Series C3ABD/1

SET ~ 2

रोल नं. Roll No.							

प्रश्न–पत्र कोड
Q.P. Code **430/1/2**

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.

नोट / NOTE :

(i) कृपया जाँच कर लें कि इस प्रश्न–पत्र में मुद्रित पृष्ठ **15** हैं।
Please check that this question paper contains **15** printed pages.

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

(iii) प्रश्न–पत्र में दाहिने हाथ की ओर दिए गए प्रश्न–पत्र कोड को छात्र 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.

(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 छात्र केवल प्रश्न–पत्र को पढ़ेंगे और इस अवधि के दौरान वे उत्तर–पुस्तिका पर कोई उत्तर नहीं लिखेंगे।
15 minutes 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 (बुनियादी)
MATHEMATICS (BASIC)

निर्धारित समय : 3 घण्टे *अधिकतम अंक : 80*
Time allowed : 3 hours *Maximum Marks : 80*

सामान्य निर्देश :

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

1. *इस प्रश्न-पत्र में **38** प्रश्न हैं। **सभी** प्रश्न अनिवार्य हैं।*
2. *प्रश्न-पत्र **पाँच** खण्डों में विभाजित है - **खण्ड क, ख, ग, घ** तथा **ड़**।*
3. ***खण्ड क** में प्रश्न संख्या **1** से **18** तक बहुविकल्पीय तथा प्रश्न संख्या **19** एवं **20** अभिकथन एवं तर्क आधारित **1** अंक के प्रश्न हैं।*
4. ***खण्ड ख** में प्रश्न संख्या **21** से **25** तक अति लघु-उत्तरीय (VSA) प्रकार के **2** अंकों के प्रश्न हैं।*
5. ***खण्ड ग** में प्रश्न संख्या **26** से **31** तक लघु-उत्तरीय (SA) प्रकार के **3** अंकों के प्रश्न हैं।*
6. ***खण्ड घ** में प्रश्न संख्या **32** से **35** तक दीर्घ-उत्तरीय (LA) प्रकार के **5** अंकों के प्रश्न हैं।*
7. ***खण्ड ड़** में प्रश्न संख्या **36** से **38** **स्रोत/प्रकरण इकाई आधारित** **4** अंकों के प्रश्न हैं। आंतरिक विकल्प **2** अंकों के प्रश्न में दिया गया है।*
8. *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 **ड़** के 3 प्रश्नों में आंतरिक विकल्प का प्रावधान दिया गया है।*
9. *जहां आवश्यक हो स्वच्छ आकृतियाँ बनाएं। यदि आवश्यक हो तो $\pi = 22/7$ लें।*
10. *कैलकुलेटर का उपयोग **वर्जित** है।*

खण्ड – क $20 \times 1 = 20$

प्रश्न संख्या 1 से 20 तक बहुविकल्पीय प्रश्न हैं तथा प्रत्येक प्रश्न 1 अंक का है।

1. LCM (850, 500) है : **1**

(a) 850×50 (b) 17×500 (c) $17 \times 5^2 \times 2^2$ (d) $17 \times 5^3 \times 2$

2. यदि द्विघात समीकरण $4x^2 - 5x + k = 0$ के मूल वास्तविक और समान हैं, तो k का मान है : **1**

(a) $\frac{5}{4}$ (b) $\frac{25}{16}$ (c) $-\frac{5}{4}$ (d) $-\frac{25}{16}$

3. किसी बंटन का माध्य तथा माध्यक क्रमशः 21 व 23 हैं। इस बंटन का बहुलक है : **1**

(a) 27 (b) 22 (c) 17 (d) 23

4. एक लंबवृत्तीय शंकु की ऊँचाई तथा त्रिज्या क्रमशः 24 cm तथा 7 cm हैं। इस शंकु की तिर्यक ऊँचाई है : **1**

(a) 24 cm (b) 31 cm (c) 26 cm (d) 25 cm

5. यदि द्विघात बहुपद $(\alpha - 1)x^2 + \alpha x + 1$ का एक शून्यक -3 है, तो α का मान है : **1**

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

General Instructions :

Read the following instructions carefully and follow them :

1. *This question paper contains **38** questions. **All** questions are compulsory.*
2. *Question paper is divided into **FIVE** sections – **SECTION A, B, C, D** and **E**.*
3. *In **section A,** question number **1** to **18** are multiple choice questions (MCQs) and question number **19** and **20** are Assertion – Reason based questions of **1** mark each.*
4. *In **section B,** question number **21** to **25** are very short answer (VSA) type questions of **2** marks each.*
5. *In **section C,** question number **26** to **31** are short answer (SA) type questions carrying **3** marks each.*
6. *In **section D,** question number **32** to **35** are long answer (LA) type questions carrying **5** marks each.*
7. *In **section E,** question number **36** to **38** are **case–based integrated units** of assessment questions carrying **4** marks each. Internal choice is provided in **2** marks question in each case study.*
8. *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**.*
9. *Draw neat figures wherever required. Take π = 22/7 wherever required if not stated.*
10. *Use of calculators is **NOT allowed**.*

SECTION – A

20×1 = 20

Q. No. 1 to 20 are Multiple Choice Questions of 1 mark each.

1. LCM (850, 500) is : **1**

(a) 850×50 (b) 17×500 (c) $17 \times 5^2 \times 2^2$ (d) $17 \times 5^3 \times 2$

2. If the roots of quadratic equation $4x^2 - 5x + k = 0$ are real and equal, then value of k is : **1**

(a) $\frac{5}{4}$ (b) $\frac{25}{16}$ (c) $-\frac{5}{4}$ (d) $-\frac{25}{16}$

3. The mean and median of a statistical data are 21 and 23 respectively. The mode of the data is : **1**

(a) 27 (b) 22 (c) 17 (d) 23

4. The height and radius of a right circular cone are 24 cm and 7 cm respectively. The slant height of the cone is : **1**

(a) 24 cm (b) 31 cm (c) 26 cm (d) 25 cm

5. If one of the zeroes of the quadratic polynomial $(\alpha - 1)x^2 + \alpha x + 1$ is –3, then the value of α is : **1**

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

6. 52 पत्तों की अच्छी प्रकार से फेंटी गई ताश की गड्डी में से यादृच्छया एक पत्ता निकाला गया। निकाले गये पत्ते के एक लाल रंग की बेगम वाला पत्ता होने की प्रायिकता है : 1

(a) $\frac{1}{13}$ (b) $\frac{2}{13}$ (c) $\frac{1}{52}$ (d) $\frac{1}{26}$

7. यदि कोई निश्चित चर x क्रम में व्यवस्थित सांख्यिकी आँकड़ों को दो समान भागों में विभाजित करता है तो x का मान कहा जाता है : 1

(a) माध्य (b) माध्यक (c) बहुलक (d) परिसर

8. तीन सिक्कों को एक साथ उछाला गया। मात्र एक पट आने की प्रायिकता है : 1

(a) $\frac{1}{8}$ (b) $\frac{1}{4}$ (c) $\frac{7}{8}$ (d) $\frac{3}{8}$

9. यदि $\sin\theta = \frac{1}{3}$ है, तो $\sec\theta$ का मान है : 1

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

10. त्रिज्या 7 cm तथा ऊँचाई 10 cm वाले एक बेलनाकार जूस के गिलास का बाह्य पृष्ठीय क्षेत्रफल है : 1

(a) 440 sq m (b) 594 sq m (c) 748 sq m (d) 1540 sq m

11. एक पासे को फेंकने पर 6 आना यदि सफलता (जीत) माना जाए, तो खेल हारने की प्रायिकता है : 1

(a) 0 (b) 1 (c) $\frac{1}{6}$ (d) $\frac{5}{6}$

12. बिंदुओं $(2, -3)$ तथा $(-2, 3)$ के बीच की दूरी है : 1

(a) $2\sqrt{13}$ इकाई (b) 5 इकाई (c) $13\sqrt{2}$ इकाई (d) 10 इकाई

13. θ के किस मान के लिए $\sin^2\theta + \sin\theta + \cos^2\theta$ का मान 2 है ? 1

(a) 45° (b) 0° (c) 90° (d) 30°

14. एक वृत्त के व्यास की लंबाई 6 cm है। यदि इस व्यास का एक सिरा $(-4, 0)$ पर है, तो इसका दूसरा सिरा, जो x-अक्ष पर है, है : 1

(a) $(0, 2)$ (b) $(6, 0)$ (c) $(2, 0)$ (d) $(4, 0)$

15. k का वह मान जिसके लिए रैखिक समीकरण युग्म $5x + 2y - 7 = 0$ तथा $2x + ky + 1 = 0$ का कोई हल नहीं है, है : 1

(a) 5 (b) $\frac{4}{5}$ (c) $\frac{5}{4}$ (d) $\frac{5}{2}$

6. A card is drawn from a well shuffled deck of 52 playing cards. The probability that drawn card is a red queen, is : **1**

(a) $\frac{1}{13}$ (b) $\frac{2}{13}$ (c) $\frac{1}{52}$ (d) $\frac{1}{26}$

7. If a certain variable x divides a statistical data arranged in order into two equal parts, then the value of x is called the : **1**

(a) mean (b) median (c) mode (d) range of the data.

8. Three coins are tossed together. The probability of getting exactly one tail, is : **1**

(a) $\frac{1}{8}$ (b) $\frac{1}{4}$ (c) $\frac{7}{8}$ (d) $\frac{3}{8}$

9. If $\sin\theta = \frac{1}{3}$, then $\sec\theta$ is equal to : **1**

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

10. Outer surface area of a cylindrical juice glass with radius 7 cm and height 10 cm, is : **1**

(a) 440 sq m (b) 594 sq m (c) 748 sq m (d) 1540 sq m

11. On a throw of a die, if getting 6 is considered success then probability of losing the game is : **1**

(a) 0 (b) 1 (c) $\frac{1}{6}$ (d) $\frac{5}{6}$

12. The distance between the points (2, –3) and (–2, 3) is : **1**

(a) $2\sqrt{13}$ units (b) 5 units (c) $13\sqrt{2}$ units (d) 10 units

13. For what value of θ, $\sin^2\theta + \sin\theta + \cos^2\theta$ is equal to 2 ? **1**

(a) 45° (b) 0° (c) 90° (d) 30°

14. The diameter of a circle is of length 6 cm. If one end of the diameter is (– 4, 0), the other end on x-axis is at : **1**

(a) (0, 2) (b) (6, 0) (c) (2, 0) (d) (4, 0)

15. The value of k for which the pair of linear equations $5x + 2y - 7 = 0$ and $2x + ky + 1 = 0$ don't have a solution, is : **1**

(a) 5 (b) $\frac{4}{5}$ (c) $\frac{5}{4}$ (d) $\frac{5}{2}$

16. k के किस मान के लिए बहुपद $kx^2 - 4x - 7$ के शून्यकों का गुणनफल 2 है ? 1

(a) $-\frac{1}{14}$ (b) $-\frac{7}{2}$ (c) $\frac{7}{2}$ (d) $-\frac{2}{7}$

17. एक समांतर श्रेढ़ी में यदि $a = 8$ तथा $a_{10} = -19$ हैं, तो d का मान है : 1

(a) 3 (b) $-\frac{11}{9}$ (c) $-\frac{27}{10}$ (d) -3

18. बिंदुओं $(-1, 3)$ तथा $\left(8, \frac{3}{2}\right)$ को मिलाने वाले रेखाखण्ड का मध्य-बिंदु है : 1

(a) $\left(\frac{7}{2}, -\frac{3}{4}\right)$ (b) $\left(\frac{7}{2}, \frac{9}{2}\right)$ (c) $\left(\frac{9}{2}, -\frac{3}{4}\right)$ (d) $\left(\frac{7}{2}, \frac{9}{4}\right)$

निर्देश :

प्रश्न संख्या 19 तथा 20 प्रत्येक में एक अभिकथन (A) के पश्चात् एक तर्क (R) दिया है। निम्न में से सही विकल्प चुनिए :

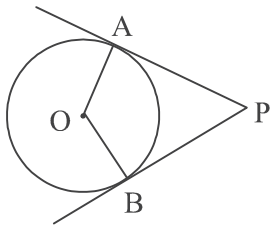
(a) दोनों, अभिकथन (A) तथा तर्क (R) सत्य हैं। तर्क (R), अभिकथन (A) की पूर्ण व्याख्या करता है।

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

(c) अभिकथन (A) सत्य है परन्तु तर्क (R) असत्य है।

(d) अभिकथन (A) असत्य है जबकि तर्क (R) सत्य है।

19. **अभिकथन (A) :** यदि केंद्र O वाले वृत्त पर एक बाह्य बिंदु P से स्पर्श रेखाएं PA तथा PB खींची गई हैं, तो चतुर्भुज OAPB एक चक्रीय चतुर्भुज है।



तर्क (R) : एक चक्रीय चतुर्भुज के सम्मुख कोण समान होते हैं। 1

20. **अभिकथन (A) :** बहुपद $p(x) = x^2 - 2x - 3$ के शून्यक -1 तथा 3 हैं।

तर्क (R) : बहुपद $p(x) = x^2 - 2x - 3$ का ग्राफ x-अक्ष को $(-1, 0)$ तथा $(3, 0)$ पर काटता है। 1

खण्ड – ख

प्रश्न संख्या 21 से 25 तक अति लघु-उत्तर वाले प्रश्न हैं, जिनमें प्रत्येक 2 अंक का है।

21. **(A)** सिद्ध कीजिए कि $6 - 4\sqrt{5}$ एक अपरिमेय संख्या है, दिया है कि $\sqrt{5}$ एक अपरिमेय संख्या है। 2

अथवा

(B) दर्शाइए कि $11 \times 19 \times 23 + 3 \times 11$ एक अभाज्य संख्या नहीं है। 2

16. For what value of k, the product of zeroes of the polynomial $kx^2 - 4x - 7$ is 2 ? **1**

(a) $-\frac{1}{14}$ (b) $-\frac{7}{2}$ (c) $\frac{7}{2}$ (d) $-\frac{2}{7}$

17. In an A.P. ; if $a = 8$ and $a_{10} = -19$, then value of d is : **1**

(a) 3 (b) $-\frac{11}{9}$ (c) $-\frac{27}{10}$ (d) –3

18. The mid-point of the line segment joining the points (–1, 3) and $\left(8, \frac{3}{2}\right)$ is : **1**

(a) $\left(\frac{7}{2}, -\frac{3}{4}\right)$ (b) $\left(\frac{7}{2}, \frac{9}{2}\right)$ (c) $\left(\frac{9}{2}, -\frac{3}{4}\right)$ (d) $\left(\frac{7}{2}, \frac{9}{4}\right)$

Directions :

In Q. No. 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Select the correct option from the following options :

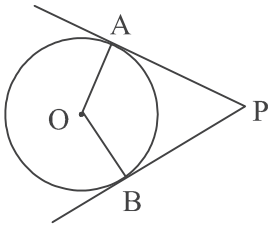
(a) Both, Assertion (A) and Reason (R) are true. Reason (R) explains Assertion (A) completely.

(b) Both, Assertion (A) and Reason (R) are true. Reason (R) does not explain 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 PA and PB are tangents drawn to a circle with centre O from an external point P, then the quadrilateral OAPB is a cyclic quadrilateral.



Reason (R) : In cyclic quadrilateral opposite angles are equal. **1**

20. Assertion (A) : Zeroes of a polynomial $p(x) = x^2 - 2x - 3$ are –1 and 3.

Reason (R) : The graph of polynomial $p(x) = x^2 - 2x - 3$ intersects x-axis at (–1, 0) and (3, 0). **1**

SECTION – B

Q. No. 21 to 25 are Very Short Answer Questions of 2 marks each.

21. (A) Prove that $6 - 4\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number. **2**

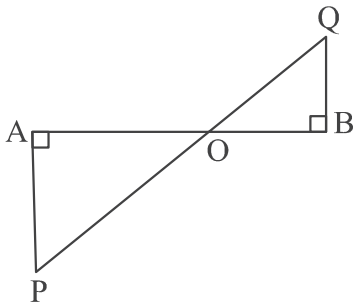
OR

(B) Show that $11 \times 19 \times 23 + 3 \times 11$ is not a prime number. **2**

22. एक थैले में 4 लाल, 5 सफेद तथा कुछ पीले रंग की गेंदें हैं। यदि थैले में से यादृच्छया एक लाल गेंद निकालने की प्रायिकता $\frac{1}{5}$ है, तो थैले में से यादृच्छया एक पीले रंग की गेंद निकालने की प्रायिकता ज्ञात कीजिए। **2**

23. एक ΔABC में, $\angle A = 90°$ है। यदि $\tan C = \sqrt{3}$ है, तो $\sin B + \cos C - \cos^2 B$ का मान ज्ञात कीजिए। **2**

24. दी गई आकृति में $AP \perp AB$ तथा $BQ \perp AB$ है। यदि $OA = 15$ cm, $BO = 12$ cm तथा $AP = 10$ cm है तो BQ की लंबाई ज्ञात कीजिए। **2**



25. **(A)** निम्नलिखित रैखिक समीकरण युग्म को x, y के लिए, बीजगणितीय विधि से हल कीजिए :
$x + 2y = 9$ तथा $y - 2x = 2$ **2**

अथवा

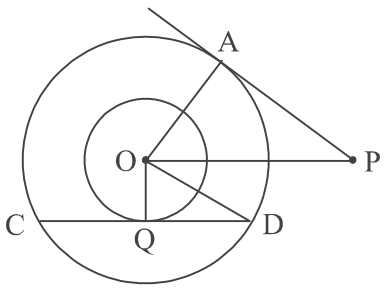
(B) जाँच कीजिए कि क्या बिंदु $(-4, 3)$, रैखिक समीकरणों $x + y + 1 = 0$ तथा $x - y = 1$ द्वारा निरूपित रेखाओं पर स्थित है। **2**

खण्ड – ग

प्रश्न संख्या 26 से 31 तक लघु–उत्तर वाले प्रश्न हैं जिनमें प्रत्येक 3 अंक का है।

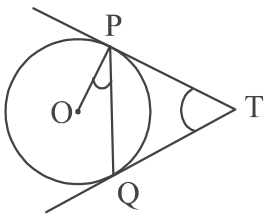
26. सिद्ध कीजिए : $\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{cosec} A$ **3**

27. **(A)** दी गई आकृति में, दो संकेंद्रीय वृत्तों की त्रिज्याएँ $OA = r$ cm तथा $OQ = 6$ cm हैं। बड़े वृत्त की जीवा CD छोटे वृत्त को Q पर स्पर्श करती है। यदि $PA = 16$ cm तथा $OP = 20$ cm है, तो जीवा CD की लम्बाई ज्ञात कीजिए। **3**



अथवा

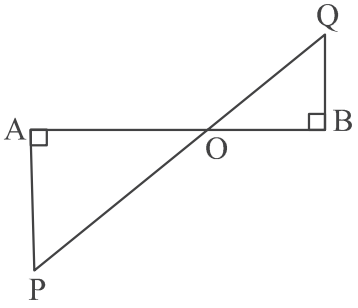
(B) दी गई आकृति में O केंद्र वाले वृत्त पर एक बाह्य बिंदु T से दो स्पर्श रेखाएँ TP तथा TQ खींची गई हैं। सिद्ध कीजिए कि $\angle PTQ = 2\angle OPQ$ **3**



22. A bag contains 4 red, 5 white and some yellow balls. If probability of drawing a red ball at random is $\frac{1}{5}$, then find the probability of drawing a yellow ball at random. **2**

23. In a ΔABC, $\angle A = 90°$. If $\tan C = \sqrt{3}$, then find the value of $\sin B + \cos C - \cos^2 B$. **2**

24. In the given figure, $AP \perp AB$ and $BQ \perp AB$. If OA = 15 cm, BO = 12 cm and AP = 10 cm, then find the length of BQ. **2**



25. **(A)** Solve the following pair of linear equations for x and y algebraically :
$x + 2y = 9$ and $y - 2x = 2$ **2**

OR

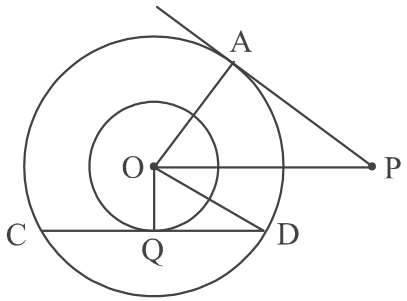
(B) Check whether the point $(-4, 3)$ lies on both the lines represented by the linear equations $x + y + 1 = 0$ and $x - y = 1$. **2**

SECTION – C

Q. No. 26 to 31 are Short Answer Questions of 3 marks each.

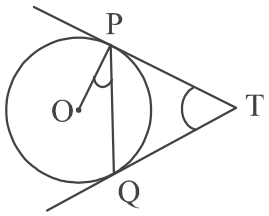
26. Prove that : $\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{cosec} A$ **3**

27. **(A)** In two concentric circles, the radii are OA = r cm and OQ = 6 cm, as shown in the figure. Chord CD of larger circle is a tangent to smaller circle at Q. PA is tangent to larger circle. If PA = 16 cm and OP = 20 cm, find the length CD. **3**



OR

(B) In given figure, two tangents PT and QT are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$. **3**



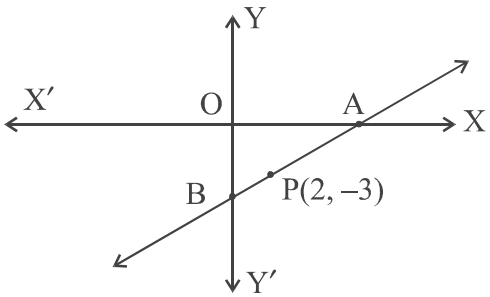
28. **(A)** एक ठोस एक बेलन के आकार का है जिसके दोनों किनारों पर उसी त्रिज्या के अर्ध गोले हैं। इस ठोस की कुल ऊँचाई 20 cm है तथा बेलन का व्यास 14 cm है। इस ठोस का पृष्ठीय क्षेत्रफल ज्ञात कीजिए। **3**

अथवा

(B) जूस का एक गिलास बेलनाकार आकार का है जिसका आधार एक ऊपर उठे अर्धगोले के आकार का है। गिलास का आंतरिक व्यास 10 cm है तथा ऊँचाई 14 cm है। इस गिलास की धारिता ज्ञात कीजिए। ($\pi = 3.14$ लीजिए) **3**

29. दो अलार्म घड़ियाँ क्रमशः 20 मिनट तथा 25 मिनट के अंतराल पर अलार्म बजाती हैं। यदि वह पहली बार एक साथ दोपहर के 12.00 बजे अलार्म बजाती हैं तो इसके बाद वह फिर एक साथ कितने बजे अलार्म बजाएंगी ? **3**

30. एक रेखा AB, x-अक्ष को A पर तथा y-अक्ष को B पर काटती है। बिंदु P(2, –3) AB पर इस प्रकार स्थित है कि AP : PB = 3 : 1 है। A तथा B के निर्देशांक ज्ञात कीजिए। **3**

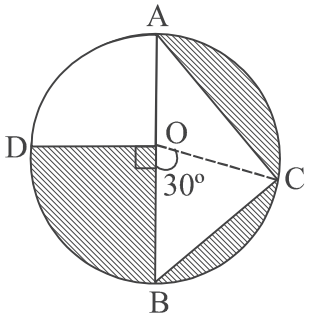


31. दो संपूरक कोणों में बड़ा कोण, छोटे कोण से 18° अधिक है। दोनों कोणों के माप ज्ञात कीजिए। **3**

खण्ड – घ

प्रश्न संख्या 32 से 35 तक दीर्घ–उत्तर वाले प्रश्न हैं, जिनमें प्रत्येक 5 अंक का है।

32. दी गई आकृति में, O वृत्त का केंद्र है। यदि AC = 28 cm, BC = 21 cm, $\angle BOD = 90^\circ$ तथा $\angle BOC = 30^\circ$ है तो छायांकित क्षेत्र का क्षेत्रफल ज्ञात कीजिए। **5**



33. **(A)** एक समतल भूमि पर खड़ी मीनार की भूमि पर पड़ रही छाया 40 मीटर लंबी हो गई जब सूर्य का उन्नतांश 60° से 30° हो गया। मीनार की ऊँचाई तथा आरम्भ में बनी छाया की लंबाई ज्ञात कीजिए। ($\sqrt{3} = 1.73$ लीजिए) **5**

अथवा

(B) एक बहुमंजिला भवन के शिखर से एक 8 मी. ऊँचे भवन के शिखर तथा पाद के अवनमन कोण क्रमशः 30° तथा 45° हैं। बहुमंजिला भवन की ऊँचाई तथा दोनों भवनों के बीच की दूरी ज्ञात कीजिए। ($\sqrt{3} = 1.73$ लीजिए) **5**

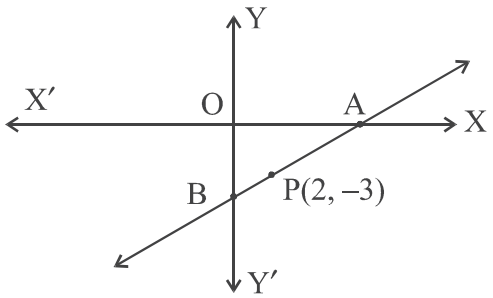
28. **(A)** A solid is in the form of a cylinder with hemi–spherical ends of same radii. The total height of the solid is 20 cm and the diameter of the cylinder is 14 cm. Find the surface area of the solid. **3**

OR

(B) A juice glass is cylindrical in shape with hemi–spherical raised up portion at the bottom. The inner diameter of glass is 10 cm and its height is 14 cm. Find the capacity of the glass. (use $\pi = 3.14$) **3**

29. Two alarm clocks ring their alarms at regular intervals of 20 minutes and 25 minutes respectively. If they first beep together at 12 noon, at what time will they beep again together next time ? **3**

30. The line AB intersects x-axis at A and y-axis at B. The point P(2, –3) lies on AB such that AP : PB = 3 : 1. Find the co-ordinates of A and B. **3**

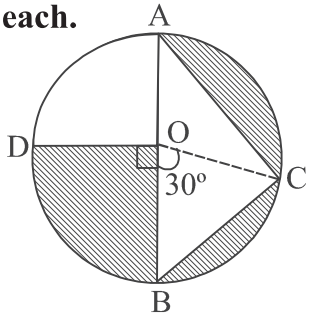


31. The greater of two supplementary angles exceeds the smaller by 18°. Find measures of these two angles. **3**

SECTION – D

Q. No. 32 to 35 are Long Answer Questions of 5 marks each.

32. O is the centre of the circle. If AC = 28 cm, BC = 21 cm, $\angle BOD = 90^\circ$ and $\angle BOC = 30^\circ$, then find the area of the shaded region given in the figure. **5**



33. **(A)** The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it was 60°. Find the height of the tower and the length of original shadow. (use $\sqrt{3} = 1.73$) **5**

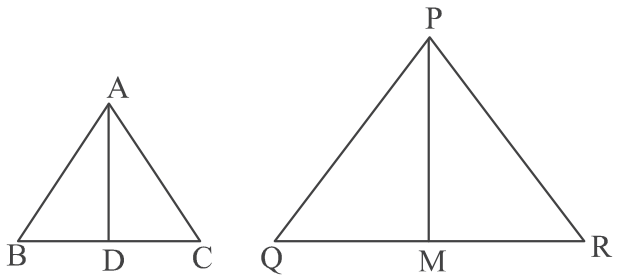
OR

(B) The angles of depression of the top and the bottom of an 8 m tall building from the top of a multi–storeyed building are 30° and 45° respectively. Find the height of the multi–storeyed building and the distance between the two buildings. (use $\sqrt{3} = 1.73$) **5**

34. **(A)** यदि किसी त्रिभुज की एक भुजा के समांतर अन्य दो भुजाओं को भिन्न-भिन्न बिंदुओं पर प्रतिच्छेद करने के लिए एक रेखा खींची जाए, तो सिद्ध कीजिए कि ये अन्य दो भुजाएँ एक ही अनुपात में विभाजित होती हैं। **5**

अथवा

(B) एक त्रिभुज ABC की भुजाएँ AB और AC तथा माध्यिका AD एक अन्य त्रिभुज PQR की भुजाओं PQ और PR तथा माध्यिका PM के क्रमशः समानुपाती हैं। दर्शाइए कि $\Delta ABC \sim \Delta PQR$ है। **5**



35. यदि किसी A.P. में $S_n = 4n^2 - n$ है, तो

(i) प्रथम पद तथा सार्वअंतर ज्ञात कीजिए।

(ii) A.P. के पद लिखिए।

(iii) A.P. का कौनसा पद 107 है ? **5**

खण्ड – ड़

प्रश्न संख्या 36 से 38 तक प्रकरण आधारित प्रश्न हैं, जिनमें प्रत्येक 4 अंक का है।

36. गुरप्रीत को पौधों पर शोध कार्य करने का बहुत शौक है। उसने कुछ पौधों के पत्ते एकत्र किए और उनकी लम्बाइयां mm में मापीं।

प्राप्त आँकड़े नीचे तालिका में दिए गए हैं :

लंबाई (mm में):	70-80	80-90	90-100	100-110	110-120	120-130	130-140
पत्तों की संख्या :	3	5	9	12	5	4	2

उपरोक्त जानकारी के आधार पर निम्न प्रश्नों के उत्तर दीजिए :

(i) आँकड़ों का माध्यक वर्ग लिखें। **1**

(ii) कितने पत्तों की लंबाई 10 cm या उससे अधिक है ? **1**

(iii) (a) आँकड़ों का माध्यक ज्ञात कीजिए। **2**

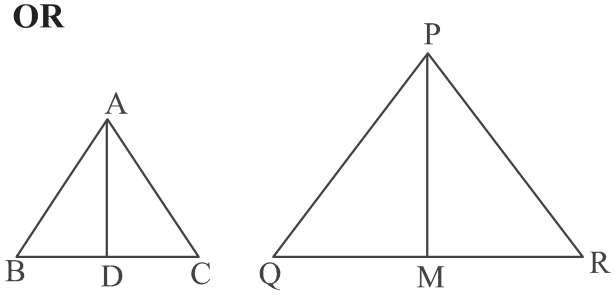
अथवा

(b) आँकड़ों का बहुलक वर्ग लिखें तथा बहुलक ज्ञात कीजिए। **2**

34. **(A)** If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that other two sides are divided in the same ratio. **5**

OR

(B) Sides AB and BC and median AD of a ΔABC are respectively proportional to sides PQ and PR and median PM of ΔPQR. Show that $\Delta ABC \sim \Delta PQR$. **5**



35. In an A.P. if $S_n = 4n^2 - n$, then

(i) find the first term and common difference.

(ii) write the A.P.

(iii) which term of the A.P. is 107 ? **5**

SECTION – E

Q. No. 36 to 38 are Case-Based Questions of 4 marks each.

36. Gurpreet is very fond of doing research on plants. She collected some leaves from different plants and measured their lengths in mm.

The data obtained is represented in the following table :

Length (in mm) :	70-80	80-90	90-100	100-110	110-120	120-130	130-140
Number of leaves :	3	5	9	12	5	4	2

Based on the above information, answer the following questions :

(i) Write the median class of the data. **1**

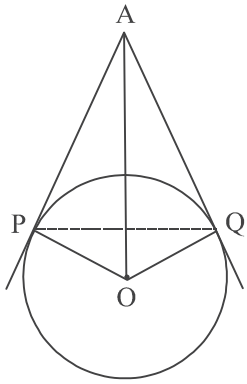
(ii) How many leaves are of length equal to or more than 10 cm ? **1**

(iii) (a) Find median of the data. **2**

OR

(b) Write the modal class and find the mode of the data. **2**

37. दिये गये चित्र में एक वृत्ताकार दर्पण को एक तार के साथ दीवार पर लटका हुआ दिखाया गया है। दिया गया आरेख दर्पण को केंद्र O वाले एक वृत्त के रूप में दर्शाता है, AP और AQ क्रमशः P तथा Q पर वृत्त की स्पर्श रेखाएं हैं। यदि AP = 30 cm तथा $\angle PAQ = 60°$ है।



उपरोक्त जानकारी के आधार पर निम्न प्रश्नों के उत्तर दीजिए :

(i) PQ की लंबाई ज्ञात कीजिए। **1**

(ii) m $\angle POQ$ ज्ञात कीजिए। **1**

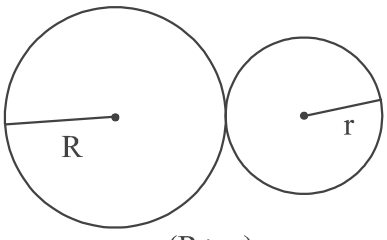
(iii) (a) OA की लंबाई ज्ञात कीजिए। **2**

अथवा

(b) दर्पण की त्रिज्या ज्ञात कीजिए। **2**

38. लान को हरा और ठंडा रखने के लिए, साधना पानी के छिड़काव वाले यंत्र का प्रयोग करती है, जो वृत्ताकार आकार में घूमते हैं और एक विशेष क्षेत्र में पानी छिड़कते हैं।

नीचे दिए गए चित्र इन दो यंत्रों द्वारा कवर किए गए क्षेत्रों को दर्शाते हैं :



(R > r)

दो वृत्त बाह्य स्पर्श कर रहे हैं तथा उनके क्षेत्रफलों का योग 130 π sq m है तथा उनके केंद्रों के बीच की दूरी 14 m है।

उपरोक्त जानकारी के आधार पर निम्न प्रश्नों के उत्तर दीजिए :

(i) उपरोक्त से R तथा r में एक द्विघात समीकरण प्राप्त कीजिए। **1**

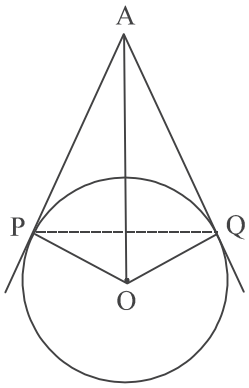
(ii) केवल r में एक द्विघात समीकरण लिखिए। **1**

(iii) (a) त्रिज्या r ज्ञात कीजिए तथा संगत पानी दिया गया क्षेत्रफल ज्ञात कीजिए। **2**

अथवा

(b) त्रिज्या R ज्ञात कीजिए तथा संगत पानी दिया गया क्षेत्रफल ज्ञात कीजिए। **2**

37. The picture given below shows a circular mirror hanging on the wall with a cord. The diagram represents the mirror as a circle with centre O. AP and AQ are tangents to the circle at P and Q respectively such that AP = 30 cm and $\angle PAQ = 60°$.



Based on the above information, answer the following questions :

(i) Find the length PQ. **1**

(ii) Find m $\angle POQ$. **1**

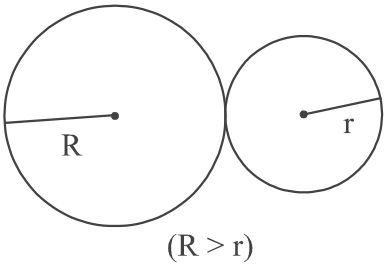
(iii) (a) Find the length OA. **2**

OR

(b) Find the radius of the mirror. **2**

38. To keep the lawn green and cool, Sadhna uses water sprinklers which rotate in circular shape and cover a particular area.

The diagram below shows the circular areas covered by two sprinklers :



(R > r)

Two circles touch externally. The sum of their areas is 130 π sq m and the distance between their centres is 14 m.

Based on above information, answer the following questions :

(i) Obtain a quadratic equation involving R and r from above. **1**

(ii) Write a quadratic equation involving only r. **1**

(iii) (a) Find the radius r and the corresponding area irrigated. **2**

OR

(b) Find the radius R and the corresponding area irrigated. **2**

Marking Scheme
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Secondary School Examination, 2024
SUBJECT NAME: MATHEMATICS BASIC (241) (Q.P. CODE 430/1/2)

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. It's 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 answers. 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 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"**.

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).This is in view of the reduced syllabus and number of questions in question paper.
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. ● Answers 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 answers 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 and 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.

Set 430/1/2

MARKING SCHEME
MATHEMATICS BASIC (241)

Section A

1. LCM (850, 500) is :

(a) 850×50 (b) 17×500 (c) $17 \times 5^2 \times 2^2$ (d) $17 \times 5^3 \times 2$

Ans: (b) 17×500 1

---

2. If the roots of quadratic equation $4x^2 - 5x + k = 0$ are real and equal, then value of k is :

(a) $\frac{5}{4}$ (b) $\frac{25}{16}$ (c) $-\frac{5}{4}$ (d) $-\frac{25}{16}$

Ans: (b) $\frac{25}{16}$ 1

---

3. The mean and median of a statistical data are 21 and 23 respectively. The mode of the data is :

(a) 27 (b) 22 (c) 17 (d) 23

Ans: (a) 27 1

---

4. The height and radius of a right circular cone are 24 cm and 7 cm respectively. The slant height of the cone is :

(a) 24 cm (b) 31 cm (c) 26 cm (d) 25 cm

Ans: (d) 25 cm 1

---

5. If one of the zeroes of the quadratic polynomial $(\alpha - 1)x^2 + \alpha x + 1$ is -3, then the value of α is :

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

Ans: (c) $\frac{4}{3}$ 1

---

6. A card is drawn from a well shuffled deck of 52 playing cards. The probability that drawn card is a red queen, is :

(a) $\frac{1}{13}$ (b) $\frac{2}{13}$ (c) $\frac{1}{52}$ (d) $\frac{1}{26}$

Ans: (d) $\frac{1}{26}$ 1

---

7. If a certain variable x divides a statistical data arranged in order into two equal parts; then the value of x is called the :

(a) mean (b) median (c) mode (d) range of the data.

Ans: (b) median 1

---

8. Three coins are tossed together. The probability of getting exactly one tail, is :

(a) $\frac{1}{8}$ (b) $\frac{1}{4}$ (c) $\frac{7}{8}$ (d) $\frac{3}{8}$

Ans: (d) $\frac{3}{8}$ 1

---

9. If $\sin\theta = \frac{1}{3}$, then $\sec\theta$ is equal to :

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

Ans: (b) $\frac{3}{2\sqrt{2}}$ 1

---

10. Outer surface area of a cylindrical juice glass with radius 7 cm and height 10 cm, is :

(a) 440 sq cm (b) 594 sq cm c) 748 sq cm (d) 1540 sq ı cm

Ans: (b) 594 sq cm 1

---

11. On a throw of a die, if getting 6 is considered success then probability of losing the game is :

(a) 0 (b) 1 (c) $\frac{1}{6}$ (d) $\frac{5}{6}$

Ans: (d) $\frac{5}{6}$ 1

---

12. The distance between the points (2, –3) and (–2, 3) is :

(a) $2\sqrt{13}$ units (b) 5 units (c) $13\sqrt{2}$ units (d) 10 units

Ans: (a) $2\sqrt{13}$ units 1

---

13. For what value of $\theta, \sin^2\theta + \sin\theta + \cos^2\theta$ is equal to 2 ?

(a) 45° (b) 0° (c) 90° (d) 30°

Ans: (c) 90° 1

---

14. The diameter of a circle is of length 6 cm. If one end of the diameter is (– 4, 0), the other end on x-axis is at :

(a) (0, 2) (b) (6, 0) (c) (2, 0) (d) (4, 0)

Ans: (c) (2,0) 1

---

15. The value of k for which the pair of linear equations $5x+2y-7=0$ and $2x+ky+1=0$ don't have a solution, is :

(a) 5 (b) $\frac{4}{5}$ (c) $\frac{5}{4}$ (d) $\frac{5}{2}$

Ans: (b) $\frac{4}{5}$ 1

---

16. For what value of k, the product of zeroes of the polynomial kx^2-4x-7 is 2 ?

(a) $-\frac{1}{14}$ (b) $-\frac{7}{2}$ (c) $\frac{7}{2}$ (d) $-\frac{2}{7}$

Ans: (b) $-\frac{7}{2}$ 1

---

17. In an A.P., if $a = 8$ and $a_{10} = -19$, then value of d is :

(a) 3 (b) $-\frac{11}{9}$ (c) $-\frac{27}{10}$ (d) –3

Ans: (d) – 3 1

---

18. The mid-point of the line segment joining the points (–1, 3) and $\left(8, \frac{3}{2}\right)$ is :

(a) $\left(\frac{7}{2}, -\frac{3}{4}\right)$ (b) $\left(\frac{7}{2}, \frac{9}{2}\right)$ (c) $\left(\frac{9}{2}, -\frac{3}{4}\right)$ (d) $\left(\frac{7}{2}, \frac{9}{4}\right)$

Ans: (d) $\left(\frac{7}{2}, \frac{9}{4}\right)$ 1

Directions :

In Q. No. 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Select the correct option from the following options :

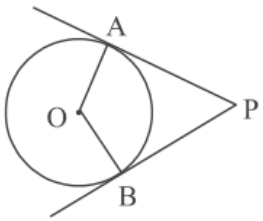
(a) Both, Assertion (A) and Reason (R) are true. Reason (R) explains Assertion (A) completely.

(b) Both, Assertion (A) and Reason (R) are true. Reason (R) does not explain 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 the PA and PB are tangents drawn to a circle with centre O from an external point P, then the quadrilateral OAPB is a cyclic quadrilateral.

Reason (R) : In a cyclic quadrilateral, opposite angles are equal.

Ans: (c) Assertion (A) is true but Reason (R) is false. 1

---

20. Assertion (A) : Zeroes of a polynomial $p(x) = x^2 - 2x - 3$ are -1 and 3.

Reason (R) : The graph of polynomial $p(x) = x^2 - 2x - 3$ intersects x-axis at $(-1, 0)$ and $(3, 0)$.

Ans: (a) Both Assertion (A) and Reason (R) are true. Reason (R) explains Assertion (A) completely. 1

Section B

21. **(A)** Prove that $6 - 4\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is an irrational number.

OR

(B) Show that $11 \times 19 \times 23 + 3 \times 11$ is not a prime number.

Sol: (A) Let us assume $6 - 4\sqrt{5}$ = x is a rational number

$\Rightarrow \sqrt{5} = \frac{6 - x}{4}$ *1*

Now RHS is rational but LHS is irrational. *1*

$\therefore$ Our assumption is wrong

Hence $6 - 4\sqrt{5}$ is irrational.

OR

(B) $11 \times 19 \times 23 + 3 \times 11 = 11 \times (19 \times 23 + 3)$ *1*

$\Rightarrow$ The given number has more than two factors *1*

Hence it is not a prime number.

---

22. A bag contains 4 red, 5 white and some yellow balls. If probability of drawing a red ball at random is $\frac{1}{5}$, then find the probability of drawing a yellow ball at random.

Sol: Let no. of yellow balls in the bag be n.

$\therefore$ Total no. of balls = 9 + n

P (red ball) = $\frac{1}{5} = \frac{4}{9 + n} \Rightarrow n = 11$ $1 + \frac{1}{2}$

$\Rightarrow$ P(yellow ball) = $\frac{11}{20}$ $\frac{1}{2}$

---

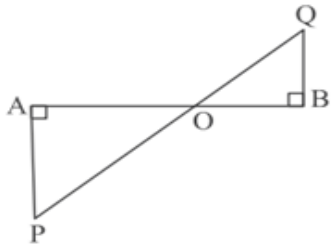
23. In a ΔABC, $\angle A = 90°$. If $\tan C = \sqrt{3}$, then find the value of $\sin B + \cos C - \cos^2 B$.

Sol: $\tan C = \sqrt{3} \Rightarrow \angle C = 60° \Rightarrow \angle B = 30°$ 1

$\therefore \sin B + \cos C - \cos^2 B = \frac{1}{2} + \frac{1}{2} - \frac{3}{4} = \frac{1}{4}$ *1*

---

24. In the given figure, AP $\perp$ AB and BQ $\perp$ AB. If OA = 15 cm, BO = 12 cm and AP = 10 cm, then find the length of BQ.



Sol: $\Delta OAP \sim \Delta OBQ$ (AA) 1

$\therefore \frac{OA}{OB} = \frac{AP}{BQ} \Rightarrow \frac{15}{12} = \frac{10}{BQ}$ $\frac{1}{2}$

$\Rightarrow BQ = 8$ cm. $\frac{1}{2}$

---

25. **(A)** Solve the following pair of linear equations for x and y algebraically :
$x + 2y = 9$ and $y - 2x = 2$

OR

(B) Check whether the point $(-4, 3)$ lies on both the lines represented by the linear equations $x + y + 1 = 0$ and $x - y = 1$.

Sol: (A) $x + 2y = 9$, _____ (i)

$y - 2x = 2$ _____ (ii)

Solving to get $x = 1$, $y = 4$. *1+1*

OR

(B) Substituting $x = -4$ and $y = 3$ in equation $x + y + 1 = 0$,

$(-4, 3)$ satisfies the equation $x + y + 1 = 0$

So $(-4, 3)$ lies on it. *1*

For $x - y = 1$, $(-4, 3)$ doesn't satisfy the equation $x - y = 1$

therefore $(-4, 3)$ does not lie on $x - y = 1$ *1*

Section C

26. Prove that : $\sqrt{\frac{\sec A - 1}{\sec A + 1}} + \sqrt{\frac{\sec A + 1}{\sec A - 1}} = 2 \operatorname{cosec} A$

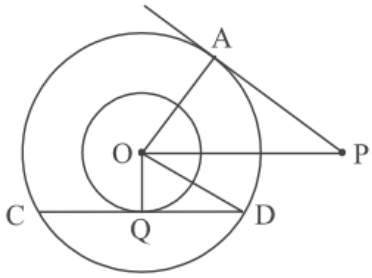
Sol: LHS = $\frac{\sec A - 1 + \sec A + 1}{\sqrt{\sec^2 A - 1}}$ *1*

$= \frac{2 \sec A}{\tan A}$ *1*

$= 2 \operatorname{cosec} A = RHS$ *1*

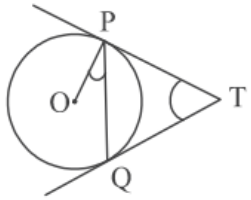
---

27. **(A)** In two concentric circles, the radii are OA = r cm and OQ = 6 cm, as shown in the figure. Chord CD of larger circle is a tangent to smaller circle at Q. PA is tangent to larger circle. If PA = 16 cm and OP = 20 cm, find the length CD.



OR

(B) In given figure, two tangents PT and QT are drawn to a circle with centre O from an external point T. Prove that ∠PTQ = 2 ∠OPQ.



Sol : (A)Since PA ⊥ OA therefore $OA^2 = 20^2 - 16^2 = 144$

$\Rightarrow$ OA = r = 12 cm *1*

In Δ OQD, $QD^2 = 12^2 - 6^2 = 108$

$\Rightarrow QD = 6\sqrt{3}$ cm *1*

Now OQ bisects CD

$\Rightarrow CD = 2 \times 6\sqrt{3} = 12\sqrt{3}$ cm *1*

OR

(B) Let ∠ PTQ = θ

In Δ TPQ, ∠ PQT = ∠ QPT and ∠ PQT + ∠ QPT + ∠ PTQ = 180°

$\Rightarrow \angle QPT = 90° - \frac{\theta}{2}$ $1\frac{1}{2}$

Now OP ⊥ PT $\Rightarrow$ ∠ OPQ + ∠ QPT = 90°

$\Rightarrow \angle OPQ = \frac{\theta}{2}$ *1*

$\Rightarrow$ ∠ PTQ = 2∠ OPQ. $\frac{1}{2}$

---

28. **(A)** A solid is in the form of a cylinder with hemi–spherical ends of same radii. The total height of the solid is 20 cm and the diameter of the cylinder is 14 cm. Find the surface area of the solid.

OR

(B) A juice glass is cylindrical in shape with hemi–spherical raised up portion at the bottom. The inner diameter of glass is 10 cm and its height is 14 cm. Find the capacity of the glass. (use $\pi = 3.14$)

Sol: (A) Height of cylinder = $20 - (2 \times 7) = 6$ cm $\frac{1}{2}$

radius of cylinder = radius of hemisphere = 7 cm $\frac{1}{2}$

Total SA = $2\pi rh + 4\pi r^2 = 2\pi r(h + 2r)$

$= 2 \times \frac{22}{7} \times 7 \times 20$ $1\frac{1}{2}$

$= 880 \text{ cm}^2$ $\frac{1}{2}$

OR

(B) radius of glass = 5 cm $\frac{1}{2}$

Capacity of glass = volume of cylinder – volume of hemisphere

$= \pi r^2 h - \frac{2}{3}\pi r^3$

$= 3.14 \times 5 \times 5 \times 14 - \frac{2}{3} \times 3.14 \times 5 \times 5 \times 5$ 2

$= \frac{2512}{3} \text{ cm}^3$ or 837.33 cm^3 (approx) $\frac{1}{2}$

---

29. Two alarm clocks ring their alarms at regular intervals of 20 minutes and 25 minutes respectively. If they first beep together at 12 noon, at what time will they beep again together next time ?

Sol: LCM (20, 25) = 100 2

$\therefore$ After 100 minutes from 12:00 noon

$\Rightarrow$ They will beep again together at 1:40 pm 1

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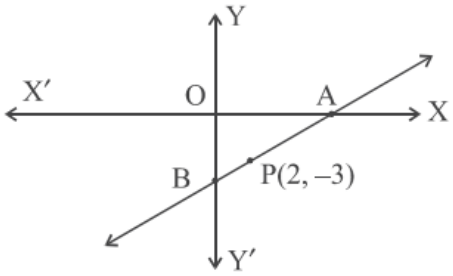
30. The line AB intersects x-axis at A and y-axis at B. The point P(2, –3) lies on AB such that AP : PB = 3 : 1. Find the co-ordinates of A and B.



Sol: Let co-ordinates of point A be (x, 0) and B(0, y) 1

$$AP : PB = 3 : 1$$

$$\therefore \frac{x+0}{4} = 2, \frac{0+3y}{4} = -3. \quad 1$$

$$\Rightarrow x = 8, y = -4 \quad 1$$

$\therefore$ Point A is (8, 0) and B is (0, – 4)

---

31. The greater of two supplementary angles exceeds the smaller by 18°. Find measures of these two angles.

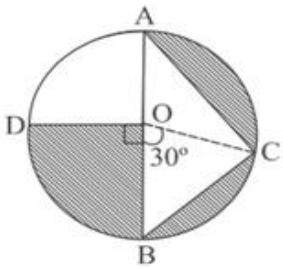
Sol: Let the measure of two angles be x° and y° (x > y)

Given x + y = 180 and x – y = 18 1+1

solving equations to get y = 81 and x = 99 $\frac{1}{2} + \frac{1}{2}$

Section D

32. O is the centre of the circle. If AC = 28 cm, BC = 21 cm, ∠BOD = 90° and ∠BOC = 30°, then find the area of the shaded region given in the figure.



Sol: Assuming AOB to be a straight line and hence the diameter of the circle.

$\Rightarrow \angle ACB = 90°$

Then in ΔACB, $AC^2 + BC^2 = 28^2 + 21^2 = (35)^2 = AB^2$

$\therefore$ AB = 35 cm is the diameter and $\Rightarrow$ $r = \frac{35}{2}$ cm 1

Area of shaded region

$$= \text{area of quadrant} + \left(\frac{1}{2} \times \pi r^2 - \text{area of } \Delta ACB\right)$$

$= \left(\frac{3}{4} \times \frac{22}{7} \times \frac{35}{2} \times \frac{35}{2}\right) - \frac{1}{2} \times 28 \times 21$ *2+1*

$= 721{\cdot}9 - 294 = 427{\cdot}9$ (approx) *1*

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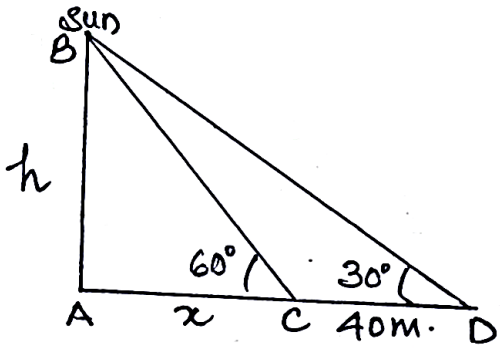
33. **(A)** The shadow of a tower standing on a level ground is found to be 40 m longer when the Sun's altitude is 30° than when it was 60°. Find the height of the tower and the length of original shadow. (use $\sqrt{3} = 1.73$)

OR

(B) The angles of depression of the top and the bottom of an 8 m tall building from the top of a multi–storeyed building are 30° and 45° respectively. Find the height of the multi–storeyed building and the distance between the two buildings. (use $\sqrt{3} = 1.73$)

Sol: (A) Let AB be the tower and AC and AD are shadows.



Correct figure *1*

In ΔBAD, $\tan 30° = \frac{h}{x+40} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+40}$ *1*

$\Rightarrow x + 40 = h\sqrt{3}$ _____ (i) $\frac{1}{2}$

In ΔBAC, $\tan 60° = \frac{h}{x} \Rightarrow \sqrt{3} = \frac{h}{x} \Rightarrow h = x\sqrt{3}$ _____ (ii) *1*

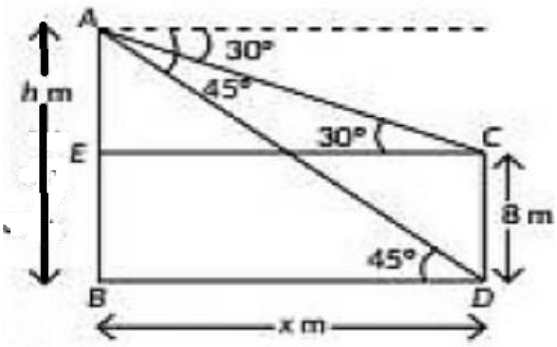
From (i) and (ii) $h = 20\sqrt{3} = 34{\cdot}6$ m *1*

And $x = 20$ $\frac{1}{2}$

length of original shadow = 20 m, height = 34·6 m.

OR

(B) Let CD and AB are buildings



Correct figure *1*

In ΔAEC, $\tan 30° = \frac{h-8}{x} \Rightarrow h - 8 = \frac{x}{\sqrt{3}}$ _____ (i) *1+* $\frac{1}{2}$

In ΔABD, $\tan 45° = \frac{h}{x} \Rightarrow h = x$ _____ (ii) *1*

Solving (i) and (ii) $h = x = 12 + 4\sqrt{3} = 18{\cdot}92$ m. *1+* $\frac{1}{2}$

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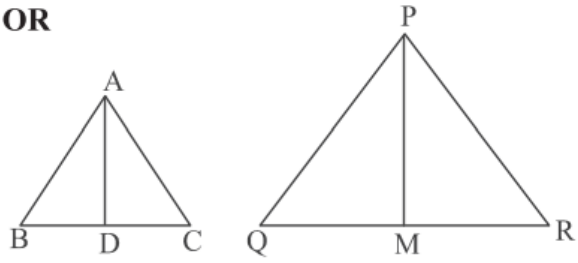
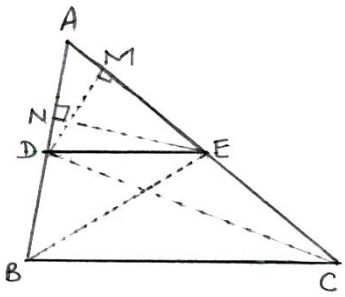
34. **(A)** If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then prove that other two sides are divided in the same ratio.

OR

(B) Sides AB and AC and median AD of a ΔABC are respectively proportional to sides PQ and PR and median PM of ΔPQR. Show that $\Delta ABC \sim \Delta PQR$.



Sol: (A)



$\frac{1}{2}$ for fig.

Given: In Δ ABC, DE || BC

To Prove: $\frac{AD}{DB} = \frac{AE}{EC}$

Construction: Join BE, DC

Draw DM ⊥ AC and EN ⊥ AB 1

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

$\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{AD}{DB}$ .....(i)

and $\frac{ar(\Delta ADE)}{ar(\Delta CDE)} = \frac{\frac{1}{2}\times AE\times DM}{\frac{1}{2}\times EC\times DM}$ 1

$\frac{ar(\Delta ADE)}{ar(\Delta CDE)} = \frac{AE}{EC}$ .....(ii)

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

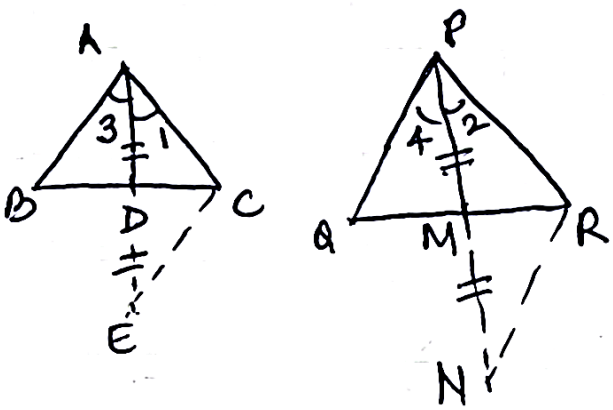
∴ ar (Δ BDE) = ar (Δ CDE) .....(iii) 1

From (i), (ii) and (iii)

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

OR

(B) Produce AD to E and PM to N such that AD = DE, PM = MN. *1*



Δ ADB ≅ Δ EDC ⇒ AB = CE, similarly PQ = RN. *1*

Given $\frac{AB}{PQ} = \frac{AC}{PR} = \frac{AD}{PM}$

$$\Rightarrow \frac{CE}{RN} = \frac{AC}{PR} = \frac{\frac{AE}{2}}{\frac{PN}{2}} \Rightarrow \Delta AEC \sim \Delta PNR \qquad 1$$

$\Rightarrow \angle 1 = \angle 2$, similarly $\angle 3 = \angle 4$

therefore $\angle 1 + \angle 3 = \angle 2 + \angle 4$ or $\angle BAC = \angle QPR$ *1*

Also $\frac{AB}{PQ} = \frac{AC}{PR}$ (given)

Therefore $\Delta ABC \sim \Delta PQR$ *1*

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35. In an A.P. if $S_n = 4n^2 - n$, then

(i) find the first term and common difference.

(ii) write the A.P.

(iii) which term of the A.P. is 107 ?

Sol: (i) $S_n = 4n^2 - n$

$S_1 = 4 - 1 = 3 = a$ *1*

$S_2 = 2a + d = 14 \Rightarrow d = 14 - 6 = 8$ $1+\frac{1}{2}$

(ii) A.P. is 3, 11, 19, 27, ... *1*

(iii) $107 = 3 + (n - 1)8 \Rightarrow n = 14$ $1+\frac{1}{2}$

SECTION E

36. Gurpreet is very fond of doing research on plants. She collected some leaves from different plants and measured their lengths in mm.

The data obtained is represented in the following table :

Length (in mm) :	70-80	80-90	90-100	100-110	110-120	120-130	130-140
Number of leaves :	3	5	9	12	5	4	2

Based on the above information, answer the following questions :

(i) Write the median class of the data. **1**

(ii) How many leaves are of length equal to or more than 10 cm ? **1**

(iii) (a) Find median of the data. **2**

OR

(b) Write the modal class and find the mode of the data. **2**

Sol: (i) Median class : 100 – 110 *1*

(ii) No. of leaves equal to or more than 10cm(100 mm) = 23 *1*

(iii) (a)

C.I.	f	cf
70 – 80	3	3
80 – 90	5	8
90 – 100	9	17
100 – 110	12	29
110 – 120	5	34
120 – 130	4	38
130 – 140	2	40 = N

Correct table $\frac{1}{2}$

$$\text{Median} = 100 + \frac{10}{12}(20 - 17) = 102{\cdot}5 \qquad 1+\frac{1}{2}$$

OR

(b) Modal class is 100 – 110 $\frac{1}{2}$

$$\text{Mode} = 100 + 10 \times \frac{12 - 9}{24 - 9 - 5} = 103 \qquad 1+\frac{1}{2}$$

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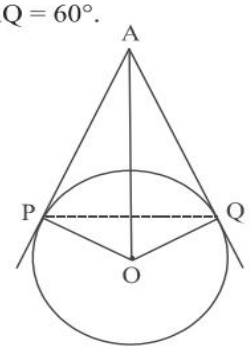
37. The picture given below shows a circular mirror hanging on the wall with a cord. The diagram represents the mirror as a circle with centre O. AP and AQ are tangents to the circle at P and Q respectively such that AP = 30 cm and $\angle PAQ = 60°$.



Based on the above information; answer the following questions :

(i) Find the length PQ. **1**

(ii) Find m $\angle POQ$. **1**

(iii) (a) Find the length OA. **2**

OR

(b) Find the radius of the mirror. **2**

Sol: (i) $\angle PAQ = 60° \Rightarrow \Delta APQ$ is an equilateral triangle $\frac{1}{2}$

$\therefore PQ = AP = 30$ cm. $\frac{1}{2}$

(ii) $\angle POQ = 180° - 60° = 120°$ *1*

(iii) (a) $\angle PAO = 30°$ $\frac{1}{2}$

In ΔAPO, $\cos 30° = \frac{AP}{OA} \Rightarrow \frac{\sqrt{3}}{2} = \frac{30}{OA}$ *1*

$\Rightarrow OA = 20\sqrt{3}$ cm. $\frac{1}{2}$

OR

(b) $\angle PAO = 30°$ $\frac{1}{2}$

In ΔAPO, $\tan 30° = \frac{OP}{AP} \Rightarrow \frac{1}{\sqrt{3}} = \frac{OP}{30}$ *1*

$\Rightarrow OP = 10\sqrt{3}$ cm. $\frac{1}{2}$

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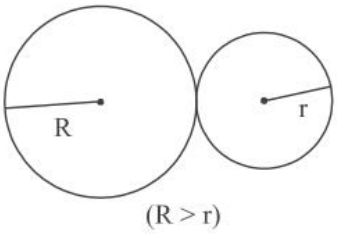
38. To keep the lawn green and cool, Sadhna uses water sprinklers which rotate in circular shape and cover a particular area.

The diagram below shows the circular areas covered by two sprinklers :



(R > r)

Two circles touch externally. The sum of their areas is 130 π sq m and the distance between their centres is 14 m.

Based on above information, answer the following questions :

(i) Obtain a quadratic equation involving R and r from above. **1**

(ii) Write a quadratic equation involving only r. **1**

(iii) (a) Find the radius r and the corresponding area irrigated. **2**

OR

(b) Find the radius R and the corresponding area irrigated. **2**

Sol: (i) $R^2 + r^2 = 130$ *1*

(ii) $r^2 - 14r + 33 = 0$ *1*

(iii) (a) $r^2 - 14r + 33 = 0 \Rightarrow (r - 11)(r - 3) = 0$

$\Rightarrow r = 3$ m, $r \neq 11$ m (As $r < R$) *1*

Corresponding area irrigated $= 9\pi$ m^2 *1*

OR

(b) $R^2 - 14R + 33 = 0 \Rightarrow (R - 11)(R - 3) = 0$

$\Rightarrow R = 11$ m, $R \neq 3$ (As $R > r$) *1*

Corresponding area irrigated $= 121\pi$ m^2 *1*
