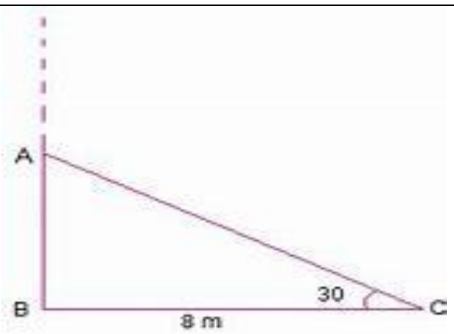
Class- X

Mathematics-Basic (241)

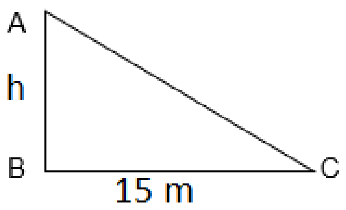
Marking Scheme SQP-2020-21

Max. Marks: 80 **Duration:3hrs**

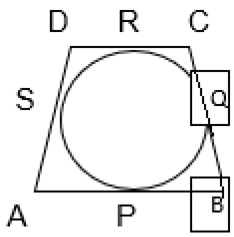
1	156 = 2^2 x 3 x 13	1
2	Quadratic polynomial is given by x^2 - (a +b) x +ab x^2 -2x -8	1
3	HCF X LCM =product of two numbers LCM (96,404) = $\frac{96 X 404}{HCF(96,404)}$ = $\frac{96 X 404}{4}$ LCM = 9696 **OR** Every composite number can be expressed (factorized) as a product of primes, and this factorization is unique, apart from the order in which the factors occur.	½ ½ 1
4	x – 2y =0 3x + 4y -20 =0 $\frac{1}{3} \neq \frac{-2}{4}$ As, $\frac{a1}{a2} \neq \frac{b1}{b2}$ is one condition for consistency. Therefore, the pair of equations is consistent.	½ ½
5	1	1
6	θ = 60° Area of sector = $\frac{\theta}{360°}$ Πr^2 A = $\frac{60°}{360°}$ X $\frac{22}{7}$ X $(6)^2$ cm^2 A = $\frac{1}{6}$ X $\frac{22}{7}$ X36 cm^2 = 18.86cm^2	½ ½

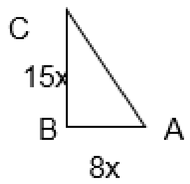
	OR Another method- Horse can graze in the field which is a circle of radius 28 cm. So, required perimeter = 2Πr= 2.Π(28) cm $=2 \times \frac{22}{7}$ X (28)cm = 176 cm	½ ½
7	By converse of Thale's theorem DE II BC ∟ADE = ∟ABC = 70° Given ∟BAC = 50° ∟ABC + ∟BAC +∟BCA =180° (Angle sum prop of triangles) $70^0 + 50^0$ + ∟BCA = 180° ∟BCA = 180° - 120° = 60° **OR** EC = AC – AE = (7- 3.5) cm = 3.5 cm $\frac{AD}{BD} = \frac{2}{3}$ and $\frac{AE}{EC} = \frac{3.5}{3.5} = \frac{1}{1}$ So, $\frac{AD}{BD} \neq \frac{AE}{EC}$ Hence, By converse of Thale's Theorem, DE is not Parallel to BC.	½ ½ ½ ½
8	Length of the fence = $\frac{Total\ cost}{Rate}$ $= \frac{Rs.5280}{Rs\ 24/metre} = 220$ m So, length of fence = Circumference of the field ∴ 220m= 2 Π r=2 X $\frac{22}{7}$ x r So, r = $\frac{220 \times 7}{2 \times 22}$ m =35 m	½ ½
9	 Sol: tan 30 ° $=\frac{AB}{BC}$ $1/\sqrt{3} = \frac{AB}{8}$ AB = 8 / √3 metres Height from where it is broken is 8/√3 metres	½ ½

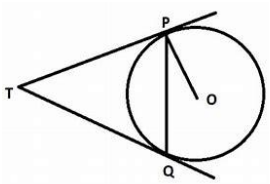
10	Perimeter = Area $2\Pi r = \Pi r^2$ r = 2 units	1
11	3 median = mode + 2 mean	1
12	8	1
13	$\frac{a1}{a2} \neq \frac{b1}{b2}$ is the condition for the given pair of equations to have unique solution. $\frac{4}{2} \neq \frac{p}{2}$ p ≠4 Therefore, for all real values of p except 4, the given pair of equations will have a unique solution. **OR** Here, $\frac{a1}{a2} = \frac{2}{4} = \frac{1}{2}$ $\frac{b1}{b2} = \frac{3}{6} = \frac{1}{2}$ and $\frac{c1}{c2} = \frac{5}{7}$ $\frac{1}{2} = \frac{1}{2} \neq \frac{5}{7}$ $\frac{a1}{a2} = \frac{b1}{b2} \neq \frac{c1}{c2}$ is the condition for which the given system of equations will represent parallel lines. So, the given system of linear equations will represent a pair of parallel lines.	½ ½ ½ ½
14	No. of red balls = 3, No.black balls =5 Total number of balls = 5 + 3 =8 Probability of red balls =$\frac{3}{8}$ **OR** Total no of possible outcomes = 6 There are 3 Prime numbers, 2,3,5. So, Probability of getting a prime number is $\frac{3}{6} = \frac{1}{2}$	½ ½ ½ ½

15	 tan 60° = $\frac{h}{15}$ $\sqrt{3} = \frac{h}{15}$ $h = 15\sqrt{3}$ m	½ ½
16	1	1
17 i)	Ans : b) Cloth material required = 2X S A of hemispherical dome = 2 x 2Π r^2 = 2 x 2x $\frac{22}{7}$ x $(2.5)^2$ m^2 = 78.57 m^2	1
ii)	a) Volume of a cylindrical pillar = Π r^2h	1
iii)	b) Lateral surface area = 2x 2Πrh = 4 x$\frac{22}{7}$ x 1.4 x 7 m^2 = 123.2 m^2	1
iv)	d) Volume of hemisphere =$\frac{2}{3}$ Π r^3 = $\frac{2}{3}$ $\frac{22}{7}$ $(3.5)^3$ m^3 = 89.83 m^3	1
v)	b) Sum of the volumes of two hemispheres of radius 1cm each= 2 x $\frac{2}{3}$ Π1^3 Volume of sphere of radius 2cm = $\frac{4}{3}$ Π 2^3 So, required ratio is $\frac{2 \times \frac{2}{3} \Pi 1^3}{\frac{4}{3} \Pi 2^3}$ = 1:8	½ ½

18 i)	c) (0,0)	1
ii)	a) (4,6)	1
iii)	a) (6,5)	1
iv)	a) (16,0)	1
v)	b) (-12,6)	1
19 i)	c) 90°	1
ii)	b) SAS	1
iii)	b) 4 : 9	1
iv)	d) Converse of Pythagoras theorem	1
v)	a) 48 cm^2	1
20 i)	d) parabola	1
ii)	a) 2	1
iii)	b) -1, 3	1
iv)	c) $x^2 - 2x - 3$	1
v)	d) 0	1
21	Let P(x,y) be the required point. Using section formula $\{\frac{m1x2+m2x1}{m1+m2}, \frac{m1y2+m2y1}{m1+m2}\}$ = (x, y) x = $\frac{3(8)+1(4)}{3+1}$, y = $\frac{3(5)+1(-3)}{3+1}$ x = 7 y= 3 (7,3) is the required point	1 1

	OR Let P(x, y) be equidistant from the points A(7,1) and B(3,5) Given AP =BP. So, $AP^2 = BP^2$ $(x-7)^2 + (y-1)^2 = (x-3)^2 + (y-5)^2$ $x^2 -14x+49 +y^2-2y +1 = x^2 -6x +9+y^2 -10y+25$ x – y =2	1 1
22	By BPT, $\frac{AM}{MB} = \frac{AL}{LC}$ ....(1) Also, $\frac{AN}{ND} = \frac{AL}{LC}$ ....(2) By Equating (1) and (2) $\frac{AM}{MB} = \frac{AN}{ND}$	½ ½ 1
23	To prove: AB + CD = AD + BC.  Proof: AS = AP (Length of tangents from an external point to a circle are equal) BQ = BP CQ = CR DS = DR AS + BQ + CQ + DS = AP + BP + CR + DR (AS+ DS) + (BQ + CQ) = (AP + BP) + (CR + DR) AD + BC = AB +CD	 1 1
24	For the correct construction	2

25	15 cot A =8, find sin A and sec A. Cot A =8/15  $\frac{Adj}{Oppo}$ =8/15 By Pythagoras Theorem $AC^2 = AB^2 + BC^2$ AC =$\sqrt{(8x)^2 + (15x)^2}$ AC= 17x Sin A = 15/17 Cos A =8/17 **OR** By Pythagoras Theorem QR = $\sqrt{(13)^2 - (12)^2}$ cm QR = 5cm Tan P =5/12 Cot R =5/12 Tan P -Cot R =5/12 -5/12 = 0	1 ½ ½ 1 1
26	9,17,25, ... $S_n = 636$ a = 9 d = $a_2 - a_1$ = 17 – 9 = 8 $S_n = \frac{n}{2}$ [2a + (n-1) d] Sn = $\frac{n}{2}$ [2a + (n-1) d]	½ ½

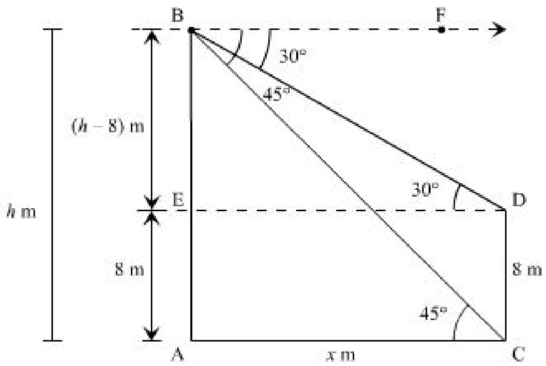
	$636 = \frac{n}{2}$ [2x 9 + (n-1) 8] 1272 = n [18 + 8n -8] 1272 = n [10 +8n] $8n^2 + 10n - 1272 = 0$ $4n^2 + 5n - 636 = 0$ $n = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $n = \frac{-5\pm\sqrt{5^2-4x\ 4x(-636)}}{2x4}$ $n = -\frac{-5\pm101}{8}$ $n=\frac{96}{8}$ n=12 $n = \frac{-106}{8}$ $n = -\frac{-53}{4}$ n=12 (since n cannot be negative)	½ ½
27	Let √3 be a rational number. Then √3 = p/q HCF (p,q) =1 Squaring both sides $(\sqrt{3})^2 = (p/q)^2$ $3 = p^2/ q^2$ $3q^2 = p^2$ 3 divides p^2 » 3 divides p 3 is a factor of p Take p = 3C $3q^2 = (3c)^2$ $3q^2 = 9C^2$ 3 divides q^2 » 3 divides q 3 is a factor of q Therefore 3 is a common factor of p and q It is a contradiction to our assumption that p/q is rational. Hence √3 is an irrational number.	1 ½ ½ 1
28		

	Required to prove -: ∟PTQ = 2∟OPQ Sol :- Let ∟PTQ = ɵ Now by the theorem TP = TQ. So, TPQ is an isosceles triangle ∟TPQ = ∟TQP = ½ (180° -ɵ) = 90° - ½ ɵ ∟OPT = 90° ∟OPQ =∟OPT -∟TPQ =90° -(90° - ½ ɵ) = ½ ɵ = ½ ∟PTQ ∟PTQ = 2∟OPQ	1 1 ½ ½
29	Let Meena has received x no. of 50 re notes and y no. of 100 re notes.So, 50 x + 100 y =2000 x + y =25 multiply by 50 50x + 100y =2000 50 x + 50 y = 1250 - - - 50y =750 Y= 15 Putting value of y=15 in equation (2) x+ 15 =25 x = 10 Meena has received 10 pieces 50 re notes and 15 pieces of 100 re notes	1 1 1
30	(i) 10,11,12…90 are two digit numbers. There are 81 numbers.So,Probability of getting a two-digit number = 81/90 =9/10 (ii) 1, 4, 9,16,25,36,49,64,81 are perfect squares. So, Probability of getting a perfect square number. = 9/90 =1/10 (iii) 5, 10,15….90 are divisible by 5. There are 18 outcomes.. So,Probability of getting a number divisible by 5. = 18/90 =1/5	 1 1 1

	OR (i) Probability of getting A king of red colour. P (King of red colour) = 2/52 =1/26 (ii) Probability of getting A spade P (a spade) = 13/52 = 1/4 (iii) Probability of getting The queen of diamonds P (a the queen of diamonds) = 1/52	1 1 1
31	$r_1 = 6$cm $r_2 = 8$cm $r_3 = 10$cm Volume of sphere = $^4/_3 \Pi r^3$ Volume of the resulting sphere = Sum of the volumes of the smaller spheres. $^4/_3 \Pi r^3 = {}^4/_3 \Pi r_1^3 + {}^4/_3 \Pi r_2^3 + {}^4/_3 \Pi r_3^3$ $^4/_3 \Pi r^3 = {}^4/_3 \Pi (r_1^3 + r_2^3 + r_3^3)$ $r^3 = 6^3 + 8^3 + 10^3$ $r^3 = 1728$ $r = \sqrt[3]{1728}$ r = 12 cm Therefore, the radius of the resulting sphere is 12cm.	1 1 1
32	(sin A-cos A+1)/ (sin A+cosA-1) = 1/(sec A-tan A) L.H.S. divide numerator and denominator by cos A = (tan A-1+secA)/ (tan A+1-sec A) = (tan A-1+secA)/(1-sec A + tan A) We know that 1+tan^2 A=sec ^{2}A Or 1=sec^2 A-tan^2 A = (sec A + tan A)(sec A – tan A) =(sec A + tan A-1)/[(sec A + tan A)(sec A-tan A)-(sec A-tan A)] =(sec A + tan A-1)/(sec A-tan A)(sec A + tan A-1)	1 1 1

	= 1/(sec A-tan A) , proved.	
33	Given:- Speed of boat =18*km*/*hr* Distance =24*km* Let *x* be the speed of stream. Let *t*1 and *t*2 be the time for upstream and downstream. As we know that, speed= distance / time ⇒time= distance / speed For upstream, Speed =(18−*x*) *km*/*hr* Distance =24*km* Time =*t*1 Therefore, $t_1 = \frac{24}{18-x}$ For downstream, Speed =(18+*x*)*km*/*hr* Distance =24*km* Time =*t*2 Therefore, $t_2 = \frac{24}{18+x}$ Now according to the question- *t*1=*t*2+1 $\frac{24}{18-x} = \frac{24}{18+x} + 1$ $\Rightarrow \frac{24(18+x) - 24\,(18-x\,)}{(18-x)(18+x)} = 1$ ⇒48*x*=(18−*x*)(18+*x*) $\Rightarrow 48x = 324 + 18x - 18x - x^2$ $\Rightarrow x^2 + 48x - 324 = 0$ $\Rightarrow x^2 + 54x - 6x - 324 = 0$ ⇒*x*(*x*+54)−6(*x*+54)=0 ⇒(*x*+54)(*x*−6)=0	½ ½ ½

	$\Rightarrow x=-54$ or $x=6$ Since speed cannot be negative. $\Rightarrow x=-54$ will be rejected $\therefore x=6$ Thus, the speed of stream is 6*km*/*hr.* **OR** Let one of the odd positive integer be x then the other odd positive integer is x+2 their sum of squares = $x^2 + (x+2)^2$ $= x^2 + x^2 + 4x + 4$ $= 2x^2 + 4x + 4$ Given that their sum of squares = 290 $\Rightarrow 2x^2 + 4x + 4 = 290$ $\Rightarrow 2x^2 + 4x = 290 - 4 = 286$ $\Rightarrow 2x^2 + 4x - 286 = 0$ $\Rightarrow 2(x^2 + 2x - 143) = 0$ $\Rightarrow x^2 + 2x - 143 = 0$ $\Rightarrow x^2 + 13x - 11x - 143 = 0$ $\Rightarrow x(x+13) - 11(x+13) = 0$ $\Rightarrow (x-11)(x+13) = 0$ $\Rightarrow (x-11) = 0, (x+13) = 0$ Therefore , x = 11 or -13 According to question, x is a positive odd integer. Hence, We take positive value of x So , x = 11 and (x+2) = 11 + 2 = 13 Therefore , the odd positive integers are 11 and 13 .	½ 1 1 1 1

34	 Let AB and CD be the multi-storeyed building and the building respectively. Let the height of the multi-storeyed building= *h* m and the distance between the two buildings = *x* m. AE = CD = 8 m [Given] BE = AB – AE = (*h* – 8) m and AC = DE = *x* m [Given] Also, ∠FBD = ∠BDE = 30° (Alternate angles) ∠FBC = ∠BCA = 45° (Alternate angles) Now, In Δ ACB, $\Rightarrow \tan 45^0 = \frac{AB}{AC}\left[\because \tan\theta = \frac{\text{Perpendicular}}{\text{Base}}\right]$ $\Rightarrow 1 = \frac{h}{x}$ $\Rightarrow x = h ......(i)$ In Δ BDE,	1 ½ 1

$\Rightarrow \tan 30^0 = \frac{BE}{ED}$

$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h-8}{x}$ 1

$\Rightarrow x = \sqrt{3}(h-8)$..........$(ii)$

From (i) and (ii), we get,

h =√3h -8√3

√3h – h =8√3

h (√3 -1) =8√3

h =$\frac{8\sqrt{3}}{\sqrt{3}-1}$

h=$\frac{8\sqrt{3}}{\sqrt{3}-1}$ x$\frac{\sqrt{3}+1}{\sqrt{3}+1}$ 1

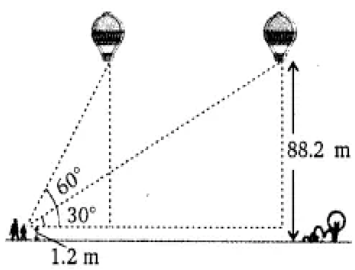
h-= 4√3 (√3 +1)

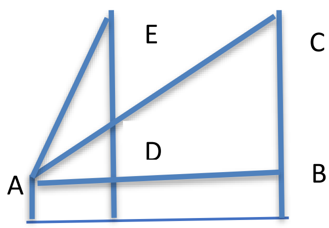
h = 12 +4√3 m

Distance between the two building

$x = \left(12+4\sqrt{3}\right)m \quad [From(i)]$ ½

OR





From the figure, the angle of elevation for the first position of the balloon ∟EAD = 60° and for second position ∟BAC = 30°.The vertical distance 1

ED = CB = 88.2-1.2 =87m.

	Let AD = x m and AB = y m. Then in right Δ ADE, tan60° = $\frac{DE}{AD}$ $\sqrt{3} = \frac{87}{x}$ $X = \frac{87}{\sqrt{3}}$ ....(i) In right ΔABC, tan 30° = $\frac{BC}{AB}$ $\frac{1}{\sqrt{3}} = \frac{87}{y}$ Y = 87√3 ....(ii) Subtracting(i) and (ii) y-x =87√3 -- $-\frac{87}{\sqrt{3}}$ y-x = $\frac{87 .2.\sqrt{3}}{\sqrt{3}.\sqrt{3}}$ y-x = 58√3 m Hence, the distance travelled by the balloon is equal to BD y-x =58√3 m.	1 1 1 1
35	Let A be the first term and D the common difference of A.P. *Tp=a=A+(p−1)D=(A−D)+pD* (1) *Tq=b=A+(q−1)D=(A−D)+qD* ..(2) *Tr=c=A+(r−1)D=(A−D)+rD* ..(3) Here we have got two unknowns A and D which are to be eliminated. We multiply (1),(2) and (3) by *q−r*,*r−p* and *p−q* respectively and add: a (q-r) = (A – D)(q-r) + D p(q-r) b(r-p) = (A-D) (r-p) + Dq (r-p) c(p-q) = (A-D) (p-q) + Dr (p-q) *a(q−r)+b(r−p)+c(p−q)* *=(A−D)[q−r+r−p+p−q]+D[p(q−r)+q(r−p)+r(p−q)]* = (A – D) (0) + D [pq-pr + qr – pq + rp – rq) =0	½ ½ ½ ½ ½ ½ 1 1

36	**Height (in cm)** f C.F. below 140 4 4 140-145 7 11 145-150 18 29 150-155 11 40 155-160 6 46 160-165 5 51 *N*=51⇒ *N/2*=51/2=25.5 As 29 is just greater than 25.5, therefore median class is 145-150. *Median*= $l + \frac{(\frac{N}{2} - C)}{f} X\ h$ Here, *l*= lower limit of median class =145 *C*=*C*.*F*. of the class preceding the median class =11 *h*= higher limit - lower limit =150−145=5 *f*= frequency of median class =18 ∴*median*= = $145 + \frac{(25.5-11)}{18} X\ 5$ =149.03 Mean by direct method **Height (in cm)** f x_i fx_i below 140 4 137.5 550 140-145 7 142.5 997.5 145-150 18 147.5 2655 150-155 11 152.5 1677.5 155-160 6 157.5 945 160-165 5 162.5 812.5 Mean = $\frac{\sum fx}{N}$ =7637.5/51 = 149.75	1 ½ ½ 1 1 1