

ABHINAV ACADEMY
TEST 03

SUBJECT: MATHEMATICS
CLASS : X

MAX. MARKS : 80
DURATION : 3 HRS

General Instruction:

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. 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. 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

Questions 1 to 20 carry 1 mark each.

1. A card is selected from a deck of 52 cards. The probability of being a red face card is
(a) $3/26$ (b) $3/13$ (c) $2/13$ (d) $1/2$
2. If two tangents inclined at an angle of 60° are drawn to a circle of radius 3cm, then the length of each tangent is equal to
(a) $\frac{\sqrt{3}}{2}$ cm (b) 3 cm (c) 6 cm (d) $3\sqrt{3}$
3. If the mean of a frequency distribution is 8.1 and $\sum f_i = 20$, $\sum f_i x_i = 132 + 5k$, then $k =$
(a) 3 (b) 4 (c) 5 (d) 6
4. If the radii of two circles are in the ratio of 4 : 3, then their areas are in the ratio of :
(a) 4 : 3 (b) 8 : 3 (c) 16 : 9 (d) 9 : 16
5. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is
(a) 10 (b) -10 (c) 5 (d) -5
6. If two positive integers a and b are written as $a = x^3 y^2$ and $b = xy^3$; x, y are prime numbers, then HCF (a, b) is
(a) xy (b) xy^2 (c) $x^3 y^3$ (d) $x^2 y^2$
7. When 2120 is expressed as the product of its prime factors we get
(a) $2 \times 5^3 \times 53$ (b) $2^3 \times 5 \times 53$ (c) $5 \times 7^2 \times 31$ (d) $5^2 \times 7 \times 33$
8. In the $\triangle ABC$, D and E are points on side AB and AC respectively such that $DE \parallel BC$. If $AE = 2$ cm, $AD = 3$ cm and $BD = 4.5$ cm, then CE equals
(a) 1 cm (b) 2 cm (c) 3 cm (d) 4 cm
9. If the distance between the points $(2, -2)$ and $(-1, x)$ is 5, one of the values of x is
(a) -2 (b) 2 (c) -1 (d) 1

10. The value of k for which the pair of equation $kx - y = 2$ and $6x - 2y = 3$ has unique solution
 (a) $k = 3$ (b) $k \neq 3$ (c) $k \neq 0$ (d) $k = 0$
11. The median class of the following data is:
- | Marks | 0 – 10 | 10 – 20 | 20 – 30 | 30 – 40 | 40 – 50 | 50 – 60 |
|-----------------|--------|---------|---------|---------|---------|---------|
| No. of students | 8 | 10 | 12 | 22 | 30 | 18 |
- (a) 20 – 30 (b) 30 – 40 (c) 40 – 50 (d) 50 – 60
12. The ratio of outer and inner perimeters of circular path is 23:22. If the path is 5 m wide, the diameter of the inner circle is
 (a) 55 m (b) 110 m (c) 220 m (d) 230 m
13. In ΔABC , right angled at B, $AB = 5$ cm and $\sin C = 1/2$. Determine the length of side AC.
 (a) 10 cm (b) 15 cm (c) 20 cm (d) none of these
14. If $x^2 + k(4x + k - 1) + 2 = 0$ has equal roots, then $k = \dots\dots\dots$
 (a) $\frac{2}{3}, 1$ (b) $\frac{2}{3}, 1$ (c) $\frac{3}{2}, \frac{1}{3}$ (d) $\frac{3}{2}, \frac{1}{3}$
15. If $x = a \cos \theta$ and $y = b \sin \theta$, then the value of $b^2x^2 + a^2y^2$ is
 (a) $a^2 + b^2$ (b) a^2/b^2 (c) a^2b^2 (d) None of these
16. ABCD is a trapezium with $AD \parallel BC$ and $AD = 4$ cm. 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
17. The value of $(\sin 45^\circ + \cos 45^\circ)$ is
 (a) $1\sqrt{2}$ (b) $\sqrt{2}$ (c) $\sqrt{3}/2$ (d) 1
18. Volumes of two spheres are in the ratio 64:27. The ratio of their surface areas is
 (a) 3:4 (b) 4:3 (c) 9:16 (d) 16:9

Direction : In the question number 19 & 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 but 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. Assertion (A): The point (0, 4) lies on y-axis.

Reason (R): The y co-ordinate of the point on x-axis is zero.

- (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

Questions 21 to 25 carry 2M each

21. If the system of equations $2x + 3y = 7$ and $(a + b)x + (2a - b)y = 21$ has infinitely many solutions, then find a and b .

22. Simplify: $\frac{\tan^2}{1 - \tan^2} - \frac{\cot^2}{1 - \cot^2}$

OR

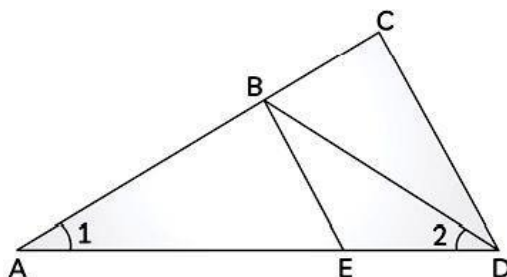
If $7 \sin^2 A + 3 \cos^2 A = 4$, then find $\tan A$

23. If the perimeter of a protractor is 72 cm, calculate its area. (Use $\pi = \frac{22}{7}$)

OR

Two circular pieces of equal radii and maximum area, touching each other are cut out from a Rectangular card board of dimensions 14 cm \times 7 cm. Find the area of the remaining card board. [Use $\pi = 22/7$]

24. In the given figure below, $AD/AE = AC/BD$ and $\angle 1 = \angle 2$. Show that $\triangle BAE \sim \triangle CAD$.



25. Find the length of the tangent from an external point P at a distance of 20 cm from the centre of a circle of radius 12 cm.

SECTION-C

Questions 26 to 31 carry 3 marks each

26. Two numbers are in the ratio of 1 : 3. If 5 is added to both the numbers, the ratio becomes 1 : 2. Find the numbers.

OR

A train covered a certain distance at a uniform speed. If the train would have been 6 km/h faster, it would have taken 4 hours less than the scheduled time. And, if the train were slower by 6 km/hr; it would have taken 6 hours more than the scheduled time. Find the length of the journey.

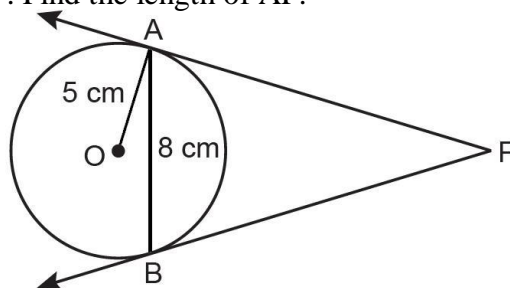
27. Given that $\sqrt{3}$ is irrational, prove that $2 + 5\sqrt{3}$ is irrational.

28. Two dice are thrown at the same time. What is the probability that the sum of the two numbers appearing on the top of the dice is (i) 7? (ii) 14? (iii) equal to 12?

29. If $\tan \frac{a}{b}$, prove that $\frac{a \sin b \cos}{a^2 b^2} = \frac{a^2 b^2}{a^2 b^2}$

30. If the zeroes of the polynomial $x^2 + px + q$ are double in value to the zeroes of $2x^2 - 5x - 3$, then find the values of p and q

31. In the given figure, AB is a chord of length 8 cm of a circle of radius 5 cm. The tangents to the circle at A and B intersect at P. Find the length of AP.



OR

Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

SECTION-D

Questions 32 to 35 carry 5M each

32. A motorboat whose speed in still water is 9 km/h, goes 15km downstream and comes back to the same spot, in a total time of 3 hours 45 minutes. Find the speed of the stream.

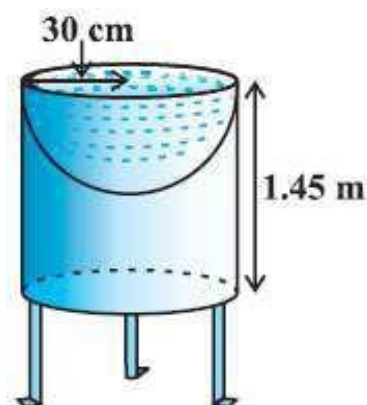
OR

A takes 6 days less than the time taken by B to finish a piece of work. If both A and B together can finish it in 4 days, find the time taken by B to finish the work.

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.

Using the above theorem prove that a line through the point of intersection of the diagonals and parallel to the base of the trapezium divides the non parallel sides in the same ratio.

34. Ramesh made a bird-bath for his garden in the shape of a cylinder with a hemispherical depression at one end. The height of the cylinder is 1.45 m and its radius is 30 cm. Find the total surface area of the bird-bath.



OR

A tent is in shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1m and 4m respectively and the slant height of the top is 2.8m. Find the area of canvas used for making the tent. Also find the cost of canvas of the tent at the rate of 500 per m^2 .

35. A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18 years onwards but less than 60 years.

Age (in years)	Number of policy holders
Below 20	2
20 – 25	4
25 – 30	18
30 – 35	21
35 – 40	33
40 – 45	11
45 – 50	3
50 – 55	6
55 – 60	2

SECTION-E (Case Study Based Questions)

Questions 36 to 38 carry 4M each

36. Aditya is a fitness freak and great athlete. He always wants to make his nation proud by winning medals and prizes in the athletic activities.

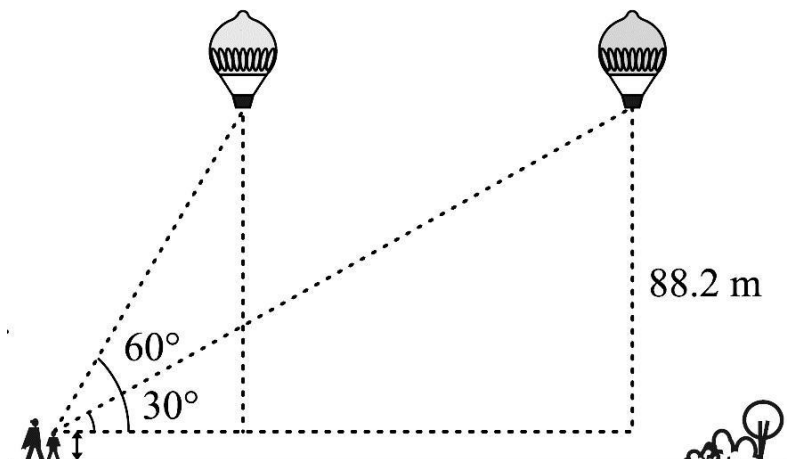


An upcoming activity for athletes was going to be organised by Railways. Aditya wants to participate in 200 m race. He can currently run that distance in 51 seconds. But he wants to increase his speed, so to do it in 31 seconds. With each day of practice, it takes him 2 seconds less.

- (i) He wants to make his best time as 31 sec. In how many days will he be able to achieve his target?
(ii) What will be the difference between the time taken on 5th day and 7th day.

(ii) Which term of the arithmetic progression 3, 15, 27, 39 ... will be 120 more than its 21st term?

37. A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at any instant is 60° . After 30 seconds, the angle of elevation reduces to 30° (see the below figure).



Based on the above information, answer the following questions. (Take $\sqrt{3} = 1.732$)

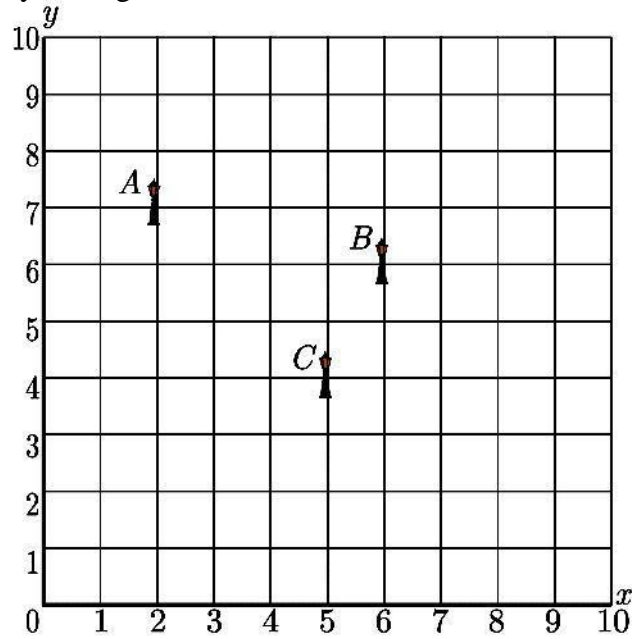
- (i) Find the distance travelled by the balloon during the interval. (2)
(ii) Find the speed of the balloon. (2)

OR

(ii) If the elevation of the sun at a given time is 30° , then find the length of the shadow cast by a tower of 150 feet height at that time. (2)

38. Resident Welfare Association (RWA) of a Gulmohar Society in Delhi have installed three electric poles A, B and C in a society's common park. Despite these three poles, some parts of the park are

still in dark. So, RWA decides to have one more electric pole D in the park. The park can be modelled as a coordinate systems given below.



On the basis of the above information, answer any four of the following questions:

- (i) What is the position of the pole C? (1)
- (ii) What is the distance of the pole B from the corner O of the park? (1)
- (iii) Find the position of the fourth pole D so that four points A, B, C and D form a parallelogram. (2)

OR

- (iii) What is the distance between poles A and C? (2)