Series : H4EFG

SET ~ 1

प्रश्न–पत्र कोड
Q.P. Code **430/4/1**

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.

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नोट

(I) कृपया जाँच कर लें कि इस प्रश्न–पत्र में मुद्रित पृष्ठ **15** हैं।

(II) कृपया जाँच कर लें कि इस प्रश्न–पत्र में **38** प्रश्न हैं।

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

(IV) **कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर–पुस्तिका में यथास्थान पर प्रश्न का क्रमांक अवश्य लिखें।**

(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।

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NOTE

(I) Please check that this question paper contains **15** printed pages.

(II) Please check that this question paper contains **38** questions.

(III) 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) **Please write down the Serial Number of the question in the answer-book at the given place before attempting it.**

(V) 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
Time allowed : 3 hours

अधिकतम अंक : 80
Maximum Marks : 80

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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 **2** अंकों 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. यदि HCF $(x, 20) = 2$ तथा LCM $(x, 20) = 60$ है, तो x का मान है : **1**

(a) 3 (b) 6 (c) 20 (d) 10

2. बिन्दुओं $(-6, 9)$ तथा $(2, 7)$ के बीच की दूरी है : **1**

(a) $2\sqrt{17}$ (b) $4\sqrt{17}$ (c) $2\sqrt{5}$ (d) $2\sqrt{15}$

3. एक A.P. का nवां पद $5n - 6$ है। इसका सार्वअन्तर है : **1**

(a) -6 (b) $5n$ (c) 5 (d) 6

4. बहुपद $p(x) = kx^2 - 9x + 3$ का एक शून्यक $\left(-\frac{3}{2}\right)$ है। k का मान है : **1**

(a) $\frac{22}{3}$ (b) $-\frac{14}{3}$ (c) $\frac{14}{3}$ (d) $-\frac{22}{3}$

5. तीन सिक्कों को एक साथ उछाला जाता है। इसकी प्रायिकता कि सिर्फ एक सिक्का पट (T) दर्शाये, है : **1**

(a) $\frac{1}{2}$ (b) $\frac{3}{8}$ (c) $\frac{7}{8}$ (d) 1

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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 of **2** marks in Section **E**.*
9. *Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.*
10. *Use of calculators is **NOT allowed**.*

SECTION – A $20 \times 1 = 20$

Question Nos. 1 to 20 are multiple choice questions of 1 mark each.

1. If HCF (x, 20) = 2 and LCM (x, 20) = 60, then value of x is : **1**

(a) 3 (b) 6 (c) 20 (d) 10

2. The distance between the points (– 6, 9) and (2, 7) is : **1**

(a) $2\sqrt{17}$ (b) $4\sqrt{17}$ (c) $2\sqrt{5}$ (d) $2\sqrt{15}$

3. If n^{th} term of an A.P. is $5n - 6$, then its common difference is : **1**

(a) – 6 (b) $5n$ (c) 5 (d) 6

4. One of the zeroes of the polynomial $p(x) = kx^2 - 9x + 3$ is $\left(-\frac{3}{2}\right)$. The value of k is : **1**

(a) $\frac{22}{3}$ (b) $-\frac{14}{3}$ (c) $\frac{14}{3}$ (d) $-\frac{22}{3}$

5. Three coins are tossed together. The probability that only one coin shows tail, is : **1**

(a) $\frac{1}{2}$ (b) $\frac{3}{8}$ (c) $\frac{7}{8}$ (d) 1

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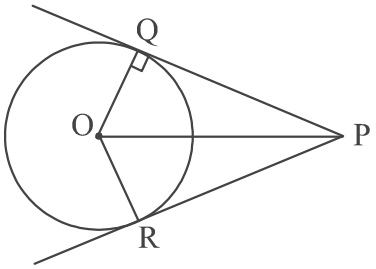
6. समान आयतन वाले दो लंबवृत्तीय बेलन की ऊँचाइयों का अनुपात 1:2 है। इनकी त्रिज्याओं का अनुपात है : **1**

(a) $\sqrt{2}:1$ (b) $1:2$ (c) $1:4$ (d) $1:\sqrt{2}$

7. यदि $\sqrt{2}\sin\theta = 1$ है, तो $\cot\theta \times \text{cosec}\,\theta$ बराबर है : **1**

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

8. PQ तथा PR, त्रिज्या 3 cm तथा केन्द्र O वाले, वृत्त पर खींची गयी दो स्पर्श रेखायें हैं। यदि प्रत्येक स्पर्श रेखा की लम्बाई 4 cm है, तो त्रिभुज OQP का परिमाप है : **1**



(a) 5 cm (b) 12 cm
(c) 9 cm (d) 8 cm

9. बहुपद $2x^2 + 5x + 1$ के शून्यक α तथा β हैं। $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$ का मान है : **1**

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

10. A.P. : $10\sqrt{2}, 6\sqrt{2}, 2\sqrt{2}, \ldots$ का 20वां पद है : **1**

(a) $-76 + 10\sqrt{2}$ (b) $-62\sqrt{2}$ (c) $-66\sqrt{2}$ (d) $86\sqrt{2}$

11. यदि $\sec\theta - \tan\theta = 2$ है, तो $\sec\theta + \tan\theta$ का मान है : **1**

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

12. 52 पत्तों वाली अच्छी प्रकार से फेंटी गयी ताशों की गड्डी में से एक पत्ता यादृच्छया निकाला गया। इसकी प्रायिकता कि निकाले गये पत्ते पर अंकित संख्या '9' है, है : **1**

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

13. वृत्त के केन्द्र पर $210°$ का कोण अंतरित करने वाली चाप की लम्बाई $\frac{44}{3}$ cm है। वृत्त की त्रिज्या है : **1**

(a) $2\sqrt{2}$ cm (b) 4 cm (c) 8 cm (d) $\frac{1}{4}$ cm

14. m का वह मान जिसके लिये रेखायें $14x + my = 20$ तथा $-3x + 2y = 16$ समान्तर हैं, है : **1**

(a) $-\frac{3}{14}$ (b) $-\frac{7}{3}$ (c) $-\frac{28}{3}$ (d) $-\frac{3}{28}$

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6. Two right circular cylinders of equal volumes have their heights in the ratio 1:2. The ratio of their radii is : **1**

(a) $\sqrt{2}:1$ (b) $1:2$ (c) $1:4$ (d) $1:\sqrt{2}$

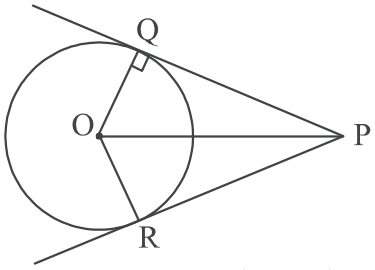
7. If $\sqrt{2}\sin\theta = 1$, then $\cot\theta \times \text{cosec}\,\theta$ is equal to : **1**

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

8. PQ and PR are tangents to the circle of radius 3 cm and centre O. If length of each tangent is 4 cm, then perimeter of Δ OQP is : **1**

(a) 5 cm (b) 12 cm

(c) 9 cm (d) 8 cm



9. α, β are zeroes of the polynomial $2x^2 + 5x + 1$. The value of $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$ is : **1**

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

10. The 20^{th} term of the A.P. : $10\sqrt{2}, 6\sqrt{2}, 2\sqrt{2}, \ldots$ is : **1**

(a) $-76 + 10\sqrt{2}$ (b) $-62\sqrt{2}$ (c) $-66\sqrt{2}$ (d) $86\sqrt{2}$

11. If $\sec\theta - \tan\theta = 2$, then $\sec\theta + \tan\theta$ is equal to : **1**

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

12. A card is drawn at random from a well shuffled deck of 52 playing cards. The probability that drawn card shows number '9' is : **1**

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

13. The length of arc subtending an angle of 210° at the centre of the circle, is $\frac{44}{3}$ cm. The radius of the circle is : **1**

(a) $2\sqrt{2}$ cm (b) 4 cm (c) 8 cm (d) $\frac{1}{4}$ cm

14. The value of m for which lines $14x + my = 20$ and $-3x + 2y = 16$ are parallel, is : **1**

(a) $-\frac{3}{14}$ (b) $-\frac{7}{3}$ (c) $-\frac{28}{3}$ (d) $-\frac{3}{28}$

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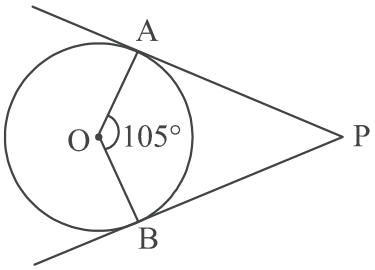
15. 7 cm आधार त्रिज्या वाले शंकु का वक्र पृष्ठीय क्षेत्रफल 550 cm^2 है। शंकु की तिर्यक ऊँचाई है : **1**

(a) 25 cm (b) 14 cm (c) 20 cm (d) 24 cm

16. यदि $\sin A = \frac{2}{3}$ है, तो $\cos A$ का मान है : **1**

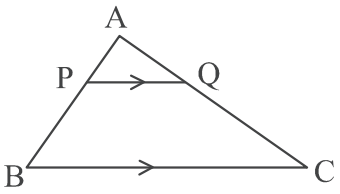
(a) $\frac{3}{2}$ (b) $\frac{\sqrt{5}}{3}$ (c) $\frac{1}{3}$ (d) $\frac{1}{\sqrt{3}}$

17. PA तथा PB , केन्द्र O वाले वृत्त पर खींची गयी दो स्पर्श रेखायें हैं। यदि $\angle AOB = 105°$ है तो $\angle OAP + \angle APB$ का मान है : **1**



(a) 75° (b) 175°
(c) 180° (d) 165°

18. Δ ABC में PQ || BC है। दिया गया है कि AP = 2.4 cm, PB = 3.6 cm तथा BC = 5.4 cm है। PQ की लम्बाई है : **1**



(a) 2.7 cm (b) 1.8 cm
(c) 3.6 cm (d) 2.16 cm

निर्देश :

प्रश्न संख्या 19 और 20 अभिकथन एवं तर्क आधारित प्रश्न हैं। दो कथन दिए गए हैं जिनमें एक को अभिकथन (A) तथा दूसरे को तर्क (R) द्वारा अंकित किया गया है। इन प्रश्नों के सही उत्तर नीचे दिए गए कोडों (a), (b), (c) और (d) में से चुनकर दीजिए :

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

(b) अभिकथन (A) और तर्क (R) दोनों सही हैं, परन्तु तर्क (R), अभिकथन (A) की सही व्याख्या ***नहीं*** करता है।

(c) अभिकथन (A) सही है, परन्तु तर्क (R) ग़लत है।

(d) अभिकथन (A) ग़लत है, परन्तु तर्क (R) सही है।

19. **अभिकथन (A) :** एक कक्षा परीक्षा में विद्यार्थियों के माध्यक प्राप्तांक 16 हैं। इसका अर्थ है आधी कक्षा के प्राप्तांक 16 से कम हैं।

तर्क (R) : माध्यक पूरे वितरण को दो बराबर भागों में बाँटता है। **1**

20. **अभिकथन (A) :** यदि घटना E के घटित होने की प्रायिकता $P(E) = \frac{1}{999}$ है, तो $P(\overline{E}) = 0.001$ है।

तर्क (R) : $P(E) + P(\overline{E}) = 1$ **1**

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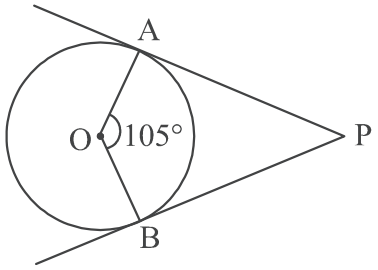
15. The curved surface area of a cone with base radius 7 cm, is 550 cm^2. The slant height of the cone is : **1**

(a) 25 cm (b) 14 cm (c) 20 cm (d) 24 cm

16. If $\sin A = \frac{2}{3}$, then cos A is equal to : **1**

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

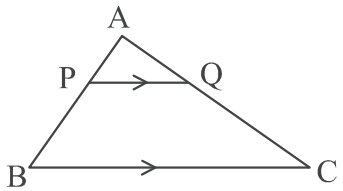
17. PA and PB are tangents to a circle with centre O. If $\angle AOB = 105°$ then $\angle OAP + \angle APB$ is equal to : **1**



(a) 75° (b) 175°

(c) 180° (d) 165°

18. In Δ ABC, PQ || BC. It is given that AP = 2.4 cm, PB = 3.6 cm and BC = 5.4 cm. PQ is equal to : **1**



(a) 2.7 cm (b) 1.8 cm

(c) 3.6 cm (d) 2.16 cm

Directions :

Question numbers 19 and 20 are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :

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

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

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

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

19. **Assertion (A) :** Median marks of students in a class test is 16. It means half of the class got marks less than 16.

Reason (R) : Median divides the distribution in two equal parts. **1**

20. **Assertion (A) :** If E is an event such that $P(E) = \frac{1}{999}$, then $P(\overline{E}) = 0.001$.

Reason (R) : $P(E) + P(\overline{E}) = 1$ **1**

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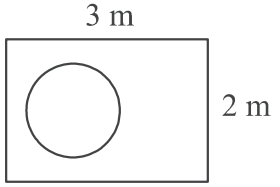
खण्ड – ख

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

21. दर्शाइये कि किसी प्राकृत संख्या n के लिये संख्या 45^n अंक 0 पर समाप्त नहीं हो सकती। उस अभाज्य संख्या 'a' का मान बताइये जिसे 45^n से गुणा करने पर गुणनफल, अंक 0 पर समाप्त हो। **2**

22. बिन्दुओं (2, 8) तथा (– 3, – 5) को जोड़ने वाला रेखाखंड बिन्दु P(x, 0) से एक निश्चित अनुपात में विभाजित होता है। वह अनुपात तथा x का मान ज्ञात कीजिए। **2**

23. **(A)** एक सिक्के को आकृति में दिखाये गये आयताकार क्षेत्र में यादृच्छया रूप से गिराया जाता है। इसकी क्या प्रायिकता है कि वह सिक्का 0.7 m त्रिज्या वाले वृत्त में गिरेगा? **2**



अथवा

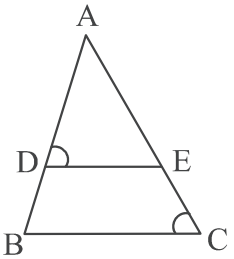
(B) एक पासे को दो बार फेंका गया। इसकी क्या प्रायिकता है कि (i) दो प्राप्त संख्याओं के बीच का अंतर 3 हो। (ii) दो प्राप्त संख्याओं का योग 8 हो। **2**

24. **(A)** सिद्ध कीजिये कि किसी बाह्य बिंदु से किसी वृत्त पर खींची गई स्पर्श रेखाओं के बीच का कोण स्पर्श बिंदुओं को मिलाने वाले रेखाखंड द्वारा केन्द्र पर अंतरित कोण का संपूरक होता है। **2**

अथवा

(B) सिद्ध कीजिये कि किसी वृत्त के किसी व्यास के सिरों पर खींची गई स्पर्श रेखायें समान्तर होती हैं। **2**

25. दी गई आकृति में $\angle ADE = \angle ACB$ तथा $\frac{AD}{DB} = \frac{AE}{EC}$ है। सिद्ध कीजिये कि ΔABC एक समद्विबाहु त्रिभुज है। **2**



खण्ड – ग

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

26. बहुपद $p(x) = 6x^2 + 13x - 5$ के शून्यक ज्ञात कीजिये और शून्यकों तथा गुणांकों के बीच के संबंध की सत्यता की जाँच कीजिये। **3**

27. **(A)** समान्तर श्रेणी $7, 10\frac{1}{2}, 14, \ldots\ldots 84$ का योग ज्ञात कीजिये। **3**

अथवा

(B) यदि किसी A.P. के प्रथम n पदों का योग $S_n = \frac{n}{2}(2n + 8)$ है तो इसका प्रथम पद तथा सार्वअन्तर ज्ञात कीजिये। इसके पश्चात् 15वां पद ज्ञात कीजिये। **3**

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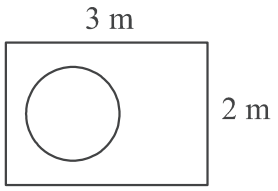
SECTION – B

Question Nos. 21 to 25 are very short answer questions of 2 marks each.

21. Show that 45^n can not end with the digit 0, n being a natural number. Write the prime number 'a' which on multiplying with 45^n makes the product end with the digit 0. **2**

22. Point P(x, 0) divides the line segment joining the points (2, 8) and (– 3, – 5) in a certain ratio. Find the ratio and hence find the value of x. **2**

23. (A) A coin is dropped at random on the rectangular region shown in the figure. What is the probability that it will land inside the circle with radius 0.7 m ? **2**



OR

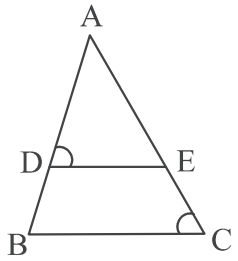
(B) A die is thrown twice. What is the probability that (i) difference between two numbers obtained is 3 ? (ii) sum of the numbers obtained is 8 ? **2**

24. (A) Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre. **2**

OR

(B) Prove that the tangents drawn at the ends of a diameter of a circle are parallel. **2**

25. In the given figure $\angle ADE = \angle ACB$ and $\frac{AD}{DB} = \frac{AE}{EC}$. Prove that ΔABC is an isosceles triangle. **2**



SECTION – C

Question Nos. 26 to 31 are short answer questions of 3 marks each.

26. Find the zeroes of the polynomial $p(x) = 6x^2 + 13x - 5$ and verify the relationship between its zeroes and the coefficients. **3**

27. (A) Find the sum of the A.P. $7, 10\frac{1}{2}, 14, \ldots\ldots 84$. **3**

OR

(B) If the sum of first n terms of an A.P. is given by $S_n = \frac{n}{2}(2n + 8)$. Then, find its first term and common difference. Hence, find its 15^{th} term. **3**

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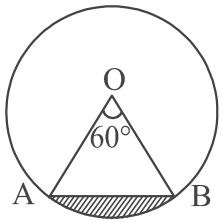
28. सिद्ध कीजिये कि $\sqrt{3}$ एक अपरिमेय संख्या है। **3**

29. **(A)** यदि बिंदु A(– 5, y), B(2, – 2), C(8, 4) तथा D(x, 5) एक समान्तर चतुर्भुज ABCD के शीर्ष इसी क्रम में हों, तो x और y का मान ज्ञात कीजिये। इस समान्तर चतुर्भुज की भुजाओं की लम्बाइयां ज्ञात कीजिये। **3**

अथवा

(B) बिन्दु A(6, – 3), B(0, 5) तथा C(– 2, 1) ΔABC के शीर्ष बिन्दु हैं। बिन्दु P(3, 1) तथा बिन्दु Q(2, – 1) क्रमशः भुजा AB तथा AC पर स्थित हैं। जाँच कीजिये कि क्या $\frac{AP}{PB} = \frac{AQ}{QC}$ है। **3**

30. 10 cm त्रिज्या वाले वृत्त की एक जीवा वृत्त के केन्द्र O पर 60° का कोण अंतरित करती है। छायांकित भाग का क्षेत्रफल ज्ञात कीजिये।



($\sqrt{3} = 1.73, \sqrt{2} = 1.41$ तथा $\pi = 3.14$ लीजिये) **3**

31. सिद्ध कीजिये कि वृत्त के परिगत बने चतुर्भुज की आमने–सामने की भुजायें केन्द्र पर संपूरक कोण अंतरित करती हैं। **3**

खण्ड – घ

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

32. **(A)** दिया गया है कि $p^2x^2 + (p^2 - q^2)x - q^2 = 0 ; (p \neq 0)$

(i) दर्शाइये कि उपरोक्त समीकरण का विविक्तकर (D) एक पूर्ण वर्ग है।

(ii) समीकरण के मूल ज्ञात कीजिये। **5**

अथवा

(B) तीन क्रमागत धनात्मक पूर्णांक इस प्रकार हैं कि सबसे छोटे पूर्णांक का वर्ग एवं बाकी दोनों के गुणनफल का योग 67 है। द्विघात समीकरण की सहायता से तीनों पूर्णांक ज्ञात कीजिये। **5**

33. निम्न आँकड़ों का 'माध्य' तथा 'बहुलक' ज्ञात कीजिये : **5**

वर्ग	15-20	20-25	25-30	30-35	35-40	40-45
बारंबारता	6	16	17	4	5	2

34. **(A)** यदि किसी त्रिभुज की एक भुजा के समान्तर अन्य दो भुजाओं को भिन्न–भिन्न बिंदुओं पर प्रतिच्छेद करने के लिये एक रेखा खींची जाये तो सिद्ध कीजिये कि ये अन्य दो भुजायें एक ही अनुपात में विभाजित हो जाती हैं। **5**

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28. Prove that $\sqrt{3}$ is an irrational number. **3**

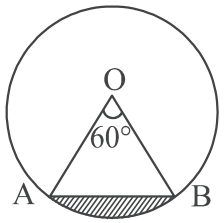
29. **(A)** If points A(– 5, y), B(2, – 2), C(8, 4) and D(x, 5) taken in order, form a parallelogram ABCD, then find the values of x and y. Hence, find lengths of sides of the parallelogram. **3**

OR

(B) A(6, – 3), B(0, 5) and C(– 2, 1) are vertices of ΔABC. Points P(3, 1) and Q(2, – 1) lie on sides AB and AC respectively. Check whether $\frac{AP}{PB} = \frac{AQ}{QC}$. **3**

30. A chord of a circle of radius 10 cm subtends an angle of 60° at the centre O. Find the area of the shaded region.

(Use $\sqrt{3} = 1.73, \sqrt{2} = 1.41$ and $\pi = 3.14$) **3**



31. Prove that the opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle. **3**

SECTION – D

Question Nos. 32 to 35 are long answer questions of 5 marks each.

32. **(A)** It is given that $p^2x^2 + (p^2 - q^2)x - q^2 = 0$; $(p \neq 0)$

(i) Show that the discriminant (D) of above equation is a perfect square.

(ii) Find the roots of the equation. **5**

OR

(B) Three consecutive positive integers are such that the sum of the square of smallest and product of other two is 67. Find the numbers, using quadratic equation. **5**

33. Find 'mean' and 'mode' of the following data : **5**

Class	15-20	20-25	25-30	30-35	35-40	40-45
Frequency	6	16	17	4	5	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 the other two sides are divided in the same ratio. **5**

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अथवा

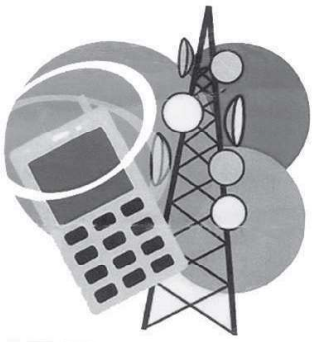
(B) ΔABC की भुजाओं AB तथा AC पर क्रमशः बिन्दु P तथा Q इस प्रकार स्थित हैं कि $PQ \parallel BC$ है। सिद्ध कीजिये कि माध्यिका AD जो कि बिन्दु A से भुजा BC पर खींची गयी है, रेखाखंड PQ को समद्विभाजित करती है। **5**

35. एक पेडस्टल के शिखर पर एक झंडा लगा है। भूमि के एक बिन्दु से पेडस्टल के शिखर का उन्नयन कोण $30°$ है तथा उसी बिन्दु से झंडे के शिखर का उन्नयन कोण $60°$ है। यदि झंडे की ऊँचाई 5 m है तो पेडस्टल की ऊँचाई तथा भूमि के उस बिन्दु से इस पेडस्टल की दूरी ज्ञात कीजिये। ($\sqrt{3} = 1.73$ लीजिये) **5**

खण्ड – ड़

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

36. एक टेलीकम्यूनिकेशन कम्पनी अपने ग्राहकों के लिये दो योजनाएँ – योजना A तथा योजना B लाती है।



दोनों योजनाओं को रैखिक समीकरण द्वारा समझा जा सकता है। यहाँ 't' खरीदे गये समय (मिनट में) को तथा 'C' उसकी कीमत दर्शाता है। समीकरण निम्न प्रकार से हैं :

योजना A : $3C = 20t$

योजना B : $3C = 10t + 300$

उपरोक्त सूचना के आधार पर निम्नलिखित प्रश्नों के उत्तर दीजिए :

(i) यदि आप योजना B लेते हैं तो आपको कितनी आरंभिक राशि देनी होगी? **1**

(ii) चारु ने योजना A खरीदी। उसने ₹ 250 में कितने मिनट खरीदे? **1**

(iii) (a) कितने मिनट खरीदने पर, दोनों योजनाओं के तहत, समान राशि देनी होगी? वह राशि कितनी होगी? **2**

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(iii) (b) कौन–सी योजना बेहतर है, यदि आप 60 मिनट खरीदना चाहते हैं? तर्कसंगत उत्तर दीजिये। **2**

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OR

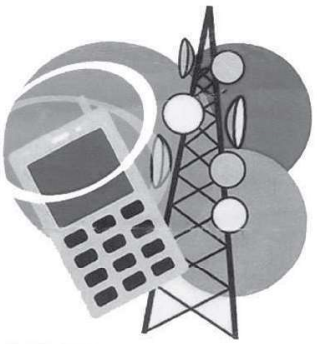
(B) In a Δ ABC, P and Q are points on AB and AC respectively such that PQ || BC. Prove that the median AD, drawn from A to BC, bisects PQ. **5**

35. From a point on the ground, the angle of elevation of the top of a pedestal is 30° and that of the top of the flagstaff fixed on the pedestal is 60°. If the length of the flagstaff is 5 m, then find the height of the pedestal and its distance from the point of observation on ground. (Use $\sqrt{3} = 1.73$) **5**

SECTION – E

Question Nos. 36 to 38 are case-based questions of 4 marks each.

36. A telecommunication company came up with two plans– plan A and plan B for its customers.



The plans are represented by linear equations where 't' represents the time (in minutes) bought and 'C' represents the cost. The equations are :

Plan A : $3C = 20t$

Plan B : $3C = 10t + 300$

Based on above information, answer the following questions :

(i) If you purchase plan B, how much initial amount you have to pay ? **1**

(ii) Charu purchased plan A. How many minutes she bought for ₹ 250 ? **1**

(iii) (a) At how many minutes, do both the plans charge the same amount? What is that amount? **2**

OR

(iii) (b) Which plan is better if you want to buy 60 minutes? Give reason for your answer. **2**

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37. गेंदों के पूल (Ball Pool) में खेलना बच्चों के लिये मनोरंजन का अच्छा साधन है। सुहाना ने अपने बच्चों के लिये पूल में भरने के लिये 7 cm व्यास वाली 600 गेंद खरीदीं। 600 गेंद रखने वाले घनाभ आकार के डिब्बे की विमायें 42 cm × 91 cm × 50 cm ($l \times b \times h$) हैं।



उपरोक्त सूचना के आधार पर निम्नलिखित प्रश्नों के उत्तर दीजिए :

(i) एक गेंद का आयतन ज्ञात कीजिए। **1**

(ii) 10 गेंदों को चमकीले रंगों से रंग किया। रंगीन पृष्ठ का क्षेत्रफल ज्ञात कीजिए। **1**

(iii) (a) डिब्बे में उपलब्ध रिक्त स्थान का आयतन ज्ञात कीजिये। **2**

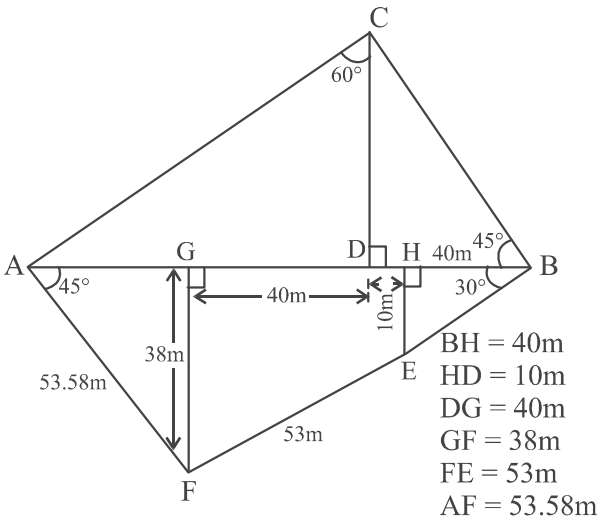
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(iii) (b) गेंदों की सबसे निचली सतह पर गेंदें सटी हुई समान रूप से रखी गयी हैं जो डिब्बे के पूरे आधार क्षेत्र को ढक लेती हैं। (A) एक गेंद द्वारा आच्छादित (covered) क्षेत्र का क्षेत्रफल निकालिये। (B) सबसे निचली सतह पर कितनी गेंदें हैं? **2**

38. रहीम तथा नदीम दो दोस्त हैं जिनके भूमिखंड एक दूसरे से लगे हुए हैं। रहीम के बेटे ने आवश्यक सूचना के साथ भूमिखंड को आरेखित किया।

यह तय किया गया कि रहीम त्रिभुजीय क्षेत्र ABC के किनारे-किनारे तार लगायेगा तथा नदीम भुजा AF, FE तथा BE के किनारे-किनारे तार लगायेगा।

आरेख को ध्यानपूर्वक देखिये और निम्नलिखित प्रश्नों के उत्तर दीजिये :



($\sqrt{2} = 1.41$ तथा $\sqrt{3} = 1.73$ लीजिये)

(i) भुजा BC की लम्बाई ज्ञात कीजिये। **1**

(ii) भुजा AG की लम्बाई ज्ञात कीजिये। **1**

(iii) (a) त्रिभुज ABC का परिमाप ज्ञात कीजिये। **2**

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(iii) (b) (AF + FE + EB) की लम्बाई ज्ञात कीजिये। **2**

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37. Playing in a ball pool is good entertainment for kids. Suhana bought 600 new balls of diameter 7 cm to fill in the pool for her kids. The cuboidal box containing 600 balls has dimensions 42 cm × 91 cm × 50 cm ($l \times b \times h$).



Based on above information, answer the following questions :

(i) Find the volume of one ball. **1**

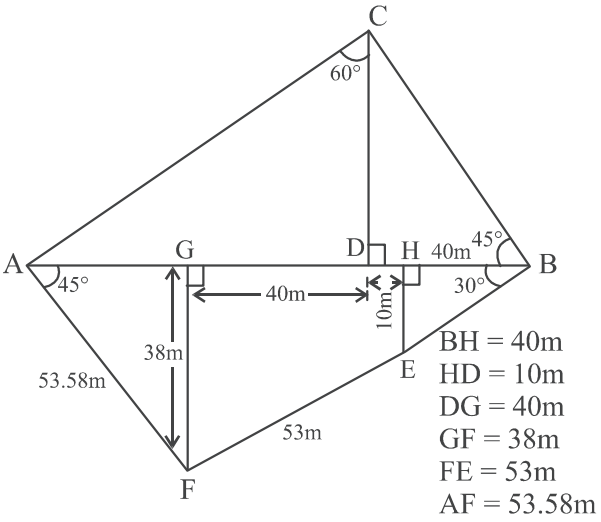
(ii) 10 balls are painted with neon colours. Determine the area of painted surface. **1**

(iii) (a) Find the volume of empty space in the box. **2**

OR

(iii) (b) The lowermost layer of the balls covers the base of the box edge to edge when balls are placed evenly adjacent to each other. (A) How much area is covered by one ball? (B) How many balls are there in lowermost layer? **2**

38. Rahim and Nadeem are two friends whose plots are adjacent to each other. Rahim's son made a drawing of the plots with necessary details.



It is decided that Rahim will fence the triangular plot ABC and Nadeem will fence along the sides AF, FE and BE.

Observe the diagram carefully and answer the following questions :

(Use $\sqrt{2} = 1.41$ and $\sqrt{3} = 1.73$)

(i) Find length BC. **1**

(ii) Find length AG. **1**

(iii) (a) Calculate perimeter of ΔABC. **2**

OR

(iii) (b) Calculate length of (AF + FE + EB). **2**

• • •

Marking Scheme
Strictly Confidential
(For Internal and Restricted use only)
Secondary School Examination, 2025
SUBJECT NAME MATHEMATICS (BASIC) (Q.P. CODE 430/4/1)

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. 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 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 430/4/1

MARKING SCHEME
MATHEMATICS (Basic)

SECTION A

*This section has **20** Multiple Choice Questions (MCQs) carrying **1** mark each.* $20\times1=20$

1. If HCF $(x, 20) = 2$ and LCM $(x, 20) = 60$, then value of x is :

(a) 3 (b) 6 (c) 20 (d) 10

Ans. (b) 6 — 1

2. The distance between the points $(-6, 9)$ and $(2, 7)$ is :

(a) $2\sqrt{17}$ (b) $4\sqrt{17}$ (c) $2\sqrt{5}$ (d) $2\sqrt{15}$

Ans. (a) $2\sqrt{17}$ — 1

3. If n^{th} term of an A.P. is $5n-6$, then its common difference is :

(a) -6 (b) $5n$ (c) 5 (d) 6

Ans. (c) 5 — 1

4. One of the zeroes of the polynomial $p(x) = kx^2 - 9x + 3$ is $\left(-\frac{3}{2}\right)$. The value of k is :

(a) $\frac{22}{3}$ (b) $-\frac{14}{3}$ (c) $\frac{14}{3}$ (d) $-\frac{22}{3}$

Ans. (d) $-\frac{22}{3}$ — 1

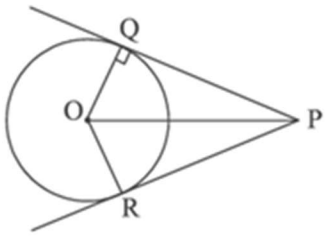
5. Three coins are tossed together. The probability that only one coin shows tail, is :

(a) $\frac{1}{2}$ (b) $\frac{3}{8}$ (c) $\frac{7}{8}$ (d) 1

Ans. (b) $\frac{3}{8}$ — 1

6. Two right circular cylinders of equal volumes have their heights in the ratio 1:2. The ratio of their radii is :

(a) $\sqrt{2}:1$ (b) $1:2$ (c) $1:4$ (d) $1:\sqrt{2}$

Ans. (a) $\sqrt{2}$: 1	1
7. If $\sqrt{2}\sin\theta = 1$, then $\cot\theta \times \text{cosec}\,\theta$ is equal to : (a) $\frac{1}{\sqrt{2}}$ (b) $\frac{1}{2\sqrt{2}}$ (c) $\sqrt{2}$ (d) $\frac{1}{2}$	
Ans. (c) $\sqrt{2}$	1
8. PQ and PR are tangents to the circle of radius 3 cm and centre O. If length of each tangent is 4 cm, then perimeter of Δ OQP is : (a) 5 cm (b) 12 cm (c) 9 cm (d) 8 cm 	
Ans. (b) 12 cm	1
9. α, β are zeroes of the polynomial $2x^2 + 5x + 1$. The value of $\left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$ is : (a) $-\frac{5}{4}$ (b) 5 (c) $\frac{5}{4}$ (d) -5	
Ans. (d) – 5	1
10. The 20^{th} term of the A.P. : $10\sqrt{2}, 6\sqrt{2}, 2\sqrt{2}, \ldots$ is : (a) $-76+10\sqrt{2}$ (b) $-62\sqrt{2}$ (c) $-66\sqrt{2}$ (d) $86\sqrt{2}$	
Ans. (c) $-66\sqrt{2}$	1
11. If $\sec\theta - \tan\theta = 2$, then $\sec\theta + \tan\theta$ is equal to : (a) $\frac{1}{2}$ (b) $\sqrt{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) 2	
Ans. (a) $\frac{1}{2}$	1
12. A card is drawn at random from a well shuffled deck of 52 playing cards. The probability that drawn card shows number '9' is : (a) $\frac{1}{26}$ (b) $\frac{4}{13}$ (c) $\frac{1}{52}$ (d) $\frac{1}{13}$	
Ans. (d) $\frac{1}{13}$	1

13. The length of arc subtending an angle of 210° at the centre of the circle, is $\frac{44}{3}$ cm. The radius of the circle is :

(a) $2\sqrt{2}$ cm (b) 4 cm (c) 8 cm (d) $\frac{1}{4}$ cm

Ans. (b) 4 cm — 1

14. The value of m for which lines $14x + my = 20$ and $-3x + 2y = 16$ are parallel, is :

(a) $-\frac{3}{14}$ (b) $-\frac{7}{3}$ (c) $-\frac{28}{3}$ (d) $-\frac{3}{28}$

Ans. (c) $-\frac{28}{3}$ — 1

15. The curved surface area of a cone with base radius 7 cm, is 550 cm^2. The slant height of the cone is :

(a) 25 cm (b) 14 cm (c) 20 cm (d) 24 cm

Ans. (a) 25 cm — 1

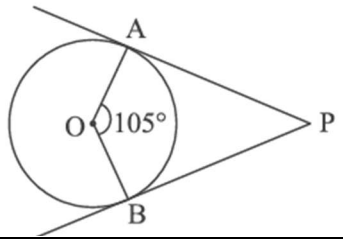
16. If $\sin A = \frac{2}{3}$, then $\cos A$ is equal to :

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

Ans. (b) $\frac{\sqrt{5}}{3}$ — 1

17. PA and PB are tangents to a circle with centre O. If $\angle AOB = 105°$ then $\angle OAP + \angle APB$ is equal to :

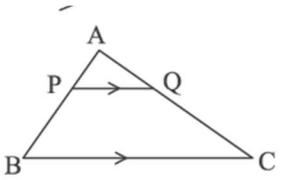
(a) 75° (b) 175°
(c) 180° (d) 165°



Ans. (d) 165° — 1

18. In Δ ABC, PQ || BC. It is given that AP = 2.4 cm, PB = 3.6 cm and BC = 5.4 cm. PQ is equal to :

(a) 2.7 cm (b) 1.8 cm
(c) 3.6 cm (d) 2.16 cm



Ans. (d) 2·16 cm — 1

Directions :
Question numbers 19 and 20 are Assertion and Reason based questions. Two statements are given, one labelled as Assertion (A) and the other is labelled as Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below :

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

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

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

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

19. Assertion (A) : Median marks of students in a class test is 16. It means half of the class got marks less than 16.

Reason (R) : Median divides the distribution in two equal parts.

Ans. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). — 1

20. Assertion (A) : If E is an event such that $P(E) = \frac{1}{999}$, then $P(\overline{E}) = 0.001$.

Reason (R) : $P(E) + P(\overline{E}) = 1$

Ans. (d) Assertion (A) is false, but Reason (R) is true. — 1

SECTION B

*This section has **5** Very Short Answer (VSA) type questions of **2** marks each.* $5 \times 2 = 10$

21. Show that 45^n can not end with the digit 0, n being a natural number. Write the prime number 'a' which on multiplying with 45^n makes the product end with the digit 0.

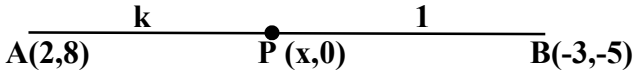
Solution: $45^n = (3 \times 3)^n \times 5^n$ — 1

To end with digit 0, 45^n should have prime factors 2 and 5 both.

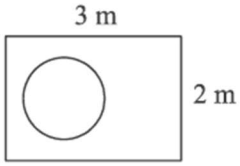
So it cannot end with digit 0. — $\frac{1}{2}$

45^n should be multiplied by $2 \Rightarrow a = 2$ — $\frac{1}{2}$

22. Point $P(x, 0)$ divides the line segment joining the points $(2, 8)$ and $(-3, -5)$ in a certain ratio. Find the ratio and hence find the value of x.

 **Solution:** Let AP : PB = k : 1 therefore $0 = \frac{-5k + 8}{k + 1} \Rightarrow k = \frac{8}{5}$ Hence required ratio is 8 : 5 $x = \frac{-24 + 10}{13} = \frac{-14}{13}$	$1\frac{1}{2}$ $\frac{1}{2}$

23. (A) A coin is dropped at random on the rectangular region shown in the figure. What is the probability that it will land inside the circle with radius 0.7 m ?



OR

(B) A die is thrown twice. What is the probability that (i) difference between two numbers obtained is 3 ? (ii) sum of the numbers obtained is 8 ?

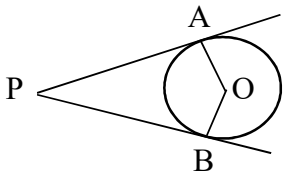
Solution: (A) Area of circle = $\frac{22}{7} \times \frac{7}{10} \times \frac{7}{10} = \frac{154}{100}$ sq m	$\frac{1}{2}$
Area of rectangle = 6 sq m	$\frac{1}{2}$
P(coin lands inside the circle) = $\frac{154}{600}$ or $\frac{77}{300}$	1
OR	
(B) (i) P(difference between two numbers obtained is 3) = $\frac{6}{36}$ or $\frac{1}{6}$	1
(ii) P (sum of numbers obtained is 8) = $\frac{5}{36}$	1

24. (A) Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the centre.

OR

(B) Prove that the tangents drawn at the ends of a diameter of a circle are parallel.

Solution: (A)



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

$\angle OAP = \angle OBP = 90°$ (tangent $\perp$ radius) $\frac{1}{2}$

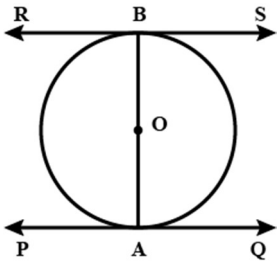
$\angle APB + \angle PBO + \angle BOA + \angle OAP = 360°$ $\frac{1}{2}$

therefore $\angle APB + \angle AOB = 180^0$

Hence, $\angle AOB$ and $\angle APB$ are supplementary $\frac{1}{2}$

OR

(B)



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

Let AB be the diameter of the circle.

therefore $\angle OAP = \angle OBR = 90°$ (tangent $\perp$ radius) $\frac{1}{2}$

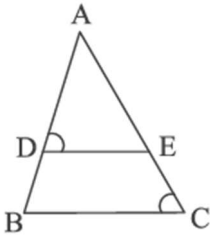
$\Rightarrow \angle OAP + \angle OBR = 180°$ $\frac{1}{2}$

$\Rightarrow$ Co-interior angles are supplementary

$\Rightarrow$ PQ $\parallel$ RS $\frac{1}{2}$

Hence tangents at the ends of a diameter of a circle are parallel.

25. In the given figure $\angle ADE = \angle ACB$ and $\frac{AD}{DB} = \frac{AE}{EC}$. Prove that ΔABC is an isosceles triangle.



Solution: Since $\frac{AD}{DB} = \frac{AE}{EC}$ therefore DE ∥ BC (By converse of BPT)	$\frac{1}{2}$
$\Rightarrow \angle ADE = \angle ABC$ (corresponding angles)	$\frac{1}{2}$
given $\angle ADE = \angle ACB$ therefore $\angle ABC = \angle ACB$	$\frac{1}{2}$
$\Rightarrow$ AC = AB or ΔABC is an isosceles triangle.	$\frac{1}{2}$

26. Find the zeroes of the polynomial $p(x) = 6x^2 + 13x - 5$ and verify the relationship between its zeroes and the coefficients.

Solution: $p(x) = 6x^2 + 13x - 5 = (3x - 1)(2x + 5)$	
Zeroes of p(x) are $\frac{1}{3}, \frac{-5}{2}$	1
Sum of zeroes = $\frac{1}{3} - \frac{5}{2} = \frac{-13}{6} = \frac{-coefficient\ of\ x}{coefficient\ of\ x^2}$	1
Product of zeroes = $\frac{1}{3} \times \frac{-5}{2} = \frac{-5}{6} = \frac{constant\ term}{coefficient\ of\ x^2}$	1

27. (A) Find the sum of the A.P. $7, 10\frac{1}{2}, 14, \ldots\ldots 84$.

OR

(B) If the sum of first n terms of an A.P. is given by $S_n = \frac{n}{2}(2n + 8)$. Then, find its first term and common difference. Hence, find its 15th term.

Solution: (A) a = 7, $d = \frac{21}{2} - 7 = \frac{7}{2}$	1
$84 = 7 + (n - 1) \times \frac{7}{2} \Rightarrow n = 23$	1
$S_{23} = \frac{23}{2}(7 + 84) = \frac{2093}{2}$	1
OR	
(B) $S_1 = a = 5$	$\frac{1}{2}$
$S_2 = 12$	$\frac{1}{2}$
Therefore, d = 2	1
Hence, $a_{15} = 33$	1

28. Prove that $\sqrt{3}$ is an irrational number.

Solution: (a) Let us assume that $\sqrt{3}$ is a rational number such that

$\sqrt{3} = \frac{p}{q}$ (p, q are co-prime integers and $q \neq 0$) — $\frac{1}{2}$

So $\sqrt{3}\, q = p \Rightarrow 3q^2 = p^2$

3 divides $p^2 \Rightarrow$ 3 divides p as well — 1

hence p is a multiple of 3 $\Rightarrow p = 3m$

$\Rightarrow p^2 = 9m^2$

$3q^2 = 9m^2 \Rightarrow q^2 = 3m^2$

3 divides $q^2 \Rightarrow$ 3 divides q as well

Hence, p and q have a common factor 3. This contradicts our assumption that they are co-prime. — 1

$\therefore$ our assumption is wrong

So $\sqrt{3}$ is an irrational number. — $\frac{1}{2}$

---

29. (A) If points A(– 5, *y*), B(2, – 2), C(8, 4) and D(*x*, 5) taken in order, form a parallelogram ABCD, then find the values of *x* and *y*. Hence, find lengths of sides of the parallelogram.

OR

(B) A(6, – 3), B(0, 5) and C(– 2, 1) are vertices of ΔABC. Points P(3, 1) and Q(2, – 1) lie on sides AB and AC respectively. Check whether $\frac{AP}{PB} = \frac{AQ}{QC}$.

Solution: (A) ABCD is a parallelogram

$\therefore$ Coordinates of mid pt. of BD = Coordinates of mid pt. of AC

$\left(\frac{2+x}{2}, \frac{-2+5}{2}\right) = \left(\frac{8-5}{2}, \frac{4+y}{2}\right)$ — 1

Getting x = 1 and y = – 1 — $\frac{1}{2} + \frac{1}{2}$

$AB = \sqrt{7^2 + (-1)^2} = \sqrt{50}$ or $5\sqrt{2}$ — $\frac{1}{2}$

$BC = \sqrt{6^2 + 6^2} = \sqrt{72}$ or $6\sqrt{2}$ — $\frac{1}{2}$

OR

(B) $AP = \sqrt{3^2 + (-4)^2} = 5$ — $\frac{1}{2}$

$PB = \sqrt{3^2 + (-4)^2} = 5$ — $\frac{1}{2}$

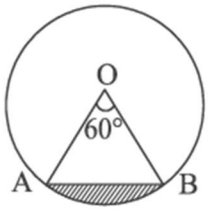
$AQ = \sqrt{4^2 + (-2)^2} = 2\sqrt{5}$ — $\frac{1}{2}$

$QC = \sqrt{4^2 + (-2)^2} = 2\sqrt{5}$ — $\frac{1}{2}$

So $\frac{AP}{PB} = 1$ and $\frac{AQ}{QC} = 1$ — 1

Therefore $\frac{AP}{PB} = \frac{AQ}{QC}$

30. A chord of a circle of radius 10 cm subtends an angle of 60° at the centre O. Find the area of the shaded region.
(Use $\sqrt{3} = 1.73, \sqrt{2} = 1.41$ and $\pi = 3.14$)



Solution:

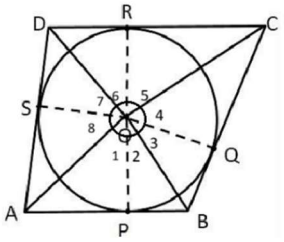
Area of sector OAB = $\frac{60}{360} \times 3{\cdot}14 \times 10^2 = \frac{314}{6}$ sq. cm — 1

Area of $\Delta OAB = \frac{\sqrt{3}}{4} \times 10^2 = \frac{173}{4}$ sq. cm — 1

Area of the shaded region = $\frac{314}{6} - \frac{173}{4} = \frac{109}{12}$ or 9·08 sq. cm — 1

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

Solution:



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

Proving $\Delta OAP \cong \Delta OAS$ (by any congruency criterion) — $\frac{1}{2}$

$\Rightarrow \angle 1 = \angle 8$ (cpct)	
Similarly $\angle 4 = \angle 5$, $\angle 6 = \angle 7$ and $\angle 2 = \angle 3$	1
Also $\angle 1 + \angle 2 + \angle 3 + \angle 4 + \angle 5 + \angle 6 + \angle 7 + \angle 8 = 360°$	$\frac{1}{2}$
$\therefore \angle 1 + \angle 2 + \angle 5 + \angle 6 = 180°$	$\frac{1}{2}$
$\angle AOB + \angle COD = 180°$	

SECTION – D

Question Nos. 32 to 35 are long answer questions of 5 marks each.

32. (A) It is given that $p^2x^2 + (p^2 - q^2)x - q^2 = 0$; $(p \neq 0)$

(i) Show that the discriminant (D) of above equation is a perfect square.

(ii) Find the roots of the equation.

OR

(B) Three consecutive positive integers are such that the sum of the square of smallest and product of other two is 67. Find the numbers, using quadratic equation.

Solution: (A) (i) Discriminant $= (p^2 - q^2)^2 + 4p^2q^2$	1
$= (p^2 + q^2)^2$	1
(ii) $x = \frac{-(p^2 - q^2) \pm \sqrt{(p^2 + q^2)^2}}{2p^2}$	1
$= \frac{q^2}{p^2}, -1$	1+ 1
OR	
(B) Let the three consecutive positive integers be x, x + 1 and x + 2	1
A.T.Q. $x^2 + (x + 1)(x + 2) = 67$	1
$\Rightarrow 2x^2 + 3x - 65 = 0$	1
$\Rightarrow (2x + 13)(x - 5) = 0$	1
$\Rightarrow x = 5$, $x = \frac{-13}{2}$ (rejected)	
So the three consecutive positive integers are 5, 6 and 7	1

33. Find 'mean' and 'mode' of the following data :

Class	15-20	20-25	25-30	30-35	35-40	40-45
Frequency	6	16	17	4	5	2

Solution:

Class	x_i	f_i	$u_i = \frac{x - 27{\cdot}5}{5}$	f_iu_i
15 – 20	17·5	6	– 2	– 12
20 – 25	22·5	16	– 1	– 16
25 – 30	27·5	17	0	0
30 – 35	32·5	4	1	4
35 – 40	37·5	5	2	10
40 – 45	42·5	2	3	6
		$\sum f_i = 50$		$\sum f_iu_i = -8$

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

$$\text{Mean} = 27{\cdot}5 - \left(\frac{8}{50} \times 5\right) \qquad 1$$

$$= 26{\cdot}7 \qquad \frac{1}{2}$$

Modal class is 25 – 30

$$\text{Mode} = 25 + 5 \times \frac{17 - 16}{34 - 16 - 4} \qquad 1\frac{1}{2}$$

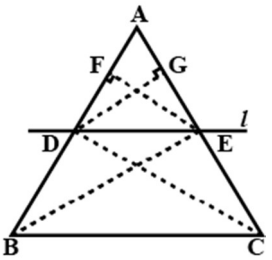
$$= 25{\cdot}36 \qquad \frac{1}{2}$$

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 the other two sides are divided in the same ratio.

OR

(B) In a Δ ABC, P and Q are points on AB and AC respectively such that PQ || BC. Prove that the median AD, drawn from A to BC, bisects PQ.

Solution: (A)



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

Given: In Δ ABC, DE || BC

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

Construction: Join BE, DC, Draw DG ⊥ AC and EF ⊥ AB

1

Proof : $\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2}\times AD\times EF}{\frac{1}{2}\times DB\times EF} \Rightarrow \frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{AD}{DB}$ .....(i) 1

and $\frac{ar(\Delta ADE)}{ar(\Delta CED)} = \frac{\frac{1}{2}\times AE\times DG}{\frac{1}{2}\times EC\times DG} \Rightarrow \frac{ar(\Delta ADE)}{ar(\Delta CED)} = \frac{AE}{EC}$ ..... (ii) 1

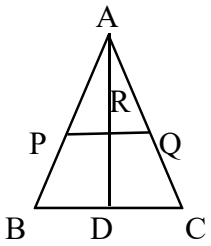
As ΔBDE and ΔCED are on the same base DE and between the same parallels DE and BC.

∴ ar(ΔBDE) = ar(ΔCED) ..……..(iii) 1

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

OR

(B)



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

Given PQ ‖ BC ⇒ PR ‖ BD

Therefore in Δ ARP and Δ ADB, ∠ PAR = ∠ BAD

and ∠ APR = ∠ ABD

∴ Δ ARP ~ Δ ADB (By AA similarity criterion) 1

$\Rightarrow \frac{AR}{AD} = \frac{PR}{BD}$ ———— (i) $\frac{1}{2}$

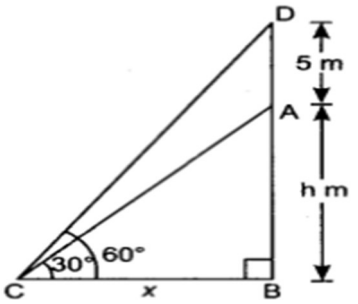
Similarly Δ ARQ ~ Δ ADC

$\Rightarrow \frac{AR}{AD} = \frac{RQ}{DC}$ ———— (ii) 1

Using (i) and (ii) $\frac{PR}{BD} = \frac{RQ}{DC}$	$\frac{1}{2}$
AD is the median ∴ BD = DC ⇒ PR = RQ	1
i.e. AD bisects PQ	$\frac{1}{2}$

35. From a point on the ground, the angle of elevation of the top of a pedestal is 30° and that of the top of the flagstaff fixed on the pedestal is 60°. If the length of the flagstaff is 5 m, then find the height of the pedestal and its distance from the point of observation on ground. (Use $\sqrt{3} = 1.73$)

Solution:



Correct figure 1

Let AB be the pedestal of height h and distance from the point of observation on ground be x.

In Δ ABC, $\tan 30° = \frac{h}{x}$ $\Rightarrow x = h\sqrt{3}$ …….(i) $1+\frac{1}{2}$

In Δ DBC, $\tan 60° = \frac{h+5}{x}$ $\Rightarrow h + 5 = x\sqrt{3}$ …….(ii) $1+\frac{1}{2}$

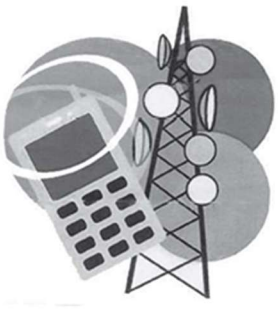
Using (i) & (ii) h = 2·5 and x = 4·33 $\frac{1}{2}+\frac{1}{2}$

∴ The height of the pedestal is 2.5 m and its distance from the point of observation is 4.33m.

SECTION – E

Question Nos. 36 to 38 are case-based questions of 4 marks each.

36. A telecommunication company came up with two plans– plan A and plan B for its customers.



The plans are represented by linear equations where 't' represents the time (in minutes) bought and 'C' represents the cost. The equations are :

Plan A : $3C = 20t$

Plan B : $3C = 10t + 300$

Based on above information, answer the following questions :

(i) If you purchase plan B, how much initial amount you have to pay ?

(ii) Charu purchased plan A. How many minutes she bought for ₹ 250 ?

(iii) (a) At how many minutes, do both the plans charge the same amount? What is that amount?

OR

(iii) (b) Which plan is better if you want to buy 60 minutes? Give reason for your answer.

Solution: (i) At $t = 0$, $3C = 300 \Rightarrow C = 100$ — 1

₹100 have to be paid initially.

(ii) $3 \times 250 = 20t \Rightarrow t = 37{\cdot}5$ minutes — 1

(iii) (a) $20t = 10t + 300 \Rightarrow t = 30$ — 1

Both plans charge same amount if a person buys 30 minutes.

$$\text{Amount} = \frac{20 \times 30}{3} = ₹\ 200$$ — 1

OR

(iii) (b) At $t = 60$, cost under plan A = ₹ 400 — $\frac{1}{2}$

At $t = 60$, cost under plan B = ₹ 300 — $\frac{1}{2}$

Plan B is better as ₹ 100 are saved. — 1

37. Playing in a ball pool is good entertainment for kids. Suhana bought 600 new balls of diameter 7 cm to fill in the pool for her kids. The cuboidal box containing 600 balls has dimensions 42 cm × 91 cm × 50 cm ($l \times b \times h$).



Based on above information, answer the following questions :

(i) Find the volume of one ball.

(ii) 10 balls are painted with neon colours. Determine the area of painted surface.

(iii) (a) Find the volume of empty space in the box.

OR

(iii) (b) The lowermost layer of the balls covers the base of the box edge to edge when balls are placed evenly adjacent to each other. (A) How much area is covered by one ball? (B) How many balls are there in lowermost layer?

Solution: (i) Volume of one ball = $\frac{4}{3} \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times \frac{7}{2} = \frac{539}{3}$ or 179.67 cu. cm — 1

(ii) Area of painted surface = $10 \times 4 \times \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2}$ = 1540 sq. cm — 1

(iii) (a) Volume of box = 42 × 91 × 50 = 191100 cu. cm — $\frac{1}{2}$

Volume of 600 balls = $600 \times \frac{539}{3}$ = 107800 cu. cm — $\frac{1}{2}$

Volume of empty space = 191100 – 107800 = 83300 cu. cm — 1

OR

(iii) (b) (A) Area covered by one ball = 7 × 7 = 49 sq. cm — 1

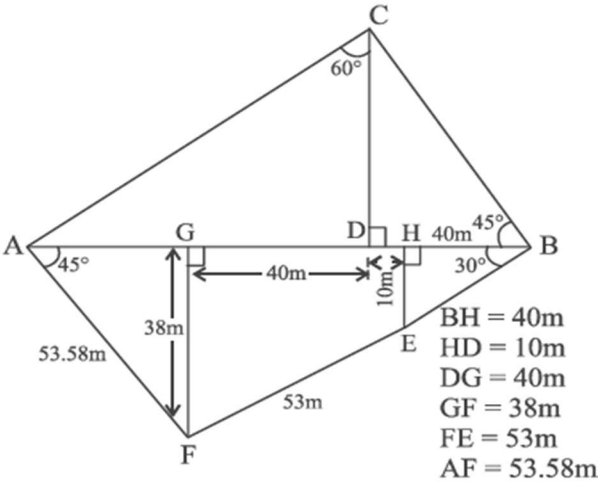
(B) Number of balls in lowermost layer = 78 — 1

38. Rahim and Nadeem are two friends whose plots are adjacent to each other. Rahim's son made a drawing of the plots with necessary details.

It is decided that Rahim will fence the triangular plot ABC and Nadeem will fence along the sides AF, FE and BE.

Observe the diagram carefully and answer the following questions :

(Use $\sqrt{2} = 1.41$ and $\sqrt{3} = 1.73$)



(i) Find length BC.

(ii) Find length AG.

(iii) (a) Calculate perimeter of ΔABC.

OR

(iii) (b) Calculate length of (AF + FE + EB).

Solution:

(i) $\cos 45° = \frac{50}{BC} \Rightarrow BC = 50 \times 1{\cdot}41 = 70{\cdot}5$ m — 1

(ii) $\tan 45° = \frac{38}{AG} \Rightarrow AG = 38$ m — 1

(iii) (a) $\sin 60° = \frac{78}{AC} \Rightarrow AC = 89{\cdot}96$ m — 1

Perimeter of $\Delta ABC = 70{\cdot}5 + 89{\cdot}96 + 38 + 50 + 40 = 288{\cdot}46$ m — 1

OR

(b) $\cos 30° = \frac{40}{BE} \Rightarrow BE = 46{\cdot}13$ m — 1

AF + FE + EB = 53·58 + 53 + 46·13 = 152·71 m — 1