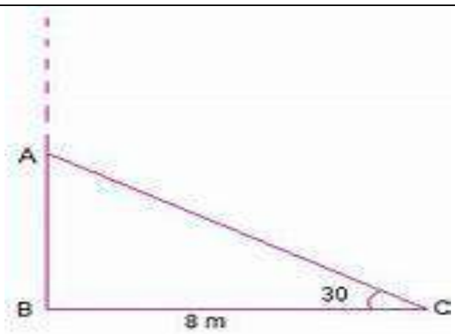
Class- X

Mathematics-Basic (241)

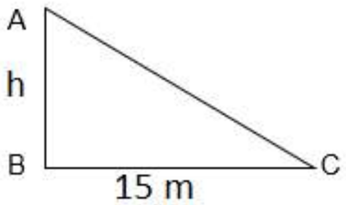
Marking Scheme SQP-2020-21

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

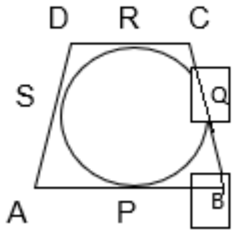
1	$156 = 2^2 \times 3 \times 13$	1
2	Quadratic polynomial is given by $x^2 - (a+b)x + ab$ $x^2 - 2x - 8$	1
3	HCF X LCM =product of two numbers LCM (96,404) $= \frac{96 \, X \, 404}{HCF(96,404)} = \frac{96 \, X \, 404}{4}$ LCM = 9696 **OR** Every composite number can be expressed (factorized) as a product 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	$\theta = 60°$ Area of sector $= \frac{\theta}{360°} \Pi r^2$ $A = \frac{60°}{360°} \, X \, \frac{22}{7} \, X \, (6)^2 \, cm^2$ $A = \frac{1}{6} \, X \, \frac{22}{7} \, X 36 \, cm^2$ $= 18.86 cm^2$	 ½ ½

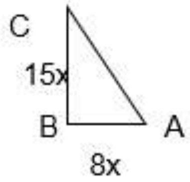
	OR Another method- Horse can graze in the field which is a circle of radius 28 cm. So, required perimeter = 2Πr= 2.Π(28) cm $=2 \times \frac{22}{7} X (28)$cm = 176 cm	½ ½
7	By converse of Thale's theorem DE II BC ∟ADE = ∟ABC = 70° Given ∟BAC = 50° ∟ABC + ∟BAC +∟BCA =180° (Angle sum prop of triangles) $70^0 + 50^0$ + ∟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

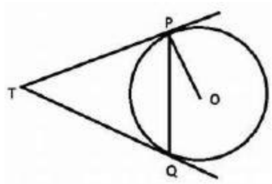
10	Perimeter = Area $2\Pi r = \Pi r^2$ r = 2 units	1
11	3 median = mode + 2 mean	1
12	8	1
13	$\frac{a1}{a2} \neq \frac{b1}{b2}$ is the condition for the given pair of equations to have unique solution. $\frac{4}{2} \neq \frac{p}{2}$ $p \neq 4$ Therefore, for all real values of p except 4, the given pair 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 $= 2 \times 2\Pi r^2$ $= 2 \times 2\times \frac{22}{7} \times (2.5)^2$ m^2 = 78.57 m^2	1
ii)	a) Volume of a cylindrical pillar = $\Pi r^2 h$	1
iii)	b) Lateral surface area = 2x $2\Pi rh$ $= 4 \times \frac{22}{7} \times 1.4 \times 7$ m^2 = 123.2 m^2	1
iv)	d) Volume of hemisphere $=\frac{2}{3}\Pi r^3$ $= \frac{2}{3}\frac{22}{7}(3.5)^3$ m^3 = 89.83 m^3	1
v)	b) Sum of the volumes of two hemispheres of radius 1cm each= $2 \times \frac{2}{3}\Pi 1^3$ Volume of sphere of radius 2cm = $\frac{4}{3}\Pi 2^3$ 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 $\{\frac{m\,1x2+m2x1}{m1+m2}, \frac{m1y2+m2y1}{m1+m2}\}$ = (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

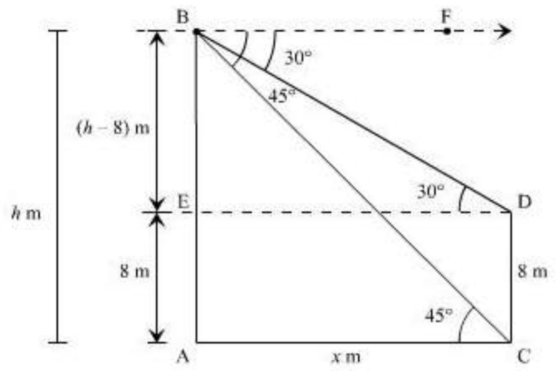
	$636 = \frac{n}{2}$ [2x 9 + (n-1) 8] 1272 = n [18 + 8n -8] 1272 = n [10 +8n] $8n^2$ +10n -1272 =0 $4n^2$ + 5n -636 =0 n = $\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ n = $\frac{-5\pm\sqrt{5^2-4x\ 4x(-636)}}{2x4}$ n =-$\frac{-5\pm101}{8}$ n=$\frac{96}{8}$ n =$\frac{-106}{8}$ n=12 n = -$\frac{-53}{4}$ n=12 (since 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	$r_1 = 6cm$ $r_2 = 8cm$ $r_3 = 10cm$ 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 $\frac{24}{18-x} = \frac{24}{18+x} + 1$ $\Rightarrow \frac{24(18+x) - 24\,(18-x\,)}{(18-x)(18+x)} = 1$ $\Rightarrow 48x=(18-x)(18+x)$ $\Rightarrow 48x=324+18x-18x-x^2$ $\Rightarrow x^2+48x-324=0$ $\Rightarrow x^2+54x-6x-324=0$ $\Rightarrow x(x+54)-6(x+54)=0$ $\Rightarrow (x+54)(x-6)=0$	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

<table>
<tr>
<td>34</td>
<td>


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,

$\Rightarrow \tan 45^0 = \frac{AB}{AC}\left[\because \tan\theta = \frac{\text{Perpendicular}}{\text{Base}}\right]$
$\Rightarrow 1 = \frac{h}{x}$
$\Rightarrow x = h \ldots\ldots(i)$

In Δ BDE,
</td>
<td>1

½

1</td>
</tr>
</table>

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

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

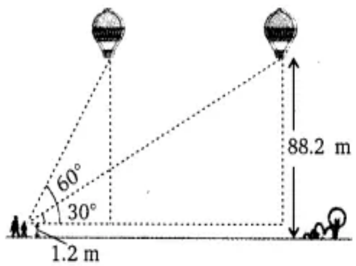
h-= 4√3 (√3 +1)

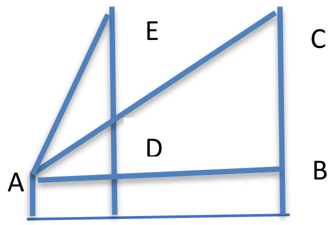
h = 12 +4√3 m

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 = $87\sqrt{3}$ ……….(ii) Subtracting(i) and (ii) y-x = $87\sqrt{3}$ -- -$\frac{87}{\sqrt{3}}$ y-x = $\frac{87 .2.\sqrt{3}}{\sqrt{3}.\sqrt{3}}$ y-x = $58\sqrt{3}$ m Hence, the distance travelled by the balloon is equal to BD y-x = $58\sqrt{3}$ 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

1

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

½

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*=

= $145 + \frac{(25.5 - 11)}{18} X\, 5$ ½

=149.03

Mean by direct method 1

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

1

$$\text{Mean} = \frac{\sum fx}{N}$$

=7637.5/51

= 149.75 1