Quarterly Common Examination
Maths

I. Answer all the questions.

01. If $A \cup B = A \cap B$ then

Ans: $A = B$

02. For any three sets P, Q and R. $P - (Q \cap R)$ is

Ans: $(P - Q) \cup (P - R)$

03. Let $A = \{\emptyset\}$ $B = P(A)$ then $A \cap B$ is

Ans: $\{\emptyset\}$

04. Which of the following is true?

Ans: $(A \cap B)' = A' \cup B'$

05. Which one of the following is an irrational number

Ans: π

06. $\sqrt{27} + \sqrt{12} =$

Ans: $3\sqrt{5}$

07. If $\frac{1}{7} = 0.\overline{142857}$ the value of $\frac{5}{7}$ is

Ans: $0.\overline{714285}$

08. $0.\overline{43} + 0.4\overline{3} =$

Ans:

09. Zeros of $(2-3x)$ is

Ans: $\frac{2}{3}$

10. The zero of polynomial $2x+5$ is

Ans: $-\frac{5}{2}$

11. If $P(a)=0$ then $(x-a)$ is a _____ if $p(x)$.

Ans: Factor

12. If $x^{51}+51$ is divided by $x+1$ than the remainder is

Ans: 50

13. The exterior angle of a triangle is equal to the sum of two _____

Ans: Interior opposite angles

14. If the diagonal of a rhombus are equal, then the rhombus is a _____

Ans: Square

II. Answer the following.

15. If $A=\{6,7,8,9\}$ and $B=\{8,10,12\}$ find $A \Delta B$.

$A=\{6,7,8,9\}$

$B=\{8,10,12\}$

$A-B=\{6,7,9\}$

$B-A=\{10,12\}$

$A \Delta B = (A - B) \cup (B - A)$

$= \{6, 7, 9\} \cup \{10, 12\}$

$A \Delta B = \{6, 7, 9, 10, 12\}$

16. If $A = \{b, e, f, g\}$ and $B = \{c, e, g, h\}$ then verify the commutative property of union of sets.

Soln:

Given

$A = \{b, e, f, g\}$

$B = \{c, e, g, h\}$

$A \cup B = \{b, c, e, f, g, h\}$ — ①

$B \cup A = \{c, b, e, f, g, h\}$ — ②

From ① & ②

$A \cup B = B \cup A$

17. If $n(A) = 25$, $n(B) = 40$, $n(A \cup B) = 50$ and $n(B') = 25$ find $n(A \cap B)$ and $n(U)$.

Soln:

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$ x

$50 = 25 + 40 - x$

$50 = 65 - x$

$x = 65 - 50$

$x = 15 \quad n(A \cap B) = 15$

$n(B) = 40 \quad n(B') = 25$

$n(U) = n(B) + n(B')$

$= 40 + 25$

$= 65 \quad n(U) = 65$

18. Convert the following decimal number in the form of p/q $0.4\bar{5}$.

Let $x = 0.4\bar{5}$

$x = 0.4555 \ldots\ldots$ ①

$10x = 4.555 \ldots\ldots$ ②

$100x = 45.555 \ldots\ldots$ ③

③ - ②

$90x = 41$

$$\boxed{x = \frac{41}{90}}$$

19. Simplify : $5\sqrt{3} + 18\sqrt{3} - 2\sqrt{3}$.

10 20. Find the value of a and b if $\frac{\sqrt{7}-2}{\sqrt{7}+2} = a\sqrt{7}+b$

$$\frac{\sqrt{7}-2}{\sqrt{7}+2} \times \frac{\sqrt{7}-2}{\sqrt{7}-2}$$

$$\frac{7-2\sqrt{7}-2\sqrt{7}+4}{(\sqrt{7})^2-2^2}$$

$$\frac{11-4\sqrt{7}}{7-4}$$

$$\frac{11-4\sqrt{7}}{3}$$

$$\frac{11}{3}-\frac{4\sqrt{7}}{3}$$

$\boxed{b=\frac{11}{3}}$ $a\sqrt{7} = -\frac{4\sqrt{7}}{3}$

$a = \frac{-4}{3}$

21. Find the value of M, if $(x-2)$ is a factor of the polynomial $2x^3-6x^2+mx+4$.

Let $p(x) = 2x^3-6x^2+mx+4$

By factor theorem, $(x-2)$ is a factor of $p(x)$, if $p(2)=0$

$$p(2)=0$$

$$2(2)^3-6(2)^2+m(2)+4=0$$

$$2(8)-6(4)+2m+4=0$$

$$-4+2m=0$$

$$m=2$$

22. Factorise : $2x^2+15x+27$

$2x^2+15x+27 = (2x+9)(x+3)$

27

2

54

$+9$ $+6^3$

$2x$ $2x$

23. The length of a rectangle is $(3x+2)$ units and its breadth is $(3x-2)$ units. Find its area interms of x. What will be the area if $x = 20$ units.

Length $= (3x+2)$ units

breadth $= (3x-2)$ units

Area = length × breadth sq. units

$= (3x+2) \times (3x-2)$

$= 3x(3x-2) + 2(3x-2)$

$= 9x^2 - 6x + 6x - 4$

Area $= 9x^2 - 4$

(i) $x = 20$ units

$= 9x^2 - 4$

$= 9(20)^2 - 4$

$= 9(400) - 4$

$= 3600 - 4$

$= 3,596$ sq. units

24. Find the quotient and the remainder when $(5x^2 - 7x + 2) \div (x-1)$

$(5x^2 - 7x + 2) \div (x-1)$

$$
\begin{array}{r|l}
 & 5x - 2 \\
\hline
x - 1 & 5x^2 - 7x + 2 \\
 & 5x^2 - 5x \\
 & (-)\ \ (+) \\
\hline
 & -2x + 2 \\
 & -2x + 2 \\
 & (+)\ \ (-) \\
\hline
 & 0
\end{array}
$$

i) $\frac{5x^2}{x} = 5x$

ii) $5x(x-1) = 5x^2 - 5x$

iii) $-\frac{2x}{x} = -2$

iv) $-2(x-) = (-2x+2)$

$\therefore$ Quotient $= 5x - 2$ Remainder $= 0$

25. The angles of a triangle are in the ratio 1 : 2 : 3 find the measu of each angle of the triangle

Let the three angles of the $\triangle$ are $x, 2x, 3x$

W.K.T

Sum of the three angles of the $\triangle$ $\}$ = 180

$x + 2x + 3x = 180^\circ$

$6x = 180^\circ$

$x = \frac{180^\circ}{6} = 30^\circ$

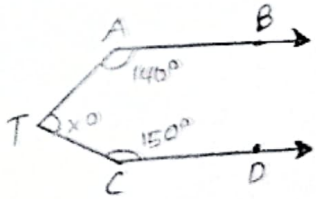
$x = 30^\circ$

Hence the three angles are

$30^\circ, 2 \times 30^\circ, 3 \times 30^\circ$

(i.e) $30^\circ, 60^\circ, 90^\circ$

26. In the figure, AB is parallel to CD find X.



Draw TU $\parallel^{el}$ to AB

Since AB $\parallel^{el}$ TU & TA is transversal

$\Rightarrow 140^\circ + \angle a = 180^\circ$

$\Rightarrow \angle a = 180^\circ - 140^\circ$

$\angle a = 40^\circ$

Again TU $\parallel^{el}$ CD & TC is transversal

$\Rightarrow \angle b + 150^\circ = 180^\circ$

$\Rightarrow \angle b = 180^\circ - 150^\circ$

$\angle b = 30^\circ$

$\angle x = \angle a + \angle b$

$\Rightarrow \angle x = 40^\circ + 30^\circ$

$\angle x = 70$

27. $\triangle ABC$ and $\triangle DEF$ are two triangles in which $AB = DF$, $\angle ACB = 70^\circ$ and $\angle ABC = 60^\circ$, $\angle DEF = 70^\circ$ and $\angle EDF = 60^\circ$ prove that the triangles are congruent.

28. Simplify: $(300000)^3 \times (2000)^4$

Soln:

$(300000)^3 \times (2000)^4$

$= (3.0 \times 10^5)^3 \times (2.0 \times 10^3)^4$

$= (3.0)^3 \times (10^5)^3 \times (2.0)^4 \times (10^3)^4$

$= (27.0) \times (10^{15}) \times (16.0) \times (10^{12})$

$= (27 \times 10^1) \times (10^{15}) \times (1.6 \times 10^1) \times (10^{12})$

$= 2.7 \times 1.6 \times 10^1 \times 10^{15} \times 10^1 \times 10^{12}$

$= 4.32 \times 10^{1+15+1+12} = 4.32 \times 10^{29}$

III. Answer the following

29. If $A = \{x : x \in Z, -2 < x \leq 4\}$, $B = \{x : x \in W, x \leq 5\}$, $C = \{-4, -1, 0, 2, 3, 4\}$ then verify $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

Soln:

Given

$A = \{-1, 0, 1, 2, 3, 4\}$

$B = \{0, 1, 2, 3, 4, 5\}$

$C = \{-4, -1, 0, 2, 3, 4\}$

L.H.S

$A \cup (B \cup C)$

$B \cup C = \{0, 2, 3, 4\}$ $B \cup C = \{0, -1, -4, 1, 2, 3, 4, 5\}$

$A \cap (B \cup C)$ $A \cap (B \cup C) = \{-1, 0, 1, 2, 3, 4\} \longrightarrow (1)$

R.H.S

$(A \cap B) \cup (A \cap C)$

$A \cap B = \{0, 1, 2, 3, 4\}$

$A \cap C = \{-1, 0, 2, 3, 4\}$

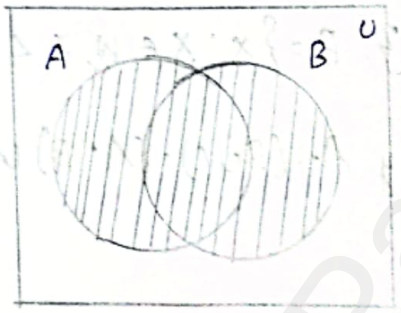
$(A \cap B) \cup (A \cap C) = \{-1, 0, 1, 2, 3, 4\}$ — (2)

From (1) & (2)

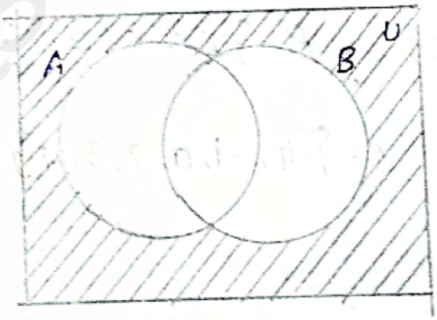
$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

30. Verify $(A \cup B)' = A' \cap B'$ using Venn diagram.

L.H.S

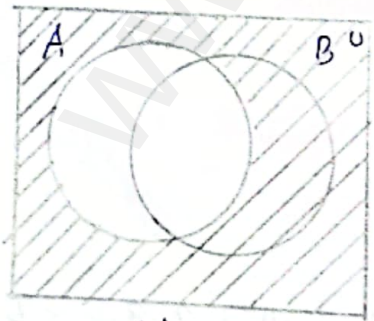


$A \cup B$

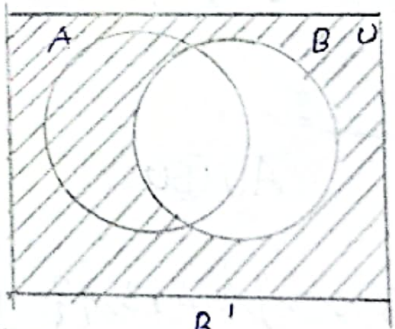


$(A \cup B)'$

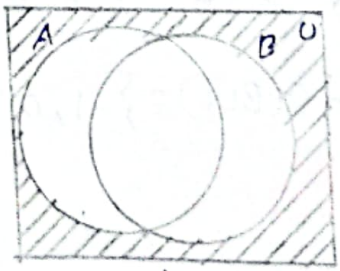
R.H.S



A'



B'



$A' \cap B'$ → (2)

From ① and ②, it is verified that $(A \cup B)' = A' \cap B'$

31. In an examination 50% of the students passed in Mathematics and 70% of students passed in Science while 10% students failed on both subjects. 300 students passed in both the subjects. Find the total number of students who appered in the examination if they took examination in only two subjects.

Let the percentage of students failed in Maths m $n(m)$

Let the percentage of students failed in Science S $n(s)$

Failed in Maths = 100% - Pass%.

= 100 - 50%.

Fail % = 50%.

Failed in Science = 100% - Pass%.

= 100 - 70%.

Fail % = 30%.

$n(m \cup s) = n(m) + n(s) - n(m \cap s)$

$= 50 + 30 - 10$

Fail in m/sci = 70%.

Pass% = Total - Fail%.

= 100 - 70

Pass% = 30%.

Maths, Science

$30\% \times x = 300$

$\frac{300}{100} \times x = 300$

$x = \frac{300 \times 100}{30}$

$x = 1000$

1000 students take part in examination.

32 Let $U = \{0,1,2,3,4,5,6,7\}$ $A = \{1,3,5,7\}$ and $B = \{0,2,3,5,7\}$

Find the following sets.

i) A' ii) B' iii) $A' \cap B'$ iv) $(A \cap B)'$ v) $(B')'$

i) A'

i) $A' = U - A = \{0,1,2,3,4,5,6,7\} - \{1,3,5,7\}$

$A' = \{0,2,4,6\}$

ii) $B' = U - B = \{0,1,2,3,4,5,6,7\} - \{0,2,3,5,7\}$

$B' = \{1,4,6\}$

iii) $A' \cap B' = \{0,2,4,6\} \cap \{1,4,6\}$

$= \{4,6\}$

iv) $(A \cap B)' - U - A \cap B$

$A \cap B = \{1,3,5,7\} - \{0,2,3,5,7\}$

$= \{3,5,7\}$

$(A \cap B)' = \{0,1,2,3,4,5,6,7\} - \{3,5,7\}$

$= \{0,1,2,4,6\}$

v) $(B')' = U - B'$

$= \{0,1,2,3,4,5,6,7\} - \{1,4,6\}$

$= \{0,2,3,5,7\}$

36. Rationalise the denominator and simplify : $\frac{5\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$

$$= \frac{5\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}}$$

$$= \frac{5\times 3 - 5\sqrt{6} + \sqrt{6} - 2}{(\sqrt{3})^2 - (\sqrt{2})^2}$$

$$= \frac{15 - 4\sqrt{6} - 2}{3-2}$$

$$= 13 - 4\sqrt{6}$$

$\frac{5\times 3 - 5\sqrt{6} + \sqrt{6} - 2}{(\sqrt{3})^2 - (\sqrt{2})^2}$

$\frac{15 - 4\sqrt{6} - 2}{3-2}$

$13 - 4\sqrt{6}$

37. If $(x+a)(x+b)(x+c) = x^3 + 14x^2 + 59x + 70$ find the value of

i) $1/a + 1/b + 1/c$ ii) $a^2 + b^2 + c^2$.

i) $1/a + 1/b + 1/c$

$$1/a + 1/b + 1/c = \frac{bc + ac + ab}{abc}$$

$$= \frac{59}{70}$$

ii) $a^2 + b^2 + c^2$

$$\frac{a(a) + b(b) + c(c)}{abc} = \frac{a^2 + b^2 + c^2}{abc}$$

$$= \frac{78}{70}$$

38. If the quotient on dividing $x^4 + 10x^3 + 35x^2 + 50x + 29$ by (x + 4) is $x^3 - ax^2 + bx + 6$ then find the value of a, b and also remainder

Soln.

Let $P(x) = x^4 + 10x^3 + 35x^2 + 50x + 29$

$x + 4 = 0$

$x = -4$

	1	10	35	50	29
-4		0	-4	-24	-44	-24
	1	6	11	6	5

Quotient $= x^3 + 6x^2 + 11x + 6$

Compared with given Quotient $= x^3 - ax^2 + bx + 6$

$\Rightarrow -a = 6$

$a = -6$

& $b = 11$

Remainder $= 5$

39. Factorise : $x^3 - 3x^2 - 10x + 24$

Soln:

40. The angles of a quadrilateral are in the ratio 2 : 4 : 5 : 7 Find all the angles

Sum of the angles of the Quadrilateral $\} = 360^\circ$

$$2x + 4x + 5x + 7x = 360^\circ$$

$$18x = 360$$

$$\Rightarrow x = \frac{360^{20}}{18_1}$$

$$x = 20^\circ$$

$2x = 2 \times 20 = 40^\circ$

$4x = 4 \times 20 = 80^\circ$

$5x = 5 \times 20 = 100^\circ$

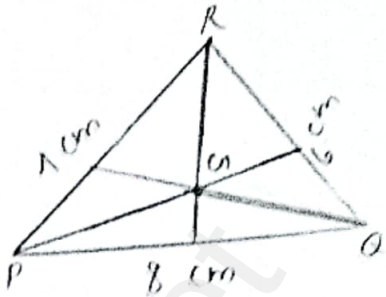
$7x = 7 \times 20 = 140^\circ$

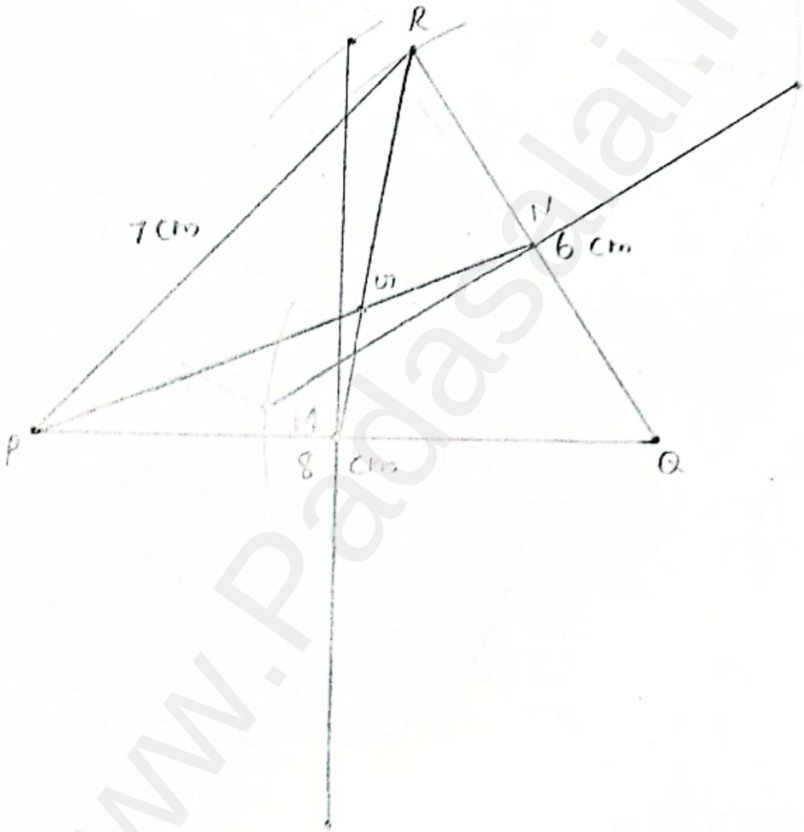
$\therefore$ All the angles of the Quadrilateral are $40^\circ, 80^\circ, 100^\circ$ and 140°

41. The length of the diagonals of a rhombus are 12 cm and 16 cm find the side of the rhombus.

IV. Answer the both questions.

43. a) Construct the centroid of ΔPQR whose sides are $PQ = 8$ cm, $QR = 6$ cm, $RP = 7$ cm.





Step 1: Draw ΔPQR using given measurements $PQ = 8$ cm $QR = 6$ cm and $RP = 7$ cm and construct the perpendicular bisector of any two sides (PQ and QR) to find the mid-points M and N of PQ and QR respectively.

Step 2: Draw the medians PN and RM and let them meet at G. The point G is the centroid of the given ΔPQR.

44. a) Draw the graph the following:

$Y = 4x - 1$

x	-1	0	1
$4x$	-4	0	4
-1	-1	-1	-1
y	-5	-1	3

Scale:

x axis 1 cm = 1 unit

y axis 1 cm = 1 unit

Points:

$(-1, -5), (0, -1), (1, 3)$