ANSWER & EXPLANATION

SECTION-A

1.Solution:

Option: c

To find a rational number in between 6 and 6.5, we can take the average of the two numbers,

So, we have $\frac{6+6.5}{2} = 6.25$

2. Solution:

Option: c

The reduction offered on the marked price is called as discount.

3. Solution:

Option: d

The degree of a polynomial in 2 variables is determined by the highest sum of the powers of the variables in each term of the polynomial.

Therefore, the degree of the polynomial $4p^3q^3 - 3q^2p^3 + 6pq$

1^{st} term degree = 3 + 3 = 6

2^{nd}term degree = 2 + 3 = 5

3^{rd} term degree = 1 + 1 = 2

4.Solution:

Option: a

Solving the first option$(a+b)(a^2 - ab + b^2)$, we get

$a(a^2 - ab + b^2) + b(a^2 - ab + b^2)$

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

Cancelling positive and negative similar terms, we get

$a^3 + b^3$

5. Solution:

Option: b

Our equation is: $9m - 2n + 2 = 0$

(a) $m = 10, n = 2$

$\therefore\ 9 \times 10 - 2 \times 2 + 2 = 0$

$88 \neq 0$

$L.H.S \neq R.H.S$

Here, L.H.S ≠ R.H.S, (10, 2) is not the solution

(b) $m = 2, n = 10$

$\therefore 9 \times 2 - 2 \times 10 + 2 = 0$

$18 - 20 + 2 = 0$

$0 = 0\ L.H.S = R.H.S$

6. Solution:

Option: c

Here, $3^x = 81$

We can also write 81 as $81 = 3^4$

$3^x = 3^4$

On comparing, we get $x = 4$

7. Solution:

Option: b

$\log_a \frac{X}{Y} = \log_a X - \log_a Y$

8.Solution:

Option: d

Option (a) lies on I Quadrant, option (b) lies on IV Quadrant, option (c) lies on II Quadrant, and option (d) lies on II Quadrant.

9. Solution:

Option: a

Two angles are said to be supplementary angles when they add up to form 180^0

Supplement of $120° = 180° - 120° = 60°$.

10. Solution:

Option: b

A triangle whose all sides are equal is an equilateral triangle, a triangle in which all sides are of different lengths is called scalene triangle and **the triangle is called Isosceles when two of its sides are equal** .In right angled triangle, one of the angle is 90°.

11. Solution:

Option: c

Let's take length as l m and breadth as b m

As we know that perimeter of a rectangle is $2(l + b)$

According to the given condition,

$l - b = 24 \quad \rightarrow$(i)

$2(l + b) = 176 \rightarrow$(ii)

From equation (i), $l = 24 + b$

Substituting this value in equation (ii), we get

$2(24 + b + b) = 176$

$48 + 4b = 176$

$4b = 176 - 48$

$4b = 128$

$b = 32\ m$

Therefore, the length will be $l = 24 + 32 = 56$ m

12. Solution:

Option: a

As we know that circumference of circle is determined by $2\pi r$

Where r is the radius of the circle and,

$\pi = \frac{22}{7}$

Given that, $2\pi r = 352$

$2 \times \frac{22}{7} \times r = 352$

$r = \frac{352 \times 7}{2 \times 22}$

$r = 56\ cm$

13.Solution

Option: c

n = 7

mean = $\frac{12+15+35+47+52+16+21}{7}$ = 28.2

14.Solution:

Option: a

Range = Maximum value – Minimum value

= 85 - 7 = 78.

SECTION-B:

15. Solution:

Let take $x = 5.639639639 \ldots = 5.\overline{639}$ → (i)

$\therefore 1000x = 5639.639639 \ldots = 5639.\overline{639}$ →-------------(ii)

Subtracting equation (i) from equation (ii), we get

$1000x - x = 5639.\overline{639} - 5.\overline{639}$

$999x = 5634$

$x = \frac{5634}{999}$

Therefore, $5.639639639 \ldots = \frac{5634}{999}$

16. Solution:

Let the C.P. of the goods be 100, then marked price will be 120

(As given that he marks the price with 20 % profit)

As we know that S.P. can be determined by

$S.P. = (100 - 7)\% \times 120$

$S.P. = 93\% \times 120 = Rs. 111.6$

$Gain\ \% = (111.6 - 100)\% = 11.6\%$

Hence, the seller makes the profit of 11.6%.

17. Solution:

$p(p+q)^3 - 3p^2q(p+q)$

Let's take $(p+q)$ common in two terms, we get

$= (p+q)(p(p+q)^2 - 3p^2q)$

Now, using the formula $(a+b)^2 = a^2 + b^2 + 2ab$, we get

$= (p+q)(p(p^2+q^2+2pq) - 3p^2q)$

$= (p+q)((p^3+pq^2+2p^2q) - 3p^2q)$

$= (p+q)(p^3+pq^2-p^2q)$

Taking p as common

$= (p+q)p(p^2+q^2-pq)$

Therefore, $p(p+q)^3 - 3p^2q(p+q) = (p+q)p(p^2+q^2-pq)$

18. Solution:

For preparing graph for the given linear equation

Let's find few solutions for the equation $7x - 2y = 28$

For y =0, we have $7x - 2 \times 0 = 28$

$x = 4$

For y =1, we have $7x - 2 \times 1 = 28$

$x = 4.28$

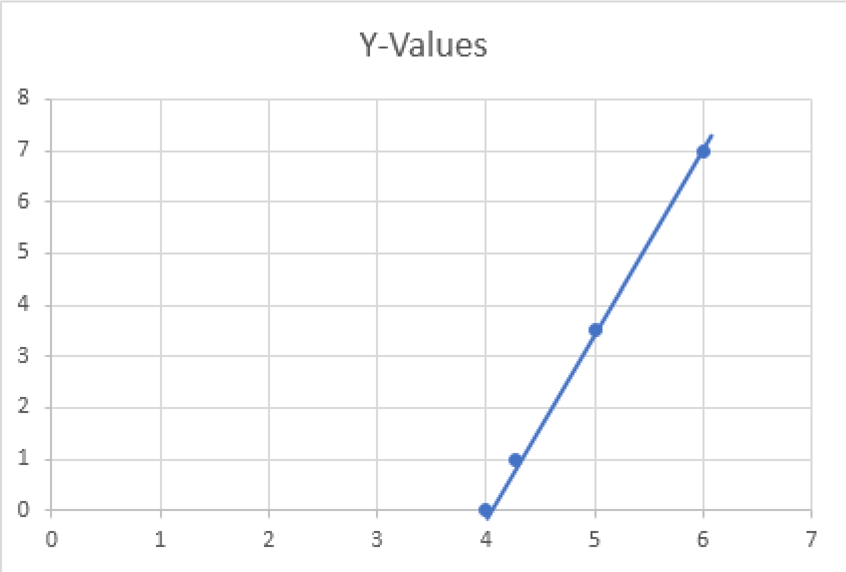
For y =3.5, we have $7x - 2 \times 3.5 = 28$

$x = 5$

For y =7, we have $7x - 2 \times 7 = 28$

$x = 6$

x	4	4.28	5	6
y	0	1	3.5	7



19. Solution:

Since, $3m - n = 2$

Let's try

a) The first solution is $(2,4)$

$\Rightarrow \quad 3 \times 2 - 4 = 2 \quad$ (It is a solution)

b)The second solution is $(3,7)$

$\Rightarrow \quad 3 \times 3 - 7 = 2 \quad$ (It is a solution)

c) The third solution is $(4,10)$

$\Rightarrow 3 \times 4 - 10 = 2$(It is a solution)

The fourth solution is $(5,13)$

$\Rightarrow \quad 3 \times 5 - 13 = 2$(It is a solution)

20. Solution:

Let the age of Raju be x years,

And the age of Sanju be y years.

According to the given condition,

$y - x = 3$

$\Rightarrow y = 3 + x$ →(i)

Also given, $2y = 3x - 19$ →(ii)

Substituting the value of y from equation (i) in equation (ii), we get

$2(3 + x) = 3x - 19$

$6 + 2x = 3x - 19$

$x = 19 + 6$

$x = 25$

Substituting the value of x in equation (i), we get

$y = 3 + 25 = 28$

Therefore, the age of Raju is 25 years and age of Sanju is 28 years.

21. Solution:

Sum of angles of a $\angle A + \angle B + \angle C = 180°$

$90° + \angle B + \angle C = 180°$

$\angle B + \angle C = 180° - 90°$

$2\angle B = 90° \therefore AB = BC$

$\angle B = \frac{90°}{2} = 45°$

$\therefore \angle B = \angle C = 45°$.

22. Solution:

Given points $x_1 = 3,\ y_1 = 1, x_2 = 5,\ y_2 = 3$

The required distance is $\sqrt{[(x_2 - x_1)^2 + (y_2 - y_1)^2]}$

$= \sqrt{[(5-3)^2 + (3-1)^2]}$

$= \sqrt{[(2)^2 + (2)^2]}$

$= \sqrt{[4 + 4]} = \sqrt{8}$

$= 2\sqrt{2}.$

23.Solution:

Given points $x_1 = -2,\ y_1 = 3,\ x_2 = 3,\ y_2 = 1,\ x_3 = 1,\ y_3 = 4$

Area of a $\Delta = \frac{1}{2}[(x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$

$= \frac{1}{2}[(-2(1-4) + 3(4-3) + 1(3-1)]$

$= \frac{1}{2}[(-2(-3) + 3(1) + 1(2)]$

$= \frac{1}{2}[6+3+2] = \frac{11}{2}\ sq.units$

24. Solution:

By Heron's formula, the area of a triangle is determined by

$A = \sqrt{s(s-a)(s-b)(s-c)}$

Where, a, b, c are sides of triangle and

$s = \frac{1}{2} \times (a+b+c)$

Here given $a = 6cm, b = 5cm, c = 3cm$

$\therefore s = \frac{1}{2} \times (6+5+3) = 7$

To find the area,

$A = \sqrt{7(7-6)(7-5)(7-3)}$

$A = \sqrt{7 \times 1 \times 2 \times 4}$

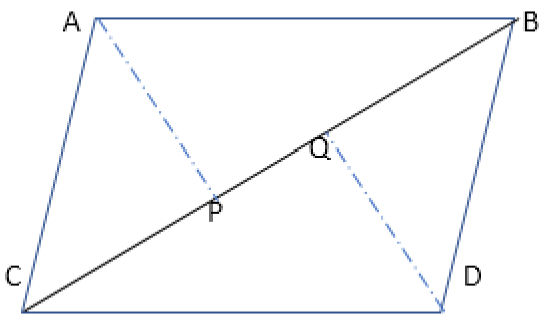
$A = 2\sqrt{14}$

$A = 2\ \times 4.96$

$A = 9.92$ sq.cm

25. Solution:

Let's draw the figure as per the question:



As given diagonal CB = 50 cm, AP = DQ = 25 cm,

Area of parallelogram ABCD = $area\ (\Delta\, ABC) + area\ (\Delta\, DBC)$

Area of parallelogram ABCD = $\left(\frac{1}{2} \times BC \times AP\right) + \left(\frac{1}{2} \times BC \times DQ\right)$

Area of parallelogram ABCD = $\left(\frac{1}{2} \times 50 \times 25\right) + \left(\frac{1}{2} \times 50 \times 25\right)$

Area of parallelogram ABCD = 1250 sq.cm

26.Solution:

Arranging the given data in an ascending order: 13, 14, 14, 18, 24, 38, 38, 38, and 55.

∴ The observation 38 is occurring the maximum number of times (i.e., 3 times)

∴ Mode of the given data = 38.

27.Solution:

Arranging the given data in an ascending order: 16,17,25,31,36,37,43,54,62.

Here, number of observations = 9 (odd)

Median = value of $\left[\frac{n+1}{2}\right]^{th}$=value of 5^{th} observation = 36.

SECTION - C

28.

a) Solution:

Remainder theorem: If the polynomial p(x) is divided by (x + a) then the remainder is p (-a) means it is same as the value of the polynomial p(x) for x = -a

Here, the dividend is $(4x^3 - 2x^2 - 5x - 1)$

$\therefore p(x) = (4x^3 - 2x^2 - 5x - 1)$

Divisor = $x - 1$

$\therefore$Take$x = 1$

As per the remainder theorem,

Remainder = $p(1) = (4 \times 1^3 - 2 \times 1^2 - 5 \times 1 - 1)$

Remainder = $p(1) = (4 - 2 - 5 - 1)$

Remainder = $p(1) = -4$

Therefore, remainder is equal to (-4).

Or

b) Solution:

(i) Suppose $p(x) = (5x^3 - 2x^2 - 7)$ + $(x^3 + 2x^2 + 7)$

Therefore, taking the similar power terms together, we get

$p(x) = (5x^3 + x^3 - 2x^2 + 2x^2 - 7 + 7)$

$p(x) = 6x^3$

(ii) Suppose$p(x) = (8p^4 + 3p^3 - 6)$ + $(5p^5 - 3p^3 + 2p^2 + 13$

Therefore, taking the similar power terms together, we get

$p(x) = (5p^5 + 8p^4 + 3p^3 - 3p^3 - 6 + 13)$

$p(x) = (5p^5 + 8p^4 + 7)$

(iii) Suppose $p(x) = (m^3 + 5m^2 - 9) + (3m^3 + 6m - 1)$

Therefore, taking the similar power terms together, we get

$p(x) = (m^3 + 3m^3 + 5m^2 + 6m - 9 - 1)$

$p(x) = (4m^3 + 5m^2 + 6m - 10)$

29.

a) Solution:

$27p^3 - 125q^3 + 343 + 315pq$

$(3p)^3 + (-5q)^3 + (7)^3 - 3(3p)(-5q)(7)$

As, we know from the formula that

$$a^3+b^3+c^3-3abc=(a+b+c)(a^2+b^2+c^2-ab-bc-ca)$$

$$(3p)^3+(-5q)^3+(7)^3-3(3p)(-5q)(7) = ((3p)+(-5q)+7)((3p)^2+(-5q)^2+7^2-(3p)(-5q)-(-5q)(7)-(7)(3p))$$

$$(3p)^3+(-5q)^3+(7)^3-3(3p)(-5q)(7) = (3p-5q+7)(9p^2+25q^2+49+15pq+35q-21p)$$

$\therefore$

$$27p^3-125q^3+343+315pq = (3p-5q+7)(9p^2+25q^2+49+15pq+35q-21p)$$

Or

b) Solution:

$(y^2-3y)^2-5(y^2-3y)-50$

Let $(y^2-3y)=x$

$(y^2-3y)^2-5(y^2-3y)-50 = x^2-5x-50$

$(y^2-3y)^2-5(y^2-3y)-50 = x^2-10x+5x-50$

Taking x common from the first two terms and 5 common from the last two terms, we get

$(y^2-3y)^2-5(y^2-3y)-50 = x(x-10)+5(x-10)$

$(y^2-3y)^2-5(y^2-3y)-50 = (x+5)(x-10)$ →(i)

Substituting the value of $x = (y^2-3y)$ in equation (i), we get

= $(y^2-3y+5)(y^2-3y-10)$

= $(y^2-5y+5)(y^2-5y+2y-10)$

= $(y^2-3y+5)(y(y-5)+2(y-5))$

= $(y^2-3y+5)(y+2)(y-5)$

Therefore, the factorization is: $(y^2-3y+5)(y+2)(y-5)$

30.

a) Solution:

$7p+8q=16$ →--(i)

$5p + 6q = 10 \rightarrow$_____(ii)

Writing p in terms of q from the (ii) equation, we get

$5p + 6q = 10$

$$p = \frac{10 - 6q}{5} \rightarrow (iii)$$

Substituting the value of p from equation (iii) into equation (i), we get

$$7\left(\frac{10-6q}{5}\right) + 8q = 16$$

$\frac{70-42q}{5} + 8q = 16$

$70 - 42q + 40q = 80$

$-2q = 10$

$q = -5 \rightarrow (iv)$

Substituting the value of q from equation (iv) into equation (iii), we get

$p = \frac{10-6(-5)}{5}$

$p = 8$

The answer is (8,-5) is the solution of the given equation.

Or

b) Solution:

$2m - 3n = 11 \rightarrow$---------(i)

$3m + 2n = 10 \rightarrow$ ---------------(ii)

Using cross-multiplication method, multiplying equation (i) by 2 and equation (ii) by 3, we get

$(2m - 3n = 11) \times 2$

$(3m + 2n = 10) \times 3$

$4m - 6n = 22 \rightarrow (iii)$

$9m + 6n = 30 \rightarrow (iv)$

Adding equation (iii) and equation (iv), we get

$13m = 52$

$m = 4$

Putting the value of m in equation (i), we get

$(3 \times 4) + 2n = 10$

$2n = 10 - 12$

$n = -1$

(4, -1) is the solution of the given equation.

31.

a) Solution:

Let the tenth digit by y and the unit digit be x.

Then the original number will be $10y + x$

And the reversed number will be $10x + y$

As per the first condition,

$10x + y = 4(10y + x) - 327$

$10x + y = 40y + 4x - 327$

$40y - y + 4x - 10x = 327$

$39y - 6x = 327 \rightarrow (i)$

As per the second condition,

$10y + x = (10x + y) + 45$

$10y - y + x - 10x = 45$

$9y - 9x = 45$

$y - x = 5$

$y = x + 5 \rightarrow (ii)$

Putting the value of y from equation (ii) into equation (i), we get

$39(x + 5) - 6x = 327$

$39x + 195 - 6x = 327$

$33x = 327 - 195$

$33x = 132$

$x = 4$

Putting the value of x into equation (ii), we get

$y = 4 + 5 = 9$

Therefore, the original number is $(10 \times 9 + 4) = 94$

Or

b) Solution:

Let the cost of 1 trouser be Rs.x and

The cost of 1 shirt be Rs.y

According to the given condition, we have,

$5x + 6y = 2060 \rightarrow$----------(i)

$4x + 3y = 1270 \rightarrow$ -----------(ii)

Using the cross-multiplication method to solve the equation, and hence

Multiplying equation (i) by 4, we get

$(5x + 6y = 2060) \times 4$

$20x + 24y = 8240 \rightarrow (iii)$

And, multiplying equation (ii) by 5

$(4x + 3y = 1270) \times 5$

$20x + 15y = 6350 \quad \rightarrow (iv)$

Subtracting equation(iv) from equation(iii), we get

$9y = 1890$

$y = 210$

Substituting the value of y in equation(ii), we get

$4x + 3 \times 210 = 1270$

$4x = 1270 - 630$

$4x = 640$

$x = 160$

Hence, the cost of 1 trouser is Rs. 160 and the cost of 1 shirt is Rs. 210.

32.

a) Solution:

If $e^2 = df$ and $p + r = 2q$, then prove that $d^{q-r}e^{r-p}f^{p-q} = 1$

Here, $d^{q-r}e^{r-p}f^{p-q} = 1$

As we know that $a^{m-n} = \frac{a^m}{a^n}$

$$\frac{d^q}{d^r} \times \frac{e^r}{e^p} \times \frac{f^p}{f^q} = 1$$

$$\left(\frac{d}{f}\right)^q \times \left(\frac{e}{d}\right)^r \times \left(\frac{f}{e}\right)^p = 1 \rightarrow\text{--------(i)}$$

As already given, that, $e^2 = df$

$$\frac{e}{d} = \frac{f}{e}$$

Putting this value in equation (i), we get

$$\left(\frac{d}{f}\right)^q \times \left(\frac{f}{e}\right)^r \times \left(\frac{f}{e}\right)^p = 1$$

$$\Rightarrow \left(\frac{d}{f}\right)^q \times \left(\frac{e}{d}\right)^{r+p} = 1 \rightarrow\text{------------(ii)}$$

Given, that $p + r = 2q$

Putting this value in equation (ii), we get

$$\left(\frac{d}{f}\right)^q \times \left(\frac{e}{d}\right)^{2q} = 1$$

$$\Rightarrow \quad d^q f^{-q} e^{2q} d^{-2q} = 1 \ \left(\because \left(\frac{a}{b}\right)^m = a^m b^{-m}\right)$$

$$\Rightarrow \quad d^{-q} f^{-q} e^{2q} = 1 \qquad (\because a^m a^n = a^{m+n})$$

$$\Rightarrow \quad (df)^{-q} e^{2q} = 1 \qquad (\because a^m b^m = ab^m)$$

$$\Rightarrow \quad e^{-2q} e^{2q} = 1 \qquad (\text{given, that, } e^2 = df)$$

$$\Rightarrow \quad 1 = 1$$

L.H.S.= R.H.S

Hence, proved.

Or

b) Solution

Here, $5 \times 125^p = 25^{p+4}$

$5 \times (5^3)^p = 5^{2^{p+4}}$

$\because a^{m^n} = a^{mn}$

$\therefore 5 \times 5^{3p} = 5^{2(p+4)}$

$5^{1+3p} = 5^{2p+8} (\because a^m a^n = a^{m+n})$

Comparing the powers, we get

$1 + 3p = 2p + 8$

$3p - 2p = 8 - 1$

$p = 7$

The answer is 7.

33.

a) Solution:

Given, that $\frac{\log p}{q-r} = \frac{\log q}{r-p} = \frac{\log r}{p-q} = k$

$\Rightarrow \quad log\, p = k(q - r)\ and\ log\, q = k(r - p)\ and\ log\, r = k(p - q) \Rightarrow p\, log\, p = kp(q - r)\ and\ \ q\, log\, q = kq(r - p)\ and\ \ r\, log\, r = kr(p - q)$

$log\, p^p = k(qp - rp),\ and\ log\, q^q = k(rq - pq)\ and\ log\, r^r = k(rp - rq)$

$(\because x \log x = \log x^x)$

Adding the three terms, we get

$log\, p^p + log\, q^q + log\, r^r = k(qp - rp) + k(rq - pq) + k(rp - rq)$

$log\, p^p + log\, q^q + log\, r^r = k(qp - rp + rq - pq + rp - rq)$

$log\, p^p + log\, q^q + log\, r^r = 0 = log\, 1 \quad (\because\ log\, 1 = 0)$

$p^p q^q r^r = 1$

Hence proved.

Or

b) Solution:

Here, we have $\frac{\log\sqrt{343}+\log 8-\log\sqrt{1000}}{\log 2.8}$

$\Rightarrow \quad \frac{\log\sqrt{7\times7\times7}+\log 2^3-\log\sqrt{10\times10\times10}}{\log\frac{28}{10}}$

$\Rightarrow \quad \frac{\log 7^{\frac{3}{2}}+\log 2^3-\log 10^{\frac{3}{2}}}{\log\frac{14}{5}}$

$\Rightarrow \quad \frac{\frac{3}{2}\log 7+3\log 2-\frac{3}{2}\log 10}{\log\frac{14}{5}}(\because \log m^n = n\log m)$

$\Rightarrow \quad \frac{\frac{3}{2}\log 7+3\log 2-\frac{3}{2}\log(2\times5)}{\log 14-\log 5}$

$\Rightarrow \quad \frac{\frac{3}{2}\log 7+3\log 2-\frac{3}{2}\log 2-\frac{3}{2}\log 5}{\log(7\times2)-\log 5}(\because \log(m\times n) = \log m+\log n)$

$\Rightarrow \quad \frac{\frac{3}{2}\log 7+\frac{3}{2}\log 2-\frac{3}{2}\log 2}{\log 7+\log 2-\log 5}$

Taking $\frac{3}{2}$ as common from the above expression, we get

$\Rightarrow \quad \frac{3}{2}\left(\frac{\log 7+\log 2-\log 2}{\log 7+\log 2-\log 5}\right)$

$\Rightarrow \frac{3}{2}$

Therefore, the answer is $\frac{3}{2}$.

34.

a) Solution

The points will be collinear if $[(x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)] = 0$

$x(3-(-6)) + 6((-6)-y) + 3(y-3) = 0$

$9x - 36 - 6y + 3y - 9 = 0$

$9x - 45 - 3y = 0$

$3x - y - 15 = 0.$

Or

b) Solution:

Substitute x = 1,

3(1) + 4y = 2

4y = -1, y = $\frac{-1}{4}$

Substitute x = 2,

3(2) + 4y = 2

4y = -4, y = -1

Substitute x = 3,

3(3) + 4y = 2

4y = -7, y = $\frac{-7}{4}$

The three solutions of the given equation are

at x= 1, y = $\frac{-1}{4}$

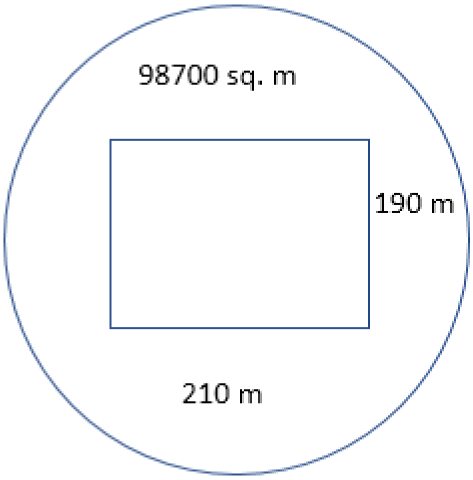
at x= 2, y = -1

at x= 3, y = $\frac{-7}{4}$

35.

a) Solution

Let's draw the figure first,



Let's find the area of the swimming pool (rectangle) = (210×190)

Area of the pool = 39900 sq.m

Area of the field = Area of the pool + Area of the grass portion of the field

$\pi r^2 = 39900 + 98700$

$\frac{22}{7} r^2 = 138600$

$r^2 = 138600 \times \frac{7}{22}$

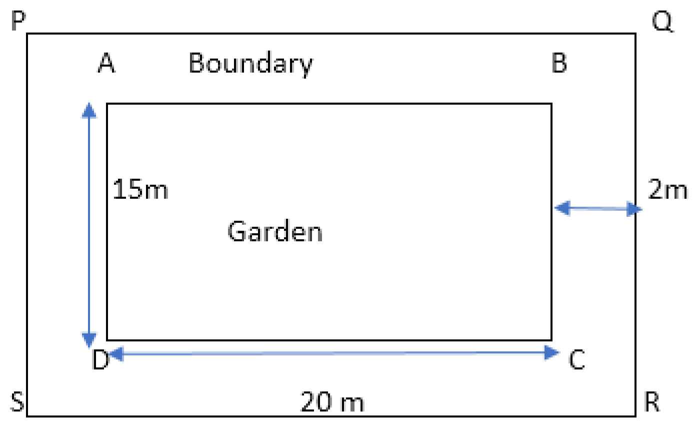
$r^2 = 900 \times 7 \times 7$

$r = 30 \times 7 = 210\ m$

Or

b) Solution

As given in the figure,



Area of garden = $15 \times 20 = 300\ sq.m$

From the figure, we can say that PQ = AB + 2 + 2 = 20 + 2 + 2 = 24 m

Also, PS = AD + 5 +5 = 15 + 2 + 2 = 19 m

Therefore, Area of rectangle PQRS = $PQ \times PS$

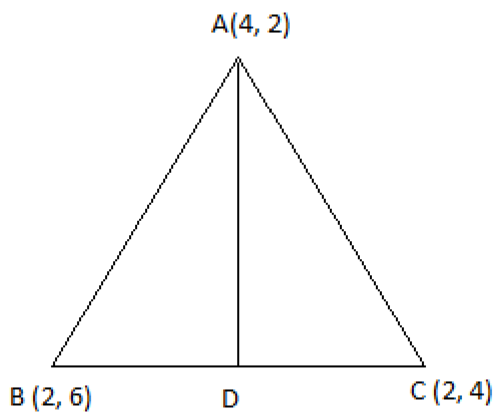
Area of rectangle PQRS $= 24 \times 19 = 456\ sq.m$

Area of the boundary = Area of rectangle PQRS – Area of the garden

⇒ Area of the boundary = 456 – 300 = 156 sq.m

Hence, the area of the boundary is 156 sq.m

36. Solution



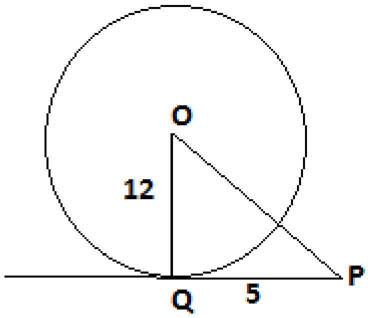
AD is the Median, so the coordinates of $D = \left\{\frac{x_1 + x_2}{2},\ \frac{y_1 + y_2}{2}\right\}$

Points $x_1 = 2, y_1 = 6,\ x_2 = 2,\ y_2 = 4$

$D = \left\{\frac{2+2}{2}, \frac{6+4}{2}\right\}$

$D = (2,5)$

37. Solution



$OP = \sqrt{(PQ)^2} + \sqrt{(OQ)^2}$

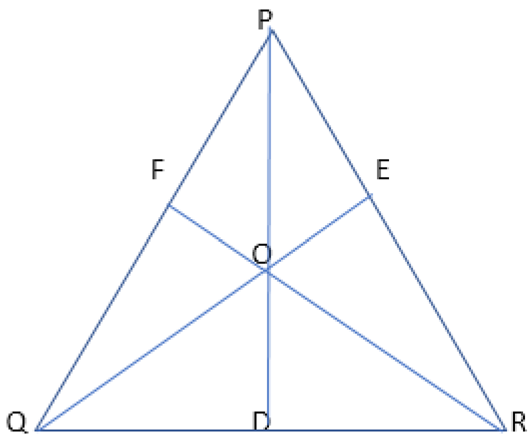
$OP = \sqrt{5^2} + \sqrt{12^2}$

$OP = \sqrt{169} = 13\ cm.$

38. Solution

Given that, AB = BC = AC and OF = 8cm, OE = 10cm, OD = 11cm

Also, $OF \perp PQ, OE \perp PR, OD \perp QR$.



Let's suppose AB = BC = AC = x

Now, $Area\ of\ \Delta PQR = Area\ of\ \Delta POQ + Area\ of\ \Delta POR + Area\ of\ \Delta QOR$

Area of a right-angled triangle = $\frac{1}{2} \times base \times height$

And area of an equilateral triangle is $\frac{\sqrt{3}}{4}a^2$

$$\frac{\sqrt{3}}{4}a^2 = (\frac{1}{2} \times PQ \times OF) + (\frac{1}{2} \times PR \times OE) + (\frac{1}{2} \times QR \times OD)$$

$$\frac{\sqrt{3}}{4}x^2 = (\frac{1}{2} \times x \times 8) + (\frac{1}{2} \times x \times 10) + (\frac{1}{2} \times x \times 11)$$

$$\frac{\sqrt{3}}{4}x^2 = \frac{x}{2}(8 + 10 + 11)$$

$$\frac{\sqrt{3}}{4}x^2 = \frac{29x}{2}$$

$$x = \frac{29 \times 2}{\sqrt{3}}$$

$$x = \frac{58}{\sqrt{3}}$$

$$\therefore Area\ of\ \Delta PQR = \frac{\sqrt{3}}{4}x^2 = \frac{\sqrt{3}}{4} \times \frac{58}{\sqrt{3}} \times \frac{58}{\sqrt{3}} = \frac{841}{\sqrt{3}} = \frac{841}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{841\sqrt{3}}{3}$$

Therefore, the area of given equilateral triangle is $\frac{841\sqrt{3}}{3}$ sq.cm

SECTION -D

39.

a) Solution:

Let's take $x = \frac{5\sqrt{2} + 7\sqrt{3}}{\sqrt{6} - \sqrt{3}} + \frac{5\sqrt{2} - 7\sqrt{3}}{\sqrt{6} + \sqrt{3}}$

$$x = \frac{(5\sqrt{2} + 7\sqrt{3})(\sqrt{6} + \sqrt{3}) + (5\sqrt{2} - 7\sqrt{3})(\sqrt{6} - \sqrt{3})}{(\sqrt{6} - \sqrt{3})(\sqrt{6} + \sqrt{3})}$$

$$x = \frac{\left(5\sqrt{2}(\sqrt{6} + \sqrt{3}) + 7\sqrt{3}(\sqrt{6} + \sqrt{3})\right) + \left(5\sqrt{2}(\sqrt{6} - \sqrt{3}) - 7\sqrt{3}(\sqrt{6} - \sqrt{3})\right)}{(\sqrt{6} - \sqrt{3})(\sqrt{6} + \sqrt{3})}$$

$$x = \frac{(10\sqrt{3} + 5\sqrt{6} + 21\sqrt{2} + 21) + (10\sqrt{3} - 5\sqrt{6} - 21\sqrt{2} + 21)}{6 - 3}$$

$$x = \frac{20\sqrt{3} + 42}{3}$$

Or

b) Solution

As given, the C.P. of 6 apples is Rs. 50 and,

The S.P. of 4 apples is Rs. 60

Suppose, no. of apples bought = L.C.M of 6 and 4 i.e. 12 apples

∴ C.P. of 12 apples = $\frac{50}{6} \times 12 = 100$

And similarly, S.P. of 12 apples = $\frac{60}{4} \times 12 = 180$

Therefore, profit = S.P. – C.P = 180 – 100 = 80

As we know, Profit % is defined by $\frac{profit}{C.P} \times 100$

∴Profit % = $\frac{80}{100} \times 100$

Profit % is equal to 80 %.

40.

a) Solution:

(i) $2x + y = 2$

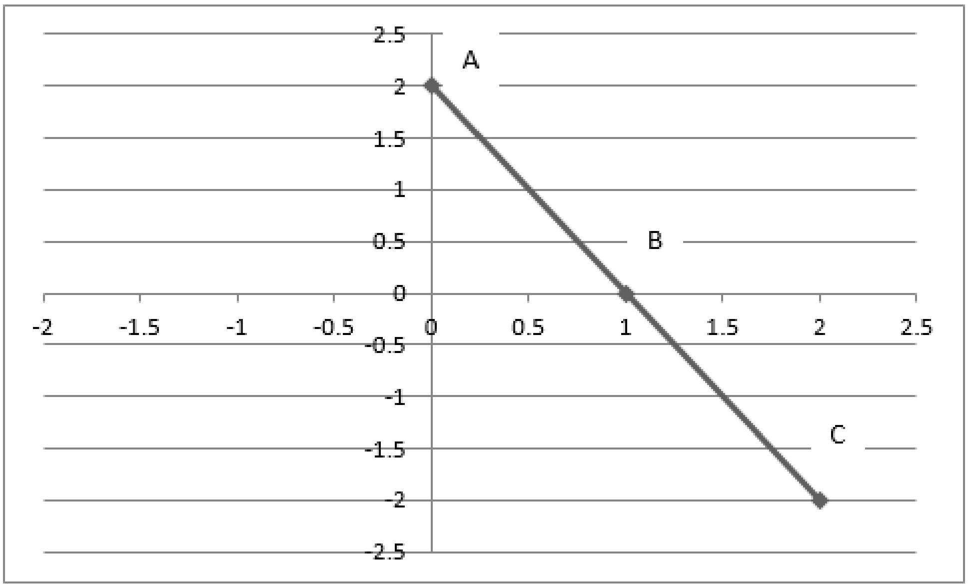
$y = 2 - 2x$

put $x = 0, y = 2 - 2(0) = 2$

put $x = 1, y = 2 - 2(1) = 0$

put $x = 2, y = 2 - 2(2) = -2$

Thus the points are $A(0,2), B(1,0), C(2,-2)$



(ii) $x + 2y = 3$

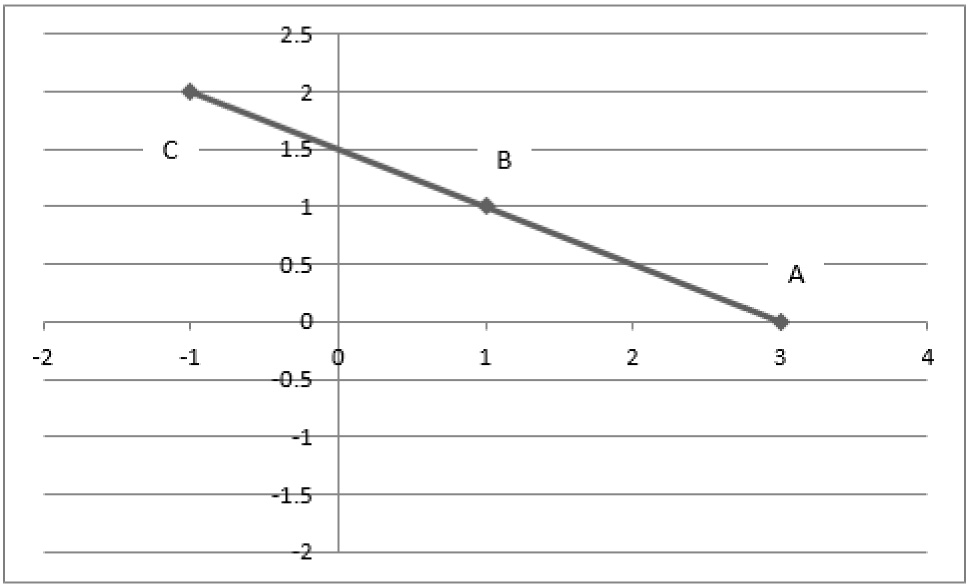
$x = 3 – 2y$

put $y = 0, x = 3 - 2(0) = 3$

put $y = 1, x = 3 - 2(1) = 1$

put $y = 2, x = 3 - 2(2) = -1$

Thus the points are $A\ (3,0), B(1,1), C(-1,2)$



Or

b) Solution:

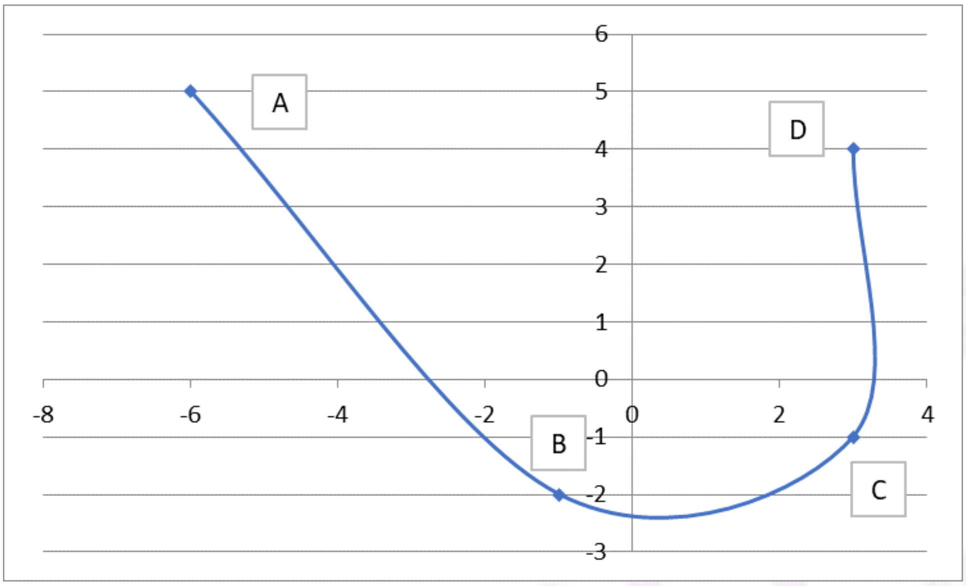
The following points lie in

$A\ (-6, 5)$ - II Quadrant

$B\ (-1, -2)$ – III Quadrant

$C\ (3, -1)$ – IV Quadrant

$D\ (3, 4)$ – I Quadrant



41.

a) Solution:

In The figure, ON || PB and OM || PC.

In ΔABP, ON || PB (given)

Basic proportionality theorem,

$\frac{AN}{AB} = \frac{AO}{AP}$ →(1)

In ΔAPC, OM || PC (given)

Basic proportionality theorem,

$\frac{AM}{AC} = \frac{AO}{AP}$ → (2)

from (1) and (2),

$\frac{AN}{AB} = \frac{AO}{AP} = \frac{AM}{AC}$

$\frac{AN}{AB} = \frac{AM}{AC}$. Hence proved.

Or

b) Solution:

Given $\Delta OMQ \cong \Delta ONP$, so $OM = ON$, $OP = OQ$

$\frac{OP}{OQ} = \frac{OM}{ON}$, (i.e) $\frac{OP}{OM} = \frac{OQ}{ON}$

In ΔOMN and ΔOPQ

$\frac{OP}{OM} = \frac{OQ}{ON}$

Using SAS, $\angle POQ = \angle MON$

Hence $\Delta OMN \cong \Delta OPQ$

42.

a) Solution

Step 1: Draw a line segment AB = 12cm

Step 2: Draw a ray AD making an acute angle with AB.

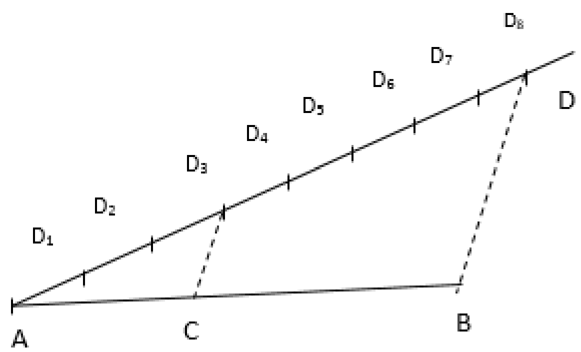
Step 3: Mark 8(5+3) equal parts on D.

Step 4: Join D_8 and B.

Step 5: Join D_3 and C, D_8 and B.

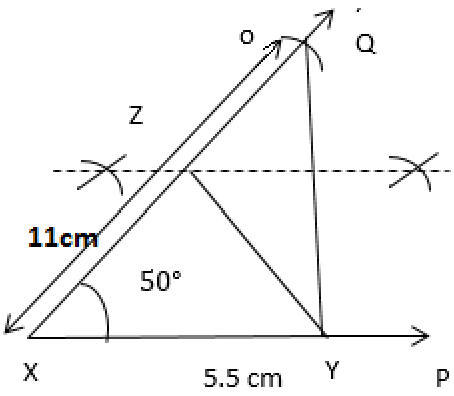
Step 6: C divides AB in the ratio 3 : 5.

Step 7: On measuring two parts, we get AC = 4.5 cm , CB = 7.5 cm



Or

b) Solution:



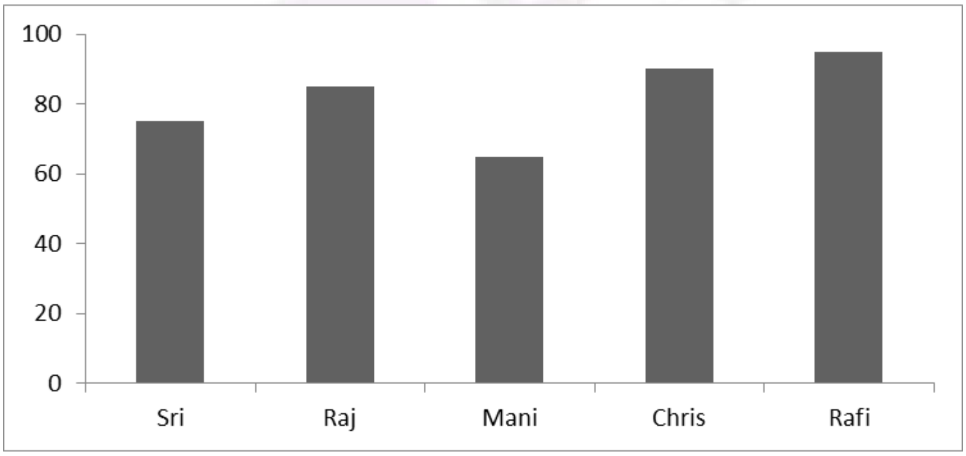
Construction:

Step 1: Draw a ray XP and cut a line segment $XY = 5.5\ cm.$
Step 2: Construct $\angle PXQ = 50°.$
Step 3: From XQ, cut a line segment $OX = 11cm.$
Step 4: Join YO.
Step 5: Draw the perpendicular bisector of QY intersecting XO at a point Z.
Step 6: Join YZ.

43.

a) Solution:

(i)The bar graph for the marks obtained by each student.



(ii) Rafiq scored the maximum marks – 95.

Or

b) Solution:

Here, the given observations are in an ascending order.

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∵ n = 10 (an even number of observations)

$$\text{Median} = \left[\frac{n+1}{2}\right]\left[\frac{\left[\frac{n}{2}\right]\text{observation}+\left[\frac{n}{2}+1\right]\text{ observation}}{2}\right]$$

$$= \left[\frac{5th\ observation + 6th\ observation}{2}\right] = \left[\frac{x+x+2}{2}\right] = \left[\frac{2x+2}{2}\right] = x + 1 = 63 \Rightarrow x = 63 - 1 = 62$$

Thus, the required value of x is 62.