Series WX1YZ/6

SET~3

प्रश्न–पत्र कोड
Q.P. Code 430/6/3

रोल नं.
Roll No.

परीक्षार्थी प्रश्न–पत्र कोड को उत्तर–पुस्तिका के मुख–पृष्ठ पर अवश्य लिखें ।
Candidates must write the Q.P. Code on the title page of the answer-book.

गणित (बुनियादी)
MATHEMATICS (BASIC)

निर्धारित समय : 3 घण्टे
Time allowed : 3 hours

अधिकतम अंक : 80
Maximum Marks : 80

नोट / NOTE :

(i) कृपया जाँच कर लें कि इस प्रश्न–पत्र में मुद्रित पृष्ठ **23** हैं ।
Please check that this question paper contains **23** printed pages.

(ii) प्रश्न–पत्र में दाहिने हाथ की ओर दिए गए प्रश्न–पत्र कोड को परीक्षार्थी उत्तर–पुस्तिका के मुख–पृष्ठ पर लिखें ।
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.

(iii) कृपया जाँच कर लें कि इस प्रश्न–पत्र में **38** प्रश्न हैं ।
Please check that this question paper contains **38** questions.

(iv) **कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर–पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें ।**
Please write down the serial number of the question in the answer-book before attempting it.

(v) इस प्रश्न–पत्र को पढ़ने के लिए 15 मिनट का समय दिया गया है । प्रश्न–पत्र का वितरण पूर्वाह्न में 10.15 बजे किया जाएगा । 10.15 बजे से 10.30 बजे तक परीक्षार्थी केवल प्रश्न–पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर–पुस्तिका पर कोई उत्तर नहीं लिखेंगे ।
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 candidates will read the question paper only and will not write any answer on the answer-book during this period.

सामान्य निर्देश :

निम्नलिखित निर्देशों को बहुत सावधानी से पढ़िए और उनका पालन कीजिए :

(i) *इस प्रश्न-पत्र में कुल* **38** *प्रश्न हैं।* ***सभी*** *प्रश्न अनिवार्य हैं।*

(ii) *प्रश्न-पत्र* ***पाँच*** *खण्डों में विभाजित है – खण्ड-* ***क, ख, ग, घ*** *तथा* ***ङ*** *।*

(iii) *खण्ड –* ***क*** *में प्रश्न संख्या* **1** *से* **18** *तक बहुविकल्पीय तथा प्रश्न संख्या* **19** *एवं* **20** *अभिकथन एवं तर्क आधारित* ***एक-एक*** *अंक के प्रश्न हैं।*

(iv) *खण्ड –* ***ख*** *में प्रश्न संख्या* **21** *से* **25** *तक अति लघु-उत्तरीय-I (VSA-I) प्रकार के* ***दो-दो*** *अंकों के प्रश्न हैं।*

(v) *खण्ड –* ***ग*** *में प्रश्न संख्या* **26** *से* **31** *तक लघु-उत्तरीय-II (SA-II) प्रकार के* ***तीन-तीन*** *अंकों के प्रश्न हैं।*

(vi) *खण्ड –* ***घ*** *में प्रश्न संख्या* **32** *से* **35** *तक दीर्घ-उत्तरीय प्रकार के* ***पाँच-पाँच*** *अंकों के प्रश्न हैं।*

(vii) *खण्ड –* ***ङ*** *में प्रश्न संख्या* **36** *से* **38** ***स्रोत / प्रकरण*** *इकाई आधारित* ***चार-चार*** *अंकों के प्रश्न हैं। आंतरिक विकल्प* ***दो-दो*** *अंकों के प्रश्न में दिया गया है।*

(viii) *प्रश्न-पत्र में समग्र विकल्प नहीं दिया गया है। यद्यपि, खण्ड –* ***ख*** *के* **2** *प्रश्नों में, खण्ड –* ***ग*** *के* **2** *प्रश्नों में, खण्ड –* ***घ*** *के* **2** *प्रश्नों में तथा खण्ड-* ***ङ*** *के* **3** *प्रश्नों में आंतरिक विकल्प का प्रावधान दिया गया है।*

(ix) *जहाँ आवश्यक हो स्वच्छ आकृतियाँ बनाएँ। यदि आवश्यक हो तो* $\pi = \frac{22}{7}$ *लें।*

(x) *कैल्कुलेटर का उपयोग वर्जित है।*

General Instructions :

Read the following instructions vary carefully and follow them :

(i) *This Question Paper contains* ***38*** *questions.* ***All*** *questions are compulsory.*

(ii) *Question Paper is divided into* ***FIVE*** *Sections –* ***Section A, B, C, D*** *and* ***E****.*

(iii) *In Section–****A*** *question number* ***1*** *to* ***18*** *are Multiple Choice Questions (MCQs) and question number* ***19*** *&* ***20*** *are Assertion-Reason based questions of* ***1*** *mark each.*

(iv) *In Section–****B*** *question number* ***21*** *to* ***25*** *are Very Short Answer-I (VSA-I) type questions of* ***2*** *marks each.*

(v) *In Section–****C*** *question number* ***26*** *to* ***31*** *are Short Answer-II (SA-II) type questions carrying* ***3*** *marks each.*

(vi) *In Section–****D*** *question number* ***32*** *to* ***35*** *are Long Answer (LA) type questions carrying* ***5*** *marks each.*

(vii) *In Section–****E*** *question number* ***36*** *to* ***38*** *are Case Study Based integrated units of Assessment questions carrying* ***4*** *marks each. Internal choice is provided in* ***2*** *marks question in each case-study.*

(viii) *There is no overall choice. However, an internal choice has been provided in* ***2*** *questions in Section–****B****,* ***2*** *questions in Section–****C****,* ***2*** *questions in Section–****D*** *and* ***3*** *questions in Section–****E****.*

(ix) *Draw neat figures wherever required. Take* $\pi = \frac{22}{7}$ *wherever required if not stated.*

(x) *Use of Calculators is NOT allowed.*

खण्ड – क

(बहुविकल्पीय प्रश्न)

खण्ड – क में **20** प्रश्न हैं और प्रत्येक प्रश्न **1** अंक का है ।

1. संख्या 5488 का अभाज्य गुणनखंडन है : **1**

(a) $2^3 \times 7^3$ (b) $2^4 \times 7^3$

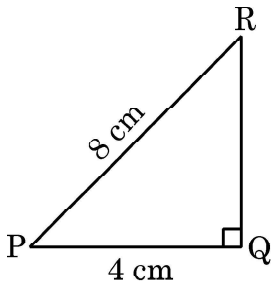
(c) $2^4 \times 7^4$ (d) $2^3 \times 7^4$

2. तीनों केंद्रीय प्रवृत्ति के मापकों में आनुभविक संबंध है : **1**

(a) बहुलक = 3 माध्य – 2 माध्यक (b) बहुलक = 2 माध्यक – 3 माध्य

(c) बहुलक = 2 माध्य – 3 माध्यक (d) बहुलक = 3 माध्यक– 2 माध्य

3. दी गई आकृति में, PQR एक समकोण त्रिभुज है जिसमें $\angle Q$ एक समकोण है । यदि PQ = 4 cm और PR = 8 cm है, तो $\angle P$ है : **1**



(a) 60° (b) 45°

(c) 30° (d) 15°

4. पहली दस प्राकृत संख्याओं का माध्यक है : **1**

(a) 5 (b) 6

(c) 5.5 (d) 6.5

Section – A

(Multiple Choice Questions)

Section – A consists of **20** questions of **1** mark each.

1. The prime factorisation of the number 5488 is **1**

(a) $2^3 \times 7^3$ (b) $2^4 \times 7^3$

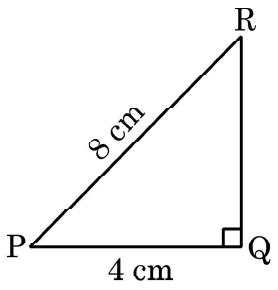
(c) $2^4 \times 7^4$ (d) $2^3 \times 7^4$

2. The Empirical relation between the three measures of central tendency is **1**

(a) Mode = 3 Mean – 2 Median (b) Mode = 2 Median – 3 Mean

(c) Mode = 2 Mean – 3 Median (d) Mode = 3 Median – 2 Mean

3. In the given figure, ΔPQR is a right triangle right angled at Q. If PQ = 4 cm and PR = 8 cm, then $\angle P$ is **1**



(a) 60° (b) 45°

(c) 30° (d) 15°

4. The median of first 10 natural numbers is **1**

(a) 5 (b) 6

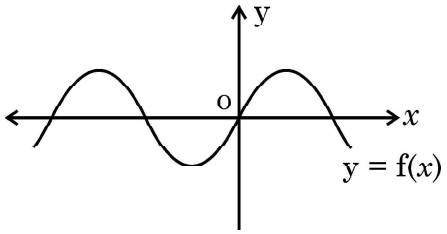
(c) 5.5 (d) 6.5

5. बहुपद $p(x) = 2x^2 - x - 3$ के शून्यक हैं : 1

(a) $-\frac{3}{2}, 1$ (b) $\frac{3}{2}, 1$

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

6. किसी बहुपद $f(x)$ के लिए, $y = f(x)$ का ग्राफ आकृति में दिखाया गया है । बहुपद $f(x)$ के शून्यकों की संख्या हैं : 1



(a) 4 (b) 3

(c) 2 (d) 1

7. बिन्दु (5, 0) की मूल बिंदु से दूरी है : 1

(a) 0 (b) 5

(c) $\sqrt{5}$ (d) 5^2

8. यदि 6, 7, x, 8, y, 14 का माध्य 9 हो, तो 1

(a) $x + y = 21$ (b) $x + y = 19$

(c) $x - y = 19$ (d) $x - y = 21$

9. यदि n एक प्राकृत संख्या है, तो 8^n निम्न में से किस अंक पर समाप्त नहीं होता है ? 1

(a) 0 (b) 2

(c) 4 (d) 6

10. 7 cm त्रिज्या वाले वृत्त के एक चतुर्थांश का क्षेत्रफल है : 1

(a) 154 cm^2 (b) 77 cm^2

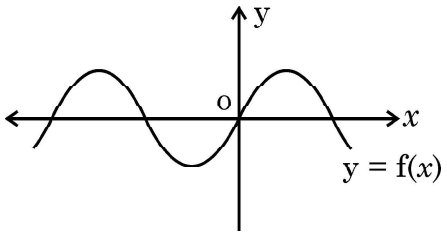
(c) $\frac{77}{2}$ cm^2 (d) $\frac{77}{4}$ cm^2

5. The zeroes of the polynomial $p(x) = 2x^2 - x - 3$ are **1**

(a) $-\frac{3}{2}, 1$ (b) $\frac{3}{2}, 1$

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

6. The graph of $y = f(x)$ is shown in the figure for some polynomial $f(x)$. The number of zeroes of $f(x)$ are **1**



(a) 4 (b) 3

(c) 2 (d) 1

7. The distance of the point (5, 0) from the origin is **1**

(a) 0 (b) 5

(c) $\sqrt{5}$ (d) 5^2

8. If the mean of 6, 7, x, 8, y, 14 is 9, then **1**

(a) $x + y = 21$ (b) $x + y = 19$

(c) $x - y = 19$ (d) $x - y = 21$

9. If n is a natural number, then 8^n cannot end with digit **1**

(a) 0 (b) 2

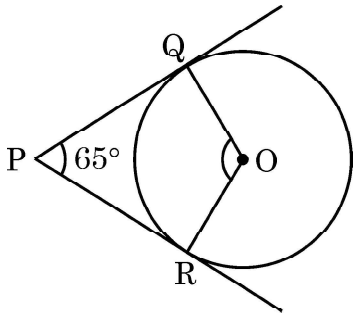
(c) 4 (d) 6

10. Area of a quadrant of a circle of radius 7 cm is **1**

(a) 154 cm^2 (b) 77 cm^2

(c) $\frac{77}{2}$ cm^2 (d) $\frac{77}{4}$ cm^2

11. दी गई आकृति में, बिंदु P से केंद्र O वाले एक वृत्त पर PQ और PR स्पर्श-रेखाएँ हैं जिसमें $\angle QPR = 65^\circ$ है । $\angle QOR$ का माप है : **1**



(a) 65° (b) 125°

(c) 115° (d) 90°

12. 52 ताश के पत्तों की अच्छी प्रकार से फेंटी गई एक गड्डी में से एक पत्ता यादृच्छया निकाला जाता है । इस पत्ते के काला बादशाह होने की प्रायिकता क्या है ? **1**

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$

(c) $\frac{1}{52}$ (d) $\frac{1}{2}$

13. यदि बिन्दु (6, k), समीकरण $x - 3y + 6 = 0$ से निरूपित रेखा पर स्थित हो, तो k का मान है **1**

(a) – 4 (b) 12

(c) –12 (d) 4

14. यदि बिंदु (2, 4), बिंदुओं (6, 3) और (a, 5) को जोड़ने वाले रेखाखंड का मध्य-बिंदु हो, तो a का मान होगा : **1**

(a) 2 (b) 4

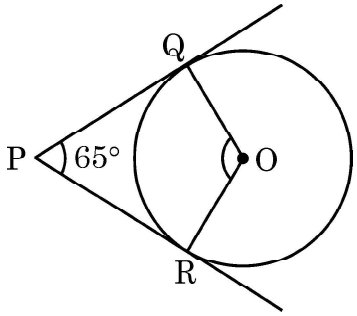
(c) – 4 (d) –2

15. एक निष्पक्ष पासा फेंका जाता है । विषम अभाज्य संख्या प्राप्त होने की प्रायिकता होगी : **1**

(a) $\frac{1}{6}$ (b) $\frac{1}{2}$

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

11. In the given figure, PQ and PR are tangents drawn from P to the circle with centre O such that $\angle QPR = 65^\circ$. The measure of $\angle QOR$ is. **1**



(a) 65° (b) 125°

(c) 115° (d) 90°

12. One card is drawn at random from a well-shuffled deck of 52 playing cards. What is the probability of getting a black king ? **1**

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$

(c) $\frac{1}{52}$ (d) $\frac{1}{2}$

13. The value of k, if (6, k) lies on the line represented by $x - 3y + 6 = 0$, is **1**

(a) – 4 (b) 12

(c) –12 (d) 4

14. If (2, 4) is the mid-point of the line-segment joining (6, 3) and (a, 5), then the value of a is **1**

(a) 2 (b) 4

(c) – 4 (d) –2

15. An unbiased die is thrown. The probability of getting an odd prime number is **1**

(a) $\frac{1}{6}$ (b) $\frac{1}{2}$

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

16. k का मान जिसके लिए रैखिक समीकरण युग्म $kx + 2y = 5$ और $3x + 4y = 1$ का कोई हल नहीं है, है : 1

(a) $k = \frac{3}{2}$ (b) $k \neq \frac{3}{2}$

(c) $k \neq \frac{2}{3}$ (d) $k = 15$

17. यदि $-5, x, 3$ किसी A.P. के तीन क्रमागत पद हैं, तो x का मान होगा : 1

(a) -2 (b) 2

(c) 1 (d) -1

18. यदि HCF (72, 120) = 24 है, तो LCM (72, 120) है : 1

(a) 72 (b) 120

(c) 360 (d) 9640

प्रश्न संख्या 19 तथा 20 के लिए निर्देश : प्रश्न **19** तथा **20** में एक अभिकथन (A) के बाद एक तर्क कथन (R) दिया गया है। निम्न में से सही विकल्प चुनिए :

(a) अभिकथन (A) तथा तर्क (R) दोनों सत्य हैं और तर्क (R), अभिकथन (A) की पूरी व्याख्या करता है।

(b) अभिकथन (A) तथा तर्क (R) दोनों सत्य हैं, परंतु तर्क (R), अभिकथन (A) की पूरी व्याख्या नहीं करता है।

(c) अभिकथन (A) सत्य है, परन्तु तर्क (R) सत्य नहीं है।

(d) अभिकथन (A) असत्य है, परन्तु तर्क (R) सत्य है।

19. **अभिकथन (A) :** $0 < \theta \leq 90^\circ$ के लिए, $\operatorname{cosec}\theta - \cot\theta$ और $\operatorname{cosec}\theta + \cot\theta$ परस्पर एक दूसरे के व्युत्क्रम हैं। 1

तर्क (R) : $\cot^2\theta - \operatorname{cosec}^2\theta = 1$

20. **अभिकथन (A) :** लीप वर्ष में 53 रविवार होने की प्रायिकता $\frac{2}{7}$ है। 1

तर्क (R) : गैर-लीप वर्ष में 53 रविवार होने की प्रायिकता $\frac{1}{7}$ है।

16. The value of 'k' for which the system of equations $kx + 2y = 5$ and $3x + 4y = 1$ have no solution, is **1**

(a) $k = \frac{3}{2}$ (b) $k \neq \frac{3}{2}$

(c) $k \neq \frac{2}{3}$ (d) $k = 15$

17. If -5, x, 3 are three consecutive terms of an A.P., then the value of x is **1**

(a) -2 (b) 2

(c) 1 (d) -1

18. If HCF (72, 120) = 24, then LCM (72, 120) is **1**

(a) 72 (b) 120

(c) 360 (d) 9640

Directions for Q. 19 & Q. 20 : In question numbers **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, but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

19. **Assertion (A) :** For $0 < \theta \leq 90^\circ$, cosec θ – cot θ and cosec θ + cot θ are reciprocal of each other. **1**

Reason (R) : $\cot^2 \theta - \text{cosec}^2 \theta = 1$

20. **Assertion (A) :** The probability that a leap year has 53 Sundays is $\frac{2}{7}$. **1**

Reason (R) : The probability that a non-leap year has 53 Sundays is $\frac{1}{7}$.

खण्ड – ख

खण्ड–ख में अति लघु–उत्तरीय प्रश्न (VSA) प्रश्न हैं और प्रत्येक प्रश्न के **2** अंक हैं ।

21. एक थैले में 30 डिस्क हैं, जिन पर 1 से 30 तक की संख्याएँ अंकित हैं । एक डिस्क यादृच्छया थैले से निकाली जाती है । प्रायिकता ज्ञात कीजिए कि निकाली गई डिस्क पर लिखी संख्या **2**

(a) 6 से विभाज्य है ।

(b) 25 से अधिक है ।

22. (a) k का वह मान ज्ञात कीजिए जिसके लिए द्विघात समीकरण $5x^2 - 10x + k = 0$ के मूल वास्तविक और बराबर हों । **2**

अथवा

(b) द्विघात समीकरण $3x^2 - 8x - (2k + 1) = 0$ का एक मूल यदि दूसरे मूल का सात गुना हो, तो k का मान ज्ञात कीजिए । **2**

23. मान ज्ञात कीजिए : $5 \operatorname{cosec}^2 45^\circ - 3 \sin^2 90^\circ + 5 \cos 0^\circ$. **2**

24. एक बिंदु P से, जो एक वृत्त के केंद्र से 25 cm दूरी पर है, वृत्त पर स्पर्श–रेखा की लम्बाई 24 cm है । वृत्त की त्रिज्या ज्ञात कीजिए । **2**

25. (a) एक द्विघात बहुपद ज्ञात कीजिए जिसके शून्यक 6 और –3 हों । **2**

अथवा

(b) बहुपद $x^2 + 4x - 12$ के शून्यक ज्ञात कीजिए । **2**

खण्ड – ग

खण्ड – ग में **26** से **31** तक लघु उत्तर (SA) प्रकार के प्रश्न है और प्रत्येक प्रश्न के **3** अंक हैं ।

26. सिद्ध कीजिए कि $7 + 4\sqrt{5}$ एक अपरिमेय संख्या है, दिया गया है कि $\sqrt{5}$ एक अपरिमेय संख्या है । **3**

27. x के लिए हल कीजिए : **3**

$$\frac{1}{x} - \frac{1}{x-2} = 3;\ x \neq 0,\ 2$$

Section – B

Section – B consists of Very Short Answer (VSA) type questions of **2** marks each.

21. A bag contains 30 discs numbered from 1 to 30. One disc is drawn at random from the bag. Find the probability that it bears a number **2**

(a) divisible by 6.

(b) greater than 25.

22. (a) Find the value of k for which the roots of the quadratic equation $5x^2 - 10x + k = 0$ are real and equal. **2**

OR

(b) If one root of the quadratic equation $3x^2 - 8x - (2k + 1) = 0$ is seven times the other, then find the value of k. **2**

23. Evaluate : $5 \operatorname{cosec}^2 45^\circ - 3 \sin^2 90^\circ + 5 \cos 0^\circ$. **2**

24. From a point P, the length of the tangent to a circle is 24 cm and the distance of P from the centre of the circle is 25 cm. Find the radius of the circle. **2**

25. (a) Find a quadratic polynomial whose zeroes are 6 and –3. **2**

OR

(b) Find the zeroes of the polynomial $x^2 + 4x - 12$. **2**

Section – C

Section – C consists of Short Answer (SA) type questions of **3** marks each.

26. Prove that $7 + 4\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number. **3**

27. Solve for x : **3**

$$\frac{1}{x} - \frac{1}{x-2} = 3;\ x \neq 0,\ 2$$

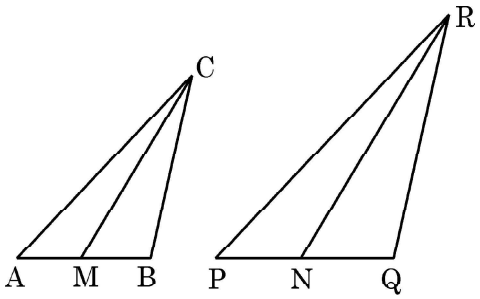
28. (a) सिद्ध कीजिए कि $\frac{\cot A - \cos A}{\cot A + \cos A} = \frac{\cos^2 A}{(1 + \sin A)^2}$ **3**

अथवा

(b) सिद्ध कीजिए कि $(\sec \theta + \tan \theta)(1 - \sin \theta) = \cos \theta$ **3**

29. (a) समांतर चतुर्भुज ABCD की बढ़ाई गई भुजा AD पर स्थित E एक बिंदु है तथा BE भुजा CD को F पर प्रतिच्छेद करती है। दर्शाइए कि $\Delta ABE \sim \Delta CFB$ है। **3**

अथवा



(b) दी गई आकृति में, CM और RN त्रिभुजों ABC और PQR की क्रमशः माध्यिकाएँ हैं। यदि $\Delta ABC \sim \Delta PQR$ है, तो सिद्ध कीजिए कि $\Delta AMC \sim \Delta PNR$ है। **3**

30. विद्यार्थियों के एक समूह द्वारा एक मोहल्ले के 20 परिवारों पर किए गए सर्वेक्षण के परिणामस्वरूप विभिन्न परिवारों के सदस्यों की संख्या से संबंधित निम्नलिखित आँकड़े प्राप्त हुए : **3**

परिवार माप	1-3	3-5	5-7	7-9	9-11
परिवारों की संख्या	7	8	2	2	1

इन आँकड़ों का माध्यक ज्ञात कीजिए।

31. बिंदुओं (5, 3) और (4, 5) को जोड़ने वाले रेखाखंड का सम-त्रिभाजन करने वाले बिंदुओं के निर्देशांक ज्ञात कीजिए। **3**

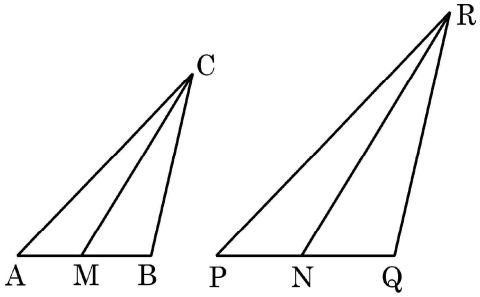
28. (a) Prove that $\frac{\cot A - \cos A}{\cot A + \cos A} = \frac{\cos^2 A}{(1+\sin A)^2}$ **3**

OR

(b) Prove that $(\sec \theta + \tan \theta)(1 - \sin \theta) = \cos \theta$ **3**

29. (a) E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that $\Delta ABE \sim \Delta CFB$. **3**

OR



(b) In the given figure, CM and RN are respectively the medians of ΔABC and ΔPQR. If $\Delta ABC \sim \Delta PQR$, then prove that $\Delta AMC \sim \Delta PNR$. **3**

30. A survey conducted on 20 households in a locality by a group of students resulted in the following frequency table for the number of family members in a household : **3**

Family size	1-3	3-5	5-7	7-9	9-11
Number of Families	7	8	2	2	1

Find the median of this data.

31. Find the co-ordinates of the points of trisection of the line-segment joining the points (5, 3) and (4, 5). **3**

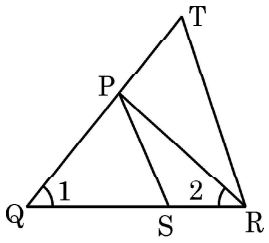
खण्ड – घ

खण्ड – घ में दीर्घ उत्तर (LA) प्रकार के प्रश्न हैं और प्रत्येक प्रश्न के **5** अंक हैं ।

32. (a) सिद्ध कीजिए कि किसी त्रिभुज की एक भुजा के समांतर अन्य दो भुजाओं को भिन्न-भिन्न बिंदुओं पर प्रतिच्छेद करने के लिए एक रेखा खींची जाए, तो ये अन्य दो भुजाएँ एक ही अनुपात में विभाजित हो जाती है । **5**

अथवा

(b) दी गई आकृति में, $\frac{QR}{QS} = \frac{QT}{PR}$ तथा $\angle 1 = \angle 2$ है । सिद्ध कीजिए कि $\Delta PQS \sim \Delta TQR$. **5**



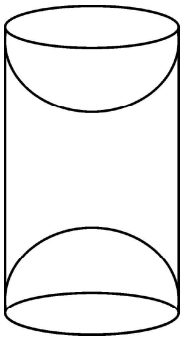
33. (a) एक नदी के पुल के एक बिंदु से नदी के सम्मुख किनारों के अवनमन कोण क्रमश: 30° और 45° हैं । यदि पुल किनारों से 3 m की ऊँचाई पर हो, तो नदी की चौड़ाई ज्ञात कीजिए । ($\sqrt{3} = 1.73$ का प्रयोग करें) **5**

अथवा

(b) भूमि के एक बिंदु से एक 20 m ऊँचे भवन के शिखर पर लगी एक संचार मीनार के तल और शिखर के उन्नयन कोण क्रमश: 45° और 60° हैं । मीनार की ऊँचाई ज्ञात कीजिए । ($\sqrt{3} = 1.73$ का प्रयोग करें) **5**

34. एक A.P. के चौथे और आँठवें पदों का योगफल 24 और छठे और दसवें पदों का योगफल 44 है । A.P. ज्ञात कीजिए । A.P. के पहले 25 पदों का योग भी ज्ञात कीजिए । **5**

35. लकड़ी के एक ठोस बेलन के प्रत्येक सिरे से एक अर्धगोला खोदकर निकालते हुए, एक वस्तु बनाई गई है, जैसा कि आकृति में दर्शाया गया है । यदि बेलन की ऊँचाई 10 cm है और आधार की त्रिज्या 3.5 cm है, तो इस वस्तु का संपूर्ण पृष्ठीय क्षेत्रफल ज्ञात कीजिए । **5**



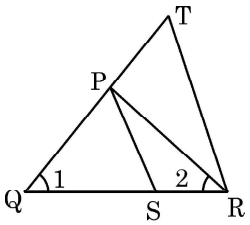
Section – D

Section – D consists of Long Answer (LA) type questions of **5** marks each.

32. (a) Prove that a line drawn parallel to one side of a triangle to intersect the other two sides in distinct points, divides the two sides in the same ratio. **5**

OR

(b) In the given figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$. Prove that $\Delta PQS \sim \Delta TQR$. **5**



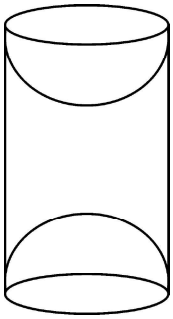
33. (a) From a point on a bridge across a river, the angles of depression of the banks on opposite sides of the river are 30° and 45° respectively. If the bridge is at a height of 3 m from the banks, find the width of the river. (Use $\sqrt{3} = 1.73$) **5**

OR

(b) From a point on the ground, the angle of elevation of the bottom and top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower. (Use $\sqrt{3} = 1.73$) **5**

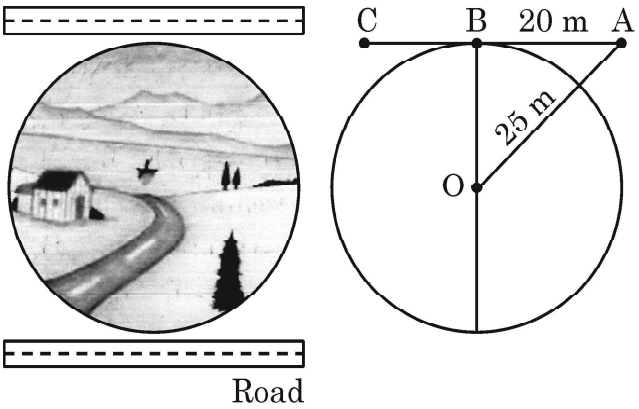
34. The sum of the 4^{th} and 8^{th} term of an A.P. is 24 and the sum of the 6^{th} and 10^{th} term of the A.P. is 44. Find the A.P. Also, find the sum of first 25 terms of the A.P. **5**

35. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder (as shown in the figure). **5**
If the height of the cylinder is 10 cm and its base is of radius 3.5 cm, find the total surface area of the article.



खण्ड – ङ

खण्ड – ङ में स्रोत/प्रकरण आधारित प्रश्न हैं और प्रत्येक प्रश्न के **4** अंक हैं ।

36. 

वृत्ताकार गाँव "धरमकोट" के लोग इसके सबसे नजदीक एक सड़क बनाना चाहते हैं । सड़क गाँव से होकर नहीं जा सकती । लेकिन लोग चाहते हैं कि सड़क गाँव के केंद्र से कम से कम दूरी पर हो । मान लीजिए कि सड़क A से शुरू होती है जो वृत्ताकार गाँव के बाहर है (जैसा चित्र में दिखाया गया है) और B पर वृत्ताकार गाँव की सीमा को इस प्रकार स्पर्श करती है कि AB = 20 m । गाँव के केंद्र O से बिंदु A की दूरी 25 m है ।

उपरोक्त सूचना के आधार पर, निम्न प्रश्नों के उत्तर दीजिए :

(i) यदि B, AC का मध्य-बिन्दु है, तो AC की दूरी ज्ञात कीजिए । **1**

(ii) गाँव के केंद्र से सड़क की न्यूनतम दूरी ज्ञात कीजिए । **1**

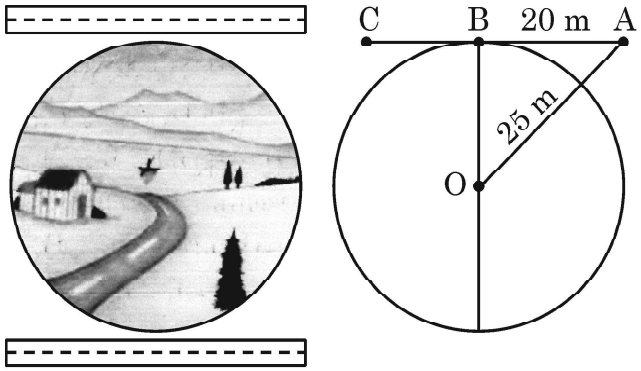
(iii) गाँव की परिधि ज्ञात कीजिए । **2**

अथवा

(iii) गाँव का क्षेत्रफल ज्ञात कीजिए । **2**

Section – E

Section – E comprises of **3** Case Study questions each of **4** marks.

36. 

People of a circular village Dharamkot want to construct a road nearest to it. The road cannot pass through the village. But the people want the road at a shortest distance from the centre of the village. Suppose the road starts from A which is outside the circular village (as shown in the figure) and touch the boundary of the circular village at B such that AB = 20 m. Also the distance of the point A from the centre O of the village is 25 m.

Based on the above information, answer the following questions :

(i) If B is the mid-point of AC, then find the distance AC. **1**

(ii) Find the shortest distance of the road from the centre of the village. **1**

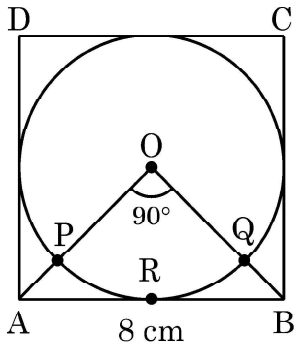
(iii) Find the circumference of the village. **2**

OR

(iii) Find the area of the village. **2**

37. एक विद्यालय में 'पृथ्वी दिवस' सप्ताह के उद्घाटन के लिए स्वयंसेवकों को बैज दिए गए । आयोजकों ने इन बैजों को एक NGO से खरीदा था, जिसने इन बैजों को एक वृत्त के रूप में बनाया था, जो भुजा 8 cm के एक वर्ग में खुदा हुआ था

O वृत्त का केंद्र तथा $\angle AOB = 90^\circ$ है :



उपरोक्त के आधार पर, निम्न प्रश्नों के उत्तर दीजिए :

(i) वर्ग ABCD का क्षेत्रफल कितना है ? **1**

(ii) वर्ग ABCD के विकर्ण AC की लम्बाई कितनी है ? **1**

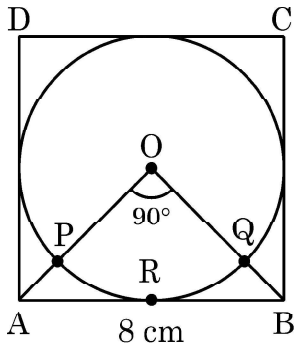
(iii) त्रिज्य खंड OPRQO का क्षेत्रफल ज्ञात कीजिए । **2**

अथवा

(iii) वर्ग ABCD का बचा हुआ क्षेत्रफल ज्ञात कीजिए जब वृत्त के क्षेत्रफल को हटा दिया जाता है । **2**

37. For the inauguration of 'Earth day' week in a school, badges were given to volunteers. Organisers purchased these badges from an NGO, who made these badges in the form of a circle inscribed in a square of side 8 cm.

O is the centre of the circle and $\angle AOB = 90^\circ$:



Based on the above information, answer the following questions :

(i) What is the area of square ABCD ? **1**

(ii) What is the length of diagonal AC of square ABCD ? **1**

(iii) Find the area of sector OPRQO. **2**

OR

(iii) Find the area of remaining part of square ABCD when area of circle is excluded. **2**

38. 

लोकेश, मुंबई में एक प्रोडक्शन मैनेजर, अपने दफ्तर आने के लिए हर रोज एक टैक्सी भाड़े पर लेता है । मुंबई में टैक्सी के भाड़े में एक नियत भाड़े के अतिरिक्त चली गई दूरी पर भाड़ा सम्मिलित किया जाता है । उसका दफ्तर, उसके घर से 10 km की दूरी पर है । 10 km दूरी के लिए वह ₹ 105 का भाड़ा देता है । घर वापस आते समय उसने दूसरा रास्ता अपनाया । उसने 15 km की दूरी तय की और उसके द्वारा भुगतान किया भाड़ा ₹ 155 था ।

उपरोक्त सूचना के आधार पर, निम्न प्रश्नों के उत्तर दीजिए :

(i) नियत भाड़ा कितना है ? **1**

(ii) प्रति km भाड़ा कितना है ? **1**

(iii) यदि नियत भाड़ा ₹ 20 और प्रति km भाड़ा ₹ 10 हो, तो लोकेश को 10 km की दूरी तय करने के लिए कितना भाड़ा देना होगा ? **2**

अथवा

(iii) यदि नियत भाड़ा और प्रति km भाड़ा वही है जो ऊपर (i) और (ii) में ज्ञात किए गए हैं, तो ज्ञात कीजिए कि लोकेश ने घर से दफ्तर की दूरी 10 km और दफ्तर से घर की दूरी 25 km तय करने के लिए कुल कितना भाड़ा दिया । **2**

38.

Lokesh, a production manager in Mumbai, hires a taxi everyday to go to his office. The taxi charges in Mumbai consists of a fixed charges together with the charges for the distance covered. His office is at a distance of 10 km from his home. For a distance of 10 km to his office, Lokesh paid ₹ 105. While coming back home, he took another route. He covered a distance of 15 km and the charges paid by him were ₹ 155.

Based on the above information, answer the following questions :

(i) What are the fixed charges ? **1**

(ii) What are the charges per km ? **1**

(iii) If fixed charges are ₹ 20 and charges per km are ₹ 10, then how much Lokesh have to pay for travelling a distance of 10 km ? **2**

OR

(iii) Find the total amount paid by Lokesh for travelling 10 km from home to office and 25 km from office to home. [Fixed charges and charges per km are as in (i) & (ii). **2**

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2023
SUBJECT NAME MATHEMATICS (BASIC)
(PAPER CODE 430/6/3)

General Instructions: -

1	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
2	**"Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. Its' leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc may invite action under various rules of the Board and IPC."**
3	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, Answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them. In class-X, while evaluating two competency-based questions, please try to understand given Answer and even if reply is not from marking scheme but correct competency is enumerated by the candidate, due marks should be awarded.**
4	The Marking scheme carries only suggested value points for the **Answer**s These are in the nature of Guidelines only and do not constitute the complete **Answer**. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
5	The Head-Examiner must go through the first five **Answer** books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining **Answer** books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
6	Evaluators will mark(√) wherever **Answer** is correct. For wrong **Answer** CROSS 'X" be marked. Evaluators will not put right **(✓)**while evaluating which gives an impression that **Answer** is correct and no marks are awarded. **This is the most common mistake which evaluators are committing.**
7	If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.
8	If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.
9	If a student has attempted an extra question, **Answer** of the question deserving more marks should be retained and the other **Answer** scored out with a note **"Extra Question"**. However, for MCQs (Q1 to Q20), only first attempt to be evaluated.
10	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.

11	A full scale of marks _____(example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the **Answer** deserves it.
12	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 **Answer** books per day in main subjects and 25 **Answer** books per day in other subjects (Details are given in Spot Guidelines).
13	Ensure that you do not make the following common types of errors committed by the Examiner in the past:- ● Leaving **Answer** or part thereof unassessed in an **Answer** book. ● Giving more marks for an **Answer** than assigned to it. ● Wrong totaling of marks awarded on an **Answer**. ● Wrong transfer of marks from the inside pages of the **Answer** book to the title page. ● Wrong question wise totaling on the title page. ● Wrong totaling of marks of the two columns on the title page. ● Wrong grand total. ● Marks in words and figures not tallying/not same. ● Wrong transfer of marks from the **Answer** book to online award list. ● **Answer**s marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect **Answer**.) ● Half or a part of **Answer** marked correct and the rest as wrong, but no marks awarded.
14	While evaluating the **Answer** books if the **Answer** is found to be totally incorrect, it should be marked as cross (X) and awarded zero (0)Marks.
15	Any un assessed portion, non-carrying over of marks to the title page, or totaling error detected by the candidate shall damage the prestige of all the personnel engaged in the evaluation work as also of the Board. Hence, in order to uphold the prestige of all concerned, it is again reiterated that the instructions be followed meticulously and judiciously.
16	The Examiners should acquaint themselves with the guidelines given in the "**Guidelines for spot Evaluation**" before starting the actual evaluation.
17	Every Examiner shall also ensure that all the **Answer**s are evaluated, marks carried over to the title page, correctly totaled and written in figures and words.
18	The candidates are entitled to obtain photocopy of the **Answer** Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each **Answer** as given in the Marking Scheme.

MARKING SCHEME
MATHEMATICS (BASIC) 430/6/3

1 The prime factorisation of the number 5488 is

(a) $2^3 \times 7^3$ (b) $2^4 \times 7^3$

(c) $2^4 \times 7^4$ (d) $2^3 \times 7^4$

Answer (b) $2^4 \times 7^3$ 1

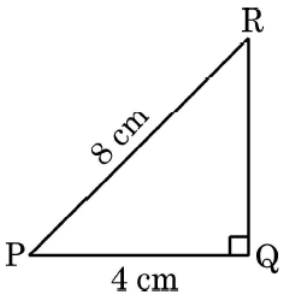
2 The Empirical relation between the three measures of central tendency is

(a) Mode = 3 Mean – 2 Median (b) Mode = 2 Median – 3 Mean

(c) Mode = 2 Mean – 3 Median (d) Mode = 3 Median – 2 Mean

Answer (d) Mode = 3 Median – 2 Mean 1

3 In the given figure, ΔPQR is a right triangle right angled at Q. If PQ = 4 cm and PR = 8 cm, then $\angle P$ is



(a) 60° (b) 45°

(c) 30° (d) 15°

Answer (a) 60° 1

4 The median of first 10 natural numbers is

(a) 5 (b) 6

(c) 5.5 (d) 6.5

Answer (c) 5.5 1

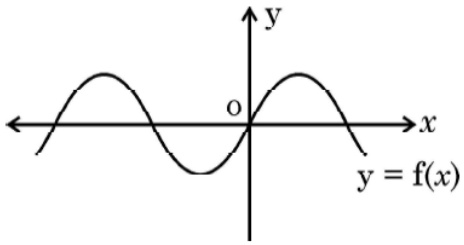
5 The zeroes of the polynomial $p(x) = 2x^2 - x - 3$ are

(a) $-\frac{3}{2}, 1$ (b) $\frac{3}{2}, 1$

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

Answer (d) $\frac{3}{2}, -1$ 1

6 The graph of $y = f(x)$ is shown in the figure for some polynomial $f(x)$. The number of zeroes of $f(x)$ are



(a) 4 (b) 3

(c) 2 (d) 1

Answer (a) 4 1

7 The distance of the point (5, 0) from the origin is

(a) 0 (b) 5

(c) $\sqrt{5}$ (d) 5^2

Answer (b) 5 1

8 If the mean of 6, 7, x, 8, y, 14 is 9, then

(a) $x + y = 21$ (b) $x + y = 19$

(c) $x - y = 19$ (d) $x - y = 21$

Answer (b) x + y = 19 1

9 If n is a natural number, then 8^n cannot end with digit

(a) 0 (b) 2

(c) 4 (d) 6

Answer (a) 0 1

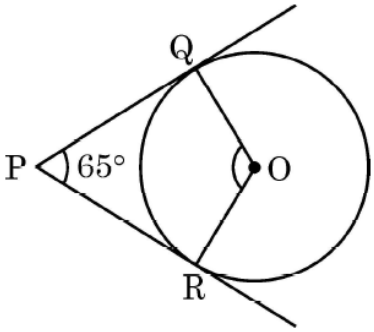
10 Area of a quadrant of a circle of radius 7 cm is

(a) $154\ cm^2$ (b) $77\ cm^2$

(c) $\frac{77}{2}\ cm^2$ (d) $\frac{77}{4}\ cm^2$

Answer (c) $\frac{77}{2}\ cm^2$ 1

11 In the given figure, PQ and PR are tangents drawn from P to the circle with centre O such that $\angle QPR = 65°$. The measure of $\angle QOR$ is.



(a) $65°$ (b) $125°$

(c) $115°$ (d) $90°$

Answer (c) $115°$ 1

12 One card is drawn at random from a well-shuffled deck of 52 playing cards. What is the probability of getting a black king ?

(a) $\frac{1}{26}$ (b) $\frac{1}{13}$

(c) $\frac{1}{52}$ (d) $\frac{1}{2}$

Answer (a) $\frac{1}{26}$ 1

13 The value of k, if (6, k) lies on the line represented by $x - 3y + 6 = 0$, is

(a) -4 (b) 12

(c) -12 (d) 4

Answer (d) 4 1

14 If (2, 4) is the mid-point of the line-segment joining (6, 3) and (a, 5), then the value of a is

(a) 2 (b) 4

(c) -4 (d) -2

Answer (d) -2 1

15 An unbiased die is thrown. The probability of getting an odd prime number is

(a) $\frac{1}{6}$ (b) $\frac{1}{2}$

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

Answer (d) $\frac{1}{3}$ 1

16 The value of 'k' for which the system of equations $kx + 2y = 5$ and $3x + 4y = 1$ have no solution, is

(a) $k = \frac{3}{2}$ (b) $k \neq \frac{3}{2}$

(c) $k \neq \frac{2}{3}$ (d) $k = 15$

Answer (a) $k = \frac{3}{2}$ 1

17 If -5, x, 3 are three consecutive terms of an A.P., then the value of x is

(a) -2 (b) 2

(c) 1 (d) -1

Answer (d) -1 1

18 If HCF (72, 120) = 24, then LCM (72, 120) is

(a) 72 (b) 120

(c) 360 (d) 9640

Answer (c) 360 1

19 **Directions for Q. 19 & Q. 20** : In question numbers **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, but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true, but Reason (R) is false.

(d) Assertion (A) is false, but Reason (R) is true.

Assertion (A) : For $0 < \theta \leq 90^\circ$, cosec θ – cot θ and cosec θ + cot θ are reciprocal of each other.

Reason (R) : $\cot^2 \theta - \text{cosec}^2 \theta = 1$

Answer (c) Assertion (A) is true, but Reason (R) is false. 1

20 **Assertion (A) :** The probability that a leap year has 53 Sundays is $\frac{2}{7}$.

Reason (R) : The probability that a non-leap year has 53 Sundays is $\frac{1}{7}$.

Answer (b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A). 1

SECTION B

Section – B consists of Very Short Answer (VSA) type questions of **2** marks each.

21 A bag contains 30 discs numbered from 1 to 30. One disc is drawn at random from the bag. Find the probability that it bears a number

(a) divisible by 6.

(b) greater than 25.

Solution (i) P (Number divisible by 6) = $\frac{5}{30}$ or $\frac{1}{6}$ *1*

(ii) P (Number greater than 25) = $\frac{5}{30}$ or $\frac{1}{6}$ *1*

22 (a) Find the value of k for which the roots of the quadratic equation $5x^2 - 10x + k = 0$ are real and equal.

Solution (a) $5x^2 - 10x + k = 0$; $a = 5, b = -10, c = k$ ½

Roots are real and equal

$D = 0 \Rightarrow b^2 - 4ac = 0$ ½

$(-10)^2 - 4(5)(k) = 0 \Rightarrow 100 - 20k = 0$ ½

$k = 5$ ½

OR

22 (b) If one root of the quadratic equation $3x^2 - 8x - (2k + 1) = 0$ is seven times the other, then find the value of k.

Solution (b)

Let roots be $\alpha, 7\alpha$ ½

$\alpha + 7\alpha = -\left(\frac{-8}{3}\right) = \frac{8}{3} \Rightarrow 8\alpha = \frac{8}{3}$ gives $\alpha = \frac{1}{3}$ ½

$\alpha(7\alpha) = -\frac{(2k+1)}{3} \Rightarrow 7\alpha^2 = -\frac{(2k+1)}{3}$ ½

$k = -\frac{5}{3}$ ½

---

23 Evaluate : $5\ \text{cosec}^2\ 45° - 3\ \sin^2\ 90° + 5\ \cos\ 0°$.

Solution

$5\ \text{cosec}^2\ 45° - 3\ \sin^2\ 90° + 5\ \cos\ 0°$

$=5(\sqrt{2})^2 - 3(1)^2 + 5(1)$ $1\frac{1}{2}$

$= 12$ $\frac{1}{2}$

---

24 From a point P, the length of the tangent to a circle is 24 cm and the distance of P from the centre of the circle is 25 cm. Find the radius of the circle.

Solution

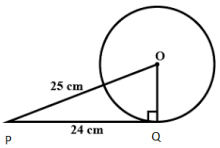


Figure ½

$OQ = \sqrt{25^2 - 24^2}$ *1*

OQ = 7 cm ½

---

25 (a) Find a quadratic polynomial whose zeroes are 6 and –3.

Solution

(a) Sum of zeroes=6+ (–3) = 3 $\frac{1}{2}$

Product of zeroes = 6(– 3) = – 18 $\frac{1}{2}$

Quadratic polynomial is $(x^2 - 3x - 18)$ or $k\ (x^2 - 3x - 18)$ *1*

OR

25 Find the zeroes of the polynomial $x^2 + 4x - 12$.

Solution (b) $x^2 + 4x - 12 = (x + 6)(x - 2)$ 1

Zeroes are -6 and 2 1

SECTION C

26 Prove that $7 + 4\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number.

Solution

Let us assume that $7 + 4\sqrt{5}$ is rational

$7 + 4\sqrt{5} = \frac{p}{q}$; $q \neq 0$ and p, q are integers 1

$\Rightarrow \sqrt{5} = \frac{p-7q}{4q}$ 1

Clearly $\frac{p-7q}{4q}$ is rational but $\sqrt{5}$ is irrational

Our assumption is wrong $\Rightarrow 7+4\sqrt{5}$ is irrational. 1

27 Solve for x :

$$\frac{1}{x}-\frac{1}{x-2}=3;\ x\neq 0,\ 2$$

Solution

$\frac{x-2-x}{x(x-2)}=3$ 1

$\Rightarrow 3x^2-6x+2=0$ 1

$x=\frac{6\pm 2\sqrt{3}}{6}$ or $\frac{3\pm\sqrt{3}}{3}$ 1

28 (a) Prove that $\frac{\cot A-\cos A}{\cot A+\cos A}=\frac{\cos^2 A}{(1+\sin A)^2}$

Solution

(a)LHS $=\frac{cot\ A-\cos A}{cot\ A+\cos A}=\frac{\frac{cos\ A}{\sin A}-\cos A}{\frac{cos\ A}{\sin A}+\cos A}$ ½

$=\frac{1-sin\ A}{1+sin\ A}$ 1

$=\frac{(1-\sin A)(1+\sin A)}{(1+\sin A)(1+\sin A)}$ *1*

$=\frac{1-\sin^2 A}{(1+\sin A)^2}=\frac{cos^2 A}{(1+\sin A)^2}$ ½

OR

28 (b) Prove that $(\sec\theta+\tan\theta)(1-\sin\theta)=\cos\theta$

Solution

(b) LHS $=(\sec\theta+\tan\theta)(1-\sin\theta)$

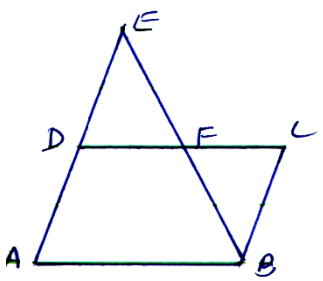
$=\left(\frac{1}{cos\ \theta}+\frac{\sin\theta}{\cos\theta}\right)(1-\sin\theta)$ *1*

$=\left(\frac{1+\sin\theta}{\cos\theta}\right)(1-\sin\theta)=\frac{(1-\sin^2\theta)}{\cos\theta}$ ½ + ½

$=\frac{cos^2\ \theta}{\cos\theta}=\cos\theta=$ RHS 1

29 (a) E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that $\Delta ABE \sim \Delta CFB$.

Solution



(a)ABCD is a parallelogram (1 for figure)

To prove: $\Delta ABE \sim \Delta CFB$

In ΔABE and ΔCFB,

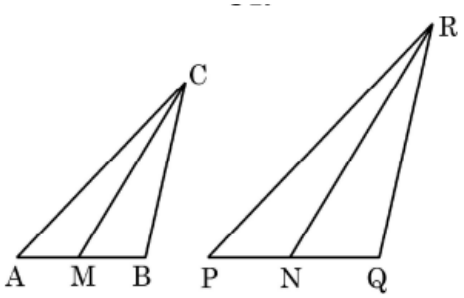
$\angle A = \angle C$ (opp. angles of parallelogram) ½

$\angle AEB = \angle CBF$ (alt. int. angles) ½

$\therefore \Delta ABE \sim \Delta CFB$ (AA similarity) *1*

OR

29 (b)



In the given figure, CM and RN are respectively the medians of ΔABC and ΔPQR. If $\Delta ABC \sim \Delta PQR$, then prove that $\Delta AMC \sim \Delta PNR$.

Solution (b) $\Delta ABC \sim \Delta PQR$

$\frac{AB}{PQ} = \frac{AC}{PR} \Rightarrow \frac{2AM}{2PN} = \frac{AC}{PR}$ ½+1

$\frac{AM}{PN} = \frac{AC}{PR}$

Also $\angle A = \angle P$ $(\Delta ABC \sim \Delta PQR)$

$\therefore \Delta AMC \sim \Delta PNR$ (SAS similarity) 1½

30 A survey conducted on 20 households in a locality by a group of students resulted in the following frequency table for the number of family members in a household :

Family size	1-3	3-5	5-7	7-9	9-11
Number of Families	7	8	2	2	1

Find the median of this data.

Solution

Family size	1 – 3	3 – 5	5 – 7	7 – 9	9 – 11
Number of families	7	8	2	2	1
Cf	7	15	17	19	20

for correct cf 1

Median class 3 – 5 ½

Median = $l + \frac{\frac{N}{2} - cf}{f} \times h$

$= 3 + \frac{10 - 7}{8} \times 2$ 1

$= 3{\cdot}75$ ½

31 Find the co-ordinates of the points of trisection of the line-segment joining the points (5, 3) and (4, 5).

Solution

A C D B

(5, 3) (4, 5)

Let C divides AB in the ratio 1 : 2 ½

$\therefore C\left(\frac{1\times4+2\times5}{1+2}, \frac{1\times5+2\times3}{1+2}\right)$, i.e., $C\left(\frac{14}{3}, \frac{11}{3}\right)$ *1*

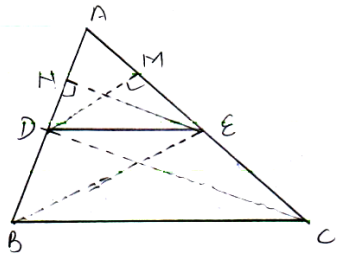
Let D divides AB in the ratio 2 : 1 ½

$\therefore D\left(\frac{2\times4+1\times5}{2+1}, \frac{2\times5+1\times3}{2+1}\right)$, i.e., $D\left(\frac{13}{3}, \frac{13}{3}\right)$ *1*

SECTION D

32 (a) Prove that a line drawn parallel to one side of a triangle to intersect the other two sides in distinct points, divides the two sides in the same ratio.

Solution (a)



1 for figure

Given In Δ ABC, DE // BC $\frac{1}{2}$

To prove : $\frac{AD}{DB} = \frac{AE}{EC}$ $\frac{1}{2}$

Const.: Join BE, CD. Draw DM ⊥ AC and EN ⊥ AB $\frac{1}{2}$

Proof : $\frac{ar(\Delta\,ADE)}{ar(\Delta\,BDE)} = \frac{\frac{1}{2}\times AD\times EN}{\frac{1}{2}\times DB\times EN} = \frac{AD}{DB}$ _____ (i) *1*

similarly $\frac{ar(\Delta\,ADE)}{ar(\Delta\,CDE)} = \frac{AE}{EC}$ _____ (ii) $\frac{1}{2}$

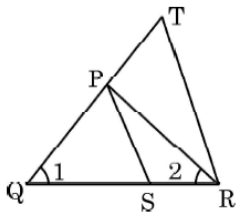
Δ BDE and Δ CDE are on the same base DE and between the same parallel lines BC and DE.

ar(Δ ADE) = ar(Δ CDE) _____ (iii) $\frac{1}{2}$

From (i), (ii) and (iii) $\frac{AD}{DB} = \frac{AE}{EC}$ $\frac{1}{2}$

OR

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



Solution (b) In Δ PQR, ∠ 1 = ∠ 2

∴ PQ = PR (sides opposite to equal angles) 1

Now $\frac{QR}{QS} = \frac{QT}{PR}$

$\Rightarrow \frac{QS}{QR} = \frac{PR}{QT} \Rightarrow \frac{QS}{QR} = \frac{PQ}{QT}$ (as PR = PQ) _____ (i) 2

In Δ PQS and Δ TQR,

$\angle Q = \angle Q$ (common)

$\frac{QS}{QR} = \frac{PQ}{QT}$ (from (i)) $1\frac{1}{2}$

$\therefore$ Δ PQS ~ Δ TQR (SAS similarity) $\frac{1}{2}$

33 (a) From a point on a bridge across a river, the angles of depression of the banks on opposite sides of the river are 30° and 45° respectively. If the bridge is at a height of 3 m from the banks, find the width of the river. (Use $\sqrt{3} = 1.73$)

Solution (a)

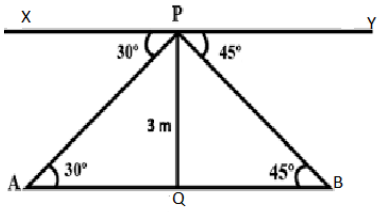


fig. 1

In Δ APQ, $\tan 30° = \frac{3}{AQ}$ 1

$\frac{1}{\sqrt{3}} = \frac{3}{AQ} \Rightarrow AQ = 3\sqrt{3}$ ½

In Δ PBQ, $\tan 45° = \frac{3}{BQ}$ 1

BQ = 3 ½

$\therefore$ AB = AQ + BQ = $3\sqrt{3} + 3$ ½

= 3(1·73 + 1) = 8·19 ½

Width of river = 8·19 m

OR

(b) From a point on the ground, the angle of elevation of the bottom and top of a transmission tower fixed at the top of a 20 m high building are 45° and 60° respectively. Find the height of the tower. (Use $\sqrt{3} = 1.73$)

Solution (b) BC = transmission tower = h and AD = x

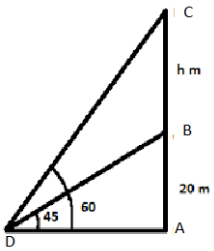


fig. 1

In Δ ABD, $\tan 45° = \frac{20}{x}$ 1

x = 20 ½

In Δ ACD, $\tan 60° = \frac{20 + h}{x}$ — 1

$\sqrt{3}x = 20 + h$ — ½

$\therefore h = 20(\sqrt{3} - 1)$ m — ½

$h = 14.6$ m — ½

34 The sum of the 4th and 8th term of an A.P. is 24 and the sum of the 6th and 10th term of the A.P. is 44. Find the A.P. Also, find the sum of first 25 terms of the A.P.

Solution

$a_4 + a_8 = 24, \Rightarrow a + 3d + a + 7d = 24$ — 1

$\Rightarrow 2a + 10d = 24$ or $a + 5d = 12$ _____ (i) — ½

$a_6 + a_{10} = 44 \Rightarrow a + 5d + a + 9d = 44$

$2a + 14d = 44$ or $a + 7d = 22$ _____ (ii) — 1

Solving (i) and (ii), $d = 5, a = -13$ — ½ + ½

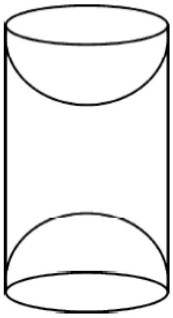
$\therefore$ AP is $-13, -8, -3, 2, 7, ...$ — ½

$S_{25} = \frac{25}{2}[2a + 24d]$

$= \frac{25}{2}[-26 + 120]$ — ½

$= 1175$ — ½

35 A wooden article was made by scooping out a hemisphere from each end of a solid cylinder (as shown in the figure).
If the height of the cylinder is 10 cm and its base is of radius 3.5 cm, find the total surface area of the article.



Solution

Total surface area of the article = CSA of cylinder + CSA of 2 hemispheres — 1

$= 2\pi rh + 2(2\pi r^2)$

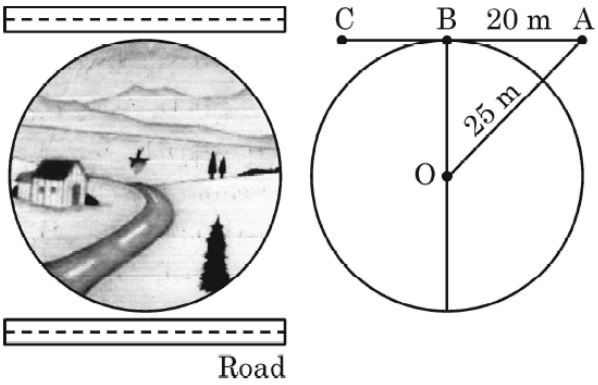
$= 2 \times \frac{22}{7} \times \frac{7}{2} \times 10 + 4 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$ — *1+1*

$= 2 \times \frac{22}{7} \times \frac{7}{2}(10 + 2 \times \frac{7}{2})$ — *1*

$= 22(10 + 7)$

$= 22 \times 17 = 374\ cm^2$ — *1*

36 **Section – E** comprises of **3** Case Study questions each of **4** marks.



People of a circular village Dharamkot want to construct a road nearest to it. The road cannot pass through the village. But the people want the road at a shortest distance from the centre of the village. Suppose the road starts from A which is outside the circular village (as shown in the figure) and touch the boundary of the circular village at B such that AB = 20 m. Also the distance of the point A from the centre O of the village is 25 m.

Based on the above information, answer the following questions :

(i) If B is the mid-point of AC, then find the distance AC.

(ii) Find the shortest distance of the road from the centre of the village.

(iii) Find the circumference of the village.

OR

(iii) Find the area of the village.

Solution

(i) AC = AB + BC = 20 + 20 = 40 m — *1*

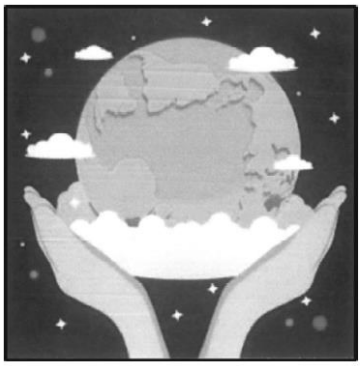
(ii) Shortest distance OB = $\sqrt{25^2 - 20^2}$ = 15 m — 1

(iii) Circumference = $2\pi(15) = 30\pi$ m or $\frac{660}{7}$ m — 1+1

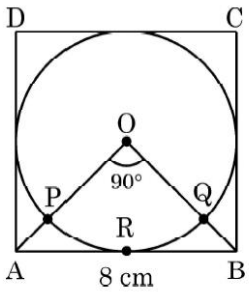
(OR)

(iii) Area = $\pi(15)^2 = 225\pi$ sq. m or $\frac{4950}{7}$ sq. m — 1+1

37 For the inauguration of 'Earth day' week in a school, badges were given to volunteers. Organisers purchased these badges from an NGO, who made these badges in the form of a circle inscribed in a square of side 8 cm.



O is the centre of the circle and $\angle AOB = 90°$:



Based on the above information, answer the following questions :

(i) What is the area of square ABCD ?

(ii) What is the length of diagonal AC of square ABCD ?

(iii) Find the area of sector OPRQO.

OR

(iii) Find the area of remaining part of square ABCD when area of circle is excluded.

Solution

(i) Area of square ABCD = $(8)^2 = 64\ cm^2$ 1

(ii) AC = $\sqrt{(8)^2 + (8)^2} = \sqrt{128} = 8\sqrt{2}$ cm 1

(iii) We know that diagonals of square bisect each other at 90°

$\angle AOB = 90°$

Area of sector OPRQ = $\frac{\pi r^2 \theta}{360°}$

$= \frac{22}{7} \times 4 \times 4 \times \frac{90}{360}$ 1

$= \frac{88}{7}\ cm^2$ 1

OR

(iii) Area of circle = $\pi r^2 = \frac{22}{7} \times 4 \times 4 = \frac{352}{7}$ cm^2 1

Required area = $64 - \frac{352}{7} = \frac{96}{7}$ cm^2 1

38

Lokesh, a production manager in Mumbai, hires a taxi everyday to go to his office. The taxi charges in Mumbai consists of a fixed charges together with the charges for the distance covered. His office is at a distance of 10 km from his home. For a distance of 10 km to his office, Lokesh paid ₹ 105. While coming back home, he took another route. He covered a distance of 15 km and the charges paid by him were ₹ 155.

Based on the above information, answer the following questions :

(i) What are the fixed charges ?

(ii) What are the charges per km ?

(iii) If fixed charges are ₹ 20 and charges per km are ₹ 10, then how much Lokesh have to pay for travelling a distance of 10 km ?

OR

(iii) Find the total amount paid by Lokesh for travelling 10 km from home to office and 25 km from office to home. [Fixed charges and charges per km are as in (i) & (ii).

Solution (i) Let fixed charge = ₹ x and charges per km = ₹ y

$x + 10y = 105$, $x + 15y = 155$ $\frac{1}{2}$

On solving, $x = 5$

$\therefore$ Fixed charge = ₹ 5 $\frac{1}{2}$

(ii) on solving, we get y =10
Charge per km = ₹10 *1*

(iii) x + 10y = 20 + 10(10) = ₹ 120 1+1

OR

(iii) Required amount=x + 10y + x + 25y = 2x + 35y 1
= 2(5) + 35(10) = 10 + 350 = ₹ 360 1
