Solution ①/(a)/(i)   As quadratic eqⁿ given,

$$8x^2 - x - 2 = 0 \quad -①$$

Discriminant, $D = b^2 - 4ac$.

$\left\{ \because \begin{array}{l} b \to \text{coefficient of } x \\ a \to \text{coefficient of } x^2 \\ c \to \text{constant.} \end{array} \right.$

$\therefore\ b = (-1)$
$a = 8$
$c = (-2)$

$$\therefore D = b^2 - 4ac$$
$$= (-1)^2 - 4(8)(-2)$$
$$= 1 + 64$$
$$[D = 65]$$

Solution ①/(a)/(ii)

$D = b^2 - 4ac$ General quadratic eqⁿ $(ax^2 + bx + c = 0)$

(i) $D > 0$ $\longrightarrow$ 2 Real and distinct solotion.

as $D = 65 > 0$ $\to$ 2 Real & Distinct solⁿ.

Solution ①/(a)/(iii)

As $D > 0$ & $a > 0$

So, graph will be upward parabola cutting x-axis at two different points
$(\alpha, \beta) \to$ roots of quadratic eqⁿ.

Solution ①/ⓑ $y = -x^2 + 2x + 35$

The axis of symmetry is a vertical line

$x = -\dfrac{b}{2a}$ $\left\{ \because \begin{array}{l} b \to \text{coeff. of } x \\ a \to \text{coeff. of } x^2 \end{array} \right.$

$$\therefore\ x = -\frac{2}{2(-1)} = 1 \checkmark$$

Solution (1)/(b)/(ii)

As calculating $x = 1$ put in standard eqn.

$$y = -x^2 + 2x + 35$$
$$= -1^2 + 2\cdot(1) + 35$$
$$= -1 + 2 + 35$$
$$y = 36$$

$\therefore$ Coordinates of vertex $(1, 36)$.

Solution 1/©/(i)

$$x^2 - 14x + 11 = 0.$$

By completing ~~a~~. square Method,

$$x^2 - 2\cdot7\cdot x + (7)^2 - (7)^2 + 11 = 0$$

$$x^2 - 2\cdot7\cdot x + (7)^2 - 38 = 0$$

$$(x-7)^2 - 38 = 0 \longrightarrow \text{(Ans)}$$

Solution 1/©/(ii)

from above solⁿ in 1/©/(i)

$$(x-7)^2 = 38$$

$$x-7 = \pm\sqrt{38}$$

$$x-7 = +\sqrt{38}$$
$$x = 7+\sqrt{38}$$

$$x-7 = -\sqrt{38}$$
$$x = 7-\sqrt{38}$$

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solution (1) / (c) / (iii)

vertex of quad. eq^n .

$y = x^2 - 14x + 11$ —— (1)

x - intersept

~~x~~ $(13.16, 0)$ & $(0.8, 0)$

Eq^n of axis $= \frac{-b}{2a}$

$= -\frac{(-14)}{2(1)}$

$x = 7$

$\therefore$ put in $(x = 7)$ in (1)

$(y = -38)$

$\therefore$ vertex is $(7, -38)$ //

solution 1 (c) (iv)

$\therefore$ x- Intersecpt (13.16, 0) & (0.84, 0)

y- Intersecpt - (0, 11)

equation of axis =

$$x = \frac{-b}{2a}$$

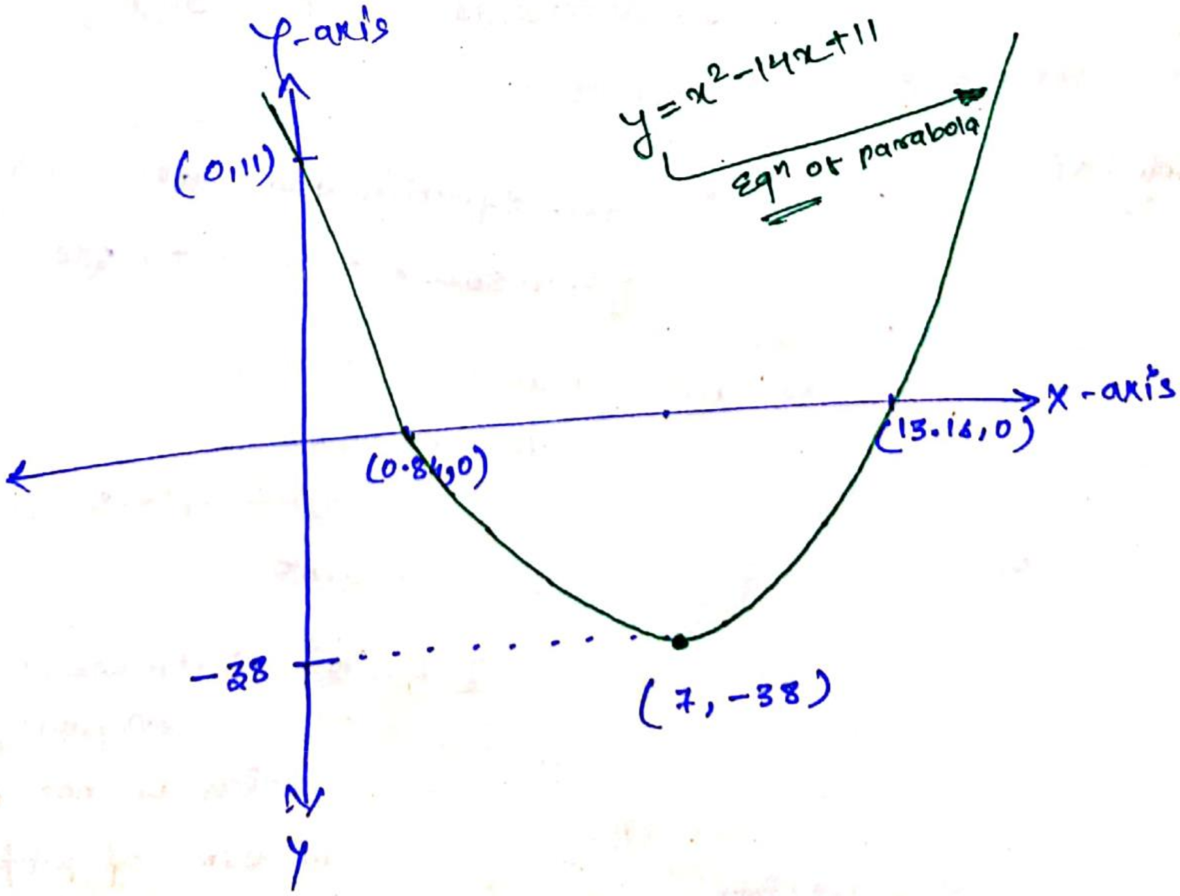
$$[x = 7].$$

$\therefore$ vetrix of parabola.

(7, -38)

($\because$ $x = 7$ in $y = x^2 - 14x + 11$

$y = -38$)



Solution Q/a

Considering the equation that Aikta evaluates.

$y = 4.862x^2 - 7.211x + 4.836.$

as Discriminant

$D = b^2 - 4ac$

$= (-7.211)^2 - 4(4.862)(4.836)$

$= -42.05$

$[D < 0] \rightarrow$ Hence, it produce imaginary roots which is not possible in terms of profit.

Solution ② / ⓑ

$$y = -7.291x^2 + 5.771x - 0.502 \quad \text{—} (1)$$

(i) on calculating y-intersept

$(x=0)$

put in eq^n ①

$$\boxed{y = -0.502}$$

Solution ② / ⓑ / (ii)

'y' would be "Negative" because if No smoothie will be made $(x=0)$ then Raw Material would get wasted leads to loss.

Solution ② / ⓑ / (iii)

$$y = -7.291x^2 + 5.771x - 0.502 \quad \text{—} (1)$$

put $(y=0)$ in eq ①

$$0 = -7.291x^2 + 5.771x - 0.502$$

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

$\left\{ \because b = 5.771 \right.$
$a = -7.291$
$c = -0.502$

$$= \frac{-5.771 \pm \sqrt{(5.771)^2 - 4(-7.291)(-0.502)}}{2(-7.291)}$$

$x_1 = 0.099$ | $X_2 = 0.692$

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Solution (2)/(B)/(iv)

As on calculating X - intersept on previous question.

$x_1 = 0.099$ | $X_2 = 0.692$

Hence minimum amount of smoothie that company need to produce is

$x = 0.099$ thousand ltr.

Solution (2)/(B)/(v)

$$y = -7.291x^2 + 5.771x - 0.502 \quad \text{—(1)}$$

$x = 0.5$ (given in ques.)

put in (1)

$$y = -1.822 + 2.885 - 0.502$$

$$\{y = 0.5615\}$$

Hence target profit will not be achieved, by Aikta's equation.

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Question 3. (Answer.)

Soln. 3(a)

Dot plot → A freequency plot that shows the number of times a response occured in a data Set, where each data value is represented a dot.

we don't think its a good idea because in this particular question we have total 40 data points.

20 of each (2019 & 2020 - Year)

which make it very confusing, and hard to Interpret what exactly data is showing, rather it becomes ~~over-crowded.~~ Over-crowded.

Solution 3(b) :- (Reference to subsection 1.2 of unit 11 is Not provided.)

But our views to improve the clarity of representation of Boxplots :-

1). Both plots should be firstly assigned for particular Year - (data representation)

2.) Exact values should be retained. i.e., in between two intervals values should be mentioned.

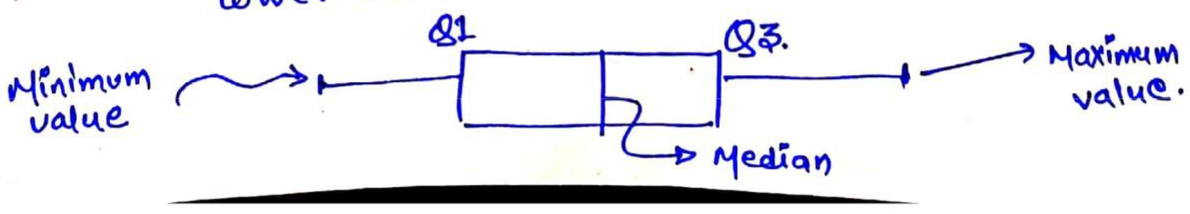
Solution 3 (c) :- for Reference check Raw data as Minimum value for

'2020' year ⟶ 0

'2019' year ⟶ 8

So, upper box plot is of 2020 Year employee data.

lower box plot is of 2019 Year " " .



Solution 3(d) (i) False,

Employees worked more hours in 2019

as Average working hours = 33.7 hours.

Average working hours of 2020 = 31.05 hours.

Soln 3(d) (ii) (TRUE,)

Explanation :- variability in Box plot is measured by (IQR)

$IQR = Q_3 - Q_1$

(Interquartile Range)

IQR - for (2019) Year

$$\left.\begin{aligned} Q_3 &= 40 \\ Q_1 &= 25 \end{aligned}\right\} \quad \begin{aligned} IQR &= Q_3 - Q_1 \\ &= 40 - 25 \\ &= 15 \end{aligned}$$

IQR for (2020) - Year

$$\left.\begin{aligned} Q_3 &= 41.5 \\ Q_1 &= 22 \end{aligned}\right\} \quad \begin{aligned} IQR &= Q_3 - Q_1 \\ &= 41.5 - 22 \\ &\Rightarrow 19.5 \end{aligned}$$

$\therefore IQR|_{2020} > IQR|_{2019}$

Solution 3 (d) → (iii) (FALSE)

Explanation :-

Employee working Hours . Data.

0
0
8
16
20
24
28
32
35
35
36
37
38
40
41
42
45
47
48
49

Median = $\frac{35+36}{2} = 35.5$

Explanation :-

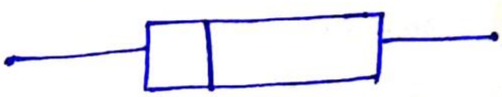
Only half of the employees worked more than the Median values of Hours.

Solution 3(e) :- As on observing the box and wishkers data are skewed on left i.e., negatively skewed.

Reason :- when the median is closer to the top of the box, and if the ~~when~~ whisker is shorter on the upper end of the box, then the distribution is Negatively skewed.

eg:-

(Negative skew)



(Positive skew)

Solution 3 (f) - (i)

figure 4 - belongs to 2020 year empolyee Data.
figure 3 - belongs to 2019 " "

Reason :- Because in 2019 year's data, there is No employee working hours lies between 30 - 35 range.

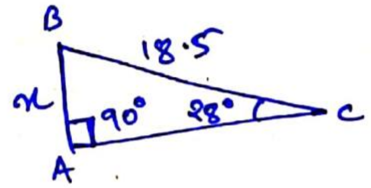
While in 2020 years - employeyees data lies between 30 - 35 range of working hours.

Solution 3 (f) → (ii) Histogram provide us more insightful look at freequency distribution as compared to the Boxplot representation.

Solution 3 (f) - (iii) Box-plot allows us to compare given various data set better than Histogram. as Boxplots summarizes variation in data set visually.

Solution 4!-

(a)



In given $\triangle ABC$,
apply sin law, .

$$\frac{18.5}{\sin 90^\circ} = \frac{x}{\sin 28^\circ}$$

On cross multiplication.

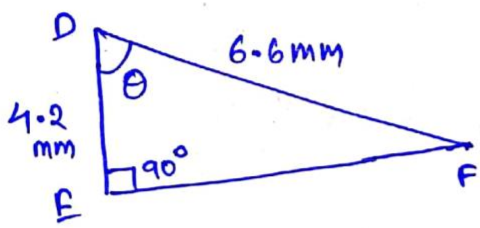
$$\Rightarrow x = \sin 28^\circ \times \frac{18.5}{\sin 90^\circ}$$

1.

$$= 0.4694 \times 18.5$$

$$\boxed{x = 8.6 \text{ cm}}$$

Solution 4 (b)



Apply pythagoras theorem,

$$(DF)^2 = (DE)^2 + (EF)^2$$

$$(6.6)^2 = (4.2)^2 + (EF)^2$$

$$EF = \sqrt{(6.6)^2 - (4.2)^2}$$

$$\boxed{EF = 5.09}$$

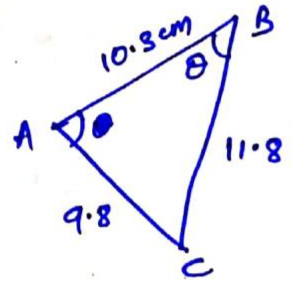
As we know,

$$\sin\theta = \frac{5.09}{6.6} = 0.77$$

$$\theta = \sin^{-1}(0.771)$$

$$= 50.47^\circ$$

Solution 4 (c) - (i)



Applying cosine law,

$$c^2 = a^2 + b^2 - 2ab\cos\theta$$

let $c = 9.8$ cm
$a = 10.3$ cm
$b = 11.8$ cm

$$\therefore (9.8)^2 = (10.3)^2 + (11.8)^2 - 2(10.3)(11.8)\cos\theta$$

$$96.04 = 245.33 - 243.08\cos\theta$$

$$\cos\theta = 0.6141$$

$$\theta = \cos^{-1}(0.6141)$$

$$[\theta = 52.11^\circ]$$

Soln 4 (c) - (ii) Area of $\Delta ABC = \frac{1}{2} \times (AB \times BC) \times \sin\theta$

$$= \frac{1}{2} \times (10.3 \times 11.8) \times \sin 52.11$$

$$= (60.77) \times (\sin 52.11)$$

$$= 47.95 \text{ cm}^2$$

Soln 4 (d) - (i) Convert 98° to radians.

⇒ As we know,

$180^\circ \longrightarrow \pi$ radians.

$\therefore 98^\circ \longrightarrow x$.

$$\therefore x = \frac{98}{180} \times \pi$$

$[x = 0.54\pi]$ radians.

Soln. 4 (d) – (ii)

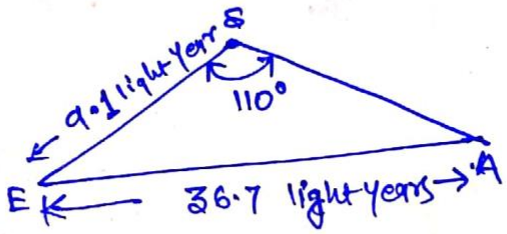
Area of a sector $= \pi r^2 \times \frac{\theta}{360°}$

$= \pi \times 2.8^2 \times \frac{98}{360}$

$(\because r = 2.8 cm)$ $= 6.704\ cm^2$

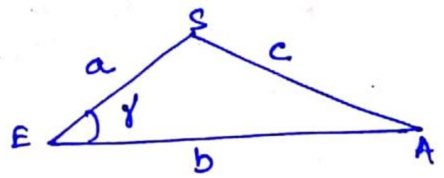
Solution(5) (a)

E → Earth
A → Arcturus.
S → current position.



Solution(5) – (b)

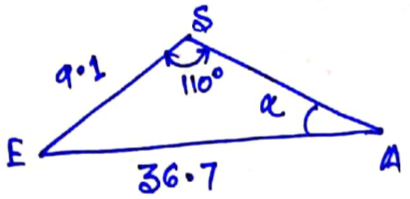
As cosine Rule states.



$c = \sqrt{a^2 + b^2 - 2ab\cos\gamma}$

she cannot directly put cosine rule as γ angle is unknow for ~~any~~ value of side (c) calculating

Solution(5) -(c)/(i)



Apply sine law.

$$\frac{9.1}{\sin\alpha} = \frac{36.7}{\sin 110^\circ}$$

$$\sin\alpha = \frac{9.1}{36.7} \times \sin 110^\circ$$

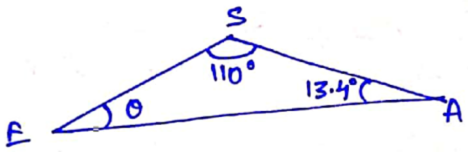
$$= 0.247 \times (\sin 110^\circ)$$

$$= 0.232$$

$$\alpha = \sin^{-1}(0.232)$$

$$\left[\alpha = 13.42^\circ\right]$$ //

Soln 5-(c)/(ii)



As we know,

sum of all angles in $\Delta = 180^\circ$

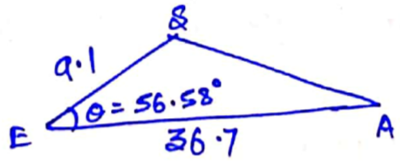
i.e.,

$$\theta + 110 + 13.42 = 180$$

$$\therefore \theta = 180 - (110 + 13.42)$$

$$\left[\theta = 56.58^\circ\right]$$

Soln 5(c)/(iii)



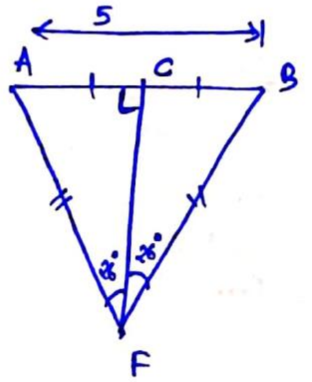
Apply cosine rule.

$$SA = \sqrt{(SE)^2 + (EA)^2 - 2.(SE)(EA)\cos 56.58}$$

$$= \sqrt{(9.1)^2 + (36.7)^2 - 2(9.1)(36.7)\cos(56.58)}$$

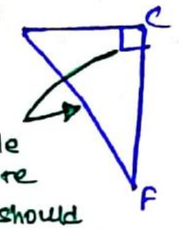
$$SA = \underline{32.58}$$ light (Approx) Years

Solution (6) / (a)



As per the property of right angle triangle.

Side opposite to the right angle triangle should be largest i.e., AF & BF



90° angle opposite side should be greater (or more) as compared to other two sides { AC = 2.5m, CF = 6.5m }

↓ As calculated by student.

Solution (6) / (b)

There is a cross-Multiplication error, As student performing division instead of Multiplication for finding the side CF.

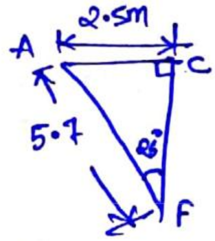
Error (2) → Calculated value of side CF is "wrong".

$$CF = \cos 26^\circ \times 5.7$$

$$[CF = 5.12\,m]$$

Solution (6) / (c) → "NO" → It can easily by putting the value of $\tan\theta$

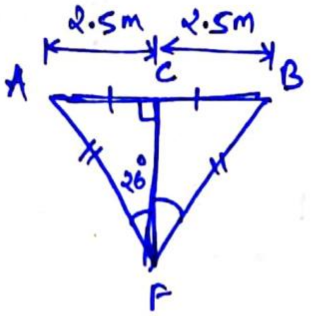
i.e.,



$$\tan\theta = \frac{AC}{CF}$$

$$\tan 26^\circ = \frac{2.5}{CF} \quad \therefore CF = 5.12\,m$$

Solution 6 / (d)



By Congruency of a ~~right~~ triangle ACF and ΔBCF

$AC = BC = 2.5m$

{ $\because \angle ACF = \angle BCF$
$\Rightarrow AF = BF$ (given)
CF = common)
Hence using this
Δ is congruence)

Now, In ΔACF

$$\tan\theta = \frac{AC}{CF}.$$

$$\tan 26^\circ = \frac{2.5}{CF}$$

$$[CF = 5.12\,m]$$

Solution 7 / (a) → "STATISTICS"

I found statistics is relevant and intresting because of its usage to find out relevant detail from the given "RAW DATA"

Solution 7 / (b) → "Yes" I feel Confident in choosen topic "STATISTICS" I can take random data of any particular field and can make detailed research on it using "STATICAL TACTICS", like finding out Data freequency, Mean, MODE, MEDIAN etc.