FOUNDATION EXAMINATION

(SYLLABUS 2008)

SUGGESTED ANSWERS TO QUESTIONS

JUNE 2012

Paper- 4 : BUSINESS MATHEMATICS AND STATISTICS FUNDAMENTALS

Time Allowed : 3 Hours **Full Marks :** 100

The figures in the margin on the right side indicate full marks.
*Answer **all** questions.*
Notations and symbols have usual meanings.

SECTION - I (Arithmetic—10 marks)

Q. 1. Answer *any two* of the following : [3×2]

Choose the correct option showing the proper reasons/calculations.

(a) 10 years before, the ages of father and son were in the ratio 5:2. If at present their total age is 90 years, the present age of the son is

(i) 40 years (ii) 25 years (iii) 30 years (iv) none of these

(b) If the speed of a car to go uphill is 20 km/hr and down is 30 km/hr, then average speed of the car is (in km/hr)

(i) 23 (ii) 24 (iii) 25 (iv) none of these

(c) The difference of Banker's Discount and True Discount for a bill amount of ₹ 2000 due in 5 years at the rate of 5% per annum in ₹ is

(i) 100 (ii) 75 (iii) 50 (iv) none of these

Answer 1.

(a) (iii)

Father's present age = x; Son's present age = y

$\therefore \frac{x-10}{y-10}=\frac{5}{2}$

or, $2x - 20 = 5y - 50$

or, $2x - 5y = -30$ ... (i)

and

$x + y = 90$ ... (ii)

Solving (i) & (ii) we get, $x = 60$ and $y = 30$.

(b) (ii)

Average speed $= \frac{2}{\frac{1}{20}+\frac{1}{30}} = 24$ km/hr.

(c) (i)

BD – TD = $\text{Ani} - \frac{\text{Ani}}{1+\text{ni}} = 2000 \times 5 \times \frac{5}{100}\left[1 - \frac{1}{1+\left(\frac{5\times5}{100}\right)}\right] =$ ₹ 100

Q. 2. Answer *any one* of the following : [4×1]

(a) Two vessels contain mixtures of milk and water in the ratio 5:1 and 9:1. They are mixed together in the ratio 1:5. Find the ratio of milk and water in the final mixture.

(b) An amount of money at certain rate of simple interest per annum becomes ₹ 2,400 in 4 years and ₹ 2,500 in 5 years. Find the rate of interest p.a.

Answer 2. (a)

Let 1 litre of mixture of first vessel be mixed with 5 litres of mixture of second vessel.

1 litre of first vessel contains $1 \times \frac{5}{6} = \frac{5}{6}$ litre of milk and $1 \times \frac{1}{6} = \frac{1}{6}$ litre of water.

5 litre of second vessel contains $5 \times \frac{9}{10} = \frac{9}{2}$ litre of milk and $5 \times \frac{1}{10} = \frac{1}{2}$ litre of water.

So, in the final mixture, milk : water $= \left(\frac{5}{6}+\frac{9}{2}\right) : \left(\frac{1}{6}+\frac{1}{2}\right) = 8:1$

Answer 2. (b)

A = P (1 + ni). So, 2400 = P(1 + 4i), 2500 = P(1 + 5i)

$\therefore \quad \frac{2400}{2500} = \frac{P(1+4i)}{P(1+5i)} \Rightarrow i = \frac{1}{20} = 5\%$

So, the rate of interest is 5% p.a.

Section - II (Algebra—15 marks)

Q. 3. Answer *any three* of the following : [3×3]

Choose the correct option showing the proper reasons/calculations.

(a) If $\frac{1+i}{1-i}$ = A + iB, then the value of A/B is (where $i = \sqrt{-1}$)

(i) $\frac{4}{3}$ (ii) 1 (iii) $\frac{3}{4}$ (iv) none of these

(b) If $(a+b) \propto (a-b)$ and when a = 6, b = 2, then for b = 3, the value of a is

(i) 6 (ii) 9 (iii) 12 (iv) none of these

(c) If $x = 7 + 4\sqrt{3}$, then the value of $\sqrt{x} - \frac{1}{\sqrt{x}}$ is

(i) $\sqrt{3}$ (ii) $2\sqrt{3}$ (iii) $3\sqrt{3}$ (iv) none of these

(d) The number of ways in which 6 books out of 9 different books can be arranged in a book shelf so that 3 particular books remain together is

(i) 120 (ii) 480 (iii) 2880 (iv) none of these

(e) For the statements p : "it is raining" and q : "it is cloudy", the symbolic form of the statement that "it is neither raining nor cloudy", is

(i) $p \vee q$ (ii) $p \wedge q$ (iii) $p \wedge \sim q$ (iv) $\sim p \wedge \sim q$

Answer 3. (a) (iv)

$$\frac{1+i}{1-i} = \frac{(1+i)^2}{(1-i)(1+i)} = \frac{2i}{(1-i^2)} = i = 0 + i \times 1 = A + iB$$

A = 0, B = 1, A/B = 0

Answer 3. (b) (ii)

$$(a+b) = k(a-b) \Rightarrow a = \frac{k+1}{k-1} b$$

For b = 2, a = 6 we get $\frac{k+1}{k-1} = 3 \Rightarrow a = 3b$

So for b = 3, a = 9.

Answer 3. (c) (ii)

$$\sqrt{x} = 2 + \sqrt{3}, \quad \frac{1}{\sqrt{x}} = 2 - \sqrt{3}$$

$$\therefore \sqrt{x} - \frac{1}{\sqrt{x}} = 2\sqrt{3}$$

Answer 3. (d) (iii)

No. of ways $= {}^6P_3 \times 4 \times 3! = 2880$

Answer 3. (e) (iv)

$\sim p \wedge \sim q$

Q. 4. Answer *any two* of the following : [3×2]

(a) In a class of 30 students, 15 students have taken Hindi, 10 students have taken Hindi but not English. All the students in the class have taken at least one of the subjects of English and Hindi. Find the number of students who have taken English but not Hindi.

(b) Find the value of $\log_{\frac{1}{2}} \log_2 \log_3 81$

(c) The total expenses of a boarding house are partly fixed and the rest varies as the number of boarders. The charges is ₹ 100 per head when there are 25 boarders and ₹ 80 when there are 50 boarders. Find the number of boarders for which the total expenses will be ₹ 7,000.

Answer 4. (a)

$n(E \cup H) = 30, \quad n(H) = 15 \quad n(E' \cap H) = 10$

$n(E \cap H) = 15 - 10 = 5$

$n(E \cup H) = n(E) + n(H) - n(E \cap H) \Rightarrow n(E) = 30 - (15 - 5) = 20$

$n(E \cap H') = n(E) - n(E \cap H) = 20 - 5 = 15$

So, the no. of students who have taken English but not Hindi is 15.

Answer 4. (b)

$\text{Log}_{\frac{1}{2}} \text{Log}_2 \text{Log}_3 81 = \text{Log}_{\frac{1}{2}} \text{Log}_2 \text{Log}_3 4 = \text{Log}_{\frac{1}{2}} 2 = -1$

Answer 4. (c)

Fixed cost = C_1, Total cost = C, No. of boarders = n

$\therefore C = C_1 + kn$

Hence, 2500 = C_1 + 25 k and 4000 = C_1 + 50k

$\Rightarrow C_1 = 1000,$ k = 60

$\therefore$ C = 1000 + 60n

$\therefore$ When C = 7000, n = 100.

The no. of boarders is 100.

SECTION - III (Mensuration—15 marks)

Q. 5. Answer *any three* of the following : [3×3]

Choose the correct option showing the proper reasons/calculations.

(a) Three sides of a triangle are in the ratio of 3:4:5 and its perimeter is 24 cm. Its area is

(i) 12 sq cm (ii) 24 sq cm (iii) 48 sq cm (iv) none of these

(b) The sum and difference of the external and inner radii of a circular ring are 14 cm and 4 cm respectively. The area of the ring is $\left(\pi = \frac{22}{7}\right)$

(i) 44 sq cm (ii) 144 sq cm (iii) 176 sq cm (iv) none of these

(c) Three solid metal cubes with edges 3 ft, 4 ft and 5 ft of same metal are melted without any loss of metal into a single new cube. The surface area of the new cube in sq ft is

(i) 144 (ii) 216 (iii) 432 (iv) none of these

(d) The volume of two spheres are in the ratio 1:8. If the sum of their radii is 6 cm then bigger sphere has radius as

(i) 4 cm (ii) 4.5 cm (iii) 5 cm (iv) none of these

(e) Slant height and whole surface area of a right circular cone are 7 cm and 147.84 sq cm respectively.

The radius of the base of the cone is $\left(\pi = \frac{22}{7}\right)$

(i) 4.4 cm (ii) 4.2 cm (iii) 4.8 cm (iv) none of these

Answer 5. (a) — (ii)

Sides are 6 cm, 8 cm and 10 cm.

$2s = 24 \Rightarrow s = 12$

Area $= \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{12(12-6)(12-8)(12-10)}$ = 24 sq cm.

Answer 5. (b) — (iii)

R = 9 cm, r = 5 cm

Area $= \pi\left(R^2 - r^2\right) = \frac{22}{7}(81-25) = 176$ sq cm.

Answer 5. (c) — (ii)

Volume of the new cube $= a^3 = 3^3 + 4^3 + 5^3 = 216 \Rightarrow a = 6$ ft

Surface area of the new cube = $6a^2$ = 216 sq ft.

Answer 5. (d) — (i)

$$\frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3} = \frac{1}{8} \Rightarrow \frac{r_1}{r_2} = \frac{1}{2} \Rightarrow 2r_1 - r_2 = 0$$

Again $r_1 + r_2 = 6$. Hence $r_1 = 2$ and $r_2 = 4$

Answer 5. (e) — (ii)

Whole surface area of the cone $= \pi r(r+l) = 147.84$

$\Rightarrow r^2 + 7r - 47.04 = 0 \Rightarrow r = 4.2$ ($\because r \neq -11.2$)

Q. 6. Answer *any two* of the following : [3×2]

(a) Determine each interior angle of a decagon.

(b) Find the area of an equilateral triangle of side 6 cm.

(c) If the perimeter and one diagonal of a rectangle are 14 cm and 5 cm respectively, find the area of the rectangle.

Answer 6. (a)

Sum of the interior angles = (2 × 10 – 4) × 90° = 16 × 90° = 1440°

∴ Each interior angle = 1440°⁄10 = 144°

Answer 6. (b)

Altitude $= \sqrt{6^2 - 3^2} = 3\sqrt{3}$

Area $= \frac{1}{2} \times \text{Base} \times \text{Altitude} = \frac{1}{2} \times 6 \times 3\sqrt{3} = 9\sqrt{3}$ sq. cm

Answer 6. (c)

2 (l + b) = 14, $\sqrt{l^2 + b^2} = 5$

Solving we get l = 4, b = 3

Reqd. area = lb = 12 sq cm.

SECTION - IV (Co-ordinate Geometry—10 marks)

Q. 7. Answer *any two* of the following : [3×2]

Choose the correct option showing the proper reasons/calculations.

(a) If the x-intercept of a line passing through (1, 3) is 2, then y-intercept of the line is

(i) 2 (ii) 3 (iii) 6 (iv) none of these

(b) If the diameter of a circle $x^2 + y^2 + 4x - 7y - k = 0$ be 9, then the value of k is

(i) 6 (ii) – 4 (iii) 4 (iv) none of these

(c) Focus of the parabola $y^2 - 8y - 8x + 8 = 0$ is

(i) (2, 0) (ii) (1, 4) (iii) (1, 2) (iv) none of these

(d) The ecentricity of the hyperbola $4x^2 - 9y^2 = 36$ is

(i) $\frac{\sqrt{13}}{3}$ (ii) $\frac{13}{3}$ (iii) $\frac{13}{9}$ (iv) none of these

Answer 7. (a) — (iii)

x-intercept = a, y-intercept = b

$\frac{x}{a} + \frac{y}{b} = 1$. When a = 2, the line passes through (1, 3).

So, $\frac{1}{2} + \frac{3}{b} = 1 \Rightarrow b = 6$

Answer 7. (b) — (iii)

$g = 2,\ f = -\frac{7}{2}$, $C = -K$

$\therefore\ 2\sqrt{4+\frac{49}{4}+K} = 9 \Rightarrow K = 4$

Answer 7. (c) — (ii)

$y^2 - 8y - 8x + 8 = 0 \Rightarrow (y-4)^2 = 4.2.(x+1) \Rightarrow y^2 = 4.2.x$

Where Y = y – 4 and X = x + 1. In (X, Y) Co-ordinate, focus is (2, 0)

In (x, y) co-ordinate focus is (2 – 1, 0 + 4) = (1,4)

Answer 7. (d) — (i)

$4x^2 - 9y^2 = 36 \Rightarrow \frac{x^2}{9} - \frac{y^2}{4} = 1$

$\therefore\ e = \sqrt{1+\frac{4}{9}} = \frac{\sqrt{13}}{3}$

Q. 8. Answer *any one* of the following : [4×1]

(a) Find the equation of a straight line passing through (–4, 3) and being perpendicular to the line passing through points (3, 4) and (6, 8).

(b) Find the distance between the focii of the ellipse $4x^2 + 5y^2 = 20$.

Answer 8. (a)

Gradient of the line passing through (3, 4) and (6, 8) is $\frac{8-4}{6-3} = \frac{4}{3}$

$\therefore$ Gradient of the reqd. line $= -\frac{3}{4}$.

Equation of the reqd. line passing through (– 4, 3) is

$y - 3 = -\frac{3}{4\ (x+4)} \Rightarrow 3x + 4y = 0$

Answer 8. (b)

$4x^2 + 5y^2 = 20 \Rightarrow \frac{x^2}{5} + \frac{y^2}{4} = 1 \Rightarrow a^2 = 5,\ b^2 = 4$

Now, $b^2 = a^2(1 - e^2) \Rightarrow e = \frac{1}{\sqrt{5}}$

Focii are at $(\pm ae, 0) = (\pm 1, 0)$ i.e. at (1, 0) and (– 1, 0)

Distance between the focii = 2 units.

SECTION - V (Calculus—15 marks)

Q. 9. Answer *any three* of the following : [3×3]

Choose the correct option showing the proper reasons/calculations.

(a) If $f(x) = x + |x|$, the value of $f(-1) + f(-1)$ is

(i) 0 (ii) 2 (iii) 4 (iv) none of these

(b) If $f(x) = x + 1, \ x \le 1$

$= 5 - ax^2, \ x > 1$

then f(x) is continuous at x = 1, when a is

(i) 1 (ii) 2 (iii) 3 (iv) none of these

(c) If x = ct and $y = \frac{c}{t}$, then the value of $\frac{d^2y}{dx^2}$ at $t = \frac{1}{2}$ is

(i) $\frac{1}{16}$ (ii) $\frac{c}{8}$ (iii) $\frac{16}{c}$ (iv) none of these

(d) If $u = \frac{x+y}{x-y}$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y}$ is

(i) 1 (ii) 0 (iii) –1 (iv) none of these

(e) The value of $\int_0^2 \frac{2-x}{2+x}dx$ is

(i) $4 \log_e 2 + 2$ (ii) $2 \log_e 2 - 2$ (iii) $4 \log_e 2$ (iv) none of these

Answer 9. (a) — (ii)

$f(1) = 1 + 1 = 2, \ \ f(-1) = -1 + 1 = 0$

$\therefore \ f(1) + f(-1) = 2$

Answer 9. (b) — (iii)

Required condition $\lim_{x \to 1^+} f(x) = \lim_{x \to 1^-} f(x)$

$\Rightarrow 5 - a = 2$

$\Rightarrow a = 3.$

Answer 9. (c) — (iii)

$x = ct \ \ \therefore \frac{dx}{dt} = c, \ \ y = \frac{c}{t} \ \ \therefore \frac{dy}{dt} = -\frac{c}{t^2}$

$\therefore \frac{dy}{dx} = -\frac{1}{t^2} \Rightarrow \frac{d^2y}{dx^2} = \frac{2}{t^3}\frac{dt}{dx} = \frac{2}{ct^3} \qquad \therefore \left.\frac{d^2y}{dx^2}\right|_{t=\frac{1}{2}} = \frac{16}{C}$

Answer 9. (d) — (ii)

$$u = \frac{x+y}{x-y} = \frac{x\left(1+\frac{y}{x}\right)}{x\left(1-\frac{y}{x}\right)} = x^o\phi\left(\frac{y}{x}\right)$$

$\therefore$ By Euler's theorem $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$

Answer 9. (e) — (iv)

$$\int_0^2 \frac{2-x}{2+x}\,dx = \int_0^2 \frac{4-(2+x)}{2+x}\,dx = \int_0^2 \frac{4}{2+x}\,dx = \int_0^2 dx = 4\log_e 2 - 2$$

Q. 10. Answer *any two* of the following : [3×2]

(a) If $y = x^3 \log\frac{1}{x}$, prove that $x\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 3x^2 = 0$

(b) A manufacturer can sell x items per month at a price of ₹ p = 198 – 2x per item. Cost price of those x items is ₹ 2x + 200. How much production will yield maximum profit per month?

(c) Integrate $\int \frac{e^{x-1} + x^{e-1}}{e^x + x^e}dx$

Answer 10. (a)

$$y = x^3 \log\frac{1}{x} \Rightarrow \frac{dy}{dx} = -3x^2 \log x - x^2$$

$$\therefore \frac{d^2y}{dx^2} = -6x \log x - 5x$$

$$\therefore x\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 3x^2 = -6x^2 \log x - 5x^2 - 2(-3x^2 \log x - x^2) + 3x^2 = 0$$

Answer 10. (b)

Profit P = xp – (2x + 200)

$= x(198 - 2x) - (2x + 200) = -2x^2 + 196x - 200$

$$\frac{dp}{dx} = 0 \Rightarrow -4x + 196 = 0 \Rightarrow x = 49$$

$$\frac{d^2p}{dx^2} = -4 < 0$$

Thus for maximum profit, production quantity is x = 49.

Answer 10. (c)

$$I = \frac{1}{e}\int \frac{e^x + ex^{e-1}}{e^x + x^e}\,dx$$

Let $e^x + x^e = t \quad \therefore \left(e^x + ex^{e-1}\right)dx = dt$

$$\therefore\ I = \frac{1}{e}\log t + c$$

$$= \frac{1}{e}\log\left(e^x + x^e\right) + c$$

Section - VI (Statistical Methods—35 marks)

Q. 11. Answer *any seven* of the following : [3×7]

Choose the correct option showing proper reasons/calculations.

(a) The arithmetic mean of first n positive odd integers is 10. The value of n is

(i) 11 (ii) 10 (iii) 9 (iv) none of these

(b) G. M. of the numbers 3, 6, 24 and 48 is

(i) 8 (ii) 10 (iii) 12 (iv) none of these

(c) If a car moves first 20 km at a speed of 40 km/h and next 40 km at a speed of 20 km/h, then the average speed of the car during whole journey is

(i) 24 km/h (ii) 30 km/h (iii) 36 km/h (iv) none of these

(d) If the median and mode for a moderately skewed distribution are 8 and 5 respectively, the mean of the distribution is

(i) 6.5 (ii) 10 (iii) 9.5 (iv) none of these

(e) If the relation between two variables u and v is 5v – 7u = 1 and range of u is 5, then the range of v is

(i) $\frac{7}{5}$ (ii) 7 (iii) 5 (iv) none of these

(f) The mean deviation of first six positive even integers about their median is

(i) 6 (ii) 4 (iii) 3 (iv) none of these

(g) If the mean and standard deviation of 100 observations are 40 and 5 respectively, then sum of squares of the observations is

(i) 16250000 (ii) 162500 (iii) 1625 (iv) none of these

(h) For a variable x if $\sum_{i=1}^{8}(x_i - 3) = 96$ and $\sum_{i=1}^{8}(x_i - 10)^2 = 736$ then its variance is

(i) 65 (ii) 66 (iii) 67 (iv) none of these

(i) If the coefficient of variation and variance of a group of observations are 50% and 9 respectively then arithmatic mean of deviations of the observations about 2 is

(i) 3 (ii) 4 (iii) 6 (iv) none of these

(j) In a distribution, mean = 24, median = 23, coefficient of skewness = 0.6, then coefficient of variation is

(i) 20.83% (ii) 10.83% (iii) 20% (iv) none of these

Answer 11. (a) — (ii)

$$\text{A.M.} = \frac{1+3+5+.....+(2n-1)}{n} = 10 \Rightarrow n = 10$$

Answer 11. (b) — (iii)

$$\text{G.M.} = \sqrt[4]{3\times 6\times 24\times 48} = 3\times 2^2 = 12$$

Answer 11. (c) — (i)

$$\text{Average speed} = \frac{20+40}{\frac{20}{40}+\frac{40}{20}} = 24 \text{ km/h}$$

Answer 11. (d) — (iii)

mean – mode = 3 (mean – median)

$\Rightarrow$ mean – 5 = 3 (mean – 8) $\Rightarrow$ mean = 9.5

Answer 11. (e) — (ii)

5 × Range of v =7 × Range of u

$$\Rightarrow \text{Range of v} = \frac{7\times 5}{5} = 7$$

Answer 11. (f) — (iii)

First six positive even integers are 2, 4, 6, 8, 10, 12

$$\text{Median} = \frac{6+8}{2} = 7$$

$$\text{MD about median} = \frac{1}{6}\left[|2-7|+|4-7|+|6-7|+|8-7|+|10-7|+|12-7|\right] = 3$$

Answer 11. (g) — (ii)

$$\sqrt{\frac{\Sigma x^2}{100}-(40)^2} = 5 \Rightarrow \Sigma x^2 = 162500$$

Answer 11. (h) — (ii)

$$\sum_{i=1}^{8}(x_i-3)=96 \quad \Rightarrow \sum_{i=1}^{8}x_i=120$$

$$\sum_{i=1}^{8}(x_i-10)^2=\sum_{i=1}^{8}x_i^2-20\sum_{i=1}^{8}x_i+800=736$$

$$\Rightarrow \sum_{i=1}^{8}x_i^2=2336$$

$$\text{Variance } =\frac{2336}{8}-\left(\frac{120}{8}\right)^2=67$$

Answer 11. (i) — (ii)

$$50=\frac{3}{\text{mean}}\times 100 \Rightarrow \text{mean}=6$$

Let n = no. of observations

$$\text{Mean of deviations of observations about } 2=\frac{1}{n}\Sigma(x-2)=\text{mean}-2=4$$

Answer 11. (j) — (i)

$$\text{Coefficient of skewness } =\frac{3(\text{mean}-\text{median})}{\text{S.D}}$$

$$\Rightarrow 0.6=\frac{3(24-23)}{\text{S.D}} \Rightarrow \text{S.D}=5$$

$$\therefore \text{ CV}=\frac{5}{24}\times 100=20.83\%$$

Q. 12. (a) Answer *any two* of the following : [5×2]

(i) Represent the following data by line chart using a false base line :

Year	:	2005	2006	2007	2008	2009	2010
Production of spindles (Nos.)	:	8500	9000	11000	9050	10000	12000

(ii) Find the median and mode of the following frequency distribution of marks :

Marks	:	10–20	20–30	30–40	40–50	50–60	60–70	70–80
No. of students	:	5	7	18	31	24	12	3

(iii) The mean and variance of 6 values of a variable are 8 and $8\frac{2}{3}$ respectively. If 4 values of the variable are 4, 9, 11 and 12, find the other two values of the variable.

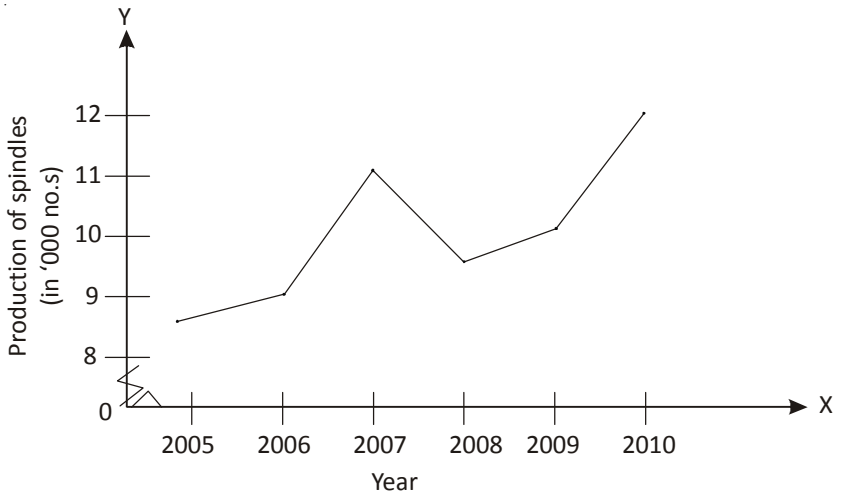
(b) Write short note on *any one* of the following : [4×1]

(i) Primary data

(ii) Cumulative frequency polygon

Answer 12. (a)

(i) Draw 2 mutually perpendicular lines. Taking years along the horizontal line and production (in 1000) along the vertical one. Plot the points on the years 2005, 2006, 2007, 2008, 2009, 2010 against their corresponding production numbers 8, 9, 10, 11, 12. These points thus obtained are joined pair wise by the straight line right from (2005, 8), (2006, 6), ... (2010, 12). A line chart is obtained.



(ii)

Class of marks	**Frequency (f)**	**C.F (< type)**
10-20	5	5
20-30	7	12
30-40	18 $\rightarrow f_{-1}$	30
40-50	31 $\rightarrow f_0$	61
50-60	24 $\rightarrow f_1$	85
60-70	12	97
70-80	3	100
Total	N = 100	

$\frac{N}{2} = 50$. Median class is 40 – 50. Modal class is 40 – 50 whose ferequency is maximum.

$\therefore \frac{\text{Median} - 40}{50 - 40} = \frac{\frac{100}{2} - 30}{61 - 30} \Rightarrow$ Median = 46.45.

Mode $= 40 + \frac{f_0 - f_{-1}}{2f_0 - f_{-1} - f_1} \times$ class length $= 40 + \frac{31-18}{62-18-24} \times 10 = 46.5$

(iii) Let the other two numbers be a and b.

$\therefore 4+9+11+12+a+b = 6\times 8 \Rightarrow a+b = 12$ ... (1)

Again $\frac{a^2+b^2+16+81+121+144}{6} = \frac{26}{3} + 64 \Rightarrow a^2+b^2 = 74$ ... (2)

Solving (1) and (2) we get, the other two values are 5 and 7.

Answer 12. (b)

(i) **Primary Data :** Data which are collected for the first time, for a specific purpose are known as Primary Data.

For example, data relating to national income collected by government are primary data.

Example : (i) Reserve Bank of India Bulletin (monthly)

(ii) Jute Bulletin (monthly), (published by Govt. of India).

(iii) Indian Textile Bulletin (monthly).

(iv) Statement of Railway Board (yearly), (published by Ministry of Railway, Govt. of India).

(ii) **Cumulative frequency polygon :**

If the cumulative frequencies are plotted against the class-boundaries and successive points are joined by straight lines, we get what is known as O give or cumulative (or cumulative frequency polygon). There are two types of O give.

(a) Less than type — Cumulative Frequencies from below are plotted against the upper class-boundaries.

(b) Greater than type — Cumulative Frequencies from above are plotted against the corresponding lower boundaries.

The former is known as less than type, because the ordinate of any point on the curve (obtained) indicates the frequency of all values less than or equal to the corresponding value of the variable represented by the abscissa of the point.

Similarly, the latter one is known as the greater than type.