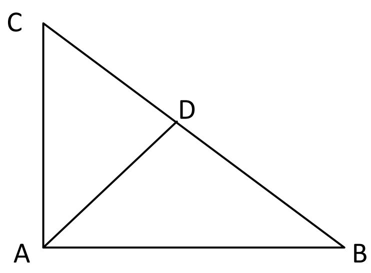
TVSSC COMMON REVISION EXAMINATION-2019-2020

MATHEMATICS (041)

MARKING SCHEME

Class : X

Q. No.	EXPECTED ANSWERS	Marks
	SECTION - A	
1.	Option (d)	(1)
2.	Option (a)	(1)
3.	Option (b)	(1)
4.	Option (c)	(1)
5.	Option (a)	(1)
6.	Option (d)	(1)
7.	Option (c)	(1)
8.	Option (b)	(1)
9.	Option (a)	(1)
10.	Option (d)	(1)
11.	$2\pi rh + \pi rl$ OR $\pi r(2h + l)$	(1)
12.	$\alpha + \beta = \frac{3}{k}$ $\alpha\beta = \frac{2k}{k} = 2$ $\alpha + \beta = \alpha\beta$ $\frac{3}{k} = 2$ $k = \frac{3}{2}$ **(OR)** No real roots	(1)

13.	AB = 15 cm	(1)
14.	n = 30	(1)
15.	$\frac{3}{11}$	(1)
16.	Let θ be quotient by n is divided by 3. Divident = Divisor x Quotient + Remainder n = 9 x Q + 7 n = 9Q + 7 Now 3n – 1 = 3(9Q + 7) – 1 = 27Q + 21 – 1 = 27Q + 20 = 27Q + 18 + 2 When 3n – 1 is divided by 9 ∴27Q + 18 is also divided by 9 i e) When 9 (3Q + 2) + 2 is divided by 9, the remainder is 2.	½ ½
17.	$\frac{AC}{AD} = \frac{BA}{BD}$ $\frac{0.25}{AD} = \frac{1}{2.25}$ AD = 0.25 x 2.25 = 5.625 m.  	½ ½
18.	∴PA and PB are tangents to a circle with centre O. $OA \perp AP$, $OB \perp PB$ $\angle APB$=110°, $\angle OAP = \angle OBP = 90°$ In quadrilateral OAPB, $\angle OAP + \angle APB + \angle PBO + \angle BOA = 360°$ 90° + 110° + 90° $+ \angle BOA = 360°$ $\angle BOA = 360° - 290° = 70°$ ∴ $\angle POA = \angle POB$ $\angle POA = \frac{1}{2}\angle AOB$ $= \frac{1}{2} \times 70°$ $\angle POA = 35°$ **(OR)**	 ½ ½

	OA = 5 cm OB = 13 cm AB = ? $OB^2 = OA^2 + AB^2$ $(13)^2 - (5)^2 = AB^2$ $144 = AB^2$ AB = 12 cm CB = 2 x 12 = 24 cm	½ ½
19.	14, 21, 28 ……………….. 98 a = 14, d = 7, l = 98 $n = \frac{l-a}{d} + 1$ $= \frac{98-14}{7} + 1$ $= \frac{84}{7} + 1$ = 12 + 1 n = 13	½ ½
20.	$ay^2 + ay + 3 = 0\ ;\ y^2 + y + b = 0$ a + a + 3 = 0 ; 1 + 1 + b = 0 2a = –3 ; b = –2 $ab = \frac{-3}{2} \times -2$ ab = 3	½ ½
	SECTION -B	
21.	Number of natural numbers between 102 and 998 which are divisible by 2 and 5 both are 110, 120, 130 .. .. 990 a = 110, d = 10, l = 990 $n = \frac{l-a}{d} + 1$ $= \frac{990-110}{10} + 1$ $n = \frac{880}{10} + 1$ n=89	½ ½ ½ ½
22.	A quadrilateral circumscribing a circle with centre 0, such that it touches side AB, BC, CD and DA at P, Q, R and S. To prove: AB + CD = BC + DA Proof: Length of tangent drawn from an external point are equal	

	AP = AS -------------------- (1) BP = BQ -------------------- (2) DR = DS -------------------- (3) CR = CQ ------------------- (4) Adding eqn 1, 2, 3 and 4 AP + BP + DR + CR = AS + DS + BQ + CQ AB + CD = BC + DA Hence proved.	1 ½ ½
23.	Given: ΔABC, $\angle B$=90° ,D is the midpoints of BC To prove: $AC^2 = 4AD^2 – 3AB^2$ Proof In ΔABC, $\angle B$=90° $AC^2 = AB^2 + BC^2$ $= AB^2 + (2BD)^2$ $= AB^2 + 4BD^2$ ---------------------------(1) In ΔABD, $AD^2 = AB^2 + BD^2$ $BD^2 = AD^2 – AB^2$ ---------------------------(2) Sub (2) in (1), $AC^2 = AB^2 + 4 (AD^2-AB^2)$ $= AB^2 + 4AD^2 – 4AB^2$ $AC^2 = 4AD^2 - 3AB^2$ Hence proved **(OR)** Given : AB||CD To prove : AB = 2CD Proof : In ΔAOB and ΔCOD $\angle AOB = \angle COD$ [VOA] $\angle DCA = \angle CAB$ [Alt.Angle] By AA Similarity, ΔAOB ~ ΔCOD By theorem, $\frac{\text{ar}\Delta AOB}{\text{ar}\Delta\text{COD}} = \frac{AB^2}{DC^2} = \frac{(2CD)^2}{CD^2} = \frac{4}{1}$ Ratio = 4 : 1	 ½ ½ ½ ½ 1 ½ ½
24.	If right Δ ABC, AC is the broken part of the tree Total height = AB+AC.	

	In rt Δ ABC, tan 30° = $\frac{AB}{BC}$ $\frac{1}{\sqrt{3}} = \frac{AB}{8}$ $\frac{8}{\sqrt{3}}$ = AB Cos 30° = $\frac{BC}{AC}$ $\frac{\sqrt{3}}{2} = \frac{8}{AC}$ AC = $\frac{16}{\sqrt{3}}$ (i) Height of the tree = AB + AC = $\frac{8}{\sqrt{3}} + \frac{16}{\sqrt{3}} = \frac{24}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$ = $\frac{24\sqrt{3}}{3}$ = $8\sqrt{3}$ m. ii) Height of the tree is broken = $\frac{8}{\sqrt{3}}$ m or $\frac{8\sqrt{3}}{3}$ m	½ ½ ½ ½
25.	(i) Different birthdays 365 – 1 = 364 P(Hamida's birthday is different from savita's birthday) = $\frac{364}{365}$ (ii) P (savitha and Hamida have the same birthday) = 1 – P (Different birthday) = $1 - \frac{364}{365}$ = $\frac{1}{365}$ **(OR)** n(s) = 52 P (Neither a red nor a queen) = $\frac{24}{52} = \frac{6}{13}$	1 1 ½ 1½
26.	Type A Volume of glass= volume of cylinder – volume of hemisphere $=\pi r^2 h - \frac{2}{3}\pi r^3$ $= 3.14 \times 4 \times 4 \times 15 - \frac{2}{3} \times 3.14 \times 4 \times 4 \times 4$ $= 753.6 - 133.97 = 619.63$ Type B	½

	Volume of glass= volume of cylinder – volume of cone $=\pi r^2 h - \frac{1}{3}\pi r^2 h$ $= 3.14 \times 4 \times 4 \times 15 - \frac{1}{3} \times 3.14 \times 4 \times 4 \times 0.5$ $= 753.6 - 8.37 = 745.23$ Loss Loss by 125.6 ml	½ ½ ½
	SECTION-C	
27.	Let q be the quotient and r be the remainder when n is divided by 3 p = 3q+r, 0 ≤r <3 p = 3q or 3q+1 or 3q + 2 Case I : If p=3q, then n is divisible by 3 but n+2, n+4 are not divisible by 3 Case II : If p=3q+1 p+2 = 3q+3 = 3(q+1) which is divisible by 3 p+4 = 3q+5 Case III : If p = 3q+2 p+2 = 3q+4 p+4 = 3q+6 = 3q (q+2) which is divisible by 3 Hence, One and only one out of p, p+2, or p+4 is divisible by 3 for some integer p. **(OR)** let root 5 be rational then it must in the form of p/q [q is not equal to 0][p and q are co-prime] root 5=p/q => root 5 * q = p squaring on both sides => 5*q*q = p*p ------> 1 p*p is divisible by 5 p is divisible by 5 p = 5c [c is a positive integer] [squaring on both sides] p*p = 25c*c --------- > 2 sub p*p in 1 5*q*q = 25*c*c q*q = 5*c*c	½ ½ ½ ½ ½ ½ ½ ½ ½

	=> q is divisble by 5 thus q and p have a common factor 5 there is a contradiction as our assumsion p &q are co prime but it has a common factor so √5 is an irrational	½ ½ ½
28.	$S_m = n$, $S_n = m$. To prove : $S_{m+n} = -(m+n)$ $S_m = \frac{m}{2}[2a+(m-1)d]$ $n = \frac{m}{2}[2a+(m-1)d]$ ------------(1) $S_n = \frac{n}{2}[2a+(n-1)d]$ $m = \frac{n}{2}[2a+(n-1)d]$ ------------(2) Subtract (2) from (1). $\frac{m}{2}[2a+(m-1)d] - \frac{n}{2}[2a+(n-1)d] = n-m$ $\frac{2am}{2} + \frac{md}{2}(m-1) - \frac{2an}{2} - \frac{nd}{2}(n-1) = n-m$ $2a(\frac{m-n}{2}) + \frac{d}{2}(m^2-m-n^2+n) = n-m$ $2a(\frac{m-n}{2}) + \frac{d}{2}[(m+n)(m-n)-(-n+m)] = n-m$ $2a(\frac{m-n}{2}) + \frac{d}{2}(m-n)[m+n-1) = n-m$ $\frac{m-n}{2}[2a+(m+n-1)d] = -(m-n)$ $\frac{1}{2}[2a+(m+n-1)d] = -1$ Multiply (m+n) on both sides $\frac{m+n}{2}[2a+(m+n-1)d] = -(m+n)$ $S_{m+n} = -(m+n)$ Hence proved	 ½ ½ ½ 1 ½
29.	$2(ax - by) + (a + 4b) = 0$ $2(bx - ay) + (b - 4a) = 0$ $2ax - 2by = -a-4b$ ----------(1) $2bx + 2ay = 4a-b$ ----------(2) Multiply (1) by a and (2) by b $2a^2x - 2aby = -a^2 - 4ab$ $2b^2x - 2aby = 4ab - b^2$ $2x(a^2 + b^2) = -(a^2 + b^2)$ $2x = -1$ $x = \frac{-1}{2}$ substitute in (1)	 ½ ½ 1

	$2a(\frac{-1}{2}) - 2by = - a - 4b$ $- a - 2by = - a - 4b$ $- 2by = - 4b$ $y = 4$	1
	(OR) BE ∥ CD, BC ∥ DE, BC ⊥CD So, opposite sides are parallel & four right angles is a rectangle. CD = BE = 7 x+y = 7 -----------(1) BC = DE = x-y -----------(2) Perimeter = 27 AB+BC+CD+DE+AE = 27 5+x-y+7+x-y+5 = 27 17+2x – 2y = 27 2x – 2y = 10 x – y = 5 -------------(3) Solving (1) & (3) 2x = 12 x = 6; y = 1.	1 ½ ½ ½, ½
30.	Given polynomial is $x^4 + x^3 + 8x^2 + px + q$ Since $x^2 + 1$ divides $x^4 + x^3 + 8x^2 + px + q$, so the quotient will be a polynomial of degree 2. So, we can write $x^4 + x^3 + 8x^2 + px + q = (x^2 + 1)(a_1x^2 + b_1x + c_1)$ $\Rightarrow x^4 + x^3 + 8x^2 + px + q = a_1x^4 + a_1x^2 + b_1x^3 + b_1x + c_1x^2 + c_1$ $\Rightarrow x^4 + x^3 + 8x^2 + px + q = a_1x^4 + b_1x^3 + (a_1 + c_1)x^2 + b_1x + c_1$ Comparing the coefficient of x^4 on both sides, we get – $a_1 = 1$ On comparing the coefficient of x^3, we get – $b_1 = 1$ On comparing the coefficient of x^2, we get – $a_1 + c_1 = 8$ $\Rightarrow 1 + c_1 = 8$ $\Rightarrow c_1 = 7$ On comparing the coefficient of x on both sides, we get – $p = b_1 = 1$ $\Rightarrow p = 1$ On comparing the constants on both sides, we get – $q = c_1 = 7$ $\Rightarrow q = 7$ Hence, values of p and q are 1 and 7.	½ ½ ½ ½ ½ ½
31.	(i) Ar (Δ ABC) = $[x_1 (y_2-y_3) + x_2 (y_3-y_1) + x_3 (y_1-y_2)]$ $= \frac{1}{2}[2 (3+1) + (-3)(-1-2) + (-2)(2-3)]$ $= \frac{1}{2}[2 (4) + (-3)(-3) + (-2)(-1)]$	½

	$= \frac{1}{2}$ [8+9+2]	
	$= \frac{19}{2}$ units	½
	Ar (Δ CDA) $= \frac{1}{2}$ [(-2)(-1-2)+(3)(2+1)+(2)(-1+1)]	
	$= \frac{1}{2}$ [(-2)(-3)+3(3)+0]	
	$= \frac{1}{2}$ [6+9]	
	$= \frac{15}{2}$ units	½
	Group X covered more Area	
	(ii) Difference between them in Area	
	$= \frac{19}{2} - \frac{15}{2}$	½
	$= \frac{4}{2}$	
	= 2 units.	½
32.	$\sin\theta = \frac{m}{n}$	
	By Pythagoras thm,	
	$AC^2 = AB^2 + BC^2$	
	$n^2 = m^2 + BC^2$	
	$n^2 - m^2 = BC^2$	
	$BC = \sqrt{n^2 - m^2}$	½
	$\tan\theta = \frac{m}{\sqrt{n^2-m^2}}$; $\cot\theta = \frac{\sqrt{n^2-m^2}}{m}$	½,½
	$\frac{\tan\theta + 4}{4\cot\theta + 1} = \frac{\frac{m}{\sqrt{n^2-m^2}} + 4}{4\frac{\sqrt{n^2-m^2}}{m} + 1}$	½
	$= \frac{m + 4\sqrt{n^2-m^2} / \sqrt{n^2-m^2}}{4\sqrt{n^2-m^2} + m / m}$	½
	$= \frac{\frac{1}{\sqrt{n^2-m^2}}}{\frac{1}{m}}$	
	$= \frac{m}{\sqrt{n^2-m^2}}$	½
	(OR)	
	$= \frac{\cos^2(45^\circ+\theta)+\cos^2(45^\circ-\theta)}{\tan(60^\circ+\theta)\tan(30^\circ-\theta)} + (\cot 30^\circ + \sin 90^\circ) \times (\tan 60^\circ - \sec 0^\circ)$	
	$= \frac{\cos^2(45^\circ+\theta)+\cos^2\{90^\circ-(45^\circ-\theta)\}}{\tan\{90^\circ-(30^\circ-\theta)\}\tan(30^\circ-\theta)} + (\sqrt{3}+1) \times (\sqrt{3}-1)$	1, ½
	= 1 + [3 - 1]	1
	= 1 + 2	

	= 3	½
33.	Length of chord = 5 cm Angle of sector = 90° Let r be the radius Then OA = OB = r cm centre of sector OABO = 90° AOB is a right angled triangle by Py. Them $AB^2 = OA^2 + OB^2$ $25 = 2r^2$ $r = \frac{5}{\sqrt{2}}$ cm Also AOB is an isosceles triangle $OD \perp AB$ AD = DB = 2.5cm Let AD = h cm In rt ΔAOD, By py. thm $AO^2 = AD^2 + OD^2$ $\left(\frac{5}{\sqrt{2}}\right)^2 = \left(\frac{5}{2}\right)^2 + h^2$ $h^2 = \left(\frac{5}{\sqrt{2}}\right)^2 - \left(\frac{5}{2}\right)^2$ $= \frac{25}{4}$ h = $\frac{5}{2}$ ∴ Area of isosceles triangle $AOB = \frac{1}{2} \times b \times h$ $= \frac{1}{2} \times 5 \times \frac{5}{2}$ $= \frac{25}{4} cm^2$ Area of minor sector $= \frac{1}{2} r^2\theta$ $= \frac{1}{2} \times \left(\frac{5}{\sqrt{2}}\right)^2 . \frac{\pi}{2}$ $\frac{25\pi}{8} cm^2$ Area of the minor segment = Area of the minor sector – Area of an isosceles triangle $= \left(\frac{25\pi}{8} - \frac{25}{4}\right) cm^2$ Area of major Segment = Area of the circle – Area of the minor segment $= \pi^2 - \left(\frac{25\pi}{8} - \frac{25}{4}\right)$ $= \pi \left(\frac{5}{\sqrt{2}}\right)^2 - \left(\frac{25\pi}{8} - \frac{25}{4}\right)$ $= \frac{25\pi}{2} - \frac{25\pi}{8} + \frac{25}{4}$ $= \left(\frac{75\pi}{8} + \frac{25}{4}\right) cm^2$	½ ½ ½ ½

	∴ Difference of the areas of two segments of a circle = Area of major segment – Area of minor segment $= \left(\frac{75\pi}{8} + \frac{25}{4}\right) - \left(\frac{25\pi}{8} - \frac{25}{4}\right)$ $= \left(\frac{25\pi}{4} + \frac{25}{2}\right) cm^2$	½ ½
34.	Mode: Highest frequency = 23 Modal class = 35 – 45 $f_0 = 21, f_1 = 23, f_2 = 14, l = 35, h = 10$ Mode: $= l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$ = 35 + $\left(\frac{23-21}{2(23)-21-14}\right) \times 10$ = 35 + $\left(\frac{2}{46-35}\right) \times 10$ = 35 + $\frac{20}{11}$ = 35 + 1.81 = 36.81 Mean:	½ ½

C. I	f	x	fx
5 – 15	6	10	60
15 – 25	11	20	220
25 – 35	21	30	630
35 – 45	23	40	920
45 – 55	14	50	700
55 – 65	5	60	300
$\sum f$ =	80		2830

½

Mean = $\frac{\sum fx}{\sum f}$

= $\frac{2830}{80}$

= 35. 375

Maximum number of patients admitted in the hospital are of the age 36.8 yrs (approx). ½ ½

While on an average the age of a patient admitted to the hospital is 35.37 years. ½

	SECTION - D	
35.	Correct construction : Triangles Similar triangles (OR) Correct construction: Triangles Construction of tangents	 1½ 2½ 1½ 2½
36.	Diagram with markings	½

	i) Let $CD \parallel AB$, then CD = p Area of ΔABC = $\frac{1}{2}(AB \times CD) = \frac{1}{2}CP$ also, Area of ΔABC = $\frac{1}{2}(BC \times AC) = \frac{1}{2}ab$ $\Rightarrow \frac{1}{2}CP = \frac{1}{2}ab$ CP = ab ⟶ proved ii) since ΔABC is a right angled Δ at C $AB^2 = AC^2 + BC^2$ $C^2 = a^2 + b^2$ $\left(\frac{ab}{p}\right)^2 = a^2 + b^2$ $[\because CP = ab \Rightarrow C = \frac{ab}{p}]$ $\frac{a^2b^2}{p^2} = a^2 + b^2$ $\frac{1}{p^2} = \frac{a^2+b^2}{a^2b^2}$ $\frac{1}{p^2} = \frac{1}{b^2} + \frac{1}{a^2} - proved$	½ 1 ½ ½ 1
37.	Let the time taken by the larger tab to fill the tank = x hr. ∴ Time taken by the smaller tap to fill the tank = $(x + 10)$ hr. ∴ portion of the tank filled by larger tap in 1 hr = $\frac{1}{x}$ ∴ portion of the tank filled by the smaller tap in 1 hr = $\frac{1}{x+10}$ According to the Question, portion of the tank filled by both taps in 1 hr = $\frac{1}{\frac{75}{8}} = \frac{8}{75}$ $\Rightarrow \frac{1}{x} + \frac{1}{x+10} = \frac{8}{75}$ $4x^2 - 35x - 375 = 0$ $x = 15 \ or \ -6\frac{1}{4}$ ∴ Time taken by each to fill the tank separately are 15 hr & 15 + 10 = 25 hr. **(OR)** $\frac{1}{x+1} + \frac{2}{x+2} = \frac{4}{x+4}$, $x \neq -1, -2, -4$ $\frac{x+2+2(x+1)}{(x+2)(x+1)} = \frac{4}{x+4}$ $(x + 4)(3x + 4) = 4(x^2 + 3x + 2)$ Solving, $x^2 - 4x - 8 = 0$ $x = \frac{4 \pm \sqrt{16+32}}{2} = \frac{4 \pm \sqrt{48}}{2}$ $= \frac{4 \pm 4\sqrt{3}}{2}$ $\therefore x = 2 \pm 2\sqrt{3}$	½ 1½ 1 ½ ½ 1 1 1 1
38.	Given: AR= 4 cm, AD = 12cm $\angle ARQ = \angle ADC = 90°$ $\angle A$ = $\angle A$ (common) ⇒ ΔADC ~ ΔAQR (by AA)	1

	$\frac{QR}{AR} = \frac{CD}{AD} \Longrightarrow \frac{QR}{4} = \frac{6}{12}$ QR = 2 cm. Radius of bigger cone = R = 6 cm Radius smaller cone = r = 2 cm Height of the frestum = RD = 12 – 4 = 8 cm Slant height of the frustum $l = \sqrt{(R-r)^2 + h^2}$ $l = \sqrt{(6-2)^2 + 8^2}$ $= 4\sqrt{5}$ =2 x 2.236 = 8.944 cm TSA of frustum = $\pi l(R + l) + \pi R^2 + \pi r^2$ = 224.877 + 125.714 = 350.591 cm^2 **(OR)** Volume of toy = Volume of hemisphere + Volume of cone $= \frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$ $= \frac{2}{3} \times 3.14 \times 8 + \frac{1}{3} \times 3.14 \times 4 \times 2$ $= (3.14 \times 8)\left(\frac{2}{3} + \frac{1}{3}\right) = 25.12 cm^3$ Volume of right circular cylinder = $\pi^2 h$ = 3.14 x2^2 x4 = 50.24 cm^3 Required volume = V. of cylinder - V. of toy = 50.24 – 25.12 = 25.12 cm^3 ∴ The difference of the volume of the cylinder a toy is 25.12 cm^3	1 1 1 1 ½ ½ 1 ½ ½
39.	In ΔEDC, tan 30° = $\frac{ED}{CD}$ $\frac{1}{\sqrt{3}} = \frac{14}{CD}$ CD = 14$\sqrt{3}$ CD = 24.248 In ΔABE, tan 60° = $\frac{AB}{BE}$ $\sqrt{3} = \frac{AB}{24.248}$ 41.998 = AB ⇒ CD = BE = 24.258 m ∴The distance of the cliff from the ship = 24.248 m Height of the cliff = AB + BC = 41.998 + 14 = 55.998 m	1,1 1 ½ ½
40.	Correct table Correct graph Median	1½ 1 1½