

**SET-5****Series AQ@QA****प्रश्न-पत्र कोड 30/B/5**
Q.P. Codeरोल 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.

- कृपया जाँच कर लें कि इस प्रश्न-पत्र में मुद्रित पृष्ठ 11 हैं।
- प्रश्न-पत्र में दाहिने हाथ की ओर दिए गए प्रश्न-पत्र कोड को परीक्षार्थी उत्तर-पुस्तिका के मुख-पृष्ठ पर लिखें।
- कृपया जाँच कर लें कि इस प्रश्न-पत्र में 14 प्रश्न हैं।
- कृपया प्रश्न का उत्तर लिखना शुरू करने से पहले, उत्तर-पुस्तिका में प्रश्न का क्रमांक अवश्य लिखें।
- 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।
- Please check that this question paper contains 11 printed pages.
- Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 14 questions.
- **Please write down the serial number of the question in the answer-book before attempting it.**
- 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer-book during this period.

**गणित (मानक)****(केवल दृष्टिबाधित परीक्षार्थियों के लिए)****MATHEMATICS (STANDARD)****(FOR VISUALLY IMPAIRED CANDIDATES ONLY)**

निर्धारित समय : 2 घण्टे

Time allowed : 2 hours

अधिकतम अंक : 40

Maximum Marks : 40



सामान्य निर्देश:

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

- (i) इस प्रश्न-पत्र में कुल **14** प्रश्न हैं। **सभी** प्रश्न अनिवार्य हैं।
- (ii) यह प्रश्न-पत्र **तीन** खण्डों में विभाजित है – **खण्ड क, ख तथा ग**।
- (iii) **खण्ड क** में **6** प्रश्न (प्र.सं. **1** से **6**) हैं, जिनमें प्रत्येक प्रश्न **2** अंक का है। दो प्रश्नों में आंतरिक विकल्प प्रदान किया गया है।
- (iv) **खण्ड ख** में **4** प्रश्न (प्र.सं. **7** से **10**) हैं, जिनमें प्रत्येक प्रश्न **3** अंक का है। एक प्रश्न में आंतरिक विकल्प प्रदान किया गया है।
- (v) **खण्ड ग** में **4** प्रश्न (प्र.सं. **11** से **14**) हैं, जिनमें प्रत्येक प्रश्न **4** अंक का है। एक प्रश्न में आंतरिक विकल्प प्रदान किया गया है। इस खण्ड में दो प्रकरण अध्ययन आधारित प्रश्न भी शामिल हैं।
- (vi) कैल्कुलेटर के उपयोग की अनुमति **नहीं** है।

खण्ड क

इस खण्ड में **6** प्रश्न हैं जिनमें प्रत्येक के **2** अंक हैं।

1. (क) निम्नलिखित समांतर श्रेढ़ी के पदों की संख्या ज्ञात कीजिए : 2
 $5, 11, 17, \dots, 203$
अथवा
(ख) उस समांतर श्रेढ़ी के प्रथम 20 पदों का योगफल ज्ञात कीजिए जिसका n वाँ पद $a_n = 5 - 3n$ द्वारा प्रदत्त है। 2
2. द्विघात समीकरण $9x^2 - 6\sqrt{2}x + 2 = 0$ के मूल ज्ञात कीजिए। 2
3. 18 सेमी \times 22 सेमी \times 6 सेमी विमाओं वाले धातु के एक ठोस घनाभ को पिघलाकर 3 सेमी व्यास वाली कितनी गोलाकार गोलियाँ बनाई जा सकती हैं ? 2



General Instructions :

Read the following instructions very carefully and strictly follow them :

- (i) *This question paper contains **14** questions. **All** questions are compulsory.*
- (ii) *This question paper is divided into **three** sections – **Section A, B and C.***
- (iii) ***Section A** comprises of **6** questions (Q. no. **1** to **6**) of **2** marks each. Internal choice has been provided in **two** questions.*
- (iv) ***Section B** comprises of **4** questions (Q. no. **7** to **10**) of **3** marks each. Internal choice has been provided in **one** question.*
- (v) ***Section C** comprises of **4** questions (Q. no. **11** to **14**) of **4** marks each. Internal choice has been provided in **one** question. It also contains two case study based questions.*
- (vi) *Use of calculator is **not** permitted.*

SECTION A

*This section contains **6** questions of **2** marks each.*

1. (a) Find the number of terms in the following AP : 2
5, 11, 17,, 203
- OR**
- (b) Find the sum of the first 20 terms of an AP whose n^{th} term is given as $a_n = 5 - 3n$. 2
2. Find the roots of the quadratic equation $9x^2 - 6\sqrt{2}x + 2 = 0$. 2
3. How many spherical shots each having diameter 3 cm can be made by melting a cuboidal solid of dimensions $18 \text{ cm} \times 22 \text{ cm} \times 6 \text{ cm}$? 2



4. निम्नलिखित बंटन का बहुलक 24 है तथा सभी बारंबारताओं का योगफल 50 है ।
लुप्त बारंबारताएँ x तथा y के मान ज्ञात कीजिए :

2

वर्ग	बारंबारता
0 – 10	4
10 – 20	x
20 – 30	20
30 – 40	y
40 – 50	6

5. दो संकेंद्री वृत्तों में, बड़े वृत्त की एक जीवा, जिसकी लंबाई 48 सेमी है, छोटे वृत्त की स्पर्श-रेखा है । यदि छोटे वृत्त की त्रिज्या 7 सेमी है, तो बड़े वृत्त की त्रिज्या ज्ञात कीजिए ।

2

6. (क) दो क्रमागत विषम धन पूर्णांकों का गुणनफल 255 है । एक द्विघात समीकरण के सूत्रण की सहायता से ये पूर्णांक ज्ञात कीजिए ।

2

अथवा

- (ख) k के वे मान ज्ञात कीजिए जिनके लिए द्विघात समीकरण

$$(k + 3)x^2 + kx + 1 = 0 \text{ के दो मूल वास्तविक तथा बराबर हों ।}$$

2

खण्ड ख

इस खण्ड में 4 प्रश्न हैं जिनमें प्रत्येक के 3 अंक हैं ।

7. 4 सेमी त्रिज्या के एक वृत्त के केंद्र O से 7 सेमी की दूरी पर स्थित एक बिंदु P से खींची जाने वाली दो स्पर्श-रेखाओं की रचना के पद लिखिए ।

3



4. The mode of the following distribution is 24 and the sum of all frequencies is 50. Find the missing frequencies x and y . 2

<i>Class</i>	<i>Frequency</i>
0 – 10	4
10 – 20	x
20 – 30	20
30 – 40	y
40 – 50	6

5. In two concentric circles, a chord of length 48 cm of the larger circle is a tangent to the smaller circle, whose radius is 7 cm. Find the radius of the larger circle. 2
6. (a) The product of two consecutive odd positive integers is 255. Find the integers, by formulating a quadratic equation. 2

OR

- (b) Find the value(s) of k for the quadratic equation,
 $(k + 3)x^2 + kx + 1 = 0$, to have two real and equal roots. 2

SECTION B

This section contains 4 questions of 3 marks each.

7. Write the steps of construction for constructing a pair of tangents to a circle of radius 4 cm from a point P, at a distance of 7 cm from its centre O. 3



8. (क) समुद्र तल से 60 मी. ऊँची लाइट-हाउस के शिखर से देखने पर दो समुद्री जहाजों के अवनमन कोण 45° तथा 60° हैं। यदि लाइट-हाउस के एक ही ओर एक जहाज दूसरे जहाज के ठीक पीछे हो, तो दोनों जहाजों के बीच की दूरी ज्ञात कीजिए। [$\sqrt{3} = 1.732$ लीजिए]

3

अथवा

- (ख) 1.6 मी. लम्बा एक लड़का, जो एक लैम्प-पोस्ट से 3 मी. की दूरी पर खड़ा है, भूमि पर 4 मी. लंबी छाया बनाता है, तो लैम्प-पोस्ट की ऊँचाई ज्ञात कीजिए।

3

9. निम्नलिखित बारंबारता बंटन 50 पॉलिसीधारकों की आयु के आँकड़े दर्शाता है। माध्यक आयु ज्ञात कीजिए, यदि पॉलिसी केवल उन्हीं व्यक्तियों को दी जाती है, जिनकी आयु 18 वर्ष या उससे अधिक हो, परन्तु 60 वर्ष से कम हो।

3

आयु (वर्षों में)	पॉलिसीधारकों की संख्या
20 से कम	1
30 से कम	12
40 से कम	39
50 से कम	46
60 से कम	50

10. निम्नलिखित सारणी किसी मोहल्ले के 50 परिवारों में भोजन पर हुए दैनिक व्यय को दर्शाती है। माध्य दैनिक व्यय ज्ञात कीजिए।

3

दैनिक व्यय (₹ में)	परिवारों की संख्या
200 – 250	8
250 – 300	10
300 – 350	12
350 – 400	10
400 – 450	10



8. (a) As observed from the top of a lighthouse 60 m high from the sea level, the angles of depression of two ships are 45° and 60° . If one ship is exactly behind the other on the same side of the lighthouse, then find the distance between the two ships. [Use $\sqrt{3} = 1.732$] 3

OR

- (b) A 1.6 m tall boy stands at a distance of 3 m from a lamp-post and casts a shadow of length 4 m on the ground. Find the height of the lamp-post. 3
9. The following frequency distribution shows the ages of 50 policyholders. Calculate the median age, if policies are given only to persons having age 18 years onwards, but less than 60 years. 3

<i>Age (in years)</i>	<i>Number of Policyholders</i>
Below 20	1
Below 30	12
Below 40	39
Below 50	46
Below 60	50

10. The table below shows the daily expenditure on food of 50 households of a locality. Find the mean daily expenditure. 3

<i>Daily Expenditure (in ₹)</i>	<i>Number of Households</i>
200 – 250	8
250 – 300	10
300 – 350	12
350 – 400	10
400 – 450	10



खण्ड ग

इस खण्ड में 4 प्रश्न हैं जिनमें प्रत्येक के 4 अंक हैं ।

11. (क) यदि दो वृत्त परस्पर बाह्य स्पर्श करते हैं, तो सिद्ध कीजिए कि स्पर्श बिंदु, वृत्तों के केंद्रों को मिलाने वाली रेखा पर स्थित है ।

4

अथवा

- (ख) सिद्ध कीजिए कि एक बाह्य बिंदु से वृत्त पर खींची गई दो स्पर्श-रेखाओं की लंबाइयाँ समान होती हैं ।

4

12. समतल भूमि पर स्थित एक बिंदु से, एक ऊर्ध्वाधर खड़ी मीनार के शिखर का उन्नयन कोण α इस प्रकार पाया गया कि $\tan \alpha = \frac{5}{12}$ है । मीनार की ओर 192 मी. की दूरी चलने पर बना उन्नयन कोण β इस प्रकार पाया गया कि $\tan \beta = \frac{3}{4}$ है । मीनार की ऊँचाई ज्ञात कीजिए ।

4

प्रकरण अध्ययन – 1

13. मकान अथवा कार जैसी महँगी वस्तु खरीदने के लिए एक मध्यम-वर्गीय व्यक्ति के लिए बैंक से ऋण लेकर उसे आसान किश्तों में ब्याज सहित चुकाना आसान हो जाता है ।

अमन एक कार खरीदने के लिए बैंक से ₹ 2,36,000 का ऋण लेता है और उसे मासिक किश्तों में चुकाना शुरू करता है । वह ₹ 2,000 की पहली किश्त चुकाता है तथा उसके बाद प्रति माह किश्त में ₹ 500 की बढ़ोतरी करता है ।

- (क) ज्ञात कीजिए कि वह 25वीं किश्त में कितनी राशि चुकाता है ।

2

- (ख) ज्ञात कीजिए कि वह पहली 25 किश्तों में कुल कितनी राशि चुकाता है ।

2



SECTION C

This section contains 4 questions of 4 marks each.

11. (a) If two circles touch each other externally, then prove that the point of contact lies on the line joining their centres. 4

OR

- (b) Prove that the lengths of two tangents drawn from an external point to a circle are equal. 4

12. At a point on the level ground, the angle of elevation of the top of a vertical tower is found to be α , such that $\tan \alpha = \frac{5}{12}$. On walking 192 m towards the tower, the angle of elevation β is such that $\tan \beta = \frac{3}{4}$. Find the height of the tower. 4

Case Study – 1

13. While buying an expensive item like a house or a car, it becomes easier for a middle-class person to take a loan from a bank and then repay the loan along with interest in easy instalments.

Aman buys a car by taking a loan of ₹ 2,36,000 from the bank and starts repaying the loan in monthly instalments. He pays ₹ 2,000 as the first instalment and then increases the instalment by ₹ 500 every month.

- (a) Find the amount he pays in the 25th instalment. 2
- (b) Find the total amount paid by him in first 25 instalments. 2



प्रकरण अध्ययन – 2

14. शंक्वाकार आधार वाले टैंक, जिसके ऊपर एक उसी व्यास का बेलन अध्यारोपित होता है, उद्योग में बहुत लाभकारी होते हैं, विशेषतया तब, जब टैंक से निकाली गई आखिरी बूँद भी बहुत महत्त्व रखती हो ।

विकास ने एक शंक्वाकार आधार वाला टैंक बनाया जहाँ शंक्वाकार भाग की ऊँचाई उसकी त्रिज्या के बराबर है तथा बेलनाकार भाग की ऊँचाई उसकी त्रिज्या की दुगुनी है । टैंक ऊपर से बंद है ।

(क) यदि बेलनाकार भाग की त्रिज्या 3 मी. है, तो टैंक का आयतन ज्ञात कीजिए ।

2

(ख) बेलनाकार भाग के आयतन का शंक्वाकार भाग के आयतन से अनुपात ज्ञात कीजिए ।

2



Case Study – 2

14. Conical bottom tanks in which an inverted cone at the bottom is surmounted by a cylinder of same diameter, are very advantageous in industry, specially where getting every last drop from the tank is important.

Vikas designed a conical bottom tank where the height of the conical part is equal to its radius and the height of the cylindrical part is two times of its radius. The tank is closed from the top.

- (a) If the radius of the cylindrical part is 3 m, then find the volume of the tank. 2
- (b) Find the ratio of the volume of the cylindrical part to the volume of the conical part. 2

Strictly Confidential : (For Internal and Restricted use only)

Secondary School Examination

Term–II, 2022

Marking Scheme : MATHEMATICS (Standard) (For VI)

(Subject Code : 041)

[Paper Code : 30/B/5]

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 Newspaper/ Website, etc., may invite action under IPC.”**
3. Evaluation is to be done as per instruction 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 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, marks should be awarded.**
4. 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. 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.
5. Evaluators will mark (3) wherever answer is correct. For wrong answer ‘7’ be marked. Evaluators will not put right kind of mark while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
6. 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 totalled up and written in the left-hand margin and encircled. This may be followed strictly.
7. 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.

8. If a student has attempted both option given in question, answer of the question deserving more marks should be retained and the other answer scored out.
9. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
10. A full scale of marks _____ (example 0–100 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
11. Every examiner has to necessarily do evaluation work for full working hours, i.e., 8 hours everyday 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).
12. 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 totalling of marks awarded on a reply
 - Wrong transfer of marks from the inside pages of the answer book to the title page
 - Wrong questionwise totalling on the title page
 - Wrong totalling of marks of the two columns on the title page
 - Wrong grand total
 - Marks in words and figures not tallying
 - 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 7 for incorrect answer).
 - Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
13. While evaluating the answer books if the answer is found to be totally incorrect, it should be marked as (7) and awarded zero (0) Mark.
14. Any unassessed portion, non-carrying over of marks to the title page, or totalling error detected by the candidates 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.
15. The examiners should acquaint themselves with the guidelines given in the guidelines for spot evaluation before starting the actual evaluation.
16. Every examiner shall also ensure that all the answers are evaluated, marks carried over to the title page, correctly totalled and written in figures and words.
17. The Board permits candidates to obtain photocopy of the Answer Book on request in an RTI application and also separately as a part of the re-evaluation process on payment of the processing charges.

MARKING SCHEME

Secondary School Examination Term–II, 2022

MATHEMATICS (Standard) (For VI) (Subject Code : 041)

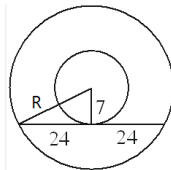
[Paper Code : 30/B/5]

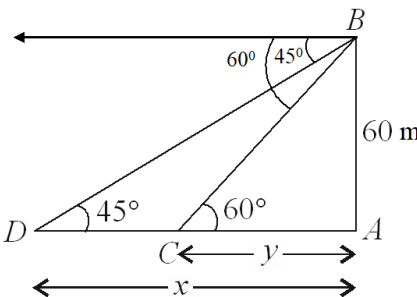
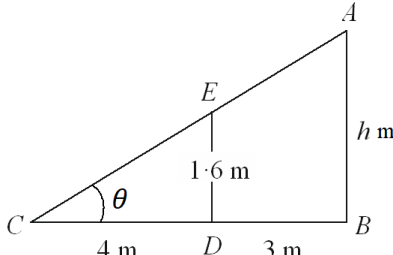
General Instructions:

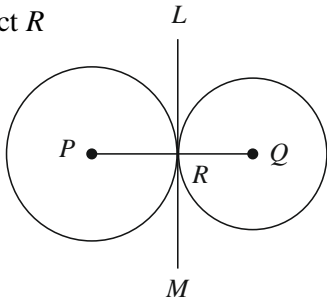
1. The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the meaning, such answers should be given full weightage.
2. 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.
3. Alternative methods are accepted. Proportional marks are to be awarded.
4. If a candidate has attempted a question twice, answer of the question deserving more marks should be retained and the other answer scored out.
5. A full scale of marks - 0 to 40 has to be used. Please do not hesitate to award full marks if the answer deserves it.
6. Separate Marking Scheme for all the three sets has been given.
7. As per orders of the Hon'ble Supreme Court. The candidates would now be permitted to obtain photocopy of the Answer book on request on payment of the prescribed fee. All 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.

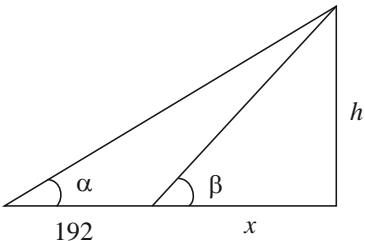
Q. No.	EXPECTED ANSWER / VALUE POINTS	Marks
SECTION – A		
1. (a)	Find the number of terms in the following AP : 5, 11, 17,, 203	Given
Sol.	AP is 5, 11, 17, . . . , 203 $\Rightarrow a = 5, d = 6$ and $a_n = 203$ $203 = 5 + (n - 1)6$ $\Rightarrow n - 1 = \frac{198}{6} = 33 \Rightarrow n = 34$	1 $\frac{1}{2}$ $\frac{1}{2}$
Or		
(b)	Find the sum of the first 20 terms of an AP whose n^{th} term is given as $a_n = 5 - 3n$.	
Sol.	$a_n = 5 - 3n \Rightarrow a_1 = 2, a_2 = -1 \Rightarrow d = -3$ $S_{20} = 10[4 + 19(-3)] = -530$	1 1
2.	Find the roots of the quadratic equation $9x^2 - 6\sqrt{2}x + 2 = 0$.	
Sol.	$9x^2 - 6\sqrt{2}x + 2 = 0$	

	$\Rightarrow 9x^2 - 3\sqrt{2}x - 3\sqrt{2}x + 2 = 0$ $\Rightarrow 3x(3x - \sqrt{2}) - \sqrt{2}(3x - \sqrt{2}) = 0$ $\Rightarrow (3x - \sqrt{2})(3x - \sqrt{2}) = 0$ $\Rightarrow x = \frac{\sqrt{2}}{3}, \frac{\sqrt{2}}{3}$	$\frac{1}{2}$ 1 $\frac{1}{2}$												
3.	How many spherical shots each having diameter 3 cm can be made by melting a cuboidal solid of dimensions 18 cm \times 22 cm \times 6 cm ?													
Sol.	Volume of one lead shot = $\frac{4}{3} \times \frac{22}{7} \times \left(\frac{3}{2}\right)^3 \text{ cm}^3$ \therefore Number of lead shots = $\frac{18 \times 22 \times 6}{\frac{4}{3} \times \frac{22}{7} \times \frac{27}{8}}$ $= \frac{18 \times 22 \times 6 \times 3 \times 7 \times 8}{4 \times 22 \times 27}$ $= 168$	$\frac{1}{2}$ 1 $\frac{1}{2}$												
4.	The mode of the following distribution is 24 and the sum of all frequencies is 50. Find the missing frequencies x and y.													
	<table><tr><th>Class</th><th>Frequency</th></tr><tr><td>0 – 10</td><td>4</td></tr><tr><td>10 – 20</td><td>x</td></tr><tr><td>20 – 30</td><td>20</td></tr><tr><td>30 – 40</td><td>y</td></tr><tr><td>40 – 50</td><td>6</td></tr></table>	Class	Frequency	0 – 10	4	10 – 20	x	20 – 30	20	30 – 40	y	40 – 50	6	
Class	Frequency													
0 – 10	4													
10 – 20	x													
20 – 30	20													
30 – 40	y													
40 – 50	6													
Sol.	$30 + x + y = 50 \Rightarrow x + y = 20$ Modal group is 20 – 30, $\Rightarrow 24 = 20 + \frac{20 - x}{40 - x - y} \times 10$ $4 = \frac{20 - x}{40 - 20} \times 10 \quad \Rightarrow x = 12 \quad \left. \begin{array}{l} \\ \therefore y = 8 \end{array} \right\}$	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$												

5.	In two concentric circles, a chord of length 48 cm of the larger circle is a tangent to the smaller circle, whose radius is 7 cm. Find the radius of the larger circle.	
Sol.	<p>Let R be the radius</p> $\Rightarrow R^2 = (7)^2 + (24)^2$ $= 49 + 576 = 625$ $\Rightarrow R = 25 \text{ cm}$	 <p>1</p> <p>1</p>
6.(a)	The product of two consecutive odd positive integers is 255. Find the integers, by formulating a quadratic equation.	
Sol.	<p>Let two consecutive odd positive integers be $x, x+2$</p> $\therefore x(x+2) = 255$ $\Rightarrow x^2 + 2x - 255 = 0$ $\Rightarrow x^2 + 17x - 15x - 255 = 0$ $\Rightarrow (x+17)(x-15) = 0$ $\Rightarrow x = 15$ <p>\therefore Two consecutive odd positive integers are 15 and 17</p> <p style="text-align: center;">Or</p>	<p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
(b)	Find the value(s) of k for the quadratic equation, $(k+3)x^2 + kx + 1 = 0$, to have two real and equal roots.	
Sol.	$(k+3)x^2 + kx + 1 = 0$ <p>For equal roots, $k^2 - 4(k+3)1 = 0$</p> $\Rightarrow k^2 - 4k - 12 = 0$ $\Rightarrow k = 6, -2$	<p>1</p> <p>$\frac{1}{2}$</p> <p>$\frac{1}{2}$</p>
SECTION – B		
7.	Write the steps of construction for constructing a pair of tangents to a circle of radius 4 cm from a point P , at a distance of 7 cm from its centre O .	
Sol.	<p>(i) Draw a circle of radius 4 cm with centre O</p> <p>(ii) Take a point P at a distance of 7 cm from O</p> <p>(iii) Construct a circle with OP as diameter to intersect the first circle at Q and R</p> <p>(iv) Join PQ and PR to get the tangents</p>	3

8.(a)	As observed from the top of a lighthouse 60 m high from the sea level, the angles of depression of two ships are 45° and 60°. If one ship is exactly behind the other on the same side of the lighthouse, then find the distance between the two ships. [Use $\sqrt{3} = 1.732$]																			
Sol.	<div><div>$\frac{AB}{AC} = \tan 60^\circ = \sqrt{3}$$\Rightarrow AC = y = \frac{60}{\sqrt{3}} = 20\sqrt{3} \text{ m}$$\frac{AB}{AD} = \tan 45^\circ = 1$$\Rightarrow AD = x = 60 \text{ m}$$\therefore CD = 60 - 20\sqrt{3} = 60 - 20 \times 1.732$$= 60 - 34.64 = 25.36 \text{ m}$</div><div></div></div>	<div>1</div> <div>1</div> <div>1</div>																		
(b)	<div>Or</div> <div>A 1.6 m tall boy stands at a distance of 3 m from a lamp-post and casts a shadow of length 4 m on the ground. Find the height of the lamp-post.</div>																			
Sol.	<div><div>Let the height of lamp post be h m</div><div>$\tan \theta = \frac{1.6}{4} = 0.4$<div>Also $\tan \theta = \frac{h}{7}$</div><div>$\therefore \frac{h}{7} = 0.4$</div><div>$\Rightarrow h = 2.8 \text{ m}$</div></div><div></div></div>	<div>1</div> <div>1</div> <div>1</div>																		
9.	<div>The following frequency distribution shows the ages of 50 policyholders. Calculate the median age, if policies are given only to persons having age 18 years onwards, but less than 60 years.</div> <div><table><tr><th>Age (in years)</th><th>Number of Policyholders</th></tr><tr><td>Below 20</td><td>1</td></tr><tr><td>Below 30</td><td>12</td></tr><tr><td>Below 40</td><td>39</td></tr><tr><td>Below 50</td><td>46</td></tr><tr><td>Below 60</td><td>50</td></tr></table></div>	Age (in years)	Number of Policyholders	Below 20	1	Below 30	12	Below 40	39	Below 50	46	Below 60	50							
Age (in years)	Number of Policyholders																			
Below 20	1																			
Below 30	12																			
Below 40	39																			
Below 50	46																			
Below 60	50																			
Sol.	<div><table><tr><td></td><td>18–20</td><td>20–30</td><td>30–40</td><td>40–50</td><td>50–60</td></tr><tr><td><i>f</i></td><td>1</td><td>11</td><td>27</td><td>7</td><td>4</td></tr><tr><td><i>c.f.</i></td><td>1</td><td>12</td><td>39</td><td>46</td><td>50</td></tr></table></div>		18–20	20–30	30–40	40–50	50–60	<i>f</i>	1	11	27	7	4	<i>c.f.</i>	1	12	39	46	50	<div>Correct table</div> <div>1½</div>
	18–20	20–30	30–40	40–50	50–60															
<i>f</i>	1	11	27	7	4															
<i>c.f.</i>	1	12	39	46	50															

	Median class = 30–40 Median = $30 + \frac{25-12}{27} \times 10 = 34.8$ \therefore Median age is 34.8 years	$\frac{1}{2}$ 1												
10.	The table below shows the daily expenditure on food of 50 households of a locality. Find the mean daily expenditure. <table><tr><th>Daily Expenditure (in ₹)</th><th>Number of Households</th></tr><tr><td>200 – 250</td><td>8</td></tr><tr><td>250 – 300</td><td>10</td></tr><tr><td>300 – 350</td><td>12</td></tr><tr><td>350 – 400</td><td>10</td></tr><tr><td>400 – 450</td><td>10</td></tr></table>	Daily Expenditure (in ₹)	Number of Households	200 – 250	8	250 – 300	10	300 – 350	12	350 – 400	10	400 – 450	10	
Daily Expenditure (in ₹)	Number of Households													
200 – 250	8													
250 – 300	10													
300 – 350	12													
350 – 400	10													
400 – 450	10													
Sol.	x_i : 225 275 325 375 425 f_i : 8 10 12 10 10 = 50 $f_i x_i$: 1800 2750 3900 3750 4250 = 16450 Mean = $\frac{\sum f_i x_i}{\sum f_i} = \frac{16450}{50} = 329$ \therefore Mean daily expenditure is ₹ 329	Correct table 2 1												
	SECTION – C													
11.(a)	If two circles touch each other externally, then prove that the point of contact lies on the line joining their centres.													
Sol.	Let LM be the common tangent at the point of contact R $\Rightarrow \angle PRL = 90^\circ$ $\angle QRL = 90^\circ$ $\Rightarrow \angle PRQ = 180^\circ$ $\Rightarrow R$ lies on PQ <div></div> Or	1 1 1 1												
(b)	Prove that the lengths of two tangents drawn from an external point to a circle are equal.													
Sol.	Correct given, to prove, construction Correct proof	$1\frac{1}{2}$ $2\frac{1}{2}$												

<p>12.</p> <p>Sol.</p>	<p>At a point on the level ground, the angle of elevation of the top of a vertical tower is found to be α, such that $\tan \alpha = \frac{5}{12}$. On walking 192 m towards the tower, the angle of elevation β is such that $\tan \beta = \frac{3}{4}$. Find the height of the tower.</p> $\frac{h}{x+192} = \frac{5}{12} \quad \dots\dots\dots (i)$ <p>and $\frac{h}{x} = \frac{3}{4} \quad \dots\dots\dots (ii)$</p> <p>Solving equation (i) and (ii), we get</p> $h = 180 \text{ m}$ 	<p>1</p> <p>1</p> <p>2</p>
<p>13.</p> <p>Sol.</p>	<p>While buying an expensive item like a house or a car, it becomes easier for a middle-class person to take a loan from a bank and then repay the loan along with interest in easy instalments.</p> <p>Aman buys a car by taking a loan of ₹ 2,36,000 from the bank and starts repaying the loan in monthly instalments. He pays ₹ 2,000 as the first instalment and then increases the instalment by ₹ 500 every month.</p> <p>(a) Find the amount he pays in the 25th instalment.</p> <p>(b) Find the total amount paid by him in first 25 instalments.</p> <p>He pays 2000, 2500, 3000,</p> <p>It is an A.P. where $a = 2000$, $d = 500$</p> <p>(a) $a_{25} = 2000 + 24 \times 500 = ₹ 14,000$</p> <p>The total amount paid in the 25th instalment is ₹ 14,000</p> <p>(b) $S_{25} = \frac{25}{2} [2000 + 14000]$</p> <p>$= ₹ 2,00,000$</p> <p>The total amount paid by him in first 25 instalments is ₹ 2,00,000</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>

<p>14.</p> <p>Sol.</p>	<p>Conical bottom tanks in which an inverted cone at the bottom is surmounted by a cylinder of same diameter, are very advantageous in industry, specially where getting every last drop from the tank is important.</p> <p>Vikas designed a conical bottom tank where the height of the conical part is equal to its radius and the height of the cylindrical part is two times of its radius. The tank is closed from the top.</p> <p>(a) If the radius of the cylindrical part is 3 m, then find the volume of the tank.</p> <p>(b) Find the ratio of the volume of the cylindrical part to the volume of the conical part.</p> <p>Let radius = $r \Rightarrow$ Height of cone = r Height of cylinder = $2r$ (a) $r = 3\text{m}$</p> $V = \pi r^2 \cdot 2r + \frac{1}{3} \pi r^2 \cdot r$ $= \frac{7}{3} \pi r^3$ $= \frac{7}{3} \times \frac{22}{7} \times 3 \times 3 \times 3 = 198 \text{ m}^3 \text{ or } 63\pi \text{ m}^3$ <p>(b)</p> $\frac{\text{Volume of cylinder}}{\text{Volume of cone}} = \frac{\pi r^2 \cdot 2r}{\frac{1}{3} \pi r^2 \cdot r}$ $= \frac{6}{1}$ <p>i.e. 6 : 1</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>
--------------------------------------	---	-------------------------------------

* * *