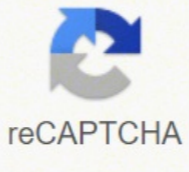


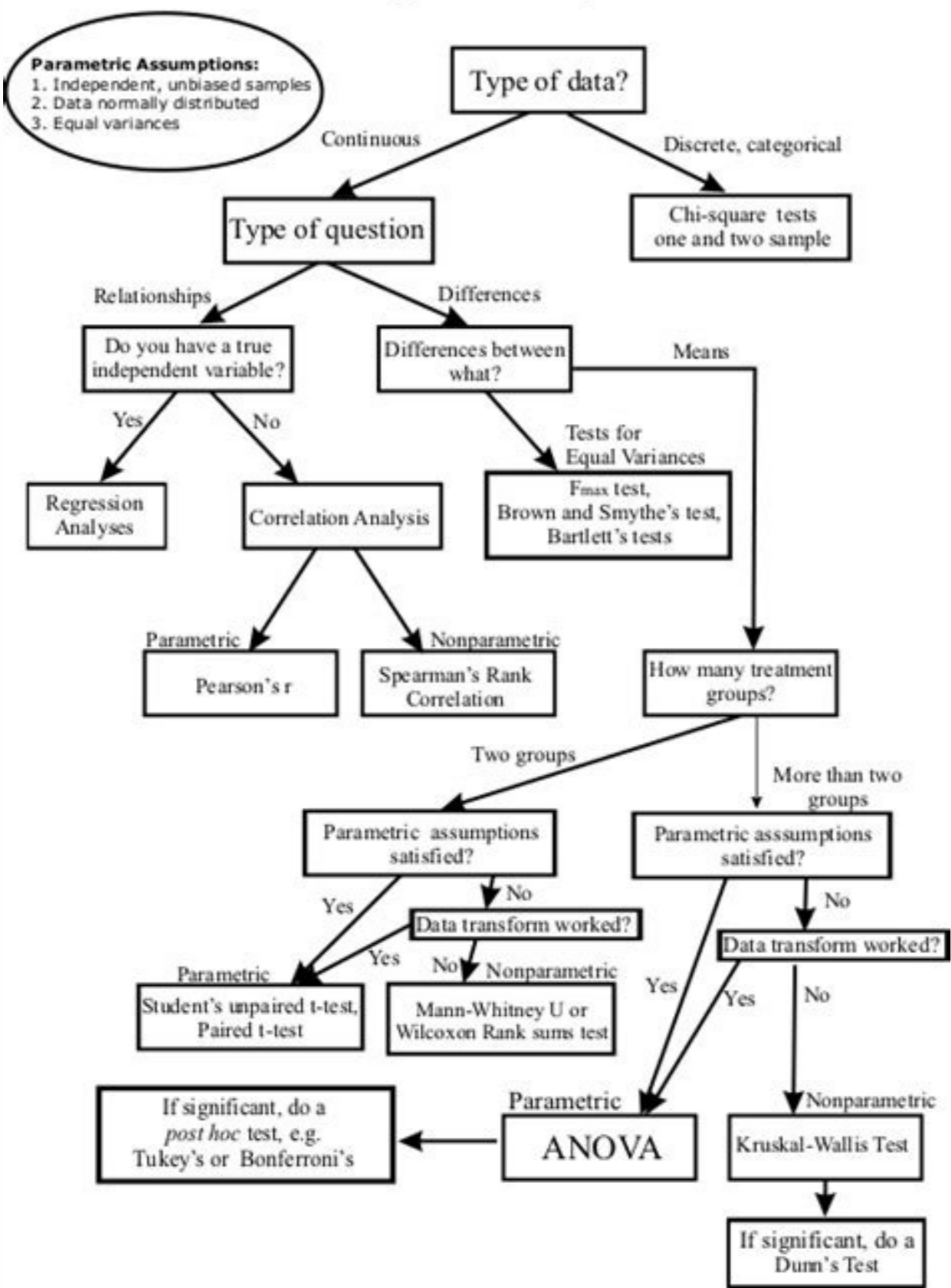


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Flow Chart for Selecting Commonly Used Statistical Tests



$$Y - \bar{Y} = b_{yx}(X - \bar{X})$$

SamacheerKalvi.Guide

$$b_{yx} = r \frac{\sigma_y}{\sigma_x} = \frac{\sum xy}{\sum x^2} = \frac{-93}{140} = -0.664$$

$$Y - 38 = -0.664(X - 32)$$

$$Y = -0.664X + 21.248 + 38$$

$$Y = -0.664X + 59.248$$

$$X = 0.91Y - 41.35$$

ii) the most likely value of Y when X = 10

$$Y = 0.48(10) + 67.72$$

$$\Rightarrow Y = 4.8 + 67.72 \Rightarrow Y = 72.52$$

9. Find the equation of the regression line of Y on X, if the observations  $(X_i, Y_i)$  are the following (1, 4) (2, 8) (3, 2) (4, 12) (5, 10) (6, 14) (7, 16) (8, 6) (9, 18)

**Solution :**

X	Y	X <sup>2</sup>	Y <sup>2</sup>	XY
1	4	1	16	4
2	8	4	64	16
3	2	9	4	6
4	12	16	144	48
5	10	25	100	50
6	14	36	196	84
7	16	49	256	112
8	6	64	36	48
9	18	81	324	162
45	90	285	1140	530

$$\bar{X} = \frac{45}{9} = 5$$

$$\bar{Y} = \frac{90}{9} = 10$$

$$b_{yx} = \frac{N\sum XY - (\sum X)(\sum Y)}{N\sum X^2 - (\sum X)^2}$$

$$= \frac{9(530) - (45)(90)}{9(285) - (45)^2}$$

$$= \frac{4770 - 4050}{2565 - 2025} = \frac{720}{540} = 1.33$$

∴ Regression line of Y on X is

$$Y - \bar{Y} = b_{yx} (X - \bar{X})$$

$$\Rightarrow Y - 10 = 1.33 (X - 5)$$

$$\Rightarrow Y - 10 = 1.33X - 6.65$$

$$\Rightarrow Y = 1.33X + 3.35$$

10. A survey was conducted to study the relationship between expenditure on accommodation (X) and expenditure on Food and Entertainment (Y) and the following results were obtained:



**Solution :**

Given  $\bar{X} = 6, \bar{Y} = 8$

$\sigma_X = 5, \sigma_Y = \frac{40}{3}$

and  $r(X, Y) = \frac{8}{15}$

Regression co-efficient of Y on X

$$b_{yx} = r \cdot \frac{\sigma_X}{\sigma_Y} = \frac{8}{15} \left( \frac{40}{3 \times 5} \right)$$

$$= \frac{320}{225} = 1.422$$

$b_{yx} = 1.422$

Regression line of Y on X is

$Y - \bar{Y} = b_{yx}(X - \bar{X})$

$Y - 8 = 1.422(X - 6)$

$Y - 8 = 1.422X - 8.532$

$Y = 1.422X - 0.532$

When  $X = ₹ 100$

$Y = 1.422(100) - 0.532$

$= 142.2 - 0.532$

$Y = 141.67$

$\therefore$  When  $X = ₹ 100, Y = ₹ 141.67$

(a) Regression equation of X on Y is

$\Rightarrow X - \bar{X} = b_{xy}(Y - \bar{Y})$

$\Rightarrow X - 32 = -0.234(Y - 38)$

$\Rightarrow X - 32 = -0.234Y + 8.892$

$\Rightarrow X = -0.234Y + 8.892 + 32$

$\Rightarrow X = -0.234Y + 40.892$

Regression equation of Y on X is

$Y - \bar{Y} = b_{yx}(X - \bar{X})$

$Y - 38 = -0.664(X - 32)$

$Y = -0.664X + 21.25 + 38$

$Y = -0.664X + 59.25 \dots (1)$

(b) Co-efficient of correlation between the marks in Economics and Statistics is

$r(X, Y) = \frac{\Sigma xy}{\sqrt{\Sigma x^2} \cdot \sqrt{\Sigma y^2}} = \frac{-93}{\sqrt{140} \cdot \sqrt{398}}$

$= \frac{-93}{(11.83)(19.95)} = \frac{-93}{236.009} = -0.394$

(c) To estimate the marks in statistics (Y) for a given mark in (Economics),

Put  $X = 30$  in (1) we get,

$Y = -0.664(30) + 59.25 = -19.92 + 59.25$

$Y = 39.33$

2. The heights (in cm.) of a group of fathers and sons are given below

Heights of fathers	158	166	163	165	167	170	167	172	177	181
Heights of Sons	163	158	167	170	160	180	170	175	172	175

Find the lines of regression and estimate the height of son when the height of the father is 164 cm.

Solution :

Heights of fathers (X)	Heights of sons (Y)	$dx = X - 168$	$dy = Y - 169$	$dx^2$	$dy^2$	$dx \cdot dy$
158	163	-10	-6	100	36	60
166	158	-2	-11	4	121	22
163	167	-5	-2	25	4	10
165	170	-3	1	9	1	-3
167	160	-1	-9	1	81	9
170	180	2	11	4	121	22
167	170	-1	1	1	1	-1
172	175	4	6	16	36	24
177	172	9	3	81	9	27
181	175	13	6	169	36	78
1686	1690	6	0	410	446	248



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