Q.	Part A - Statistics	Marks
1	Consultant	1
2	(d) Census survey	1
3	(b) Ogive: represent median diagrammatically	1
4	(b) Quartiles	1
5	True	1
6	(d) 0.5	1
7	True	1
8	(b) Production policy	1
9	(b) Moderately positive **OR** (a) Median	1
10	(a) Laspeyres	1
11	 (see table below) Median = Size of $(N+1)/2^{th}$ item Median is located at the size of the items in whose cumulative frequency $(N+1)/2^{th}$ item falls. $= (177+1)/2^{th}$ item = 89th item The 89th item is falling in 122 cumulative frequencies. So, the median will be 50. Median = 50	3

Table for Q11:

Marks	No. of students	c.f
10	4	4
20	16	20
30	32	52
40	30	82
50	40	**122**
60	32	154
70	14	168
80	9	177
N	177	

12	Standard deviation is considered to be the best measure of dispersion and is therefore, the most widely used measure of dispersion. It is based on all values and thus, provides information about the complete series. Because of this reason, a change in even one value affects the value of standard deviation. **OR** Absolute measure of Dispersion has units of measure like kg., cm, Rs., etc. Whereas Relative Measure is a ratio. Relative measure of dispersion is a pure number without unit of measure. Absolute measure will tell you about individual groups; on the other hand Relative Measure will help to compare between two or more groups or sets of data. So, I would use an absolute measure of dispersion.	3
13	Calculation of lower quartile (Q_1) and upper quartile (Q_3).	4

S. No.	Income (in ₹) arranged in ascending order
1	14
2	20
3	27
4	33
5	35
6	42
7	47
8	49
9	50
10	52
11	84
N = 11	

Lower quartile (Q_1) = Size of (N + 1) / 4th item
= (11 + 1)/4th item
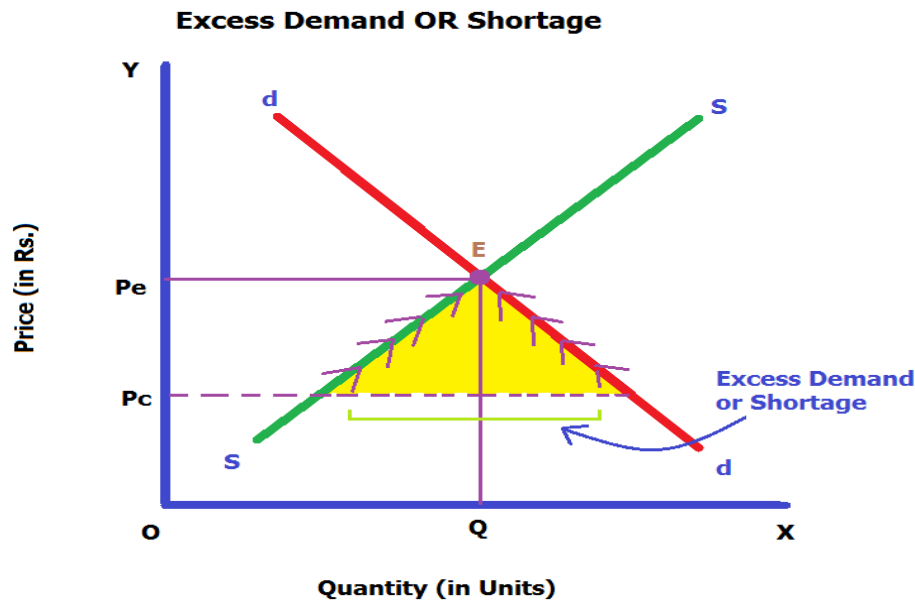= Size of 3rd item
(Q_1) = 27

Upper quartile (Q_3) = Size of 3 (N + 1) / 4th item

= Size of 3 (11 + 1) / 4th item

= Size of 9th item

(Q_3) = 50

14	Since, $\bar{x} = \dfrac{\Sigma X}{N}$	4

$\Sigma X = N\bar{x}$

Here, $\bar{x} = 530$, N = 80

$\Sigma X = 80 \times 530$

= 42,400

Calculated ΣX, i.e., 42,400, is wrong as the student misread the item 230 as 300. Let us get correct ΣX by subtracting the incorrect and adding the correct item as ΣX.

Incorrect ΣX = 42,400

Less: Incorrect item   300

                     42,100

Add: Correct item   230

Correct ΣX =   42,330

Hence, corrected arithmetic mean is $\dfrac{42,330}{80}$ = Rs.529.125

OR

Class	Frequency (f)	Mid-value (x)	fx
0 - 10	3	5	45
10 - 20	6	15	90
20 - 30	12	25	300
30 - 40	f	35	35f
40 - 50	5	45	225
	$\Sigma f = 26 + f$		$\Sigma fx = 660 + 35f$

Mean = $\dfrac{\Sigma fx}{\Sigma f}$

30 = $\dfrac{660 + 35f}{26 + f}$

780 + 30f = 660 + 35f

780 - 660 = 35f - 30f

120 = 5f

f = 120 / 5 = 24

15	**Construction of price index number**						4

	2018 Base year		2020 Current Year		p_1q_1	p_0q_0
Items	Price (p_0)	Quantity (q_0)	Price (p_1)	Quantity (q_1)		
A	30	10	50	8	400	300
B	60	15	70	6	420	900
C	50	20	60	20	1200	1,000
D	30	18	30	30	900	540
					$\Sigma p_1q_1 = $ 2,920	$\Sigma p_0q_0 = $ 2,740

Pasche's method = $\dfrac{\Sigma p_1 q_1}{\Sigma p_0 q_0} \times 100$

$= \dfrac{2,920}{2,740} \times 100$

$= 106.6$

16	Here, following information is given:	6

$n = 20$, $r_k = 1.6$

Rank of coefficient of correlation $(r_k) = 1 - \dfrac{6\Sigma D^2}{N^3 - N}$

$1.6 = 1 - \dfrac{6\Sigma D^2}{20^3 - 20}$

$\dfrac{6\Sigma D^2}{7980} = 1 - 1.6$

$\Sigma D^2 = \dfrac{7980 \times -0.6}{6}$

$\Sigma D^2 = 798$

Since one difference is wrongly taken as 14 instead of 18, the corrected value of ΣD^2 is given

Corrected $\Sigma D^2 = 798 - 14^2 + 18^2$

$= 798 - 196 + 324$

	= 926
	
	Corrected (r_k) = 1 - 6 x 926
	                7,980
	
	           = 1 - 5,556
	                7,980
	           = 1 - 0.70
	           = 0.30
	Corrected (r_k) = 0.30	

17	**Following are the properties of standard deviation:** **(a) The sum of the square of the deviations of the items from their arithmetic mean is the minimum.** The sum is less than the sum of the square of the deviations of the items from any other value. **(b) Standard deviation does not change due to change of origin:** Standard deviation will remain the same, if in a series any value is added (or subtracted) to all observations. **(c) Change of scale affects the standard deviation:** If all the observations are multiplied (or divided) by a constant, then the standard deviations also need to get multiplied (or divided) by this constant. **(d) Standard deviation can be calculated of the compiled series:** Like arithmetic mean, standard deviations can be calculated of two or more groups. **(e) Standard deviation will always be greater than mean deviation from mean. i.e.** Standard deviation > Mean deviation from Mean	6
	SECTION - B Micro Economics	
18	The opportunity cost of a product is the next best alternative foregone.	1
19	(d) Where MU=0	1
20	(d) Increase in the price of substitute goods	1
21	Price elasticity of supply	1
22	Returns to factor	1
23	Increases	1
24	Minimum	1
25	(a) Uniform price	1
26	Oligopoly is that market situation or structure in which there are a few large (giant) firms which are interdependent especially for price and output decisions.	1

	OR (c) Price discrimination	
27	These are those costs which do not vary directly with the level of output. e.g. Payment of insurance premium.	1
28	**Impact on country:** Earthquake causes destruction of factories, offices and human life. There will be an acute shortage of labour force and capital stock. **Impact on ppc:** This will shift PP curve to the left i.e. potential level of production will fall. Government should try to increase the production capacity of the economy by producing more capital goods like machinery and equipment. This will increase the production and will help the PP curve to shift rightward to reach its original potential level of production. **OR** *(table below)*	3

Basis	Positive Economics	Normative Economics
(a) Meaning	A part of economics grounded on information and certainty is positive economics.	A part of economics grounded on values, perspectives, and discernment is normative economics.
(b) Nature	Illustrative	Dictatorial
(c) Outlook	Objective	Subjective
(d) Deals with	What actually is?	What has to be?

29	**Perfect knowledge among buyers and sellers:** Perfect knowledge among buyers implies that they know everything about the product like, the size, quality, price etc. So, no one pays more due to ignorance. Its implication is that commodities are standardized and a uniform price prevails. Perfect knowledge among sellers implies that they know everything about the factor market and product market. They have equal access to all the inputs and know about their prices in different markets and different time periods. So, no individual firm enjoys any special benefit or suffers any loss in availing these factors.	3
30	As we know, lemon and buttermilk both are substitute goods. In the case of substitute goods, if the price of one commodity increases, demand for other goods will also increase. It has a positive relationship. In this case, as the price of lemons increases then the demand of butter milk will rise which shows the effect of price and demand positive relation as they both are substitute goods.	4

31	**Law of variable proportion:** ● Law of variable proportions is a concept of short run. ● This law states, as we combine more and more units of variable factor with the same fixed factors, total Product initially increases at an increasing rate, then at a diminishing rate and reaches its maximum level and finally it falls. There are three phases in the behavior of TP as per law of variable proportion ● Increasing Returns to a factor: In this phase TP increases at an increasing rate. ● Diminishing Returns to a factor: This is the phase where TP increases but this time TP increases at a decreasing rate. ● Negative Returns to a factor: In this phase TP declines because of poor coordination between variable and fixed factor In first phase there is excess of fixed factors i.e. Capital and in third phase there is excess of variable factor i.e. Labour. So, the best phase for a rational producer to operate is II. **OR** ● If the government has increased the taxes on production of cars, then the price of cars will rise. ● Own price directly affects profits so it is the most important determinant of supply. ● With the rise in own price of the commodity, profit margin rises, so its quantity supplied also rises and if price of a commodity falls, its quantity supplied also falls. ● Thus, we can say that there is a direct relation between the price of a commodity and its quantity supplied.	4
32	● There is an inverse relationship between the price of other goods and quantity supplied of the given commodity. ● When the price of other commodities rises, the production of such other commodities becomes more profitable in comparison to the given commodity. ● Supply of the given commodity falls because the producer shifts resources to the other commodity which is more profitable.	4
33	**Excess demand:** In microeconomics, excess demand is a situation. When at a given market price, quantity demanded is more than quantity supplied i.e. buyers are willing to buy more than what suppliers are willing to supply. **Diagram & its basic information:**	6

Excess Demand OR Shortage

In the given diagram:
- Y-axis depicts price in rupees of the commodity and X-axis depicts quantity in units.
- 'dd' is the demand curve and 'ss' is the original supply curve.

Process of reaching equilibrium level:
In the above diagram, the present market price is 'OP$_c$' at which suppliers are willing to supply P$_c$M whereas buyers are willing to buy P$_c$N i.e. quantity demanded > quantity supplied.
- This excess demand causes shortage equal to 'MN'
· Shortage leads to competition among buyers;
· Prices start rising.
· Both law of demand and law of supply operate;
· As a result, demand starts contracting and supply starts expanding (as shown by arrow marks).
· This process continues until the market equilibrium level 'E'.

OR

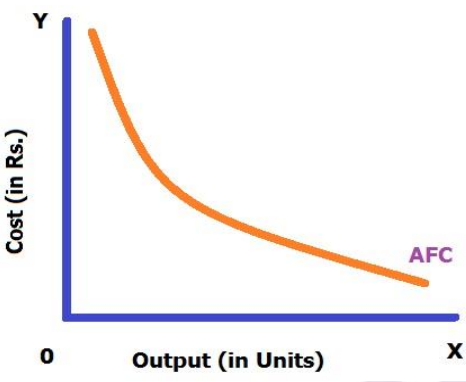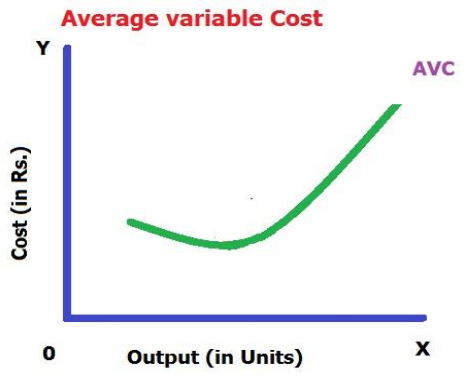**Following are the properties of indifference curve**
(a) indifference curve always slopes downwards from left to right: ·
An indifference curve has a negative slope, i.e., it slopes downward from left to right.
Reason: If a consumer decides to have one more unit of a commodity (say apples), the quantity of another good (say oranges) must fall so that the total satisfaction (utility) remains the same.

(b) indifference curve is always convex to the origin: IC is strictly Convex to origin i.e., MRSxy is always diminishing

	Reason: Due to the law of diminishing marginal utility a consumer is always willing to sacrifice lesser units of a commodity for every additional unit of another good. **(c) higher indifference curve represents higher level of satisfaction:** Higher indifference curve represents larger bundles of goods i.e. bundles which contain more of both or more of at least one. It is assumed that a consumer's preferences are monotonic i.e. he always prefers a larger bundle as it gives him higher satisfaction.	
34	**(a) Average fixed cost:** It is the fixed cost of producing per unit of a commodity. AFC = TFC/Output **(b) Average variable cost:** Variable cost of producing per unit of the commodity AVC = TVC/Output **(c) Average cost:** It is the cost of producing per unit of a commodity. ATC = TC/Output	6

Average Cost Curve