## SOLUTION

**Q.1. (A) Four alternative answers are given for every subquestion. Choose the correct alternative and write its alphabet with subquestion number. [4]**

(1) To draw graph of $4x + 5y = 19$, what will be the value of $y$ when $x = 1$?

(a) 4 (b) 3 (c) 2 (d) –3

(2) What is the sum of the first 10 natural numbers?

(a) 55 (b) 20 (c) 65 (d) 11

(3) From the following equations, which one is the quadratic equation?

(a) $\frac{5}{x} - 3 = x^2$ (b) $x(x + 5) = 2$

(c) $n - 1 = 2n$ (d) $\frac{1}{x^2}(x + 2) = x$

(4) In the format of GSTIN there are ________ alpha-numericals.

(a) 9 (b) 10 (c) 16 (d) 15

**Ans. (1) – (b), (2) – (a), (3) – (b), (4) – (d)**

**Q.1. (B) Solve the following sub-questions. [4]**

**(1) For simultaneous equations in variable x and y, if $D_x = 25$, $D_y = 40$, D = 5, then what is the value of x?**

**Solution:**

$$x = \frac{D_x}{D}$$

$D_x = 25$ and $D = 5$ (given)

$$\therefore \quad x = \frac{25}{5}$$

$$\therefore \quad \boxed{x = 5}$$

**(2) Find the first term and common difference for the following A.P.: 127, 135, 143, 151...**

**Solution:** First term = a = 127

Common difference,

$d = t_{n+1} - t_n$

Here, $t_1 = 127$, $t_2 = 135$, $t_3 = 143$, $t_4 = 151$

$\therefore \quad d = t_2 - t_1 = 135 - 127 = 8$

$\therefore \quad d = t_3 - t_2 = 143 - 135 = 8$

$\therefore \quad d = t_4 - t_3 = 151 - 143 = 8$

$\therefore \quad \boxed{\text{Common difference} = d = 8}$

**(3) A die is rolled then write sample space 'S' and number of sample point *n*(S).**

**Solution:**

A die is rolled.

$\therefore \quad S = \{1, 2, 3, 4, 5, 6\}$

$\therefore \quad n(S) = 6$

**(4) If $\sum f_i d_i = 108$ and $\sum f_i = 100$, then find $\bar{d} = ?$**

**Solution:**

$$\bar{d} = \frac{\sum f_i d_i}{\sum f_i}$$

$$= \frac{108}{100}$$

$$\boxed{\therefore \quad \bar{d} = 1.08}$$

**Q.2. (A) Complete the following activities and rewrite it. (Any *two*) [4]**

**(1) Activity:**

$$\begin{vmatrix} 3 & 2 \\ 4 & 5 \end{vmatrix} = 3 \times \boxed{\phantom{00}} - \boxed{\phantom{00}} \times 4$$

$$= \boxed{\phantom{00}} - 8$$

$$= \boxed{\phantom{00}}$$

**Solution:**

$$\begin{vmatrix} 3 & 2 \\ 4 & 5 \end{vmatrix} = 3 \times \boxed{5} - \boxed{2} \times 4$$

$$= \boxed{15} - 8$$

$$= \boxed{7}$$

**(2)** One of the roots of quadratic equation $5m^2 + 2m + k = 0$ is $-\frac{7}{5}$. Complete the following activity to find the value of $k$.

**Activity:**

$-\frac{7}{5}$ is a root of quadratic equation

$5m^2 + 2m + k = 0$

Put $m = \boxed{\phantom{00}}$ in the equation

$\therefore \quad 5 \times \left(-\frac{7}{5}\right)^2 + 2 \times \boxed{\phantom{00}} + k = 0$

$\therefore \quad \boxed{\phantom{00}} + \left(-\frac{14}{5}\right) + k = 0$

$\therefore \quad k = \boxed{\phantom{00}}$

**Solution:**

$-\frac{7}{5}$ is a root of quadratic equation

$5m^2 + 2m + k = 0$

Put $m = \boxed{-\frac{7}{5}}$ in the equation.

$\therefore \quad 5 \times \left(-\frac{7}{5}\right)^2 + 2 \times \boxed{\left(-\frac{7}{5}\right)} + k = 0$

$\therefore \quad \boxed{\frac{49}{5}} + \left(-\frac{14}{5}\right) + k = 0$

$\therefore \quad \frac{49 - 14}{5} + k = 0$

$$\therefore \quad \frac{35}{5} + k = 0$$

$$\therefore \quad k = \boxed{-7}$$

**(3)** Complete the activity to prepare a table showing the co-ordinates which are necessary to draw a frequency polygon:

| **Class** | 18–19 | 19–20 | 20–21 | ☐ |
|---|---|---|---|---|
| **Class Mark** | 18.5 | 19.5 | ☐ | 21.5 |
| **Frequency** | 4 | ☐ | 15 | 19 |
| **Co–ordinates of point** | (☐ , ☐) | (19.5, 13) | (20.5, 15) | (21.5, 19) |

**Ans.**

| **Class** | 18–19 | 19–20 | 20–21 | $\boxed{21–22}$ |
|---|---|---|---|---|
| **Class Mark** | 18.5 | 19.5 | $\boxed{20.5}$ | 21.5 |
| **Frequency** | 4 | $\boxed{13}$ | 15 | 19 |
| **Co–ordinates of point** | $(\boxed{18.5, 4})$ | (19.5, 13) | (20.5, 15) | (21.5, 19) |

**(B) Solve the following subquestions. (Any *four*)** **[8]**

**(1) Sum of two numbers is 7 and their difference is 5. Find the numbers.**

(i) Let the two numbers be a and b.

$\therefore$ According to the given conditions,

$$a + b = 7 \quad \text{....(1)}$$

$$a - b = 5 \quad \text{....(2)}$$

Adding (1) and (2),

$$a + b + a - b = 7 + 5$$

$$\therefore \quad 2a = 12$$

$$\therefore \quad a = \frac{12}{2}$$

$$\therefore \quad \boxed{a = 6}$$

Substituting a = 6 in (2),

$$6 - b = 5$$

$$\therefore \quad -b = 5 - 6$$

$$\therefore \quad -b = -1$$

$$\therefore \quad \boxed{b = 1}$$

$\therefore$ The two numbers are 2 and 6.

**(2) Solve the quadratic equation by factorisation method:**

$x^2 + x - 20 = 0.$

**Solution:**

$$x^2 + x - 20 = 0$$

$$\therefore \quad x^2 + 5x - 4x - 20 = 0$$

$$\therefore \quad x(x + 5) - 4(x + 5) = 0$$

$$\therefore \quad (x + 5)(x - 4) = 0$$

$$\therefore \quad x + 5 = 0 \text{ or } x - 4 = 0$$

$$\therefore \quad x = -5 \text{ or } x = 4$$

$$\therefore \quad \boxed{x = -5, 4}$$

**(3) Find the 19th term of the following A.P:**

**7, 13, 19, 25, .......**

**Solution:**

Here,

$$a = 7,\ t_2 = 13,\ t_2 = 19,\ \ldots\ldots\ d = t_2 - a = 13 - 7 = 6$$

$$t_n = a + (a - 1)\,d$$

$$\therefore \quad \text{For } n = 19,\ t_{19} = 70 + (19 - 1)$$

$$= 7 + 18\,(6)$$

$$= 7 + 108$$

$$\therefore \quad \boxed{t_{19} = 115}$$

**(4) For the following experiments, write sample space 'S' and number of sample points *n*(S):**

Two digit numbers are formed using digits 2, 3 and 5 without repeating a digit.

**Ans:** Let S be the sample space.

Then,

S = {23, 25, 32, 35, 52, 53}

$\therefore$ n(S) = 6.

**(5) The following table shows causes of noise pollution. Find the measure of central angles for each, to draw a pie diagram:**

| Construction | Traffic | Aircraft take offs | Industry |
|---|---|---|---|
| 10% | 50% | 15% | 25% |

(i) Central angle for construction =

$$= \frac{\text{Pollution caused by construction}}{\text{Total pollution}} \times 360°$$

$$= \frac{10\%}{100\%} \times 360°$$

$\therefore$ Central angle for construction = 36°

Similarly,

(ii) Central angle for traffic $= \frac{50\%}{100\%} \times 360°$

$= 180°$

(iii) Central angle for aircraft take offs $= \frac{15\%}{100\%} \times 360°$

$= 54°$

(iv) Central angle for industry $= \frac{25\%}{100\%} \times 360°$

$= 90°$

**Q.3. (A) Complete the following activity and rewrite it. (Any *one*)** **[3]**

**(1) In an A.P. the first term is –5 and last term is 45. If sum of '*n*' terms in the A.P. is 120, then complete the activity to find *n*.**

**Activity:**

$t_1 = -5$, $t_n = \square$, $S_n = \square$

$$S_n = \frac{n}{2}[t_1 + \square]$$

$$\square = \frac{n}{2}[-5 + 45]$$

$$240 = n \times \square$$

$$\therefore \quad n = \square$$

**Solution:**

$t_1 = -5$, $t_n = \boxed{45}$, $S_n = \boxed{120}$

$$S_n = \frac{n}{2}[t_1 + \boxed{t_n}]$$

$$\boxed{120} = \frac{n}{2}[-5 + 45]$$

$$240 = n \times \boxed{40}$$

$$\therefore \quad n = \boxed{6}$$

**(2) A card is drawn from a well shuffled pack of 52 playing cards. Complete the acitivity to find the probability of the event that the card drawn is a red card.**

**Activity:**

'S' is the sample space.

$n(S) = 52$

Event A : Card drawn is a red card.

Total number of red cards = $\square$ hearts + $\square$ diamonds

$\therefore \quad n(A) = \square$

$$p(A) = \frac{\boxed{\phantom{00}}}{n(S)}$$

$$p(A) = \frac{\boxed{\phantom{00}}}{52}$$

$$p(A) = \boxed{\phantom{00}}$$

**Solution:**

'S' is the sample space.

$n(S) = 52$

Event A : Card drawn is a red card.

Total number of red cards = $\boxed{13}$ hearts + $\boxed{13}$ diamonds

$\therefore \quad n(A) = \boxed{26}$

$$p(A) = \frac{\boxed{n(A)}}{n(S)}$$

$$p(A) = \frac{\boxed{26}}{52}$$

$$p(A) = \boxed{\frac{1}{2}}$$

**(B) Solve the following subquestions. (Any *two*)** **[6]**

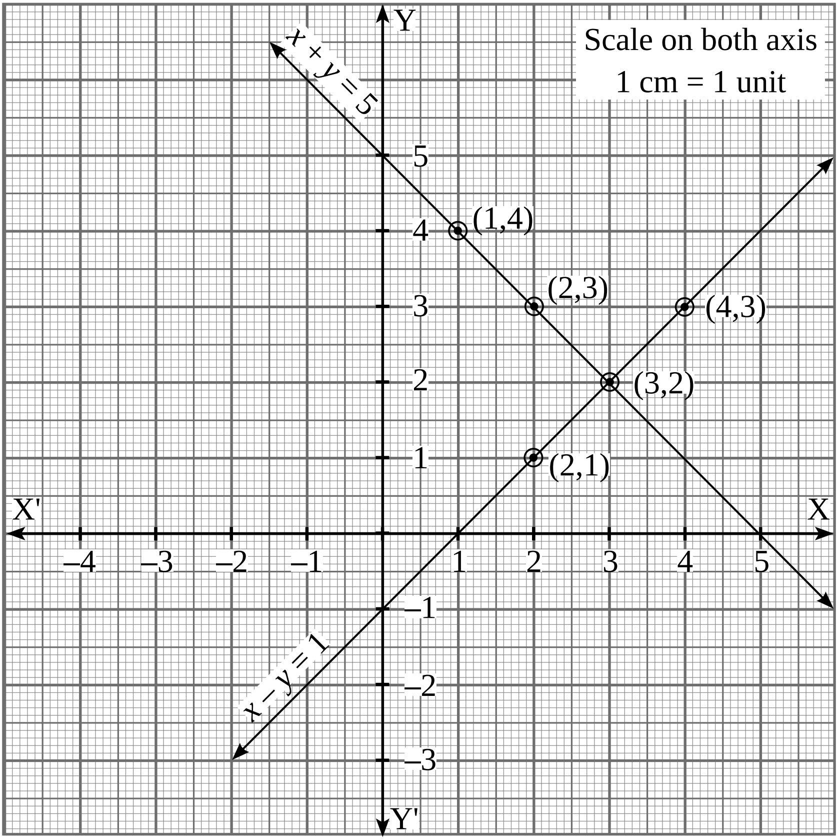
**(1) Solve the following simultaneous equations graphically:**

$x + y = 5$; $x - y = 1$.

**Solution:** $x + y = 5$ $x - y = 1$

| $x$ | 1 | 2 | 3 |
|---|---|---|---|
| $y$ | 4 | 3 | 2 |
| $(x, y)$ | (1, 4) | (2, 3) | (3, 2) |

| $x$ | 2 | 3 | 4 |
|---|---|---|---|
| $y$ | 1 | 2 | 3 |
| $(x, y)$ | (2, 1) | (3, 2) | (4, 3) |




**Solution:**

$(x, y) = (3, 2)$

$\therefore \quad x = 3, y = 2$

The two lines intersect at point (3, 2)

$\therefore$ The solution is $x = 3$ and $y = 2$

**(2) Solve quadratic equation using formula method:**

$5m^2 + 13m + 8 = 0$

Comparing the above equation with $am^2 + bm + c = 0$,

a = 5, b = 13, c = 8

$$m = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\therefore \quad m = \frac{-13 \pm \sqrt{13^2 - 4(5)(8)}}{2(5)}$$

$\therefore \quad m = \dfrac{-13 \pm \sqrt{169 - 160}}{10}$

$\therefore \quad m = \dfrac{-13 \pm \sqrt{9}}{10}$

$\therefore \quad m = \dfrac{-13 \pm 3}{10}$

$\therefore \quad m = \dfrac{-13 + 3}{10} \quad \text{or} \quad m = \dfrac{-13 - 3}{10}$

$\therefore \quad m = \dfrac{-10}{10} = \boxed{-1} \quad \text{or} \quad m = \dfrac{-16}{10} = \boxed{\dfrac{-8}{5}}$

$\therefore \quad \boxed{m = -1} \quad \text{or} \quad \boxed{m = \dfrac{-8}{5}}$

$\therefore \quad \boxed{m = -1, \dfrac{-8}{5}}$

**(3) A retailer sold 2 tins of lustre paint and taxable value of each tin is ₹ 2,800. If the rate of GST is 28%, then find the amount of CGST and SGST charged in the tax invoice.**

**Given:**

Taxable value of each tin = ₹ 2800

No. of tins = 2

Rate of GST = 28%

The rate of GST is divided into equal parts because rate of CGST and rate of SGST are same.

$\therefore$ Rate of CGST = $\dfrac{1}{2} \times 28\% = 14\%$

Now, taxable value of 2 tins = 2 × ₹ 2800

= ₹ 5600

$\therefore$ Amount of CSGT = 14% of 5600

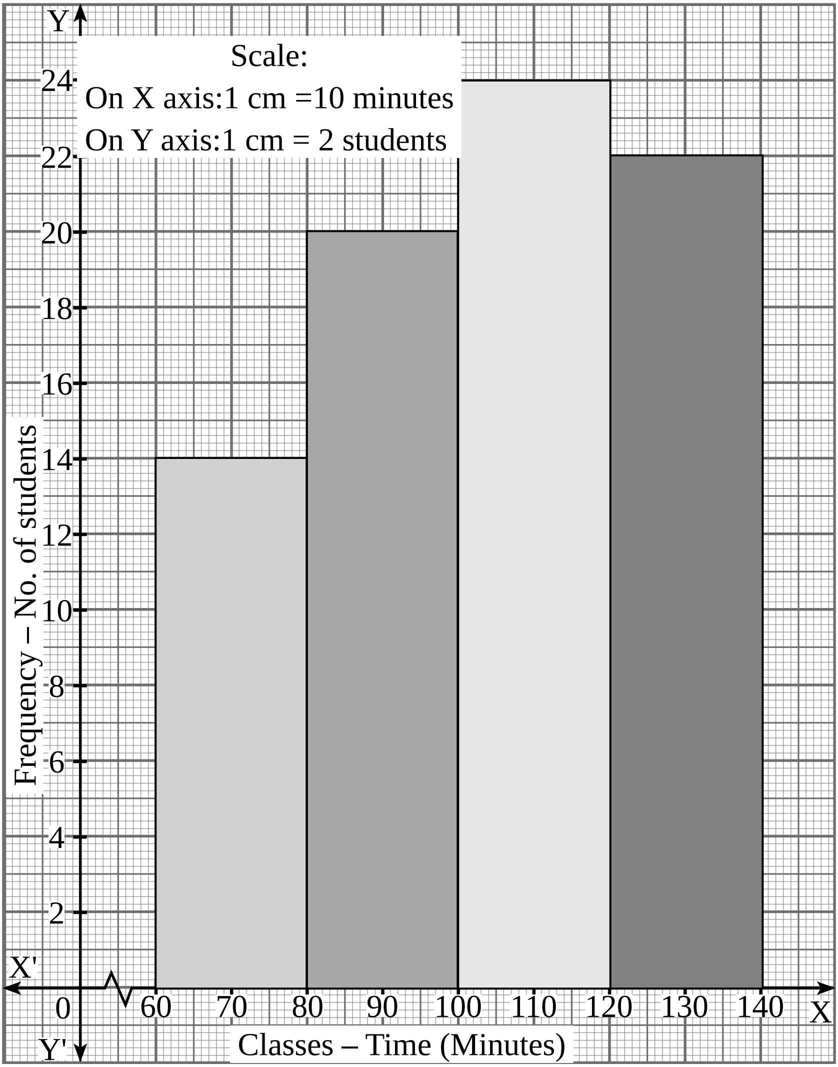
$\therefore$ $= \dfrac{14}{100} \times 5600$

$\therefore$ $\boxed{= ₹\ 784}$

$\therefore$ Amount of SGST $\boxed{= ₹\ 784}$

**(4)** Time allotted for the preparation of an examination by some students is shown in the table. Draw a histogram to show this information:

| **Time** (minutes) | **No. of students** |
|---|---|
| 60–80 | 14 |
| 80–100 | 20 |
| 100–120 | 24 |
| 120–140 | 22 |



**Q.4. Solve the following subquestions. (Any *two*)** **[8]**

**(1) If one root of the quadratic equation $ax^2 + bx + c = 0$ is half of the other root, show that, $b^2 = \frac{9ac}{2}$.**

**Solution:**

It is given that one root of the quadratic equation is half of the other root.

$\therefore$ Let the two roots of the equation be α and $\frac{1}{2}$ α

$$\text{Sum of roots} = \frac{-b}{a}$$

$$\therefore \quad \alpha + \frac{1}{2}\alpha = \frac{-b}{a}$$

$$\therefore \quad \frac{2\alpha + \alpha}{2} = \frac{-b}{a}$$

$$\therefore \quad \frac{3\alpha}{2} = \frac{-b}{a}$$

$$\therefore \quad \alpha = \frac{-2b}{3a} \qquad \text{....(1)}$$

$$\text{Product of roots} = \frac{c}{a}$$

$$\therefore \quad \alpha \frac{1}{2}\alpha = \frac{c}{a}$$

$$\therefore \quad \frac{1}{2}\alpha^2 = \frac{c}{a}$$

$$\therefore \quad \alpha^2 = \frac{2c}{a}$$

$$\therefore \quad \alpha = \sqrt{\frac{2c}{a}}$$

$\therefore$ From (1) and (2),

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

On squaring both sides,

$$\frac{4b^2}{9a^2} = \frac{2c}{a}$$

$$\therefore \quad b^2 = \frac{2(9)\,ca^2}{4a} = \frac{9ac}{2}$$

**(2) Bhujangrao invested ₹2,50,590 in shares of F.V. ₹ 10 when M.V. is ₹ 250. Rate of brokerage is 0.2% and GST is 18%, then, find:**

**a. the number of shares purchased,**

**b. the amount of brokerage paid, and**

**c. GST paid for the trading.**

**Solution:**

**Given:**

Sum invested = ₹ 2,50,590

Brokerage = 0.2%

GST rate = 18%

F.V. = ₹ 10

M.V. = ₹ 250

$\therefore$ Brokerage per share $= 250 \times \dfrac{0.2}{100}$

= ₹ 0.5

$\therefore$ GST per share on brokerage = 18% of 0.5 = ₹ 0.09

$\therefore$ Cost of 1 share = MV + brokerage + GST

$\therefore$ = 250 + 0.5 + 0.09

$\therefore$ = ₹ 250.59

$\therefore$ No. of shares $= \dfrac{2,50,590}{250.59} = 1000$

$\because$ Total brokerage = brokerage per share × no. of shares.

= 0.5 × 1000

$\therefore$ Total brokerage = 500

Total GST = 0.09 × 1000

$\therefore$ Total GST = ₹ 90

(a) 1000 shares were purchased.

(b) Brokerage paid was ₹ 500.

(c) GST paid for the trading was ₹ 90.

(3) **The following table shows frequency distribution of number of trees planted by students in the school:**

| No. of Trees Planted | No. of Students |
|---|---|
| 0–10 | 30 |
| 10–20 | 70 |
| 20–30 | 100 |
| 30–40 | 70 |
| 40–50 | 40 |

**Find the mode of trees planted.**

**Solution:**

| No. of Trees Planted | No. of Students |
|---|---|
| 0–10 | 30 |
| 10–20 | 70 $\longrightarrow f_0$ |
| 20–30 | 100 $\longrightarrow f_1$ |
| 30–40 | 70 $\longrightarrow f_2$ |
| 40–50 | 40 |

The maximum number of the students is in the class 20–30.

$\therefore$ The modal class is 20–30.

$$\text{Mode} = L + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right] \times h$$

L = 20
H = 10
$f_0$ = 70
$f_1$ = 100
$f_2$ = 70

$$\therefore \quad \text{Mode} = 20 + \left[\frac{100 - 70}{2(100) - 70 - 70}\right] \times 10$$

$$\therefore \quad = 20 + \left[\frac{30}{200 - 140}\right] \times 10$$

$$\therefore \quad = 20 + \left[\frac{30}{60}\right] \times 10$$

$$\therefore \quad \text{Mode} = 20 + \frac{1}{2}(10)$$

$= 20 + 5$

$\therefore$ $\boxed{\text{Mode} = 25 \text{ trees.}}$

$\therefore$ The mode is 25 trees.

**Q.5. Solve the following subquestions. (Any *one*)** **[3]**

**(1) Six faces of a die are as shown below:**

| A | B | C | D | E | O |
|---|---|---|---|---|---|

**If the die is rolled once, find the probability of event 'M' that 'English vowel appears on upper face'.**

**Solution:**

Let S be the sample space.

$\therefore$ S = {A, B, C, D, E, O}

$\therefore$ $n(S) = 6$

Event M = English vowel appears on upper face.

$\therefore$ M = {A, E, O}

$\therefore$ $n(M) = 3$

$\therefore$ $P(M) = \frac{n(M)}{n(S)}$

$\therefore$ $= \frac{3}{6}$

$\therefore$ $P(M) = \frac{1}{2}$

$\therefore$ The probability of a vowel appearing on the upper face is $\frac{1}{2}$.

**(2) Construct any one linear equation in two variables. Obtain another equation by interchanging only coeffcients of variables. Find the value of the variables.**

**Solution:**

A linear equation in two variables a and b is

$2a + 3b = 8$ …(1)

By interchanging the coefficients of variables, we get

$3a + 2b = 8$ ...(2)

Adding (1) and (2),

$$2a + 3b + 3a + 2b = 8 + 8$$

$$\therefore \quad 5a + 5b = 16$$

$$\therefore \quad 5(a + b) = 16$$

$$\therefore \quad a + b = \frac{16}{5} \qquad \text{...(3)}$$

Substracting (2) from (1),

$$2a + 3b - (3a + 2b) = 8 - 8$$

$$\therefore \quad 2a + 3b - 3a - 2b = 0$$

$$\therefore \quad -a + b = 0$$

$$\therefore \quad a - b = 0$$

$$\therefore \quad a = b \qquad \text{...(4)}$$

From (3) and (4),

$$a + a = \frac{16}{5}$$

$$\therefore \quad 2a = \frac{16}{5}$$

$$\therefore \quad a = \frac{16}{5 \times 2}$$

$$\therefore \quad a = \frac{8}{5}$$

$$\therefore \quad \boxed{a = 1.6}$$

$$a = b \qquad \text{...(from (4))}$$

$$\therefore \quad \boxed{b = 1.6}$$

$$\therefore \quad \boxed{a = b = 1.6}$$