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Chapter 03

Question No: 01

i) positive angle

ii) Nagetive angle

Question No: 02

i). 90° right angle

180° straight angle

45° acute angle

270° reflex angle

30° acute angle

Question

i) $60^\circ + 30^\circ = 90^\circ$

complementary.

ii- $80^\circ + 100^\circ = 180^\circ$

supplementary

iii- $45^\circ + 45^\circ = 90^\circ$

complementary

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iv- $120^\circ + 60^\circ = 180^\circ$

supplementary

v- $90^\circ + 90^\circ = 180^\circ$

supplementary

Question 04

(i)

$\angle A = 50^\circ$

$\angle B = 70^\circ$

$\angle C = ?$

In triangle

$\triangle ABC = 180^\circ$

$\angle C = 180^\circ - \angle A - \angle B$

$= 180^\circ - 50^\circ - 70^\circ$

$\angle C = 60^\circ$

(ii)

$\angle A = 90^\circ$

$\angle B = 80^\circ$

$\angle C = 100^\circ$

$\angle D =$

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In quadrilateral

$ABCD = 360^\circ$

$\angle D = 360^\circ - \angle A - \angle B - \angle C$

$\angle D = 360^\circ - 90 - 80 - 100$

$\angle D = 90^\circ$

(iii)

$\angle X = 60^\circ$

$\angle Y = 80^\circ$

$\angle Z = ?$

In triangle

$\Delta XYZ = 180^\circ$

$\angle Z = 180^\circ - \angle X - \angle Y$

$\angle Z = 180^\circ - 60^\circ - 80^\circ$

$\angle Z = 180 - 140^\circ$

$\angle Z = 40^\circ$

(v)

$\angle W = 120^\circ$

$\angle X = 70^\circ$

$\angle Y = 110^\circ$

$\angle Z = ?$

In quadrilateral

$WXYZ = 360^\circ$

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$\angle Z = 360^\circ - \angle W - \angle X - \angle Y$

$\angle Z = 360^\circ - 120^\circ - 70^\circ - 110^\circ$

$\angle Z = 360^\circ - 300^\circ$

$\angle Z = 60^\circ$

(iv)

$\angle P = 50^\circ$

$\angle Q = ?$

In parallelogram PQRS opposite angles ar equal

~~$\angle Q = \angle S$~~ $\angle Q = \angle S$

adjacent angles are supplementary since

$\angle P + \angle Q = 180^\circ$

$50^\circ + \angle Q = 180^\circ$

$\angle Q = 180 - 50^\circ$

$\angle Q = 130^\circ$

Question 05

Let ~~Suppose~~

$\angle A = 50^\circ$

$\angle B = 70^\circ$

$\angle L = ?$

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In triangle

$\angle A + \angle B + \angle C = 180^\circ$

$50^\circ + 70^\circ + \angle C = 180^\circ$

$120^\circ + \angle C = 180^\circ$

$\angle C = 180^\circ - 120^\circ$

$\angle C = 60^\circ$

So third angle is 60°.

Question 06

(a)

Let

right angle $\angle A = 90^\circ$

$\angle B = 30^\circ$

$\angle C = ?$

In triangle

$\angle A + \angle B + \angle C = 180^\circ$

$90^\circ + 30^\circ + \angle C = 180^\circ$

$120^\circ + \angle C = 180^\circ$

$\angle C = 180^\circ - 120^\circ$

$\angle C = 60^\circ$

right angle $= 90^\circ$

third angle $= 60^\circ$

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(b)

Let

first angle = x

second angle = $2x$

third angle = $50°$

triangle = $180°$

$x + 2x + 50° = 180°$

$3x + 50 = 180$

$3x = 180 - 50$

$3x = 130$

$x = \frac{130}{3}$

$x = 43.34...$

second angle = $2x$

$= 2 \times 43.3$

$= 86.67...$

So

first angle = 43.34

second angle = 86.67

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Question No 7

Similar like question -5

Question No 8

In supplementary angle sume of two angle is equal to 120° so

Let

$$x + 120^\circ = 180^\circ$$

$$x = 180 - 120^\circ$$

$$x = 60^\circ$$

Question No 10

Let angle $= x$

So

$$x = \frac{1}{2}(90 - x) - 5^\circ$$

$$x = 45^\circ - \frac{1}{2}x - 5$$

$$x = 40 - \frac{1}{2}x$$

$$x + \frac{1}{2}x = 40^\circ$$

$$\frac{2+1}{2}x = 40^\circ$$

$$\frac{3}{2}x = 40^\circ$$

$$x = \frac{40 \times 2}{3}$$

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$x = \frac{80^\circ}{3}$

$x = 26.67^\circ$

Question 11

two angles complementary

one angle = 40°

Let second angle = x

$x + 40^\circ = 90^\circ$

$x = 90 - 40$

$x = 50^\circ$

Question 12

same method like question no 10.

Question 13

one angle = 70°

other three angle = ?

In parallelogram

opposite angles are equal

so one angle also 70°

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In in parallelogram to
& consecutive angles are
supplementary so let

$x + 70 = 180^\circ$

$x = 180^\circ - 70^\circ$

$x = 110^\circ$

Now to angles are 70°
and other two are 110°.

Question No 14

same method like question
4 -> (ii)

Question No 15

Same method like question
number 13.

Question No 16

In a regular hexagon
All sides equal
all interior & angles are equal

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total interior angles find by

$= (n-2) \times 180^\circ$ $\therefore n =$ Number of sides

$= 6-2 \times 180$

$= 4 \times 180^\circ$

$= 720^\circ$

Each angle $= \frac{\text{Sum of angles}}{\text{Number of angles}}$

$= \frac{720^\circ}{6}$

$= 120^\circ$

so each angle in regular hexagon is 120°.

Question No : 17

Same like question 14.

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Question No : 18

Let in a quadrilateral ABCD

$\angle A = 80^\circ$

$\angle B = 100^\circ$

$\angle C = ?$

$\angle D = ?$

Let unknown angle $= x$

$\angle A + \angle B + \angle C + \angle D = 360^\circ$

$80^\circ + 100 + \angle C + \angle D = 360^\circ$

$\angle C + \angle D = 360^\circ - 180^\circ$

$x + x = 360 - 180^\circ$

$2x = 180^\circ$

$x = \frac{180^\circ}{2}$

$x = 90^\circ$

So remaining both angles are $90^\circ, 90^\circ$.

Question No : 19

In a regular octagon

all sides are equal

all exterior angles are equal.

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Octagon is the sum of

Sum of all exterior angles in octagon is equal to 360° so each angle is

$$\text{each angle} = \frac{\text{sum of angles}}{\text{Number of angles}}$$

$$= \frac{360}{8}$$

$$= 45°$$

so each exterior is 45°.

Question 20

(i)

Lenght = 5cm

Breadth = 4 cm

Height = 3cm

Volume = ?

Volume = Lenght x Breadth x Height

= 5cm x 4cm x 3 cm

= 60 cm^3

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→ question (ii) and (iii) also same.

→ and question 21 complete also have same method

→ question 22 also same method

→ question 23 also have same method

Question No 24

(a)

lenght = 15 cm

breadth = 9 cm

height = 12 cm

cubical sides = 3 cm

Total Number of boxes = ?

volume of carton is

Volume = L x B x H

= 15 cm x 9 cm x 12 cm

= 1620 cm^3

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Volume of box

$\text{Volume}_{(b)} = 3 \times 3 \times 3 = 27 cm^3$

$\text{Number of boxes} = \frac{\text{Volume (c)}}{\text{Volume (b)}}$

$= \frac{1620}{27}$

$= 60$

60 boxes in carton.

(B)

Same method like question number 23.

Question 25

Same method like question number 24 (a).

Question 26

i- Straight line

ii- Tangent line

iii- Paralled line

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iv. perpendicular line

v. skew line

Question :27

(i)

Circumference $C=?$

$C = 2\pi r$

$C = 2\pi \times 6$

$C = 12\pi$ units

(ii)

area $A=?$

$A = \pi r^2$

$A = \pi (6)^2$

$A = \pi 36$

$A = 36\pi$ square units

(iii)

$\theta = 45^\circ$

Lenght of arc $=?$

$\text{Lenght} = \frac{\theta}{360} \times 2\pi r$

$\theta = 45^\circ, \quad r = 6$

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$$L = \frac{45}{360} \times 2\pi \times 6 = \frac{1}{8} \times 12\pi$$

$$L = \frac{12\pi}{8}$$

$$\boxed{L = \frac{3\pi}{2} \text{ units}}$$

(iv)

$\theta = 90^\circ$

area of sector $S = ?$

$$S = \frac{\theta}{360} \times \pi r^2$$

$$S = \frac{90}{360} \times \pi (6)^2$$

$$S = \frac{90}{360} \times 36\pi$$

$$S = \frac{1}{4} \times 36\pi$$

$$\boxed{S = 9\pi \text{ square units}}$$

Question No 28

same method like previous question.

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Question No: 29

i) Squre

ii) Regular Hexagon

iii- Regular pentagon

iv- Equilateral triangle

v- equiangle octagon

Question No: 30

i- $n = 6$

$lenght = s = 8$

Perimeter = ?

$p = n \times s$

$= 6 \times 8$

$= 48$ units

ii-

interior angle = ?

Each interior angle = $\frac{\text{sum of angle}}{\text{Number of angle}}$

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$$= \frac{(n-2)\times 180^\circ}{6}$$

$$= \frac{6-2\times 180^\circ}{6}$$

$$= \frac{4\times 180^\circ}{6}$$

$$= \frac{720^\circ}{6}$$

$$= 120^\circ$$

So each exterior angle is 120°.

iii-

exterior angle = ?

number of sides = 6

each exterior angle $= \frac{360^\circ}{n}$

$$= \frac{360}{6}$$

$$= 60^\circ$$

So each exterior angle is 60°.

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Question No: 31

i- Set of vowels

ii- Set of odd numbers less then 14.

iii- Set of perfect squre of first six natural numbers

iv- Set of distinct letters in phrase set theory.

v- Set of prime number between 10 and 30.

Question No: 32

i- $A = \{3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

ii- $B = \{-11, -10, -9 \ldots 110, 111\}$

iii- $C = \{2, 3\}$

iv- $E = \{1, 3, 5, 7\}$

v- $F = \{-3, -2, -1, 0, 1, 2, 3\}$

Question No: 33

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Question No 34

(i)

$N = \{1, 2, 3, 4\}$

$X = \{5\times1, 5\times2, 5\times3, 5\times4\}$

$X = \{5, 10, 15, 20\}$

$x = \{4\}$

So cardinal number is 4.

(ii)

Total alphabets = 26

vowel = 5

consonant = 26 − 5

= 21

So cardinal number is 21.

(iii)

set include all prime number.

So cardinal number is infinite ∞.

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Question No 35

a) ⟶ (i)

To find subsets

2^n $\therefore n = 6$

$2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$

To find proper subsets

$2^n - 1$

$2^6 - 1 = 64 - 1 = 63$

(ii)

To find subsets

2^n $n = 7$

$2^7 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 128$

To find proper subsets

$2^n - 1 = 128 - 1 = 127$

(B)

(i)

$X = \{a, d, f, g, h\}$

$Y = \{b, e, g, h, k\}$

$X - Y = \{a, d, f, g, h\} - \{b, e, g, h, k\}$

$= \{a, d, f\}$

$Y - X = \{b, e, g, h, k\} - \{a, d, f, g, h\}$

$= \{b, e, k\}$

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$(X-Y) \cup (Y-X) = \{a, d, f\} \cup \{b, e, k\}$

$= \{a, b, d, e, f, k\}$

other part of this question has same method.

Question 36

$A = \{1, 2, 3\}$

$B = \{1, 2, 3, 4\}$.

All elements of A is present in B so it A is proper subset of B.

∴ Therefore, No A is not improper subset of B.

Question 37

same like previous question

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Question No 42

Solution:-

$B = \{3, 4, 5\}$

$= \{\}, \{3\}, \{4\}, \{5\}, \{3,4\}, \{3,5\}$
$\{4,5\}, \{3,4,5\}$

Question No 43

(i)

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

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

$A \cup B = \{0, 1, 2, 4, 6\} \cup \{-3, -1, 0, 2, 4, 5\}$

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

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

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

(ii)

$A = \{2, 4, 6, 8\}$

$B = \phi$

$A \cup B = \{2, 4, 6, 8\} \cup \{\phi\}$

$= \{2, 4, 6, 8\}$

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$A \cap B = \{2, 4, 6, 8\} \cap \{\}$

$= \{\}$

(iii) and (iv) are same both like previous questions.

Question 44

(i) and (ii) are same like previous question.

(iii)

$A = \{1, 2, 3, 4, 5\}$

$B = \{4, 5, 6, 7, 8\}$

$B - A = \{4, 5, 6, 7, 8\} - \{1, 2, 3, 4, 5\}$

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

(iv)

$A = \{1, 2, 3, 4, 5\}$

$C B = \{3, 4, 5\}$

$A \oplus B = (A \cup B) - (A \cap C)$

$= \{1, 2, 3, 4, 5\} \cup \{3, 4, 5\} - \{1, 2, 3, 4, 5\} \cap \{\}$

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

$= \{1, 2\}$

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Question No 45

$U = \{1, 2, 3, \ldots, 10\}$

$P = \{2, 4, 6, 8, 10\}$

$Q = \{3, 6, 9\}$

i) complement of P

$U - P = \{1, 2, 3, \ldots 10\} - \{2, 4, 6, 8, 10\}$

$= \{1, 3, 5, 7, 9\}$

ii. intersection of P and Q

$P \cap Q = \{2, 4, 6, 8, 10\} \cap \{3, 6, 9\}$

$= \{6\}$

Question No 46

$X = \{1, 2, 3, 4\}$

$Y = \{3, 4, 5, 6\}$

$Z = \{5, 6, 7, 8\}$

To identify disjoint

A $X \cap Y = \{1, 2, 3, 4\} \cap \{3, 4, 5, 6\}$

$= \{3, 4\}$

$X \cap Y \neq \emptyset$ so x and y are not disjoint

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$X \cap Z = \{1,2,3,4\} \cap \{5,6,7,8\}$

$= \{\}$

X and Z are disjoint

$Y \cap Z = \{3,4,5,6\} \cap \{5,6,7,8\}$

$= \{5,6\}$

Y and Z are not disjoint.

Question No 47

Solution:-

$A = \{1,2,3,4,5\}$

$B = \{3,4,5,6,7\}$

i) $A \cup B = \{1,2,3,4,5\} \cup \{3,4,5,6,7\}$

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

ii) $A \cap B = \{1,2,3,4,5\} \cap \{3,4,5,6,7\}$

$= \{3,4,5\}$

iii. $A - B = \{1,2,3,4,5\} - \{3,4,5,6,7\}$

$= \{1,2\}$

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

$= \{6,7\}$

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Question 48

Solution:-

Same like previous question.

Question 49

Solution:-

$M = \{1, 2, 3, 4, 5\}$

$N = \{4, 5, 6, 7, 8\}$

$M \Delta N = (M \cup N) - (M \cap N)$

$M \cup N = \{1, 2, 3, 4, 5\} \cup \{4, 5, 6, 7, 8\}$

$= \{1, 2, 3, 4, 5, 6, 7, 8\}$

$M \cap N = \{1, 2, 3, 4, 5\} \cap \{4, 5, 6, 7, 8\}$

$= \{4, 5\}$

$M \Delta N = (M \cup N) - (M \cap N)$

$= \{1, 2, 3, 4, 5, 6, 7, 8\} - \{4, 5\}$

$= \{1, 2, 3, 6, 7, 8\}$

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Question No 50

Solution:-

$S = \{1, 2, 3, \cdots, 10\}$

$A = \{5, 10\}$

$B = \{2, 4, 6, 8, 10\}$

i) $(A \cup B)'$

$A \cup B = \{5, 10\} \cup \{2, 4, 6, 8, 10\}$

$= \{2, 4, 5, 6, 8, 10\}$

$(A \cup B)' = S - A \cup B$

$= \{1, 2, 3, \cdots, 10\} - \{2, 4, 5, 6, 8, 10\}$

$= \{1, 3, 7, 9\}$

ii) $(A' \cap B')$

$A' = S - A$

$= \{1, 2, 3, \cdots, 10\} - \{5, 10\}$

$= \{1, 2, 3, 4, 6, 7, 8, 9\}$

$B' = S - B$

$= \{1, 2, 3, \cdots, 10\} - \{2, 4, 6, 8, 10\}$

$= \{1, 3, 5, 7, 9\}$

$A' \cap B' = \{1, 2, 3, 4, 6, 7, 8, 9\} \cap \{1, 3, 5, 7, 9\}$

$= \{1, 3, 7, 9\}$

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Question No 51

Solution:-

All part of this question have same method like previous question.

Question No 52

Solution:-

Used cereal A = 1500

Used cereal B = 600

Used cereal C = 700

Used cereal A and B = 300

Used cereal A and C = 260

used cereal B and C = 50

total cereal = 5000

i) A'

$A' = \text{total} - A$

$= 5000 - 1500$

$= 3500$

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ii- $(A \cap B)'$

$(A \cap B)' = \text{total} - A \cap B$

$= 5000 - 300$

$= 4700$

iii- ~~$(A \cup B)'$~~ $(B \cup C)'$

~~$A \cup B = A + B - A \cap B$~~

$= 3$

$(B \cup C)' = \text{total} - B \cup C$

~~$A \cup B$~~ $= B \cup C = B + C - B \cap C$

$= 600 + 700 - 50$

$= 1300 - 50$

$= 1250$

$(B \cup C)' = \text{total} - B \cup C$

$= 5000 - 1250$

$= 3750$

Question No : 53

Student pass in Group I = 75%

Student pass in Group II = 82%

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Let

Group I is equal to A

Group II is equal to B

fail student = 15%

let

So 100% - 15% = 85%

student pass at least in one group

$|A \cup B| = 85\%$

Formula of union of two sets

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

$85\% = 75\% + 82\% - A \cap B$

$85 = 75 + 82 - A \cap B$

$85 = 157 - A \cap B$

$A \cap B = 157 - 85$

$A \cap B = 72$

72% passed in both

85% passed in both

Final answer

85%

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Question No 54

Total student = 1000

Failed in first term = 200

Failed in second term = 390

Failed in third term = 280

Failed in exactly two terms = 180

Failed in all three = 0

Let :

A = student failed in first term

B = student failed in second term

C = student failed in third term

$A \cup B \cup C$ = student fail in all terms

Now use principle of inclusion and exclusion

$|A \cup B \cup C| = A + B + C - (A \cap B) - (A \cap C) - (A \cap B \cap C)$

$= 200 + 390 + 280 - 180 + 0$

$= 690$

student that not failed is $1000 - 690 = 310$

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Question No 55

(i)

$S = \{1, 2, 3, 4\}$

$= \{\}, \{1\}, \{2\}, \{3\}, \{4\}, \{1, 2\}, \{1, 3\}$
$\{1, 4\}, \{2, 3\}, \{2, 4\}, \{1, 2, 3\}, \{1, 2, 4\}$
$\{3, 4\}, \{1, 2, 3\}, \{1, 2, 4\}, \{1, 3, 4\}, \{2, 3, 4\}$

(ii)

Same like previous

Question No 56

$U = \{1, 2, 3, \ldots, 19\}$

$A = \{2, 3, 5, 7, 11, 13, 17, 19\}$

$B = \{3, 6, 9, 12, 15\}$

$C = \{1, 3, 5, 7, 9, 11, 13, 15, 17\}$

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

$A \cap B = \{2, 3, 5, 7, 11, 13, 17, 19\} \cap \{3, 6, 9, 12, 15\}$
$= \{3\}$

$A \cap C = \{2, 3, 5, 7, 11, 13, 17, 19\} \cap \{1, 3, 5, 7, 9, 11, 13, 15, 17\}$
$= \{3, 5, 7, 11, 13, 17\}$

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$(A \cap B) \cup (A \cap C) = \{3\} \cup \{3, 5, 7, 11, 13, 17\}$

$= \{3, 5, 7, 11, 13, 17\}$

Question No 57

Total housewives = 200

Brand A users = 40

Brand B users = 76

Brand C users = 82

Exactly two brand users = 36

all brand users =

34 use A not C

10 use both A and B

we are find:

How many use none of brand?

How many use exactly one?

Let

A = those use brand A

B = those use brand B

C = those use brand C

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Question 59

Solution:-

People who use brand A $\Rightarrow A = 42\%$

People who use brand B $\Rightarrow B = 51\%$

People who use brand B $\Rightarrow B = 68\%$

$A \cap B = 30\%$

$B \cap C = 28\%$

$A \cap C = 36\%$

$A \cup B \cup C = 100\% - 8\% = 92\%$

Find :

$A \cap B \cap C = ?$

Use Exclusion-inclusion principle

$(A \cup B \cup C) = A + B + C - (A \cap B) - (B \cap C) - (A \cap C) + (A \cap B \cap C)$

$92 = 42 + 51 + 68 - 30 - 28 - 36 + (A \cap B \cap C)$

$92 = 161 - 30 - 28 - 36 + (A \cap B \cap C)$

$92 = 67 + (A \cap B \cap C)$

$92 - 67 = (A \cap B \cap C)$

$25\% = (A \cap B \cap C)$

25% use all three brand of soap.

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Question No 60

Solution:-

Total = 10,000

A = 5010

B = 3470

C = 4820

$(A \cap B) = 1000$

$(A \cap C) = 840$

$(A \cap B \cap C) = 500$

$B \cap C = x$

Using principle of inclusion-exclusion

$(A \cup B \cup C) = A + B + C - (A \cap B) - (A \cap C) - (B \cap C) + (A \cap B \cap C)$

$10000 = 5010 + 3470 + 4820 - 1000 + 840 - x + 500$

$10,000 = 11,960 - x$

$x = 11,960 - 10,000$

$x = 1960$

So maximum value of $(B \cap C)$ should be 1960.

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Question No 61

Solution:-

i- Function

ii- Function

iii- Function

iv- Function

v- Function

vi- Non Function

vii- Function

Question No 62

i- $f(x) = 100$

$f(1) = 100$

$f(2) = 100$

$f(a+b) = 100$

Constant function so output always 100.

ii- $f(x) = 5x + 8$

$f(1) = 5(1) + 8 = 5 + 8 = 13$

$f(-2) = 5(-2) + 8 = -10 + 8 = -2$

$f(a+b) = 5(a+b) + 8$

$= 5a + 5b + 8$

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iii- $f(x) = x^2 - 3x + 7$

$f(1) = (1)^2 - 3(1) + 7$

$= 1 - 3 + 7$

$= 8 - 3$

$= 5$

$f(-2) = (-2)^2 - 3(-2) + 7$

$= 4 + 6 + 7$

$= 17$

$f(a+b) = (a+b)^2 - 3(a+b) + 7$

$= a^2 + 2ab + b^2 - 3a - 3b + 7$

v- $f(x) = 49 - x$

$f(1) = 49 - 1 = 48$

$f(-2) = 49 - (-2) = 49 + 2 = 51$

$f(a+b) = 49 - (a+b) = 49 - a - b$

Question 03

Solution

i- $f(x) = 4x + 10 - 2x$

$f(x) = 4x - 2x + 10$

$= 2x + 10$

$f(0) = 2(0) + 10 = 0 + 10 = 10$

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$f(-3) = 2(-3) + 10 = -6 + 10 = 4$

$f(c+d) = 2(c+d) + 10 = 2c + 2d + 10$

ii- $f(x) = dx$

$f(0) = d(0) = 0$

$f(-3) = d(-3) = -3d$

$f(c+d) = d(c+d) = cd + d^2$

iii- $f(x) = x^2 + 20x$

$f(0) = (0)^2 + 20(0) = 0$

$f(-3) = (-3)^2 + 20(-3) = 0$

$= 9 - 60$

$= -51$

$f(c+d) = (c+d)^2 + 20(c+d)$

$= c^2 + 2cd + d^2 + 20c + 20d$

iv- $f(x) = m$

$f(0) = m$

$f(-3) = m$

$f(c+d) = m$

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Question 67

Solution

i) Fixed annual cost $C = 250,000$

Variable cost = 6 per unit

so variable cost is $6x$

where x is the number of ~~product~~ unit produced.

Now

$$C = 250000 + 6x$$

ii)

$x = 200,000$ so

$$f(200,000) = 250,000 + 6(200,000)$$

$$= 250,000 + 1200000$$

$$= 1450000$$

Means 1450000 is cost to produce 200,000 units.

iii- **Restricted Domain:-**

The domain represents the possible value of x the number of units so x must be b/w 0 to 300,000

$$0 \leq x \leq 300,000$$

Day: Date:

Restricted Range :-

The range represents the possible value of C, the total cost, the minimum cost occure when no units are produce

when $x = 0$

$C = 250,000 + 6(x)$

$= 250,000 + 6(0)$

$= 250,000$

And the maximum cost when maximum units produce

$x = 300,000$

$C = 250,000 + 6(300,000)$

$C = 250,000 + 1800000$

$C = 2050,000$

Thus range is

$250,000 \leq C \leq 2,050,000$

Day:_____ Date:_____

Question No 68

i) $C = f(x) = 60x + 0.2x^2 + 25,000$

Quadratic function

ii) if $x = 25,000$

then $C = ?$

$C = 60(25,000) + (0.2)(25,000) + 25000$

$C = 1500,0000 + (0.2)(625000000) + 25000$

$C = 1500,000 + 125,000,000 + 25000$

$C = 126525000$

So total cost is 126525000 Rs.

iii- If $x = 0$

$C = 60(0) + (0.2)(0)^2 + 25000$

$C = 0 + 0 + 25000$

$C = 25000$

the cost producing zero unit is 25000 Rs.

Question No 69

$n_1 = 245,000$

$n_2 = 215000$

$t_1 = 0$ year, 1991

$t_2 = 5$ year

Day: Date:

linear Function

$n = f(t) = mt + c$

$n = f(t) = mt + c$

m = rate of change of passengers per year

c = y-intercept

Now

slop m is

$$m = \frac{\text{change of } n}{\text{change of } t}$$

$$= \frac{n_2 - n_1}{t_2 - t_1}$$

$$= \frac{215000 + 245,000}{5 - 0}$$

$$= \frac{-30,000}{5}$$

$$= -6,000$$

This indicate 6000 passengers per year

Determine

y-intercept

$n = f(t) = mt + c$

$n = 450,000$, $t = 0$

Date:

$n = mt + c$

$245000 = (-6000)(0) + c$

$c = 245000$

Now linear function

$n = (-6000)t + 245,000$

ii- Number of passenger in 2010

So.

$= 2010 - 1991 = 19$

$n = (-6000)(19) + 245,000$

$n = -114,000 + 245,000$

$n = 131,000$

the passenger remain is 131,000 in 2010.

iii-

$n = 180,000$

$t = ?$

$180,000 = -6000 \times t + 245,000$

$6000 \times t = 245000 - 180,000$

$6000 \times t = 65,000$

$t = \frac{65,000}{6000}$

$t = 10.83$

So $1991 + 10.83 = 2001.83$

Day:_____ Date:_____

Near in the end of 2001 the ridership fall below 180,000 passengers.

Question NO : 70

Solution:-

Development costs = 150,000 Rs

Advertising cost per minute = 15000 Rs

Sales generated per minute of advertising = 70,000 Rs

→ Rs 47,500 is absorbed to cover the variable production cost

→ Rs 15,000 goes to pay for advertising cost per minute

→ Reminder is the contribution fixed cost and profit.

i-

& total sales generated per minute = 70,000

47,500 goes to cover variable cost

15,000 is advertising cost per minute

Day:_____ Date:_____

Contribution = 70,000 - 42,500 - 15000

= 2500

ii-

Number of minute = $\frac{150,000}{7500}$

= 20

20 minute is required to developonest cost.

iii-

Number of spots = 15

Sales generated per minute of advertising = 70,000

Advertising cost per minute = 15,000

NOTE

total Revenue = .15 x 70,000

= 1050,000

total advertising cost = 15 x 15000

= 225,000

total production cost = 15 x 47,500

= 712,500

Day: Date:

Note: total cost is

total cost = 225,000 + 712,500 = 937,500

total profit=?

it is calculated by difference of revenue and cost

Profit = total Revenue - Total cost

= 1050,000 - 937,500

= 112,500 Rs

So total profit is 112,500 Rs.

Question No 71

Solution:-

⇒ If car drive less 100 miles the charge is Rs. 15 per mile

⇒ If car drive more than 100 miles the charges is for first 100 miles is 15 per mile and 9 per miles for additional miles beyond 100.

Day: Date:

Now

C(50) and C(150)

50 less then 100 so

$C(50) = 15 \times 50 = 750$

150 more the 100 so

$C(150) = 15(100) + 9(50)$

$= 1500 + 450$

$= 1950$

so the drive chorges for C(50) and C(150) aire 750 and 1950 respectively.

Question No 72

Solution:-

Initial cost of machine = 4000 Rs

Scape value after 6 year = 400 Rs

Life spqn = 6 years

value decrease eqaly every year.

1) Average decrease:-

Total depreciation = 4000 - 400 = 3600

So life spqn = 6 year

Now . $\frac{3600}{6}$ = 600 Rs per year

Day: Date:

equation for value vs age

$V(t)$ = value of machine in t year

initial value = 4000 Rs

Depreciation per year = 600 Rs

So equation is

$$V(t) = 4000 - 600t$$

where t is b/t 0 and 6.

schedule showing value of machine by age:-

Age of Machine	Value
0	4000
1	3400
2	2800
3	2200
4	1600
5	1000
6	400

Day: Date:

Question No 73

Solution:-

Selling price per unit = 65 Rs

Variable cost per unit = 20 + 27.50 = 47.50

fixed costs = 180,000 Rs

Let x = number of unit produce and sold.

i) Profit function

i) Revenue function ;-

It is total money earned by x unit

Revenue = 65 x

ii cost function

total cost = Fixed cost + variable cost x No. unit

= 180,000 + 47.50 x x

= 180,000 + 47.50 x

Profit ?

R Profit = total Revenue - total cost

= 65x - (180,000 + 47.50x)

= 65x - 180,000 - 47.50x

Profit (x) = 17.5x - 180,000

Day: Date:

ii- Profit for 20,000 units?

$x = 20,000$

~~$P(x) = \text{Revenue} - \text{cost}$~~

$P(20000) = 17.5(20000) - 180,000$

$= 350000 - 180,000$

$= 175000$ Rs

So profit is 175 000 Rs.

Question No 74

~~Solution~~

Given:.

Guaranteed payment for national team = 100000

National team also get 25% gate receipts

Ticket price = 12 Rs

Let x = number of tickets sold

University wants profit 240,000

Sell-out = 50,000 fans

Solution

i- Number of tickets to recover 100,000

$0.25 \times 12x + 100,000 = 12x$

$3x + 100,000 = 12x$

$100000 = 12x - 3x$

Day: Date:

$x = \frac{100000}{3}$

$x = 33,332.33$

$x = 33,334$

So

$100000 = 9x$

$x = \frac{100000}{9}$

$x = 11,111.11$

Hence 11,111 tickets

ii. tickets for profit 240,000

total Revenue $= 12x$

amount paid = 100,000 + 25% of ticket share

$= 100,000 + 0.25 \times 12x$

$= 100,000 + 3x$

profit = Revenue − Payment (Cost)

$P(x) = 12x - (100,000 + 3x)$

$P(x) = 12x - 100,000 - 3x$

$= 9x - 100,000$

Now set equal to desired profit

$240,000 = 9x - 100000$

$240,000 - 100000 = 9x$

$140,000 = 9x$

$x = \frac{140,000}{9}$

$x = 37,778$ tickets

Now

37,778 tickets must be sold to get 240,000 profit.

Day: Date:

iii- If 50,000 fans are guaranteed what ticket price to get profit 240,000.

Now

Revenue = 50,000 x price

National team receives = 100,000 + 25% of revenue

= 100,000 fans x 50,000 P

= 100,000 + 12,500 P

profit = Revenue - Payment

= 50,000 P - (100,000 + 12500 P)

= 50,000 P - 100,000 - 12500 P

profit = 37500 P - 100,000

Now put value of profit

240,000 = 37500 P - 100,000

240,000 - 100,000 = 37500 P

140,000 = 37500 P

$P = \frac{140000}{37500}$

P = 9.07 Rs

So the ticket price is 9.07 Rs.

Day: Date:

iv- If ticket price = 12 and game sells out = 50,000 fans what total profit.

Revenue = $50,000 \times 12 = 600,000$

payment = 100,000 + 25% of Revenue

$= 100,000 + 0.25 \times 600,000$

$= 100,000 + 150,000$

$= 250,000$ Rs

profit = Revenue − payment

$= 600,000 - 250,000$

profit = 350,000

Question No 75

Given:

$$q = p^2 - 90p + 2025$$

with condition

$$0 \leq p \leq 45$$

q = number of units

p = price

i) $q = p^2 - 90p + 2025$

So $q(x) = ap^2 + bp + c$

so it is quadratic Function.

Day: Date:

ii- Demand at P=30 Rs

$q = (30)^2 - 90 \times 30 + 2025$

$q = 900 - 2700 + 2025$

$q = 225$ units

so 225 units demanded at 30 Rs.

iii- Price that results in zero demand

$0 = p^2 - 90p + 2025$

$p^2 - 90p = -2025$

add 2025 at both sides to complete square

$p^2 - 90$

$0 = (p - 45)^2$

$\because (a-b)^2 = a^2 - 2ab + b^2$

take square root at both sides

$0 = \sqrt{(p-45)^2}$

$0 = p - 45$

$\boxed{P = 45}$

So the price at demand zero is 45 Rs.

Day: Date:

Question No 76

Given:-

Variable cost per unit = 22.50 Rs

Fixed cost = 25,000 Rs

selling price per unit = 30 Rs

Expected number of units to sold = 30,000

Solution:-

i- Break even?

$$\text{Break even} = \frac{\text{Fixed cost}}{\text{selling price} - \text{variable cost}}$$

$$= \frac{25000}{30 - 22.5}$$

$$= \frac{25,000}{7.5}$$

$$= 33,333.33$$

Break even = 33,334 units

ii- Expected Profit at 30,000 Revenue?

Revenue = Selling price × Number of units

$$= 30 \times 30,000$$

$$= 900000$$

Date:

Day:

total cost = ?

Cost = fixed cost + total varible cost

= 25000 + 22.50 × 30,000

= 250000 + 675000

= 925000

profit = Revene - cost

= 900,000 - 925000

= -25000

So at 30,0000 units the company will loss of 25000.

Question No 77

Given

The annual rate of maintenance expenditure is given by the function

$$r(t) = 120 + 8t^2$$

t = age of automobile in year

r(t) = expenditure per year in rupees at age t.

Date:

Solution:-

i) Annual Maintenance Rate when car 4 years old?

$t = 4$

$r(4) = 120 + 8(4)^2$

$r(4) = 120 + 8(16)$

$r(4) = 120 + 128$

$r(4) = 228$

So annual maintenance rate when car 4 years old is 228 Rs.

ii) Total maintenance Costs for the first 3 year

So $t = 1, t = 2, t = 3$

$r(i) = 120 + 8(i)^2$

$r(1) = 120 + 8(i)$

$r(1) = 120 + 8$

$r(1) = 128$ Rs

when $t = 2$

$r(2) = 120 + 8(2)^2$

$r(2) = 120 + 8(4)$

$r(2) = 120 + 32$

$r(2) = 152$ Rs

Day: Date:

When $t = 3$

$r(3) = 120 + 8(3)^2$

$r(3) = 120 + 8(9)$

$r(3) = 120 + 72$

$r(3) = 192$ Rs

total cost $= r(1) + r(2) + r(3)$

$= 128 + 152 + 192$

total cost $= 472$ Rs

Question No 79

Given:-

type 1 profit = 5 per bar

type 2 profit = 10 per bar

If total bars sold more then 3000 then 2 Rs extra per bar.

No additional Rs 2 take if less then 3000 are sold.

Date:

Solution:

total profit function

If

x = number of I type bars sold

y = number of II type bars sold

In case I:

profit = x + y

when bar sold less 3000.

profit = 5x + 10y → (i)

In case II:

when bars sold more 3000 then

profit = 5x + 10y + 2(x + y − 3000) → (ii)

Simplify

profit = 5x + 10y + 2x + 2y − 6000

7x + 12y − 6000 → (iii)

iii) If type I = 1500 Rs and type II = 1000 bar then profit

~~profit~~ =

total bar = 1500 + 1000 = 2500

which is less then 3000 so no addition 2 Rs taken.

Day: Date:

x = 1500 , y = 1000

use equation (i)

profit = 5(1500) + 10(1000)

= 7500 + 10000

= 17,500 Rs

iii Expected profit if 2500 for type I and 800 for type 2 bars

x = 2500

y = 800

total bars = 2500 + 800

= 3300

which is ~~exceed~~ exceede to 3000.

More to 3000 bar sold is

3300 - 3000 = 300

Use equation (ii)

profit = 5(2500) + 10(800) + 2(300)

= 12500 + 8000 + 600

Profit = 21300 Rs

Question No 80

Same method like previous question.

Day:_____ Date:_____

Question No 80

Give Data:-

type I gas = 200 Rs

type II gas = 250 Rs

additional price when units exceed over 6000 = 20 Rs

Bonus pay by government = 50,000 when excede over 6000 units

Solution:

i-

Let's

x = gas I type

y = gas II type

so

$f(x+y) = 200x + 250y \rightarrow ii$

~~$f(x+y) = 200x + 250y + bonus \rightarrow iii$~~

if masks excede over 60,00 Unit then this equation used.

$f(x+y) = 200x + 250y + 20(x+y+bonus)$

Day: Date:

ii. manfacturers sale if 2500 masks of type I and 3000 masks of type II.

total = 2500 + 3000 = 5500

when supplies never excede

So equation (i) is used

$ Sales = 200(2500) + 250(3000)

= 500000 + 750000

= 1250,000 Rs

Manfacturers sale is 1250,000 Rs.

iii- Manfacturers sale if 3500 masks of type I and 3000 masks of type II.

x = 3500 , y = 3000

total masks = 3500 + 3000 = 6500

The total number excede 6000 units so additional price and bonus also could be taken.

Day:_____ Date:_____

the equation (2) is used.

Sales = 20(3500) + 25(3000) + bonus + 20(x+y-6000)

Sales = 700000 + 750000 + 50,000 + 20(3500 + 3000 - 6000)

Sales = 700000 + 750000 + 50000 + 20(6500 - 6000)

Sales = 700000 + 75000 + 50000 + 20(500)

Sales = 700000 + 750000 + 50000 + 10000

Sales = 1510000 Rs

So the manfecturers sale is 1510000 Rs.