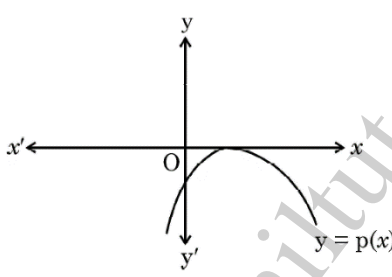
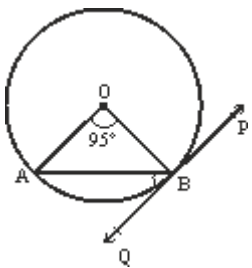


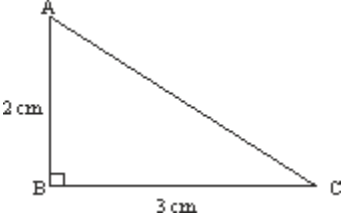
**MARKING SCHEME**  
**MATHEMATICS (Subject Code-041)**  
**(PAPER CODE: 30/1/1)**

Q. No.	EXPECTED OUTCOMES/VALUE POINTS	Marks
	<b>SECTION A</b> 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.	<p>The graph of <math>y = p(x)</math> is given, for a polynomial <math>p(x)</math>. The number of zeroes of <math>p(x)</math> from the graph is</p> <p>(A) 3                      (B) 1                      (C) 2                      (D) 0</p> <div style="text-align: center;">  </div>	
Sol.	(B) 1	1
2.	<p>The value of <math>k</math> for which the pair of equations <math>kx = y + 2</math> and <math>6x = 2y + 3</math> has infinitely many solutions,</p> <p>(A) is <math>k = 3</math>              (B) does not exist              (C) is <math>k = -3</math>              (D) is <math>k = 4</math></p>	
Sol.	(B) does not exist	1
3.	<p>If <math>p - 1</math>, <math>p + 1</math> and <math>2p + 3</math> are in A.P., then the value of <math>p</math> is</p> <p>(A) <math>-2</math>                      (B) <math>4</math>                      (C) <math>0</math>                      (D) <math>2</math></p>	
Sol.	(C) 0	1
4.	<p>In what ratio, does <math>x</math>-axis divide the line segment joining the points <math>A(3, 6)</math> and <math>B(-12, -3)</math> ?</p> <p>(A) 1 : 2                      (B) 1 : 4                      (C) 4 : 1                      (D) 2 : 1</p>	

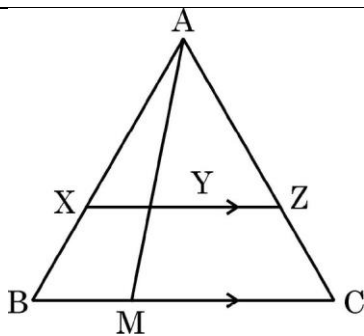
Sol.	(D) 2 : 1	1
5.	<p>In the given figure, <math>PQ</math> is tangent to the circle centred at <math>O</math>. If <math>\angle AOB = 95^\circ</math>, then the measure of <math>\angle ABQ</math> will be</p>  <p>(A) <math>47.5^\circ</math>      (B) <math>42.5^\circ</math>      (C) <math>85^\circ</math>      (D) <math>95^\circ</math></p>	
Sol.	(A) $47.5^\circ$	1
6.	<p>If <math>2 \tan A = 3</math>, then the value of <math>\frac{4 \sin A + 3 \cos A}{4 \sin A - 3 \cos A}</math> is</p> <p>(A) <math>\frac{7}{\sqrt{13}}</math>      (B) <math>\frac{1}{\sqrt{13}}</math>      (C) 3      (D) does not exist</p>	
Sol.	(C) 3	1
7.	<p>If <math>\alpha, \beta</math> are the zeroes of a polynomial <math>p(x) = x^2 + x - 1</math>, then <math>\frac{1}{\alpha} + \frac{1}{\beta}</math> equals to</p> <p>(A) 1      (B) 2      (C) -1      (D) <math>-\frac{1}{2}</math></p>	
Sol.	(A) 1	1
8.	<p>The least positive value of <math>k</math>, for which the quadratic equation <math>2x^2 + kx - 4 = 0</math> has rational roots, is</p> <p>(A) <math>\pm 2\sqrt{2}</math>      (B) 2      (C) <math>\pm 2</math>      (D) <math>\sqrt{2}</math></p>	
Sol.	(B) 2	1
9.	<p><math>\left[ \frac{3}{4} \tan^2 30^\circ - \sec^2 45^\circ + \sin^2 60^\circ \right]</math> is equal to</p> <p>(A) -1      (B) <math>\frac{5}{6}</math>      (C) <math>-\frac{3}{2}</math>      (D) <math>\frac{1}{6}</math></p>	
Sol.	(A) -1	1

10.	Curved surface area of a cylinder of height 5 cm is $94.2 \text{ cm}^2$ . Radius of the cylinder is (Take $\pi = 3.14$ ) (A) 2 cm      (B) 3 cm      (C) 2.9 cm      (D) 6 cm															
Sol.	(B) 3	1														
11.	The distribution below gives the marks obtained by 80 students on a test : <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Marks</th> <th>Less than 10</th> <th>Less than 20</th> <th>Less than 30</th> <th>Less than 40</th> <th>Less than 50</th> <th>Less than 60</th> </tr> </thead> <tbody> <tr> <td>Number of Students</td> <td>3</td> <td>12</td> <td>27</td> <td>57</td> <td>75</td> <td>80</td> </tr> </tbody> </table> <p>The modal class of this distribution is :  (A) 10-20      (B) 20-30  (C) 30-40      (D) 50-60</p>	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	
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										
Sol.	(C) 30 – 40	1														
12.	The curved surface area of a cone having height 24 cm and radius 7 cm, is (A) $528 \text{ cm}^2$ (B) $1056 \text{ cm}^2$ (C) $550 \text{ cm}^2$ (D) $500 \text{ cm}^2$															
Sol.	(C) $550 \text{ cm}^2$	1														
13.	The distance between the points $(0, 2\sqrt{5})$ and $(-2\sqrt{5}, 0)$ is (A) $2\sqrt{10}$ units      (B) $4\sqrt{10}$ units      (C) $2\sqrt{20}$ units      (D) 0															
Sol.	(A) $2\sqrt{10}$ units	1														
14.	Which of the following is a quadratic polynomial having zeroes $-\frac{2}{3}$ and $\frac{2}{3}$ ? (A) $4x^2 - 9$ (B) $\frac{4}{9}(9x^2 + 4)$ (C) $x^2 + \frac{9}{4}$ (D) $5(9x^2 - 4)$															
Sol.	(D) $5(9x^2 - 4)$	1														
15.	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														

16.	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
17.	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
18.	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) $\frac{3}{4}$	1
<b>Assertion-Reason Type Questions</b>		
<p>In Question 19 and 20, an <b>Assertion (A)</b> statement is followed by a statement of <b>Reason (R)</b>. Select the correct option out of the following :</p> <p>(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.</p>		
19.	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

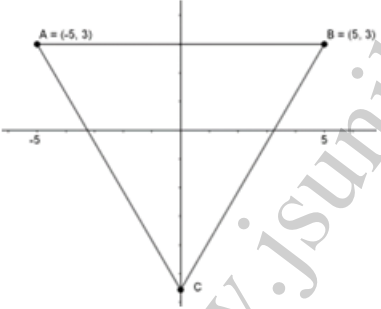
20.	<p>Assertion (A): The perimeter of <math>\triangle ABC</math> is a rational number.</p> <p>Reason (R): The sum of the squares of two rational numbers is always rational.</p> 	
Sol.	(D) Assertion (A) is false but Reason (R) is true	1

	<p><b>SECTION B</b></p> <p>This section comprises of Very Short Answer (VSA) type questions of 2 marks each.</p>	
21(a).	Solve the pair of equations $x = 3$ and $y = -4$ graphically.	
Sol.	<p>Correct graph of both the equations.</p> <p>Solution of equation is <math>x = 3, y = -4</math></p>	<p>1</p> <p>1</p>
	<b>OR</b>	
21(b).	<p>Using graphical method, find whether following system of linear equations is consistent or not:</p> <p style="text-align: center;"><math>x = 0</math> and <math>y = -7</math></p>	
Sol.	<p>Correct graph of <math>y = -7</math> and <math>x = 0</math></p> <p>As <math>y = -7</math> is intersecting <math>x = 0</math> at <math>(0, -7)</math></p> <p>So, system of equations is consistent</p>	<p>1</p> <p>1</p>
22.	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.	

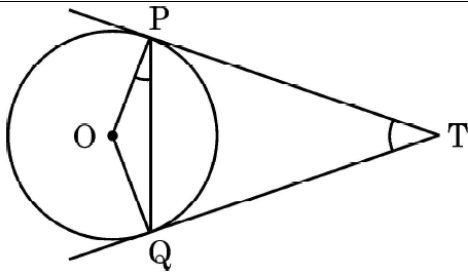


Sol.	<p>As <math>XZ \parallel BC</math> Therefore <math>\frac{AX}{XB} = \frac{3}{2} = \frac{AZ}{ZC}</math> - (i)</p> <p><math>\Delta AXY \sim \Delta ABM</math></p> <p><math>\Rightarrow \frac{AX}{AB} = \frac{XY}{BM}</math> or <math>\frac{3}{5} = \frac{XY}{3}</math></p> <p><math>\Rightarrow XY = \frac{9}{5}</math> or 1.8 cm</p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
23(a).	If $\sin\theta + \cos\theta = \sqrt{3}$ , then find the value of $\sin\theta \cdot \cos\theta$ .	
Sol.	<p><math>\sin\theta + \cos\theta = \sqrt{3}</math></p> <p>squaring both sides</p> <p><math>\sin^2\theta + \cos^2\theta + 2\sin\theta\cos\theta = 3</math></p> <p><math>\Rightarrow 1 + 2\sin\theta\cos\theta = 3</math></p> <p><math>\Rightarrow \sin\theta\cos\theta = 1</math></p>	<p>1</p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
	<b>OR</b>	
23(b).	If $\sin\alpha = \frac{1}{\sqrt{2}}$ and $\cot\beta = \sqrt{3}$ , then find the value of $\operatorname{cosec}\alpha + \operatorname{cosec}\beta$	

Sol.	$\operatorname{cosec} \alpha = \frac{1}{\sin \alpha} = \sqrt{2}$ $\operatorname{cosec} \beta = \sqrt{1 + \cot^2 \beta} = \sqrt{1 + 3} = 2$ $\therefore \operatorname{cosec} \alpha + \operatorname{cosec} \beta = \sqrt{2} + 2 \text{ or } \sqrt{2} (\sqrt{2} + 1)$	$\frac{1}{2}$  1  $\frac{1}{2}$
24.	Find the greatest number which divides 85 and 72 leaving remainders 1 and 2 respectively.	
Sol.	<p>We have to find HCF of <math>85 - 1 = 84</math> and <math>72 - 2 = 70</math>.</p> <p>HCF of 84 and 70 = 14</p>	  1  1
25.	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.	<p>Total No of Balls=9</p> <p>(i) <math>P(\text{drawn ball is red}) = \frac{4}{9}</math></p> <p>(ii) <math>P(\text{drawn ball is yellow}) = \frac{2}{9}</math></p>	  1  1
	<p><b>SECTION C</b></p> <p>This section comprises of Short Answer (SA) type questions of 3 marks each.</p>	
26.	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.	<p>Let the numbers be <math>x</math> and <math>y</math>, <math>x &gt; y</math></p> <p>Therefore <math>\frac{1}{2} (x - y) = 2</math> — (i)</p> <p>and <math>2y + x = 13</math> — (ii)</p> <p>Solving equations (i) and (ii)</p> <p><math>x = 7, y = 3</math></p>	  1  1  1

27.	Prove that $\sqrt{5}$ is an irrational number.	
Sol.	<p>Let <math>\sqrt{5}</math> be a rational number.</p> <p><math>\therefore \sqrt{5} = \frac{p}{q}</math>, where <math>q \neq 0</math> and let <math>p</math> &amp; <math>q</math> be co-primes.</p> <p><math>5q^2 = p^2 \Rightarrow p^2</math> is divisible by 5 <math>\Rightarrow p</math> is divisible by 5</p> <p><math>\Rightarrow p = 5a</math>, where 'a' is some integer ----- (i)</p> <p><math>25a^2 = 5q^2 \Rightarrow q^2 = 5a^2 \Rightarrow q^2</math> is divisible by 5 <math>\Rightarrow q</math> is divisible by 5</p> <p><math>\Rightarrow q = 5b</math>, where 'b' is some integer ----- (ii)</p> <p>(i) and (ii) leads to contradiction as 'p' and 'q' are co-primes.</p> <p><math>\therefore \sqrt{5}</math> is an irrational number.</p>	<p><math>\frac{1}{2}</math></p> <p>1</p> <p><math>\frac{1}{2}</math></p> <p>1</p>
28.	If $(-5,3)$ and $(5,3)$ are two vertices of an equilateral triangle, then find coordinates of the third vertex, given that origin lies inside the triangle. (Take $\sqrt{3} = 1.7$ )	
Sol.	 <p>Let the third vertex be <math>(x,y)</math></p> <p>A <math>(-5,3)</math> B <math>(5,3)</math> C <math>(x,y)</math></p> <p><math>AB=10=AC</math></p> <p><math>AC^2=100</math></p> <p><math>(-5-x)^2+(3-y)^2 = (5-x)^2+(3-y)^2</math></p> <p><math>20x = 0</math></p> <p><math>x=0</math></p> <p><math>(3-y)^2=75</math></p> <p><math>3-y = \pm 5\sqrt{3}</math></p> <p><math>y=3-5\sqrt{3}</math></p> <p><math>y= -5.5</math></p> <p>The coordinates of the third vertex are <math>(0,-5.5)</math></p>	<p>1</p> <p>1</p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
29(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  $\theta$

$$\Rightarrow \angle TPQ = \angle TQP = \frac{180^\circ - \theta}{2} = 90^\circ - \frac{\theta}{2}$$

Now  $\angle OPT = 90^\circ$

$$\Rightarrow \angle OPQ = 90^\circ - (90^\circ - \frac{\theta}{2}) = \frac{\theta}{2}$$

$$\angle PTQ = 2 \angle OPQ$$

1

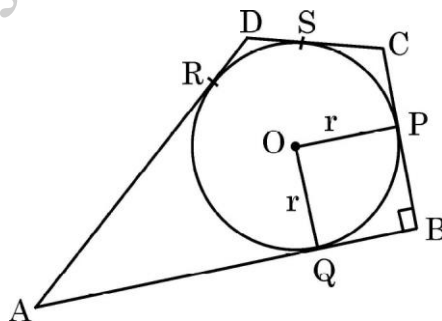
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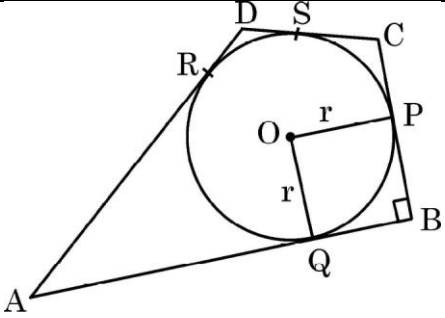
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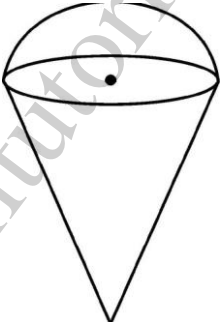
**OR**

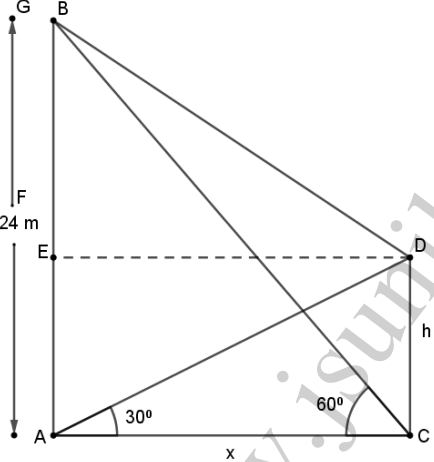
29(b).

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

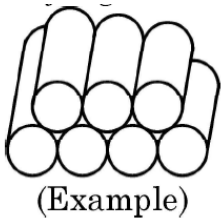


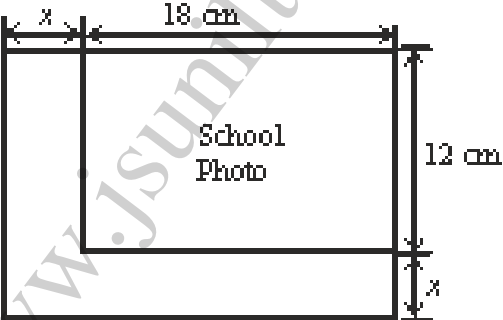
<p>Sol.</p>	 <p>DR = DS = 3 cm</p> <p><math>\therefore AR = AD - DR = 17 - 3 = 14</math> cm  <math>\Rightarrow AQ = AR = 14</math> cm</p> <p><math>\therefore QB = AB - AQ = 20 - 14 = 6</math> cm</p> <p>Since <math>QB = OP = r \therefore</math> radius = 6 cm</p>	<p><math>\frac{1}{2}</math></p> <p>1</p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
<p>30.</p>	<p>Prove that: <math>\frac{\tan \theta + \sec \theta - 1}{\tan \theta - \sec \theta + 1} = \frac{1 + \sin \theta}{\cos \theta}</math></p>	
<p>Sol.</p>	<p>LHS = <math>\frac{(\tan \theta + \sec \theta) - (\sec^2 \theta - \tan^2 \theta)}{\tan \theta - \sec \theta + 1}</math></p> <p><math>= \frac{(\tan \theta + \sec \theta)(1 - \sec \theta + \tan \theta)}{\tan \theta - \sec \theta + 1}</math></p> <p><math>= \tan \theta + \sec \theta</math></p> <p><math>= \frac{1 + \sin \theta}{\cos \theta} = \text{RHS}</math></p>	<p>1</p> <p><b>1</b></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p>
<p>31(a).</p>	<p>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 <math>\left(\frac{1408}{21}\right)m^3</math> of air. Take <math>\left(\pi = \frac{22}{7}\right)</math></p>	

Sol.	<p>Let h be height of cylindrical part and r be radius of hemisphere</p> <p>Volume of room = <math>2\pi r^3 + \frac{2}{3}\pi r^3 = \frac{1408}{21}</math></p> <p><math>\Rightarrow r = 2</math></p> <p>Therefore, h=4</p> <p>Height of the room is = 6m</p>	<p>½</p> <p>1</p> <p>½</p> <p>½</p> <p>½</p>
OR		
31(b).	<p>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 <math>\left(\frac{1}{6}\right)^{th}</math> of the volume of the cone is unfilled but hemisphere is formed on the top. Find volume of the ice-cream. (Take <math>\pi = 3.14</math>)</p> <div style="text-align: center;">  </div>	
Sol.	<p>Volume of the cone = <math>\frac{1}{3} \times \pi \times 9 \times 12 = 36\pi cm^3</math></p> <p>Volume of ice-cream in the cone = <math>\frac{5}{6} \times 36 \times \pi = 30\pi cm^3</math></p> <p>Volume of ice-cream on top = <math>\frac{2}{3} \times 27 \times \pi = 18\pi cm^3</math></p> <p>Total volume of the ice-cream = <math>(30\pi + 18\pi) = 48\pi cm^3</math></p> <p><math>= 48 \times 3.14 = 150.72 cm^3</math></p>	<p>1</p> <p>½</p> <p>1</p> <p>½</p>
<p><b>SECTION D</b></p> <p>This section comprises of Long Answer (LA) type questions of 5 marks each.</p>		

32.	If a line is drawn parallel to one side of a triangle to intersect the other two sides at distinct points, prove that the other two sides are divided in the same ratio.	
Sol.	Correct Given, to prove, figure, construction Correct proof	2 3
33(a).	The angle of elevation of the top of a tower 24 m high from the foot of another tower in the same plane is $60^\circ$ . The angle of elevation of the top of second tower from the foot of the first tower is $30^\circ$ . Find the distance between two towers and the height of the other tower. Also, find the length of the wire attached to the tops of both the towers.	
Sol.	 <p>Let AB and CD be the given towers.</p> $\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{h}{x} \Rightarrow x = h\sqrt{3} \text{ --- (i)}$ $\tan 60^\circ = \sqrt{3} = \frac{24}{x} \Rightarrow x = \frac{24}{\sqrt{3}} \text{ or } 8\sqrt{3} \text{ --- (ii)}$ <p>using (i) and (ii)</p> $x = 8\sqrt{3} \text{ and } h = 8$ <p>length of wire = <math>\sqrt{BE^2 + x^2} = \sqrt{256 + 192} = \sqrt{448} \text{ m} = 8\sqrt{7} \text{ m}</math></p>	1 mark for correct figure  1  1  $\frac{1}{2} + \frac{1}{2}$  1



	$\begin{aligned} \text{Area of major segment} &= \frac{22}{7} \times 14 \times 14 - \left( \frac{308}{3} - 49\sqrt{3} \right) \\ &= 616 - \frac{308}{3} + 49\sqrt{3} \\ &= \left( \frac{1540}{3} + 49\sqrt{3} \right) \text{cm}^2 \text{ or } 598.1\text{cm}^2 \end{aligned}$	1 1
35(a).	The ratio of the 11 <sup>th</sup> term to 17 <sup>th</sup> term of an A.P. is 3:4. Find the ratio of 5 <sup>th</sup> term to 21 <sup>st</sup> term of the same A.P. Also, find the ratio of the sum of first 5 terms to that of first 21 terms.	
Sol.	<p>Given <math>\frac{a + 10d}{a + 16d} = \frac{3}{4}</math></p> <p><math>\Rightarrow 4a + 40d = 3a + 48d</math></p> <p><math>\Rightarrow a = 8d</math> (i)</p> <p>therefore <math>\frac{a_5}{a_{21}} = \frac{a + 4d}{a + 20d} = \frac{3}{7}</math> using (i)</p> <p><math>a_5 : a_{21} = 3 : 7</math></p> $\frac{s_5}{s_{21}} = \frac{\frac{5}{2}(2a + 4d)}{\frac{21}{2}(2a + 20d)} = \frac{5 \times 20d}{21 \times 36d} = \frac{25}{189}$ <p>Therefore, <math>S_5 : S_{21} = 25 : 189</math></p>	1 1 1 2
	<b>OR</b>	
35(b).	<p>250 logs are stacked in the following manner:</p> <p>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?</p> <div style="text-align: center;">  <p>(Example)</p> </div>	
Sol.	<p>Let the number of rows be n.</p> <p>A.P. formed is 22, 21, 20, 19, .....</p>	

	<p>Here <math>a = 22</math>, <math>d = -1</math> <math>S_n = 250</math></p> $\therefore 250 = \frac{n}{2} [44 + (n-1)(-1)]$ $\Rightarrow n^2 - 45n + 500 = 0$ $\Rightarrow (n-25)(n-20) = 0$ <p><math>n \neq 25 \therefore n = 20</math></p> <p>logs in top row = <math>a_{20} = 22 + 19(-1) = 3</math></p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>
	<p><b>SECTION E</b></p> <p>This section comprises of 3 case-study based questions of 4 marks each.</p>	
36.	<p>While designing the school year book, a teacher asked the student that the length and width of a particular photo is increased by <math>x</math> 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:</p> <p>(I) Write an algebraic equation depicting the above information.</p> <p>(II) Write the corresponding quadratic equation in standard form.</p> <p>(III) What should be the new dimensions of the enlarged photo?</p> <div style="text-align: center;">  <p>The diagram shows a smaller rectangle labeled 'School Photo' with a length of 18 cm and a width of 12 cm. A larger rectangle is formed by extending the sides of the smaller rectangle by a distance of <math>x</math> units on all four sides. The new length is <math>18 + x</math> cm and the new width is <math>12 + x</math> cm.</p> </div> <p style="text-align: center;">OR</p> <p>Can any rational value of <math>x</math> make the new area equal to <math>220\text{cm}^2</math></p>	
Sol.	<p>(i) <math>(18 + x)(12 + x) = 2(18 \times 12)</math></p> <p>(ii) <math>x^2 + 30x - 216 = 0</math></p> <p>(iii) Solving : <math>x^2 + 30x - 216 = 0</math></p> $\Rightarrow (x + 36)(x - 6) = 0$ $x \neq -36 \therefore \Rightarrow x = 6.$ <p>new dimensions are <math>24\text{ cm} \times 18\text{ cm}</math></p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>

**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

37.

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

(II) 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

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

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	

$$\begin{aligned} \text{Median} &= 600 + \frac{200}{7} (12 - 6) \\ &= \frac{5400}{7} \text{ or } 771.4 \end{aligned}$$

OR

(ii)

Rainfall	$x_i$	$f_i$	$f_i x_i$
200 – 400	300	2	600
400 – 600	500	4	2000

1

$\frac{1}{2}$

$\frac{1}{2}$  for correct table

1

600 – 800	700	7	4900	1 for correct table
800 – 1000	900	4	3600	
1000 – 1200	1100	2	2200	
1200 – 1400	1300	3	3900	
1400 – 1600	1500	1	1500	
1600 – 1800	1700	1	1700	
		24	20400	

Mean =  $\frac{20400}{24} = 850$

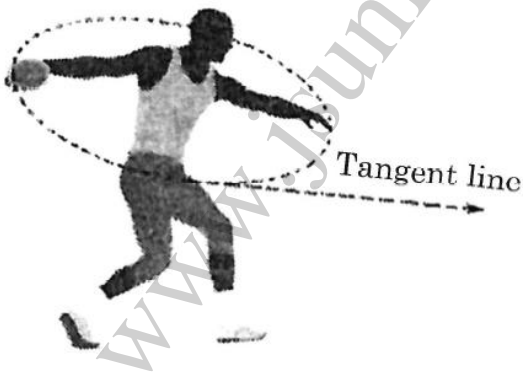
(iii) Sub-divisions having good rainfall =  $2 + 3 + 1 + 1 = 7$ .

1

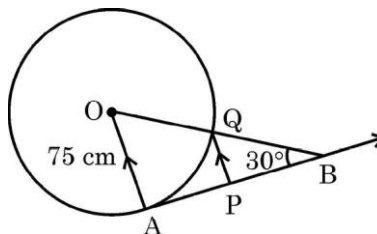
1

38.

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  $\angle ABO = 30^\circ$ . PQ is parallel to OA.



	<p>Based on above information:</p> <p>(a) find the length of AB.  (b) find the length of OB.  (c) find the length of AP.</p> <p>OR</p> <p>Find the length of PQ</p>	
Sol.	<p>(i) <math>\tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{75}{AB}</math></p> <p><math>\Rightarrow AB = 75\sqrt{3}</math> cm</p> <p>(ii) <math>\sin 30^\circ = \frac{1}{2} = \frac{75}{OB}</math></p> <p><math>\Rightarrow OB = 150</math> cm</p> <p>(iii) <math>QB = 150 - 75 = 75</math> cm  <math>\Rightarrow Q</math> is mid point. of OB</p> <p>Since <math>PQ \parallel AO</math> therefore <math>P</math> is mid point of AB</p> <p>Hence <math>AP = \frac{75\sqrt{3}}{2}</math> cm.</p> <p>OR</p> <p>(iii) <math>QB = 150 - 75 = 75</math> cm  Now, <math>\Delta BQP \sim \Delta BOA</math></p> <p><math>\Rightarrow \frac{QB}{OB} = \frac{PQ}{OA}</math></p> <p><math>\Rightarrow \frac{1}{2} = \frac{PQ}{75}</math></p> <p><math>\Rightarrow PQ = \frac{75}{2}</math> cm</p>	<p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p><math>\frac{1}{2}</math></p> <p>1</p> <p>1</p> <p><math>\frac{1}{2}</math></p> <p>1</p> <p><math>\frac{1}{2}</math></p>