MASTER YOUR MATHS

15 Complete Sample Papers for CBSE Class 10 (2026 Board)

Based on the Latest CBSE Syllabus

Mr. Amit Mittal

PGT Mathematics, St. Francis School Baraut

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Preface

CBSE's continuous reforms in the assessment system highlight a strong shift towards Competency-Based Education (CBE), where understanding, reasoning, and real-life application stand above memorization. Mathematics, as a discipline, remains central to nurturing essential 21st-century skills such as logical reasoning, analytical thinking, quantitative literacy, and decision-making.

This book, "Master Your Maths – 15 Complete Sample Papers for CBSE Class 10 (2026 Board)", has been crafted in alignment with the Latest CBSE Syllabus and Assessment Framework 2026, ensuring that students receive rich, meaningful, and exam-oriented practice.

The sample papers in this book incorporate the full spectrum of Bloom's Taxonomy:

- *Remembering & understanding – strengthening foundations*
- *Applying – using concepts in real-life situations*
- *Analysing & evaluating – developing higher-order thinking*
- *Creating – encouraging students to think beyond routine methods*

To support CBSE's vision of competency-driven assessment, each paper includes:

- ✓ *Case-based questions*
- ✓ *Data-based and source-based items*
- ✓ *Real-life mathematical applications*
- ✓ *Higher Order Thinking Skills (HOTS)*
- ✓ *Integrated, interdisciplinary questions*
- ✓ *Variety in question typology as per CBSE 2026 Blueprint*

With carefully graded difficulty, each paper allows students to progress from confidence-building exercises to advanced problem-solving tasks. Practising these papers in timed conditions will help learners develop speed, accuracy, and exam temperament.

I encourage students to use this book as a tool for reflection: identify errors, analyse patterns, and strengthen weaker areas. Learning mathematics is a journey—made meaningful through consistent practice and mindful revision.

I sincerely hope this book supports every learner in not only achieving excellent marks but also in developing a deep and lasting understanding of Mathematics.

Mr. Amit Mittal
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TIME MANAGEMENT FOR THE CBSE 2026 BOARD EXAM

Success in Mathematics depends not only on understanding concepts but also on solving questions within the time limit. Many students know the method but struggle to complete the paper on time. Effective time management can significantly improve marks and reduce exam stress.

This page gives a simple, practical strategy that students can follow while attempting each of the 15 sample papers in this book—and during the actual CBSE Board Examination.

Section A – Objective Type (1 Mark Each)

Section A consists of 20 objective-type questions, each carrying one mark. Most questions in this section are direct and can be solved within 10–20 seconds, though a few may require slightly more time. A good strategy is to aim for **one minute per question** and comfortably complete this entire section within **30 minutes**, ensuring accuracy while keeping enough time for later sections.

Section B – Short Answer (2 Marks Each)

Section B contains five two-mark questions that involve short calculations, reasoning, or simple steps. Since these questions are slightly lengthier than Section A, you should aim to spend **two minutes per question**, and keep **five minutes extra** as a safety margin. This allows you to complete Section B smoothly in about **15 minutes**, without rushing through important details.

Section C – Application-Based (3 Marks Each)

Section C has six questions of three marks each. These require explanation, proper steps, and sometimes a construction-based question may appear here. It is advisable to spend **four minutes per question** and keep **six minutes extra** for flexibility. With this plan, the whole section can be completed in **30 minutes**, ensuring clear and well-presented solutions.

Section D – Long Answer (4 Marks Each)

Section D comprises four long-answer questions, each worth four marks. These questions involve multiple steps, conceptual understanding, and careful presentation. You should aim to spend **ten minutes per question**, along with **ten extra minutes** for review. This brings the total time for Section D to about **50 minutes**, allowing you to complete the longest part of the paper without pressure.

Section E – Case-Based Questions

Section E consists of three case-based questions that require careful reading and application of concepts. You should plan **10 minutes for each case study**, making it **30 minutes** for the full section, and keep an additional **5 minutes extra** for safety.

Extra 20 Minutes – Final Checking

After completing all five sections of the paper, you will still have around **20 minutes** left. This time should be used wisely for rechecking your solutions, verifying calculations, correcting small mistakes, and ensuring that all diagrams, graphs, and constructions are neat and accurate.

Proper utilisation of these final 20 minutes helps you submit a clean, error-free and confident answer sheet.

Blueprint for CBSE 2026 Pre-Board Exams

(NOT OFFICIAL)

CH.NO.	NAME OF CHAPTERS	1 MARK (20)	2 MARK (5)	3 MARK (6)	5 MARK (4)	4 MARK (3)	TOTAL 80(38)
1	REAL NUMBERS	1(1)	2(1)	3(1)			6(3)
2	POLYNOMIALS	2(2)		3(1)			5(3)
3	PAIR OF LINEAR EQUATIONS IN TWO VARIABLES	1(1)			5(1)		6(2)
4	QUADRATIC EQUATIONS	1(1)		3(1)			4(2)
5	ARITHMETIC PROGRESSIONS	2(2)	2(1)				4(3)
6	TRIANGLES		2(1)	6(2)		4(1)	8(3)
7	COORDINATE GEOMETRY	2(2)	2(2)				6(4)
8	INTRODUCTION TO TRIGONOMETRY	1(1)	2(1)	3(1)			6(3)
9	SOME APPLICATIONS OF TRIGONOMETRY	1(1)			5(1)		6(2)
10	CIRCLES	2(2)			5(1)		7(3)
11	AREAS RELATED TO CICLES	1(1)		3(1)			4(2)
12	SURFACE AREAS AND VOLUMES	2(2)				4(1)	6(3)
13	STATISTICS	2(2)			5(1)		7(3)
14	PROBABILITY	1(1)				4(1)	5(2)
	TOTAL	**20(20)**	**10(5)**	**18(6)**	**20(4)**	**12(3)**	**80(38)**

ST Francis School Baraut

Series : SFS/02/01

SET – 1

ROLL No.

Q.P Code 10/02/01

Candidates must write the Q.P Code on the title page of the Answer book.

- Please check that this question paper contains 7 printed pages.
- Please check that this question paper contains 38 questions.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please write down the serial number of the question in the answer-book before attempting it.
- 15 minute time has been allotted to read this question paper.
- The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

गणित
MATHEMATICS

निर्धारित समय : 3 घण्टे | *अधिकतम अंक : 80*

Time allowed : 3 hours | *Maximum Marks : 80*

General Instructions:

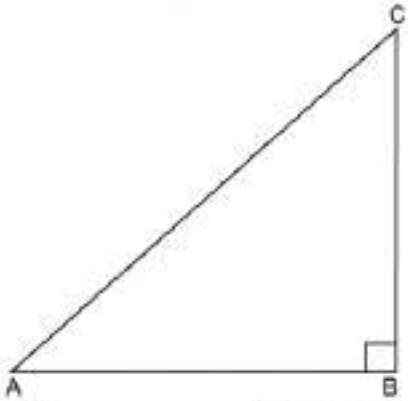
Read the following instructions carefully and follow them:

1. *This question paper contains* ***38 questions****. All Questions are compulsory.*
2. *This Question Paper is divided into* ***5*** *Sections* ***A, B, C, D*** *and* ***E.***
3. *In* ***Section A****, Question numbers* ***1-18*** *are multiple choice questions (MCQs) and questions no.* ***19*** *and* ***20*** *are Assertion-Reason based questions of* ***01*** *mark each.*
4. *In* ***Section B****, Question numbers* ***21-25*** *are very short answer (VSA) type questions, carrying* ***02*** *marks each.*
5. *In* ***Section C****, Question numbers* ***26-31*** *are short answer (SA) type questions, carrying* ***03*** *marks each.*
6. *In* ***Section D****, Question numbers* ***32-35*** *are long answer (LA) type questions, carrying* ***05*** *marks each.*
7. *In* ***Section E****, Question numbers* ***36-38*** *are case study-based questions carrying* ***4*** *marks each with sub parts of the values of* ***1****,* ***1*** *and* ***2*** *marks each respectively.*
8. *There is no overall choice. However, an internal choice in* ***2*** *questions of* ***Section B****,* ***2*** *questions of* ***Section C*** *and* ***2*** *questions of* ***Section D*** *has been provided. An internal choice has been provided in all the* ***2*** *marks questions of* ***Section E.***
9. *Draw neat and clean figures wherever required. Take* $\pi = \frac{22}{7}$ *wherever required if not stated.*
10. *Use of calculators is* ***NOT*** *allowed.*

SECTION – A

Section A consists of 20 questions of 1 mark each.

1. In given triangle if $\sin A \times$ trigonometric ratio $(C) = 1$, then trigonometric ratio is **[Conceptual Application]**



(*a*) cos C (*b*) sec C (*c*) cosec C (*d*) cot C

2. A bag contains 3 red, 4 black and 1 white ball, a ball is drawn from the bag, the probability of drawing a green ball is **[Conceptual Application]**

(*a*) $\frac{1}{8}$ (*b*) $\frac{1}{2}$ (*c*) 0 (*d*) $\frac{3}{8}$

3. For the given distribution, class size of 4th class is **[Conceptual Application]**

x	f
1–6	3
7–12	9
13–18	7
19–24	6
25–30	3

(*a*) 21.5 (*b*) 5 (*c*) 6 (*d*) 1

4. The diameter of a car wheel is 42 cm. The number of complete revolutions it will make in moving 132 km is **[Conceptual Application]**

(*a*) 10^4 (*b*) 10^5 (*c*) 10^6 (*d*) 10^3

5. The time in seconds, taken by 150 athletes to run a 110 m hurdle race are tabulated as **[Conceptual Application]**

Time in seconds	Number of athletes
13.8–14.0	2
14.0–14.2	4
14.2–14.4	5
14.4–14.6	71
14.6–14.8	48
14.8–15.0	20

The number of athletes who completed the race in less than 14.6 seconds is **[Conceptual Application]**

(*a*) 11 (*b*) 71 (*c*) 82 (*d*) 130

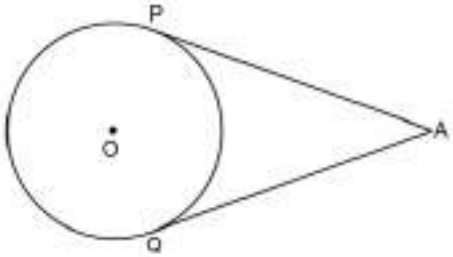
6. The length of diagonal of a cube is $10\sqrt{3}$ cm, if two such cubes are joined end to end then surface area of solid so formed is **[Conceptual Application]**

(*a*) 1000 cm^3 (*b*) 2000 cm^3 (*c*) 2000 cm^2 (*d*) 1000 cm^2

7. A wire is in the form of a circle of radius 28 cm. It is cut and formed into a square, the diagonal of the square thus formed is **[Conceptual Application]**

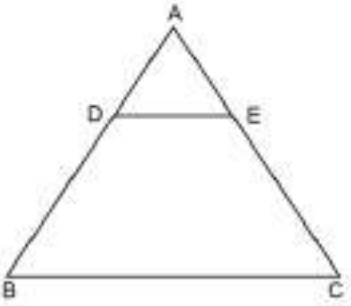
(*a*) 44 cm (*b*) 176 cm (*c*) $44\sqrt{2}$ cm (*d*) 88 cm

8. In the given figure, AP and AQ are tangents to a circle with centre O and radius 4 cm. If distance of A from circumference of circle is 5 cm, then length of AQ is **[Conceptual Application]**



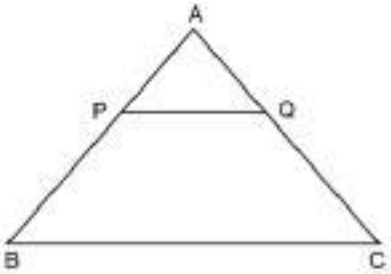
(*a*) $\sqrt{65}$ cm (*b*) 8 cm (*c*) 4 cm (*d*) 3 cm

9. In the given figure, DE || BC, and AD : DB = 1 : 2, then perimeter(ΔABC) : perimeter(ΔADE) is **[Conceptual Application]**



(a) 1 : 2 (b) 1 : 4 (c) 1 : 3 (d) 3 : 1

10. In the given figure, points P and Q are such that AP = 2 cm, PB = 4 cm, AQ = 3 cm, QC = 6 cm. If BC = λPQ, then λ is **[Conceptual Application]**



(a) 3 (b) 6 (c) 2 (d) 4

11. If $3x = \sec\theta$ and $\frac{3}{x} = \tan\theta$, then value of $4\left(x^2 - \frac{1}{x^2}\right)$ is **[Conceptual Application]**

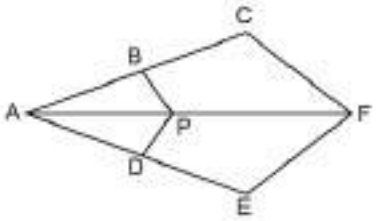
(a) $\frac{4}{9}$ (b) $\frac{4}{3}$ (c) $\frac{1}{9}$ (d) $\frac{1}{3}$

12. If $\sin A = \frac{\sqrt{3}}{2}$, then value of $2\cot^2 A - 1$ is **[Conceptual Application]**

(a) 5 (b) $-\frac{1}{3}$ (c) $\frac{1}{3}$ (d) $2\sqrt{3} - 1$

13. In the given figure, AB = 2 cm, AC = 8 cm. **[NCERT, Page 84]**

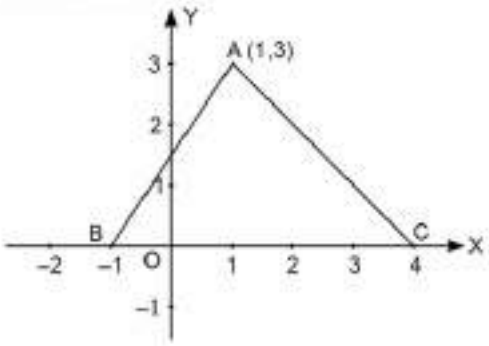
If PB || CF and DP || EF then $\frac{AD}{DE}$ is



(a) $\frac{3}{4}$ (b) $\frac{1}{3}$

(c) $\frac{1}{4}$ (d) $\frac{2}{3}$

14. In the given figure, perimeter of ΔABC is **[Conceptual Application]**



(a) $(\sqrt{2} + 3 + \sqrt{13})$ units (b) $(\sqrt{13} + 3\sqrt{2} + 4)$ units

(c) $(\sqrt{13} + 3\sqrt{2} + 5)$ units (d) $(\sqrt{13} + 2\sqrt{3} + 5)$ units

15. For what values of k, the following pair of equations has no solution? **[NCERT, Page 26]**

$2x + 3y = 5$ and $6x + ky = 15$

(a) $k = 9$ (b) $k \neq 9$ (c) $k = \pm 9$ (d) no value of k

16. Sum of zeroes of a quadratic polynomial is (-9) if one of the zeroes is 2, then polynomial is **[Conceptual Application]**

(a) $x^2 - 9x - 2$ (b) $x^2 - 9x + 11$ (c) $x^2 + 9x - 22$ (d) $x^2 + 9x + 22$

17. Roots of quadratic equation $ax^2 + bx + c = 0$ are real and equal, if **[NCERT, Page 45]**

(a) $b^2 < 4ac$ (b) $b^2 = 4ac$ (c) $4ac \leq b^2$ (d) $4ac < b^2$

18. Sum of two irrational numbers **[Conceptual Application]**

(a) is always a natural number (b) is always an irrational number

(c) is a real number (d) can be rational or irrational number

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.

(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.

19. **Assertion (A):** The number 6^n never ends with digit '0' for any natural number 'n'.

Reason (R): The number a^n never ends with digit '0' for any natural number 'n'. **[Conceptual Application]**

20. **Assertion (A):** The points $(-1, 3)$, $(2, 1)$ and $(5, -1)$ are collinear.

Reason (R): If we plot these points on graph, they all lie on a line. **[Conceptual Application]**

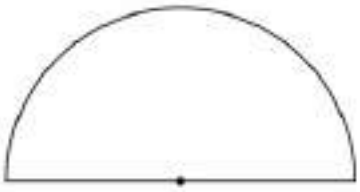
SECTION – B

Section B consists of 5 questions of 2 marks each.

21. (A) The length of minute hand of a clock is 14 cm. Find the area swept by it from 8:05 a.m. to 8:25 a.m. **[NCERT, Page 158]**

OR

(B) Find the radius of the protractor if its perimeter is 72 cm. **[Conceptual Application]**

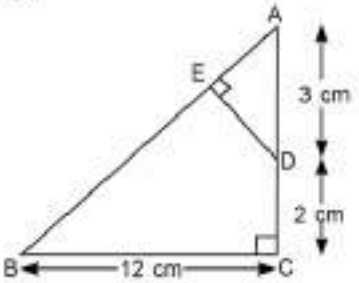


22. (A) If $\cot A = \frac{12}{5}$, find the value of $(\sin A + \cos A)\operatorname{cosec} A$. **[NCERT, Page 121]**

OR

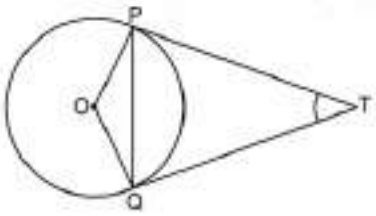
(B) At sometime of the day, the length of the shadow of the tower is equal to its height. Find the supplement of Sun's altitude at that time. **[Conceptual Application]**

23. In the given figure, ΔABC is right-angled at C and DE perpendicular to AB, AD = 3 cm, DC = 2 cm, BC = 12 cm, find DE. **[Conceptual Application]**



24. Solve for x and y algebraically : $x + 6y = 6$; $3x + 18y = 5$ **[NCERT, Page 36]**

25. In figure, PQ is a chord of length 8 cm of a circle of radius 5 cm. The tangents at P and Q intersect at point T. Find length of TP and TQ. **[NCERT, Page 150-151]**



SECTION – C

Section C consists of 6 questions of 3 marks each.

26. Two dice are thrown simultaneously, what is the probability that **[Conceptual Application]**

(*i*) 5 will not come up on either of them?

(*ii*) 5 will come up on at least once?

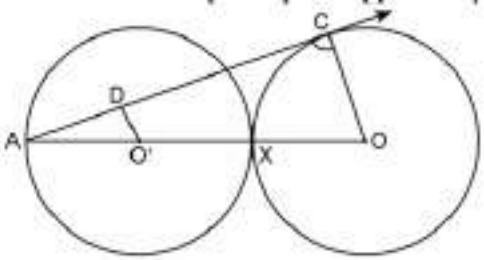
(*iii*) 5 will come up at both the dice?

27. Prove that $\cos^4 A + \sin^2 A = \sin^4 A + \cos^2 A$. **[Conceptual Application]**

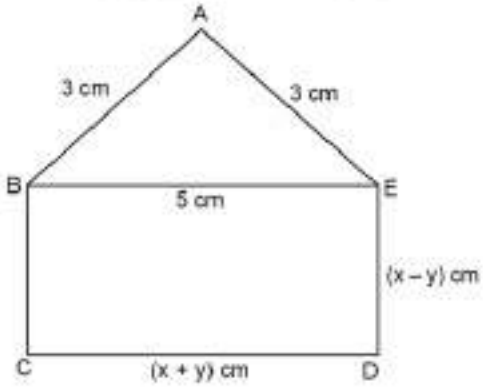
28. (A) ABC is an isosceles triangle in which AB = AC circumscribing about a circle. Show that BC is bisected at the point of contact. **[Conceptual Application]**

OR

(B) In given figure, two equal circles with centres O and O′ touch each other at X. OO′ produced meets the circle with centre O′ at A. AC is tangent to the circle with centre O, at point C. O′D is perpendicular to AC, find $\frac{DO'}{CO}$. **[Conceptual Application]**



29. (A) In the given figure, ABCDE is a pentagon with BE || CD and BC || ED. BCDE is a rectangle. If perimeter of pentagon is 21 cm, find the value $3x - 5y$. **[Conceptual Application]**



OR

(B) The incomes of A and B are in the ratio of 8 : 7 and their expenditure are in the ratio of 19 : 16. If each saves ₹ 1250, find the income of each A and B. **[NCERT, Page 34]**

30. For the quadratic polynomial $f(x) = ax^2 + bx + c, a \neq 0$ if $a + c = b$, find the zeroes of the polynomial.

[Conceptual Application]

31. Prove that $\sqrt{3}$ is an irrational number. **[NCERT, Page 7-8]**

SECTION – D

Section D consists of 4 questions of 5 marks each.

32. If the mean of following frequency distribution is 91, find the missing frequencies f_1 and f_2.

[Conceptual Application]

Class interval	Frequency
0 – 30	12
30 – 60	21
60 – 90	f_1
90 – 120	52
120 – 150	f_2
150 – 180	11
	150

33. (A) A circus tent was erected in a village for circus shows. Tent is cylindrical surmounted by a conical tent. The diameter of circular tent is 120 m and height 15 m. The total height of tent is 26 m. Find the canvas required to make the circus tent. If it costs ₹ 200 per metre of length with standard width of 15 m. Find the total cost in erecting the tent. **[Conceptual Application]**

OR

(B) Given a cylinder, cone having same radius of base and height equal to diameter of base. If sphere of radius, equal to base of cylinder is taken find the ratio of volume of a cylinder, a cone and a sphere. **[Conceptual Application]**

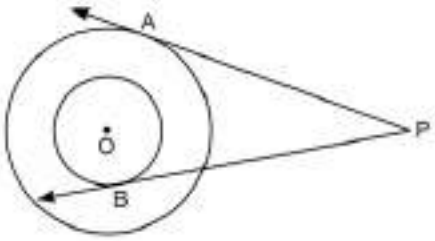
34. Prove that tangent to a circle is perpendicular to radius of a circle at the point of contact.

[NCERT, Page 146-147]

Using the above solve the following:

In figure there are two concentric circles with centre O and of radius 5 cm and 3 cm. From an external point P, tangents PA and PB are drawn to these circles. If PA = 12 cm, find the length of BP.

[Conceptual Application]



35. (A) A and B have certain number of mangoes. A says to B "If you give me 30 of your mangoes, I will have twice as many as left with you." B replies "if you give me 10, I will have thrice as many as left with you." How many mangoes does each have? **[Conceptual Application]**

OR

(B) Solve the following system of equations graphically:

$3x - 2y - 1 = 0, 2x - 3y + 6 = 0$

Shade the region bounded by the lines and the x-axis. **[Conceptual Application]**

SECTION – E

Section E consists of 3 case study based questions of 4 marks each.

36. You must have seen lighthouse on sea routes. These lighthouses help the sailor to locate the danger of striking ship with rocks or any other accidental eventually. A lighthouse is 100 m high and a ship is 80 m away and deck of ship is 20 m above sea level.

Now answer the following: **[Integrated]**

(*i*) If the sailor is looking at the lighthouse, what is the angle of elevation?

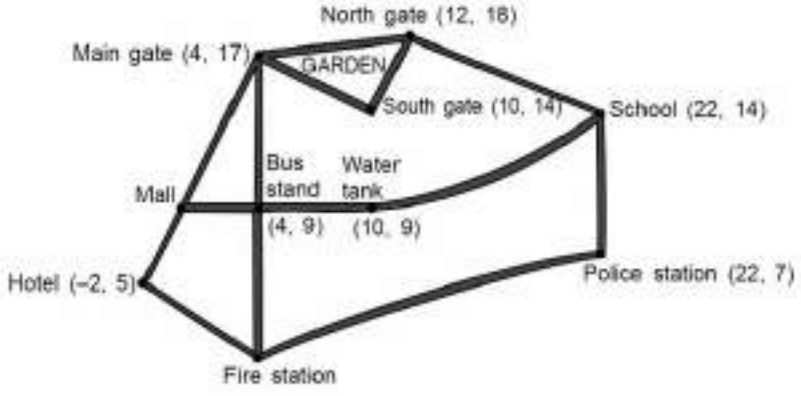
(*ii*) If angle of depression of ship from lighthouse is 45°, then at how much distance is ship from lighthouse?

(*iii*) (A) What is tangent of angle of depression of image of lighthouse?

OR

(B) What is depth of image of lighthouse from deck of the ship?

37. Shown below is a map of Giri's neighbourhood.



Giri did a survey of his neighbourhood and collected the following information.

- The hotel, mall and the main gate of the garden lie in a straight line.
- The distance between the hotel and the mall is half the distance between the mall and the main gate of the garden.
- The bus stand is exactly midway between the main gate of the garden and the fire station.
- The mall, bus stand and the water tank lie in a straight line.

Now answer the following: **[Integrated]**

(*i*) What is the x-coordinate of the mall's location?

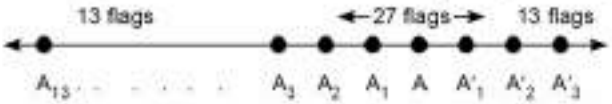
(*ii*) What are the coordinates of the fire station?

(*iii*) (A) What is the shortest distance between the water tank and the school?

OR

(B) How much more is the shortest distance of the school from the water tank than the distance of the school from the police station?

38. The students of a school decided to beautify the school on annual day by fixing colourful flags on straight passage of the school. They have 27 flags to be fixed at intervals of every 2 m. The flags are stored at the position of the middle most flag. Ruchi was given the responsibility of placing the flags. Ruchi kept her books where flags were stored. She could carry only one flag at a time.



Now answer the following: **[Integrated]**

(*i*) How much distance did she cover in completing the job and returning back to collect her book?

(*ii*) At what place is the middle most flag?

(*iii*) (A) What is the maximum distance she travelled carrying a flag?

OR

(B) What is distance between 3rd and 5th flags from middle on either side of middle flag?

ST Francis School
Baraut

Series : SFS/02/02

SET – 2

ROLL No.

Q.P Code 10/02/02

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गणित
MATHEMATICS

निर्धारित समय : 3 घण्टे | *अधिकतम अंक : 80*

Time allowed : 3 hours | *Maximum Marks : 80*

General Instructions:

Read the following instructions carefully and follow them:

1. *This question paper contains **38 questions**. All Questions are compulsory.*
2. *This Question Paper is divided into **5** Sections **A, B, C, D** and **E**.*
3. *In **Section A**, Question numbers **1-18** are multiple choice questions (MCQs) and questions no. **19** and **20** are Assertion-Reason based questions of **01** mark each.*
4. *In **Section B**, Question numbers **21-25** are very short answer (VSA) type questions, carrying **02** marks each.*
5. *In **Section C**, Question numbers **26-31** are short answer (SA) type questions, carrying **03** marks each.*
6. *In **Section D**, Question numbers **32-35** are long answer (LA) type questions, carrying **05** marks each.*
7. *In **Section E**, Question numbers **36-38** are case study-based questions carrying **4** marks each with sub parts of the values of **1, 1** and **2** marks each respectively.*
8. *There is no overall choice. However, an internal choice in **2** questions of **Section B**, **2** questions of **Section C** and **2** questions of **Section D** has been provided. An internal choice has been provided in all the **2** marks questions of **Section E**.*
9. *Draw neat and clean figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.*
10. *Use of calculators is **NOT** allowed.*

SECTION – A

Section A consists of 20 questions of 1 mark each.

1. If $\sin\theta - \cos\theta = 0$, then the value of $(\sin^4\theta + \cos^4\theta)$ is **[Conceptual Application]**

(a) 1 (b) $\frac{3}{4}$ (c) $\frac{1}{2}$ (d) $\frac{1}{4}$

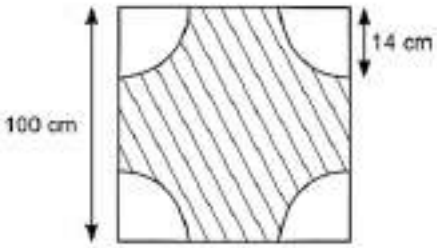
2. Radius of circumcircle of a triangle ABC is $5\sqrt{10}$ units. If point P is equidistant from A(1, 3), B(– 3, 5) and C(5, – 1), then AP = **[Conceptual Application]**

(a) 5 units (b) $5\sqrt{5}$ units (c) 25 units (d) $5\sqrt{10}$ units

3. The mean age of combined group of men and women is 30 years. If the mean of the age of men and women are respectively 32 and 27, then the percentage of women in the group is **[Conceptual Application]**

(a) 30 (b) 20 (c) 50 (d) 40

4. In figure, at each corner of square side 100 cm, a quadrant of radius 14 cm is formed, then area of shaded region is **[Conceptual Application]**



(a) 9834 cm^2 (b) 9348 cm^2 (c) 9384 cm^2 (d) 9884 cm^2

5. The relationship between mean, median and mode for a moderately skewed distribution is **[NCERT, Page 197]**

(a) mode = median – 2 mean (b) mode = 3 median – 2 mean

(c) mode = 2 median – 3 mean (d) mode = median – mean

6. The curved surface area of a cylinder of height 14 cm is 88 cm^2, then diameter of the cylinder is **[Conceptual Application]**

(a) 8.5 cm (b) 1 cm (c) 1.5 cm (d) 2 cm

7. The length of the minute hand of a wall clock is 7 cm, then how much area does it sweep in 20 minutes? **[NCERT, Page 158]**

(a) 51 cm^2 (b) 49.33 cm^2 (c) 51.33 cm^2 (d) 52 cm^2

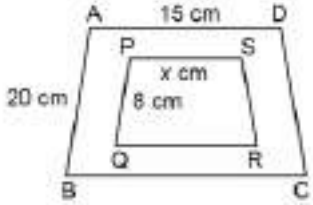
8. $\sin 45° - \cos 45°$ is equal to **[NCERT, Page 125]**

(a) $2\cos\theta$ (b) 0 (c) $2\sin\theta$ (d) 1

9. Distance between two parallel tangents is 14 cm, then the radius of circle is **[NCERT, Page 152]**

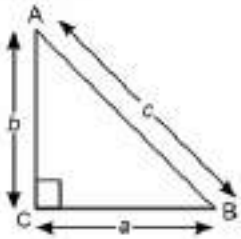
(a) 6 cm (b) 7 cm (c) 12 cm (d) 14 cm

10. If quadrilateral ABCD and PQRS are similar, then x = **[Conceptual Application]**



(a) 4 cm (b) 5 cm (c) 6 cm (d) 7 cm

11. In ΔABC, $\angle C = 90°$, then $\tan A + \tan B$ = **[Conceptual Application]**



(a) $\frac{b^2}{ac}$ (b) $a + b$ (c) $\frac{a^2}{bc}$ (d) $\frac{c^2}{ab}$

12. In right triangle, $\angle B = 90°$, AB = 24 cm, BC = 7 cm, then $\cos C$ = **[NCERT, Page 121]**

(a) $\frac{7}{24}$ (b) $\frac{24}{25}$ (c) $\frac{25}{24}$ (d) $\frac{7}{25}$

13. What is the largest number that divides each one of 1152 and 1664 exactly? **[Conceptual Application]**

(a) 32 (b) 64 (c) 128 (d) 256

14. The ratio in which the line $3x + y - 9 = 0$ divides the line segment joining the points (1, 3) and (2, 7) is **[Conceptual Application]**

(*a*) 3 : 2 (*b*) 2 : 3 (*c*) 3 : 4 (*d*) 4 : 3

15. Three runners running around a circular track, can complete one revolution in 2, 3 and 4 hrs respectively. They will meet again at the starting point after **[Conceptual Application]**

(*a*) 8 hrs (*b*) 6 hrs (*c*) 12 hrs (*d*) 18 hrs

16. If the zeroes of the quadratic polynomial $x^2 + (a + 1)x + b$ are 2 and –3, then **[Conceptual Application]**

(*a*) $a = -7, b = -1$ (*b*) $a = 5, b = -1$ (*c*) $a = 2, b = -6$ (*d*) $a = 0, b = -6$

17. A quadratic polynomial whose zeroes are $\frac{3}{5}$ and $-\frac{1}{2}$ are **[Conceptual Application]**

(*a*) $10x^2 - x - 3$ (*b*) $10x^2 + x - 3$ (*c*) $10x^2 - x + 3$ (*d*) None of these

18. 4 bells toll together at 9:00 am. They toll after 7, 8, 11 and 12 seconds respectively. How many times will they toll together again in the next 3 hours? **[Conceptual Application]**

(*a*) 3 (*b*) 4 (*c*) 5 (*d*) 6

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.

(*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.

19. **Assertion (A):** PA and PB are two tangents to a circle with centre O, such that $\angle AOB = 110°$, then $\angle APB = 90°$.

Reason (R): The length of two tangents drawn from an external point are equal. **[Integrated]**

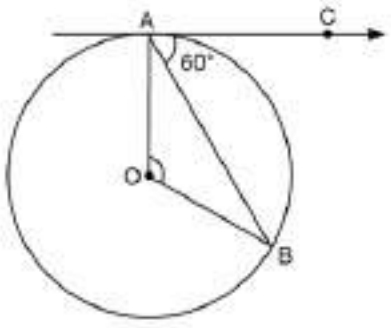
20. **Assertion (A):** Pair of linear equations: $9x + 3y + 12 = 0$, $8x + 6y + 24 = 0$ have infinitely many solutions.

Reason (R): Pair of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions, if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ **[NCERT, Page 26]**

SECTION – B

Section B consists of 5 questions of 2 marks each.

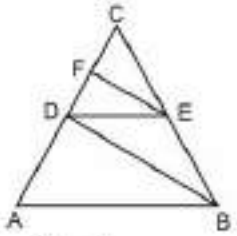
21. In the given figure, O is the centre of a circle. AB is a chord and the tangent AC at A makes an angle of 60° with AB. Find $\angle AOB$. **[Conceptual Application]**



22. Find the number of solutions of the following pair of linear equations: [NCERT, Page 26]

$$3x - 3y = 5$$
$$7x - 2y = 2$$

23. In fig. AB || DE and BD || EF. Prove that $DC^2 = CF \times AC$ [Conceptual Application]



24. (A) For $\theta = 30°$, verify that: $\sin 2\theta = \dfrac{2\tan\theta}{1+\tan^2\theta}$. [NCERT, Page 127]

OR

(B) If $x = p\cos^3\theta$ and $y = q\sin^3\theta$, prove that $\left(\dfrac{x}{p}\right)^{2/3} + \left(\dfrac{y}{q}\right)^{2/3} = 1$ [Conceptual Application]

25. (A) A chord of circle of radius 28 cm subtends a right angle at the centre. What is the area of the minor sector? [NCERT, Page 158]

OR

(B) The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes. [NCERT, Page 158]

SECTION – C

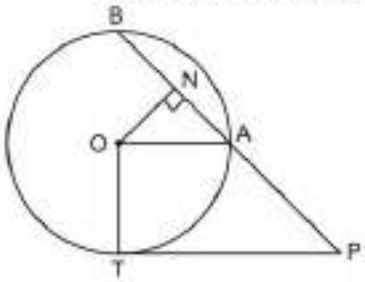
Section C consists of 6 questions of 3 marks each.

26. A boy standing on a horizontal plane finds a kite flying at a distance of 150 m from him at an angle of elevation of 30°. A girl standing on the roof of 30 m high building finds the angle of elevation of the same kite to be 45°. Both boy and girl are on the opposite side of the kite. Find the distance of the kite from the girl. [Conceptual Application]

27. (A) In the given figure, PT is a tangent and PAB is a secant to a circle with centre O. ON is perpendicular to the chord AB. Prove that: [Conceptual Application]

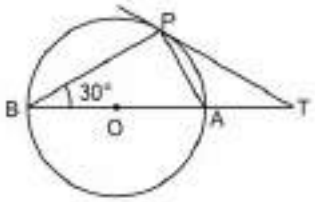
(*i*) $PA \cdot PB = PN^2 - AN^2$

(*ii*) $PN^2 - AN^2 = OP^2 - OT^2$



OR

(B) In the given figure, O is the centre of the circle and TP is the tangent to the circle from an external point T. If $\angle PBT = 30°$, prove that BA : AT = 2 : 1. [Conceptual Application]



28. If $\sin(A + 2B) = \frac{\sqrt{3}}{2}$ and $\cos(A + 4B) = 0$, $A > B$, and $A + 4B \leq 90°$, then find A and B.

[NCERT, Page 126]

29. (A) Find the zeroes of the polynomial $4\sqrt{3}x^2 + 4\sqrt{3}x - 3\sqrt{3}$. Also, verify the relationship between the zeroes and the coefficients. **[NCERT, Page 23]**

OR

(B) Solve for x: $\frac{4}{x} - 3 = \frac{5}{2x + 3}, x \neq 0, \frac{-3}{2}$. **[Conceptual Application]**

30. Solve for x and y:

$ax + by = a^2 - b^2$

$bx + y = b(a - 1)$ **[NCERT, Page 36]**

31. Prove that $15 + 17\sqrt{3}$ be an irrational number. **[NCERT, Page 9]**

SECTION – D

Section D consists of 4 questions of 5 marks each.

32. The marks obtained by 100 students in a mathematics test consisting of 100 marks are given in the following table:

Marks obtained	Number of students
0 – 14	8
14 – 28	20
28 – 42	28
42 – 56	18
56 – 70	26

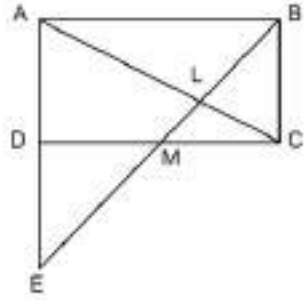
Find the mean marks obtained by the students. **[NCERT, Page 181]**

33. (A) Find the number of bricks, each measuring 25 cm × 12.5 cm × 7.5 cm, required to construct a wall 24 m long, 20 m high and 0.5 m thick while the cement and sand mixture occupies $\frac{1}{20}$th of the volume of the wall. **[Conceptual Application]**

OR

(B) Irrigation canals are used to move water from a source (whether it is a stream, reservoir or holding tank). A farmer connects a pipe of internal diameter 20 cm from a canal into a cylindrical tank in his field, which is 10 m in diameter and 2 m deep. If water flows through the pipe at the rate of 6 km/h, in how much time will the tank be filled? **[Conceptual Application]**

34. In the given figure, M is mid-point of the side CD of a rectangle ABCD. BM when joined meets AC at L and AD produced at E. Prove that EL = 2BL. **[Conceptual Application]**



35. (A) The sum of three numbers of an AP is 3 and the product of the first and the third number is (–35). Find the three numbers. **[Conceptual Application]**

OR

(B) Shalini gets pocket money from her father every day. Out of the pocket money, she saves ₹ 30 on the first day and on each succeeding day, she increases her savings by 500 paise. At the end of every month, Shalini purchases some biscuits packs, toffees and nuts from the amount that she saved and distribute these items to the needy children in her school. **[Conceptual Application]**

(*i*) Find the amount saved by Shalini on 10th day.

(*ii*) Find the total amount saved by Shalini in 30 days.

SECTION – E

Section E consists of 3 case study based questions of 4 marks each.

Case study based questions are compulsory.

36. Two friends Raj and Anuj have to travel to Shimla via Chandigarh from Gurgaon. When they reached the bus stand of Gurgaon, Raj got a call from his friend Ankit who was also on his way to bus stand. Ankit requested Raj to buy two tickets to Chandigarh and 3 tickets to Shimla also Anuj's friend Kamal asked Anuj to buy 3 tickets to Chandigarh and 4 tickets to Shimla. Raj purchased 2 tickets to Chandigarh and 3 tickets to Shimla for ₹ 3700, Anuj spent ₹ 5100 to buy 3 tickets to Chandigarh and 4 tickets to Shimla.

Now answer the following **[Integrated]**

(*i*) If cost of one ticket to Chandigarh is ₹ x and cost of one ticket to Shimla is ₹ y then represent the situation algebraically.

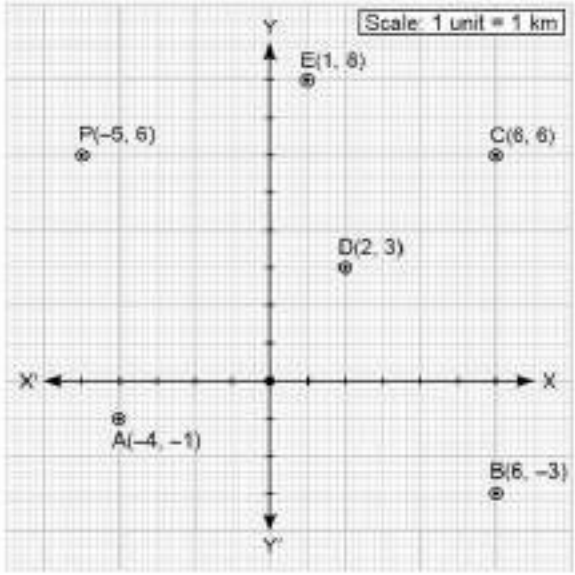
(*ii*) Find the cost of one ticket from Gurgaon to Chandigarh.

(*iii*) (A) If Raj purchases 3 tickets to Chandigarh and 5 tickets to Shimla, how much amount he will pay?

OR

(B) If Anuj spends ₹ 5600 to buy tickets find how many total number of tickets he purchased?

37. Five ships are positioned in the Indian Ocean. Their positions were plotted on a graph paper in reference to a rectangular coordinate axes.



An enemy ship is spotted at P(–5, 6).

Now answer the following **[Integrated]**

(*i*) What is the distance between P and E?

(*ii*) Find the coordinates of mid-point of BD.

(*iii*) (A) Ship D is moved to a position which is mid-point of AE. Find the distance moved by D.

OR

(B) We find a rock at new position G such that B, G and C are in a straight line and BG : GC = 3 : 1 then find the coordinates of G.

38. Group of friends playing with cards bearing numbers 5 to 50. All cards placed in a box and are mixed thoroughly one friend withdrawns the card from box at random and then replace it.

				5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35
36	37	38	39	40
41	42	43	44	45
46	47	48	49	50

Answer the questions based on above **[Integrated]**

(*i*) What is the probability that the card withdrawn from the box bears a prime number less than 10?

(*ii*) What is the probability that the card withdrawn from the box bears a number which is a perfect square?

(*iii*) (A) What is the probability that the card withdrawn from the box bears a number which is multiple of 7 between 40 and 50?

OR

(B) Find the probability of drawing a card bearing number 5 and 50.

ST Francis School
Baraut

ESTD. 2016

Series : SFS/02/03

SET – 3

ROLL No.

Q.P Code 10/02/03

Candidates must write the Q.P Code on the title page of the Answer book.

- Please check that this question paper contains 7 printed pages.
- Please check that this question paper contains 38 questions.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please write down the serial number of the question in the answer-book before attempting it.
- 15 minute time has been allotted to read this question paper.
- The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

गणित
MATHEMATICS

निर्धारित समय : 3 घण्टे | *अधिकतम अंक : 80*

Time allowed : 3 hours | *Maximum Marks : 80*

General Instructions:

Read the following instructions carefully and follow them:

1. *This question paper contains* ***38 questions****. All Questions are compulsory.*
2. *This Question Paper is divided into* ***5*** *Sections* ***A, B, C, D*** *and* ***E****.*
3. *In* ***Section A****, Question numbers* ***1-18*** *are multiple choice questions (MCQs) and questions no.* ***19*** *and* ***20*** *are Assertion-Reason based questions of* ***01*** *mark each.*
4. *In* ***Section B****, Question numbers* ***21-25*** *are very short answer (VSA) type questions, carrying* ***02*** *marks each.*
5. *In* ***Section C****, Question numbers* ***26-31*** *are short answer (SA) type questions, carrying* ***03*** *marks each.*
6. *In* ***Section D****, Question numbers* ***32-35*** *are long answer (LA) type questions, carrying* ***05*** *marks each.*
7. *In* ***Section E****, Question numbers* ***36-38*** *are case study-based questions carrying* ***4*** *marks each with sub parts of the values of* ***1****,* ***1*** *and* ***2*** *marks each respectively.*
8. *There is no overall choice. However, an internal choice in* ***2*** *questions of* ***Section B****,* ***2*** *questions of* ***Section C*** *and* ***2*** *questions of* ***Section D*** *has been provided. An internal choice has been provided in all the* ***2*** *marks questions of* ***Section E****.*
9. *Draw neat and clean figures wherever required. Take* $\pi = \frac{22}{7}$ *wherever required if not stated.*
10. *Use of calculators is* ***NOT*** *allowed.*

SECTION – A

Section A consists of 20 questions of 1 mark each.

1. If $\sin\theta + \operatorname{cosec}\theta = 4$, then $\sin^2\theta + \operatorname{cosec}^2\theta$ is equal to **[Conceptual Application]**

(a) 8 (b) 4 (c) 14 (d) 16

2. Let a and b be two positive integers such that $a = x^2yz^3$ and $b = x^3y^2$, where x, y and z are prime numbers. If HCF $(a, b) = x^m y^n z^p$ then value of p is **[NCERT, Page 4]**

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

3. A general quadratic equation whose roots are equal in magnitude and opposite in signs is **[Conceptual Application]**

(a) $ax^2 + bx + c = 0, \quad a, b, c > 0$ (b) $ax^2 + c = 0, \quad a > 0, \quad c < 0$

(c) $ax^2 + bx = 0, \quad a, b > 0$ (d) $ax^2 + c = 0, \quad a < 0, \quad c < 0$

4. If $2x \sin\alpha = 3\cos\alpha$, then $x : 1$ is **[Conceptual Application]**

(a) $2 : 3\cot\alpha$ (b) $2 : 3\tan\alpha$ (c) $3\cot\alpha : 1$ (d) $3\cot\alpha : 2$

5. The perimeters of two similar triangles ABC and DEF are 60 cm and 48 cm respectively. If DE = 8 cm, then length of AB is **[Conceptual Application]**

(a) 12 cm (b) 4 cm (c) 20 cm (d) 10 cm

6. Points P, Q, R divides the joins of points A(2, – 7) and B(4, 6) into equal parts taken in order starting from A. Then coordinates of R are **[NCERT, Page 109]**

(a) $\left(\frac{7}{2}, \frac{11}{4}\right)$ (b) $\left(3, -\frac{1}{2}\right)$ (c) $\left(\frac{5}{2}, \frac{-15}{4}\right)$ (d) (6, – 1)

7. If α, β are zeroes of the polynomial $f(x) = x^2 - 3kx + 2k - 5$ such that sum of zeroes is equal to twice the product of zeroes then value of k is **[Conceptual Application]**

(a) 0 (b) 15 (c) –10 (d) 10

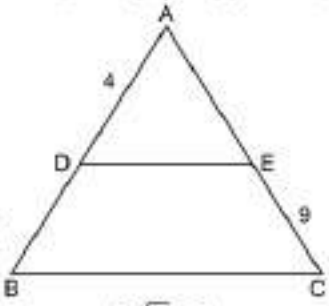
8. The values of p for which the system of equations $(2p - 1)x + (p - 1)y = 2p + 1; y + 3x - 1 = 0$ has no solution is **[NCERT, Page 26]**

(a) 2 (b) – 2 (c) 3 (d) – 3

9. In the given figure, DE || BC and BD = AE, then value of BD is **[Conceptual Application]**

(a) 9 (b) 6

(c) ± 6 (d) 36



10. If $\sec\alpha = \frac{2}{\sqrt{3}}$, then value of $\frac{3\sin\alpha - 2\cos\alpha}{3\sin\alpha + 2\cos\alpha}$ is **[Conceptual Application]**

(a) $\frac{3\sqrt{3}-2}{3\sqrt{3}+2}$ (b) $\frac{3-2\sqrt{3}}{3+2\sqrt{3}}$ (c) $\frac{3+2\sqrt{3}}{3-2\sqrt{3}}$ (d) $\frac{3\sqrt{3}+2}{3\sqrt{3}-2}$

11. Two dice are rolled simultaneously. The probability of getting number greater than 4 on each die is **[Conceptual Application]**

(a) $\frac{1}{6}$ (b) $\frac{1}{9}$ (c) $\frac{1}{36}$ (d) $\frac{1}{18}$

12. Median class for the distribution

Class interval	Frequency
0—5	3
5—10	9
10—15	2
15—20	5
20—25	7

is **[NCERT, Page 199]**

(a) 12.5 (b) 10—15 (c) 15—20 (d) 5—10

13. The arc of a circle is of length 5π cm and the sector it bounds has an area of 20π cm^2, the radius of the circle is **[Conceptual Application]**

(a) 6 cm (b) 10 cm (c) 12 cm (d) 8 cm

14. The mean of given data is 7 and median 4, then mode of the data is **[NCERT, Page 197]**

(a) 3 (b) 11 (c) not possible (d) 13

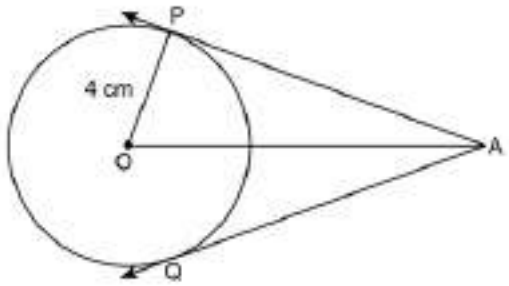
15. Two cubes each of volume 27 cm^3 are joined end to end to form a solid. The surface area of resultant cuboid is **[NCERT, Page 166]**

(*a*) 90 cm^2 (*b*) 90 cm^3 (*c*) 60 cm^2 (*d*) 60 cm^3

16. The area of a square which can be inscribed in a circle of radius 6 cm, is **[Conceptual Application]**

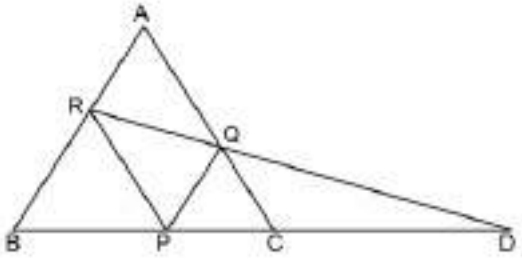
(*a*) 12 cm^2 (*b*) 72 cm^2 (*c*) 36 cm^2 (*d*) 144 cm^2

17. In the given figure, AP and AQ are tangents to a circle of radius 4 cm. If AP = $4\sqrt{3}$ cm, then $\angle$ PAQ is **[Conceptual Application]**



(*a*) 40° (*b*) 45° (*c*) 60° (*d*) 30°

18. In the given figure, PQ || BA, and PR || CA. If PD = 12 cm, then BD × CD is equal to **[Conceptual Application]**



(*a*) 12 cm^2 (*b*) 72 cm^2 (*c*) 48 cm^2 (*d*) 144 cm^2

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.

(*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.

19. **Assertion (A):** $\sqrt{3}$ is an irrational number.

Reason (R): Square root of a prime number is always irrational. **[Conceptual Application]**

20. **Assertion (A):** In triangle ABC, BC = 12 cm. If D and E are mid points of sides AB and AC respectively, then coordinates of D and E can be D(0, 3) and E(6, 3).

Reason (R): The line segment joining two sides of a triangle is parallel to the third and half of it.

[Conceptual Application]

SECTION – B

Section B consists of 5 questions of 2 marks each.

21. (A) If $7\sin^2\theta + 3\cos^2\theta = 4$, find positive value of $\tan\theta$. **[Conceptual Application]**

OR

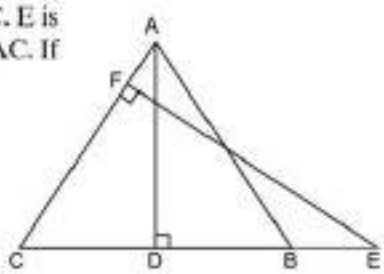
(B) If $3x = \text{cosec}\,\theta$ and $\frac{3}{x} = \cot\theta$, evaluate $3\left(x^2 - \frac{1}{x^2}\right)$. **[Conceptual Application]**

22. (A) The length of the hour hand of a clock is 3 cm. Find the area swept by it during the time 8.00 a.m. to 9.00 a.m. **[NCERT, Page 158]**

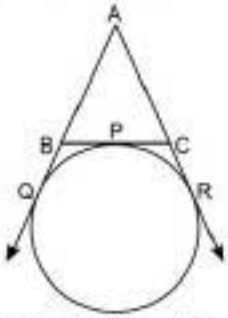
OR

(B) A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the area of the minor segment. **[NCERT, Page 158]**

23. In the given figure, ABC is an isosceles triangle in which AB = AC. E is a point on the side CB produced such that FE is perpendicular to AC. If AD is perpendicular to CB, prove that AB × EF = AD × EC. **[NCERT, Page 96]**



24. In the given figure, find perimeter of ΔABC if AR = 15 cm. **[Conceptual Application]**



25. Solve for x and y : $0.2x + 0.3y = 1.3$; $0.4x + 0.5y = 2.3$. **[NCERT, Page 36]**

SECTION – C

Section C consists of 6 questions of 3 marks each.

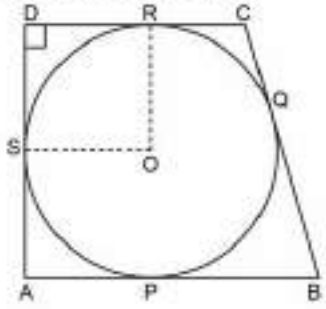
26. A bag contains cards numbered 30 to 43. A card is drawn from the bag. Find the probability that

(*i*) card drawn is a prime numbered card.

(*ii*) card drawn is numbered divisible by 7.

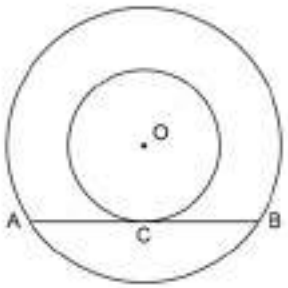
(*iii*) card drawn is numbered between 33 and 40. **[Conceptual Application]**

27. (A) A quadrilateral ABCD is drawn so that ∠D = 90°, BC = 38 cm and CD = 25 cm. A circle is inscribed in the quadrilateral and it touches the sides AB, BC, CD and DA at P, Q, R and S respectively. If BP = 27 cm, find the radius of the inscribed circle. **[Conceptual Application]**



OR

(B) Chord AB of the bigger circle is tangent to concentric small circle at the point C. Show that C bisects AB. **[NCERT, Page 149]**



28. In triangle ABC, AB = x units, AC = 7 units and cos B = 0.

Evaluate $\sqrt{7-x}\tan C + \sqrt{7+x}\cot A - 14\cos A + 21\sin C + \sqrt{49+x^2}\cos B$. **[Conceptual Application]**

29. (A) A part of monthly hostel charges is fixed and the rest depends upon the number of days one has taken food in the mess. When student A takes food for 22 days, he has to pay ₹ 1380 as hostel charge whereas a student B who takes food for 28 days pays ₹ 1680 as hostel charges. Find the fixed charge and cost of food per day. **[NCERT, Page 33]**

OR

(B) A bag contains 94 coins of 5 rupees and 2 rupees denomination. If the total worth of these coins be ₹ 308, find the number of coins of each kind. **[Conceptual Application]**

30. If α and β are the zeroes of polynomial $3x^2 - 5x + 1$, then find the polynomial whose zeroes are 3α and 3β. **[NCERT, Page 23]**

31. Show that $(\sqrt{2}+\sqrt{3})^2$ is an irrational given that $\sqrt{6}$ is an irrational number. **[Conceptual Application]**

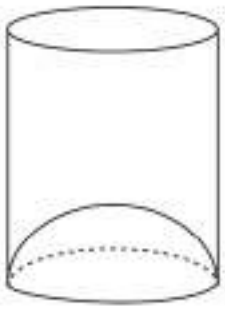
SECTION – D

Section D consists of 4 questions of 5 marks each.

32. (A) A company manufactures gas cylinders with hemispherical ends. The total length of the solid cylinder is 19 m and diameter of cylinder is 7 m, find the volume and surface area of the cylinder. **[Integrated]**

OR

(B) A juice seller serves his customers using a glass as shown in figure. The inner diameter of cylindrical glass is 5 cm but the bottom of the glass has a hemispherical raised portion, which reduces the capacity of the glass. If the height of the glass is 10 cm, find the apparent capacity of the glass and its actual capacity. [Use $\pi = 3.14$] **[NCERT, Page 168]**

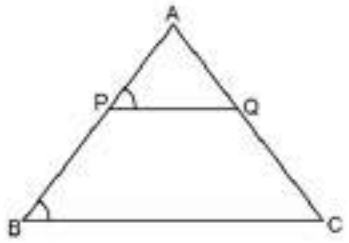


33. Find the median for the following data **[NCERT, Page 199]**

Class interval	Frequency
20-40	12
40-60	18
60-80	23
80-100	15
100-120	12
120-140	12
140-160	8

34. State and prove Basic Proportionality Theorem.

Using above, in the given figure, PQ || BC, AP = x, PB = $x - 2$, AQ = $x + 2$ and QC = $x - 1$, find the value of $3x - 5$. **[Integrated]**



35. (A) Some students planned a picnic. The total budget for food was ₹ 2000. But 5 students failed to attend the picnic and thus the cost of the food for each member is increased by ₹ 20. How many students attended the picnic and how much did each student pay for the food?

[Conceptual Application]

OR

(B) 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 work in 4 days, find the time taken by A to finish the work. **[Conceptual Application]**

SECTION – E

Section E consists of 3 case study based questions of 4 marks each.

36. Flight of planes are controlled by ATC and directions are given accordingly. ATC finds that angle of elevation of aeroplane from point on the ground is 60°. After a flight of 50 seconds, it is observed that angle of elevation changes to 30°. The height of the plane remains constant at $5000\sqrt{3}$ m.

Using the above information answer the following: **[Integrated]**

(*i*) Show the situation using a diagram.

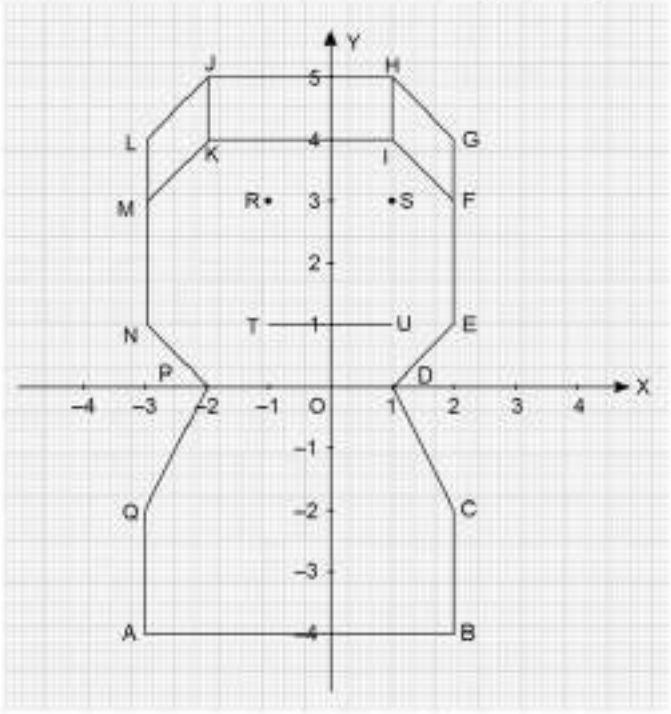
(*ii*) What is the speed of the plane in km/h when angle of elevation, changed from 60° to 30°?

(*iii*) (A) What is the distance travelled by the plane in 50 seconds?

OR

(B) It was observed that after 30 seconds angle of elevation changed to 45°. How much distance was travelled during this duration?

37. When we board metro, we come across beautiful morals on walls and pillars many in the form of geometrical figures. One student went home and drew imaginative figure as:



Using above figure answer the following: **[Integrated]**

(*i*) What are coordinates of eyes R and S?

(*ii*) What is width of cap MKIFGHJL?

(*iii*) (A) What are coordinates of point where AB cuts the *y*-axis?

OR

(B) What are coordinates of the point where KI cuts the *y*-axis?

38. Priya is preparing for the bicycle Marathon. Her racing bicycle has a device to calculate the number of kilometres she cycled. She decides to increase the distance she cycles everyday by a fixed number of kilometres.

Now answer the following: **[Integrated]**

(*i*) On the first day Priya cycled 8 km and increase the distance covered each day by 3 km. How much distance she cycle on 5th day.

(*ii*) On third day Priya cycled 11 km and on 8th day she cycled 26 km. How much kilometer she cycled on Ist day.

(*iii*) (A) Priya plans to go on a cycle tour from Bangalore to Mangalore covering 425 km. She travels 20 km on day 1 and increases the distance covered each day by 5 km. In how many days will she reach her destination?

OR

(B) Priya plans to go on cycle tour from Banglore to Surathkal covering 450 km.
She travels 15 km on day 1 and increases the distance covered each day by 4 km. How many kilometer she cycled in 8 days?

ST Francis School Baraut

ESTD. 2016

Series : SFS/02/04

SET – 4

ROLL No.

Q.P Code 10/02/04

Candidates must write the Q.P Code on the title page of the Answer book.

- Please check that this question paper contains 7 printed pages.
- Please check that this question paper contains 38 questions.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please write down the serial number of the question in the answer-book before attempting it.
- 15 minute time has been allotted to read this question paper.
- The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

गणित
MATHEMATICS

निर्धारित समय : 3 घण्टे | *अधिकतम अंक : 80*

Time allowed : 3 hours | *Maximum Marks : 80*

General Instructions:

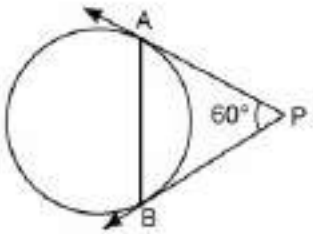
Read the following instructions carefully and follow them:

1. *This question paper contains **38 questions**. All Questions are compulsory.*
2. *This Question Paper is divided into **5** Sections **A**, **B**, **C**, **D** and **E**.*
3. *In **Section A**, Question numbers **1-18** are multiple choice questions (MCQs) and questions no. **19** and **20** are Assertion-Reason based questions of **01** mark each.*
4. *In **Section B**, Question numbers **21-25** are very short answer (VSA) type questions, carrying **02** marks each.*
5. *In **Section C**, Question numbers **26-31** are short answer (SA) type questions, carrying **03** marks each.*
6. *In **Section D**, Question numbers **32-35** are long answer (LA) type questions, carrying **05** marks each.*
7. *In **Section E**, Question numbers **36-38** are case study-based questions carrying **4** marks each with sub parts of the values of **1**, **1** and **2** marks each respectively.*
8. *There is no overall choice. However, an internal choice in 2 questions of **Section B**, 2 questions of **Section C** and 2 questions of **Section D** has been provided. An internal choice has been provided in all the **2** marks questions of **Section E**.*
9. *Draw neat and clean figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.*
10. *Use of calculators is **NOT** allowed.*

SECTION – A

Section A consists of 20 questions of 1 mark each.

1. In figure PA and PB are tangents to a circle, PA = 9 cm and $\angle APB = 60°$, then chord AB = **[Conceptual Application]**



(a) 4 cm (b) 7 cm (c) 6 cm (d) 9 cm

2. The LCM of 2.5, 0.5 and 0.175 is **[Conceptual Application]**

(a) 2.5 (b) 5 (c) 7.5 (d) 17.5

3. If in two triangles ABC and PQR, $\frac{AB}{QR} = \frac{BC}{PR} = \frac{CA}{PQ}$, then **[NCERT, Page 85]**

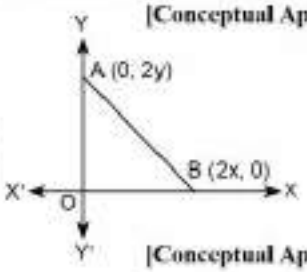
(a) $\Delta PQR \sim \Delta CAB$ (b) $\Delta PQR \sim \Delta ABC$

(c) $\Delta CBA \sim \Delta PQR$ (d) $\Delta BCA \sim \Delta PQR$

4. If $\sin\theta = \sqrt{3}\cos\theta$, $0° < \theta < 90°$, then θ is equal to **[NCERT, Page 127]**

(a) 30° (b) 45° (c) 60° (d) 90°

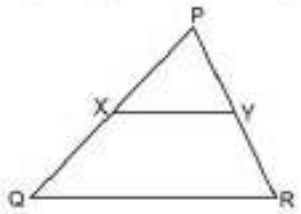
5. The coordinates of the point which is equidistant from the three vertices of the ΔAOB as shown in the figure are **[Conceptual Application]**



(a) (x, y) (b) (y, x)

(c) $\left(\frac{x}{2}, \frac{y}{2}\right)$ (d) $\left(\frac{y}{2}, \frac{x}{2}\right)$

6. In figure XY || QR, $\frac{PX}{XQ} = \frac{PY}{YR} = \frac{1}{2}$, then **[Conceptual Application]**



(a) $XY = \frac{1}{3}QR$ (b) $XY = QR$

(c) $XY^2 = QR^2$ (d) $XY = \frac{1}{2}QR$

7. Three vertices of a parallelogram taken in order are (–1, –6), (2, –5) and (7, 2). The fourth vertex is **[Conceptual Application]**

(a) (1, 4) (b) (1, 1) (c) (4, 4) (d) (4, 1)

8. If $x = a$ and $y = b$ is the solution of the linear equation $x - y = 2$ and $x + y = 4$, then values of a and b are **[Conceptual Application]**

(a) 2, 1 (b) 3, 1 (c) 4, 6 (d) 1, 2

9. In an AP, 18, 13, 8, 3, ..., the value of S_{35} = **[NCERT, Page 65]**

(a) 2345 (b) 2435 (c) – 2345 (d) – 2435

10. $(x + 2)^3 = 2x(x^2 - 1)$ is **[NCERT, Page 41]**

(a) linear equation (b) not quadratic equation

(c) quadratic equation (d) not defined

11. If $a = (2^2 \times 3^3 \times 5^4)$ and $b = (2^3 \times 3^2 \times 5)$, then HCF (a, b) = **[NCERT, Page 4]**

(a) 90 (b) 180 (c) 360 (d) 540

12. In ΔABC, $\angle B = 90°$, if $\tan A = 1$, then $2 \sin A \cos A$ = **[Conceptual Application]**

(a) 0 (b) 1 (c) $\frac{1}{2}$ (d) Not defined

13. The probability of getting a red face card from a pack of cards is **[NCERT, Page 215]**

(a) $\frac{3}{26}$ (b) $\frac{1}{13}$ (c) $\frac{1}{52}$ (d) $\frac{1}{4}$

14. A card is drawn from a well-shuffled deck of 52 playing cards. The probability that the card will not be an ace is **[NCERT, Page 207]**

(a) $\frac{1}{13}$ (b) $\frac{1}{4}$ (c) $\frac{12}{13}$ (d) $\frac{3}{4}$

15. While computing mean of grouped data, we assume that the frequencies are **[Conceptual Application]**

(a) evenly distributed over all the classes (b) centred at the class marks of the classes

(c) centred at the upper limits of the classes (d) centred at the lower limits of the classes

16. In making 1000 revolutions, a wheel covers 88 km, then the diameter of the wheel is $\left(\pi = \frac{22}{7}\right)$ **[Conceptual Application]**

(a) 7 m (b) 14 m (c) 36 m (d) 28 m

17. If two solid hemispheres of the same base radius r are joined together along their bases, then curved surface area of this new solid is **[Conceptual Application]**

(a) $4\pi r^2$ (b) $6\pi r^2$ (c) $3\pi r^2$ (d) $8\pi r^2$

18. The arc of a circle of radius 30 cm having length 19 cm, then angle subtended by this arc at the centre O of the circle is $\left(\pi = \frac{22}{7}\right)$ **[Conceptual Application]**

(a) 36.27° (b) 36° (c) 30.99° (d) 34°

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.

(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.

19. **Assertion (A):** If in a ΔABC, a line DE $||$ BC, intersects AB in D and AC in E, then $\frac{AB}{AD} = \frac{AC}{AE}$.

Reason (R): If a line is drawn parallel to one side of a triangle intersecting the other two sides, then the other two sides are divided in the same ratio. **[Integrated]**

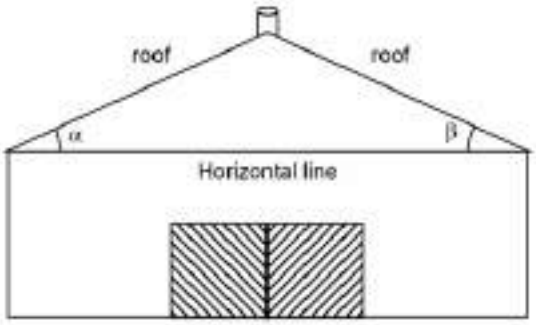
20. **Assertion (A):** In a right-angled triangle, if $\tan\theta = \frac{3}{4}$, the greatest side of the triangle is 5 units.

Reason (R): (greatest side)^2 i.e. (hypotenuse)^2 = (perpendicular)^2 + (base)^2. **[NCERT, Page 118]**

SECTION – B

Section B consists of 5 questions of 2 marks each.

21. (A) In some buildings especially in industries, the roof is inclined. This inclination of roof is the application of trigonometric functions. Here the roof of industry is inclined at angles α and β with horizontal line as shown. Determine the value of $\sin(\alpha + \beta)$, if $\operatorname{cosec}\alpha = \sqrt{2}$ and $\cot\beta = 1$, where both α and β are acute angles. **[Conceptual Application]**



OR

(B) Evaluate: $\sin^6\theta - \cos^6\theta$. **[Conceptual Application]**

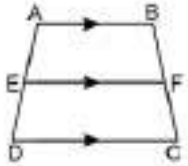
22. (A) An arc of a circle is of length 7π cm and the sector it bounds has an area of 28π cm^2. Find the radius of the circle. **[Conceptual Application]**

OR

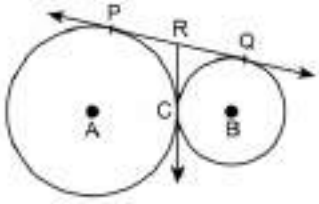
(B) The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour? $\left(\pi = \frac{22}{7}\right)$ **[Conceptual Application]**

23. Find the sum of all multiples of 7 lying between 100 and 1000. **[Conceptual Application]**

24. In the given figure, ABCD is a trapezium in which AB || DC || EF. Show that $\frac{AE}{ED} = \frac{BF}{FC}$. **[NCERT, Page 83]**



25. In the given figure, two circles touch each other at the point C. Prove that the common tangent to the circles at C, bisects the common tangent at P and Q. **[Conceptual Application]**



SECTION – C

Section C consists of 6 questions of 3 marks each.

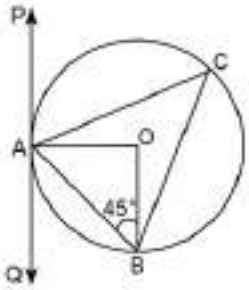
26. Cards marked with numbers 4 to 99 are placed in a box and mixed thoroughly. One card is drawn from this box. Find the probability that the number on the card is:

(*i*) a perfect square.

(*ii*) a multiple of 7.

(*iii*) a prime number less than 30. **[Conceptual Application]**

27. (A) In the given figure, PAQ is a tangent to the circle with centre O at a point A. If $\angle OBA = 45°$, find the value of $\angle BAQ$ and $\angle ACB$. **[Conceptual Application]**



OR

(B) The incircle of ΔABC touches the sides BC, CA and AB at D, E and F respectively. Show that:

$AF + BD + CE = AE + BF + CD = \frac{1}{2}$ (perimeter of ΔABC). **[Conceptual Application]**

28. From a window (120 metres high above the ground) of a house in a street, the angles of elevation and depression of the top and the foot of another house on opposite side of street are 60° and 45° respectively. Show that the height of the opposite house is $120\,(1 + \sqrt{3})$ metres. **[Conceptual Application]**

29. Manju and Manish participate in a cycle race, organised for National integration. Manju takes 18 minutes to complete one round, while Manish takes 12 minutes for the same. Suppose they both start at the same time and go in the same direction. After how many minutes, will they meet again at the starting point? **[Conceptual Application]**

30. Solve for x : $\frac{x-2}{x-4}+\frac{x-6}{x-8}=6\frac{2}{3}$, $(x \neq 4, 8)$ **[Conceptual Application]**

31. (A) Abhishek is planning a journey by ship to Andaman. Andaman trip in itself is an adventure. There are three ports in India from where you can sail to Andaman: Kolkata, Chennai and Vishakhapatnam. Abhishek did not know the length of journey so he took the help of an expert who helped him by solving a simple mathematical situation related to ships.

The ship covered a certain distance at a uniform speed. If the speed of ship would have been 6 km/h faster, it would have taken 4 hours less than the scheduled time. And if the speed of ship were slower by 6 km/h, it would have taken 6 hours more than the scheduled time. Find the length of the journey. **[Conceptual Application]**

OR

(B) Two pipes running together can fill a cistern in 6 minutes. If one pipe takes 5 minutes more than the other to fill the cistern, find the time in which each pipe would fill the cistern. **[Conceptual Application]**

SECTION – D

Section D consists of 4 questions of 5 marks each.

32. The median of the distribution given below is 14.4.

Class interval	Frequency
0 – 6	4
6 – 12	x
12 – 18	5
18 – 24	y
24 – 30	1

Find the values of x and y, if the sum of frequency is 20. **[NCERT, Page 195-196]**

33. (A) A cylindrical vessel with internal radius 5 cm and height 10.5 cm is full of water. A solid cone of base radius 3.5 cm and height 6 cm is completely immersed in water. Find the volume of **[Conceptual Application]**

(*i*) water displaced out of the cylindrical vessel.

(*ii*) water left in the cylindrical vessel.

OR

(B) A sector of a circle of radius 12 cm has the angle 120°. It is rolled up so that two bounding radii are joined together to form a cone. Find the volume of the cone. **[Conceptual Application]**

34. Prove that the lengths of tangents drawn from an external point to a circle are equal. **[NCERT, Page 149]**

35. (A) Find the zeroes of the quadratic polynomial $7y^2-\frac{11}{3}y-\frac{2}{3}$ and verify the relationship between the zeroes and the coefficients. **[NCERT, Page 23]**

OR

(B) If the zeroes of x^2-px+6 are in the ratio 2 : 3, find p. **[Conceptual Application]**

SECTION – E

Section E consists of 3 case study based questions of 4 marks each.

36. On a golf course, three holes A(-6, -1), B and C(9, -4) lie on a straight line in that order. The distance between B and C is two times that between B and A.

Rahul strikes the ball, which is at point P(2, 3), such that it goes in the hole B.

Now, answer the following: **[Integrated]**

(*i*) Find the coordinates of hole B.

(*ii*) Find the coordinates of midpoint of AP.

(*iii*) (A) Find the shortest distance covered by the ball.

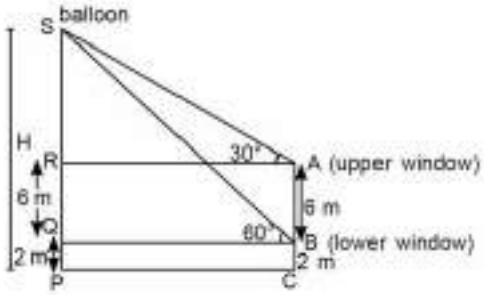
OR

(B) Find distance between AC.

37. A building is made by keeping the lower window of a building at a particular height above the ground and upper window is constructed at some height vertically above the lower window. Position of both windows are shown in diagram.

Both windows are designed and constructed in order to have proper Sunlight.

At certain instant, the angle of elevation of balloon from these windows are shown. Balloon is flying at constant height H above the ground.



Now, answer the following: **[Integrated]**

(*i*) Find the length AR in terms of H.

(*ii*) Find the height H.

(*iii*) (A) Find the distance of balloon from the lower window.

OR

(B) Find the distance of balloon from the upper window.

38. Our country can be a manufacturing hub due to cheap labour cost and a very high number of skilled technical man powers, which can contribute to cheaper and higher production. The manufacturing of mobile phone sets production unit increase by a fixed number every year. It manufactures 4,20,000 sets in the 5th year and 6,00,000 sets in 8th year.

Now, answer the following: **[Integrated]**

(*i*) Find the production in the first year.

(*ii*) Find the common difference.

(*iii*) (A) What will be the total production in the first 4 years?

OR

(B) What will be the total production in first 5 years?

ST Francis School Baraut

ESTD. 2016

Series : SFS/02/05

SET – 5

ROLL No.

Q.P Code 10/02/05

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- Please check that this question paper contains 7 printed pages.
- Please check that this question paper contains 38 questions.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please write down the serial number of the question in the answer-book before attempting it.
- 15 minute time has been allotted to read this question paper.
- The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

गणित
MATHEMATICS

निर्धारित समय : 3 घण्टे | *अधिकतम अंक : 80*

Time allowed : 3 hours | *Maximum Marks : 80*

General Instructions:

Read the following instructions carefully and follow them:

1. *This question paper contains **38 questions**. All Questions are compulsory.*
2. *This Question Paper is divided into **5** Sections **A**, **B**, **C**, **D** and **E**.*
3. *In **Section A**, Question numbers **1-18** are multiple choice questions (MCQs) and questions no. **19** and **20** are Assertion-Reason based questions of **01** mark each.*
4. *In **Section B**, Question numbers **21-25** are very short answer (VSA) type questions, carrying **02** marks each.*
5. *In **Section C**, Question numbers **26-31** are short answer (SA) type questions, carrying **03** marks each.*
6. *In **Section D**, Question numbers **32-35** are long answer (LA) type questions, carrying **05** marks each.*
7. *In **Section E**, Question numbers **36-38** are case study-based questions carrying **4** marks each with sub parts of the values of **1**, **1** and **2** marks each respectively.*
8. *There is no overall choice. However, an internal choice in **2** questions of **Section B**, 2 questions of **Section C** and 2 questions of **Section D** has been provided. An internal choice has been provided in all the **2** marks questions of **Section E**.*
9. *Draw neat and clean figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.*
10. *Use of calculators is **NOT** allowed.*

SECTION – A

Section A consists of 20 questions of 1 mark each.

1. If $\sin\theta$ and $\cos\theta$ are the roots of the equation $ax^2 - bx + c = 0$, then a, b, c satisfy the relation **[Conceptual Application]**

(a) $b^2 - a^2 = 2ac$ (b) $a^2 - b^2 = 2ac$ (c) $a^2 + b^2 = c^2$ (d) $a^2 + b^2 = 2ac$

2. For an event E, $P(E) + P(\overline{E}) = q$, then **[NCERT, Page 206]**

(a) $0 \le q < 1$ (b) $0 < q \le 1$ (c) $0 < q < 1$ (d) None of these

3. If the mode of a data is 18 and the mean is 24, then median is: **[NCERT, Page 197]**

(a) 10 (b) 15 (c) 22 (d) 24

4. A solid cube is cut into 27 small cubes of equal volume, then the ratio of the surface areas of the given cube and that of one small cube is **[Conceptual Application]**

(a) 9 : 1 (b) 1 : 9 (c) 1 : 1 (d) 2 : 3

5. If $\Sigma f_i = 11$, $\Sigma f_i x_i = 2p + 52$ and the mean of any distribution is 6, then the value of p is **[NCERT, Page 174]**

(a) 4 (b) 5 (c) 6 (d) 7

6. Which term of the AP: 22, 19, 16 ..., is its first negative term? **[NCERT, Page 71]**

(a) 9 (b) 8 (c) 10 (d) 11

7. Three numbers are in an AP, having sum 24. Its middle term is **[Conceptual Application]**

(a) 6 (b) 8 (c) 3 (d) 2

8. AOBC is a rectangle whose three vertices are A(0, 3), O(0, 0) and B(5, 0). The length of its diagonal is **[Conceptual Application]**

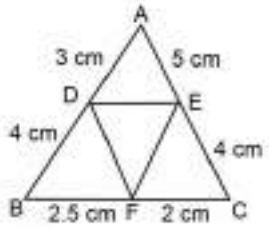
(a) 5 units (b) 3 units (c) $\sqrt{34}$ units (d) 4 units

9. If $\Delta ABC \sim \Delta EDF$ and ΔABC is not similar to ΔDEF, then which of the following is not true? **[Conceptual Application]**

(a) BC . EF = AC . FD (b) AB . EF = AC . DE

(c) BC . DE = AB . EF (d) BC . DE = AB . FD

10. In given figure, AD = 3 cm, AE = 5 cm, BD = 4 cm, CE = 4 cm, CF = 2 cm, BF = 2.5 cm, then **[NCERT, Page 84]**



(a) DE || BC (b) DF || AC (c) EF || AB (d) None of these

11. If $\sqrt{3}\sin\theta - \cos\theta = 0$, and $0° < \theta < 90°$, then θ = **[NCERT, Page 127]**

(a) 30° (b) 45° (c) 90° (d) 60°

12. $(\text{cosec } A - \sin A)(\sec A - \cos A)(\tan A + \cot A)$ = **[Conceptual Application]**

(a) 2 (b) –2 (c) 1 (d) –1

13. Number of tangents to a circle which are parallel to a secant is **[NCERT, Page 146]**

(a) 1 (b) 2 (c) 3 (d) infinite

14. If three points (0, 0), $(3, \sqrt{3})$ and $(3, k)$ form an equilateral triangle, then k = **[Conceptual Application]**

(a) 2 (b) –3 (c) $-\sqrt{3}$ (d) $-\sqrt{2}$

15. The HCF of 2472, 1284 and a third number N is 12. If their LCM is $2^3 \times 3^2 \times 5 \times 103 \times 107$, then the number N is : **[Conceptual Application]**

(a) $2^2 \times 3^2 \times 7$ (b) $2^2 \times 3^3 \times 103$ (c) $2^2 \times 3^2 \times 5$ (d) $2^4 \times 3^2 \times 11$

16. If $p(x) = ax^2 + bx + c$ and $a + c = b$, then one of the zero is **[Conceptual Application]**

(a) $\frac{b}{a}$ (b) $\frac{c}{a}$ (c) $\frac{-c}{a}$ (d) $\frac{-b}{a}$

17. If $(1 - p)$ is a root of the equation $x^2 + px + 1 - p = 0$, then its roots are **[Conceptual Application]**

(a) 0, 1 (b) –1, 1 (c) 0, –1 (d) –1, 2

18. If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$, where x, y are prime numbers, then HCF(a, b) is **[NCERT, Page 4]**

(a) xy (b) xy^2 (c) x^3y^3 (d) x^2y^2

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.

(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.

19. **Assertion (A):** The two tangents are drawn to a circle from an external point, then they subtend equal angles at the centre.

Reason (R): A parallelogram circumscribing a circle is a rhombus. **[Integrated]**

20. **Assertion (A):** Discriminant of the quadratic equation $3x^2 + 4x - 5 = 0$ is 76.

Reason (R): $D = b^2 + 4ac$ **[Conceptual Application]**

SECTION – B

Section B consists of 5 questions of 2 marks each.

21. (A) If $\frac{\cos\alpha}{\cos\beta} = m$ and $\frac{\cos\alpha}{\sin\beta} = n$, prove that $(m^2 + n^2)\cos^2\beta = n^2$. **[Conceptual Application]**

OR

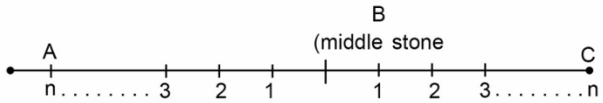
(B) Solve the equation for θ: $\frac{\cos^2\theta}{\cot^2\theta - \cos^2\theta} = 3$. **[Conceptual Application]**

22. (A) If 5th term of an AP is zero, show that 33rd term is two times its 19th term. **[Conceptual Application]**

OR

(B) Along a road lies an odd number of stones of weight 10 kg each, placed at intervals of 10 metres. These stones have to be assembled around the middle stone. Nirvah, a stone loader can carry only one stone of 10 kg at a time. He started the job with one of the end stones by carrying them in succession. In carrying all the stones, he covered a distance of 3 km. Find the number of stones.

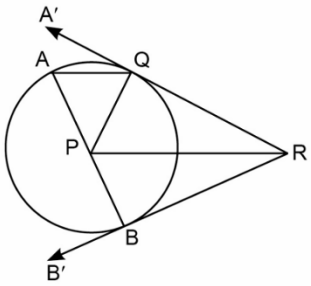
[Conceptual Application]



23. Aftab tells his daughter, "Seven years ago, I was seven times as old as you were then. Also, three years from now, I shall be three times as old as you will be." Represent this situation algebraically.

[NCERT, Page 31]

24. In the given figure, QR is a tangent at Q. P is centre of the circle and PR || AQ, where AQ is a chord through A, an end point of the diameter AB. Prove that BR is tangent at B. **[Conceptual Application]**



25. If a hexagon ABCDEF circumscribes a circle, prove that AB + CD + EF = BC + DE + FA.

[Conceptual Application]

SECTION – C

Section C consists of 6 questions of 3 marks each.

26. A game has 8 triangles of which 6 are blue and rest are green, 12 rectangles of which 3 are green and rest are blue, and 10 rhombuses of which 3 are blue and rest are green. One piece is lost at random. Find the probability that it is **[Conceptual Application]**

(*i*) a rectangle (*ii*) a triangle of green colour (*iii*) a rhombus of blue colour

27. If $\sec\theta = x + \frac{1}{4x}$, then prove that $\sec\theta - \tan\theta = \frac{1}{2x}$ or $2x$. **[Conceptual Application]**

28. (A) Prove that the line segments joining the mid-points of the adjacent sides of a quadrilateral form a parallelogram. **[Conceptual Application]**

OR

(B) Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle. **[NCERT, Page 152]**

29. (A) A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that the cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day. If the total cost of production on that day was ₹ 90, find the number of articles produced and the cost of each article. **[NCERT, Page 39-40]**

OR

(B) Find the 31st term of an AP whose 11th term is 38 and the 16th term is 73. **[NCERT, Page 62]**

30. Solve for x :

$$\frac{2x}{x-3} + \frac{1}{2x+3} + \frac{3x+9}{(x-3)(2x+3)} = 0\,;\, x \neq 3, \frac{-3}{2}$$ **[Conceptual Application]**

31. Prove that $3 - 2\sqrt{5}$ is an irrational. **[Conceptual Application]**

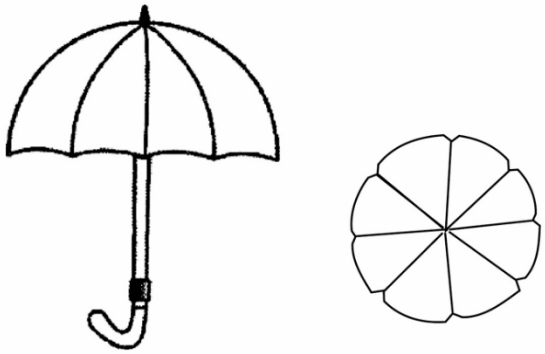
SECTION – D

Section D consists of 4 questions of 5 marks each.

32. (A) A chord PQ of a circle of radius 10 cm subtends an angle of 60° at the centre of circle. Find the area of major and minor segments of the circle. **[NCERT, Page 158]**

OR

(B) An umbrella has 8 ribs which are equally spaced (see figure). Assuming umbrella to be a flat circle of radius 45 cm, find the area between the two consecutive ribs of the umbrella. **[NCERT, Page 159]**



33. Find mean, median and mode of the following data: **[NCERT, Page 198]**

Classes	Frequency
0 – 20	6
20 – 40	8
40 – 60	10
60 – 80	12
80 – 100	6
100 – 120	5
120 – 140	3

34. The diagonals of a quadrilateral ABCD intersect each other at the point O such that $\frac{AO}{BO} = \frac{CO}{DO}$. Show that ABCD is a trapezium. **[NCERT, Page 85]**

35. (A) Determine graphically the coordinates of the vertices of a triangle formed by the equations $2x - 3y + 6 = 0$ and $2x + 3y - 18 = 0$; and the y-axis. Also, find the area of this triangle. **[NCERT, Page 29]**

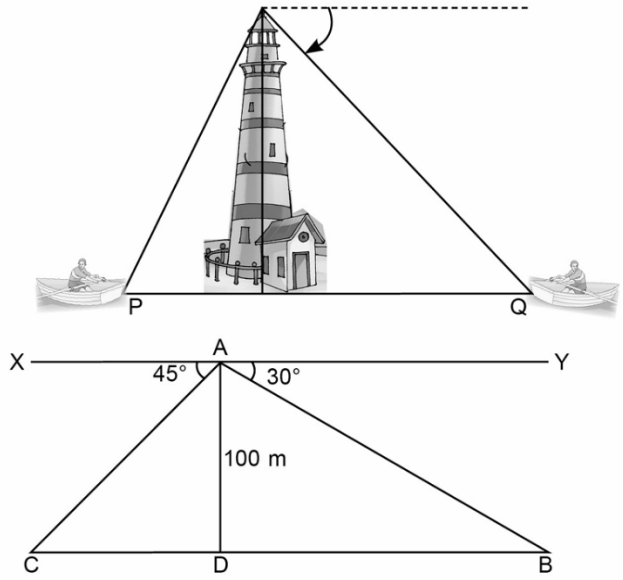
OR

(B) Eight times a two-digit number is equal to three times the number obtained by reversing the order of the digits. If the difference between the digits of the number is 5, find the number. **[Conceptual Application]**

SECTION – E

Section E consists of 3 case study based questions of 4 marks each.

36. A boy is standing on the top of lighthouse. He observed boat P and boat Q are approaching to lighthouse from opposite directions. He finds that angle depression of boat P is 45° and angle of depression of boat Q is 30°. He also knows that height of the lighthouse is 100 m.



Based on the above information, answer the following questions: **[Integrated]**

(*i*) Find ∠ACD.

(*ii*) Find the length of CD.

(*iii*) (A) Find the length of BD.

OR

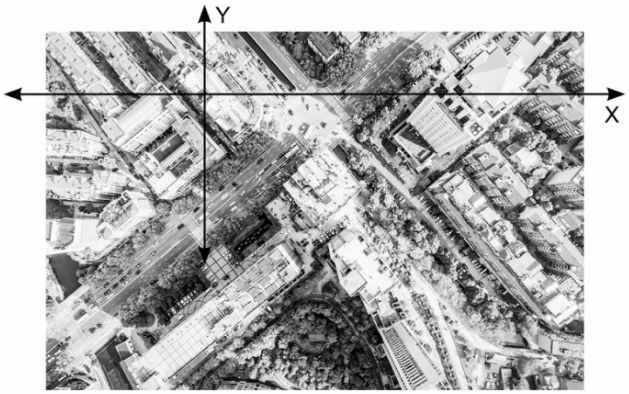
(B) Find the length of AC.

37. Satellite image of a colony is shown below. In this view, a particular house is pointed out by a flag, which is situated at the point of intersection of x and y-axes. If we go 2 cm East and 3cm North from the house, then we reach to a grocery store. If we go 4 cm West and 6 cm South from the house, then we reach to a electrician's shop. If we go 6 cm East and 8 cm South from the house then we reach to a food cart. If we go 6 cm West and 8 cm North from the house, then we reach to a bus stand.

Scale

x-axis: 1 cm = 1 unit

y-axis: 1 cm = 1 unit



Now answer the following: **[Integrated]**

(*i*) Find the distance between grocery store and food cart.

(*ii*) Find the distance of the bus stand from the house.

(*iii*) (A) If the grocery store and electrician's shop lie on a line, find the ratio of distance of house from grocery store to that from electrician's shop.

OR

(B) Find the ratio of distance of house from bus stand, to food cart.

38. The farmers in the field make a heap of wheat in the field in the form of a cone. The base diameter of heap formed in the field is 24 m and height of heap formed is 3.5 m.

Answer the questions based on above: **[Integrated]**

(*i*) What will be the slant height of heap formed in the field?

(*ii*) How much canvas cloth is required to just cover the heap?

(*iii*) (A) Find the volume of heap of wheat?

OR

(B) Farmers packed the wheat into bags. If volume of each bag of wheat is 0.48 m^3, then two many bags of wheat can be made?

ST Francis School Baraut

Series : SFS/02/06 **SET – 6**

ROLL No. **Q.P Code 10/02/06**

Candidates must write the Q.P Code on the title page of the Answer book.

- Please check that this question paper contains 7 printed pages.
- Please check that this question paper contains 38 questions.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
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गणित
MATHEMATICS

निर्धारित समय : 3 घण्टे *अधिकतम अंक : 80*

Time allowed : 3 hours *Maximum Marks : 80*

General Instructions:

Read the following instructions carefully and follow them:

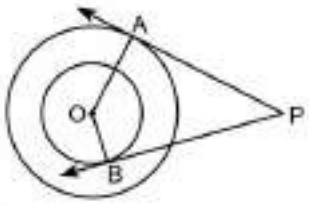
1. *This question paper contains* ***38 questions****. All Questions are compulsory.*
2. *This Question Paper is divided into* ***5*** *Sections* ***A, B, C, D*** *and* ***E****.*
3. *In* ***Section A****, Question numbers* ***1-18*** *are multiple choice questions (MCQs) and questions no.* ***19*** *and* ***20*** *are Assertion-Reason based questions of* ***01*** *mark each.*
4. *In* ***Section B****, Question numbers* ***21-25*** *are very short answer (VSA) type questions, carrying* ***02*** *marks each.*
5. *In* ***Section C****, Question numbers* ***26-31*** *are short answer (SA) type questions, carrying* ***03*** *marks each.*
6. *In* ***Section D****, Question numbers* ***32-35*** *are long answer (LA) type questions, carrying* ***05*** *marks each.*
7. *In* ***Section E****, Question numbers* ***36-38*** *are case study-based questions carrying* ***4*** *marks each with sub parts of the values of* ***1, 1*** *and* ***2*** *marks each respectively.*
8. *There is no overall choice. However, an internal choice in* ***2*** *questions of* ***Section B****,* ***2*** *questions of* ***Section C*** *and* ***2*** *questions of* ***Section D*** *has been provided. An internal choice has been provided in all the* ***2*** *marks questions of* ***Section E****.*
9. *Draw neat and clean figures wherever required. Take* $\pi = \frac{22}{7}$ *wherever required if not stated.*
10. *Use of calculators is* ***NOT*** *allowed.*

SECTION – A

Section A consists of 20 questions of 1 mark each.

1. In the figure, there are two concentric circles with centre O and radii 5 cm and 3 cm. PA and PB are tangents to these circles from an external point P. If PA = 12 cm, then length of PB (in cm) is

[Conceptual Application]



(*a*) 10 (*b*) $4\sqrt{10}$ (*c*) 12 (*d*) $\sqrt{178}$

2. If two towers of heights h_1 and h_2 subtend angles of 60° and 30° respectively at the mid-point of the line joining their feet, then $h_1 : h_2$ =

[Conceptual Application]

(*a*) 1 : 2 (*b*) 1 : 3 (*c*) 2 : 1 (*d*) 3 : 1

3. If the difference of mode and median of a data is 26, then the difference of median and mean is **[NCERT, Page 197]**

(a) 13 (b) 26 (c) 8 (d) 32

4. If the circumference of a circle is 352 metres, then its area in square metres is **[Conceptual Application]**

(a) 5986 (b) 6589 (c) 7952 (d) 9856

5. The median from the table

Value	7	8	9	10	11	12	13
Frequency	2	1	4	5	6	1	3

is **[NCERT, Page 188 to 190]**

(a) 11 (b) 10 (c) 12 (d) 11.5

6. Two cylindrical cans have equal base areas. If one of the can is 15 cm high and other is 20 cm high, then the ratio of their volumes is. **[Conceptual Application]**

(a) 2 : 3 (b) 3 : 4 (c) 4 : 3 (d) 3 : 2

7. The area of the square inscribed in circle of diameter p is **[Conceptual Application]**

(a) p^2 cm^2 (b) $\frac{p^2}{2}$ cm^2 (c) $\frac{p}{2}$ cm^2 (d) $\frac{p^2}{\sqrt{2}}$ cm^2

8. If tangents PA and PB from a point P to a circle with centre O are inclined to each other at angle of 80°, then $\angle$POA is equal to **[NCERT, Page 151]**

(a) 50° (b) 60° (c) 70° (d) 80°

9. If in two right triangles, hypotenuse and one side of one triangle are proportional to the hypotenuse and one side of the other triangle, then the two triangles are similar. This may be referred to as the **[NCERT, Page 98]**

(a) AAA similarity criterion (b) ASS similarity criterion

(c) SAS similarity criterion (d) RHS similarity criterion

10. In ΔPQR and ΔMNS, $\frac{PQ}{NS} = \frac{QR}{MS} = \frac{PR}{MN}$, then symbolically we write it as **[NCERT, Page 85-86]**

(a) $\Delta PQR \sim \Delta MNS$ (b) $\Delta PQR \sim \Delta SMP$ (c) $\Delta QRP \sim \Delta NSM$ (d) $\Delta QRP \sim \Delta SMN$

11. $\frac{1+\cot^2 A}{1+\tan^2 A} =$ **[NCERT, Page 131]**

(a) $\tan^2 A$ (b) $\cot^2 A$ (c) $\operatorname{cosec}^2 A - 1$ (d) $1 - \sin^2 A$

12. If $\tan\theta + \cot\theta = 4$, then $\tan^4\theta + \cot^4\theta =$ **[Conceptual Application]**

(a) 196 (b) 194 (c) 192 (d) 190

13. The height of mountains is found out using the idea of indirect measurements which is based on the **[Conceptual Application]**

(a) principle of congruent figures (b) principle of similarity of figures

(c) principle of equality of figures (d) None of these.

14. The distance of the point (α, β) from y-axis is **[Conceptual Application]**

(a) α units (b) $|\alpha|$ units (c) β units (d) $|\beta|$ units

15. The roots of the equation $x + \frac{1}{x} = 5\frac{1}{5}$ are **[NCERT, Page 44]**

(a) $5, \frac{1}{5}$ (b) $5, -5$ (c) $-5, -5$ (d) $2, -2$

16. HCF of a and b is 15 and $a \times b = 4500$, then LCM of a and b is **[NCERT, Page 4]**

(a) 900 (b) 300 (c) 600 (d) 115

17. The value of k for which the equation $9x^2 + 8kx + 16 = 0$ has equal roots is **[NCERT, Page 47]**

(a) 3 (b) –3 (c) ±3 (d) 2

18. The ratio between the LCM and HCF of 5, 15, 20 is: **[Conceptual Application]**

(a) 9 : 1 (b) 4 : 3 (c) 11 : 1 (d) 12 : 1

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.

(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.

19. **Assertion (A):** If one zero of the polynomial $p(x) = (k^2 + 4)x^2 + 9x + 4k$ is the reciprocal of the other zero then $k = 2$

Reason (R): If $(x - a)$ is a factor of the polynomial $p(x)$, then a is a zero of $p(x)$. **[Conceptual Application]**

20. **Assertion (A):** The point (0, 6) lies on y-axis.

Reason (R): The x coordinate of the point on y-axis is zero. **[NCERT, Page 104]**

SECTION – B

Section B consists of 5 questions of 2 marks each.

21. (A) If $\cos\theta = \frac{1}{2}$, find $\frac{\sec^2\theta + \tan^2\theta}{7 - 2\sec\theta \cdot \operatorname{cosec}\theta}$ **[NCERT, Page 121]**

OR

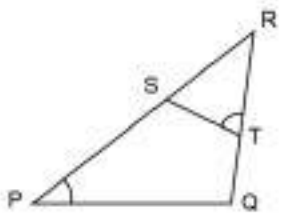
(B) Prove that $(\operatorname{cosec} A - \sin A)(\sec A - \cos A) = \frac{1}{\tan A + \cot A}$ **[NCERT, Page 131]**

22. (A) The circumference of the edge of a hemispherical bowl is 132 cm. Find the capacity of the bowl. (Use $\pi = \frac{22}{7}$) **[Conceptual Application]**

OR

(B) Find the area of a sector of an angle A (in degrees) of a circle with radius R. **[NCERT, Page 155]**

23. In the given figure, $\angle P = \angle RTS$. Show that: $\Delta RPQ \sim \Delta RTS$ and $\frac{RQ}{RP} = \frac{RS}{RT}$. **[Conceptual Application]**



24. Which term of an Arithmetic Progression: 2, 7, 12, 17, ..., is 137? **[NCERT, Page 58]**

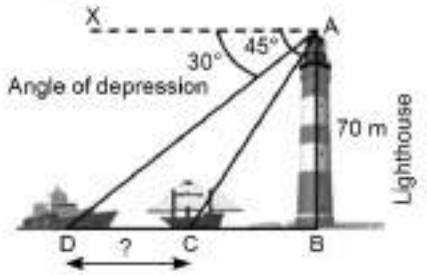
25. Find the distance between two parallel tangents of a circle of radius 6 cm. **[Conceptual Application]**

SECTION – C

Section C consists of 6 questions of 3 marks each.

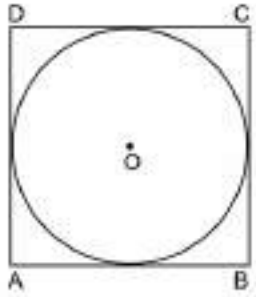
26. Lighthouse is a tower with a bright light at the top. Lighthouse serve as a navigational aid and to warn boats or ships about dangerous area.

Study the diagram and answer the question based on it.



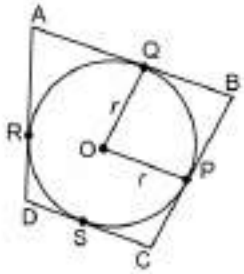
If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships. (Use $\sqrt{3} = 1.73$) **[Conceptual Application]**

27. (A) A quadrilateral ABCD is drawn to circumscribe a circle. Prove that: AB + CD = AD + BC. **[NCERT, Page 152]**



OR

(B) In the given figure, a circle is inscribed in a quadrilateral ABCD in which $\angle B = 90°$. If AD = 23 cm, AB = 29 cm and DS = 5 cm, find the radius (r) of the circle. **[Conceptual Application]**



28. If $\cot\theta = \sqrt{7}$, show that $\dfrac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2\theta + \sec^2\theta} = \dfrac{3}{4}$. **[Conceptual Application]**

29. (A) Solve the given equation for x and y by substitution method

$5x - 3y + 4 = 0$

$10x - 6y + 9 = 0$ **[NCERT, Page 33]**

OR

(B) Determine by drawing graph, whether the following pair of linear equations has infinite number of solutions or not: $y = 5$ and $y + 3 = 0$ **[NCERT, Page 27]**

30. Solve the following system of equations graphically:

$x + 2y = 4$

$4x + 3y = 10$ **[NCERT, Page 26-27]**

31. Prove that $\sqrt{p} + \sqrt{q}$ is an irrational, where p and q are primes. **[Conceptual Application]**

SECTION – D

Section D consists of 4 questions of 5 marks each.

32. The marks of 80 students of class X in Mathematics test are given below. Find the mode of these marks obtained by the students in Mathematics test. **[NCERT, Page 186]**

Marks	Frequency
0 – 10	2
10 – 20	6
20 – 30	12
30 – 40	16
40 – 50	13
50 – 60	20
60 – 70	5
70 – 80	1
80 – 90	4
90 – 100	1
Total	80

33. (A) A circus tent is in the shape of a cylinder surmounted by a conical top of the same diameter. If their common diameter is 56 m, the height of cylindrical part is 6 m and the total height of the tent above the ground is 27 m, find the area of canvas used in making the tent. **[NCERT, Page 167]**

OR

(B) A solid is in the form of a cylinder with hemispherical ends. The total height of the solid is 20 cm and the diameter of the cylinder is 7 cm. Find the total volume of the solid. **[Conceptual Application]**

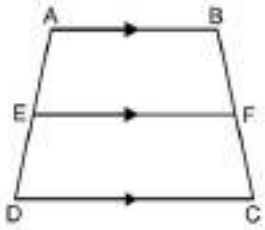
34. (A) At t minutes past 2 p.m. the time needed by the minutes hand of a clock to show 3 p.m. was found to be 3 minutes less than $\frac{t^2}{4}$ minutes. Find t. **[Conceptual Application]**

OR

(B) At present Asha's age (in years) is 2 more than the square of her daughter Nisha's age. When Nisha grows to her mother's present age, Asha's age would be one year less than 10 times the present age of Nisha. Find the present ages of both Asha and Nisha. **[Conceptual Application]**

35. If a line is drawn parallel to one side of a triangle, the other two sides are divided in the same ratio, prove it. Use this result to prove the following: **[NCERT, Page 80-81]**

In the given figure, if ABCD is a trapezium in which AB || DC || EF, then $\frac{AE}{ED} = \frac{BF}{FC}$. **[NCERT, Page 83]**



SECTION – E

Section E consists of 3 case study based questions of 4 marks each.

36. Akshat appears for a multiple choice questions test with four choices one of which is right. He either guesses or copies or knows the answer to a question. Total number of questions in the test is 50.

He knows the answer to 50% of the questions, he guesses the answer of 15 questions and copies the answer of remaining questions. **[Integrated]**

(*i*) What is the probability that he knows the answer of a question?

(*ii*) What is probability that Akshat guesses the answer of a question?

(*iii*) (A) What is the probability that Akshat copies the answer of a question?

OR

(B) What is the probability that Akshat does not copy the answer of a question?

37. The houses of four friends are located by points A, B, P and Q as shown in figure.

If coordinates of A and B with respect to coordinate axes are known and P and Q trisect the AB. Then answer the following questions based on it **[Integrated]**

(*i*) Find the coordinates of P.

(*ii*) Find the coordinates of Q.

(*iii*) (A) Find the distance PQ.

OR

(B) Find the distance AB.

38. Deepak and Sanju works together in a bank in Delhi. Hometown of both of them is Rampur in Uttar Pradesh which is at a distance of 300 km from Delhi. To reach Rampur from Delhi they travel partly by train and partly by bus. This Diwali they travelled separately to Rampur. Deepak travels 60 km by train and remaining by bus and taken 4 hrs. Sanju travels 100 km by train and remaining by bus and takes 4 hrs 10 minutes.

Now answer the following: **[Integrated]**

(*i*) If speed of train is x km/h and speed of bus is y km/h then write algebraic representation of the situation.

(*ii*) Find the speed of the bus.

(*iii*) (A) If speed of the train is 90 km/h and speed of the bus is 60 km/h then find time taken by Deepak to travel 60 km by train and 240 km by bus.

OR

(B) If speed of the train is 120 km/h and speed of bus is 60 km/h then find time taken by Sanju to travel 120 km by train and 180 km by bus.

ST Francis School Baraut

ESTD. 2016

Series : SFS/02/07

SET – 7

ROLL No.

Q.P Code 10/02/07

Candidates must write the Q.P Code on the title page of the Answer book.

- Please check that this question paper contains 7 printed pages.
- Please check that this question paper contains 38 questions.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please write down the serial number of the question in the answer-book before attempting it.
- 15 minute time has been allotted to read this question paper.
- The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

गणित
MATHEMATICS

निर्धारित समय : 3 घण्टे | *अधिकतम अंक : 80*

Time allowed : 3 hours | *Maximum Marks : 80*

General Instructions:

Read the following instructions carefully and follow them:

1. *This question paper contains **38 questions.** All Questions are compulsory.*
2. *This Question Paper is divided into **5** Sections **A**, **B**, **C**, **D** and **E**.*
3. *In **Section A**, Question numbers **1-18** are multiple choice questions (MCQs) and questions no. **19** and **20** are Assertion-Reason based questions of **01** mark each.*
4. *In **Section B**, Question numbers **21-25** are very short answer (VSA) type questions, carrying **02** marks each.*
5. *In **Section C**, Question numbers **26-31** are short answer (SA) type questions, carrying **03** marks each.*
6. *In **Section D**, Question numbers **32-35** are long answer (LA) type questions, carrying **05** marks each.*
7. *In **Section E**, Question numbers **36-38** are case study-based questions carrying **4** marks each with sub parts of the values of **1**, **1** and **2** marks each respectively.*
8. *There is no overall choice. However, an internal choice in **2** questions of **Section B**, 2 questions of **Section C** and 2 questions of **Section D** has been provided. An internal choice has been provided in all the **2** marks questions of **Section E**.*
9. *Draw neat and clean figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.*
10. *Use of calculators is **NOT** allowed.*

SECTION – A

Section A consists of 20 questions of 1 mark each.

1. Which of the following is incorrect (θ is an acute angle)? **[Conceptual Application]**

(a) $\tan\theta = 3$ (b) $\sin\theta = 3$ (c) $\sec\theta = 3$ (d) $\cot\theta = 3$

2. A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, how many tickets has she bought? **[Conceptual Application]**

(a) 40 (b) 240 (c) 480 (d) 750

3. The mean and median of the same data are 24 and 26 respectively. The value of mode is:

[NCERT, Page 197]

(a) 23 (b) 26 (c) 25 (d) 30

4. In an arranged series of an even number of $2n$ terms, the median is: **[Conceptual Application]**

(a) mean of nth term (b) mean of $(n + 1)$th term

(c) Both (a) and (b) (d) Neither (a) nor (b)

5. A kite is flying at a height of 30 m from the ground. The length of string from the kite to the ground is 60 m. Assuming that here is no slack in the string, the angle of elevation of the kite at the ground is

[NCERT, Page 141]

(*a*) 45° (*b*) 30° (*c*) 60° (*d*) 90°

6. A sphere and cube have equal surface area. The ratio of the volume of the sphere to that of cube is

[Conceptual Application]

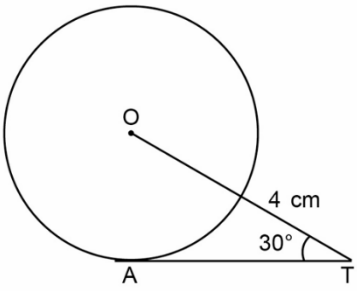
(*a*) $\sqrt{\pi} : \sqrt{6}$ (*b*) $\sqrt{6} : \sqrt{\pi}$ (*c*) $\sqrt{\pi} : \sqrt{3}$ (*d*) $\sqrt{3} : \sqrt{\pi}$

7. Length of the shadow of a person is x when the angle of elevation of the Sun is 45°. If the length of the shadow increases by $(\sqrt{3} - 1)\,x$, then the angle of elevation of the Sun should become

[Conceptual Application]

(*a*) 60° (*b*) 45° (*c*) 30° (*d*) 20°

8. In figure AT is tangent to the circle, with centre O. OT = 4 cm, ∠OTA = 30°, then AT = **[Conceptual Application]**



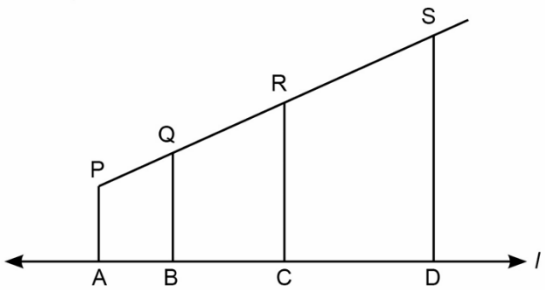
(*a*) 4 cm

(*b*) 2 cm

(*c*) $2\sqrt{3}$ cm

(*d*) $4\sqrt{3}$ cm

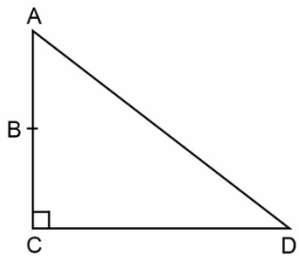
9. In the given figure, PA, QB, RC and SD are all perpendiculars to a line l. If AB = 6 cm, BC = 9 cm, CD = 15 cm and SP = 40 cm, then PQ = **[Conceptual Application]**



(*a*) 6 cm (*b*) 30 cm (*c*) 20 cm (*d*) 8 cm

10. In right triangle ACD, AB + AD = BC + CD. If AB = x, BC = h and CD = d, then x =

[Conceptual Application]



(*a*) $\dfrac{hd}{2h+d}$ (*b*) $d - h$ (*c*) $h + d$ (*d*) $\dfrac{h}{2}$

11. If $0 < \theta < \dfrac{\pi}{4}$, then the simplest form of $\sqrt{1 - 2\sin\theta\cos\theta}$ is **[Conceptual Application]**

(*a*) $\sin\theta - \cos\theta$ (*b*) $\cos\theta - \sin\theta$ (*c*) $\cos\theta + \sin\theta$ (*d*) $\sin\theta\cos\theta$

12. If $\tan\theta + \sin\theta = m$ and $\tan\theta - \sin\theta = n$, then $m^2 - n^2$ is equal to **[Conceptual Application]**

(*a*) $\sqrt{mn}$ (*b*) $\sqrt{\frac{m}{n}}$ (*c*) $4\sqrt{mn}$ (*d*) None of these

13. What is the smallest number which when increased by 6 becomes divisible by 36, 63 and 108 ? **[Conceptual Application]**

(*a*) 750 (*b*) 752 (*c*) 754 (*d*) 756

14. If the distance between the points$(4, p)$ and $(1, 0)$ is 5 units, then the value of p is **[NCERT, Page 105]**

(*a*) 4 only (*b*) ± 4 (*c*) –4 only (*d*) 0

15. The HCF and the LCM of 12, 21, 15 respectively are **[NCERT, Page 5]**

(*a*) 3, 140 (*b*) 12, 420 (*c*) 3, 420 (*d*) 420, 3

16. If the quadratic equation $mx^2 + 2x + m = 0$ has two equal roots, then the values of m are **[NCERT, Page 47]**

(*a*) ±1 (*b*) 0, 2 (*c*) 0, 1 (*d*) –1, 0

17. If $y = a + \frac{b}{x}$ where a, b are real numbers, $y = 1$ when $x = -1$ and $y = 5$ when $x = -5$ then $a + b =$ **[NCERT, Page 33]**

(*a*) –1 (*b*) 0 (*c*) 11 (*d*) 10

18. What is the greatest possible speed at which a man can walk 52 km and 91 km in an exact number of minutes ? **[Conceptual Application]**

(*a*) 17 m/min (*b*) 7 m/min (*c*) 13 m/min (*d*) 26 m/min

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.

(*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.

19. Assertion (A): The point (–1, 6) divides the line segment joining the points (–3, 10) and (6, –8) in the ratio 2 : 7 internally.

Reason (R): Three points A, B and C are collinear if AB + BC = AC. **[Conceptual Application]**

20. Assertion (A): $3x - 4y = 7$ and $6x - 8y = k$ have infinite number of solutions if $k = 14$.

Reason (R): $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$. **[NCERT, Page 26]**

SECTION – B

Section B consists of 5 questions of 2 marks each.

21. If tangents AB and AC, inclined to each other at an angle of 120° are drawn to a circle with centre O of radius 6 cm, then find the length of each tangent. **[Conceptual Application]**

22. (A) If $\sin\theta + \cos\theta = \sqrt{2}$ find the value of $\sin\theta \cdot \cos\theta$. **[Conceptual Application]**

OR

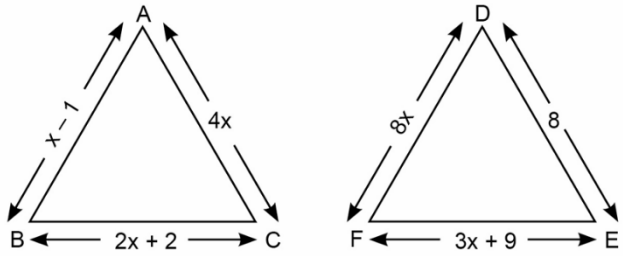
(B) In a triangle ABC, right-angled at B, the ratio of AB to AC is $1 : \sqrt{2}$. Find the value of $\frac{2\tan A}{1+\tan^2 A}$. **[Conceptual Application]**

23. (A) A contractor constructs a vertical pillar at a horizontal distance of 300 m from a fixed point. It was decided that angle of elevation of the top of the complete pillar from that point to be 60°. He finished the job by making a pillar such that the angle of elevation of its top was 30°. Find the height of the pillar to be increased as per the terms of contract. **[Conceptual Application]**

OR

(B) A kite is flying at a height of 60 m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 60°. Find the length of the string, assuming that there is no slack in the string. **[NCERT, Page 141]**

24. In the given figure, $\Delta ABC \sim \Delta DEF$. Find the length of the sides of each triangle. **[NCERT, Page 95]**



25. Which term of the AP: 129, 125, 121, 117, ..., is its first negative term? **[NCERT, Page 71]**

SECTION – C

Section C consists of 6 questions of 3 marks each.

26. A card is drawn at random from a well-shuffled deck of 52 playing cards. Find the probability that the card drawn is **[Conceptual Application]**

(*i*) either a heart or a queen.

(*ii*) a black king.

(*iii*) neither an ace nor a jack.

27. (A) The tangent at any point of a circle is perpendicular to the radius through the point of contact. Prove it. **[NCERT, Page 146-147]**

OR

(B) Two tangents PA and PB are drawn to the circle with centre O, such that $\angle APB = 120°$. Prove that $OP = 2AP$. **[Conceptual Application]**

28. Prove the following identity :

$$\frac{\sin\theta}{1-\cos\theta} + \frac{\tan\theta}{1+\cos\theta} = \sec\theta \cdot \operatorname{cosec}\theta + \cot\theta$$ **[Conceptual Application]**

29. (A) A railway half ticket costs half the full fare, but the reservation charges are the same on half ticket as on a full ticket. One reserved first class ticket from station P to station Q costs ₹ 2240. Also, one reserved first class ticket and one reserved first class half ticket from station P to station Q costs ₹ 3380. Find the full first class fare from station P to station Q and also, the reservation charges for a ticket. **[Conceptual Application]**

OR

(B) If the roots of the quadratic equation $p(q-r)x^2 + q(r-p)x + r(p-q) = 0$ are equal, show that $\frac{1}{p} + \frac{1}{r} = \frac{2}{q}$.

[Conceptual Application]

30. If α and β are the zeroes of the quadratic polynomial $25x^2 + 25x + 5$, then find the value of $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$.

[Conceptual Application]

31. Three sets of Physics, Chemistry and Mathematics books have to be stacked in such a way that all the books are stored topic wise and the number of books in each stack is the same. The number of Physics books is 192, the number of Chemistry books is 240 and the number of Mathematics books is 168. Determine the number of stacks each of Physics, Chemistry and Mathematics books.

[Conceptual Application]

SECTION – D

Section D consists of 4 questions of 5 marks each.

32. If AD and PM are medians of triangles ABC and PQR, respectively where $\Delta ABC \sim \Delta PQR$, prove that $\frac{AB}{PQ} = \frac{AD}{PM}$.

[NCERT, Page 93-94]

33. (A) A company's owner employed 150 workers to finish a piece of work in a certain fixed number of days. On the first day, all 150 workers worked. He dropped four workers on the second day, four more workers were dropped on the third day and so on. In this way, work got finished in 8 more days. Find the number of days in which work was to be completed originally. **[Conceptual Application]**

OR

(B) Show that the sum of first n even natural numbers is equal to $\left(1 + \frac{1}{n}\right)$ times the sum of the first n odd natural numbers. **[Conceptual Application]**

34. (A) A solid wooden toy is in the form of a hemisphere surmounted by a cone of same radius. The radius of hemisphere is 3.5 cm and the total wood used in the making of toy is $166\frac{5}{6}$ cm^3. Find the height of the toy. Also find the cost of painting the hemispherical part of the toy at the rate of ₹ 10 per cm^2. Use $\pi = \frac{22}{7}$. **[Conceptual Application]**

OR

(B) The dimensions of a room are 8m × 6m × hm. It has two doors each of size 2m × 1m and one almirah of size 3 m × 2 m. The cost of covering the walls by wallpaper which is 40 cm wide at ₹ 1.25 per m is ₹ 362.50. Find the height of the room. **[Conceptual Application]**

35. The following distribution gives the annual income of the number of persons as shown:

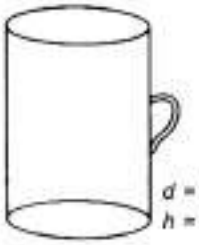
Income (in lakhs)	Number of persons
0 – 5	4
5 – 10	13
10 – 15	6
15 – 20	2
20 – 25	5

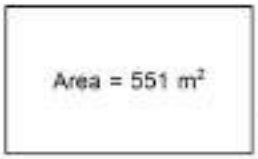
Find the median income. **[NCERT, Page 199]**

SECTION – E

Section E consists of 3 case study based questions of 4 marks each.

36. Adventure camps are the perfect place for the children to practice decision making for themselves without parents and teachers guiding their every move. Some students of a school reached for adventure at Sakleshpur. At the camp, the waiters served some students with a welcome drink in a cylindrical glass and some students in a hemispherical cup whose dimensions are shown below. After that they went for a jungle trek. The jungle trek was enjoyable but tiring. As dusk fell, it was time to take shelter. Each group of four students was given a canvas of area 551 m^2. Each group had to make a conical tent to accommodate all the four students. Assuming that all the stitching and wasting incurred while cutting, would amount to 1 m^2, the students put the tents. The radius of the tent is 7 m.





Now answer the following: **[Integrated]**

(*i*) Find the volume of cylindrical cup.

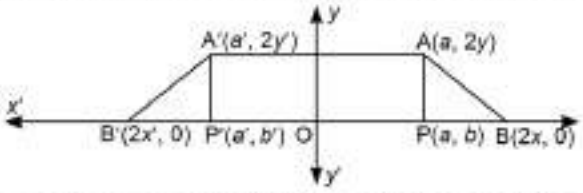
(*ii*) Find the volume of hemispherical cup.

(*iii*) (A) Which container had more juice and by how much?

OR

(B) Find the height of the conical tent prepared to accommodate four students.

37. A floor designed is made by 2-dimensional geometrical figures as shown on coordinate axes.



Coordinates of points are also represented. Here A′P′B′ is mirror image of APB along y axis.

Answer the following questions based on above diagram. **[Integrated]**

(*i*) Find the coordinates of mid point of PP′.

(*ii*) Find the distance of point P from y-axis.

(*iii*) (A) Find the distance PP′

OR

(B) Find the distance AA′

38. Sumedh is a science graduate. Driving in his passion. After finishing his graduation he drives a taxi in Sikkim. He charges a fixed amount together with the charge for the distance covered.

A person paid him ₹ 1100 for travelling 50 km by his taxi. On the next day a person paid him ₹ 1900 for travelling 90 km by his taxi. **[Integrated]**

(*i*) What are the fixed charges for his taxi?

(*ii*) What is the rate per kilometre for travelling by his taxi?

(*iii*) (A) If in peak tourist season sumedh increases the fixed charges by 60%, what will be the cost of travelling 50 km by his taxi?

OR

(B) If in lean tourist season he decreases the fixed charges by 50%, what will be the cost of travelling 60 km by his taxi?

ST Francis School Baraut

ESTD. 2016

Series : SFS/02/08

SET – 8

ROLL No.

Q.P Code 10/02/08

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गणित
MATHEMATICS

निर्धारित समय : 3 घण्टे | *अधिकतम अंक : 80*

Time allowed : 3 hours | *Maximum Marks : 80*

General Instructions:

Read the following instructions carefully and follow them:

1. *This question paper contains **38 questions**. All Questions are compulsory.*
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9. *Draw neat and clean figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.*
10. *Use of calculators is **NOT** allowed.*

SECTION – A

Section A consists of 20 questions of 1 mark each.

1. If $\sin\theta + \sin^2\theta + \sin^3\theta = 1$, then $\cos^6\theta - 4\cos^4\theta + 8\cos^2\theta$ is equal to **[Conceptual Application]**

(*a*) 1 (*b*) 2 (*c*) 3 (*d*) 4

2. A card is selected from a deck of 52 cards. The probability of its being a red face card is **[NCERT, Page 215]**

(*a*) $\frac{3}{26}$ (*b*) $\frac{3}{13}$ (*c*) $\frac{2}{13}$ (*d*) $\frac{1}{2}$

3. Which of the following is not a measure of central tendency? **[NCERT, Page 171]**

(*a*) Mean (*b*) Median (*c*) Class interval (*d*) Mode

4. The diameter of a wheel is 1.26 m. The distance travelled in 500 revolutions is $\left(\pi = \frac{22}{7}\right)$ **[Conceptual Application]**

(*a*) 2670 m (*b*) 2880 m (*c*) 1980 m (*d*) 1596 m

5. If four vertices of a parallelogram taken in order are $(-3, -1)$, (a, b), $(3, 3)$ and $(4, 3)$, then $a : b =$ **[NCERT, Page 110]**

(*a*) 1 : 4 (*b*) 4 : 1 (*c*) 1 : 2 (*d*) 2 : 1

6. The radius (in cm) of the largest right circular cone that can be cut out from a cube of edge 4.2 cm is **[Conceptual Application]**

(*a*) 4.2 (*b*) 2.1 (*c*) 8.1 (*d*) 1.05

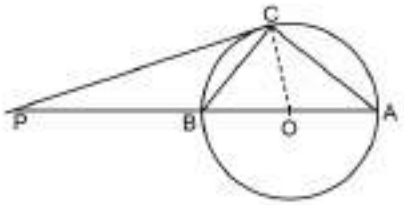
7. Area of the largest triangle that can be inscribed in a semicircle of radius r units is **[Conceptual Application]**

[Conceptual Application]

(*a*) r^2 sq units (*b*) $\frac{1}{2} r^2$ sq units

(*c*) $2r^2$ sq units (*d*) $\sqrt{2}\, r^2$ sq units

8. The tangent at a point C of a circle and a diameter AB when extended intersect at P. If $\angle PCA = 110°$, then $\angle CBA =$ **[Conceptual Application]**



(*a*) 80° (*b*) 60° (*c*) 40° (*d*) 70°

9. A ladder 15 m long just reaches the top of a vertical wall. If the ladder makes an angle of 60° with the wall, then the height of the wall is **[Conceptual Application]**

(*a*) $15\sqrt{3}$ m (*b*) $\frac{15\sqrt{3}}{2}$ m (*c*) $\frac{15}{2}$ m (*d*) 15 m

10. The angle of depression of a car, standing on the ground, from the top of a 75 m high tower, is 30°. The distance of the car from the base of the tower (in m) is: **[Conceptual Application]**

(*a*) $25\sqrt{3}$ (*b*) $50\sqrt{3}$ (*c*) $75\sqrt{3}$ (*d*) 150

11. $\frac{2\tan 30°}{1 - \tan^2 30°} =$ _____ **[NCERT, Page 127]**

(*a*) $\sqrt{3}$ (*b*) $\frac{1}{\sqrt{3}}$ (*c*) 1 (*d*) -1

12. If $\operatorname{cosec}\theta - \cot\theta = \frac{1}{4}$, then $\operatorname{cosec}\theta + \cot\theta =$ **[Conceptual Application]**

(*a*) 1 (*b*) 2 (*c*) 3 (*d*) 4

13. The greatest number of 5 digits, that will give us remainder of 5, when divided by 8 and 9 respectively is **[Conceptual Application]**

(*a*) 99921 (*b*) 99931 (*c*) 99941 (*d*) 99951

14. Perimeter of the triangle whose vertices are (0, 12), (0, 0) and (5, 0) is **[Conceptual Application]**

(*a*) 20 units (*b*) 25 units (*c*) 17 units (*d*) 30 units

15. If the numbers a, b, c, d, e form an AP, then the value of $a - 4b + 6c - 4d + e$ is **[Conceptual Application]**

(*a*) 1 (*b*) 2

(*c*) 0 (*d*) None of these

16. The LCM of two numbers is 2400. Which of the following cannot be their HCF? **[Conceptual Application]**

(*a*) 300 (*b*) 400 (*c*) 500 (*d*) 600

17. If α, β are the roots of the equation $x^2 + 5x + 5 = 0$, then equation whose roots are $\alpha + 1$ and $\beta + 1$ is **[Conceptual Application]**

(*a*) $x^2 + 5x - 5 = 0$ (*b*) $x^2 + 3x + 5 = 0$

(*c*) $x^2 + 3x + 1 = 0$ (*d*) None of these

18. Two alarm clocks ring their alarms at regular intervals of 50 seconds and 48 seconds. If they first beep together at 12 noon, at what time will they beep again for the first time ? **[NCERT, Page 6-7]**

(*a*) 12 : 20 pm (*b*) 12 : 12 pm

(*c*) 12 : 11 pm (*d*) None of these

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.

(*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.

19. **Assertion (A):** The polynomial $p(x) = x^3 + x$ has one real zero.

Reason (R): A polynomial of nth degree has at most n zeroes. **[Integrated]**

20. **Assertion (A):** The arithmetic mean of the following given distribution table is 14.

x_i	5	10	15	16	20
f_i	2	6	8	5	4

Reason (R): Mean $= l + \left(\dfrac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$ **[Integrated]**

SECTION – B

Section B consists of 5 questions of 2 marks each.

21. (A) If $\sin A + \sin^3 A = \cos^2 A$ then find the value $\cos^6 A - 4\cos^4 A + 8\cos^2 A$. **[Conceptual Application]**

OR

(B) Find the value of $\dfrac{\cot\theta}{\operatorname{cosec}\theta + 1} + \dfrac{\operatorname{cosec}\theta + 1}{\cot\theta}$. **[NCERT, Page 131]**

22. (A) If the areas of three adjacent faces of a cuboid are X, Y and Z respectively, then find the volume of the cuboid. **[Conceptual Application]**

OR

(B) The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes. **[NCERT, Page 158]**

23. A tangent PT at a point P of a circle of radius 5 cm meets a line through the centre O at a point T so that OT = 13 cm. Then find the length of PT. **[NCERT, Page 147]**

24. Evaluate:

$$\frac{\tan^2 60° + 4\sin^2 45° + 3\sec^2 30° + 5\cos^2 90°}{\text{cosec } 30° + \sec 60° - \cot^2 30°}$$ **[NCERT, Page 127]**

25. If S_n denotes the sum of n terms of an AP whose common difference is d and first term is a, find $S_n - 2S_{n-1} + S_{n-2}$. **[Conceptual Application]**

SECTION – C

Section C consists of 6 questions of 3 marks each.

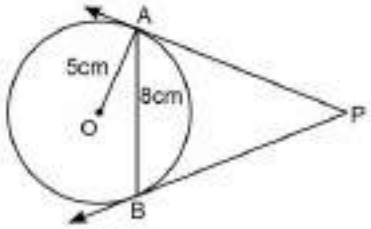
26. The king, queen and jack of clubs are removed from a deck of 52 playing cards. Then the cards are well-shuffled. One card is drawn at random from the remaining cards. Find the probability of getting

(*i*) a heart (*ii*) a king (*iii*) a club **[Conceptual Application]**

27. (A) Prove that the parallelogram circumscribing a circle is a rhombus. **[NCERT, Page 152]**

OR

(B) In fig., 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. **[NCERT, Page 150-151]**



28. Prove that $(\cot A + \sec B)^2 - (\tan B - \text{cosec } A)^2 = 2(\cot A . \sec B + \tan B . \text{cosec } A)$ **[Conceptual Application]**

29. (A) In a class, one-third of students had gone to watch drama. Twice the square root of the students had gone to watch magic show and remaining 12 students had gone to watch football match. Find the total number of students in the class. **[Conceptual Application]**

OR

(B) A train is travelling at a uniform speed for 360 km would have taken 48 minutes less to travel the same distance, if its speed were 5 km/hour more. Find the original speed of the train.

[NCERT, Page 42]

30. My grand father is a retired maths teacher. He teaches me daily in the evening to improve my maths skill. Yesterday, he gave me a mathematical question written as: "A natural number, when increased by 12, becomes equal to 160 times its reciprocal." Find the number. Give your solution.

[Conceptual Application]

31. A sweet shopkeeper prepares 396 *gulab jamuns* and 342 *rasgullas*. He packs them into containers. Each container consists of either *gulab jamun* or *rasgulla*, but have equal number of pieces. Find the number of pieces he should put in each container so that numbers of containers are least.

[Conceptual Application]

SECTION – D

Section D consists of 4 questions if 5 marks each.

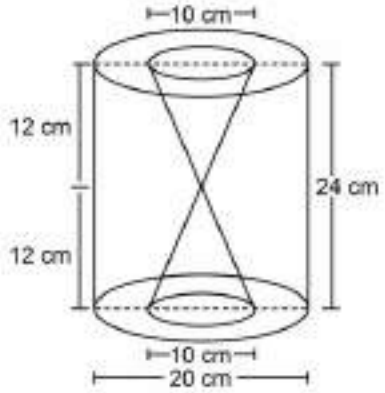
32. If the median of the following distribution is 46, find the missing frequencies p and q.

[NCERT, Page 195-196]

Class intervals	Frequency
10 – 20	12
20 – 30	30
30 – 40	p
40 – 50	65
50 – 60	q
60 – 70	25
70 – 80	18
Total	230

33. (A) Find the volume of the recycled material used in making the solid as shown in figure. It is given that diameter of cylinder is 20 cm and diameter of each of two equal conical cavity is 10 cm.

[Conceptual Application]



OR

(B) The length of a hall is 20 m and width 16 m. The sum of the areas of the floor and the flat roof is equal to the sum of the areas of the four walls. Find the height and the volume of the hall.

[Conceptual Application]

34. Sides AB and AC and median AD of a ΔABC are respectively proportional to sides PQ and PR and median PM of another ΔPQR. Show that $\Delta ABC \sim \Delta PQR$. **[NCERT, Page 97]**

35. (A) A contract of construction job specifies a penalty for delay of completion beyond a certain date as follows: ₹ 200 for the first day, ₹ 250 for the second day, ₹ 300 for the third day, etc., the penalty for each succeeding day being ₹ 50 more than for the preceding day. How much money the contractor has to pay as penalty, if he has delayed the work by 30 days? **[Conceptual Application]**

OR

(B) Find the 31st term of an AP whose 11th term is 38 and the 16th term is 73. **[NCERT, Page 62]**

SECTION – E

Section E consists of 3 case study based questions of 4 marks each.

36. Quadratic equations has many aspects in real life. Quadratic equations are very useful while calculating areas of a room, box, perimeter a plot of land etc. For example. Rajuvinder need to make a top of a study table whose length is 1.5 m longer than its breadth. He has various questions in his mind. Help him to answer the questions. **[Integrated]**

(*i*) If Rajuvinder has $3m^2$ of plywood. He used it to make a top of a study table whose length is 1.5 m longer than its breadth. Represent this situation in form of quadratic equation.

(*ii*) What are the dimensions of top of the study table?

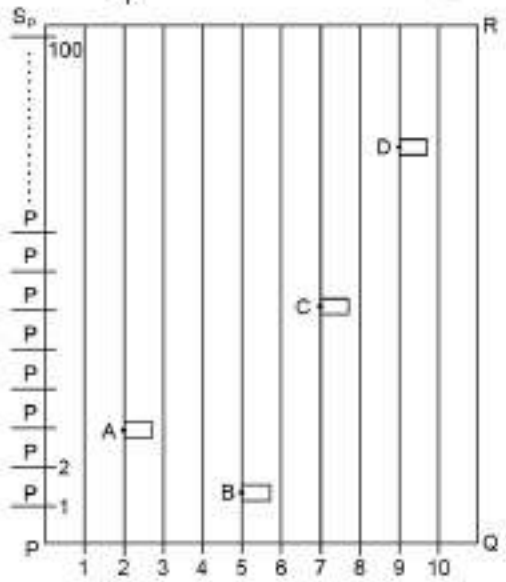
(*iii*) (A) If Rajuvinder keeps the length and breadth of top of study table equal then what is the quadratic equation representing this situation?

OR

(B) What are the dimensions of square shape study table?

37. School of design and architect celebrates its annual sports day in the month of November every year. This year also their rectangular shaped ground PQRS is marked with lines (with the chalk powder). These lines are at a distance of 1 m each and 100 flags have been placed at distance of 1 m from each other along PS.

To begin with Sarika runs $\frac{1}{4}$th of distance PS and post a white flag at A. Durva runs $\frac{1}{5}$th the distance of PS on the 5th line and post a green flag at B. Ashish runs $\frac{1}{2}$ the distance of PS on the 7 line and place a red flag at C. Pratham runs $\frac{3}{4}$th the distance of PS along 9th line and post blue flag at D.



Now answer the following: **[Integrated]**

(*i*) Taking P as origin what are the coordinates of A?

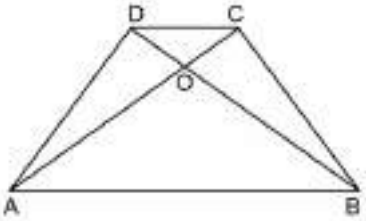
(*ii*) Find the Mid point of AD.

(*iii*) (A) Find the distance between AB.

OR

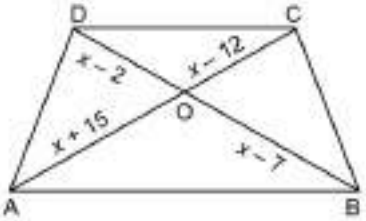
(B) Find the distance between AC

38. Karamveer a carpenter designs a trapezium ABCD shaped model as shown in which AB || DC and diagonal AC and BD divides each other in the ratio 1 : 3. Later he find that side AB is three times the CD.



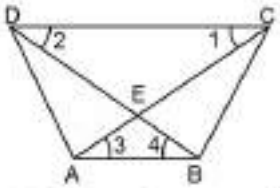
After that he designed various other trapezium shaped model with some other measurements as mentioned in some questions given below. Help him to determine the measurements. **[Integrated]**

(*i*) In the given model (trapezium shaped) ABCD, AB || DC then find *x*.

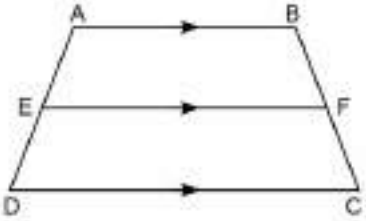


(*ii*) He designed a quadrilateral ABCD, such that $\angle 1 = \angle 3$ and $\angle 2 = \angle 4$

If $\frac{AE}{EC} = \frac{BE}{DE} = \frac{1}{2}$, and DC = 4 cm then find AB.



(*iii*) (A) He designed a trapezium ABCD, as shown such that AB || DC || EF, then find AE × FC.



OR

(B) He designed a trapezium ABCD in which AB || DC. If diagonals AC and BD intersects at P then find AP × DP.

ST Francis School Baraut

Series : SFS/02/09 **SET – 9**

ROLL No. **Q.P Code 10/02/09**

Candidates must write the Q.P Code on the title page of the Answer book.

- Please check that this question paper contains 7 printed pages.
- Please check that this question paper contains 38 questions.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please write down the serial number of the question in the answer-book before attempting it.
- 15 minute time has been allotted to read this question paper.
- The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

गणित
MATHEMATICS

निर्धारित समय : 3 घण्टे *अधिकतम अंक : 80*

Time allowed : 3 hours *Maximum Marks : 80*

General Instructions:

Read the following instructions carefully and follow them:

1. *This question paper contains **38 questions**. All Questions are compulsory.*
2. *This Question Paper is divided into 5 Sections **A**, **B**, **C**, **D** and **E**.*
3. *In **Section A**, Question numbers **1-18** are multiple choice questions (MCQs) and questions no. **19** and **20** are Assertion-Reason based questions of **01** mark each.*
4. *In **Section B**, Question numbers **21-25** are very short answer (VSA) type questions, carrying **02** marks each.*
5. *In **Section C**, Question numbers **26-31** are short answer (SA) type questions, carrying **03** marks each.*
6. *In **Section D**, Question numbers **32-35** are long answer (LA) type questions, carrying **05** marks each.*
7. *In **Section E**, Question numbers **36-38** are case study-based questions carrying **4** marks each with sub parts of the values of **1**, **1** and **2** marks each respectively.*
8. *There is no overall choice. However, an internal choice in **2** questions of **Section B**, 2 questions of **Section C** and 2 questions of **Section D** has been provided. An internal choice has been provided in all the **2** marks questions of **Section E**.*
9. *Draw neat and clean figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.*
10. *Use of calculators is **NOT** allowed.*

SECTION – A

Section A consists of 20 questions of 1 mark each.

1. If $4\tan\theta = 3$, then $\left(\frac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}\right)$ is equal to **[NCERT, Page 121]**

(a) $\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) $\frac{3}{4}$

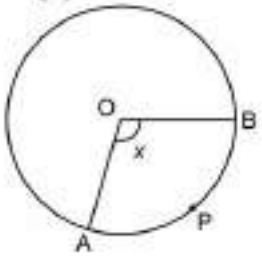
2. If $A = 2n + 13$, $B = n + 7$, where n is a natural number, then HCF of A and B is: **[Conceptual Application]**

(a) 2 (b) 1 (c) 3 (d) 4

3. The mean of 5 numbers is 18. One number is excluded their mean becomes 16. Then the excluded number is **[Conceptual Application]**

(a) 15 (b) 25 (c) 26 (d) 30

4. In figure, O is centre of circle, the area of sector OAPB is $\frac{5}{18}$ of the area of the circle, then x = **[NCERT, Page 155]**



(a) 100° (b) 36°

(c) 18° (d) 50°

5. The mean age of combined group of men and women is 30 years. If the mean of the age of men and women are respectively 32 and 27, then the percentage of women in the group is

[Conceptual Application]

(*a*) 30 (*b*) 20 (*c*) 50 (*d*) 40

6. Three vertices of a parallelogram, taken in order, are (1, 2), (0, 4) and (3, 7), then the fourth vertex is

[NCERT, Page 111]

(*a*) (4, 5) (*b*) (5, 4) (*c*) (6, 3) (*d*) (9, 5)

7. The circumference of the base of cone is 44 m. if height of cone is 9 m. then its volume is

[Conceptual Application]

(*a*) 462 m^2 (*b*) 462 m^3 (*c*) 492 m^3 (*d*) 426 m^3

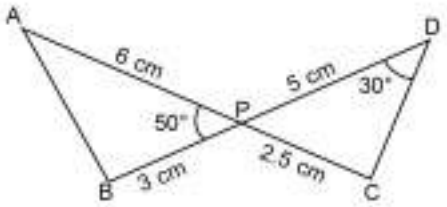
8. A circle is inscribed in a triangle with sides 8 cm, 15 cm and 17 cm, then the radius of circle is

[Conceptual Application]

(*a*) 6 cm (*b*) 5 cm (*c*) 4 cm (*d*) 3 cm

9. In the given figure, two line segments AC and BD intersect each other at the point P such that PA = 6 cm, PB = 3 cm, PC = 2.5 cm, PD = 5 cm, $\angle APB = 50°$ and $\angle CDP = 30°$. Then, $\angle PBA$ is equal to

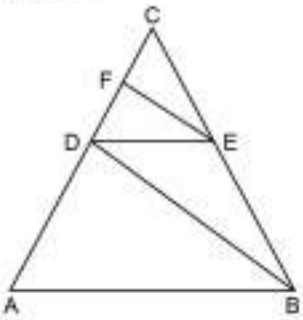
[Conceptual Application]



(*a*) 50° (*b*) 30° (*c*) 60° (*d*) 100°

10. In figure AB || DE, BD || EF, then DC^2 =

[Conceptual Application]



(*a*) CF × AC (*b*) CF × CE (*c*) CF × EF (*d*) CF × AD

11. If $p(x) = ax^2 + bx + c$, then $-\frac{b}{a}$ is equal to

[Conceptual Application]

(*a*) 0 (*b*) 1 (*c*) product of zeroes (*d*) sum of zeroes

12. 3 cot θ = 2, the value of tan θ =

[NCERT, Page 121]

(*a*) $\frac{2}{3}$ (*b*) $\frac{3}{2}$ (*c*) $\frac{3}{\sqrt{13}}$ (*d*) $\frac{2}{\sqrt{13}}$

13. On MG road, three consecutive traffic lights change after 36, 42 and 72 seconds. If the lights are first switched on at 9:00 am, at what time will they change simultaneously? **[Conceptual Application]**

(*a*) 9:08:04 (*b*) 9:08:24 (*c*) 9:08:44 (*d*) None of these

14. The ratio in which the line segment joining the points (1, –3) and (4, 5) divided by *x*-axis is

[NCERT, Page 111]

(*a*) 3:5 (*b*) 5:3 (*c*) 1:5 (*d*) 5:1

15. The equations $\frac{xy}{x+y} = \frac{1}{9}$ and $\frac{xy}{x-y} = \frac{1}{4}$ are equivalent to the equations: **[Conceptual Application]**

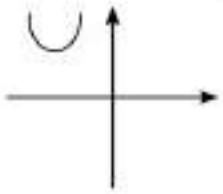
(*a*) $-\frac{1}{x}+\frac{1}{y}=9;\ \frac{1}{x}+\frac{1}{y}=4$ (*b*) $\frac{1}{x}-\frac{1}{y}=9;\ -\frac{1}{x}-\frac{1}{y}=4$

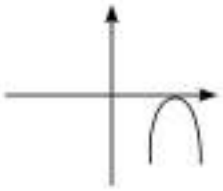
(*c*) $\frac{1}{x}+\frac{1}{y}=-4;\ \frac{1}{x}+\frac{1}{y}=-9$ (*d*) $\frac{1}{x}+\frac{1}{y}=9;\ -\frac{1}{x}+\frac{1}{y}=4$

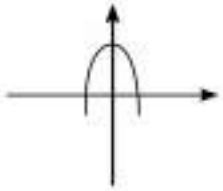
16. The graph of $y = x^3 - 4x$ cuts x-axis at (–2, 0), (0, 0) and (2, 0). The zeroes of $x^3 - 4x$ are **[Conceptual Application]**

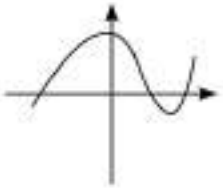
(*a*) 0, 0, 0 (*b*) –2, 2, 2 (*c*) –2, 0, 2 (*d*) –2, –2, 2

17. Which of the following is not the graph of quadratic polynomial? **[NCERT, Page 18]**

(*a*) 

(*b*) 

(*c*) 

(*d*) 

18. Two equilateral triangles have the sides of lengths 34 and 85 respectively. The greatest length of tape that can measure the sides of both of them exactly is **[Conceptual Application]**

(*a*) 34 units (*b*) 17 units (*c*) 51 units (*d*) None of these

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.

(*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.

19. Assertion (A): The linear equations $x - 2y - 3 = 0$ and $3x + 4y - 20 = 0$ have infinitely many solutions.

Reason (R): The system of equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinite solutions if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$. **[NCERT, Page 26]**

20. Assertion (A): Two identical solid cube of side 5 cm are joined end to end. Then total surface area of the resulting cuboid is 300 cm^2.

Reason (R): Total surface area of a cuboid is $2(lb + bh + lh)$. **[Conceptual Application]**

SECTION – B

Section B consists of 5 questions of 2 marks each.

21. (A) Given $15 \cot A = 8$, find $\sin A$ and $\sec A$. **[NCERT, Page 121]**

OR

(B) Given $\sec \theta = \frac{13}{12}$, calculate all other trigonometric ratios. **[NCERT, Page 121]**

22. (A) Find the area of a sector of a circle with radius 14 cm, if the length of the corresponding arc is 22 cm.

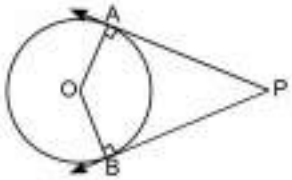
$\left(\pi = \frac{22}{7}\right)$ **[Conceptual Application]**

OR

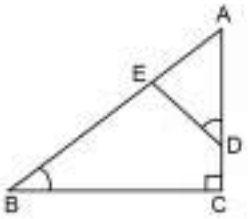
(B) The wheels of a car are of diameter 80 cm each. How many complete revolutions does each wheel make in 10 minutes when the car is travelling at a speed of 66 km per hour? $\left(\pi = \frac{22}{7}\right)$

[Conceptual Application]

23. In the given figure, PA and PB are the two tangents to a circle at A and B respectively. If O is centre of circle and $\angle AOB = 140°$, find $\angle APB$. **[NCERT, Page 151]**



24. In ΔABC, $\angle ADE = \angle B$. Prove that $\Delta ADE \sim \Delta ABC$. If AD = 7.5 cm, AB = 13.2 cm and BC = 4.4 cm, then find DE. **[Conceptual Application]**



25. Represent the following situation in the form of pair of linear equations in two variables. The cost of 2 shirts and 1 pant is ₹ 625 and 3 shirts and 2 pants together cost ₹ 1125. Find the cost of 1 shirt and 1 pant.

[NCERT, Page 29]

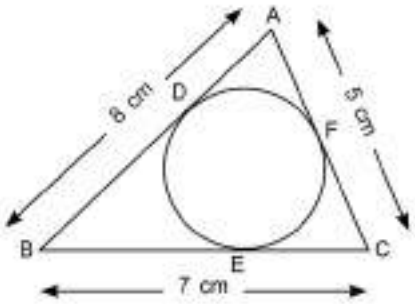
SECTION – C

Section C consists of 6 questions of 3 marks each.

26. (A) Two tangents AB and AC are drawn to a circle with centre O so that $\angle BAC = 120°$. Prove that OA = 2AB. **[Conceptual Application]**

OR

(B) A circle is inscribed in ΔABC having sides AB = 8 cm, BC = 7 cm and AC = 5 cm. Find AD, BE and CF. **[NCERT, Page 152]**



27. If $\cot\theta = \sqrt{7}$, evaluate: $\dfrac{\text{cosec}^2\theta - \sec^2\theta}{\text{cosec}^2\theta + \sec^2\theta}$. **[NCERT, Page 121]**

28. (A) Solve for x and y: $\dfrac{2x}{y+1} = 1$; $\dfrac{x+4}{2y} = \dfrac{1}{2}$. Hence find m where $m = 2x - 3y$. **[Conceptual Application]**

OR

(B) One year ago, a man was 8 times as old as his son. At present, his age is equal to the square of his son's age (in years). Find their present ages. **[Conceptual Application]**

29. Find the zeroes of $\sqrt{3}x^2 + 10x + 7\sqrt{3}$. **[NCERT, Page 20]**

30. Prove that $\sqrt{6}$ is an irrational. **[NCERT, Page 9]**

31. In the following APs, find the missing terms in the boxes: **[Conceptual Application]**

(*i*) 2, ☐, 26 (*ii*) ☐, 13, ☐, 3 (*iii*) 5, ☐, ☐, $9\frac{1}{2}$

SECTION – D

Section D consists of 4 questions of 5 marks each.

32. The length of the shadow of a tower standing on the level ground is found to be $2k$ metres longer when the Sun's altitude is 30°, then when it was 45°. Find the height of the tower in terms of k. **[NCERT, Page 138-139]**

33. (A) Ramaya decided to organise a small party with 11 persons on her birthday. There is small ground near to her home. She decided to arrange the party in this ground. She fixed the conical tent in the ground which can accommodate 11 persons. Each person must have 4 square metres of space on the ground and 20 m^3 of air to breath. Find the height of the conical tent. **[Conceptual Application]**

OR

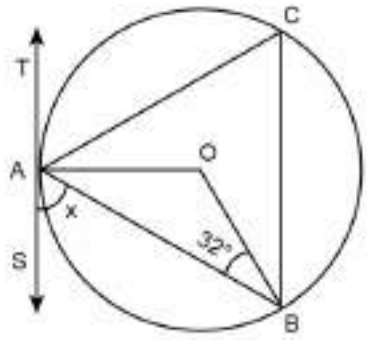
(B) A chord of a circle of the radius 12 cm subtends an angle of 120° at the centre. Find the area of the corresponding segment of the circle. (Use $\pi = 3.14$ and $\sqrt{3} = 1.73$). **[NCERT, Page 158]**

34. (A) What is the probability that month of December had exactly 5 Sundays, 5 Mondays and 5 Tuesdays? **[Conceptual Application]**

OR

(B) A three-digit number is chosen. Find the probability at all three digits are not same. **[Conceptual Application]**

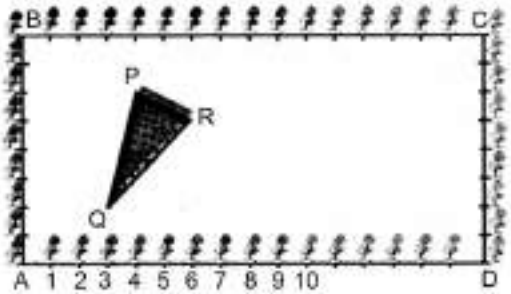
35. In the given figure, TAS is a tangent to the circle, with centre O, at the point A. If $\angle OBA = 32°$, find the value of x. **[Conceptual Application]**



SECTION – E

Section E consists of 3 case study based questions of 4 marks each.

36. The class X students school in krishnagar have been allotted a rectangular plot of land for their gardening activity. Saplings of Gulmohar are planted on the boundary at a distance of 1 m from each other. There is triangular grassy lawn in the plot as shown in the figure. The students are to sow seeds of flowering plants on the remaining area of the plot.



Now answer the following: **[Integrated]**

(*i*) Taking A as origin, find the coordinates of P.

(*ii*) What will be the coordinates of P, if C is the origin?

(*iii*) (A) What will be the coordinates of R, if C is the origin?

OR

(B) What will be the coordinates of Q, if C is the origin?

37. Mr. Gopal Rana took voluntary retirement from his job. After the retirement he purchased a piece of land near Rishikesh and built a farm house. His son Ashok studies in a school in Dehradoon and stays in hostel. During summer vacation, Ashok is back home and staying with his parents. During a general discussion Mr Gopal told Ashok that he purchased cows and hen's and invested ₹ 5,40,000 one cow cost him ₹ 50,000 and cost of one hen is ₹ 200.

Each cow give 10 kg of milk per day and on the average one egg per day obtained from each hen. Milk sells ₹ 90 per kg and selling price of one egg is ₹ 10. By selling milk and eggs he gets ₹ 11000 per day.

Now answer the following: **[Integrated]**

(*i*) If x is number of cows and y is number of hens. then represent the situation algebraically.

(*ii*) For what value of p, the system of equations

$2x + 3y - 14 = 0$ and $5x - py - 14 = 0$

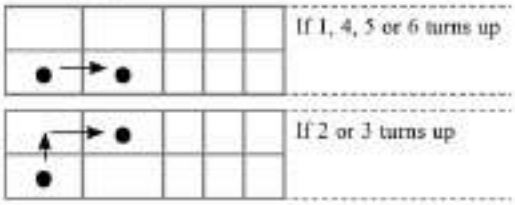
will not have a unique solution?

(*iii*) (A) Find the total number of cows and cattle.

OR

(B) Find the total number of legs of cows and hens.

38.



37	38	39	40	41	42	43	44	45
28	29	30	31	32	33	34	35	36
19	20	21	22	23	24	25	26	27
10	11	12	13	14	15	16	17	18
1	2	3	4	5	6	7	8	9

The diagram shows a grid of numbered squares. A small marble is placed in first square. A fair die is thrown. If 1,4,5 or 6 turns up then marble is moved one square to the right. If 2 or 3 turns up then marble is moved one square up and one square on right

Now answer the following: **[Integrated]**

(*i*) If marble is in 3rd square what is the probability that it will move to the right?

(*ii*) If marble is in square number 6 then what is the probability that it will not move to square number 7?

(*iii*) (A) If marble is in a square number 14, what is the probability to will move to a square with even number?

OR

(B) If marble is in square number 35 what is the probability that it will move to a square whose number is a perfect square?

ST Francis School Baraut

ESTD. 2016

Series : SFS/02/10 **SET – 10**

ROLL No. **Q.P Code 10/02/10**

Candidates must write the Q.P Code on the title page of the Answer book.

- Please check that this question paper contains 7 printed pages.
- Please check that this question paper contains 38 questions.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please write down the serial number of the question in the answer-book before attempting it.
- 15 minute time has been allotted to read this question paper.
- The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

गणित
MATHEMATICS

निर्धारित समय : 3 घण्टे *अधिकतम अंक : 80*

Time allowed : 3 hours *Maximum Marks : 80*

General Instructions:

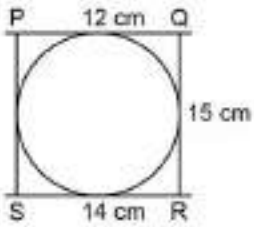
Read the following instructions carefully and follow them:

1. *This question paper contains **38 questions**. All Questions are compulsory.*
2. *This Question Paper is divided into **5** Sections **A, B, C, D** and **E**.*
3. *In **Section A**, Question numbers **1-18** are multiple choice questions (MCQs) and questions no. **19** and **20** are Assertion-Reason based questions of **01** mark each.*
4. *In **Section B**, Question numbers **21-25** are very short answer (VSA) type questions, carrying **02** marks each.*
5. *In **Section C**, Question numbers **26-31** are short answer (SA) type questions, carrying **03** marks each.*
6. *In **Section D**, Question numbers **32-35** are long answer (LA) type questions, carrying **05** marks each.*
7. *In **Section E**, Question numbers **36-38** are case study-based questions carrying **4** marks each with sub parts of the values of **1, 1** and **2** marks each respectively.*
8. *There is no overall choice. However, an internal choice in **2** questions of **Section B**, 2 questions of **Section C** and 2 questions of **Section D** has been provided. An internal choice has been provided in all the **2** marks questions of **Section E**.*
9. *Draw neat and clean figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.*
10. *Use of calculators is **NOT** allowed.*

SECTION – A

Section A consists of 20 questions of 1 mark each.

1. A quadrilateral PQRS is drawn to circumscribe a circle. If PQ = 12 cm, QR = 15 cm and RS = 14 cm, then the length of SP is **[Conceptual Application]**



(*a*) 15 cm (*b*) 14 cm

(*c*) 12 cm (*d*) 11 cm

2. Given that $\sin\theta = \frac{a}{b}$, then $\cos\theta$ is **[NCERT, Page 121]**

(*a*) $\frac{b}{\sqrt{b^2-a^2}}$ (*b*) $\frac{b}{a}$ (*c*) $\frac{\sqrt{b^2-a^2}}{b}$ (*d*) $\frac{a}{\sqrt{b^2-a^2}}$

3. $(\sec A + \tan A)(1 - \sin A)$ equals: **[NCERT, Page 131]**

(*a*) sec A (*b*) sin A (*c*) cosec A (*d*) cos A

4. If a pole 6 m high casts a shadow $2\sqrt{3}$ m long on the ground, then the Sun's elevation is

[Conceptual Application]

(*a*) 60° (*b*) 45° (*c*) 30° (*d*) 90°

5. If the perimeter and the area of a circle are numerically equal, then the radius of the circle is

[Conceptual Application]

(*a*) 2 units (*b*) π units (*c*) 4 units (*d*) 7 units

6. It is proposed to build a new circular park equal in area to the sum of areas of two circular parks of diameters 16 m and 12 m in a locality. The radius of the new park is **[Conceptual Application]**

(*a*) 10 m (*b*) 15 m (*c*) 20 m (*d*) 24 m

7. There is a square board of side '$2a$' units circumscribing a red circle. Jayadev is asked to keep a dot on the above said board. The probability that he keeps the dot on the shaded region is

[Conceptual Application]

(*a*) $\frac{\pi}{4}$ (*b*) $\frac{4-\pi}{4}$

(*c*) $\frac{\pi-4}{4}$ (*d*) $\frac{4}{\pi}$

8. 2 cards of hearts and 4 cards of spades are missing from a pack of 52 cards. A card is drawn at random from remaining pack. The probability of getting a black card is **[Conceptual Application]**

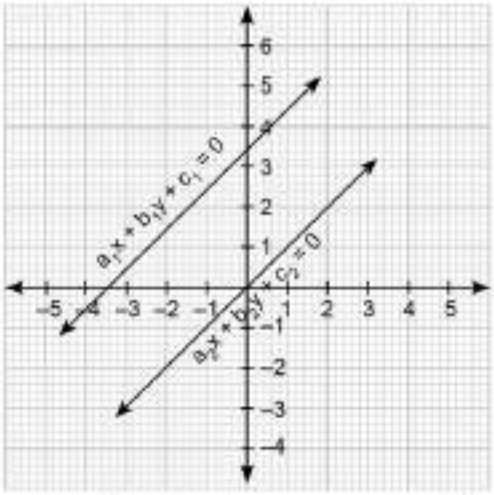
(*a*) $\frac{22}{52}$ (*b*) $\frac{22}{46}$ (*c*) $\frac{24}{52}$ (*d*) $\frac{24}{46}$

9. The upper limit of the modal class of the given distribution is: **[Conceptual Application]**

Height [in cm]	Below 140	Below 145	Below 150	Below 155	Below 160	Below 165
Number of girls	4	11	29	40	46	51

(*a*) 165 (*b*) 160 (*c*) 155 (*d*) 150

10. The lines representing the given pair of linear equations are non-intersecting. Which of the following statements is true? **[NCERT, Page 26]**



(*a*) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (*b*) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$ (*c*) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$ (*d*) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$

11. The nature of roots of the quadratic equation $9x^2 - 6x - 2 = 0$ is: **[NCERT, Page 47]**

(*a*) no real roots (*b*) 2 equal real roots

(*c*) 2 distinct real roots (*d*) more than 2 real roots

12. Two APs have the same common difference. The first term of one of these is (–1) and that of the other is (– 8). Then the difference between their 4th terms is **[Conceptual Application]**

(*a*) 1 (*b*) –7 (*c*) 7 (*d*) 9

13. What is the ratio in which the line segment joining (2, –3) and (5, 6) is divided by *x*-axis? **[NCERT, Page 111]**

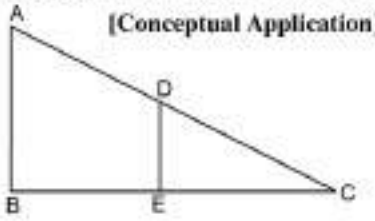
(*a*) 1 : 2 (*b*) 2 : 1 (*c*) 2 : 5 (*d*) 5 : 2

14. A point (x, y) is at a distance of 5 units from the origin. How many such points lie in the third quadrant? **[Conceptual Application]**

(*a*) 0 (*b*) 1

(*c*) 2 (*d*) infinitely many

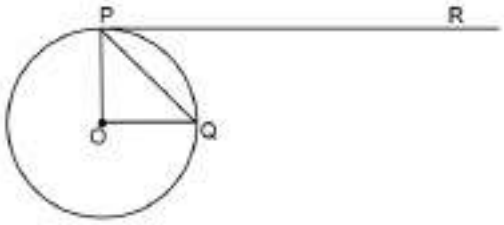
15. In ΔABC, $DE \parallel AB$. If $AB = a$, $DE = x$, $BE = b$ and $EC = c$. Then x expressed in terms of a, b and c is: **[Conceptual Application]**



(*a*) $\frac{ac}{b}$ (*b*) $\frac{ac}{b+c}$

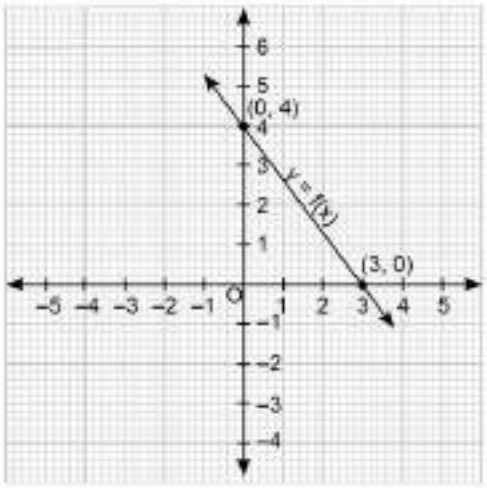
(*c*) $\frac{ab}{c}$ (*d*) $\frac{ab}{b+c}$

16. If O is centre of a circle and chord PQ makes an angle 50° with the tangent PR at the point of contact P, then the angle subtended by the chord at the centre is **[Conceptual Application]**



(*a*) 130° (*b*) 100° (*c*) 50° (*d*) 30°

17. The given linear polynomial $y = f(x)$ has **[NCERT, Page 12]**



(*a*) 2 zeroes (*b*) 1 zero and the zero is '3'

(*c*) 1 zero and the zero is '4' (*d*) No zero

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

[NCERT, Page 5]

(a) xy (b) xy^2 (c) x^3y^3 (d) x^2y^2

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.

(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.

19. Assertion (A): $-5, \frac{-5}{2}, 0, \frac{5}{2}, \ldots$ is in Arithmetic Progression.

Reason (R): The terms of an Arithmetic Progression cannot have both positive and negative rational numbers.

[Conceptual Application]

20. Assertion (A): Total surface area of the top is the sum of the curved surface area of the hemisphere and the curved surface area of the cone.

Reason (R): Top is obtained by joining the plane surfaces of the hemisphere and cone together.

[Conceptual Application]

SECTION – B

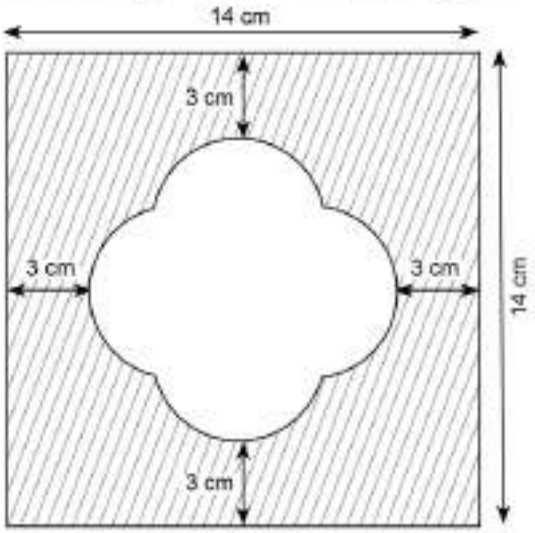
Section B consists of 5 questions of 2 marks each.

21. (A) With vertices A, B and C of ΔABC as centres, arcs are drawn with radii 14 cm and the three portions of the triangle so obtained are removed. Find the total area removed from the triangle.

[Conceptual Application]

OR

(B) Find the area of the unshaded region shown in the given figure. **[Conceptual Application]**



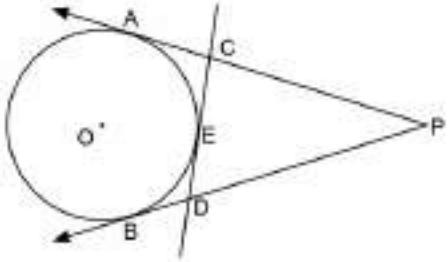
22. (A) If $\tan(A+B)=\sqrt{3}$ and $\tan(A-B)=\frac{1}{\sqrt{3}}$; $0°<A+B<90°$; $A>B$, find A and B. **[NCERT, Page 127]**

OR

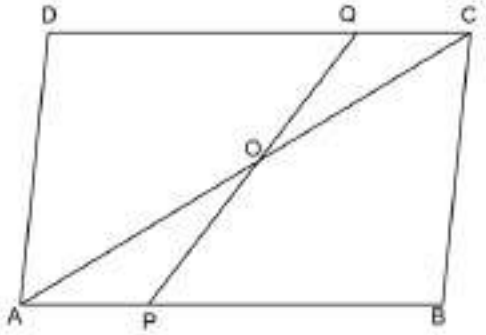
(B) Find the value of x, if $2\operatorname{cosec}^2 30° + x\sin^2 60° - \frac{3}{4}\tan^2 30° = 10$ **[Conceptual Application]**

23. Prove that $\sqrt{2}$ is an irrational number. **[NCERT, Page 6-7]**

24. From an external point P, two tangents, PA and PB are drawn to a circle with centre O. At a point E on the circle, a tangent is drawn to intersect PA and PB at C and D, respectively. If PA = 10 cm, find the perimeter of ΔPCD. **[Conceptual Application]**



25. ABCD is a parallelogram. Point P divides AB in the ratio 2:3 and point Q divides DC in the ratio 4:1. Prove that OC is half of OA. **[Conceptual Application]**



SECTION – C

Section C consists of 6 questions of 3 marks each.

26. The length of 40 leaves of a plant are measured correct to nearest millimetre, and the data obtained is represented in the following table.

Length (in mm)	118 – 126	127 – 135	136 – 144	145 – 153	154 – 162	163 – 171	172 – 180
Number of leaves	3	5	9	12	5	4	2

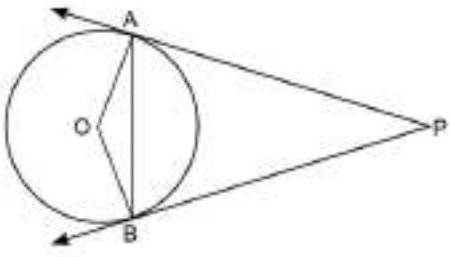
Find the mean length of the leaves. **[NCERT, Page 182]**

27. If $1+\sin^2\theta = 3\sin\theta\cos\theta$, then prove that $\tan\theta = 1$ or $\frac{1}{2}$. **[Conceptual Application]**

28. (A) PA and PB are tangents drawn to a circle of centre O from an external point P. Chord AB makes an angle of 30° with the radius at the point of contact.

If length of the chord is 6 cm, find the length of the tangent PA and the length of the radius OA.

[Conceptual Application]



OR

(B) Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$. **[NCERT, Page 150]**

29. (A) The sum of a two-digit number and the number obtained by reversing the digits is 66. If the digits of the number differ by 2, find the number. How many such numbers are there? **[NCERT, Page 35-36]**

OR

(B) Solve: $\frac{2}{\sqrt{x}} + \frac{3}{\sqrt{y}} = 2; \frac{4}{\sqrt{x}} - \frac{9}{\sqrt{y}} = -1, x, y > 0$ **[Conceptual Application]**

30. If α, β are zeroes of quadratic polynomial $5x^2 + 5x + 1$, find the value of

(*i*) $\alpha^2 + \beta^2$

(*ii*) $\alpha^{-1} + \beta^{-1}$ **[Conceptual Application]**

31. National Art convention got registrations from students from all parts of the country, of which 60 are interested in music, 84 are interested in dance and 108 students are interested in handicrafts. For optimum cultural exchange, organisers wish to keep them in minimum number of groups such that each group consists of students interested in the same art form and the number of students in each group is the same. Find the number of students in each group. Find the number of groups in each art form. How many rooms are required if each group will be allotted a room? **[Conceptual Application]**

SECTION – D

Section D consists of 4 questions of 5 marks each.

32. The median of the following data is 50. Find the values of '*p*' and '*q*', if the sum of all frequencies is 90. Also find the mode of the data: **[NCERT, Page 195-196]**

Marks obtained	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Number of students	*p*	15	25	20	*q*	8	10

33. (A) Water is flowing at the rate of 15 km/h through a pipe of diameter 14 cm into a cuboidal pond which is 50 m long and 44 m wide. In what time will the level of water in pond rise by 21 cm? What should be the speed of water if the rise in water level is to be attained in 1 hour?

[Conceptual Application]

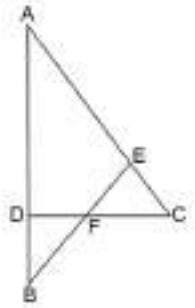
OR

(B) A tent is in the shape of a cylinder surmounted by a conical top. If the height and radius of the cylindrical part are 3 m and 14 m respectively, and the total height of the tent is 13.5 m, find the area of the canvas required for making the tent, keeping a provision of 26 m^2 of canvas for stitching and wastage. Also, find the cost of the canvas to be purchased at the rate of ₹ 500 per m^2. **[NCERT, Page 167]**

34. (*a*) State and prove Basic Proportionality theorem. **[NCERT, Page 80-81]**

(*b*) In the given figure $\angle CEF = \angle CFE$. F is the midpoint of DC.

Prove that $\frac{AB}{BD} = \frac{AE}{FD}$ **[Conceptual Application]**



35. (A) Show that the sum of first n even natural numbers is equal to $\left(1+\frac{1}{n}\right)$ times the sum of the first n odd natural numbers. **[Conceptual Application]**

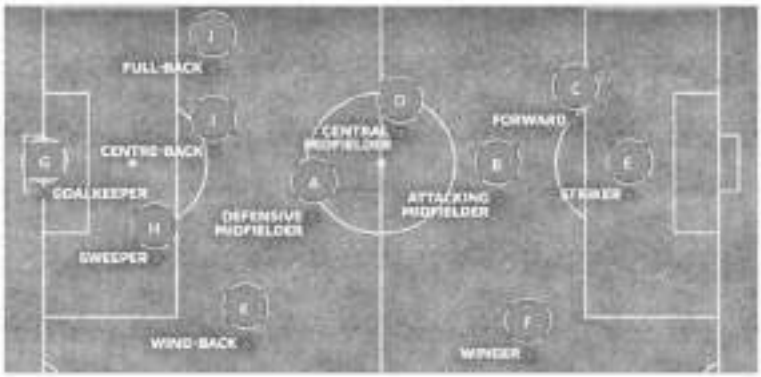
OR

(B) Two water taps together can fill a tank in $9\frac{3}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tank. **[Conceptual Application]**

SECTION – E

Section E consists of 3 case study based questions of 4 marks each.

36. Tharunya was thrilled to know that the football tournament is fixed with a monthly time frame from 20th July to 20th August 2023 and for the first time in the FIFA Women's World Cup's history, two nations host in 10 venues. Her father felt that the game can be better understood if the position of players is represented as points on a coordinate plane.



Now answer the following **[Integrated]**

(*i*) At an instance, the midfielders and forward formed a parallelogram. Find the position of the central midfielder (D) if the position of other players who formed the parallelogram are : A(1,2), B(4,3) and C(6,6)

(*ii*) If Defensive midfielder A(1,4), Attacking midfielder B(2, –3) and Striker E(a,b) lie on the same straight line and B is equidistant from A and E, find the position of E.

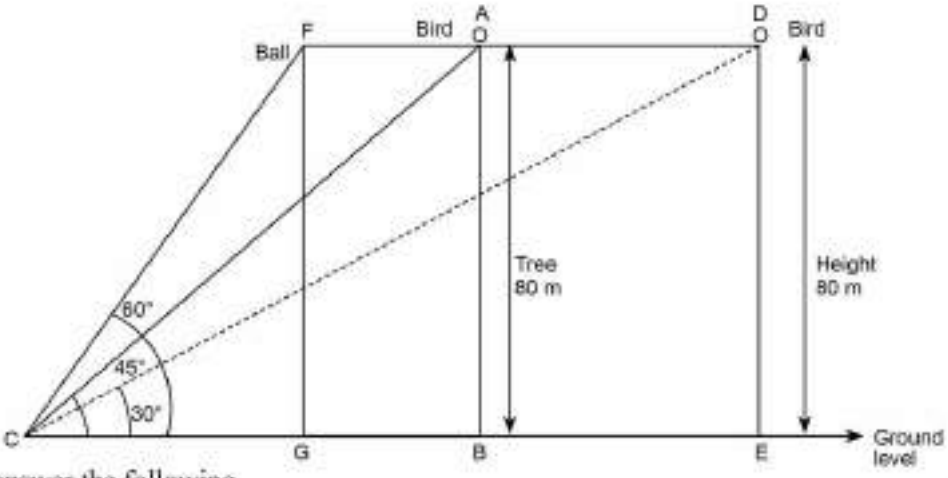
(*iii*) (A) Check if the Goal keeper G(–3,5), Sweeper H(3, 1) and Wing-back K(0, 3) fall on a same straight line.

OR

(B) Check if the Full-back J(5, –3) and centre-back I(–4, 6) are equidistant from forward C(0,1) and if C is the mid-point of IJ.

37. One evening, Kaushik was in a park. Children were playing cricket. Birds were singing on a nearby tree of height 80 m. He observed a bird on the tree at an angle of elevation of 45°.

When a sixer was hit, a ball flew through the tree frightening the bird to fly away. In 2 seconds, he observed the bird flying at the same height at an angle of elevation of 30° and the ball flying towards him at the same height at an angle of elevation of 60°.



Now answer the following **[Integrated]**

(*i*) At what distance from the foot of the tree was he observing the bird sitting on the tree?

(*ii*) What is the speed of the bird in m/min if it had flown $20(\sqrt{3}+1)$ m?

(*iii*) (A) How far did the bird fly in the mentioned time?

OR

(B) After hitting the tree, how far did the ball travel in the sky when Kaushik saw the ball?

38. Manpreet Kaur is the national record holder for women in the shot-put discipline. Her throw of 18.86 m at the Asian Grand Prix in 2017 is the biggest distance for an Indian female athlete.

Keeping her as a role model, Sanjitha is determined to earn gold in Olympics one day.

Initially her throw reached 7.56 m only. Being an athlete in school, she regularly practiced both in the mornings and in the evenings and was able to improve the distance by 9 cm every week.

During the special camp for 15 days, she started with 40 throws and every day kept increasing the number of throws by 12 to achieve this remarkable progress.

Now answer the following **[Integrated]**

(*i*) How many throws Sanjitha practiced on 11th day of the camp?

(*ii*) How many throws did she do during the entire camp of 15 days?

(*iii*) (A) What would be Sanjitha's throw distance at the end of 6 weeks?

OR

(B) When will she be able to achieve a throw of 11.16 m?