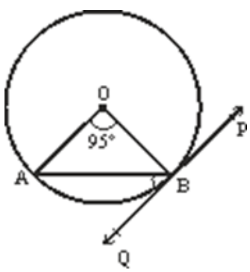
Marking Scheme **Strictly Confidential** **(For Internal and Restricted use only)** **Secondary School Examination, 2023** **MATHEMATICS PAPER CODE 30/1/2**	
General Instructions: -	
1	You are aware that evaluation is the most important process in the actual and correct assessment of the candidates. 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 various rules of the Board and IPC."**
3	Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration. Marking Scheme should be strictly adhered to and religiously followed. **However, while evaluating, answers which are based on latest information or knowledge and/or are innovative, they may be assessed for their correctness otherwise and due marks be awarded to them.**
4	The Marking scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, the due marks should be awarded accordingly.
5	The Head-Examiner must go through the first five answer books evaluated by each evaluator on the first day, to ensure that evaluation has been carried out as per the instructions given in the Marking Scheme. If there is any variation, the same should be zero after deliberation and discussion. The remaining answer books meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
6	Evaluators will mark (√) wherever answer is correct. For wrong answer CROSS 'X" be marked. Evaluators will not put right (✓) while evaluating which gives an impression that answer is correct and no marks are awarded. **This is most common mistake which evaluators are committing.**
7	If a question has parts, please award marks on the right-hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left-hand margin and encircled. This may be followed strictly.
8	If a question does not have any parts, marks must be awarded in the left-hand margin and encircled. This may also be followed strictly.
9	**<u>In Q1-Q20, if a candidate attempts the question more than once (without canceling the previous attempt), marks shall be awarded for the first attempt only and the other answer scored out with a note "Extra Question".</u>**

10	**<u>In Q21-Q38, if a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note "Extra Question".</u>**
11	No marks to be deducted for the cumulative effect of an error. It should be penalized only once.
12	A full scale of marks __________ (example 0 to 80/70/60/50/40/30 marks as given in Question Paper) has to be used. Please do not hesitate to award full marks if the answer deserves it.
13	Every examiner has to necessarily do evaluation work for full working hours i.e., 8 hours every day and evaluate 20 answer books per day in main subjects and 25 answer books per day in other subjects (Details are given in Spot Guidelines). This is in view of the reduced syllabus and number of questions in question paper.
14	Ensure that you do not make the following common types of errors committed by the Examiner in the past:- ● Leaving answer or part thereof unassessed in an answer book. ● Giving more marks for an answer than assigned to it. ● Wrong totaling of marks awarded on an answer. ● Wrong transfer of marks from the inside pages of the answer book to the title page. ● Wrong question wise totaling on the title page. ● Wrong totaling of marks of the two columns on the title page. ● Wrong grand total. ● Marks in words and figures not tallying/not same. ● Wrong transfer of marks from the answer book to online award list. ● Answers marked as correct, but marks not awarded. (Ensure that the right tick mark is correctly and clearly indicated. It should merely be a line. Same is with the X for incorrect answer.) ● Half or a part of answer marked correct and the rest as wrong, but no marks awarded.
15	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.
16	Any un assessed 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.
17	The Examiners should acquaint themselves with the guidelines given in the "**Guidelines for spot Evaluation**" before starting the actual evaluation.
18	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.
19	The candidates are entitled to obtain photocopy of the Answer Book on request on payment of the prescribed processing fee. All Examiners/Additional Head Examiners/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.

MARKING SCHEME
MATHEMATICS (Subject Code–041)
(PAPER CODE: 30/1/2)

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	SECTION A Questions no. 1 to 18 are multiple choice questions (MCQs) and questions number 19 and 20 are Assertion-Reason based questions of 1 mark each	
1.	In what ratio, does x-axis divide the line segment joining the points $A(3,6)$ and $B(-12,-3)$? (A) $1:2$ (B) $1:4$ (C) $4:1$ (D) $2:1$	
Sol.	(D) 2 : 1	1
2.	In the given figure, PQ is tangent to the circle centered at O. If $\angle AOB = 95^\circ$, then the measure of $\angle ABQ$ will be (A) 47.5° (B) 42.5° (C) 85° (D) 95° 	
Sol.	(A) $47{\cdot}5^\circ$	1
3.	If $2\tan A = 3$, then the value of $\dfrac{4\sin A + 3\cos A}{4\sin A - 3\cos A}$ (A) $\frac{7}{\sqrt{13}}$ (B) $\frac{1}{\sqrt{13}}$ (C) 3 (D) does not exist	
Sol.	(C) 3	1

4. In a group of 20 people, 5 can't swim. If one person is selected at random, then the probability that he/she can swim, is

(A) $\frac{3}{4}$ (B) $\frac{1}{3}$ (C) 1 (D) $\frac{1}{4}$

Sol. (A) 3/4 — 1

5. The distribution below gives the marks obtained by 80 students on a test:

Marks	Less than 10	Less than 20	Less than 30	Less than 40	Less than 50	Less than 60
Number of Students	3	12	27	57	75	80

The modal class of this distribution is :

(A) 10-20 (B) 20 - 30
(C) 30-40 (D) 50 - 60

Sol. (C) 30 – 40 — 1

6. The curved surface area of a cone having height 24 cm and radius 7 cm, is

(A) 528 cm^2 (B) 1056 cm^2 (C) 550 cm^2 (D) 500 cm^2

Sol. (C) 550 cm^2 — 1

7. The end-points of a diameter of a circle are (2, 4) and (-3, -1). The radius of the circle is

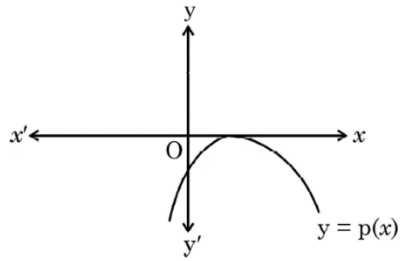
(A) $2\sqrt{5}$ (B) $\frac{5}{2}\sqrt{5}$ (C) $\frac{5}{2}\sqrt{2}$ (D) $5\sqrt{2}$

Sol. (C) $\frac{5}{2}\sqrt{2}$ — 1

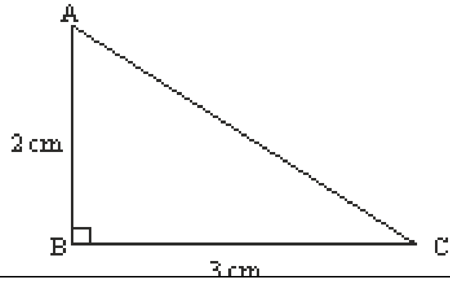
8. Which of the following is a quadratic polynomial with zeroes $\frac{5}{3}$ and 0?

(A) $3x(3x-5)$ (B) $3x(x-5)$ (C) $x^2-\frac{5}{3}$ (D) $\frac{5}{3}x^2$

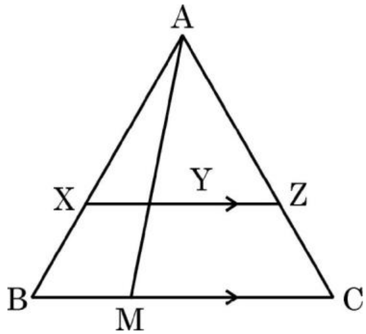
Sol. (A) $3x(3x-5)$ — 1

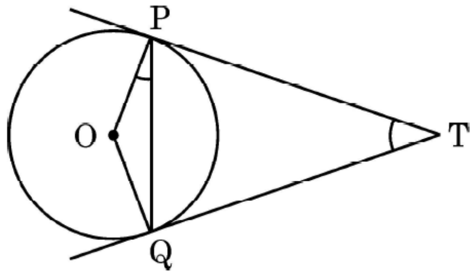
9.	The graph of $y = p(x)$ is given, for a polynomial $p(x)$. The number of zeroes of $p(x)$ from the graph is:  (A) 3 (B) 1 (C) 2 (D) 0	
Sol.	(B) 1	1
10.	The value of k for which the pair of equations $kx = y + 2$ and $6x = 2y + 3$ has infinitely many solutions, (A) is $k = 3$ (B) does not exist (C) is $k = -3$ (D) is $k = 4$	
Sol.	(B) does not exist	1
11.	If a, b , c form a A.P. with common difference d, then the value of a - 2b – c is equal to (A) $2a + 4d$ (B) 0 (C) $-2a - 4d$ (D) $-2a - 3d$	
Sol.	(C) $-2a - 4d$	1
12.	If the value of each observation of a statistical data is increased by 3, then the mean of the data (A) remains unchanged (B) increases by 3 (C) increases by 6 (D) increases by 3n	
Sol.	(B) increases by 3	1
13.	Probability of happening of an event is denoted by p and probability of non-happening of the event is denoted by q. Relation between p and q is (A) $p + q = 1$ (B) $p = 1, q = 1$ (C) $p = q - 1$ (D) $p + q + 1 = 0$	
Sol.	(A) $p + q = 1$	1
14.	A girl calculates that the probability of her winning the first prize in a lottery is 0.08. If 6000 tickets are sold, how many tickets has she bought? (A) 40 (B) 240 (C) 480 (D) 750	

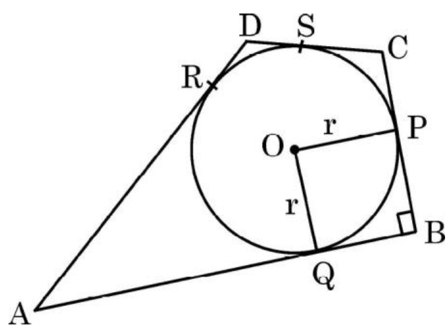
Sol.	(C) 480	1
15.	If α, β are the zeroes of a polynomial $p(x) = x^2 + x - 1$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ equals to (A) 1 (B) 2 (C) -1 (D) $\frac{-1}{2}$	
Sol.	(A) 1	1
16.	The least positive value of k, for which the quadratic equation $2x^2 + kx - 4 = 0$ has rational roots, is (A) $\pm 2\sqrt{2}$ (B) 2 (C) ± 2 (D) $\sqrt{2}$	
Sol.	(B) 2	1
17.	$\left[\frac{5}{8}\sec^2 60^\circ - \tan^2 60^\circ + \cos^2 45^\circ\right]$ is equal to (A) $\frac{-5}{3}$ (B) $\frac{-1}{2}$ (C) 0 (D) $\frac{-1}{4}$	
Sol.	(C) 0	1
18.	Curved surface area of a cylinder of height 5 cm is 94.2 cm ^{2}. Radius of the cylinder is (Take π = 3.14) (A) 2 cm (B) 3 cm (C) 2.9 cm (D) 6 cm	
Sol.	(B) 3cm	1
	Assertion-Reason Type Questions In Question **19** and **20**, an **Assertion (A)** statement is followed by a statement of **Reason (R)**. Select the correct option out of the following : (A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). (B) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A). (C) Assertion (A) is true but Reason (R) is false. (D) Assertion (A) is false but Reason (R) is true.	

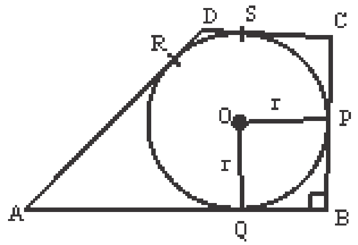
19.	Assertion (A) : The perimeter of ΔABC is a rational number. Reason (R) : The sum of the squares of two rational numbers is always rational.  	
Sol.	(D) Assertion (A) is false but Reason (R) is true	1
20.	Assertion (A): Point $P\ (0,\ 2)$ is the point of intersection of *y*-axis with the line $3x + 2y = 4$. Reason (R): The distance of point $P\ (0,\ 2)$ from x-axis is 2 units.	
Sol.	(B) Both Assertion (A) and Reason (R) are correct but Reason (R) is not the correct explanation of Assertion (A)	1
	SECTION B This section comprises of Very Short Answer (VSA) type questions of 2 marks each.	
21.	Find the least number which when divided by 12, 16 and 24 leaves remainder 7 in each case	
Sol.	LCM of 12, 16, 24 = 48 Required number is 48 + 7 = 55.	1 1
22.	A bag contains 4 red, 3 blue and 2 yellow balls. One ball is drawn at random from the bag. Find the probability that drawn ball is (i) red (ii) yellow.	
Sol.	Total No of Balls=9 (i) P(drawn ball is red) = $\frac{4}{9}$	1

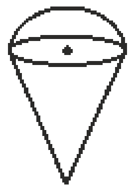
	(ii) P(drawn ball is yellow) = $\frac{2}{9}$	1
23(a).	Solve the pair of equations x=5 and y=7 graphically.	
Sol.	Drawing correct graph Solution is x = 5, y = 7	1 1
	OR	
23(b).	Using graphical method, find whether pair of equations x=0 and y = −3 is consistent or not	
Sol.	Drawing correct graph As $x = 0$ and $y = -3$ are intersecting ∴ Pair of equations is consistent	1 1
24(a).	If $sin\theta + cos\theta = \sqrt{3}$, then find the value of $sin\theta \cdot cos\theta$.	
Sol.	$\sin\theta + \cos\theta = \sqrt{3}$ squaring both sides $\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3$ $\Rightarrow 1 + 2\sin\theta\cos\theta = 3$ $\Rightarrow \sin\theta\cos\theta = 1$	 1 $\frac{1}{2}$ $\frac{1}{2}$
	OR	
24(b).	If $\sin\alpha = \frac{1}{\sqrt{2}}$ and $\cot\beta = \sqrt{3}$, then find the value of cosecα+ cosecβ	

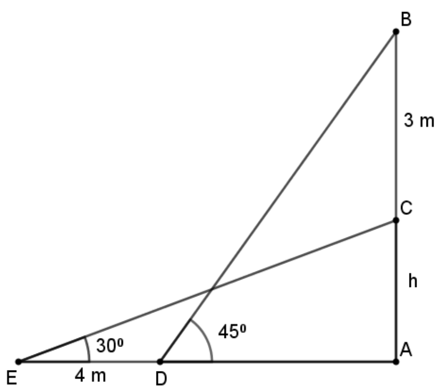
Sol.	$\text{cosec}\ \alpha = \frac{1}{\sin\ \alpha} = \sqrt{2}$ $\text{cosec}\ \beta = \sqrt{1 + \cot^2\beta} = \sqrt{1+3} = 2$ $\therefore\ \text{cosec}\ \alpha + \text{cosec}\ \beta = \sqrt{2} + 2$ or $\sqrt{2}\ (\sqrt{2} + 1)$	$\frac{1}{2}$ 1 $\frac{1}{2}$
25.	In the given figure, XZ is parallel to BC. AZ = 3 cm, ZC = 2 cm, BM = 3 cm and MC = 5 cm. Find the length of XY.  	
Sol.	As $XZ \parallel BC$ Therefore, $\frac{AX}{XB} = \frac{3}{2} = \frac{AZ}{ZC}$ — (i) Δ AXY ~ Δ ABM $\Rightarrow \frac{AX}{AB} = \frac{XY}{BM}$ or $\frac{3}{5} = \frac{XY}{3}$ $\Rightarrow XY = \frac{9}{5}$ or 1·8 cm	½ ½ ½ ½
	SECTION C This section comprises of Short Answer (SA) type questions of 3 marks each.	
26.	The centre of a circle is (2a, a-7). Find the values of ‘a’ if the circle passes through the point (11,-9). Radius of the circle is $5\sqrt{2}$ cm.	
Sol.	$(2a - 11)^2 + (a - 7 + 9)^2 = (5\sqrt{2})^2$ $\Rightarrow 5a^2 - 40a + 75 = 0$ $\Rightarrow (a - 5)(5a - 15) = 0$ a = 5, a = 3	1 1 1

27(a).	(a) Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that $\angle PTQ = 2\angle OPQ$.  	
Sol.	TP = TQ $\Rightarrow \angle TPQ = \angle TQP$ Let $\angle PTQ$ be θ $\Rightarrow \angle TPQ = \angle TQP = \frac{180° - \theta}{2} = 90° - \frac{\theta}{2}$ Now $\angle OPT = 90°$ $\Rightarrow \angle OPQ = 90° - (90° - \frac{\theta}{2}) = \frac{\theta}{2}$ $\angle PTQ = 2\angle OPQ$	 1 1 1
	OR	

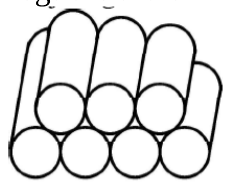
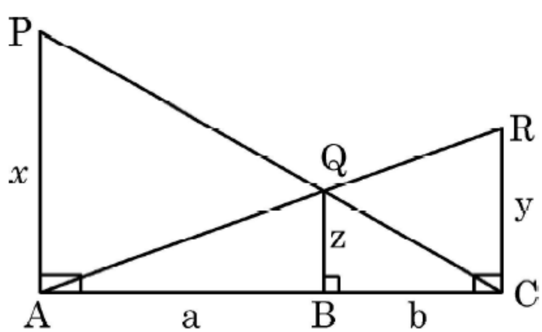
27(b).	In the given figure, a circle is inscribed in a quadrilateral ABCD in which $\angle B = 90^0$ .If AD=17 cm, AB = 20 cm and DS = 3 cm, then find the radius of the circle.  	

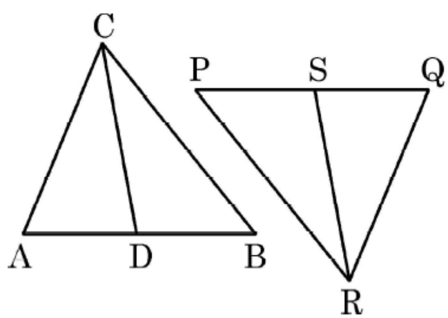
Sol.	 DR = DS = 3 cm $\therefore$ AR = AD – DR = 17 – 3 = 14 cm $\Rightarrow$ AQ = AR = 14 cm $\therefore$ QB = AB – AQ = 20 – 14 = 6 cm Since QB = OP = r $\therefore$ radius = 6 cm	½ 1 ½ ½ ½
28.	Half of the difference between two numbers is 2. The sum of the greater number and twice the smaller number is 13. Find the numbers.	
Sol.	Let the numbers be x and y, x > y Therefore $\frac{1}{2}(x-y) = 2$ — (i) and $2y + x = 13$ — (ii) Solving equations (i) and (ii) x = 7, y = 3	 1 1 1
29(a).	A room is in the form of cylinder surmounted by a hemi-spherical dome. The base radius of hemisphere is one-half the height of cylindrical part. Find total height of the room if it contains $\left(\frac{1408}{21}\right)m^3$ of air. Take $\left(\pi = \frac{22}{7}\right)$	
Sol.	Let h be height of cylindrical part and r be radius of hemisphere Volume of room $= 2\pi r^3 + \frac{2}{3}\pi r^3 = \frac{1408}{21}$ $\Rightarrow$ r = 2 Therefore, h=4 Height of the room is = 6m	½ 1 ½ ½ ½

	OR	
29(b).	An empty cone is of radius 3 cm and height 12 cm. Ice-cream is filled in it so that lower part of the cone which is $\left(\frac{1}{6}\right)^{th}$ of the volume of the cone is unfilled but hemisphere is formed on the top. Find volume of the ice-cream. (Take π = 3.14) 	
Sol.	Volume of the cone = $=\frac{1}{3}\times\pi\times9\times12=36\pi cm^3$	1
	Volume of ice-cream in the cone = $\frac{5}{6}\times 36\times\pi = 30\pi cm^3$	½
	Volume of ice-cream on top = $\frac{2}{3}\times 27\times\pi = 18\pi cm^3$	1
	Total volume of the ice-cream = $(30\pi+18\pi)=48\pi cm^3$	
	$=48\times3.14=150.72cm^3$	½
30.	Prove that $\sqrt{5}$ is an irrational number	
Sol.	Let $\sqrt{\mathbf{5}}$ be a rational number. $\therefore \sqrt{\mathbf{5}} = \frac{\mathbf{p}}{\mathbf{q}}$, where q≠0 and let p & q be co-primes. $5q^2 = p^2 \Rightarrow p^2$ is divisible by 5 $\Rightarrow$ p is divisible by 5 $\Rightarrow$ p = 5a, where ‘a’ is some integer ----- (i) $25a^2 = 5q^2 \Rightarrow q^2 = 5a^2 \Rightarrow q^2$ is divisible by 5 $\Rightarrow$ q is divisible by 5 $\Rightarrow$ q = 5b, where ‘b’ is some integer ----- (ii) (i) and (ii) leads to contradiction as ‘p’ and ‘q’ are co-primes. $\therefore \sqrt{\mathbf{5}}$ is an irrational number.	½ 1 ½ 1
31.	Prove that $(cos\,e\,cA - sin\,A)(sec\,A - cos\,A) = \frac{1}{cot\,A - tan\,A}$	

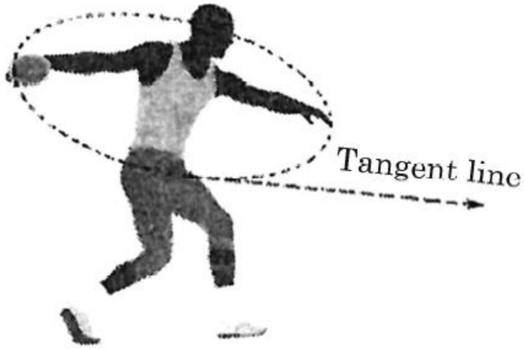
Sol.	LHS $=\left(\frac{1}{\sin A} - \sin A\right)\left(\frac{1}{\cos A} - \cos A\right)$ $= \frac{1 - \sin^2 A}{\sin A} \times \frac{1 - \cos^2 A}{\cos A}$ $= \sin A \cos A$ RHS $= \frac{1}{\frac{\cos A}{\sin A} + \frac{\sin A}{\cos A}}$ $= \frac{\sin A \cos A}{\sin^2 A + \cos^2 A}$ $= \sin A \cos A =$ LHS	½ ½ ½ ½ ½ ½
	SECTION D This section comprises of Long Answer (LA) type questions of 5 marks each.	
32.	A ladder set against a wall at an angle 45^0 to the ground. If the foot of the ladder is pulled away from the wall through a distance of 4 m, its top slides a distance of 3 m down the wall making an angle 30^0 with the ground. Find the final height of the top of the ladder from the ground and length of the ladder.	
Sol.	 $\sin 45° = \frac{AB}{BD} = \frac{h+3}{BD}$ $\Rightarrow BD = (h+3)\sqrt{2}$ ------ (i) $\sin 30° = \frac{1}{2} = \frac{h}{CE}$ $\Rightarrow CE = 2h$ ------ (ii)	1 for correct figure 1 1

	length of ladder remains same Therefore BD = CE $\Rightarrow$ (h + 3) $\sqrt{2}$ = 2h $\Rightarrow h = \frac{3\sqrt{2}}{2-\sqrt{2}} = 3(\sqrt{2}+1)$ Final height of the top of the ladder = 3($\sqrt{2}$ + 1) m and length of ladder = 2h = 6($\sqrt{2}$ + 1) m	1 1
33(a).	The ratio of the 11th term to 17th term of an A.P. is 3:4. Find the ratio of 5th term to 21st term of the same A.P. Also, find the ratio of the sum of first 5 terms to that of first 21 terms.	
Sol.	Given $\frac{a+10d}{a+16d} = \frac{3}{4}$ $\Rightarrow$ 4a + 40d = 3a + 48d $\Rightarrow$ a = 8d (i) therefore $\frac{a_5}{a_{21}} = \frac{a+4d}{a+20d} = \frac{3}{7}$ using(i) $a_5 : a_{21} = 3 : 7$ $\frac{s_5}{s_{21}} = \frac{\frac{5}{2}(2a+4d)}{\frac{21}{2}(2a+20d)} = \frac{5\times 20d}{21\times 36d} = \frac{25}{189}$ Therefore, $S_5:S_{21}$=25:189	1 1 1 2
	OR	

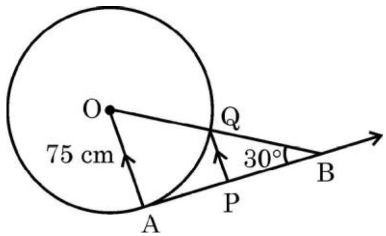
33(b).	250 logs are stacked in the following manner: 22 logs in the bottom row, 21 in the next row, 20 in the row next to it and so on (as shown by an example). In how many rows, are the 250 logs placed and how many logs are there in the top row?  (Example)	
Sol.	Let the number of rows be n. A.P. formed is 22, 21, 20, 19, ... Here a = 22, d = – 1 Sn = 250 $\therefore\ 250 = \frac{n}{2}[44 + (n-1)(-1)]$ $\Rightarrow n^2 - 45n + 500 = 0$ $\Rightarrow (n-25)(n-20) = 0$ $n \neq 25\ \therefore\ n = 20$ logs in top row = $a_{20} = 22 + 19(-1) = 3$	1 1 1 1 1
34(a).	PA, QB and RC are each perpendicular to AC. If AP = x, QB = z, RC = Y, AB = a and BC = b, then prove that $\frac{1}{x}+\frac{1}{y}=\frac{1}{z}$ 	
Sol.	(a)Δ CQB ~ Δ CPA	

	$\Rightarrow \dfrac{b}{a+b} = \dfrac{z}{x}$ — (i) Also Δ AQB ~ Δ ARC $\Rightarrow \dfrac{a}{a+b} = \dfrac{z}{y}$ — (ii) from (i) and (ii) $\dfrac{z}{x} + \dfrac{z}{y} = \dfrac{a+b}{a+b} = 1$ $\Rightarrow \dfrac{1}{x} + \dfrac{1}{y} = \dfrac{1}{z}$	$1\frac{1}{2}$ $1\frac{1}{2}$ 1 1
	OR	
34(b).	In the given figure, CD and RS are respectively the medians of ΔABC and ΔPQR. If $\Delta ABC \sim \Delta PQR$ then prove that: (i) Δ ADC~ΔPSR (ii) $AD \times PR = AC \times PS$ 	
Sol.	(i) Δ ABC ~ Δ PQR $\Rightarrow \angle A = \angle P$ and $\dfrac{AB}{PQ} = \dfrac{AC}{PR}$ $\Rightarrow \dfrac{2AD}{2PS} = \dfrac{AC}{PR}$	1 $\frac{1}{2}$ $\frac{1}{2}$

	$\Rightarrow \dfrac{AD}{PS} = \dfrac{AC}{PR}$ and $\angle A = \angle P$ Therefore Δ ADC ~ Δ PSR (ii)Hence $\frac{AD}{PS} = \frac{AC}{PR}$ $\Rightarrow AD \times PR = AC \times PS$	1 1 1
35.	A chord of a circle of radius 14 cm subtends an angle of 60^0 at the center. Find the area of the corresponding minor segment of the circle. Also find the area of the major segment of the circle.	
Sol.	Area of minor segment $= \dfrac{22}{7} \times 14 \times 14 \times \dfrac{60}{360} - \dfrac{1}{2} \times 14 \times 14 \times \dfrac{\sqrt{3}}{2}$ $= \left(\dfrac{308}{3} - 49\sqrt{3}\right) cm^2$ or $17.9 cm^2$ Area of major segment $= \frac{22}{7} \times 14 \times 14 - \left(\frac{308}{3} - 49\sqrt{3}\right)$ $= 616 - \dfrac{308}{3} + 49\sqrt{3}$ $= \left(\dfrac{1540}{3} + 49\sqrt{3}\right) cm^2$ or $598.1 cm^2$	1+1 1 1 1
	SECTION E This section comprises of 3 case-study based questions of 4 marks each.	
36.	The discus throw is an event in which an athlete attempts to throw a discus. The athlete spins anti-clockwise around one and a half times through a circle, then releases the throw. When released, the discus travels along tangent to the circular spin orbit.	



In the given figure, AB is one such tangent to a circle of radius 75 cm. Point O is centre of the circle and $\angle ABO = 30^0$. PQ is parallel to OA.



Based on above information:

(a) find the length of AB.

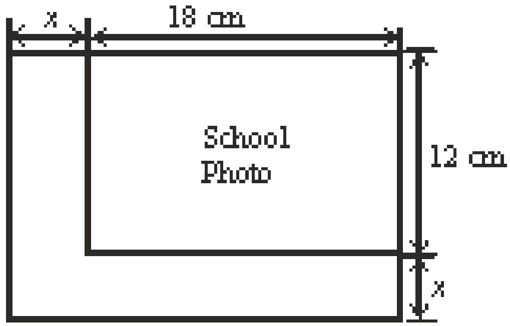
(b) find the length of OB.

(c) find the length of AP.

OR

Find the length of PQ

Sol.	(i) $\tan 30° = \frac{1}{\sqrt{3}} = \frac{75}{AB}$ $\Rightarrow AB = 75\sqrt{3}$ cm (ii) $\sin 30° = \frac{1}{2} = \frac{75}{OB}$ $\Rightarrow OB = 150$ cm (iii) QB = 150 – 75 = 75 cm $\Rightarrow$ Q is mid-point. of OB Since PQ ll AO therefore P is mid-point of AB Hence $AP = \frac{75\sqrt{3}}{2}$ cm. **OR** (iii) QB = 150 – 75 = 75 cm Now, Δ BQP ~ Δ BOA $\Rightarrow \frac{QB}{OB} = \frac{PQ}{OA}$ $\Rightarrow \frac{1}{2} = \frac{PQ}{75}$ $\Rightarrow PQ = \frac{75}{2}$ cm	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ 1 1 $\frac{1}{2}$ 1 $\frac{1}{2}$
37.	While designing the school year book, a teacher asked the student that the length and width of a particular photo is increased by x units each to double the area of the photo. The original photo is 18 cm long and 12 cm wide. Based on the above information, answer the following questions: (I) Write an algebraic equation depicting the above information. (II) Write the corresponding quadratic equation in standard form. (III) What should be the new dimensions of the enlarged photo?	

	 OR Can any rational value of x make the new area equal to $220cm^2$	
Sol.	(i) $(18 + x)(12 + x) = 2(18 \times 12)$ (ii) $x^2 + 30x - 216 = 0$ (iii) Solving: $x^2 + 30x - 216 = 0$ $\Rightarrow (x + 36)(x - 6) = 0$ $x \neq -36 \therefore \Rightarrow x = 6.$ new dimensions are 24 cm $\times$ 18 cm **OR** (iii) If $(18 + x)(12 + x) = 220$ then $x^2 + 30x - 4 = 0$ Here D = 900 + 16 = 916 which is not a perfect square. Thus, we can't have any such rational value of x.	1 1 1 1 1 1
38.	India meteorological department observes seasonal and annual rainfall every year in different sub-divisions of our country.	

It helps them to compare and analyse the results. The table given below shows sub-division wise seasonal (monsoon) rainfall (mm) in 2018:

Rainfall (mm)	Number of Sub-divisions
200-400	2
400-600	4
600-800	7
800-1000	4
1000-1200	2
1200-1400	3
1400 -1600	1
1600-1800	1

Based on the above information, answer the following questions:

(I) Write the modal class.

(II) Find the median of the given data.

OR

Find the mean rainfall in this season.

(III) If sub-division having at least 1000 mm rainfall during monsoon season, is considered good rainfall sub-division, then how many sub-divisions had good rainfall?

Sol.	(i) Modal Class is 600-800	1

	(ii) $\frac{N}{2} = 12$, median class is 600 – 800	½

Rainfall	x_i	f_i	cf.
200 – 400	300	2	2
400 – 600	500	4	6
600 – 800	700	7	13
800 – 1000	900	4	17
1000 – 1200	1100	2	19
1200 – 1400	1300	3	22
1400 – 1600	1500	1	23
1600 – 1800	1700	1	24
		24	

½ for correct table

Median = $600 + \frac{200}{7}(12 - 6)$

$= \frac{5400}{7}$ or 771·4 — 1

OR

(ii)

Rainfall	x_i	f_i	$f_i x_i$
200 – 400	300	2	600
400 – 600	500	4	2000
600 – 800	700	7	4900
800 – 1000	900	4	3600
1000 – 1200	1100	2	2200
1200 – 1400	1300	3	3900
1400 – 1600	1500	1	1500

	<table><tr><td>1600 – 1800</td><td>1700</td><td>1</td><td>1700</td></tr><tr><td></td><td></td><td>24</td><td>20400</td></tr></table> Mean = $\frac{20400}{24}$ = 850 (iii) Sub-divisions having good rainfall = 2 + 3 + 1 + 1 = 7.	1 for correct table 1 1