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Secondary School Certificate Examination

Compartment (July 2019)

Marking Scheme — Mathematics 30(B)

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 efforts in 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.**
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.
6. If a question does not have any parts, marks must be awarded in the left hand margin and encircled.
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 0 to 80 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 / 25 answer books per day.
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 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 (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 30(B)

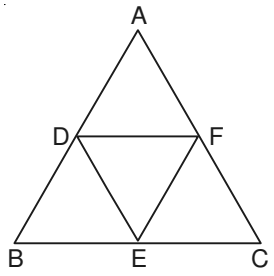
EXPECTED ANSWER/VALUE POINTS

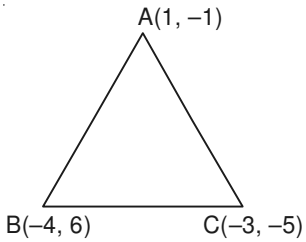
SECTION A

Q.NO.		MARKS
1.	$3 \times 5^2 - 5 \times 5 + 5\,k = 0$	$\frac{1}{2}$
	$\Rightarrow \quad k = -10$	$\frac{1}{2}$
2.	$2(3k - 1) = 8 + 2k$	$\frac{1}{2}$
	Solving, we get $k = \frac{5}{2}$	$\frac{1}{2}$
	OR	
	$a + 5d = 29,\ a + 13d = 69$	$\frac{1}{2}$
	Solving, we get, $a = 4$	$\frac{1}{2}$
3.	$\left(\frac{-6+(-2)}{2}, \frac{5+3}{2}\right) = \left(\frac{a}{2}, 4\right)$	$\frac{1}{2}$
	$\Rightarrow \quad a = -8$	$\frac{1}{2}$
4.	$\Delta ABC \sim \Delta PQR$	
	$\Rightarrow \quad \angle A = \angle P = 32°,\ \angle R = \angle C = 65°$	$\frac{1}{2}$
	$\Rightarrow \quad \angle B = \angle Q = 83°$	$\frac{1}{2}$
5.	$\frac{135}{2^2 5^4 3^2} = \frac{15}{2^2 5^4} = \frac{3}{2^2 5^3}$	$\frac{1}{2}$
	It will terminate after 3 places of decimal.	$\frac{1}{2}$
6.	$\cos\frac{A}{2} = \frac{\sqrt{3}}{2} \Rightarrow \frac{A}{2} = 30°$	$\frac{1}{2}$

	$\therefore \quad A = 60°$	$\frac{1}{2}$
	OR	
	$2 \sec^2 \theta + 2 (\sec^2 \theta - 1) - 7$	
	$= 4 \sec^2 \theta - 9$	$\frac{1}{2}$
	$= 4 \times \left(\frac{3}{2}\right)^2 - 9 = 0$	$\frac{1}{2}$
	SECTION B	
7.	10^{th} term from the end $= 255 - (10 - 1) \times 5$	$1\frac{1}{2}$
	$= 210$	$\frac{1}{2}$
	OR	
	A.P. formed is 12, 16, 20, ..., 248	$\frac{1}{2}$
	$a_n = 248 \Rightarrow 12 + (n - 1) \times 4 = 248$	1
	Solving, we get $n = 60$	$\frac{1}{2}$
8.	A(1, 2) — 4 : 3 — G — B(2, 3) Coordinates of G are $\left(\frac{8+3}{7}, \frac{12+6}{7}\right)$	1
	$= \left(\frac{11}{7}, \frac{18}{7}\right)$	1
9.	LCM $= \frac{315375}{145}$	1
	$= 2175$	1
10.	(i) P(a black ace) $= \frac{2}{52}$ or $\frac{1}{26}$	1
	(ii) P(neither a jack nor a king) $= 1 - \frac{8}{52}$	
	$= \frac{44}{52}$ or $\frac{11}{13}$	1

11.	For infinitely many solutions,	
	$\frac{2}{m+n} = \frac{3}{2m-n} = \frac{11}{33}$	1
	$\Rightarrow$ m + n = 6 and 2m – n = 9	
	Solving, we get m = 5 and n = 1	1
	OR	
	Let the present age of man be x years	
	x + 15 = 4(x – 15)	1
	$\Rightarrow$ x = 25	
	$\therefore$ Present age of man = 25 years	1
12.	Total number of outcomes = 36	$\frac{1}{2}$
	Favourable outcomes are (1, 4), (4, 1), (2, 3) & (3, 2) i.e. 4	$\frac{1}{2}$
	P(sum 5) = $\frac{4}{36}$ or $\frac{1}{9}$	1
	SECTION C	
13.	Mode = $1200 + \frac{41-40}{2\times41-40-27}\times400$	2
	= $1200 + \frac{80}{3}$	
	= $\frac{3680}{3}$ or 1226.67 hrs.	1
14.	$2x^2 + x - 10$	
	= (x – 2) (2x + 5)	
	$\therefore$ Zeroes are 2, $\frac{-5}{2}$	1
	Sum of zeros = $2 + \left(\frac{-5}{2}\right) = \frac{-1}{2}$	
	= $\frac{-b}{a}$	1

	Product of zeroes = –5	
	$= \frac{c}{a}$	1
15.	Let as assume that $\sqrt{5}$ be a rational number	
	and $\sqrt{5} = \frac{a}{b}$, where b ≠ 0 and a & b are coprimes	
	$\Rightarrow \quad a^2 = 5b^2$	1
	Thus a^2 is a multiple of 5	
	$\Rightarrow$ a is a multiple of 5	$\frac{1}{2}$
	Let a = 5m for some integer m	
	$\therefore \quad b^2 = 5m^2$	$\frac{1}{2}$
	Thus b^2 is a multiple of 5	
	$\Rightarrow$ b is a multiple of 5	$\frac{1}{2}$
	Hence 5 is a common factor of a and b	
	This contradicts the fact that a and b are coprimes	
	Hence $\sqrt{5}$ is an irrational number	$\frac{1}{2}$
16.	$\frac{ar(\Delta ABC)}{ar(\Delta DEF)} = \left(\frac{BC}{EF}\right)^2$	1
	$\Rightarrow \quad \frac{64}{121} = \left(\frac{BC}{15.4}\right)^2$	1
	Solving, we get BC = 11.2 cm	1
	OR	
	 D and E are mid points of AB and BC respectively.	
	$\therefore$ DE ∥ AC and DE = $\frac{1}{2}$AC ...(1)	1
	ΔDBE ~ ΔABC (AA similarity)	1

	$\therefore \frac{ar(\Delta DBE)}{ar(\Delta ABC)} = \left(\frac{DE}{AC}\right)^2 = \frac{1}{4}$ (using (1))	1
17.	Water flowing through pipe in 1 hour	
	$= \pi \times \frac{8}{100} \times \frac{8}{100} \times 4000\ m^3 = \frac{256 \times 22}{70}\ m^3$	1
	Water required to fill the tank = $22 \times 20 \times 16\ m^3$	1
	Time taken to fill $\frac{256 \times 22}{70}\ m^3$ water = 1 hr	
	$\therefore$ Time taken to fill $22 \times 20 \times 16\ m^3$ water	
	$= \frac{70 \times 22 \times 20 \times 16}{256 \times 22} = \frac{175}{2}$ hrs or 87.5 hrs.	1
	OR	
	Volume of earth dug out from well	
	= Volume of earth spread	
	$\Rightarrow \pi \times 8 \times 8 \times 28 = \pi \times (20^2 - 8^2) \times h$	2
	$\Rightarrow h = \frac{16}{3} m$	
	Level raised = $\frac{16}{3} m$	1
18.	$PA^2 = PB^2$	
	$\Rightarrow (x - 3)^2 + (y - 6)^2 = (x + 3)^2 + (y - 4)^2$	1
	$\Rightarrow x^2 + 9 - 6x + y^2 + 36 - 12y = x^2 + 9 + 6x + y^2 + 16 - 8y$	1
	$\therefore 12x + 4y - 20 = 0$ or $3x + y = 5$	1
	OR	
	 ar(ΔABC)	
	$= \frac{1}{2}[1(6+5) - 4(-5+1) - 3(-1-6)]$	2
	$= \frac{1}{2}[11 + 16 + 21]$	
	= 24 sq. units	1

19. Let unit's place digit be x

and ten's place digit be y

$\therefore$ Number = 10y + x $\frac{1}{2}$

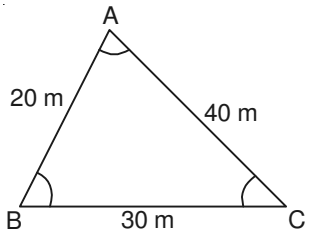
x – y = 6 ..(1) or y – x = 6 ...(2) $\frac{1}{2}$

and x + 10y + 10x + y = 110 $\Rightarrow$ x + y = 10 ...(3) 1

Solving (1) and (3), we get x = 8, y = 2

Solving (2) and (3), we get x = 2, y = 8

$\therefore$ Two such possible numbers are 28 or 82. $\frac{1}{2}+\frac{1}{2}$

20. 

Required area

$= \frac{\pi \times 7^2}{360°}(\angle A + \angle B + \angle C)$ 2

$= \frac{22}{7} \times \frac{7 \times 7}{360°} \times 180°$

$= 77 \text{ m}^2$ 1

21. L.H.S. $= \frac{\cos A}{1 - \tan A} - \frac{\sin^2 A}{\cos A - \sin A}$

$= \frac{\cos^2 A}{\cos A - \sin A} - \frac{\sin^2 A}{\cos A - \sin A}$ 1

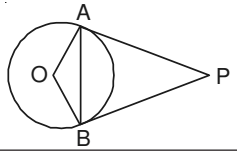
$= \frac{\cos^2 A - \sin^2 A}{\cos A - \sin A} = \cos A + \sin A$ 1+1

= R.H.S.

OR

L.H.S. $= \frac{\tan A + \tan B}{\cot A + \cot B} = \frac{\tan A + \tan B}{\frac{\tan A + \tan B}{\tan A \tan B}}$ 2

= tan A tan B = R.H.S. 1

22. 

$\angle PAO = \angle PBO = 90°$ 1

In quadrilateral OAPB,

$\angle AOB + \angle OBP + \angle APB + \angle PAO = 360°$ 1

$\Rightarrow \angle AOB + \angle APB = 180°$ 1

SECTION D

23. L.H.S. $= \dfrac{(1+\sin\theta)^2 + (1-\sin\theta)^2}{\cos^2\theta}$

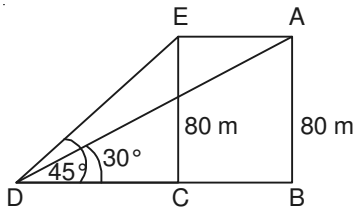
$= \dfrac{2(1+\sin^2\theta)}{\cos^2\theta} = 2(\sec^2\theta + \tan^2\theta)$ 1+1

R.H.S. $= 2\left(\dfrac{\sec^2\theta + \tan^2\theta}{\sec^2\theta - \tan^2\theta}\right)$

$= \dfrac{2(\sec^2\theta + \tan^2\theta)}{1} = 2(\sec^2\theta + \tan^2\theta)$ 1+1

$\because$ L.H.S. = R.H.S.

24.



In ΔEDC,

$\dfrac{80}{DC} = \tan 45°$

$\Rightarrow$ DC = 80 m 1

in ΔABD,

$\dfrac{80}{BD} = \tan 30°$

$\Rightarrow$ BD = $80\sqrt{3}$ 1

Distance covered by bird = $80(\sqrt{3}-1)$ m 1

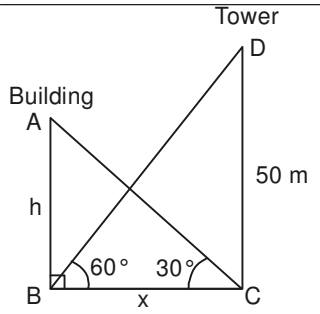
$\therefore$ Speed of bird = $\dfrac{80(\sqrt{3}-1)}{2}$ m/sec

= $40(\sqrt{3}-1)$ m/sec = 29.2 m/sec 1

OR

In ΔABC,

$\dfrac{h}{x} = \tan 30°$ 1



$\Rightarrow x = h\sqrt{3}$ ...(1) — 1

In ΔDCB, $\frac{50}{x} = \tan 60°$

$50 = x\sqrt{3}$

$= h\sqrt{3} \times \sqrt{3}$ — 1

$\therefore h = \frac{50}{3}$

$\therefore$ Height of building $= \frac{50}{3}$ m or 16.67 m — 1

25. Correctly stated given, to prove and construction — $\frac{1}{2} \times 3 = 1\frac{1}{2}$

Correct proof — $2\frac{1}{2}$

26. Writing the steps of construction of ΔABC — 1

Writing the steps of construction of triangle similar to ΔABC with scale factor $\frac{3}{4}$ — 3

27.

Classes	Frequencies	cf
0-5	12	12
5-10	a	12 + a
10-15	12	24 + a
15-20	15	39 + a
20-25	b	39 + a + b
25-30	6	45 + a + b
30-35	6	51 + a + b
35-40	4	55 + a + b
Total	70	

Correct Table — $1\frac{1}{2}$

$55 + a + b = 70 \Rightarrow a + b = 15$ ...(1) — $\frac{1}{2}$

Median = 16 $\therefore$ median class is 15 – 20 — $\frac{1}{2}$

	$\Rightarrow \quad 15 + \frac{35 - 24 - a}{15} \times 5 = 16$	1
	$\Rightarrow$ a = 8 From (1), b = 7	$\frac{1}{2}$
28.	Let marks in Mathematics be x	
	$\therefore$ Marks in English = 40 – x	$\frac{1}{2}$
	(x + 3) (40 – x – 4) = 360	1
	$\Rightarrow$ $x^2 - 33x + 252 = 0$	1
	(x – 21) (x – 12) = 0	
	x = 21 or 12	1
	$\therefore$ Marks in Mathematics = 21 or (12, 28) and Marks in English = 19	$\frac{1}{2}$
	OR	
	$\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}$	
	$\Rightarrow \quad \frac{\cancel{x} - 7 - \cancel{x} - 4}{(x+4)(x-7)} = \frac{11}{30}$	$1\frac{1}{2}$
	$\Rightarrow$ $x^2 - 3x + 2 = 0$	1
	$\Rightarrow$ (x – 2) (x – 1) = 0	1
	$\therefore$ x = 2 or 1	$\frac{1}{2}$
29.	Surface area of metal sheet	
	$= \pi(r_1 + r_2)l + \pi r_1^2$	1
	$l = \sqrt{16^2 + (26-14)^2}$	
	$= \sqrt{256+144} = 20\,\text{cm}$	1
	$\therefore$ Surface area of sheet	

	$= \frac{22}{7}[(14+26)\times 20+14^2]$ cm^2	
	$= \frac{22}{7}\times 996$ cm^2	1
	cost of metal sheet $= \frac{22}{\cancel{7}}\times 996\times\frac{\cancel{7}}{100}$	
	= ₹ 219.12	1
30.	Let the value of prizes be	
	x, x – 20, x – 40, x – 60, x – 80, x – 100, x – 120	1
	$\Rightarrow$ x + (x – 20) + (x – 40) + (x – 60) + (x – 80) + (x – 100) + (x – 120) = 700	1
	$\Rightarrow$ 7x – 420 = 700	
	7x = 1120 $\Rightarrow$ x = 160	1
	$\therefore$ Value of each of the prizes is	
	₹ 160, ₹ 140, ₹ 120, ₹ 100, ₹ 80, ₹ 60 and ₹ 40	1
	OR	
	a_4 = 80,000 $\Rightarrow$ a + 3d = 80,000	1
	a_7 = 1,10,000 $\Rightarrow$ a + 6d = 1,10,000	1
	3d = 30000 $\Rightarrow$ d = 10000	
	$\because$ a = 50,000	1
	$S_{15} = \frac{15}{2}[1,00,000+1,40,000]$	
	= 15 × 1,20,000	
	= 1800,000	1