Series CD1BA/3 SET~1

प्रश्न–पत्र कोड
Q.P. Code **430/3/1**

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.

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) 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 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.

(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.

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 :

(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 1 अंक के प्रश्न हैं।*

(iv) *खण्ड – **ख** में प्रश्न संख्या 21 से 25 तक अति लघु-उत्तरीय (VSA) प्रकार के 2 अंकों के प्रश्न हैं।*

(v) *खण्ड – **ग** में प्रश्न संख्या 26 से 31 तक लघु-उत्तरीय (SA) प्रकार के 3 अंकों के प्रश्न हैं।*

(vi) *खण्ड – **घ** में प्रश्न संख्या 32 से 35 तक दीर्घ-उत्तरीय (LA) प्रकार के 5 अंकों के प्रश्न हैं।*

(vii) *खण्ड – **ङ** में प्रश्न संख्या 36 से 38 प्रकरण अध्ययन आधारित 4 अंकों के प्रश्न हैं। आंतरिक विकल्प 2 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 very carefully and follow them :

(i) *This question paper contains **38** questions. **All** questions are compulsory.*

(ii) *Question Paper is divided into **5** 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 (VSA) type questions of **2** marks each.*

(v) *In Section–**C** question number **26** to **31** are Short Answer (SA) 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 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 $\pi = 22/7$ wherever required if not stated.*

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

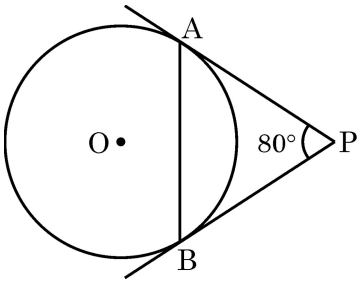
खण्ड – क

20 × 1 = 20

(बहुविकल्पीय प्रश्न)

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

1. दी गई आकृति में, एक वृत्त पर बाह्य बिंदु P से खींची गई स्पर्श-रेखाएँ PA तथा PB परस्पर 80° के कोण पर झुकी हुई हैं । ∠PAB का माप है : **1**



(A) 80^o (B) 60^o

(C) 50^o (D) 40^o

2. k का/के वे मान जिनके लिए द्विघात समीकरण $5x^2 - 9kx + 5 = 0$ के मूल वास्तविक और समान है, हैं : **1**

(A) $\frac{-10}{9}$ (B) $\pm \frac{9}{10}$

(C) $\frac{10}{9}$ (D) $\pm \frac{10}{9}$

3. बिंदुओं A(–1, 5) तथा B(6, –2) के बीच की दूरी है : **1**

(A) $2\sqrt{7}$ (B) $7\sqrt{2}$

(C) 49 (D) 14

4. द्विघातीय बहुपद जिसके शून्यक 3 तथा –2 हैं, है : **1**

(A) $x^2 - x - 6$ (B) $x^2 + x - 6$

(C) $2x^2 - x - 12$ (D) $x^2 + x + 6$

5. रैखिक समीकरणों $x = a$ तथा $y = b$ $(a \neq b)$ द्वारा निरूपित रेखाएँ **1**

(A) (a, b) पर प्रतिच्छेदी हैं । (B) (b, a) पर प्रतिच्छेदी हैं ।

(C) समांतर हैं । (D) संपाती हैं ।

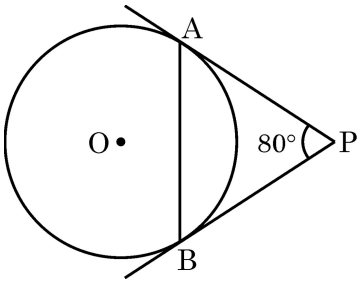
Section – A

20 × 1 = 20

(Multiple Choice Questions)

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

1. In the given figure, tangents PA and PB drawn from P to circle are inclined to each other at an angle of 80°. The measure of ∠PAB is **1**



(A) 80^o (B) 60^o

(C) 50^o (D) 40^o

2. The value(s) of k for which the quadratic equation $5x^2 - 9kx + 5 = 0$ has real and equal roots, is/are : **1**

(A) $\frac{-10}{9}$ (B) $\pm \frac{9}{10}$

(C) $\frac{10}{9}$ (D) $\pm \frac{10}{9}$

3. The distance between the points A(–1, 5) and B(6, –2) is : **1**

(A) $2\sqrt{7}$ (B) $7\sqrt{2}$

(C) 49 (D) 14

4. A quadratic polynomial whose zeroes are 3 and –2, is : **1**

(A) $x^2 - x - 6$ (B) $x^2 + x - 6$

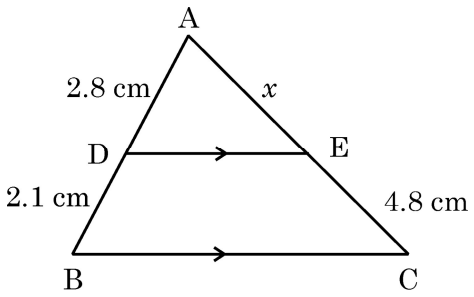
(C) $2x^2 - x - 12$ (D) $x^2 + x + 6$

5. The lines represented by linear equations x = a and y = b (a ≠ b) are **1**

(A) intersecting at (a, b). (B) intersecting at (b, a).

(C) parallel. (D) coincident.

6. यदि दी गई आकृति में, DE || BC है । यदि AD = 2.8 cm, DB = 2.1 cm तथा EC = 4.8 cm है, तो x का मान है : **1**



(A) 3.6 cm (B) 2.4 cm

(C) 6.4 cm (D) 4.8 cm

7. एक समकोण त्रिभुज ABC, जिसमें $\angle A = 90^\circ$ तथा AB = AC है, में sin C का मान है : **1**

(A) 0 (B) $\frac{\sqrt{3}}{2}$

(C) $\frac{1}{2}$ (D) $\frac{1}{\sqrt{2}}$

8. एक पासा एक बार उछाला गया । इस पर 6 से कम संख्या के आने की प्रायिकता है : **1**

(A) 0 (B) $\frac{5}{6}$

(C) $\frac{1}{6}$ (D) 1

9. एक बाह्य बिंदु P से वृत्त पर एक स्पर्श-रेखा PA खींची गई । P से स्पर्श-रेखा PA के समांतर खींची जा सकने वाली स्पर्श-रेखाओं की संख्या है : **1**

(A) 2 (B) 2 से अधिक

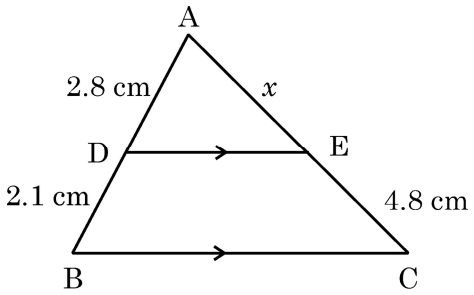
(C) 1 (D) 0

10. यदि एक गोले का आयतन $\frac{11}{21}$ cm^3 है, तो इसकी त्रिज्या है : **1**

(A) 2 cm (B) 4 cm

(C) $\frac{1}{2}$ cm (D) $\frac{1}{4}$ cm

6. If in the given figure, DE || BC. If AD = 2.8 cm, DB = 2.1 cm and EC = 4.8 cm, then the value of x is : **1**



(A) 3.6 cm (B) 2.4 cm

(C) 6.4 cm (D) 4.8 cm

7. In a right-angled triangle ABC, $\angle A = 90^\circ$ and AB = AC. The value of sin C is : **1**

(A) 0 (B) $\frac{\sqrt{3}}{2}$

(C) $\frac{1}{2}$ (D) $\frac{1}{\sqrt{2}}$

8. A die is thrown once. The probability of getting a number less than 6, is : **1**

(A) 0 (B) $\frac{5}{6}$

(C) $\frac{1}{6}$ (D) 1

9. From an external point P, a tangent PA is drawn to a circle. The number of tangents through P parallel to PA is : **1**

(A) 2 (B) more than 2

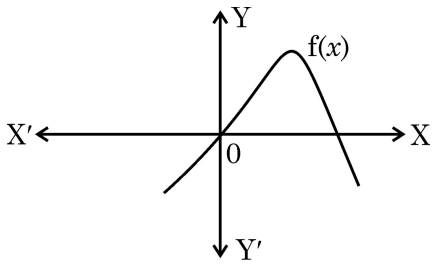
(C) 1 (D) 0

10. If the volume of a sphere is $\frac{11}{21}$ cm^3, then the radius of the sphere is : **1**

(A) 2 cm (B) 4 cm

(C) $\frac{1}{2}$ cm (D) $\frac{1}{4}$ cm

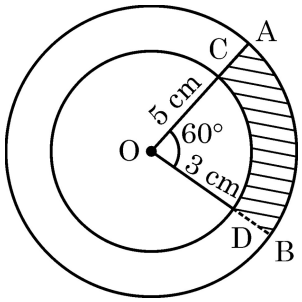
11. दी गई आकृति में, बहुपद f(x) का आलेख दर्शाया गया है । बहुपद f(x) के शून्यकों की संख्या है : **1**



(A) 3 (B) 1

(C) 0 (D) 2

12. दी गई आकृति में, केंद्र O वाले दो संकेन्द्रीय वृत्त दर्शाए गए हैं जिनकी त्रिज्याएँ 5 cm तथा 3 cm हैं । OAB बड़े वृत्त का त्रिज्य खण्ड है जिसका केंद्रीय कोण 60° है तथा OCD छोटे वृत्त का त्रिज्य खण्ड है । छायांकित क्षेत्र का क्षेत्रफल है : **1**



(A) $\frac{7\pi}{2}$ cm^2 (B) $\frac{8\pi}{3}$ cm^2

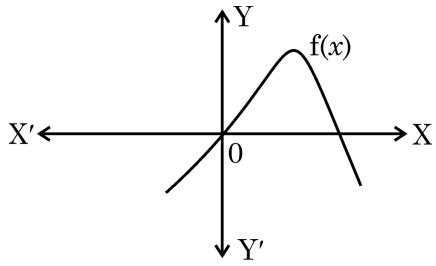
(C) $\frac{25\pi}{6}$ cm^2 (D) $\frac{3\pi}{2}$ cm^2

13. यदि किन्हीं आँकड़ों का माध्य तथा माध्यक क्रमशः 10 तथा 11 हैं, तो इन आँकड़ों का बहुलक है : **1**

(A) 12 (B) 8

(C) 20 (D) 13

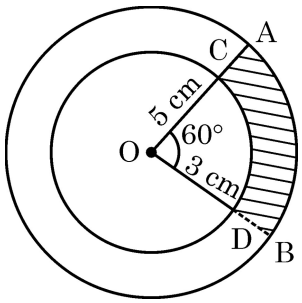
11. In the given figure, graph of a polynomial f(x) is shown. The number of zeroes of polynomial f(x) is : **1**



(A) 3 (B) 1

(C) 0 (D) 2

12. In the given figure, two concentric circles of radii 5 cm and 3 cm have their centre O. OAB is a sector of outer circle making an angle of 60° at the centre while OCD is the sector of smaller circle. The area of the shaded region is : **1**



(A) $\frac{7\pi}{2}$ cm^2 (B) $\frac{8\pi}{3}$ cm^2

(C) $\frac{25\pi}{6}$ cm^2 (D) $\frac{3\pi}{2}$ cm^2

13. If the mean and median of a data are 10 and 11 respectively, then mode of the data is : **1**

(A) 12 (B) 8

(C) 20 (D) 13

14. दो निष्पक्ष सिक्कों को एक साथ उछाला गया । 2 चित आने की प्रायिकता है : **1**

(A) $\frac{1}{2}$ (B) $\frac{3}{4}$

(C) $\frac{1}{4}$ (D) $\frac{3}{8}$

15. यदि $\cos A = \frac{1}{2}$ है, तो $\tan A$ का मान है : **1**

(A) $\frac{1}{\sqrt{3}}$ (B) $\sqrt{3}$

(C) 3 (D) $\frac{3}{2}$

16. भुजा 14 cm वाले एक ठोस घन में से अधिकतम व्यास का एक गोला काटकर निकाला गया । गोले की त्रिज्या है : **1**

(A) 7 cm (B) 14 cm

(C) $\frac{7}{2}$ cm (D) $\sqrt{14}$ cm

17. एक समांतर श्रेढ़ी जिसका nवाँ पद $a_n = 5n - 1$ द्वारा दिया गया है, का सार्व अंतर है : **1**

(A) 1 (B) 6

(C) 5 (D) 4

18. यदि किसी बंटन के लिए $\sum_{1}^{n} f_i x_i = 132 + 5p$ तथा $\sum_{1}^{n} f_i = 20$ है तथा बंटन का माध्य 8.1 है, तो p का मान है : **1**

(A) 3 (B) 6

(C) 4 (D) 5

14. Two fair coins are tossed together. The probability of getting 2 heads, is : **1**

(A) $\frac{1}{2}$ (B) $\frac{3}{4}$

(C) $\frac{1}{4}$ (D) $\frac{3}{8}$

15. If $\cos A = \frac{1}{2}$, then tan A is equal to **1**

(A) $\frac{1}{\sqrt{3}}$ (B) $\sqrt{3}$

(C) 3 (D) $\frac{3}{2}$

16. From a solid cube of side 14 cm, a sphere of maximum diameter is carved out. The radius of sphere is : **1**

(A) 7 cm (B) 14 cm

(C) $\frac{7}{2}$ cm (D) $\sqrt{14}$ cm

17. The common difference of an A.P. whose n^{th} term is given by $a_n = 5n - 1$, is : **1**

(A) 1 (B) 6

(C) 5 (D) 4

18. If for a distribution, $\sum_{1}^{n} f_i x_i = 132 + 5p$, $\sum_{1}^{n} f_i = 20$ and the mean of the distribution is 8.1, then the value of p is : **1**

(A) 3 (B) 6

(C) 4 (D) 5

(अभिकथन – तर्क आधारित)

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

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

(B) अभिकथन (A) तथा तर्क (R) दोनों सत्य हैं । 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, जबकि तर्क (R) सत्य है ।

19. **अभिकथन (A) :** बिंदु P(a, b) की मूल बिंदु से दूरी $a^2 + b^2$ है । **1**

तर्क (R) : दो बिंदुओं $A(x_1, y_1)$ तथा $B(x_2, y_2)$ के बीच की दूरी $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ होती है ।

20. **अभिकथन (A) :** $\sqrt{2}\,(5 - \sqrt{2}\,)$ एक अपरिमेय संख्या है । **1**

तर्क (R) : दो अपरिमेय संख्याओं का गुणनफल सदैव एक अपरिमेय संख्या होती है ।

खण्ड – ख

(अति लघु–उत्तरीय प्रश्न)

प्रश्न संख्या **21** से **25** तक अति लघु–उत्तरीय प्रकार के प्रश्न हैं तथा प्रत्येक प्रश्न के **2** अंक हैं ।

21. (a) यदि बिंदु Q(0, 2), बिंदुओं P(5, –3) तथा R(x, 7) से समान दूरी पर है, तो x का/के मान ज्ञात कीजिए । **2**

अथवा

(b) यदि A(1, 1) तथा B(7, 9) वृत्त के किसी व्यास के सिरे हैं, तो वृत्त के केंद्र के निर्देशांक ज्ञात कीजिए । **2**

22. मान ज्ञात कीजिए : $4 \sin^2 60° \tan^2 45° - 2 \sec^2 30° \tan^2 60°$ **2**

(Assertion – Reason based questions)

Directions : In question numbers **19** and **20**, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option from the following :

(A) Both Assertion (A) and Reason (R) are true. Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true. Reason (R) is not the correct explanation of Assertion (A).

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

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

19. **Assertion (A) :** The distance of P(a, b) from origin is $a^2 + b^2$. **1**

Reason (R) : The distance between two points A(x_1, y_1) and B(x_2, y_2) is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

20. **Assertion (A) :** $\sqrt{2}\,(5 - \sqrt{2}\,)$ is an irrational number. **1**

Reason (R) : Product of two irrational numbers is always irrational.

Section – B

(Very Short Answer Type Questions)

Q. No. **21** to **25** are Very Short Answer type questions of **2** marks each.

21. (a) If Q(0, 2) is equidistant from P(5, –3) and R(x, 7), find the value(s) of x. **2**

OR

(b) If A(1, 1) and B(7, 9) are the end points of a diameter of a circle, then find the co-ordinates of the centre of the circle. **2**

22. Evaluate : $4 \sin^2 60° \tan^2 45° - 2 \sec^2 30° \tan^2 60°$ **2**

23. (a) सिद्ध कीजिए कि $-7 - 2\sqrt{3}$ एक अपरिमेय संख्या है, जबकि दिया है कि $\sqrt{3}$ एक अपरिमेय संख्या है । **2**

अथवा

(b) व्याख्या कीजिए कि $(7 \times 11 \times 13 + 2 \times 11)$ एक अभाज्य संख्या क्यों नहीं है । **2**

24. वह अनुपात ज्ञात कीजिए जिसमें Y-अक्ष, बिंदुओं A(5, – 6) तथा B(–1, – 4) के मिलाने वाले रेखाखण्ड को विभाजित करता है । विभाजन बिंदु भी ज्ञात कीजिए । **2**

25. 1 से 80 तक की संख्याओं से अंकित 80 कार्डों में से एक कार्ड यादृच्छया निकाला गया । प्रायिकता ज्ञात कीजिए कि निकाले गए कार्ड पर अंकित संख्या 8 से विभाजित नहीं है । **2**

खण्ड – ग

(लघु–उत्तरीय प्रश्न)

प्रश्न संख्या **26** से **31** तक लघु–उत्तरीय प्रकार के प्रश्न हैं तथा प्रत्येक प्रश्न के **3** अंक हैं ।

26. अभाज्य गुणनखण्डन विधि से, दो संख्याओं 336 तथा 54 का ल.स. (LCM) तथा म.स. (HCF) ज्ञात कीजिए । **3**

27. एक समकोण त्रिभुज की ऊँचाई इसके आधार से 7 cm कम है । यदि इसका कर्ण 17 cm लंबा है, तो **3**

(a) उपरोक्त आँकड़ों को एक द्विघात समीकरण से निरूपित कीजिए ।

(b) त्रिभुज की भुजाओं की लंबाइयाँ ज्ञात कीजिए ।

28. (a) एक बर्तन एक खोखले अर्धगोले पर अध्यारोपित एक खोखले बेलन के आकार का है । अर्धगोले का व्यास 14 cm है तथा बर्तन की कुल ऊँचाई 13 cm है । इस बर्तन का आंतरिक पृष्ठीय क्षेत्रफल ज्ञात कीजिए । **3**

अथवा

(b) एक ठोस खिलौना, एक अर्धगोले पर अध्यारोपित एक लंब–वृत्तीय शंकु के आकार का है । शंकु की ऊँचाई 2 cm है तथा इसके आधार का व्यास 4 cm है । खिलौने का आयतन ज्ञात कीजिए । **3**

23. (a) Prove that $-7 - 2\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number. **2**

OR

(b) Explain why $(7 \times 11 \times 13 + 2 \times 11)$ is not a prime number. **2**

24. Find the ratio in which the Y-axis divides the line segment joining the points A(5, –6) and B(–1, –4). Also, find the point of intersection. **2**

25. There are 80 cards numbered from 1 to 80. One card is drawn at random from them. Find the probability that the number on the selected card is not divisible by 8. **2**

Section – C

(Short Answer Type Questions)

Q. No. **26** to **31** are Short Answer type questions of **3** marks each.

26. Find LCM and HCF of two numbers 336 and 54, using prime-factorisation method. **3**

27. The altitude of a right-angled triangle is 7 cm less than its base. If its hypotenuse is 17 cm long, then **3**

(a) represent the above information in the form of a quadratic equation;

(b) find the length of the sides of the triangle.

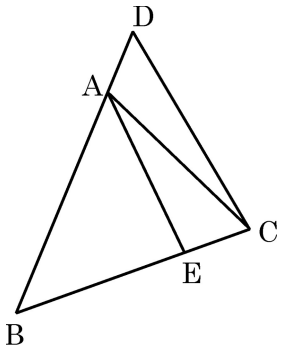
28. (a) A vessel is in the form of a hollow hemisphere surmounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel. **3**

OR

(b) A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy. **3**

29. द्विघात बहुपद $5x^2 + 3x - 2$ के शून्यक ज्ञात कीजिए । शून्यकों तथा गुणांक के बीच के संबंध का सत्यापन कीजिए । **3**

30. दी गई आकृति में, $\angle ABC = \angle ACB$ हैं, तथा $\frac{BC}{BE} = \frac{BD}{AC}$ है । **3**



दर्शाइए कि $\Delta ABE \sim \Delta DBC$ तथा $AE \parallel DC$.

31. (a) सिद्ध कीजिए : $(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$. **3**

अथवा

(b) यदि $\cos A = \frac{5}{13}$ है, तो सत्यापित कीजिए कि : **3**

$$\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} = \cos A + \sin A.$$

खण्ड – घ

(दीर्घ–उत्तरीय प्रश्न)

प्रश्न संख्या **32** से **35** तक दीर्घ–उत्तरीय वाले प्रश्न हैं जिनमें प्रत्येक के **5** अंक हैं ।

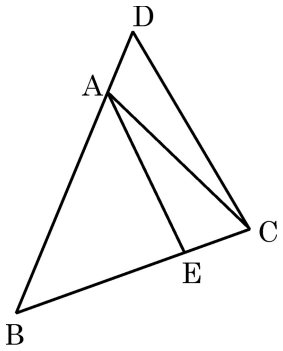
32. 50 कर्मचारियों के प्रति घंटा वेतन, नीचे दिए गए बंटन में दर्शाए गए हैं : **5**

प्रति घंटा वेतन (₹ में)	100-120	120-140	140-160	160-180	180-200
कर्मचारियों की संख्या	12	14	8	6	10

उपरोक्त आँकड़ों का माध्य तथा माध्यक ज्ञात कीजिए ।

29. Find the zeroes of the quadratic polynomial $5x^2 + 3x - 2$ and verify the relationship between the zeroes and the co-efficients. **3**

30. In the given figure, $\angle ABC = \angle ACB$ and $\frac{BC}{BE} = \frac{BD}{AC}$. **3**



Show that $\Delta ABE \sim \Delta DBC$ and AE || DC.

31. (a) Prove that $(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$. **3**

OR

(b) If $\cos A = \frac{5}{13}$, then verify that $\frac{\cos A}{1 - \tan A} + \frac{\sin A}{1 - \cot A} = \cos A + \sin A$. **3**

Section – D

(Long Answer Type Questions)

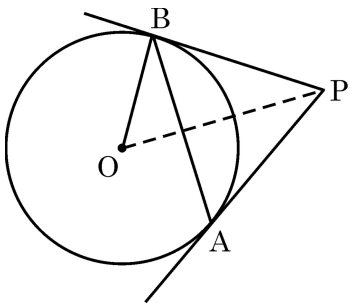
Q. No. **32** to **35** are Long Answer type questions of **5** marks each.

32. Consider the following distribution of hourly wages of 50 workers of a factory : **5**

Hourly wages (in ₹)	100-120	120-140	140-160	160-180	180-200
Number of workers	12	14	8	6	10

Find the mean and the median of the above data.

33. (a) दी गई आकृति में, 5 cm त्रिज्या वाले एक वृत्त की एक जीवा AB की लंबाई 6 cm है । A तथा B पर खींची गई स्पर्श-रेखाएँ बिंदु P पर मिलती हैं । PB की लंबाई ज्ञात कीजिए । **5**



अथवा

(b) सिद्ध कीजिए कि वृत्त के परिगत खींची गई समांतरचतुर्भुज एक समचतुर्भुज होती है । इस समचतुर्भुज का क्षेत्रफल भी ज्ञात कीजिए, जबकि वृत्त की त्रिज्या 3 cm है तथा समचतुर्भुज की एक भुजा 10 cm लंबी है । **5**

34. एक 100 m चौड़ी सड़क के दोनों किनारों पर दो समान ऊँचाई के खम्भे एक दूसरे के विपरीत खड़े हैं । सड़क के बीच के किसी बिंदु से इन खम्भों के शिखरों के उन्नयन कोण क्रमशः 60° तथा 30° हैं । खम्भों की ऊँचाई तथा इस बिंदु से खम्भों की दूरियाँ ज्ञात कीजिए । **5**

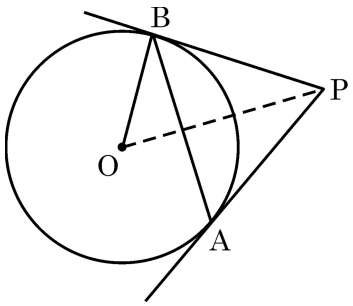
35. (a) ग्राफीय विधि से, निम्न समीकरण युग्म का हल ज्ञात कीजिए : **5**

$x + 2y = 8$ तथा $3x - 2y = 12$

अथवा

(b) एक 2-अंकों की संख्या के अंकों का योग 9 है । इस संख्या का नौ-गुना, इस संख्या की अंकों का स्थान पलटने पर बनी संख्या के दो गुने के समान है । संख्या ज्ञात कीजिए । **5**

33. (a) In the given figure, AB is chord of length 6 cm of a circle of radius 5 cm. The tangents at A and B intersect at a point P. Find the length of PB. **5**



OR

(b) Prove that the parallelogram circumscribing a circle is a rhombus. Also, find area of the rhombus, if radius of circle is 3 cm and length of one side of the rhombus is 10 cm. **5**

34. Two poles of equal height are standing opposite each other on either side of a road, which is 100 m wide. From a point somewhere between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles and the distances of the point from the poles. **5**

35. (a) Using graphical method, solve the following pair of equations : **5**

$x + 2y = 8$ and $3x - 2y = 12$

OR

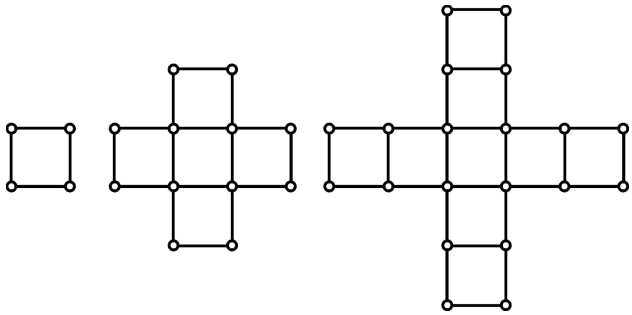
(b) The sum of the digits of a 2-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number. **5**

खण्ड – ङ

(प्रकरण अध्ययन आधारित प्रश्न)

प्रश्न संख्या **36** से **38** तक प्रकरण अध्ययन आधारित प्रश्न हैं । प्रत्येक प्रश्न के **4** अंक हैं ।

36. एक प्रतियोगी-परीक्षा की तैयारी करते समय, अकबर के सामने एक माचिस की तीलियों के पैटर्न पर आधारित प्रश्न आया । वह पैटर्न नीचे दिया है :



आकृति (1) **आकृति (2)** **आकृति (3)** .....

उपरोक्त के आधार पर, निम्न प्रश्नों के उत्तर दीजिए :

(i) आकृति में वर्गों की संख्या द्वारा बनी समांतर श्रेढ़ी का प्रथम पद तथा सार्व अंतर लिखिए । **1**

(ii) माचिस की तीलियों की संख्या द्वारा बनने वाली समांतर श्रेढ़ी का प्रथम पद तथा सार्व अंतर लिखिए । **1**

(iii) (a) इसी प्रकार की आकृति (10) में कितने वर्ग हैं ? आकृति (10) में प्रयोग माचिस की तीलियों की संख्या भी लिखिए । **2**

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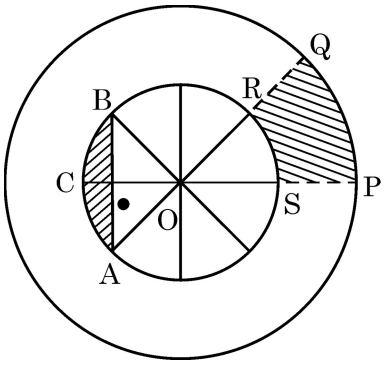
(iii) (b) यदि mवीं आकृति (आकृति (m)) में 88 तीलियों का प्रयोग हुआ है, तो m का मान ज्ञात कीजिए । इस आकृति में कितने वर्ग बनते हैं ? **2**

37. एन.एस.एस. (राष्ट्रीय सेवा योजना) का उद्देश्य छात्रों को समुदाय से जोड़ना और उन्हें समस्या समाधान प्रक्रिया में शामिल करना है । एन.एस.एस. का प्रतीक उड़ीसा में स्थित कोणार्क सूर्य मंदिर के रथ चक्र पर आधारित है, पहिया जीवन के प्रगति चक्र का प्रतीक है । प्रतीक का आरेखिक चित्र नीचे दिया गया है :



Section – E

(Case Study based Questions)

Q. No. **36** to **38** are Case Study based questions of **4** marks each.

36. While preparing for a competitive examination, Akbar came across a match-stick pattern based question. The pattern is given below :

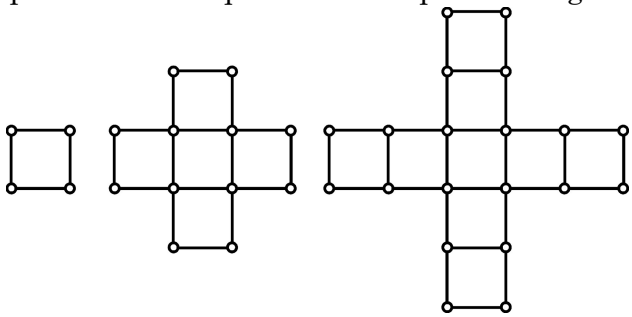


Fig. (1) **Fig. (2)** **Fig. (3)** .....

Based on the above information, answer the following questions :

(i) Write first term and common difference of the A.P. formed by number of squares in each figure. **1**

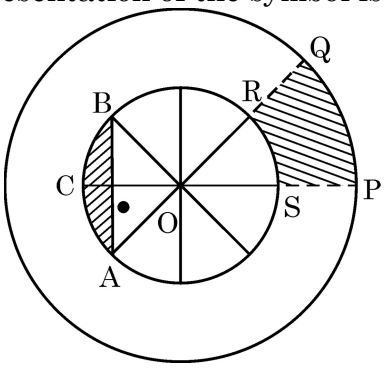
(ii) Write first term and common difference of the A.P. formed by number of sticks used in each figure. **1**

(iii) (a) How many squares are there in Fig. (10) ? Also, write the number of sticks used in Fig. (10). **2**

OR

(iii) (b) If 88 sticks are used to make m^{th} figure (Fig. (m)), find the value of m. How many squares are formed in this figure ? **2**

37. NSS (National Service Scheme) aims to connect the students to the community and to involve them in problem solving process.
NSS symbol is based on the 'Rath' wheel of the Konark Sun Temple situated in Odisha. The wheel signifies the progress cycle of life.
The diagramatic representation of the symbol is given below :



ऊपर दी गई आकृति का अवलोकन कीजिए । अन्त: वृत्त के व्यास समान रूप से रखे गए हैं । दिया है कि OP = 21 cm तथा OS = 10 cm है, तो

ऊपर दी गई जानकारी के आधार पर निम्नलिखित प्रश्नों के उत्तर दीजिये :

(i) $m\angle ROS$ ज्ञात कीजिए । **1**

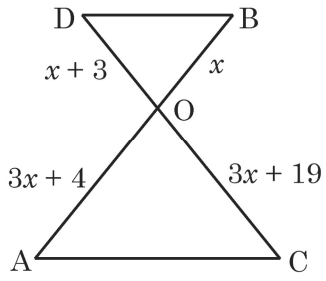
(ii) त्रिज्य खण्ड OPQ का परिमाप ज्ञात कीजिए । **1**

(iii) (a) छायांकित क्षेत्र PQRS का क्षेत्रफल ज्ञात कीजिए । **2**

अथवा

(iii) (b) छायांकित क्षेत्र ACB (वृत्त खण्ड ACB) का क्षेत्रफल ज्ञात कीजिए । **2**

38. दी गई आकृति में, एक बंद किया जा सकने वाला मेज दर्शाया गया है :



मेज के पैर रेखा खण्ड AB तथा CD द्वारा निरूपित हैं जो O पर मिलते हैं । AC तथा BD को मिलाएँ । यह मानते हुए कि मेज का ऊपरी भाग भूमि के समांतर है तथा OB = x, OD = $x + 3$, OC = $3x + 19$ तथा OA = $3x + 4$ है, तो निम्न के उत्तर दीजिए :

(i) सिद्ध कीजिए कि $\Delta OAC \sim \Delta OBD$. **1**

(ii) सिद्ध कीजिए कि $\frac{OA}{AC} = \frac{OB}{BD}$. **1**

(iii) (a) आकृति के अवलोकन से, x का मान ज्ञात कीजिए । अत: OC की लंबाई ज्ञात कीजिए । **2**

अथवा

(iii) (b) आकृति के अवलोकन से, $\frac{BD}{AC}$ ज्ञात कीजिए । **2**

Observe the figure given above. The diameters of inner circle are equally placed. Given that OP = 21 cm, OS = 10 cm.

Based on the above information, answer the following questions :

(i) Find m∠ROS. **1**

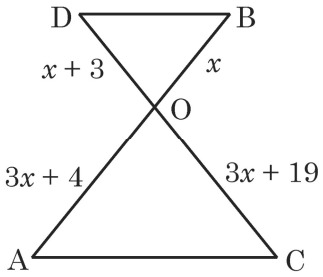
(ii) Find the perimeter of sector OPQ. **1**

(iii) (a) Find the area of shaded region PQRS. **2**

OR

(iii) (b) Find the area of shaded region ACB i.e. the segment ACB. **2**

38. In the figure given below, a folding table is shown :



The legs of the table are represented by line segments AB and CD intersecting at O. Join AC and BD.

Considering table top is parallel to the ground, and OB = x, OD = $x + 3$, OC = $3x + 19$ and OA = $3x + 4$, answer the following questions :

(i) Prove that Δ OAC is similar to ΔOBD. **1**

(ii) Prove that $\frac{OA}{AC} = \frac{OB}{BD}$. **1**

(iii) (a) Observe the figure and find the value of x. Hence, find the length of OC. **2**

OR

(iii) (b) Observe the figure and find $\frac{BD}{AC}$. **2**

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2024
SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE 430/3/1)

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 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 (0-80) (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 unassessed 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 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.

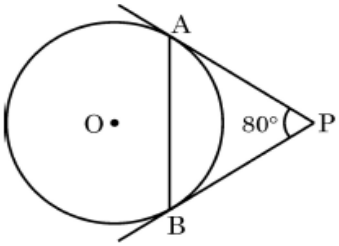
Set 430/3/1

MARKING SCHEME
MATHEMATICS (BASIC)

SECTION A

20×1=20

1. In the given figure, tangents PA and PB drawn from P to circle are inclined to each other at an angle of 80°. The measure of ∠PAB is



(A) 80° (B) 60°
(C) 50° (D) 40°

Ans. (C) 50° *1*

---

2. The value(s) of k for which the quadratic equation $5x^2 - 9kx + 5 = 0$ has real and equal roots, is/are :

(A) $\frac{-10}{9}$ (B) $\pm\frac{9}{10}$
(C) $\frac{10}{9}$ (D) $\pm\frac{10}{9}$

Ans. (D) $\pm\frac{10}{9}$ *1*

---

3. The distance between the points A(–1, 5) and B(6, –2) is :

(A) $2\sqrt{7}$ (B) $7\sqrt{2}$
(C) 49 (D) 14

Ans. (B) $7\sqrt{2}$ *1*

---

4. A quadratic polynomial whose zeroes are 3 and –2, is : 1

(A) $x^2 - x - 6$ (B) $x^2 + x - 6$
(C) $2x^2 - x - 12$ (D) $x^2 + x + 6$

Ans.. (A) $x^2 - x - 6$ *1*

---

5. The lines represented by linear equations $x = a$ and $y = b$ $(a \neq b)$ are

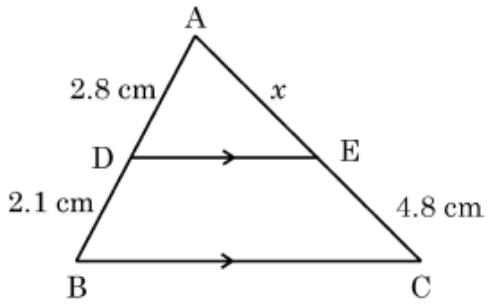
(A) intersecting at (a, b). (B) intersecting at (b, a).

(C) parallel. (D) coincident.

Ans. (A) intersecting at (a, b) *1*

---

6. If in the given figure, DE $\parallel$ BC. If AD = 2.8 cm, DB = 2.1 cm and EC = 4.8 cm, then the value of x is :



(A) 3.6 cm (B) 2.4 cm

(C) 6.4 cm (D) 4.8 cm

Ans. (C) 6.4 cm *1*

---

7. In a right-angled triangle ABC, $\angle A = 90°$ and AB = AC. The value of sin C is :

(A) 0 (B) $\frac{\sqrt{3}}{2}$

(C) $\frac{1}{2}$ (D) $\frac{1}{\sqrt{2}}$

Ans. (D) $\frac{1}{\sqrt{2}}$ *1*

---

8. A die is thrown once. The probability of getting a number less than 6, is :

(A) 0 (B) $\frac{5}{6}$

(C) $\frac{1}{6}$ (D) 1

Ans. (B) $\frac{5}{6}$ *1*

---

9. From an external point P, a tangent PA is drawn to a circle. The number of tangents through P parallel to PA is :

(A) 2 (B) more than 2

(C) 1 (D) 0

Ans. (D) 0 *1*

---

10. If the volume of a sphere is $\frac{11}{21}$ cm^3, then the radius of the sphere is :

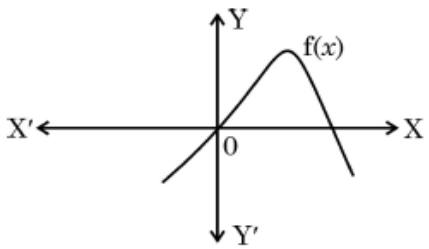
(A) 2 cm (B) 4 cm

(C) $\frac{1}{2}$ cm (D) $\frac{1}{4}$ cm

Ans.. (C) $\frac{1}{2}$ cm *1*

---

11. In the given figure, graph of a polynomial f(x) is shown. The number of zeroes of polynomial f(x) is :



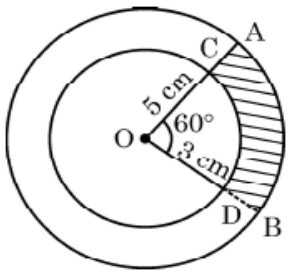
(A) 3 (B) 1

(C) 0 (D) 2

Ans. (D) 2 *1*

---

12. In the given figure, two concentric circles of radii 5 cm and 3 cm have their centre O. OAB is a sector of outer circle making an angle of 60° at the centre while OCD is the sector of smaller circle. The area of the shaded region is :



(A) $\frac{7\pi}{2}$ cm^2 (B) $\frac{8\pi}{3}$ cm^2

(C) $\frac{25\pi}{6}$ cm^2 (D) $\frac{3\pi}{2}$ cm^2

Ans. (B) $\frac{8\pi}{3}$ cm^2 *1*

---

13. If the mean and median of a data are 10 and 11 respectively, then mode of the data is :

(A) 12 (B) 8

(C) 20 (D) 13

Ans. (D) 13 *1*

---

14. Two fair coins are tossed together. The probability of getting 2 heads, is :

(A) $\frac{1}{2}$ (B) $\frac{3}{4}$

(C) $\frac{1}{4}$ (D) $\frac{3}{8}$

Ans. (C) $\frac{1}{4}$ *1*

---

15. If $\cos A = \frac{1}{2}$, then tan A is equal to

(A) $\frac{1}{\sqrt{3}}$ (B) $\sqrt{3}$

(C) 3 (D) $\frac{3}{2}$

Ans. (B) $\sqrt{3}$ *1*

---

16. From a solid cube of side 14 cm, a sphere of maximum diameter is carved out. The radius of sphere is :

(A) 7 cm (B) 14 cm

(C) $\frac{7}{2}$ cm (D) $\sqrt{14}$ cm

Ans. (A) 7 cm *1*

---

17. The common difference of an A.P. whose n^{th} term is given by $a_n = 5n - 1$, is :

(A) 1 (B) 6

(C) 5 (D) 4

Ans. (C) 5 *1*

---

18. If for a distribution, $\sum_1 f_i x_i = 132 + 5p$, $\sum_1 f_i = 20$ and the mean of the distribution is 8.1, then the value of p is :

(A) 3 (B) 6

(C) 4 (D) 5

Ans. (B) 6 *1*

---

19. **Assertion (A) :** The distance of P(a, b) from origin is $a^2 + b^2$.

Reason (R) : The distance between two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

Ans. (D) Assertion (A) is false, but Reason (R) is true. *1*

---

20. **Assertion (A) :** $\sqrt{2}(5 - \sqrt{2})$ is an irrational number.

Reason (R) : Product of two irrational numbers is always irrational.

Ans. (C) Assertion (A) is true, but Reason (R) is false. *1*

SECTION B

21. (a) If Q(0, 2) is equidistant from P(5, –3) and R(x, 7), find the value(s) of x.

OR

(b) If A(1, 1) and B(7, 9) are the end points of a diameter of a circle, then find the co-ordinates of the centre of the circle.

Solution: (a) $(0 - 5)^2 + (2 + 3)^2 = (0 - x)^2 + (2 - 7)^2$ *1*

$\Rightarrow 25 + 25 = x^2 + 25$

$\Rightarrow x = \pm 5$ *1*

OR

(b) Coordinates of centre are $\left(\frac{7+1}{2}, \frac{1+9}{2}\right)$ *1*

i.e., (4, 5) *1*

---

22. Evaluate : $4 \sin^2 60° \tan^2 45° - 2 \sec^2 30° \tan^2 60°$

Solution: $4 \times \left(\frac{\sqrt{3}}{2}\right)^2 \times 1 - 2 \times \left(\frac{2}{\sqrt{3}}\right)^2 . \left(\sqrt{3}\right)^2$ *1 1/2*

$= 3 - 8 = -5$ *1/2*

---

23. (a) Prove that $-7 - 2\sqrt{3}$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

OR

(b) Explain why $(7 \times 11 \times 13 + 2 \times 11)$ is not a prime number.

Solution: (a) Let us assume that $x = -7 - 2\sqrt{3}$ is a rational number

$\Rightarrow \sqrt{3} = \frac{-7 - x}{2}$ *1*

Now RHS is rational but LHS is irrational *1*

$\therefore$ our assumption is wrong

Hence $-7 - 2\sqrt{3}$ is irrational.

OR

(b) $7 \times 11 \times 13 + 2 \times 11 = 11 \times (7 \times 13 + 2)$ *1*

$\therefore$ the given number has more than two factors *1*

Hence, it is not a prime number.

---

24. Find the ratio in which the Y-axis divides the line segment joining the points A(5, –6) and B(–1, –4). Also, find the point of intersection.

Solution: Let the point P(0, y) divide the line segment AB in the ratio k : 1 *1/2*

$\therefore \frac{-k+5}{k+1} = 0$ or $k = 5$ *1*

$\therefore$ required ratio is 5 : 1

$y = \frac{-20-6}{6} = \frac{-13}{3}$ *1/2*

$\therefore$ point P is $(0, \frac{-13}{3})$

---

25. There are 80 cards numbered from 1 to 80. One card is drawn at random from them. Find the probability that the number on the selected card is not divisible by 8.

Solution: Numbers divisible by 8 are 8, 16, 24, 32, 40, 48, . . . , 80

$\therefore$ P(selected number is divisible by 8) = $\frac{10}{80}$ or $\frac{1}{8}$ *1*

$\therefore$ P(selected number is not divisible by 8) = $1 - \frac{1}{8} = \frac{7}{8}$ *1*

SECTION C

26. Find LCM and HCF of two numbers 336 and 54, using prime-factorisation method.

Solution: $336 = 2^4 \times 3 \times 7$ and $54 = 2 \times 3^3$ *1+1*

HCF = $2 \times 3 = 6$ *1/2*

LCM = $2^4 \times 3^3 \times 7$ *1/2*

= 3024

---

27. The altitude of a right-angled triangle is 7 cm less than its base. If its hypotenuse is 17 cm long, then

(a) represent the above information in the form of a quadratic equation;

(b) find the length of the sides of the triangle.

Solution: (a) Let base of the right triangle be x cm.

$\therefore$ altitude of the right triangle is (x – 7) cm *1/2*

Using Pythagoras theorem: $(17)^2 = x^2 + (x-7)^2$ *1/2*

$\Rightarrow 2x^2 - 14x - 240 = 0$ or $x^2 - 7x - 120 = 0$ $\frac{1}{2}$

(b) $x^2 - 7x - 120 = 0 \Rightarrow (x - 15)(x + 8) = 0$ $\frac{1}{2}$

$\therefore x = 15$ (as $x \neq -8$) $\frac{1}{2}$

$\therefore$ sides of the triangle other than the hypotenuse are 15 cm and 8 cm $\frac{1}{2}$

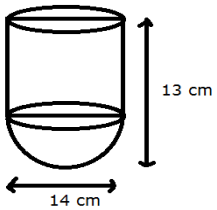
---

28. (a) A vessel is in the form of a hollow hemisphere surmounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and the total height of the vessel is 13 cm. Find the inner surface area of the vessel.

OR

(b) A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 2 cm and the diameter of the base is 4 cm. Determine the volume of the toy.

Solution: (a) Radius of the vessel is 7 cm



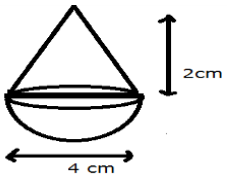
Height of the cylinder = 13 – 7 = 6 cm $\frac{1}{2}$

Inner SA = $2 \times \frac{22}{7} \times 7 \times 6 + 2 \times \frac{22}{7} \times 7 \times 7$ *1+1*

$= 572 \text{ cm}^2$ $\frac{1}{2}$

OR

(b)



Radius of the base = 2 cm $\frac{1}{2}$

Volume of the toy = $\frac{1}{3} \times \frac{22}{7} \times 4 \times 2 + \frac{2}{3} \times \frac{22}{7} \times 8$ *1+1*

$= \frac{176}{7} \text{ cm}^3$ or 25.14 cm^3 $\frac{1}{2}$

---

29. Find the zeroes of the quadratic polynomial $5x^2 + 3x - 2$ and verify the relationship between the zeroes and the co-efficients.

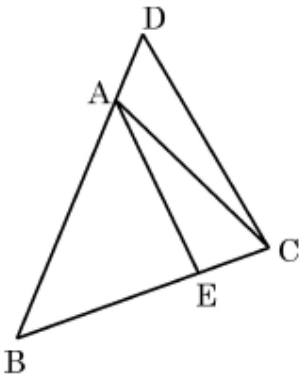
Solution: $5x^2 + 3x - 2 = (5x - 2)(x + 1) \Rightarrow x = -1, \frac{2}{5}$ *1+1*

Sum of the zeroes $= -1 + \frac{2}{5} = \frac{-3}{5} = \frac{-(Coeff.\ of\ x)}{Coeff.\ of\ x^2}$ *1/2*

Product of the zeroes $= -1 \times \frac{2}{5} = \frac{-2}{5} = \frac{\text{Constant term}}{\text{Coeff. of } x^2}$ *1/2*

---

30. In the given figure, $\angle ABC = \angle ACB$ and $\frac{BC}{BE} = \frac{BD}{AC}$.



Show that $\Delta ABE \sim \Delta DBC$ and AE || DC.

Solution: It is given that $\frac{BC}{BE} = \frac{BD}{AC}$

$\Rightarrow \frac{BE}{BC} = \frac{AB}{DB}$ ($\because \angle ABC = \angle ACB \Rightarrow AC = AB$) *1*

Also $\angle B$ is common

$\therefore \Delta ABE \sim \Delta DBC$ (SAS similarity) *1*

$\Rightarrow \angle BAE = \angle BDC$ *1/2*

But these are corresponding angles $\therefore$ AE // DC. *1/2*

---

31. (a) Prove that $(\sin\theta + \operatorname{cosec}\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta$.

OR

(b) If $\cos A = \frac{5}{13}$, then verify that $\frac{\cos A}{1-\tan A} + \frac{\sin A}{1-\cot A} = \cos A + \sin A$.

Solution: (a)

$\text{LHS} = \sin^2\theta + \operatorname{cosec}^2\theta + 2\sin\theta.\operatorname{cosec}\theta + \cos^2\theta + \sec^2\theta + 2\cos\theta.\sec\theta$ *1*

$= (\sin^2\theta + \cos^2\theta) + (\operatorname{cosec}^2\theta + \sec^2\theta) + 2\sin\theta \times \frac{1}{\sin\theta} + 2\cos\theta \times \frac{1}{\cos\theta}$ $\frac{1}{2}$

$= 1 + 1 + \cot^2\theta + 1 + \tan^2\theta + 2 + 2$ *1*

$= 7 + \tan^2\theta + \cot^2\theta = \text{RHS}$ $\frac{1}{2}$

OR

(b) $\cos A = \frac{5}{13} \Rightarrow \sin A = \frac{12}{13}$, $\tan A = \frac{12}{5}$ and $\cot A = \frac{5}{12}$ $\frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

$$\text{LHS} = \frac{\frac{5}{13}}{1-\frac{12}{5}} + \frac{\frac{12}{13}}{1-\frac{5}{12}} = \frac{25}{-91} + \frac{144}{91}$$

$$= \frac{119}{91} = \frac{17}{13}$$ *1*

$\text{RHS} = \frac{5}{13} + \frac{12}{13} = \frac{17}{13}$ $\frac{1}{2}$

$\Rightarrow$ LHS = RHS

SECTION D

32. Consider the following distribution of hourly wages of 50 workers of a factory :

Hourly wages (in ₹)	100-120	120-140	140-160	160-180	180-200
Number of workers	12	14	8	6	10

Find the mean and the median of the above data.

Solution:

C.I.	X	f	$u = \frac{x-150}{20}$	fu	cf
100 – 120	110	12	– 2	– 24	12
120 – 140	130	14	– 1	– 14	26
140 – 160	150	8	0	0	34
160 – 180	170	6	1	6	40
180 – 200	190	10	2	20	50
		50		– 12	

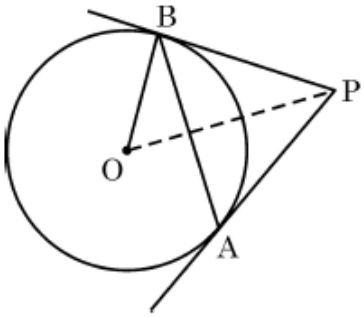
For correct table: $2\frac{1}{2}$

Mean = $150 - \frac{12}{50} \times 20 = 145 \cdot 2$ $1\frac{1}{2}$

Median = $120 + \frac{20}{14}(25 - 12) = 138 \cdot 57$ (approx.) *1*

---

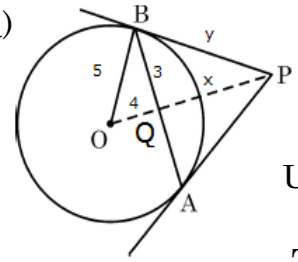
33. (a) In the given figure, AB is chord of length 6 cm of a circle of radius 5 cm. The tangents at A and B intersect at a point P. Find the length of PB.



OR

(b) Prove that the parallelogram circumscribing a circle is a rhombus. Also, find area of the rhombus, if radius of circle is 3 cm and length of one side of the rhombus is 10 cm.

Solution: (a)



Since OP ⊥ AB and bisects it

$\therefore$ BQ = QA = 3 cm *1*

Using Pythagoras Theorem in Δ OQB, OQ = 4 cm $\frac{1}{2}$

Taking PQ = x cm and PB = y cm,

Using Pythagoras Theorem in Δ OBP and Δ PQB

$x^2 + 9 = y^2$ and $(x + 4)^2 = y^2 + 25$ *1+1*

Solving equations to get $x = \frac{9}{4}$ and $y = \frac{15}{4}$ $1+\frac{1}{2}$

OR

(b) Let ABCD be a parallelogram touching the circle at P, Q, R and S

AP = AS, BP = BQ, CR= CQ and DR = DS *1*

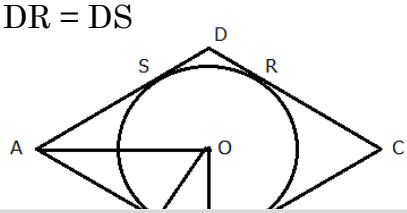


Fig: 1 mark

Adding all equations

$AP + BP + CR + DR = AS + DS + CQ + BQ$ $\frac{1}{2}$

$\Rightarrow AB + CD = AD + BC$ $\frac{1}{2}$

$\Rightarrow 2AB = 2BC$ or $AB = BC$ *1*

Hence, ABCD is a rhombus

Area of the rhombus = 4 × area of triangle AOB

$= 4 \times \frac{1}{2} \times 10 \times 3 = 60 \text{ cm}^2$ *1*

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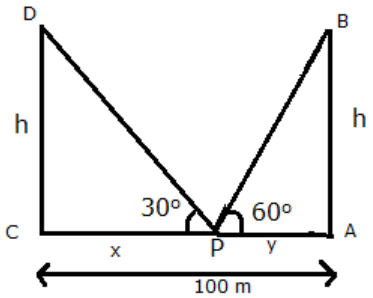
34. Two poles of equal height are standing opposite each other on either side of a road, which is 100 m wide. From a point somewhere between them on the road, the angles of elevation of the top of the poles are 60° and 30° respectively. Find the height of the poles and the distances of the point from the poles.

Solution: Let AB and CD represent poles of height h and P is a point on AC.

Let x and y be the distances of point P from the poles CD and AB



Correct Fig.: *1*

$\tan 60° = \frac{h}{y} \Rightarrow h = y\sqrt{3}$ _____ (i) *1*

$\tan 30° = \frac{h}{x} \Rightarrow h = \frac{x}{\sqrt{3}}$ _____ (ii) *1*

Solving (i) and (ii) $x = 3y$ but $x + y = 100$ *1*

$\Rightarrow x = 75$ m, $y = 25$ m $\frac{1}{2}$

Hence $h = 25\sqrt{3}$ m $\frac{1}{2}$

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35. (a) Using graphical method, solve the following pair of equations :

$x + 2y = 8$ and $3x - 2y = 12$

OR

(b) The sum of the digits of a 2-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.

Solution: (a)

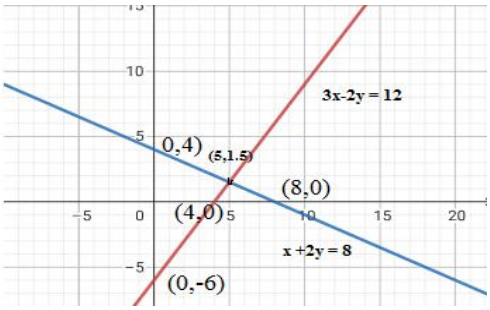
$x + 2y = 8$

x	0	8
y	4	0

$3x - 2y = 12$

x	0	4
y	-6	0

Correct Table for each equation *1+1*



Correct graph for each equation *1+1*

Correct solution x = 5, y = 1.5 *1*

OR

(b) Let the digit at ones place be x and tens place be y

$\therefore$ x + y = 9 *1*

9(10y + x) = 2(10x + y) *1*

$\Rightarrow$ x = 8y *1*

Solving equations to get x = 8 and y = 1 *1*

$\therefore$ required number is 18 *1*

SECTION E

36. While preparing for a competitive examination, Akbar came across a match-stick pattern based question. The pattern is given below :

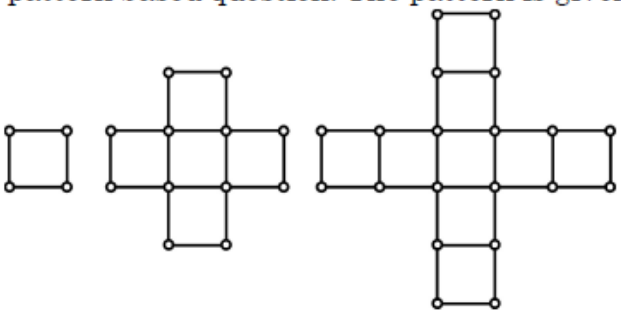


Fig. (1) Fig. (2) Fig. (3) .....

Based on the above information, answer the following questions :

(i) Write first term and common difference of the A.P. formed by number of squares in each figure.

(ii) Write first term and common difference of the A.P. formed by number of sticks used in each figure.

(iii) (a) How many squares are there in Fig. (10) ? Also, write the number of sticks used in Fig. (10).

OR

(iii) (b) If 88 sticks are used to make m^{th} figure (Fig. (m)), find the value of m. How many squares are formed in this figure ?

Solution: (i) First Term = 1 and Common difference = 4 *1*

(ii) First Term = 4 and Common difference = 12 *1*

(iii) (a) Required number of squares = $1 + (9) \times 4 = 37$ *1*

Required number of sticks = $4 + 9 \times 12 = 112$ *1*

OR

(iii) (b) $88 = 4 + (m - 1) \times 12$ *1*

$\Rightarrow m = 8$ $\frac{1}{2}$

Number of squares formed in 8^{th} fig. $= 1 + 7 \times 4 = 29$ $\frac{1}{2}$

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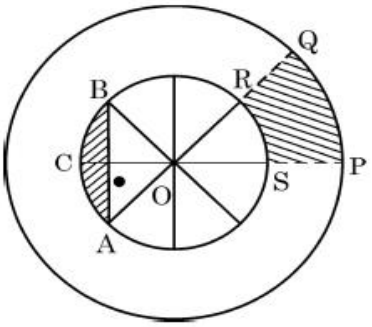
37. NSS (National Service Scheme) aims to connect the students to the community and to involve them in problem solving process.

NSS symbol is based on the 'Rath' wheel of the Konark Sun Temple situated in Odisha. The wheel signifies the progress cycle of life.

The diagramatic representation of the symbol is given below :



Observe the figure given above. The diameters of inner circle are equally placed. Given that OP = 21 cm, OS = 10 cm.

Based on the above information, answer the following questions :

(i) Find m∠ROS.

(ii) Find the perimeter of sector OPQ.

(iii) (a) Find the area of shaded region PQRS.

OR

(iii) (b) Find the area of shaded region ACB i.e. the segment ACB.

Solution: (i) $\angle ROS = \frac{360°}{8} = 45°$ *1*

(ii) Perimeter of sector OPQ $= 21 + 21 + \frac{45}{360} \times 2 \times \frac{22}{7} \times 21 = 58.5$ cm *1*

(iii) (a) Area of the region PQRS = Ar (OPQO) – Ar (OSRO)

$= \frac{45}{360} \times \frac{22}{7} \times (21^2 - 10^2)$ *1*

$= \frac{1}{8} \times \frac{22}{7} \times 341 = \frac{3751}{28}$ cm^2 or 133.96 cm^2 *1*

OR

(iii) (b) Area of segment ACB $= \frac{90}{360} \times \frac{22}{7} \times 100 - \frac{1}{2} \times 10 \times 10$ *1*

$= \frac{200}{7}$ cm^2 or 28.57 cm^2 *1*

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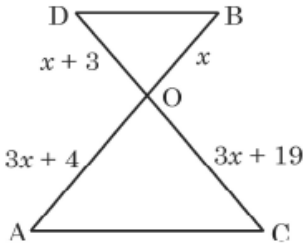
38. In the figure given below, a folding table is shown :



The legs of the table are represented by line segments AB and CD intersecting at O. Join AC and BD.

Considering table top is parallel to the ground, and OB = x, OD = $x + 3$, OC = $3x + 19$ and OA = $3x + 4$, answer the following questions :

(i) Prove that Δ OAC is similar to ΔOBD.

(ii) Prove that $\frac{OA}{AC} = \frac{OB}{BD}$.

(iii) (a) Observe the figure and find the value of x. Hence, find the length of OC.

OR

(iii) (b) Observe the figure and find $\frac{BD}{AC}$.

Solution: (i) Since $\angle D = \angle C$ and $\angle B = \angle A$ (Alternate interior angles)

$\therefore$ Δ OAC ~ Δ OBD (By AA similarity) *1*

(ii) Δ OAC ~ Δ OBD $\Rightarrow \frac{OA}{OB} = \frac{AC}{BD}$ or $\frac{OA}{AC} = \frac{OB}{BD}$ *1*

(iii) (a) Δ OAC ~ Δ OBD $\Rightarrow \frac{OA}{OB} = \frac{OC}{OD}$

$\Rightarrow \frac{3x + 4}{x} = \frac{3x + 19}{x + 3} \Rightarrow x = 2$ *1+$\frac{1}{2}$*

$\therefore$ OC = 25 *$\frac{1}{2}$*

OR

(iii) (b) Δ OBD ~ Δ OAC $\Rightarrow \frac{OB}{OA} = \frac{OD}{OC} = \frac{BD}{AC}$

$\Rightarrow \frac{x}{3x + 4} = \frac{x + 3}{3x + 19} \Rightarrow x = 2$ *1+$\frac{1}{2}$*

$\therefore \frac{BD}{AC} = \frac{2}{10}$ or $\frac{1}{5}$ *$\frac{1}{2}$*