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Secondary School Examination-2020

Marking Scheme - Mathematics 430/C/1, 430/C/2, 430/C/3

General instructions

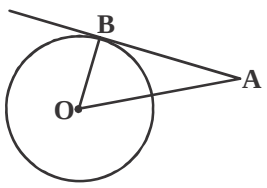
1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully. **Evaluation is a 10-12 days mission for all of us. Hence, it is necessary that you put in your best effortsin this process.**
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. **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.**
3. 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.
4. Evaluators will mark(√) wherever answer is correct. For wrong answer 'X"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.**
5. 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.
6. 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.
7. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out.
8. No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
9. A full scale of marks 80 (example 0-80 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
10. 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).
11. 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 a reply.
    - 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.
    - 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.
12. 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.
13. 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.
14. The Examiners should acquaint themselves with the guidelines given in the Guidelines for spot Evaluation before starting the actual evaluation.
15. 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.
16. 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.

QUESTION PAPER CODE 430/C/1

EXPECTED ANSWER/VALUE POINTS

SECTION – A

Q. No. 1 to 10 are multiple choice type question of 1 mark each.
Select the correct option.

Q.No.		Marks
1.	The decimal expansion of $\frac{27}{2^2 \times 5^3}$ is **(a)** 0.027 **(b)** 0.054 **(c)** 0.540 **(d)** 0.135 **Ans:** (b) 0.054	1
2.	The roots of the quadratic equation $x^2 + 4x + 5 = 0$ are **(a)** real **(b)** real and distinct **(c)** not real **(d)** real and equal **Ans:** (c) not real	1
	OR	
	"The product of two consecutive even integers is 528." The quadratic equation corresponding to the above statement, is **(a)** $x(x + 2) = 528$ **(b)** $2x(x + 4) = 528$ **(c)** $(1 + x) 2x = 528$ **(d)** $2x(2x + 1) = 528$ **Ans:** (a) $x(x + 2) = 528$	1
3.	The distance of point P(4, – 5) from origin is **(a)** 3 units **(b)** $\sqrt{40}$ units **(c)** 1 units **(d)** $\sqrt{41}$ units **Ans:** (d) $\sqrt{41}$ units	1
4.	AB and CD are two parallel tangents to a circle of radius 5 cm. The distance between the tangents is **(a)** $\sqrt{50}$ cm **(b)** 10 cm **(c)** 5 cm **(d)** $2\sqrt{5}$ cm **Ans:** (b) 10 cm	1
5.	In Figure 1, AB is a tangent to the circle with centre at O from an external point A. If OA = 6 cm and OB = $3\sqrt{3}$ cm, then the length of the tangent is  Figure-1 **(a)** 3 cm **(b)** $3\sqrt{3}$ cm **(c)** 9 cm **(d)** $\sqrt{33}$ cm **Ans:** (a) 3 cm	1

6. The lines representing linear equations x = 6 and y = 6 are

(a) parallel **(b)** intersecting

(c) coincident **(d)** passing through (0, 0)

Ans: (b) intersecting **1**

7. Which of the following cannot be the probability of an event ?

(a) $\frac{3}{20}$ **(b)** $\frac{2}{3}$ **(c)** $\frac{1.4}{2}$ **(d)** $\frac{1}{0.2}$

Ans: (d) $\frac{1}{0.2}$ **1**

8. The value of tan 30° × tan 60° is

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

Ans: (a) 1 **1**

9. The common difference of the A.P. $2, 2\sqrt{2}, 3\sqrt{2}, 4\sqrt{2}, \ldots$ is

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

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

10. The centre of the circle having end points of its one diameter as (– 4, 2) and (4, – 3) is

(a) (2, – 1) **(b)** (0, – 1) **(c)** $\left(0, -\frac{1}{2}\right)$ **(d)** $\left(4, -\frac{5}{2}\right)$

Ans: (c) $\left(0, -\frac{1}{2}\right)$ **1**

In Q. Nos. 11 to 15, fill in the blanks. Each question is of 1 mark.

11. If two triangles are similar, their corresponding sides are _____.

Ans: proportional **1**

12. Mode is the value of the observation having _____ frequency.

Ans: maximum **1**

13. If S_n denotes the sum of first n terms of an A.P., then $S_2 - S_1 =$ _____.

Ans: a_2 or a + d **1**

14. Area of a circular track having inner and outer radii r_1 and r_2 respectively is _____.

Ans: $\pi\left(r_2^2 - r_1^2\right)$ **1**

15. If the probability of non-happening of an event E is 0·75, then P(E) = _____.

Ans: 0.25 **1**

Q. Nos. 16 to 20 are short answer type questions of 1 mark each.

16. Using the graph of a polynomial y = p(x) in Figure 2, write the number of zeroes of p(x).

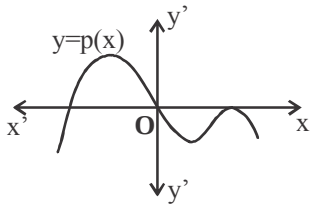


Figure-2

Ans: Number of zeroes = 3 — **1**

OR

Form a quadratic polynomial whose sum and product of zeroes are 0 and -6 respectively.

Ans: $x^2 - 6$ — **1**

17. If 2 sin A = 1, then find the value of tan A.

Ans: $\sin A = \frac{1}{2}$ — **1/2**

$A = 30°$

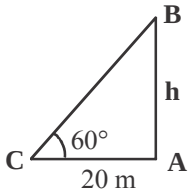
$\tan A = \frac{1}{\sqrt{3}}$ — **1/2**

18. Both types of ogives drawn on the same graph intersect at (45, 60). Find the median of the distribution.

Ans: 45 — **1**

19. The angle of elevation of the top of a building from a point on the ground which is 20 m away from the foot of the building, is 60°. Find the height of the building.

Ans:



$\tan 60° = \frac{h}{20}$ — **1/2**

$h = 20\sqrt{3}$ m — **1/2**

20. Find the area of the triangle formed by the points A(0, 0), B(4, 0) and C(0, 9).

Ans: Area of triangle $= \frac{1}{2}[0(0-9) + 4(9-0) + 0(0-0)]$ — **1/2**

$= 18$ sq. units — **1/2**

SECTION – B

Q. Nos. 21 to 26 carry 2 marks each.

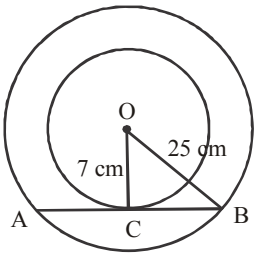
21. It is given that HCF (504, 2200) = 8, then find LCM (504, 2200).

Ans: $\text{LCM} = \dfrac{504 \times 2200}{8}$ **1 1/2**

$= 138600$ **1/2**

22. Two concentric circles are of radii 25 cm and 7 cm. Find the length of the chord of the larger circle that touches the smaller circle.

Ans:



$CB^2 = OB^2 - OC^2$ **1**

$CB^2 = (25)^2 - (7)^2$

$CB^2 = 576$

$CB = 24\,\text{cm}$ **1/2**

$AB = 48$ cm **1/2**

OR

In Figure 3, TA and TB are two tangents to a circle with centre at O. If $\angle OAB = 15°$, then find the value of $\angle ATB$.

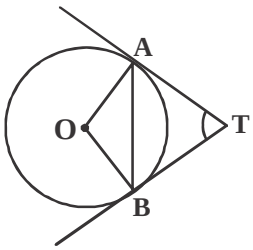


Figure-3

Ans: In $\angle AOB$, $OA = OB$

$\Rightarrow \angle OAB = \angle OBA = 15°$ **1/2**

$\angle AOB = 180° - 15° - 15°$

$= 150°$ **1**

$\angle ATB = 180° - 150°$

$= 30°$ **1/2**

23. If α and β are zeroes of the polynomial $p(x) = 3x^2 - 8x - 3$, then find the value of $(\alpha + \beta)^2 - 2\alpha\beta$.

Ans: $\alpha + \beta = \dfrac{8}{3}$ **1/2**

$\alpha\beta = -\dfrac{3}{3} = -1$ **1/2**

$(\alpha+\beta)^2 - 2\alpha\beta = \left(\dfrac{8}{3}\right)^2 - 2(-1) = \dfrac{82}{9}$ **1**

24. How many two-digit numbers are divisible by 7 ?

Ans: AP is 14, 21, …, 98 — **1**

$98 = 14 + (n-1)7$ — **1/2**

$\Rightarrow n = 13$ — **1/2**

OR

Find the sum of the first 50 natural numbers.

Ans: First 50 natural numbers are

1, 2, 3, … 50 — **1/2**

$S_{50} = \frac{50}{2}(2+(50-1)1)$ — **1**

$= 25 \times 51$

$= 1275$ — **1/2**

25. If $\cos(A+B) = \sin(A-B) = \frac{1}{2}$, $0 < A+B \leq 90°$ and $A > B$, then find the values of A and B.

Ans: $\cos(A+B) = \frac{1}{2}$

$A + B = 60° \quad \ldots$ (i) — **1/2**

$\sin(A-B) = \frac{1}{2}$

$A - B = 30° \quad \ldots$ (ii) — **1/2**

Solving (i) & (ii)

$A = 45°$ — **1/2**

$B = 15°$ — **1/2**

26. A cone of height 24 cm and radius of base 6 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the radius of the sphere.

Ans: $\frac{1}{3}\pi(6)^2(24) = \frac{4}{3} \times \pi \times r^3$ — **1 1/2**

$\Rightarrow r^3 = 216$

$r = 6$ cm — **1/2**

SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. In Figure 4, $\angle ACB = 90°$ and $CD \perp AB$. Prove that $\frac{BC^2}{AC^2} = \frac{BD}{AD}$.

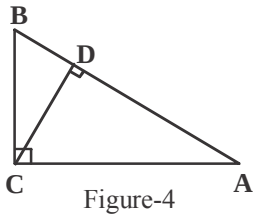


Figure-4

Ans: $\Delta ABC \sim \Delta CBD$ (By AA similarity) **1**

$$\frac{AB}{CB} = \frac{BC}{BD} = \frac{AC}{CD}$$

$\Rightarrow$ $CB^2 = AB \times BD$ … (i) **1/2**

Similarly $\Delta ABC \sim \Delta ACD$

$$\frac{AB}{AC} = \frac{BC}{CD} = \frac{AC}{AD}$$

$\Rightarrow$ $AC^2 = AB \times AD$ … (ii) **1**

By (i) and (ii)

$$\frac{CB^2}{AC^2} = \frac{AB \times BD}{AB \times AD} = \frac{BD}{AD}$$ **1/2**

28. Prove that $\frac{\cot A - \cos A}{\cot A + \cos A} = \sec^2 A + \tan^2 A - 2 \sec A \tan A$

Ans: $$LHS = \frac{\cot A - \cos A}{\cot A + \cos A}$$

$$= \frac{\frac{1}{\tan A} - \frac{1}{\sec A}}{\frac{1}{\tan A} + \frac{1}{\sec A}}$$ **1**

$$= \frac{\sec A - \tan A}{\sec A + \tan A} \times \frac{\sec A - \tan A}{\sec A - \tan A}$$ **1**

$$= \frac{(\sec A - \tan A)^2}{\sec^2 A - \tan^2 A}$$

$$= \sec^2 A + \tan^2 A - 2 \sec A \tan A = RHS$$ **1**

OR

Prove that $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$

Ans: LHS $= \frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$

$= \frac{\sin\theta(1 - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$ **1**

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

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

$= \tan\theta = \text{RHS}$ **1**

29. Draw a circle of radius 3 cm. Construct a pair of tangents to the circle from a point, 7 cm away from its centre.

Ans: Drawing a circle of radius 3 cm. **1**

Drawing correct pair of tangents. **2**

30. Find the area of the shaded region in Figure 5, if radii of the two concentric circles with centre O are 7 cm and 14 cm respectively and $\angle AOC = 40°$.

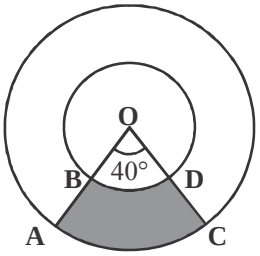


Figure-5

Ans: Area of shaded region $= \frac{\theta}{360°}\pi\left((14)^2 - (7)^2\right)$ **1$\frac{1}{2}$**

$= \frac{40°}{360°} \times \pi \times 21 \times 7$ **1**

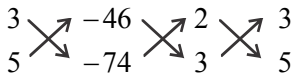
$= \frac{49}{3}\pi \text{ cm}^2$ or $\frac{154}{3} \text{ cm}^2$ **1/2**

31. Solve the following pair of linear equations using cross-multiplication method:

$2x + 3y = 46$

$3x + 5y = 74$

Ans:



1

$$\frac{x}{-222+230} = \frac{y}{-138+148} = \frac{1}{10-9}$$ **1**

$x = 8, \quad y = 10$ **1/2+1/2**

OR

Solve the following pair of equations for x and y :

$\frac{10}{x} + \frac{2}{y} = 4$

$\frac{15}{x} - \frac{15}{y} = -2$

Ans: Let $\frac{1}{x} = A, \quad \frac{1}{y} = B$

Equation reduces to

$10A + 2B = 4$

$15A - 5B = -2$ **1**

On solving $A = \frac{1}{5}, \quad B = 1$ **1/2+1/2**

$\Rightarrow \quad x = 5, \quad y = 1$ **1/2+1/2**

32. Prove that $2 + 5\sqrt{3}$ is an irrational number, it is being given that $\sqrt{3}$ is an irrational number.

Ans: Let $2 + 5\sqrt{3}$ be a rational number

$2 + 5\sqrt{3} = x$, where x is rational **1**

$5\sqrt{3} = x - 2$

$\sqrt{3} = \frac{x-2}{5}$ **1$\frac{1}{2}$**

irrational = rational

which is a contradiction.

This contradiction has arisen because of our wrong assumption. **1/2**

Hence $2 + 5\sqrt{3}$ is irrational.

OR

Define a prime number and a composite number. Hence explain why $7 \times 11 \times 13 + 13$ is a composite number.

Ans: **Prime Number:** A number which have exactly two factors 1 and the number itself. **1**

Composite Number: A number having more than two factors. **1**

$$7 \times 11 \times 13 + 13 = 13(7 \times 11 + 1)$$

$$= 13 \times 78 \quad \textbf{1/2}$$

The resulting number have more then 2 factors.
Hence, it is composite. **1/2**

33. A box contains 20 balls bearing numbers 1, 2, 3, ..., 20. A ball is drawn at random from the box. Find the probability that the number on the ball is

(i) divisible by 2. (ii) a prime number.

(iii) not divisible by 10.

Ans:

(i) No. divisible by 2 are (2, 4, 6, 8, 10, 12, 14, 16, 18, 20) **1/2**

$$P(\text{divisible by } 2) = \frac{10}{20} \text{ or } \frac{1}{2} \quad \textbf{1/2}$$

(ii) Prime numbers are (2, 3, 5, 7, 11, 13, 17, 19) **1/2**

$$P(\text{prime number}) = \frac{8}{20} \text{ or } \frac{2}{5} \quad \textbf{1/2}$$

(iii) No. not divisible by 10 are (1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19) **1/2**

$$P(\text{no. not divisible by } 10) = \frac{18}{20} \text{ or } \frac{9}{10} \quad \textbf{1/2}$$

34. Sarita has a kitchen garden of size 10 m × 10 m in her bungalow. She wants to grow vegetables that are used daily in her kitchen. She has divided the whole kitchen garden into a 10 × 10 grid as shown in Figure 6. For that she has put manure in the soil to increase the output. She has planted a tomato plant at A, a coriander plant at C and a green chilli plant at B. She invited her friend Sita to show her the kitchen garden. Sita says that saplings at A, B and C seem to form an equilateral triangle.

Read the above passage and answer the following questions :

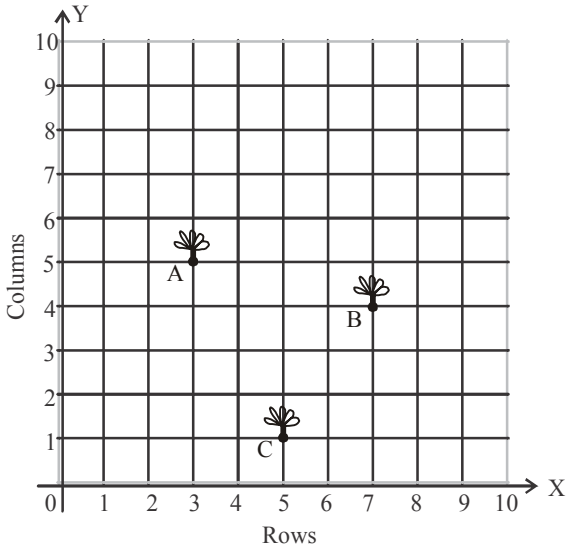


Figure 6

(i) Find the coordinates of the points A, B and C.

(ii) Is it correct to say that "ΔABC is an equilateral triangle"? Confirm your answer by using the distance formula.

Ans: (i) Coordinate of A(3, 5) **1/2**

B(7, 4) **1/2**

C(5, 1) **1/2**

(ii) $AB = \sqrt{(3-7)^2+(5-4)^2} = \sqrt{17}$ units

$BC = \sqrt{(7-5)^2+(4-1)^2} = \sqrt{13}$ units

$CA = \sqrt{(5-3)^2+(1-5)^2} = \sqrt{20}$ units

Finding any two **1**

It is not an equilateral triangle. **1/2**

SECTION – D

Question numbers 35 to 40 carry 4 marks each.

35. The difference of squares of two numbers is 204. The square of the smaller number is 4 less than 10 times the larger number. Find the two numbers.

Ans: Let the numbers are x and $(x > y)$

$x^2 - y^2 = 204$ …(i) **1**

$y^2 = 10x - 4$ …(ii) **1**

By (i) and (ii)

$x^2 - 10x + 4 - 204 = 0$

$x^2 - 10x + 200 = 0$ **1**

$(x - 20)(x + 10) = 0$

$x = 20, \quad x = -10$ (rejected) **1/2**

$y = 14$ **1/2**

36. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.

Ans: For correct given, to prove, construction and figure $4 \times \frac{1}{2} = 2$

For correct proof **2**

OR

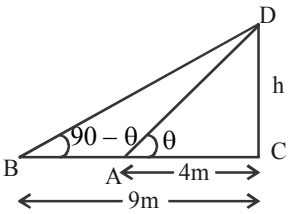
Prove that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Ans: For correct given, to prove, construction and figure $4 \times \frac{1}{2} = 2$

For correct proof **2**

37. The angles of elevation of the top of a tower from two points at a distance of 4 m and 9 m from the base of the tower and in the same straight line with it, are θ and $(90° - \theta)$ respectively. Prove that the height of the tower is 6 m.

Ans:



Correct figure **1**

$\tan \theta = \frac{h}{4}$ … (i) **1**

$\tan (90° - \theta) = \frac{h}{9}$

$\cot \theta = \frac{h}{9}$ … (ii) **1**

By (i) and (ii)

$\tan \theta \times \cot \theta = \frac{h}{4} \times \frac{h}{9}$ **1/2**

$\Rightarrow \quad h^2 = 36$

$\Rightarrow \quad h = 6$ m **1/2**

38. The radii of the circular ends of a bucket 30 cm high and open at the top are 21 cm and 7 cm. Find the capacity of the bucket. Also find the surface area of metal sheet required to make the bucket if its slant height is approximately 33 cm.

Ans:

Capacity of bucket $= \frac{1}{3}\pi \times 30\left((21)^2 + (7)^2 + 21 \times 7\right)$ **1**

$= \frac{1}{3}\pi \times 30 \times 637$ **1/2**

$= 6370\pi \text{ cm}^3$ or 20020 cm^3 **1/2**

Surface Area of Bucket $= \pi \times 33(21 + 7) + \pi(7)^2$ **1**

$= 924\pi + 49\pi$ **1/2**

$= 973\pi$ or $3058\ cm^2$ **1/2**

39. Obtain the other zeroes of the polynomial $p(x) = x^4 + 2x^3 - 7x^2 - 8x + 12$ if two of its zeroes are (-2) and (-3).

Ans: Zeroes are $-2, -3$

factors are $(x + 2), (x + 3)$ **1/2**

$g(x) = (x + 2)(x + 3) = x^2 + 5x + 6$ **1/2**

$\frac{x^4 + 2x^3 - 7x^2 - 8x + 12}{x^2 + 5x + 6} = x^2 - 3x + 2$ **2**

$x^2 - 3x + 2 = (x - 2)(x - 1)$ **1/2**

Other zeroes are 2, 1 **1/2**

OR

Find the zeroes of a quadratic polynomial $2x^2 + 3x - 14$ and verify the relationship between the zeroes and its coefficients.

Ans:

$2x^2 + 3x - 14 = 2x^2 + 7x - 4x - 14$ **1**

$= (x - 2)(2x + 7)$ **1/2**

$x = 2, -\frac{7}{2}$ **1/2**

Sum of zeroes $= 2 + \left(-\frac{7}{2}\right) = -\frac{3}{2}$ **1/2**

Product of zeroes $= 2 \times -\frac{7}{2} = -7$ **1/2**

$-\frac{b}{a} = -\frac{3}{2}$ **1/2**

$\frac{c}{a} = -\frac{14}{2} = -7$ **1/2**

$\Rightarrow$ Hence, sum of zeroes $= -\frac{b}{a}$

Product of zeroes $= \frac{c}{a}$

40. Find the mean of the following distribution :

Class :	20-50	50-80	80-110	110-140	140-170	170-200
Frequency:	5	8	15	6	12	4

Ans:

Class	f_i	x_i	$f_i x_i$
20 – 50	5	35	175
50 – 80	8	65	520
80 – 110	15	95	1425
110 – 140	6	125	750
140 – 170	12	155	1860
170 – 200	4	185	740
Total	50		5470

Correct table **2**

$\text{mean} = \frac{\Sigma f_i x_i}{\Sigma f_i}$ **1/2**

$= \frac{5470}{50}$ **1**

$= 109.4$ **1/2**

OR

Draw a 'less than' ogive for the following distribtuion :

Class :	100-150	150-200	200-250	250-300	300-350
Frequency:	8	12	15	5	10

Ans: Getting points (150, 8), (200, 20), (250, 35), (300, 40), (350, 50) **2**

Plotting correct points **1**

Joining and getting correct ogive **1**

QUESTION PAPER CODE 430/C/2

EXPECTED ANSWER/VALUE POINTS

SECTION – A

Q. No. 1 to 10 are multiple choice type question of 1 mark each.
Select the correct option.

Q.No.		Marks
1.	Which of the following cannot be the probability of an event ? **(a)** $\frac{3}{20}$ **(b)** $\frac{2}{3}$ **(c)** $\frac{1.4}{2}$ **(d)** $\frac{1}{0.2}$ **Ans:** (d) $\frac{1}{0.2}$	**1**
2.	The value of tan 30° × tan 60° is **(a)** 1 **(b)** $\frac{1}{3}$ **(c)** 3 **(d)** $\frac{1}{2}$ **Ans:** (a) 1	**1**
3.	The n^{th} term of the A.P. $\sqrt{2}, 2\sqrt{2}, 3\sqrt{2}, \ldots$ is **(a)** $n\sqrt{2}$ **(b)** $\sqrt{2n}$ **(c)** $2\sqrt{n}$ **(d)** $(n-1)\sqrt{2}$ **Ans:** (a) $n\sqrt{2}$	**1**
4.	The centre of the circle having end points of its one diameter as (– 4, 2) and (4, – 3) is **(a)** (2, – 1) **(b)** (0, – 1) **(c)** $\left(0,-\frac{1}{2}\right)$ **(d)** $\left(4,-\frac{5}{2}\right)$ **Ans:** (c) $\left(0,-\frac{1}{2}\right)$	**1**
5.	The lines representing linear equations x = 6 and y = 6 are **(a)** parallel **(b)** intersecting **(c)** coincident **(d)** passing through (0, 0) **Ans:** (b) intersecting	**1**

6. In Figure 1, AB is a tangent to the circle with centre at O from an external point A. If OA = 6 cm and OB = $3\sqrt{3}$ cm, then the length of the tangent is

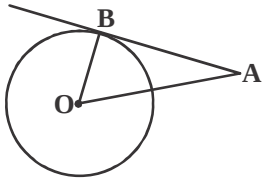


Figure-1

(a) 3 cm **(b)** $3\sqrt{3}$ cm **(c)** 9 cm **(d)** $\sqrt{33}$ cm

Ans: (a) 3 cm **1**

7. AB and CD are two parallel tangents to a circle of radius 5 cm. The distance between the tangents is

(a) $\sqrt{50}$ cm **(b)** 10 cm **(c)** 5 cm **(d)** $2\sqrt{5}$ cm

Ans: (b) 10 cm **1**

8. The decimal expansion of $\frac{33}{5^2 \times 2^2 \times 3}$ is

(a) 0.33 **(b)** 0.11 **(c)** 0.011 **(d)** 3.3

Ans: (b) 0.11 **1**

9. The roots of the quadratic equation $x^2 + 4x + 5 = 0$ are

(a) real **(b)** real and distinct

(c) not real **(d)** real and equal

Ans: (c) not real **1**

OR

" The product of two consecutive even integers is 528." The quadratic equation corresponding to the above statement, is

(a) x (x + 2) = 528 **(b)** 2x (x + 4) = 528

(c) (1 + x) 2x = 528 **(d)** 2x (2x + 1) = 528

Ans: (a) x (x + 2) = 528 **1**

10. The distance of point P(4, – 5) from origin is

(a) 3 units **(b)** $\sqrt{40}$ units **(c)** 1 units **(d)** $\sqrt{41}$ units

Ans: (d) $\sqrt{41}$ units **1**

In Q. Nos. 11 to 15, fill in the blanks. Each question is of 1 mark.

11. Area of a circular track having inner and outer radii r_1 and r_2 respectively is _____.

Ans: $\pi\left(r_2^2 - r_1^2\right)$ **1**

12. If S_n denotes the sum of first n terms of an A.P., then $S_2 - S_1 =$ _____.

Ans: a_2 or a + d — **1**

13. If the probability of non-happening of an event E is 0·75, then P(E) = _____.

Ans: 0.25 — **1**

14. Mode is the value of the observation having _____ frequency.

Ans: maximum — **1**

15. If two triangles are similar, their corresponding sides are _____.

Ans: proportional — **1**

Q. Nos. 16 to 20 are short answer type questions of 1 mark each.

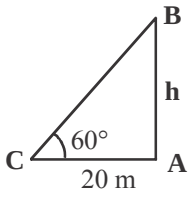
16. Find the area of the triangle formed by the points A(0, 0), B(4, 0) and C(0, 9).

Ans: Area of triangle $= \frac{1}{2}[0(0-9)+4(9-0)+0(0-0)]$ — **1/2**

$= 18 \text{ sq. units}$ — **1/2**

17. The angle of elevation of the top of a building from a point on the ground which is 20 m away from the foot of the building, is 60°. Find the height of the building.

Ans:



$\tan 60° = \frac{h}{20}$ — **1/2**

$h = 20\sqrt{3}$ m — **1/2**

18. Using the graph of a polynomial y = p(x) in Figure 2, write the number of zeroes of p(x).

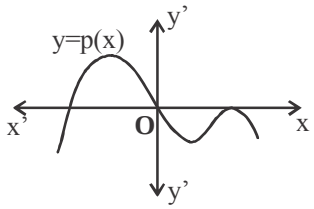


Figure-2

Ans: Number of zeroes = 3 — **1**

OR

Form a quadratic polynomial whose sum and product of zeroes are 0 and −6 respectively.

Ans: $x^2 - 6$ — **1**

19. If 2 sin A = 1, then find the value of tan A.

Ans: $\sin A = \frac{1}{2}$

$A = 30°$ **1/2**

$\tan A = \frac{1}{\sqrt{3}}$ **1/2**

20. Both types of ogives drawn on the same graph intersect at (30, 52).
Find the median of the distribution.

Ans: 30 **1**

SECTION – B

Q. Nos. 21 to 26 carry 2 marks each.

21. If $\cos (A + B) = \sin (A - B) = \frac{1}{2}$, $0 < A + B \leq 90°$ and $A > B$, then find the values of A and B.

Ans: $\cos (A + B) = \frac{1}{2}$

$A + B = 60°$ … (i) **1/2**

$\sin (A - B) = \frac{1}{2}$

$A - B = 30°$ … (ii) **1/2**

Solving (i) & (ii)

$A = 45°$ **1/2**

$B = 15°$ **1/2**

22. A cuboid measuring 1 cm × 2 cm × 4 cm is melted and recast into the shape of a cube. Find the length of each side of the cube.

Ans: $1 \times 2 \times 4 = a^3$ **1**

$\Rightarrow a = 2$ cm **1**

23. How many two-digit numbers are divisible by 7 ?

Ans: AP is 14, 21, …, 98 **1**

$98 = 14 + (n - 1)7$ **1/2**

$\Rightarrow n = 13$ **1/2**

OR

Find the sum of the first 50 natural numbers.

Ans: First 50 natural numbers are

1, 2, 3, … 50 **1/2**

$S_{50} = \frac{50}{2}(2 + (50-1)1)$ **1**

$= 25 \times 51$ **1/2**

$= 1275$

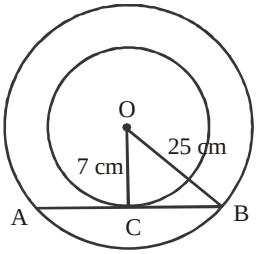
24. Check whether 9^n can end with the digit 0 for any positive integer n.

Ans: $9^n = (3 \times 3)^n$ **1**

As per the uniqueness of fundamental theorem of Arithemetic prime factorization of 9^n doesnt have 2 and 5 as its prime factors. So it will not end with digit 0 for any value of n. **1**

25. Two concentric circles are of radii 25 cm and 7 cm. Find the length of the chord of the larger circle that touches the smaller circle.

Ans:



$CB^2 = OB^2 - OC^2$

$CB^2 = (25)^2 - (7)^2$

$CB^2 = 576$

$CB = 24\,cm$

$AB = 48$ cm

OR

In Figure 3, TA and TB are two tangents to a circle with centre at O. If $\angle OAB = 15°$, then find the value of $\angle ATB$.

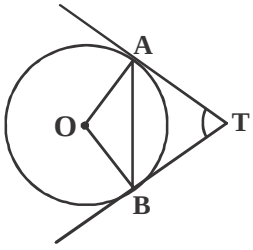


Figure-3

Ans: In $\angle AOB$, OA = OB

$\Rightarrow \angle OAB = \angle OBA = 15°$ **1/2**

$\angle AOB = 180° - 15° - 15°$

$= 150°$ **1**

$\angle ATB = 180° - 150°$

$= 30°$ **1/2**

26. If α and β are zeroes of the polynomial $p(x) = 3x^2 - 8x - 3$, then find the value of $(\alpha + \beta)^2 - 2\alpha\beta$.

Ans: $\alpha + \beta = \frac{8}{3}$ **1/2**

$\alpha\beta = -\frac{3}{3} = -1$ **1/2**

$(\alpha+\beta)^2 - 2\alpha\beta = \left(\frac{8}{3}\right)^2 - 2(-1) = \frac{82}{9}$ **1**

SECTION – C

Question numbers 27 to 34 carry 3 marks each.

27. Find the area of the shaded region in Figure 5, if radii of the two concentric circles with centre O are 7 cm and 14 cm respectively and $\angle AOC = 40°$.

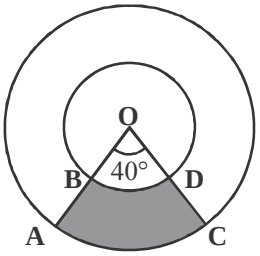


Figure-5

Ans: Area of shaded region $= \frac{\theta}{360°}\pi\left((14)^2 - (7)^2\right)$ **1$\frac{1}{2}$**

$= \frac{40°}{360°} \times \pi \times 21 \times 7$ **1**

$= \frac{49}{3}\pi \text{ cm}^2$ or $\frac{154}{3} \text{ cm}^2$ **1/2**

28. Solve the following pair of linear equations using cross-multiplication method:

$2x + 3y = 46$

$3x + 5y = 74$

Ans:

x	y	1
3	−46	3
5	−74	5

1

$\frac{x}{-222+230} = \frac{y}{-138+148} = \frac{1}{10-9}$ **1**

$x = 8, \quad y = 10$ **1/2+1/2**

OR

Solve the following pair of equations for x and y :

$$\frac{10}{x}+\frac{2}{y}=4$$

$$\frac{15}{x}-\frac{15}{y}=-2$$

Ans: Let $\frac{1}{x} = A, \quad \frac{1}{y} = B$

Equation reduces to

$10A + 2B = 4$

$15A - 5B = -2$ **1**

On solving $A = \frac{1}{5}, \quad B = 1$ **1/2+1/2**

$\Rightarrow \quad x = 5, \quad y = 1$ **1/2+1/2**

29. Prove that $4-5\sqrt{2}$ is an irrational number, given that $\sqrt{2}$ is an irrational number.

Ans: Let $4-5\sqrt{2}$ is a rational number

$\Rightarrow$ $4-5\sqrt{2}$ = x, where x is a rational **1**

$$\sqrt{2}=\frac{4-x}{5}$$

irrational = rational **1½**

which is contradiction. This contradiction has arisen because of our wrong assumption. hence $4-5\sqrt{2}$ is irrational **1/2**

OR

Show that any positive odd integer is of the form 4q + 1 or 4q + 3 where q is some integer.

Ans: Let a is any odd positive integer and q = 4

By applying Euclid's division lemma **1**

$a = 4q + r \quad 0 \le r < 4$

If r = 0, then a = 4q = 2(2q)

If r = 1, then a = 4q +1

If r = 2, then a = 4q + 2 = 2(2q + 1) **1½**

If r = 3, then a = 4q + 3

If r = 0 and 2, then a is even

If r = 1 and 3, then a is odd

$\Rightarrow$ 4q + 1 and 4q +3 are odd positive integer **1/2**

30. Sarita has a kitchen garden of size 10 m × 10 m in her bungalow. She wants to grow vegetables that are used daily in her kitchen. She has divided the whole kitchen garden into a 10 × 10 grid as shown in Figure 6. For that she has put manure in the soil to increase the output. She has planted a tomato plant at A, a coriander plant at C and a green chilli plant at B. She invited her friend Sita to show her the kitchen garden. Sita says that saplings at A, B and C seem to form an equilateral triangle.

Read the above passage and answer the following questions :

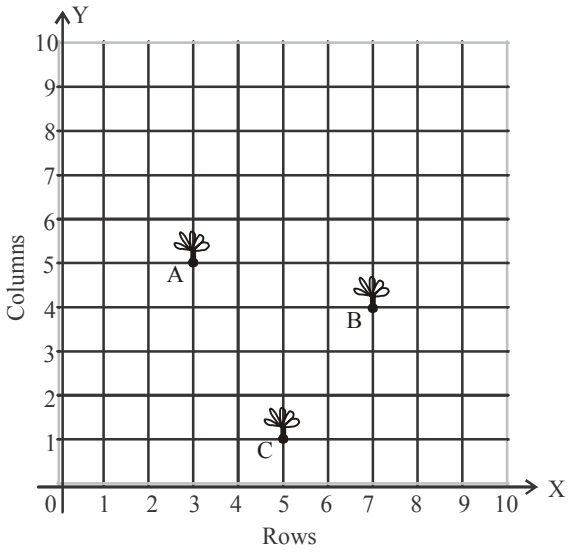


Figure 6

(i) Find the coordinates of the points A, B and C.

(ii) Is it correct to say that "ΔABC is an equilateral triangle"? Confirm your answer by using the distance formula.

Ans: (i) Coordinate of A(3, 5) **1/2**

B(7, 4) **1/2**

C(5, 1) **1/2**

(ii) $AB = \sqrt{(3-7)^2+(5-4)^2} = \sqrt{17}$ units

$BC = \sqrt{(7-5)^2+(4-1)^2} = \sqrt{13}$ units

$CA = \sqrt{(5-3)^2+(1-5)^2} = \sqrt{20}$ units

Finding any two **1**

It is not an equilateral triangle. **1/2**

31. A two-digit number is selected at random from the set of all 2-digit numbers. Find the probability that the number selected

(i) has same digits.

(ii) is a multiple of 10.

Ans: Total numbers = 90 — **1**

(i) No. having same digits (11, 22, 33, 44, 55, 66, 77, 88, 99) — **1/2**

P (No. having same digit) = $\frac{9}{90}$ or $\frac{1}{10}$ — **1/2**

(ii) No. of multiple of 10 (10, 20, 30, 40, 50, 60, 70, 80, 90) — **1/2**

P (No. is multiple of 10) = $\frac{9}{90}$ or $\frac{1}{10}$ — **1/2**

32. Construct an equilateral triangle of side 6 cm. Then construct a triangle whose sides are $\frac{2}{3}$ of the corresponding sides of the first triangle.

Ans: Construction of correct equilateral triangle — **1**

Construction of correct similar triangle — **2**

33. Prove that $\frac{\cot A - \cos A}{\cot A + \cos A} = \sec^2 A + \tan^2 A - 2\sec A \tan A$

Ans: LHS $= \frac{\cot A - \cos A}{\cot A + \cos A}$

$= \frac{\frac{1}{\tan A} - \frac{1}{\sec A}}{\frac{1}{\tan A} + \frac{1}{\sec A}}$ — **1**

$= \frac{\sec A - \tan A}{\sec A + \tan A} \times \frac{\sec A - \tan A}{\sec A - \tan A}$ — **1**

$= \frac{(\sec A - \tan A)^2}{\sec^2 A - \tan^2 A}$

$= \sec^2 A + \tan^2 A - 2 \sec A \tan A = \text{RHS}$ — **1**

OR

Prove that $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$

Ans: LHS $= \frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$

$= \frac{\sin\theta(1 - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$ — **1**

$= \frac{\sin\theta(1 - 2 + 2\cos^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$ — **1**

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

$= \tan\theta = \text{RHS}$ **1**

34. In Figure 6, $\angle ACB = 90°$ and $CD \perp AB$. Prove that $\frac{BC^2}{AC^2} = \frac{BD}{AD}$.

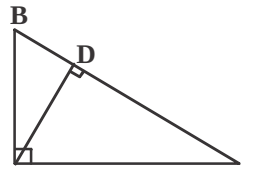


Figure-4

Ans: $\Delta ABC \sim \Delta CBD$ (By AA similarity) **1**

$$\frac{AB}{CB} = \frac{BC}{BD} = \frac{AC}{CD}$$

$\Rightarrow \quad CB^2 = AB \times BD \quad \ldots$ (i) **1/2**

Similarly $\Delta ABC \sim \Delta ACD$

$$\frac{AB}{AC} = \frac{BC}{CD} = \frac{AC}{AD}$$

$\Rightarrow \quad AC^2 = AB \times AD \quad \ldots$ (ii) **1**

By (i) and (ii)

$$\frac{CB^2}{AC^2} = \frac{AB \times BD}{AB \times AD} = \frac{BD}{AD}$$ **1/2**

SECTION – D

Question numbers 35 to 40 carry 4 marks each.

35. The radii of the circular ends of a bucket 30 cm high and open at the top are 21 cm and 7 cm. Find the capacity of the bucket. Also find the surface area of metal sheet required to make the bucket if its slant height is approximately 33 cm.

Ans:

Capacity of bucket $= \frac{1}{3}\pi \times 30\left((21)^2 + (7)^2 + 21 \times 7\right)$ **1**

$= \frac{1}{3}\pi \times 30 \times 637$ **1/2**

$= 6370\pi \text{ cm}^3 \quad \text{or} \quad 20020 \text{ cm}^3$ **1/2**

Surface Area of Bucket $= \pi \times 33(21 + 7) + \pi(7)^2$ **1**

$= 924\pi + 49\pi$ **1/2**

$= 973\pi \quad \text{or} \quad 3058 \text{ cm}^2$ **1/2**

36. Find the mean of the following distribution :

Class :	20-50	50-80	80-110	110-140	140-170	170-200
Frequency:	5	8	15	6	12	4

Ans:

Class	f_i	x_i	$f_i x_i$
20 – 50	5	35	175
50 – 80	8	65	520
80 – 110	15	95	1425
110 – 140	6	125	750
140 – 170	12	155	1860
170 – 200	4	185	740
Total	50		5470

Correct table — **2**

mean $= \frac{\Sigma f_i x_i}{\Sigma f_i}$ — **1/2**

$= \frac{5470}{50}$ — **1**

$= 109.4$ — **1/2**

OR

Draw a 'less than' ogive for the following distribtuion :

Class :	100-150	150-200	200-250	250-300	300-350
Frequency:	8	12	15	5	10

Ans: Getting points (150, 8), (200, 20), (250, 35), (300, 40), (350, 50) — **2**

Plotting correct points — **1**

Joining and getting correct ogive — **1**

37. Sum of the areas of two squares is 452 m^2. If the difference of their perimeters is 8 m, find the sides of the two squares.

Ans: Let sides of two square x m and y m (x > y)

$x^2 + y^2 = 452$ …(i) — **1**

$4x - 4y = 8$ …(ii) — **1**

$\Rightarrow x - y = 2$

By (i) & (ii)

$x^2 + (x - 2)^2 = 452$

$\Rightarrow x^2 - 2x - 224 = 0$ — **1**

$x^2 - 16x + 14x - 224 = 0$

$(x - 16)(x + 14) = 0$

$x = 16, x = -14$ (rejected) — **1/2**

$y = 14$ — **1/2**

Sides are 16 m and 14 m

38. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.

Ans: For correct given, to prove, construction and figure — $4 \times \frac{1}{2} = 2$

For correct proof — **2**

OR

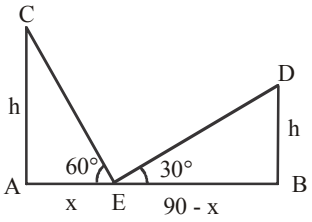
Prove that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Ans: For correct given, to prove, construction and figure — $4 \times \frac{1}{2} = 2$

For correct proof — **2**

39. Two poles of equal heights are standing opposite each other, on either side of the road which is 90 m wide. From a point 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.

Ans:



Correct figure — **1**

$$\tan 60° = \frac{h}{x}$$

$$x = \frac{h}{\sqrt{3}} \quad \ldots(i)$$ — **1**

$$\tan 30° = \frac{h}{90 - x}$$

$$90 - x = h\sqrt{3} \quad \ldots(ii)$$ — **1**

On solving (i) and (ii)

$$h = \frac{90\sqrt{3}}{4} \text{ m}$$ — **1**

40. Obtain the other zeroes of the polynomial $p(x) = x^4 + 2x^3 - 7x^2 - 8x + 12$ if two of its zeroes are (-2) and (-3).

Ans: Zeroes are $-2, -3$

factors are $(x + 2), (x + 3)$ — **1/2**

$g(x) = (x + 2)(x + 3) = x^2 + 5x + 6$ — **1/2**

$$\frac{x^4 + 2x^3 - 7x^2 - 8x + 12}{x^2 + 5x + 6} = x^2 - 3x + 2$$ — **2**

$$x^2 - 3x + 2 = (x - 2)(x - 1)$$ — **1/2**

Other zeroes are 2, 1 — **1/2**

OR

Find the zeroes of a quadratic polynomial $2x^2 + 3x - 14$ and verify the relationship between the zeroes and its coefficients.

Ans:

$$2x^2 + 3x - 14 = 2x^2 + 7x - 4x - 14$$ **1**

$$= (x - 2)(2x + 7)$$ **1/2**

$$x = 2, \ -\frac{7}{2}$$ **1/2**

$$\text{Sum of zeroes} = 2 + \left(-\frac{7}{2}\right) = -\frac{3}{2}$$ **1/2**

$$\text{Product of zeroes} = 2 \times -\frac{7}{2} = -7$$ **1/2**

$$-\frac{b}{a} = -\frac{3}{2}$$ **1/2**

$$\frac{c}{a} = -\frac{14}{2} = -7$$ **1/2**

$\Rightarrow$ Hence, sum of zeroes $= -\frac{b}{a}$

Product of zeroes $= \frac{c}{a}$

QUESTION PAPER CODE 430/C/3

EXPECTED ANSWER/VALUE POINTS

SECTION – A

Q. No. 1 to 10 are multiple choice type question of 1 mark each. Select the correct option.

Q.No.		Marks
1.	The lines representing linear equations x = 6 and y = 6 are **(a)** parallel **(b)** intersecting **(c)** coincident **(d)** passing through (0, 0) **Ans:** (b) intersecting	**1**
2.	Which of the following cannot be the probability of an event ? **(a)** $\frac{3}{20}$ **(b)** $\frac{2}{3}$ **(c)** $\frac{1.4}{2}$ **(d)** $\frac{1}{0.2}$ **Ans:** (d) $\frac{1}{0.2}$	**1**
3.	The value of 2 cos 45° cot 30° is **(a)** $\frac{\sqrt{3}}{2\sqrt{2}}$ **(b)** $2\sqrt{3}$ **(c)** $\sqrt{6}$ **(d)** $\frac{\sqrt{6}}{2}$ **Ans:** (c) $\sqrt{6}$	**1**
4.	The centre of the circle having end points of its one diameter as (– 4, 2) and (4, – 3) is **(a)** (2, – 1) **(b)** (0, – 1) **(c)** $\left(0,-\frac{1}{2}\right)$ **(d)** $\left(4,-\frac{5}{2}\right)$ **Ans:** (c) $\left(0,-\frac{1}{2}\right)$	**1**
5.	The n^{th} term of the A.P. $\left(1+\sqrt{3}\right),\left(1+2\sqrt{3}\right),\left(1+3\sqrt{3}\right),\ldots$ **(a)** $1+n\sqrt{3}$ **(b)** $n+\sqrt{3}$ **(c)** $n\left(1+\sqrt{3}\right)$ **(d)** $n\sqrt{3}$ **Ans:** (a) $1+n\sqrt{3}$	**1**
6.	The decimal expansion of $\frac{27}{2^2\times5^3}$ is **(a)** 0.027 **(b)** 0.054 **(c)** 0.540 **(d)** 0.135 **Ans:** (b) 0.054	**1**

7. The roots of the quadratic equation $x^2 + 4x + 5 = 0$ are

(a) real **(b)** real and distinct

(c) not real **(d)** real and equal

Ans: (c) not real **1**

OR

" The product of two consecutive even integers is 528." The quadratic equation corresponding to the above statement, is

(a) $x(x + 2) = 528$ **(b)** $2x(x + 4) = 528$

(c) $(1 + x)\,2x = 528$ **(d)** $2x(2x + 1) = 528$

Ans: (a) $x(x + 2) = 528$ **1**

8. The distance of point P(4, – 5) from origin is

(a) 3 units **(b)** $\sqrt{40}$ units **(c)** 1 units **(d)** $\sqrt{41}$ units

Ans: (d) $\sqrt{41}$ units **1**

9. In Figure 1, AB is a tangent to the circle with centre at O from an external point A. If OA = 6 cm and OB = $3\sqrt{3}$ cm, then the length of the tangent is

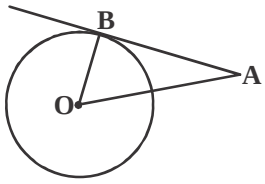


Figure-1

(a) 3 cm **(b)** $3\sqrt{3}$ cm **(c)** 9 cm **(d)** $\sqrt{33}$ cm

Ans: (a) 3 cm **1**

10. AB and CD are two parallel tangents to a circle of radius 5 cm. The distance between the tangents is

(a) $\sqrt{50}$ cm **(b)** 10 cm **(c)** 5 cm **(d)** $2\sqrt{5}$ cm

Ans: (b) 10 cm **1**

In Q. Nos. 11 to 15, fill in the blanks. Each question is of 1 mark.

11. Area of a circular track having inner and outer radii r_1 and r_2 respectively is _____.

Ans: $\pi\left(r_2^2 - r_1^2\right)$ **1**

12. If two triangles are similar, their corresponding sides are _____.

Ans: proportional **1**

13. If the probability of non-happening of an event E is 0·75, then P(E) = _____.

Ans: 0.25 **1**

14. If S_n denotes the sum of first n terms of an A.P., then $S_2 - S_1 =$ _____.

Ans: a_2 or a + d **1**

15. Mode is the value of the observation having _____ frequency.

Ans: maximum **1**

Q. Nos. 16 to 20 are short answer type questions of 1 mark each.

16. Both types of ogives drawn on the same graph intersect at (45, 60). Find the median of the distribution.

Ans: 45 **1**

17. Find the coordinates of a point P on y-axis which divides the line segment joining points (–2, 3) and (4, 3) in the ratio 1 : 2.

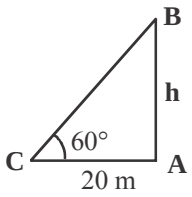
Ans: $y = \frac{3(2)+3(1)}{1+2}$ **1/2**

$\Rightarrow y = 3$

Coordinate of P(0, 3) **1/2**

18. The angle of elevation of the top of a building from a point on the ground which is 20 m away from the foot of the building, is 60°. Find the height of the building.

Ans:



$\tan 60° = \frac{h}{20}$ **1/2**

$h = 20\sqrt{3}$ m **1/2**

19. Using the graph of a polynomial y = p(x) in Figure 2, write the number of zeroes of p(x).

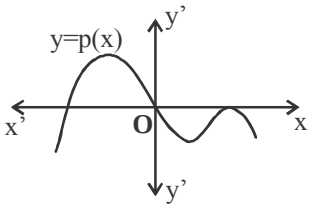


Figure-2

Ans: Number of zeroes = 3 **1**

OR

Form a quadratic polynomial whose sum and product of zeroes are 0 and -6 respectively.

Ans: $x^2 - 6$ **1**

20. If $2 \sin A = 1$, then find the value of tan A.

Ans: $\sin A = \frac{1}{2}$

$A = 30°$ **1/2**

$\tan A = \frac{1}{\sqrt{3}}$ **1/2**

SECTION – B

Q. Nos. 21 to 26 carry 2 marks each.

21. How many two-digit numbers are divisible by 7 ?

Ans: AP is 14, 21, …, 98 **1**

$98 = 14 + (n - 1)7$ **1/2**

$\Rightarrow n = 13$ **1/2**

OR

Find the sum of the first 50 natural numbers.

Ans: First 50 natural numbers are

1, 2, 3, … 50 **1/2**

$S_{50} = \frac{50}{2}(2 + (50 - 1)1)$ **1**

$= 25 \times 51$ **1/2**

$= 1275$

22. Show that $\tan 60° = \frac{2 \tan 30°}{1 - \tan^2 30°}$

Ans: LHS = tan 60° = $\sqrt{3}$ **1/2**

$$\text{RHS} = \frac{2 \tan 30°}{1 - \tan^2 30°} = \frac{2\left(\frac{1}{\sqrt{3}}\right)}{1 - \left(\frac{1}{\sqrt{3}}\right)^2}$$ **1/2**

$$= \frac{\frac{2}{\sqrt{3}}}{1 - \frac{1}{3}} = \frac{\frac{2}{\sqrt{3}}}{\frac{2}{3}}$$ **1/2**

$= \sqrt{3} = \text{LHS}$ **1/2**

23. A cone of height 24 cm and radius of base 6 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the radius of the sphere.

Ans: $\frac{1}{3}\pi(6)^2(24) = \frac{4}{3}\times\pi\times r^3$ **1 1/2**

$\Rightarrow r^3 = 216$

$r = 6$ cm **1/2**

24. It is given that HCF (504, 2200) = 8, then find LCM (504, 2200).

Ans: $LCM = \frac{504\times 2200}{8}$ **1 1/2**

$= 138600$ **1/2**

25. If zeroes of the polynomial $p(x) = kx^2 - 29x + 10$ are reciprocal of each other, then find the value of k.

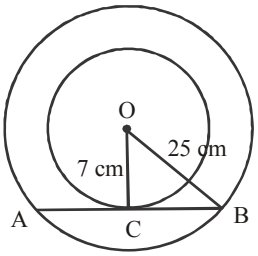
Ans: Product of zeroes = 1 **1**

$\frac{10}{k} = 1$

$k = 10$ **1**

26. Two concentric circles are of radii 25 cm and 7 cm. Find the length of the chord of the larger circle that touches the smaller circle.

Ans:



$CB^2 = OB^2 - OC^2$ **1**

$CB^2 = (25)^2 - (7)^2$

$CB^2 = 576$

$CB = 24$ cm **1/2**

$AB = 48$ cm **1/2**

OR

In Figure 3, TA and TB are two tangents to a circle with centre at O. If $\angle OAB = 15°$, then find the value of $\angle ATB$.

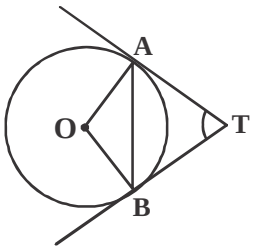


Figure-3

Ans: In $\angle AOB$, OA = OB

$\Rightarrow \angle OAB = \angle OBA = 15°$ **1/2**

$\angle AOB = 180° - 15° - 15°$

$= 150°$ **1**

$\angle ATB = 180° - 150°$

$= 30°$ **1/2**

SECTION – C

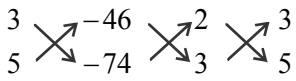
Question numbers 27 to 34 carry 3 marks each.

27. Solve the following pair of linear equations using cross-multiplication method:

$2x + 3y = 46$

$3x + 5y = 74$

Ans:



1

$$\frac{x}{-222+230} = \frac{y}{-138+148} = \frac{1}{10-9}$$ **1**

$x = 8, \quad y = 10$ **1/2+1/2**

OR

Solve the following pair of equations for x and y :

$\frac{10}{x} + \frac{2}{y} = 4$

$\frac{15}{x} - \frac{15}{y} = -2$

Ans: Let $\frac{1}{x} = A, \quad \frac{1}{y} = B$

Equation reduces to

$10A + 2B = 4$

$15A - 5B = -2$ **1**

On solving $A = \frac{1}{5}, \quad B = 1$ **1/2+1/2**

$\Rightarrow \quad x = 5, \quad y = 1$ **1/2+1/2**

28. A box contains 20 balls bearing numbers 1, 2, 3, ..., 20. A ball is drawn at random from the box. Find the probability that the number on the ball is

(i) divisible by 2. (ii) a prime number.

(iii) not divisible by 10.

Ans:

(i) No. divisible by 2 are (2, 4, 6, 8, 10, 12, 14, 16, 18, 20) **1/2**

P(divisible by 2) = $\frac{10}{20}$ or $\frac{1}{2}$ **1/2**

(ii) Prime numbers are (2, 3, 5, 7, 11, 13, 17, 19) **1/2**

P(prime number) = $\frac{8}{20}$ or $\frac{2}{5}$ **1/2**

(iii) No. not divisible by 10 are (1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19) **1/2**

P(no. not divisible by 10) = $\frac{18}{20}$ or $\frac{9}{10}$ **1/2**

29. Prove that $3\sqrt{3}-7$ is an irrational number, given that $\sqrt{3}$ is an irrational number.

Ans: Let $3\sqrt{3}-7$ be a rational number.

$3\sqrt{3}-7 = x$, where x is rational **1**

$\Rightarrow \sqrt{3} = \frac{x+7}{3}$

irrational = rational **1½**

This is a contradiction. This contradiction has arisen because of our wrong assumption. Hence $3\sqrt{3}-7$ is irrational. **1/2**

OR

Define a prime number and a composite number. Hence explain why $7 \times 11 \times 13 + 13$ is a composite number.

Ans: **Prime Number:** A number which have exactly two factors 1 and the number itself. **1**

Composite Number: A number having more than two factors. **1**

$7 \times 11 \times 13 + 13 = 13(7 \times 11 + 1)$

$= 13 \times 78$ **1/2**

The resulting number have more then 2 factors.
Hence, it is composite. **1/2**

30. Sarita has a kitchen garden of size 10 m × 10 m in her bungalow. She wants to grow vegetables that are used daily in her kitchen. She has divided the whole kitchen garden into a 10 × 10 grid as shown in Figure 6. For that she has put manure in the soil to increase the output. She has planted a tomato plant at A, a coriander plant at C and a green chilli plant at B. She invited her friend Sita to show her the kitchen garden. Sita says that saplings at A, B and C seem to form an equilateral triangle.

Read the above passage and answer the following questions :

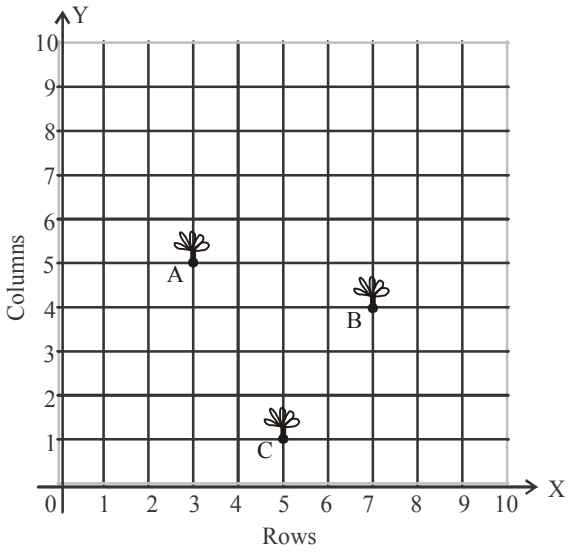


Figure 6

(i) Find the coordinates of the points A, B and C.

(ii) Is it correct to say that "ΔABC is an equilateral triangle"? Confirm your answer by using the distance formula.

Ans: (i) Coordinate of A(3, 5) **1/2**

B(7, 4) **1/2**

C(5, 1) **1/2**

(ii) AB = $\sqrt{(3-7)^2+(5-4)^2} = \sqrt{17}$ units

BC = $\sqrt{(7-5)^2+(4-1)^2} = \sqrt{13}$ units

CA = $\sqrt{(5-3)^2+(1-5)^2} = \sqrt{20}$ units

Finding any two **1**

It is not an equilateral triangle. **1/2**

31. In Figure 5, OACB is a quadrant of a circle with centre O and radius 7 cm. If OD = 3 cm, then find the area of the shaded region.

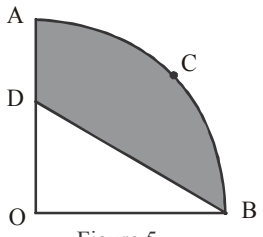


Figure 5

Ans: Area of quadrant $= \frac{1}{4}\pi(7)^2 = \frac{49}{4}\pi \text{ cm}^2$ **1**

Area of triangle $= \frac{1}{2} \times 7 \times 3 = \frac{21}{2}\text{cm}^2$ **1**

Area of shaded region $= \frac{49}{4}\pi - \frac{21}{2}$

$= \frac{7}{2}\left(\frac{7}{2}\pi - 3\right)\text{cm}^2$ or 28 cm^2 **1**

32. Draw a circle of radius 3 cm. Construct a pair of tangents to the circle from a point, 7 cm away from its centre.

Ans: Drawing a circle of radius 3 cm. **1**

Drawing correct pair of tangents. **2**

33. In Figure 6, ABC and AMP are two right triangles, right-angled at B and M respectively.

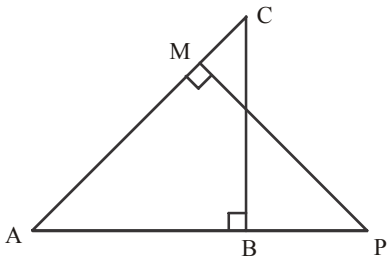


Figure 6

Prove that:

(i) $\Delta AMP \sim \Delta ABC$

(ii) $\frac{CA}{PA} = \frac{BC}{MP}$

Ans: (i) In ΔAMP and ΔABC

$\angle MAP = \angle BAC$ (common) **1**

$\angle AMP = \angle ABC$ (each 90°) **1**

By AA similarity

$\Delta AMP \sim \Delta ABC$ **1/2**

(ii) $\frac{CA}{PA} = \frac{BC}{MP} \left(\because \Delta AMP \sim \Delta ABC\right)$ **1/2**

34. Prove that $\frac{\cot A - \cos A}{\cot A + \cos A} = \sec^2 A + \tan^2 A - 2 \sec A \tan A$

Ans: LHS $= \frac{\cot A - \cos A}{\cot A + \cos A}$

$= \frac{\frac{1}{\tan A} - \frac{1}{\sec A}}{\frac{1}{\tan A} + \frac{1}{\sec A}}$ **1**

$= \frac{\sec A - \tan A}{\sec A + \tan A} \times \frac{\sec A - \tan A}{\sec A - \tan A}$ **1**

$= \frac{(\sec A - \tan A)^2}{\sec^2 A - \tan^2 A}$

$= \sec^2 A + \tan^2 A - 2 \sec A \tan A = RHS$ **1**

OR

Prove that $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$

Ans: LHS $= \frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta}$

$= \frac{\sin\theta(1 - 2\sin^2\theta)}{\cos\theta(2\cos^2\theta - 1)}$ **1**

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

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

$= \tan\theta = RHS$ **1**

SECTION – D

Question numbers 35 to 40 carry 4 marks each.

35. A hollow sphere of external and internal diameters 8 cm and 4 cm respectively is melted into a cone of base radius 4 cm. Find the height of the cone.

Ans: Let h be the height of cone.

radii of hollow sphere are 4 cm and 2 cm **1**

$$\text{Volume of sphere} = \frac{4}{3}\pi(4)^3 - \frac{4}{3}\pi(2)^3$$

$$= \frac{4}{3}\pi[64-8]$$

$$= \frac{224}{3}\pi\,cm^3 \quad \ldots(i) \qquad \textbf{1}$$

$$\text{Volume of cone} = \frac{1}{3}\pi(4)^2 h$$

$$= \frac{16}{3}\pi h\ cm^3 \quad \ldots(ii) \qquad \textbf{1}$$

Comparing (i) and (ii)

$$\frac{224}{3}\pi = \frac{16}{3}\pi h$$

$$\Rightarrow \quad h = 14 \text{ cm} \qquad \textbf{1}$$

36. The sum of the ages of a father and his son is 45 years. Five years ago, the product of their ages was four times the father's age at that time. Find their present ages.

Ans: Let the age of father = x years

age of son = (45 – x) years **1**

(x – 5) (45 – x – 5) = 4(x – 5) **1½**

On Solving

x = 36 **1**

Age of father = 36 years

Age of son = 9 years **1/2**

37. Find the mean of the following distribution :

Class :	20-50	50-80	80-110	110-140	140-170	170-200
Frequency:	5	8	15	6	12	4

Ans:

Class	f_i	x_i	$f_i x_i$
20 – 50	5	35	175
50 – 80	8	65	520
80 – 110	15	95	1425
110 – 140	6	125	750
140 – 170	12	155	1860
170 – 200	4	185	740
Total	50		5470

Correct table — **2**

$\text{mean} = \frac{\Sigma f_i x_i}{\Sigma f_i}$ — **1/2**

$= \frac{5470}{50}$ — **1**

$= 109.4$ — **1/2**

OR

Draw a 'less than' ogive for the following distribtuion :

Class :	100-150	150-200	200-250	250-300	300-350
Frequency:	8	12	15	5	10

Ans: Getting points (150, 8), (200, 20), (250, 35), (300, 40), (350, 50) — **2**

Plotting correct points — **1**

Joining and getting correct ogive — **1**

38. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, prove that the other two sides are divided in the same ratio.

Ans: For correct given, to prove, construction and figure — **$4 \times \frac{1}{2} = 2$**

For correct proof — **2**

OR

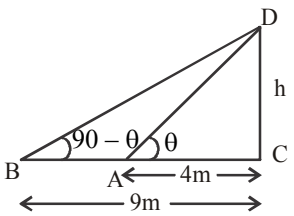
Prove that in a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Ans: For correct given, to prove, construction and figure — **$4 \times \frac{1}{2} = 2$**

For correct proof — **2**

39. The angles of elevation of the top of a tower from two points at a distance of 4 m and 9 m from the base of the tower and in the same straight line with it, are θ and (90° – θ) respectively. Prove that the height of the tower is 6 m.

Ans:



Correct figure **1**

$\tan\theta = \frac{h}{4}$ … (i) **1**

$\tan(90^\circ - \theta) = \frac{h}{9}$

$\cot\theta = \frac{h}{9}$ … (ii) **1**

By (i) and (ii)

$\tan\theta \times \cot\theta = \frac{h}{4} \times \frac{h}{9}$ **1/2**

$\Rightarrow \quad h^2 = 36$

$\Rightarrow \quad h = 6$ m **1/2**

40. Obtain the other zeroes of the polynomial $p(x) = x^4 + 2x^3 - 7x^2 - 8x + 12$ if two of its zeroes are (–2) and (–3).

Ans: Zeroes are –2, –3

factors are $(x + 2)$, $(x + 3)$ **1/2**

$g(x) = (x + 2)(x + 3) = x^2 + 5x + 6$ **1/2**

$\frac{x^4 + 2x^3 - 7x^2 - 8x + 12}{x^2 + 5x + 6} = x^2 - 3x + 2$ **2**

$x^2 - 3x + 2 = (x - 2)(x - 1)$ **1/2**

Other zeroes are 2, 1 **1/2**

OR

Find the zeroes of a quadratic polynomial $2x^2 + 3x - 14$ and verify the relationship between the zeroes and its coefficients.

Ans:

$2x^2 + 3x - 14 = 2x^2 + 7x - 4x - 14$ **1**

$= (x - 2)(2x + 7)$ **1/2**

$x = 2, \ -\frac{7}{2}$ **1/2**

Sum of zeroes $= 2 + \left(-\frac{7}{2}\right) = -\frac{3}{2}$ **1/2**

Product of zeroes $= 2 \times -\frac{7}{2} = -7$ **1/2**

	$-\frac{b}{a} = -\frac{3}{2}$	1/2
	$\frac{c}{a} = -\frac{14}{2} = -7$	1/2
	$\Rightarrow$ Hence, sum of zeroes $= -\frac{b}{a}$	
	Product of zeroes $= \frac{c}{a}$	