Virudhunagar District Common Examinations
Common Thrid Revision Test - February 2023

Standard 10
MATHEMATICS
PART - I

Time: 3.00 Hours | Marks: 100

14×1=14

Note : i) Answer all the questions.
ii) Choose the correct answer from the four alternatives and write the option code and the corresponding answer.

1) If $n(A \times B) = 6$ and $A = \{1, 3\}$ then $n(B)$ is
a) 1 b) 2 c) 3 d) 6

2) If $f: A \to B$ is a bijective function and if $n(B) = 7$, then $n(A)$ in equal to
a) 7 b) 49 c) 1 d) 14

3) The least number that is divisible by all the numbers from 1 to 10 (both inclusive) is
a) 2025 b) 5220 c) 5025 d) 2520

4) If 6 times of 6^{th} term of an AP is equal to 7 times the 7^{th} term, then the 13^{th} term of the AP in
a) 0 b) 6 c) 7 d) 13

5) $y^2 + \frac{1}{y^2}$ is not equal to
a) $\frac{y^4+1}{y^2}$ b) $\left(y+\frac{1}{y}\right)^2$ c) $\left(y-\frac{1}{y}\right)^2+2$ d) $\left(y+\frac{1}{y}\right)^2-2$

6) Find the matrix x if $2x + \begin{pmatrix}1 & 3\\5 & 7\end{pmatrix} = \begin{pmatrix}5 & 7\\9 & 5\end{pmatrix}$
a) $\begin{pmatrix}-2 & -2\\2 & -1\end{pmatrix}$ b) $\begin{pmatrix}2 & 2\\2 & -1\end{pmatrix}$ c) $\begin{pmatrix}1 & 2\\2 & 2\end{pmatrix}$ d) $\begin{pmatrix}2 & 1\\2 & 2\end{pmatrix}$

7) A tangent is perpendicular to the radius at the
a) centre b) point of contact c) infinity d) Chord

8) The straight line given by the equation $x = 11$ is
a) Parallel to x - axis b) Parallel to y - axis
c) Passing through the origin d) Passing through the point (0, 11)

9) If slope of the line PQ is $1/\sqrt{3}$ then slope of the perpendicular bisector of PQ is
a) $\sqrt{3}$ b) $-\sqrt{3}$ c) $1/\sqrt{3}$ d) 0

10) If $5x = \sec\theta$ and $5/x = \tan\theta$ then $x^2 - \frac{1}{x^2}$ is equal to
a) 25 b) $1/25$ c) 5 d) 1

11) If two solid hemispheres of same base radius r units are joined together along their bases, then curved surface area of this new solid in sq. units is
a) $4\pi r^2$ b) $6\pi r^2$ c) $3\pi r^2$ d) $8\pi r^2$

12) The ratio of the volumes of a cyclineder, a cone and a sphere, if each has the same diameter and same height is
a) 1 : 2 : 3 b) 2 : 1 : 3 c) 1 : 3 : 2 d) 3 : 1 : 2

13) The sum of all deviations of the data from its mean is
a) Always positive b) Always negative
c) Zero d) non - zero integer.

14) A page is selected at random from a book. The probability that the digit at unit place of the page number chosen is less than 7 is
a) $3/10$ b) $7/10$ c) $3/9$ d) $7/9$

PART - II

10×2=20

Answer any ten questions only. Question No. 28 is compulsory.

15) If $B \times A = \{(-2, 3), (-2,4), (0, 3), (0, 4), (3, 3), (3,4)\}$ find A and B.

16) Let $X = \{1, 2, 3, 4\}$ and $Y = \{2, 4, 6, 8, 10\}$ and $R = \{(1,2), (2,4), (3, 6), (4, 8)\}$. Show that R is a function and find its domain, Co - domain and range.

17) Find the HCF of 252525 and 363636.

18) Find the number of terms in the GP 4, 8, 16, ... 8192.

19) Add : $\frac{x^3}{x-y}+\frac{y^3}{y-x}$

20) Find the nature of the roots of the quadratic equation $\sqrt{2}t^2 - 3t + 3\sqrt{2} = 0$

21) Construct a 2×3 matrix whose elements are given by $a_{ij} = \frac{(i+j)^3}{3}$

22) A tangent ST to a circle touches it at B. AB is a Chord such that $\angle ABT = 65^\circ$. Find $\angle AOB$ where 'O' is the centre of the circle.

23) Find the equation of a line whose inclination in 45° and making an intercept – 9 on the y - axis.

24) Prove : $\frac{\cos\theta}{1+\sin\theta} = \sec\theta - \tan\theta$

25) Find the diameter of a circle whose surface area is 154 sq.cm.

26) Find the standard deviation of the first 21 natural numbers.

27) If P(A) = 0.37, P(B) = 0.42 and P $(A \cap B)$ = 0.09 then find P $(A \cup B)$

28) The volume of a cylindrical water tank is 1.078×10^6 litres. If the diameter of the tank is 7m, find its height.

PART - III

10×5=50

Answer any ten questions only. Question No. 42 is compulsory.

29) If the function f: R → R is defined by $f(x) = \begin{cases} 2x+7; & x < -2 \\ x^2 - 2; & -2 \le x < 3 \\ 3x - 2; & x \ge 3 \end{cases}$

i) f(4) ii) f(−2) iii) f(4) + 2f(1) iv) $\frac{f(1) - 3f(4)}{f(-3)}$

30) Show that (fog) o h = f o (goh) if f(x) = x − 1, g(x) = 3x + 1 and g(x) = x^2.

31) The sum of three consecutive terms that are in AP is 27 and their product is 288 find the three terms

32) Rekha has 15 square colour papers of sizes 10cm, 11cm, 12cm, ... 24cm. How much area can be decorated with these colour papers?

33) Find the square root of $37x^2 - 28x^3 + 4x^4 + 42x + 9$.

34) Find the value of x and y is $x\begin{pmatrix}4\\-3\end{pmatrix} + y\begin{pmatrix}-2\\3\end{pmatrix} = \begin{pmatrix}4\\6\end{pmatrix}$

35) State and Prove Pythagoras theoram.

36) Find the area of the quadrilateral whose vertices are (−9, 0), (−8, 6), (−1, −2) and (−6, −3)

37) From the top of a tree of height 13m the angle of elevation and depression of the top and bottom of another tree are 45° and 30° respectively. Find the height of the second tree.

38) A solid iron cylinder has total surface area of 1848 sq.m. Its curved surface area is five-sixth of its total surface area. Find the radius and height of the iron cylinder.

39) A capsule is in the shape of a cylinder with two hemisphere stuck to each of its ends. If the length of the entire capsule is 12mm and the diameter of the capsule is 3 mm, how much medicine it can hold?

40) Find the co-efficient of variation: 24, 26, 33, 37, 29, 31.

41) From a well - suffled pack of 52 cards, a card is drawn at random. Find the probability of it being either a red king or a black queen.

42) Find the equation of the perpendicular bisector of the line joining the points A(−4, 2) and B (6, −4)

PART - IV

2×8=16

Answer all the questions.

43) Construct a triangle similar to a given triangle PQR with its sides equal to 7/4 of the corresponding sides of the triangle PQR (Scale factor 7/4 > 1)

(OR)

Draw a circle of diameter 6cm from a point P, which is 8 cm away from its centre. Draw the tangents PA and PB to the circle and measure their lengths.

44) A school announces that for a certain competitions, the cash price will be distributed for all the participants equally as shown below.

No of participants (x)	2	4	6	8	10
Amount for each pariticipants Rs.(y)	180	90	60	45	36

i) Find the constant of variation. ii) Graph the above data and hence, find how much will each participant get if the number of participants are 12.

(OR)

Draw the graph of $y = x^2 - 5x - 6$ and hence solve $x^2 - 5x - 14 = 0$.

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1) c) 3

2) a) 7

3) d) 2520

4) a) 0

5) b) $(y+1/y)^2$

6) b) $\begin{pmatrix} 2 & 2 \\ 2 & -1 \end{pmatrix}$

7) b) point of contact

8) b) parallel to y axis

9) b) $-\sqrt{3}$

10) b) $1/25$

11) a) $4\pi r^2$

12) d) 3 : 1 : 2

13) c) Zero

14) b) 7/10.

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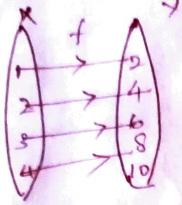
15) $A = \{3, 4\}$
$B = \{-2, 0, 3\}$

16)



All elements in X have only one image in Y.
∴ R is a function
Domain = x = {1, 2, 3, 4}
codomain = Y = {2, 4, 6, 8, 10}
Range = f = {2, 4, 6, 8}

17) Euclid's lemma

$3636\,36 = 252525(1) + 111111$

$252525 = 111111(2) + 30303$

$111111 = 30303(3) + 20202$

$30303 = 20202(1) + 10101$

$20202 = 10101(2) + 0$

∴ HCF = 10101.

18) 4, 8, 16, ... 8192

$a = 4, r = \frac{8}{4} = 2$

$t_n = ar^{n-1} = 8192$

$4(2)^{n-1} = 8192$

$2^{n-1} = 2^{11}$

$n - 1 = 11$

$n = 12$

No. of terms = 12.

19) $\frac{x^3}{x-y} + \frac{y^3}{y-x}$

$= \frac{x^3}{x-y} - \frac{y^3}{x-y}$

$= \frac{x^3 - y^3}{x-y} = \frac{(x-y)(x^2+xy+y^2)}{(x-y)}$

$= x^2 + xy + y^2$

20) $\sqrt{2}t^2 - 3t + 3\sqrt{2} = 0$

$a = \sqrt{2}, b = -3, c = 3\sqrt{2}$

$\Delta = b^2 - 4ac$

$= (-3)^2 - 4(\sqrt{2})(3\sqrt{2})$

$= 9 - 12(2)$

$= 9 - 24$

$= -15 < 0$

∴ No real root

21) $a_{ij} = \frac{(i+j)^3}{3}$

$a_{11} = \frac{2^3}{3} = 8/3$

$a_{12} = \frac{3^3}{3} = \frac{27}{3}$

$a_{13} = \frac{4^3}{3} = \frac{64}{3}$

$a_{21} = \frac{(3)^3}{3} = \frac{27}{3}$

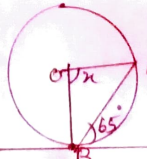
$a_{22} = \frac{(4)^3}{3} = \frac{64}{3}$

$a_{23} = \frac{(5)^3}{3} = \frac{125}{3}$

$A = \begin{pmatrix} 8/3 & 9 & 64/3 \\ 9 & 64/3 & 125/3 \end{pmatrix}$

22) $\angle ABT = 65°$

$\angle OBT = 90°$



$\angle ABO = 90 - 65 = 25°$

In $\triangle ABO$,

$\angle A + \angle B + \angle O = 180°$

$25 + 25 + x = 180°$

$x = 130°$

∴ $\angle BOA = 130°$

23) $m = \tan\theta$

$m = \tan 45° = 1$

$c = -9$

Eqn of a St. line

$y = mx + c$

$y = x - 9$

$x - y - 9 = 0.$

24) $\frac{\cos\theta}{1+\sin\theta} \times \frac{1-\sin\theta}{1-\sin\theta}$

$= \frac{\cos\theta(1-\sin\theta)}{1-\sin^2\theta}$

$= \frac{\cos\theta(1-\sin\theta)}{\cos^2\theta}$

$= \frac{1}{\cos\theta} - \frac{\sin\theta}{\cos\theta}$

$= \sec\theta - \tan\theta.$

25)

Surface Area

$4\pi r^2 = 154\ m^2$

$4 \times \frac{22}{7} \times r^2 = 154$

$r^2 = \frac{49}{4}$

$r = \frac{7}{2}$

$\therefore$ diameter $= 7m$

26)

$S.D = \sqrt{\frac{n^2-1}{12}}$

$= \sqrt{\frac{21^2-1}{12}}$

$= \sqrt{\frac{441-1}{12}}$

$= \sqrt{440/12}$

$= \sqrt{36.67}$

$= 6.06$

27) $P(A \cup B)$

$= P(A) + P(B) - P(A \cap B)$

$= 0.37 + 0.42 - 0.09$

$= 0.79 - 0.09$

$= 0.7$

28)

Volume $= 1.078 \times 10^6$

$= 1078000$ litre

$= 1078\ m^3$

diameter $= 7$

radius $= 7/2$

Volume of the tank $= \pi r^2 h$ cu.units

$\frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \times h = 1078$

$\therefore h = 28m$

5 Mark

29)

i) $f(4) = 3x - 2$

$= 3(4) - 2$

$\boxed{f(4) = 10}$

ii) $f(-2) = (-2)^2 - 2$

$= 4 - 2$

$\boxed{f(-2) = 2}$

iii) $f(1) = 1^2 - 2$

$\boxed{f(1) = -1}$

$\therefore f(4) + 2f(1)$

$= 10 - 2 = 8$

iv) $\frac{f(1) - 3f(4)}{f(-3)}$

$= \frac{-1 - 3(10)}{1}$

$= -31.$

30) LHS $(fog)oh$

$fog(x) = f[g(x)]$

$= f[3x+1]$

$= 3x + 1 - 1$

$= 3x$

$(fog)oh$

$= (fog)h(x)$

$= (fog)(x^2)$

$= 3x^2 \rightarrow (1)$

RHS $fo(goh)$

$(goh)(x)$

$= g(h(x))$

$= g(x^2)$

$= 3x^2 + 1$

$fo(goh)(x)$

$= f[3x^2 + 1]$

$= 3x^2 + 1 - 1 = 3x^2 \rightarrow (2)$

From (1) & (2)

$(fog)oh = fo(goh)$

31) Let $a-d, a, a+d$ be an A.P

Given Sum is 27

$a - d + a + a + d = 27$

$3a = 27$

$\boxed{a = 9}$

Given Product is 288

$(a-d)(a)(a+d) = 288$

$(9-d)(9)(9+d) = 288$

$9^2 - d^2 = 32$

$d^2 = 81 - 32$

$d^2 = 49$

$d = +7, -7$

$a = 9, d = 7$

$a - d = 9 - 7 = 2$

$a = 9$

$a + d = 9 + 7 = 16$

$\therefore$ The three consecutive terms are $16, 9, 2$

$2, 9, 16$ (or)

32) Area of 15 Square color papers

$= 10^2 + 11^2 + \cdots + 24^2$

$= (1^2 + 2^2 + \cdots + 24^2) - (1^2 + 2^2 + \cdots + 9^2)$

$= \frac{24 \times 25 \times 49}{6} - \frac{9 \times 10 \times 19}{6}$

$= 4900 - 285$

$= 4615\ cm^2$

33)

$2x^2 - 7x - 3$

$2x^2$ | $4x^4 - 28x^3 + 37x^2 + 42x + 9$

$4x^4$

$4x^2 - 7x$ | $-28x^3 + 37x^2$

$-28x^3 + 49x^2$ (+) (−)

$4x^2 - 7x - 3$ | $-12x^2 + 42x + 9$

$-12x^2 + 42x + 9$

0

$\therefore \sqrt{4x^4 - 28x^3 + 37x^2 + 42x + 9} = 2x^2 - 7x - 3$

34) $x\begin{pmatrix}4\\-3\end{pmatrix}+y\begin{pmatrix}-2\\3\end{pmatrix}=\begin{pmatrix}4\\6\end{pmatrix}$

$4x-2y=4 \rightarrow (1)$

$-3x+3y=6 \rightarrow (2)$

$(1)\times 3 \Rightarrow 12x-6y=12$

$(2)\times 4 \Rightarrow -12x+12y=24$

$6y=36$

$\boxed{y=6}$

Sub $y=6$ in (1)

$4x-12=4$

$4x=4+12$

$4x=16$

$\boxed{x=4}$

Ans: $x=4$, $y=6$.

35. In a right angle triangle the square of the hypotenuse is equal to the sum of the squares on the other two sides.

$AB^2+AC^2=BC^2$

$AB^2=BC\times BD \rightarrow (1)$

$AC^2=BC\times DC \rightarrow (2)$

(1) + (2)

$AB^2+AC^2=BC^2$

36) Area of a quadrilateral

$=\frac{1}{2}\begin{Bmatrix}x_1 & x_2 & x_3 & x_4 & x_1\\ y_1 & y_2 & y_3 & y_4 & y_1\end{Bmatrix}$

$=\frac{1}{2}\begin{Bmatrix}-9 & -8 & -1 & -6 & -9\\ 0 & 6 & -2 & -3 & 0\end{Bmatrix}$

$=\frac{1}{2}\{-54+16+3+0+0+6-12-27\}$

$=\frac{1}{2}\{-93+25\}$

$=\frac{1}{2}\{-68\}=-34$

Area $=+34$ Sq.units

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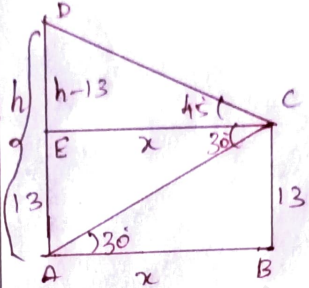
37)



In $\triangle CED$,

$\tan 45^\circ = DE/EC$

$1=\frac{h-13}{x}$

$x=h-13 \rightarrow (1)$

In $\triangle ABC$,

$\tan 30^\circ = \frac{BC}{AB}$

$\frac{1}{\sqrt{3}}=\frac{13}{x}$

$x=13\sqrt{3} \rightarrow (2)$

$(1) \Rightarrow h=x+13$

$=13\sqrt{3}+13$

$=13[1.732+1]$

$=13\times 2.732$

$=35.516$

$=35.52m$

Height of the second tree $=35.32m$

38) TSA $=1848 cm^2$

$2\pi r(h+r)=1848 \rightarrow (1)$

Given

$C.S.A=\frac{5}{6}\times T.S.A$

$=\frac{5}{6}\times 1848$

$2\pi rh=1540 m^2 \rightarrow (2)$

$(1) \Rightarrow 2\pi rh+2\pi r^2=1848$

$1540+2\pi r^2=1848$

$2\times\frac{22}{7}\times r^2=1848-1540$

$r^2=49$

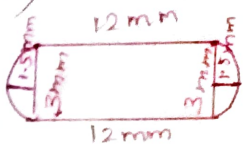
$\boxed{r=7}$

$C.S.A=2\times\frac{22}{7}\times 7\times h$

$=1540$

$\therefore \boxed{h=35m}$

39)



radius $=\frac{3}{2}=1.5$

Height $h=12mm-3mm$

$h=9mm$

Volume of the capsule

$=\pi r^2 h+2\times\frac{2}{3}\pi r^3$

$=\frac{22}{7}\times 1.5\times 1.5\left(9+\frac{4}{3}\times 1.5\right)$

$=\frac{22}{7}\times 1.5\times 1.5\times 11$

$=77.8$ Cubic mm

Volume of the capsule

$=77.8 mm^3$

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40)

Mean

$\bar{x} = \frac{24+26+33+37+29+31}{6}$

$\bar{x} = \frac{180}{6} = 30$

x	$d = x - \bar{x}$	d^2
24	−6	36
26	−4	16
33	3	9
37	7	49
29	−1	1
31	1	1
	$\Sigma d = 0$	$\Sigma d^2 = 112$

$S.D = \sqrt{\frac{\Sigma d^2}{n}}$

$= \sqrt{\frac{112}{6}}$

$= \sqrt{18.67}$

$= 4.32$

$C.V = \frac{\sigma}{\bar{x}} \times 100\%$

$= \frac{4.32}{30} \times 100\%$

$= \frac{432}{30}\%$

$C.V = 14.4\%$

41) $n(S) = 52$

Let A be the event of getting a red king

$n(A) = 2$

$P(A) = \frac{n(A)}{n(S)} = \frac{2}{52}$

Let B be the event of getting a black queen

$n(B) = 2$

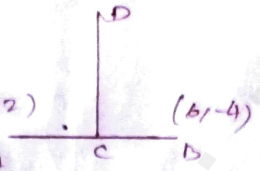
$P(B) = \frac{n(B)}{n(S)} = 2/52$

$P(A \cup B) = P(A) + P(B)$

$= \frac{2}{52} + \frac{2}{52}$

$= \frac{4}{52} = \frac{1}{13}$

42)



Slope of $AB = \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{-4-2}{6+4} = \frac{-3}{5}$

Slope of $\perp r = 5/3$

Mid point of AB

$= \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

$= \left(\frac{-4+6}{2}, \frac{2-4}{2}\right)$

$= \left(\frac{2}{2}, -\frac{2}{2}\right)$

$= (1, -1)$

Eqn of a str. line is

$y - y_1 = m(x - x_1)$

$y + 1 = \frac{5}{3}(x - 1)$

$3y + 3 = 5x - 5$

$\therefore 5x - 3y - 5 - 3 = 0$

$5x - 3y - 8 = 0$

43) a) $7/4$

b) $PA = \sqrt{OP^2 - OA^2}$

$= \sqrt{8^2 - 3^2} = \sqrt{64 - 9}$

$= \sqrt{55}$

$= 7.4$ cm

44) a)

Indirect Variation

$xy = k$

$k = 2 \times 180 = 4 \times 90 = 6 \times 60 = 8 \times 45$

$k = 360$

$\therefore xy = 360$

i) $k = 360$

ii) $y = k/x = \frac{360}{12} = 30$

b)

x	-3	-2	-1	0	1	2	3	4	5	6
y	18	8	0	-6	-10	-12	-12	-10	-6	0

7	8
8	18

Solve

$y = x^2 - 5x - 6$

$0 = x^2 - 5x - 14$

$y = 8$

Solution is $-2, 7$