraction.

29. (A) In given figure, AB is the diameter of a circle with centre O and AT is a tangent. If $\angle AOQ = 68°$, find $\angle ATQ$.

OR

(B) If a circle touches the side BC of a triangle ABC at P and extended sides AB and AC at Q and R, respectively, prove that $AQ = \dfrac{1}{2}(BC + CA + (AB))$.
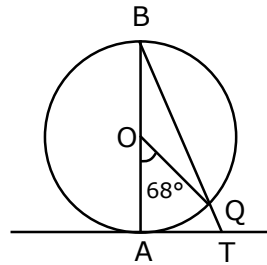
30. Prove that: $\dfrac{\operatorname{cosec}^2 x - \sin^2 x \, \cot^2 x - \cot^2 x}{\sin^2 x} = 1$

31. The frequency distribution of daily rainfall in a town during a certain period is shown below.

Rainfall (in mm)	Number of days
0 – 20	10
20 – 40	X
40 – 60	12
60 – 80	8

Unfortunately, due to manual errors, the information on the 20-40 mm range got deleted from the data.

If the mean daily rainfall for the period was 32 mm, find the number of days when the rainfall ranged between 20-40 mm. Show your work.

SECTION – D

32. (A) Two water taps together can fill a tank in $1\dfrac{7}{8}$ hours. The tap with longer diameter takes 2 hours less than the tap with smaller one to fill the tank separately. Find the time in which each tap can fill the tank separately.

OR

(B) 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?
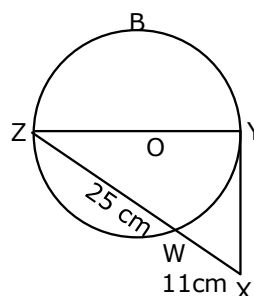
33. Shown below is circle with centre O, YX is the tangent to the circle at Y.
(i) Prove that ∆XYZ ~ ∆WYZ.
(ii) Using part(i), find the length of ZY.
Show your steps and give valid reasons.   (Note: The figure is not to scale.)

34. (A) In a rain water harvesting system, the rain water from a roof 22m × 20m drains into a cylindrical tank having diameter of base 2 m and height 3.5m. If the tank is full, find the rainfall in cm. Write your views on water conservation.

OR

(B) Rohan wants to renovate his room. He calls an architect for this work to measure the room. The length, breadth and height of a room are 8m 50cm; 6m 25 cm and 4m 75 cm respectively. He wants to put the longest rod that can measure the dimensions of the room exactly.

35. Find the unknown values in the following table:

Class Interval	Frequency	Cumulative Frequency
0 – 10	5	5
10 – 20	7	X_1
20 – 30	X_2	18
30 – 40	5	X_3
40 – 50	X_4	30

SECTION – E

36. **Answer the questions based on the given information:**

Shown below is a house of cards, a structure created by stacking playing cards on top of each other in the shape of a pyramid. Each small triangle is made using 3 cards and each layer has 1 less triangle than the layer below it.

Ankit and his friends were having a sleepover and wanted to do something fun. One of the friends suggested that they could make a house of cards.

(i) Ankit and his friends want to use 3 cards in the top layer and 18 in the bottom layer. From an AP showing the number of cards in each layer starting from the layer.

(ii) They have a total of 360 cards with them.

Find the maximum number of layers that Ankit and his friends can make using the cards they have, if they want to have 1 triangle (3 cards) at the top layer. Show your work.

(iii) On which concept this question based on ?
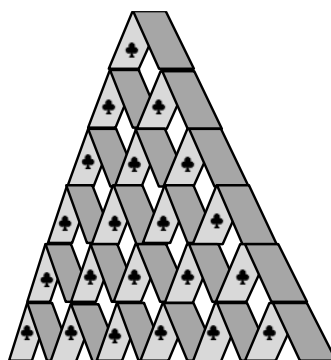
37. **Read the following text and answer the following questions:**

Aayush starts walking from his house to office. Instead of going to the office directly, he goes to a bank first, from there to his daughter's school and then reaches the office. (Assume that all distances covered are in straight lines). If the house is situated at (2, 4), bank at (5, 8), school at (13, 14) and office at (13, 26) and co-ordinates are in km.
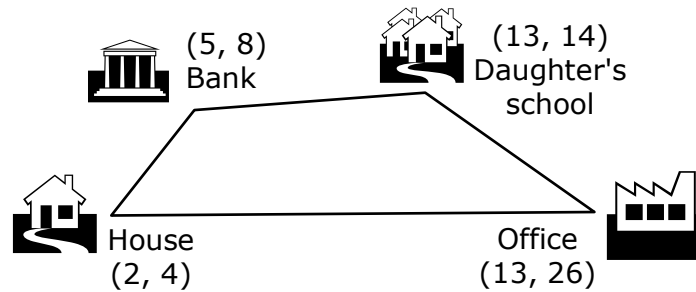
(i) What is the distance between house and bank?

OR

What is the distance between the bank and daughter's school?

(ii) What is the distance daughter's school and office?

(ii) What is the extra distance travelled by Aayush?

(5, 8)
Bank

(13, 14)
Daughter's school

House
(2, 4)

Office
(13, 26)

38. At a toll plaza, an electronic toll collection system has been installed. Fastag can be used to pay the fare. The tag can be pasted on the windscreen of a car.

At the toll plaza a tag scanner is placed at a height of 6m from the ground. The scanner reads the information on the tag of the vehicle and debits the desired toll amount from a linked bank account.

For the tag scanner to function properly the speed of a car needs to be less then 30 km per hour. A car with a tag installed at a height of 1.5m from the ground enters the scanner zone.

(i) The scanner gets activated when the car's tag is at a distance of 5 m from it. Give one trigonometric ratio for the angle between the horizontal and the line between the car tag and the scanner?

(ii) The scanner reads the complete information on the car's tag while the angle between tag and scanner changes from 30° to 60° due to car movement. What is the distance moved by the car?

OR

A vehicle with a tag pasted at a height of 2m from the ground stops in the scanner zone. The scanner reads the data at a angle of 45°. What is the distance between the tag and the scanner?

(iii) Which trigonometric ratio in a right triangle vary from 0 to 1?