Strictly Confidential: (For Internal and Restricted use only)
Secondary School Examination Comptt-2021
Marking Scheme – SUBJECT NAME: MATHEMATICS (BASIC)
SUBJECT CODE: 241

PAPER CODE: 430/3/1

General Instructions: -

1. You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. A small mistake in evaluation may lead to serious problems which may affect the future of the candidates, education system and teaching profession. To avoid mistakes, it is requested that before starting evaluation, you must read and understand the spot evaluation guidelines carefully.
2. **"Evaluation policy is a confidential policy as it is related to the confidentiality of the examinations conducted, Evaluation done and several other aspects. Its' leakage to public in any manner could lead to derailment of the examination system and affect the life and future of millions of candidates. Sharing this policy/document to anyone, publishing in any magazine and printing in News Paper/Website etc may invite action under 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 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(√) 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.**
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 totaled 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 an extra 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 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).
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 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.

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- 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.

13. 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.

14. 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.

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 totaled 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.

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MARKING SCHEME

SECONDARY SCHOOL EXAMINATION: 2021

Subject: Mathematics (BASIC)
Subject Code: 241

Question Paper Code: 430/3/1
Date of Examination: 8.9.2021

Q. No.	Expected Answer/ Value points (Part-A)	Distribution of marks
1	Distance = $\sqrt{\left(\frac{2}{3}+\frac{7}{3}\right)^2 + (5-5)^2}$ = $\sqrt{(3)^2+0}$ = 3	½ ½
2	288 = 2^5 x 3^2	1
3	D = $\frac{4}{5}$ - $\frac{1}{5}$ = $\frac{3}{5}$ **OR** a= -2, d=3, a_8 = a+7d = -2+21 =19	1 ½ ½
4	p(x) = x^2 +5x +6 a=1, b= 5, c=6 Sum of zeroes = -5 $\left(\frac{-b}{a}\right)$ Product of zeroes = 6 $\left(\frac{c}{a}\right)$	½ ½
5	12^2 + 5^2 = 144 + 25= 169 = 13^2 .: 13 cm, 12cm and 5 cm are the sides of a right triangle.	½ ½
6	Cosθ = $\frac{\sqrt{3}}{2}$ = cos 30^0 => θ = 30^0	½ ½
7	SAS (Side -Angle- Side) **OR** Ratio of areas = $\left(\frac{3}{5}\right)^2$ = $\frac{9}{25}$ = 9:25	1 1
8	Number of Zeroes = 0	1
9	$2x^2$ -5x-6= 0 a = 2 , b = - 5, c = -6 D= b^2 - 4ac =25 -4(2) (-6) =73	½ ½
10	P(red face card) =$\frac{6}{52}$ = $\frac{3}{26}$	1
11	**Correct proof of parallel tangents:** Alternate Interior angles are equal OR Sum of angles on same side of a transversal = 180^0	1

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12	OP = $\sqrt{(3)^2 + (4)^2}$ = 5 cm **OR** Distance between parallel tangents = 2 x $\frac{5}{2}$ = 5 cm	1 1
13	Sample Space = $\{HH, HT, TH, TT\}$ **OR** P(number less than 7) = 6/6 = 1	1 (½ mark may be awarded for any 3 correct outcomes) 1
14	h = 3r Volume of cone = $\frac{1}{3}\pi r^2h$ $= \frac{1}{3}\pi r^2(3r) = \pi r^3$ **OR** Total surface area of hemisphere = $3\pi r^2$	½ ½ 1
15	tan θ= $\frac{100}{100\sqrt{3}} = \frac{1}{\sqrt{3}}$ = tan30^0 θ = 30^0	½ ½
16	In ΔABC, BC = $\sqrt{(24)^2 + (7)^2} = \sqrt{576 + 49}$ BC = $\sqrt{625}$ = 25 sinB =24/25 tanC = 7/24	½ ½
17	i. Option (C) = $\frac{1}{17}$ ii. Option (B) = $\frac{8}{17}$ iii. Option (C) = $\frac{3}{17}$ iv. Option (A) = $\frac{5}{17}$ v. Option (B) = $\frac{3}{17}$	1 1 1 1 1
18	i. Option (A) a= 2, d= 3 No. of pots in 7th row = a+6d = 2 + 18 =20. ii. Option (A) Sn =100 => $\frac{n}{2}(2(2) + (n-1)3)$ =100 On solving $3n^2 + n - 200 = 0$ (3n +25) (n -8) = 0 n = -25/3 (not possible) n= 8 iii. Option (B) a_8 = a+7d =2+7(3) =23	1 1 1

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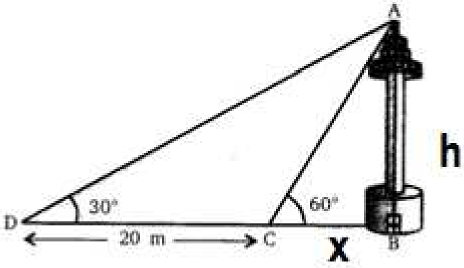
	iv. Option (A) $S_{12} = \frac{12}{2}(2(2)+11(3))$ =222 v. Option (C) $a_4 - a_2$ = a+3d – a - d = 2d = 6	1 1
19	 In ΔABC, $\frac{h}{x} = \sqrt{3}$ => h = $\sqrt{3}$x In ΔABD, $\frac{h}{x+20} = \frac{1}{\sqrt{3}}$ => h$\sqrt{3}$ =x + 20 x = 10 m h = 10 $\sqrt{3}$ m i. Option (C) BC = x =10m ii. Option (A) AB = h =10$\sqrt{3}$ m iii. Option (B) BD = x + 20 =30m iv. Option (C) Angle of elevation v. Option (B) ∠XAC = 60^0	1 1 1 1 1
20	i. Option (C) C = 2π(3) = 6π m ii. Option (B) Length = 3x6 π= 18π m iii. Option (D) Area of circle =9π m^2 iv. Option (A) AB = 9m AC = 12m v. Option (C) Perimeter = 9 +15+12= 36 m	1 1 1 1 1
21.	26=2x13 91=7x13 HCF=13 LCM=2x7x13=182	½ ½ ½ ½

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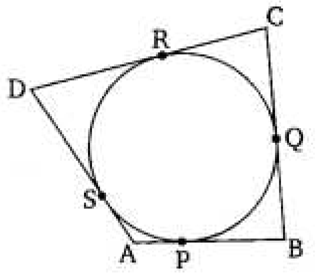
22.	Sin(A+B)= $\frac{\sqrt{3}}{2} = \sin 60^o \Rightarrow A+B=60^o$ Sin(A-B)= $\frac{1}{2} = \sin 30^o \Rightarrow A-B=30^o$ On solving A= 45° and B= 15°	½ ½ ½ + ½
OR	$\frac{\frac{1}{2}+1-\frac{2}{\sqrt{3}}}{\frac{2}{\sqrt{3}}+\frac{1}{2}+1}$ $=\frac{\frac{3}{2}-\frac{2}{\sqrt{3}}}{\frac{3}{2}+\frac{2}{\sqrt{3}}}=\frac{3\sqrt{3}-4}{3\sqrt{3}+4}$	1½ (½ mark for two correct Trigonometric ratios) ½
23.	 $\left.\begin{aligned} AP &= AS \\ BP &= BQ \\ CR &= CQ \\ DR &= DS \end{aligned}\right\}$ Length of tangents drawn from external point of a circle are equal On adding, we get (AP+BP)+(CR+DR)= (AS+DS)+(BQ+CQ) $\Rightarrow$ AB+CD= AD+BC	1 ½ ½
24.	Let smaller angle = x and greater angle = x+18° Now x+x+18° = 180° x= 81° Therefore two angles are 81° and 99° **Alternative method:** Let the Larger angle =x and smaller angle = y A.T.Q. x+y =180°---------(i) x-y= 18° --------------(ii) On solving we get x= 99° and y= 81°	½ ½ ½ ½ ½ +½ ½+ ½

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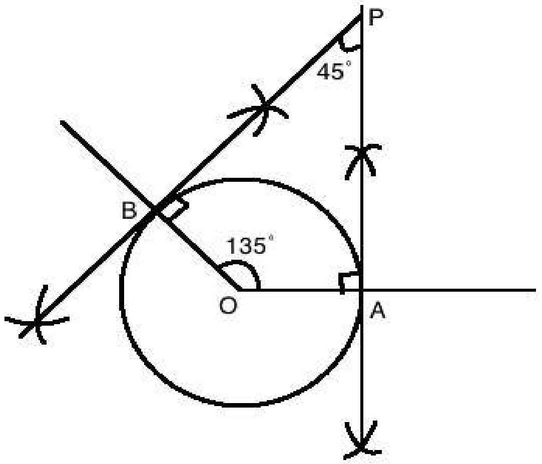
25.	Coordinates of the Point P will be $P\left(\frac{2(-3)+3(7)}{2+3},\frac{2(-4)+3(-1)}{2+3}\right)$ or $P\left(3,\frac{-11}{5}\right)$	1 1
26.	$\frac{a_1}{a_2}=\frac{5}{-10}=-\frac{1}{2}$ $\frac{b_1}{b_2}=\frac{-3}{6}=-\frac{1}{2}$ $\frac{c_1}{c_2}=\frac{11}{22}=\frac{1}{2}$ $\because \frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}\ \therefore\ Inconsistent$	½ ½ ½ ½
OR	x+y=6 $\Rightarrow$ y= 6-x 2x -3y= 4 $\Rightarrow$ 2x-3(6-x)= 4 $\Rightarrow$ x= 22/5 and y = 8/5	1 ½ +½
27.		3 marks as per accuracy and correct figure
28.	Let us assume that $7\sqrt{2}$ is rational number such that $7\sqrt{2}=\frac{a}{b}$, where a and b are co-prime and b≠0 $\sqrt{2}=\frac{a}{7b}$ Now a and 7b are integers $\therefore$ $\frac{a}{7b}$ is rational $\therefore \frac{a}{7b}=\sqrt{2}$ is rational Which contradicts the fact that $\sqrt{2}$ is irrational $\therefore$ Our supposition is wrong $\therefore$ $7\sqrt{2}$ is irrational	1 1 1

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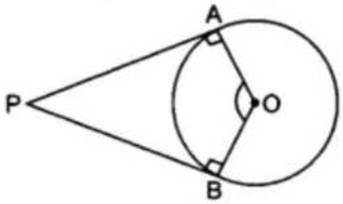
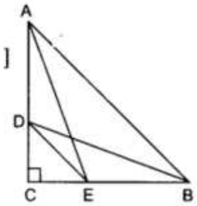
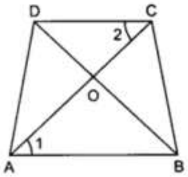
29.	 PA and PB are tangents to the circle from an external point P at the point of contacts A and B $\therefore$ OA$\perp$ AP and OB$\perp$ BP (Tangent is perpendicular to the Radius through the point of contact) $\Rightarrow \angle OAP = \angle OBP = 90^o$ In the quadrilateral OABP, $(\angle OAP + \angle OBP) + \angle APB + \angle AOB = 360^o$ $\Rightarrow (180^o) + \angle APB + \angle AOB = 360^o$ $\Rightarrow \angle APB + \angle AOB = 180^o$ Hence proved	Fig: ½ mark 1 1 ½
30.	 In ΔABC, $\angle C = 90^o$ $\therefore$ $AB^2 = AC^2 + BC^2$ (Pythagoras Theorem)-----------------------(1) In ΔDCE $DE^2 = DC^2 + CE^2$ (Given) =--(2) Adding (1) and (2) $AB^2 + DE^2 = AC^2 + BC^2 + DC^2 + CE^2$ $= (AC^2 + CE^2) + (BC^2 + DC^2)$ $= AE^2 + BD^2$ $\therefore$ $AB^2 + DE^2 = AE^2 + BD^2$	Fig: ½ mark ½ ½ 1 ½
OR	 ABCD is a trapezium in which AB ll DC and AB=2CD In ΔAOB and ΔCOD $\angle 1 = \angle 2 \quad (Alternate \quad Interior \quad Angles)$ $\angle AOB = \angle COD \quad (Vertically \quad opposite \quad angles)$	Fig: ½ mark

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	$\therefore\ \Delta AOB \sim \Delta COD$ (AA similarity Criterion) $\frac{ar(\Delta AOB)}{ar(\Delta COD)} = \frac{AB^2}{CD^2} = \frac{(2CD)^2}{CD^2}$ $= \frac{4}{1}$ $\therefore$ Ratio is 4:1	1 1 ½
31.	$LHS = \sec\theta(1-\sin\theta)(\sec\theta+\tan\theta)$ $= \frac{1}{\cos\theta}(1-\sin\theta)\left(\frac{1}{\cos\theta}+\frac{\sin\theta}{\cos\theta}\right)$ $= \frac{1-\sin\theta}{\cos\theta}\times\left(\frac{1+\sin\theta}{\cos\theta}\right) = \frac{1-\sin^2\theta}{\cos^2\theta}$ $= \frac{\cos^2\theta}{\cos^2\theta} = 1 = RHS$	1 1½ ½
OR	$LHS = \frac{1+\sec A}{\sec A} = \frac{1+\frac{1}{\cos A}}{\frac{1}{\cos A}} = \frac{\frac{1+\cos A}{\cos A}}{\frac{1}{\cos A}}$ $= 1+\cos A$ $RHS = \frac{\sin^2 A}{1-\cos A} = \frac{1-\cos^2 A}{1-\cos A} = \frac{(1-\cos A)(1+\cos A)}{1-\cos A}$ $= 1+\cos A = LHS$	1 ½ 1 ½
32.	A(1,7), B(4,2), C(-1,-1), D(-4,4) $AB = \sqrt{(4-1)^2+(2-7)^2} = \sqrt{34}$ $BC = \sqrt{(4+1)^2+(2+1)^2} = \sqrt{34}$ $CD = \sqrt{(-1+4)^2+(-1-4)^2} = \sqrt{34}$ $DA = \sqrt{(1+4)^2+(7-4)^2} = \sqrt{34}$ $\because$ AB=BC=CD=DA $\therefore$ All the sides are equal $AC = \sqrt{(1+1)^2+(7+1)^2} = \sqrt{68}$ $BD = \sqrt{(4+4)^2+(2-4)^2} = \sqrt{68}$ $\because$ AC=BD, $\therefore$ diagonals are equal Hence, ABCD is a square	1 ½ 1 ½
33.	$x^2 + 9x + 20 = (x+5)(x+4)$ Zeroes are -5 and -4 $\alpha = -5, \quad \beta = -4$ To find a polynomial whose zeroes are $\alpha+1$ *and* $\beta+1$ Sum the zeroes = $\alpha+1+\beta+1 = -5-4+2 = -7$ and	½ +½ ½

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Product of the zeroes = $(\alpha+1)(\beta+1)=(-4)(-3)=12$ ½

Quadratic polynomial is

x^2 –(Sum of the zeroes)x +product of the zeroes 1
x^2 +7x+12

Alternative method:

Let zeroes of the polynomial are $\alpha, \quad \beta$

$\alpha+\beta=-b/a=-9$ ½

$\alpha\beta=c/a=20$ ½

Sum the zeroes = $\alpha+1+\beta+1=\alpha+\beta+2=-9+2=-7$ and ½

Product of the zeroes = $(\alpha+1)(\beta+1)=\alpha\beta+\alpha+\beta+1=20-9+1=12$ ½

Quadratic polynomial is

x^2 –(Sum of the zeroes)x +product of the zeroes 1
x^2 +7x+12

34.

Volume of cone = $\frac{1}{3}\pi r^2 h=\frac{1}{3}\pi\times9\times9\times36=81\times12\pi$ cm^3 2

A.T. Q.

Volume of cone = Volume of Sphere

$\Rightarrow \quad 81\times12\pi = \frac{4}{3}\pi r^3$ 2

$\Rightarrow \quad 81\times9=r^3$

$\Rightarrow \quad r^3=9^3$

$\Rightarrow$ r=9 $\quad\Rightarrow$ Diameter =18cm ½ + ½

35.

Daily Expenditure	x_i	f_i	$x_i f_i$
100-150	125	4	500
150-200	175	5	875
200-250	225	12	2700
250-300	275	2	550
300-350	325	2	650
Total		**25**	**5275**

Table: 1 ½

Mean Daily Expenditure = $\frac{\sum f_i x_i}{\sum f_i}=\frac{5275}{25}=211$ 1

Note: Alternative method (Step deviation) of calculating Mean is acceptable

Modal Class is 200-250

l = 200, **f_1 = 12, f_0 = 5, f_2 = 2, h=50** 1

Mode= l + $\left(\frac{f_1-f_0}{2f_1-f_0-f_2}\right)\times h$

Mode= 200 + $\left(\frac{12-5}{24-5-2}\right)\times50$ 1

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	$= 200 + \frac{7}{17} \times 50$	
	$= 200 + \frac{350}{17}$	
	=220.58	½
36	Let shorter side of rectangle = x	
	Longer side = x + 30 and diagonal = x + 60	1
	Using Pythagoras theorem we get: $(x + 60)^2 = (x + 30)^2 + x^2$	1
	$\Rightarrow x^2 + 120x + 3600 = x^2 + 60x + 900 + x^2$	
	$\Rightarrow x^2 - 60x - 2700 = 0$	1
	$\Rightarrow (x - 90)(x + 30) = 0$	
	$\Rightarrow x - 90 = 0 \quad , \quad x + 30 = 0$	
	$\Rightarrow x = 90 \qquad x = -30$ (rejecting)	1
	Shorter side = 90cm	1/2
	Longer side = 90+30 = 120 cm	1/2
	OR	
	Let age of father = x years	
	Age of son = (45 – x) years	
	5 years ago, age of father = (x -5) years	
	Age of son = (40 – x) years	1
	A.T.Q., (x - 5) (40 - x) = 124	1
	⇨ $40x - x^2 - 200 + 5x = 124$	
	⇨ $x^2 - 45x + 324 = 0$	1
	⇨ (x - 36) (x - 9) = 0	
	⇨ x= 36 , x = 9 (rejecting)	1
	Age of father = 36 years	½
	Age of son = 9 years	½

Note:

- **Alternative correct methods are also acceptable.**
- **In all 1 mark questions full credit to be given if student has written the correct answer directly without detailed working.**

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