Sample Question Paper 03
Class -IX Mathematics
Summative Assessment – II

Time: 3 Hours **Max. Marks: 90**

General Instructions:

(i) All questions are compulsory.

(ii) The question paper consists of **31** question divided into five **section A, B, C, D and E.** Section-A comprises of **4** question of **1 mark** each, **Section-B** comprises of **6** question of **2 marks** each, **Section-C** comprises of **8** question of **3 marks** each and **Section-D** comprises of **10** questions of **4 marks** each. **Section E** comprises of **two questions of 3 marks each** and **1 question** of **4 marks from Open Text theme.**

(iii) There is no overall choice.

(iv) Use of calculator is not permitted.

SECTION-A

Question number **1** to **4** carry **one** mark each.

1. A cube and a sphere are of the same height. Find the ratio of their volume.
2. Find the arithmetic mean of first-five natural numbers.
3. A die is thrown. What is the probability of getting a multiple of 3 on the upper face?
4. Diagonals of a quadrilateral ABCD bisect each other. If ∠A = 35°, determine ∠B.

SECTION-B

Question number **5** to **10** carry **two** marks each.

5. If the points (2k – 3, k + 2) lies on the graph of the equation 2x + 3y + 15= 0, find the value of k.
6. Find the co-ordinates where the linear equation 3x – 4y = 11 meets at x -axis.
7. AB = DC and diagonal AC and BD intersect at P in cyclic quadrilateral Prove that $\Delta PAB \cong \Delta PDC$
8. Justify the line corresponding to side EF if ar $\left(\Delta ABC\right) = ar\left(\Delta DEF\right)$ in $\Delta ABC, AB = 8$ and altitude AB is 5 cm and $\Delta DEF, EF = 10cm$
9. At what point does the graph of the linear equation 2x + 3y = 9 meet a line which is parallel to the y – axis, at a distance of 4 units from the origin and the right of the y – axis?
10. Ten observations 6, 14, 15, 17, x + 1, 2x – 13, 30, 32, 34, 43 are written in an ascending order. The median of the data is 24. Find the value of x.

SECTION-C

Question numbers **11** to **18** carry **three** marks each.

11. Two batsman Rahul and Anil while playing a cricket match scored 120 runs. For this, write a linear equation in two Variables and draw the graph.
12. Write linear equation 3x + 2y = 18 in the form of ax + by + c = 0. Also write the values of a, b and c. are (4, 3) and (1, 2) solution of this equation?
13. In given figure, AD is a diameter of the circle. If $\angle BCD = 150°$, calculate (i) $\angle BAD$ (ii) $\angle ADB$
14. The radius and height of a cone are in the ratio 3 : 4 and its volume is 301.44 cm^3. Find the radius and slant height of the cone.
15. A cube of side 5 cm contain a sphere touching its sides. Find the volume of the gap in between.
16. A sphere and a right circular cylinder of the same radius have equal volumes. By what percentage does the diameter of the cylinder exceeds its height?
17. Prepare a continuous grouped frequency distribution from the following data:

Mid-point	5	15	25	35	45
Frequency	4	8	13	12	6

Also find the size of class intervals.

18. Bulbs are packed in cartons each containing 40 bulbs. Seven hundred cartons were examined for defective bulbs and the results are given in the following table.

Number of defective bulbs	0	**1**	**2**	3	4	5	6	More than 6
Frequency	400	180	48	41	18	8	3	2

One carton was selected at random. What is the probability that it has:
(i) no defective bulb?
(ii) defective bulbs from 2 to 6?
(iii) defective bulbs less than 4?

SECTION-D

Question numbers **19** to 28 carry **four** marks each.

19. Construct a right triangle whose base is 12 cm and sum of its hypotenuse and other side is 18 cm.
20. Construct an equilateral triangle if its altitude is 6 cm.
21. AC and BD are chords of a circle that bisect each other. Prove that AC and BD are diameters and ABCD is a rectangle.
22. The ratio between the radius of the base and height of a cylinder is 2:3. Find the total surface area of the cylinder if its volume is 1617 cm^3.
23. The auto-rickshaw fare in a city is charged as Rs 10 for the first kilometer and at Rs 4 per kilometer for subsequent distance covered. Write the linear equation to express the above statement. Draw the graph of linear equation.
24. Twenty seven solid iron spheres, each of radius r and surface area S are melted to form a sphere with surface area S' find the

(i) radius r’ of the new sphere
(ii) ratio of S and S’

25. Show that ar$\left(\Delta ABG\right)=\frac{1}{3}ar\left(\Delta ABC\right)$, if median of Δ intersect at G.
26. If the medians of a AABC intersect at G. Show that

$$ar\left(\Delta AGC\right)=ar\left(\Delta AGB\right)=ar\left(\Delta BGC\right)=\frac{1}{3}ar\left(\Delta ABC\right)$$

27. The average score of girls in class examination in a school is 67 and that of boys is 63. The average score for the whole class is 64.5 find the percentage of girls and boys in the class.
28. The weekly pocket expenses of students are given below:

POCKET EXPENSES (in Rs.)	45	40	59	71	58	47	65	
NO. OF STUDENTS		7	4	10	6	3	8	1

Find the probability that the weekly pocket expenses of a student are
(a) (i) Rs 59 (ii) more than Rs 59 (iii) less than Rs 59
(b) Find the sum of probabilities computed in (i), (ii), and (iii)s

SECTION-E (10 Marks)

(Open Text from Chapter-8 Quadrilaterals)

(*Please ensure that open text of the given theme is supplied with this question paper.)

29. OTBA Question
30. OTBA Question
31. OTBA Question

Sample Question Paper 03
Class -IX Mathematics
Summative Assessment – II

Solution

SECTION-A

Question number **1** to **4** carry **one** mark each.

1. $\frac{Volume\ of\ Cube}{Volume\ of\ the\ sphere} = \frac{a^3}{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3} = \frac{6}{\pi}$ (Let edge of cube be **a** then radius of sphere $=\frac{a}{2}$)

   ∴ Required ratio = 6 : π

2. $Mean = \frac{1+2+3+4+5}{5} = \frac{15}{5} = 3$

3. Multiples of 3 on a die **=** 3, 6

   $\therefore P(\text{a multiple of } 3) = \frac{2}{6} = \frac{1}{3}$

4. As diagonals of quadrilateral ABCD bisect each other. Therefore ABCD is a a $||^{gm}$

   ∠A + ∠B = 180° (co-interior angles)
   35° + ∠B = 180°
   ⇒∠B = 180° - 35°
   ⇒∠B = 145°

SECTION-B

Question number **5** to **10** carry **two** marks each.

5. As (2k – 3, k + 2) lies on the line 2x + 3y + 15 = 0
   So, putting x = 2k – 3 and y = k + 2 in equation, we get
   ⇒ 2(2k – 3) + 3(k +2) + 15 = 0
   ⇒ 4k – 6 + 3k + 6 + 15 = 0
   ⇒ 7k + 15 = 0

   $7k = -15 \quad \Rightarrow \quad k = -\frac{15}{7}$

6. The point where the given linear equation in two variables meets at x- axis, they y co-ordinates will be 0.

   ∴ 3x + 4y = 11
   ⇒ 3x – 4(0) =11
   $3x = 11$

$x = \frac{11}{3}$

Hence the required point is $\left(\frac{11}{3}, 0\right)$

7. In ΔPAB and ΔPDC

AB = DC

$\angle ABP = \angle DCP$ [Angle in the same segment

$\angle PAB = \angle PDC$ [Angle in the same segment

$\Delta PAB \cong \Delta PDC$ [ASA criterion]

8. Given that $ar\left(\Delta ABC\right) = ar\left(\Delta DEF\right)$

$\frac{1}{2} \times AB \times AM = \frac{1}{2} \times EF \times DN$

$\frac{1}{2} \times 8 \times 5 = \frac{1}{2} \times 10 \times DN$

20 = 5DN

DN = 4 cm

9. The line parallel to the y – axis at a distance of 4 units from the origin and on the right of the y - axis is given by x = 4.

Putting x = 4 in 2x + 3y = 9, we get

2 × 4 + 3y = 9

⇒3y = 9 – 8

$\Rightarrow y = \frac{1}{3}$

∴ The required point is $\left(4, \frac{1}{3}\right)$

10. 6, 14, 15, 17 x + 1, 2x – 13, 30, 32, 34, 43

Here, n = 10

Since the number of observations is 10 (an even number), therefore, the median

$= \dfrac{\left(\frac{10}{2}\right)^{th} observation + \left(\frac{10}{2}+1\right)^{th} observation}{2}$

$= \dfrac{5^{th} observation + 6^{th} observation}{2}$

$=24 = \dfrac{x+1+2x-13}{2} =48$

=3x – 12

3x = 48 + 12 = 60

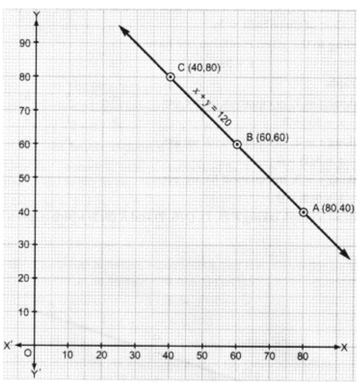
x =20

SECTION-C

Question numbers **11** to **18** carry **three** marks each.

11. Let the runs scored by Rahul be x and that by Anil be y.
According to the given condition, we have
$x + y = 120$
$\Rightarrow x = 120 - y$ ... (i)
For graph, taking y = 40, we get
$x = 120 - 40 = 80$
Again, taking y = 60, we get
$x = 120 - 60 = 60$
and taking y = 80, we get
$x = 120 - 80 = 40$

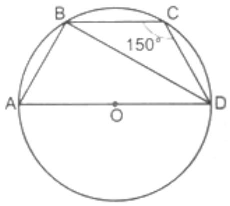
x	80	60	40
y	40	60	80
	A	B	C



12. $3x + 2y = 18$
In standard form
$3x + 2y - 18 = 0$
Or $3x + 2y + (-18) = 0$
But standard linear equation is
$ax + by + c = 0$
On comparison we get, a = 3, b = 2 , c = -18
If (4, 3) lie on the line, i.e., solution of the equation LHS = RHS
$\therefore 3(4)+ 2 (3) = 18$
$12 + 6 = 18$
$18 = 18$
As LHS = RHS, Hence (4, 3) is the solution of given equation.

Again for (1, 2)
3x + 2y = 18
$\therefore$ 3(1) + 2(2) = 18
3 + 4 = 18
7 = 18
LHS ≠ RHS
Hence (1, 2) is not the solution of given equation.

13. (i) Join BD



Now, ABCD is a cyclic quadrilateral.
$\angle BAD + \angle BCD = 180°$ (Opposite angles of a cyclic quadrilateral)
$\angle BAD + 150° = 180°$
$\angle BAD = 180° - 150° = 30°$
(ii) $\angle ABD = 90°$ (Angle in a semicircle)
Now, in ΔABD, we have
$\angle ABD + \angle BAD + \angle ADB = 180°$
$90° + 30° + \angle ADB = 180°$
$\angle ADB = 180° - 120° = 60°$

14. Let the radius of the cone (r) = 3x cm
Height of the cone (h) = 4x cm
Volume of the cone = $\frac{1}{3}\pi r^2 h$
301.44 = $\frac{1}{3} \times 3.14 \times (3x)^2 .4x$
$x^3 = \frac{301.44}{3.14 \times 12}$ =8
$x^3 = 2^3$
x = 2cm
Radius of the cone = 3x = 3×2 = 6 cm
Height of the cone = 4x = 4×2 = 8 cm
Slant height of the cone (l) = $\sqrt{r^2 + h^2} = \sqrt{6^2 + 8^2} = \sqrt{100} = 10cm$

15. Each side of the cube (a) - 5 cm
Diameter of the sphere (2r) = 5 cm
$\therefore$ Radius of the sphere $(r) = \frac{5}{2} cm$

Volume of the cube = $a^3 = 5^3\ cm^3 = 125\ cm^3$

Volume of the sphere $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\times\frac{22}{7}\times\left(\frac{5}{2}\right)^3$

$= \frac{4}{3}\times\frac{22}{7}\times\frac{5}{2}\times\frac{5}{2}\times\frac{5}{2}$

$= 65.476\ cm^3$

= Volume of gap between cube and sphere = $125.000\ cm^3 - 65.476\ cm^3$

$= 59.524\ cm^3$

16. Let the radius of sphere and cylinder be r and h be the height of cylinder. Then according to the question.

Volume of sphere = Volume of cylinder

$\Rightarrow \frac{4}{3}\pi r^3 = \pi r^2 h \quad \Rightarrow r = \frac{3}{4}h$

Diameter of the cylinder $= \frac{3}{2}h$

Difference between the diameter and height of the cylinder $= \frac{3}{2}h - h = \frac{h}{2}$

Percentage by which the diameter exceeds the height of cylinder

$= \frac{\frac{h}{2}}{h}\times 100 = \frac{h}{2}\times\frac{1}{h}\times 100 = 50\%$

Thus, the diameter of the cylinder exceeds its height by 50%.

17. If m is mid-point of a class and h is the class size, lower and upper limits of the class intervals are $m - \frac{h}{2}$ and $m + \frac{h}{2}$ respectively.

Class size (h) = 15 – 5 = 10

So, the class interval formed for the mid-point 5 is $\left(5 - \frac{10}{2}\right) - \left(5 + \frac{10}{2}\right)$

i.e., 0 – 10

Continuing in the same manner, the continuous classes formed are:

Class interval	0–10	10–20	20–30	30–40	40–50
Frequency	4	8	13	12	6

18. (i) P (a carton has no defective bulb) $= \frac{400}{700} = \frac{4}{7}$

(ii) P (defective bulbs from 2 to 6) = P (2 defective bulbs) + P (3 defective bulbs) + P (4 defective bulbs) + P (5 defective bulbs) + P (6 defective bulbs)

$=\frac{48}{700}+\frac{41}{700}+\frac{18}{700}+\frac{8}{700}+\frac{3}{700}$

$=\frac{118}{700}=\frac{59}{350}$

(iii) P (defective bulbs less than 4)

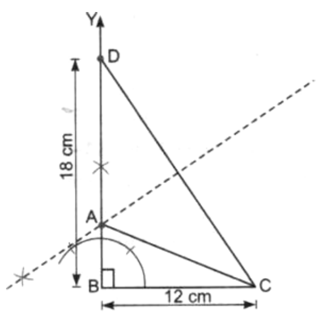
= P (no defective bulb) + P (1 defective bulb) + P (2 defective bulbs) + P (3 defective bulbs

$=\frac{400}{700}+\frac{180}{700}+\frac{48}{700}+\frac{41}{700}=\frac{669}{700}$

SECTION-D

Question numbers **19** to 28 carry **four** marks each.

19.



Steps of Construction

(i) Draw BC = 12cm.

(ii) Construct $\angle CBY = 90°$.

(iii) From ray BY, cut-off line segment BD = 18 cm.

(iv) Join CD.

(v) Draw the perpendicular bisector of CD intersecting BD at A.

(vi) Join AC to obtain the required ΔABC

Justification

Since A lies on the perpendicular bisector of CD.

Therefore,

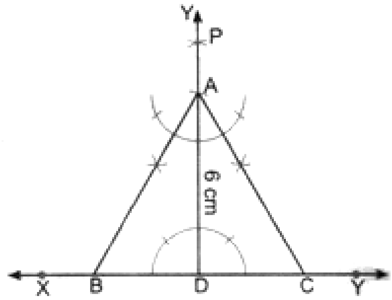
AD = AC

Now, BD = BA + AD

⇒ BD = AB + AC

Hence, ΔABC is the required triangle.

20.



Steps of Construction

(i) Draw a line XY.

(ii) Construct perpendicular PD at any point D on the line XY.

(iii) From point D, cut-off line segment AD = 6 cm.

(iv) Construct $\angle BAD = \angle CAD = 30^\circ$

Then ABC is the required triangle.

Justification

As $\angle A = \angle BAD + \angle CAD = 30^\circ + 30^\circ = 60^\circ$ and $AD \perp BC$ therefore, ΔABC is an equilateral triangle with altitude AD = 6 cm.

21. Let AC and BD bisect each other at point 0. Then,

OA=OC and OB = OD ... (i)

In triangles AOB and COD we have,

OA=OC

OB=OD

$\angle AOB = \angle COD$ (Vertically opposite angles)

$\Delta AOB \cong \Delta COD$ (SAS congruence criterion) (CPCT)

AB = CD (CPCT)

$\widehat{AB} \cong \widehat{CD}$ …….. (ii)

Similarly, BC = DA

$\widehat{BC} \cong \widehat{DA}$ ……... (iii)

From (ii) and (iii), we have

$\widehat{AB} + \widehat{BC} \cong \widehat{CD} + \widehat{DA}$

$\widehat{ABC} \cong \widehat{CDA}$

AC divides the circle into two equal parts.

AC is the diameter of the circle. Similarly, we can prove that BD is also a diameter of the circle.

Since AC and BD are diameters of the circle.

$\angle ABC = 90^\circ = \angle ADC$

Also, $\angle BAD = 90^\circ = \angle BCD$

Also, AB = CD and BC = DA (Proved above)

Hence, ABCD is a rectangle.

22. Let the radius of the base of the cylinder be 2x cm.

$\therefore$ Height of the cylinder =3x cm.

Volume of the cylinder = $\pi r^2 h$ cu units

= $\frac{22}{7}\times(2x)^2\times 3x$ cu cm.

= $\frac{22}{7}\times 4x^2\times 3x$ cu cm.

= $\frac{264}{7}x^3$ cu cm

Therefore, by the given condition

$\frac{264}{7}x^3 = 1617$

$x^3 = \frac{1617\times 7}{264} = \frac{49\times 7}{8} = \left(\frac{7}{2}\right)^3$

$\therefore$ x = $\frac{7}{2}$

Or

Thus radius = $2\times\frac{7}{2} = 7cm$

and height = $3\times\frac{7}{2} = \frac{21}{2}$ cm

Total surface area = $2\pi r(r+h)$ sq units

= $2\times\frac{22}{7}\times 7\times\left(7+\frac{21}{2}\right)$ sq cm.

= $44\times\frac{35}{2}$ *sq cm.*

= 770 sq cm.

Thus total surface area of the cylinder = 770 sq cm.

23. Let the total distance covered = x km

The total fare charged = Rs y

Since for the first kilometer, fare charged is ₹10, therefore for remaining

According to the question

y = 10 + 4(x – 1) = 10 + 4x – 4

y = 4x + 6

When x = 0, we have, y = 4 × 0 + 6, so y = 6

When x = - 1, we have, y = 4(- 4) + 6 = - 4 + 6

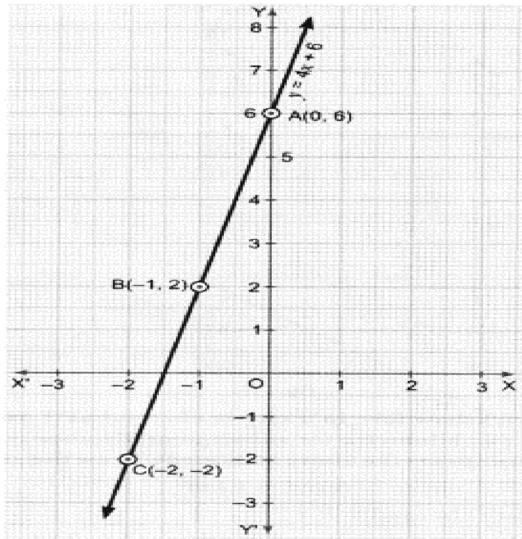
y = 2

When x = - 2, we have, y = 4 (- 2) + 6

⇒ y = - 2

x	0	-1	-2

y	6	2	-2



Represents the graph of the linear equation y = 4x + 6.

24. Total volume of 27 iron spheres =Volume of new sphere

Volume of each original sphere $= \frac{4}{3}\pi r^3$

Volume of 27 spheres = $27 \times \frac{4}{3}\pi r^3 = \frac{108}{3}\pi r^3$

Volume of new sphere $= \frac{108}{3}\pi r^3$

$\frac{4}{3}\pi (r')^3 = \frac{108}{3}\pi r^3$

$(r')^3 = \frac{108}{3}\pi r^3 \times \frac{3}{4\pi}$

$= 27r^3$

$(i) \quad r' = 3r$

(ii) Surface area of original sphere $(s) = 4\pi r^2$

Surface area of new sphere $(s') = 4\pi (r')^2$

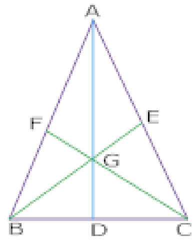
$= 4\pi (3r)^2$

$= 36\pi r^2$

$\therefore$ Ratio of S and $S' = \frac{4\pi r^2}{36\pi r^2} = \frac{1}{9}$

$= 1:9$

25. AD is median



$ar(\Delta ABD) = ar(\Delta ACD)..........(i)$

GD is median

$ar(\Delta GBD) = ar(\Delta GCD).........(ii)$

Subtracting (ii) and (i)

$ar(\Delta ABD) - ar(\Delta GBD) = ar(\Delta ACD) - ar(\Delta GCD)$

$ar(\Delta ABG) = ar(\Delta AGC)..........(iii)$

$ar(\Delta AGB) = ar(\Delta BGC)..........(iv)$

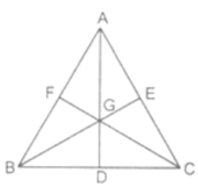
From (iii) and (iv)

$ar(\Delta AGB) = \frac{1}{3}(ar\Delta ABC)$

26. **Given:** A ΔABC in which medians AD, BE and CF intersect at G.

To prove: $ar(\Delta AGC) = ar(\Delta AGB) = ar(\Delta BGC) = \frac{1}{3} ar(\Delta ABC)$

Proof: In ΔABC, AD is the median.



As a median of a triangle divides it into two triangles of equal area.

$\therefore$ $ar(\Delta ABD) = ar(\Delta ACD)$ ………………. (i)

In ΔGBC, GD is the median

$\therefore$ $ar(\Delta GBD) = ar(\Delta GCD)$ ……………….. (ii)

Subtracting (ii) from (i), we get

$ar(\Delta ABD) - ar(\Delta GBD) = ar(\Delta ACD) - ar(\Delta GCD)$

$ar(\Delta AGB) = ar(\Delta AGC)$ ………………… (iii)

Similarly, $ar(\Delta AGB) = ar(\Delta BGC)$ ……………….. (iv)

From (iii) and (iv), we get

$ar(\Delta AGB) = ar(\Delta BGC) = ar(\Delta AGC)$ ………………… (v)

But, $ar(\Delta AGB) + ar(\Delta BGC) + ar(\Delta AGC) = ar(\Delta ABC)$ ……………………… (vi)

From (v) and (vi), we get

$3ar(\Delta AGB) = ar(\Delta ABC)$

$ar(\Delta AGB) = \frac{1}{3} ar(\Delta ABC)$

Hence, $ar(\Delta AGB) = ar(\Delta AGC)$

$ar(\Delta BGC) = \frac{1}{3} ar(\Delta ABC)$

27. Let the number of girls and boys be n_1 and n_2 respectively.

We have:

$\overline{X}_1$ = Average score of girls = 67

$\overline{X}_2$ = Average score of boys = 63

$\overline{X}$ = Average score of the whole class = 64.5

$\overline{X} = \frac{n_1 \overline{X}_1 + n_2 \overline{X}_2}{n_1 + n_2}$

64.5 = $\overline{X} = \frac{67n_1 + 63n_2}{n_1 + n_2}$

$64.5n_1 + 64.5n_2 = 67n_1 + 63n_2$

$2.5n_1 = 1.5n_2$

$25n_1 = 15n_2$

$5n_1 = 3n_2$

Total number of students in the class = $n_1 + n_2$

$\therefore$ Percentage of girls = $\frac{n_1}{n_1 + n_2} \times 100$

$= \frac{n_1}{n_1 + \frac{5n_2}{3}} \times 100 \quad [\therefore 5n_1 = 3n_2]$

$= \frac{3n_1}{3n_1 + 5n_1} \times 100$

$= \frac{3}{8} \times 100 = 37.5$

And percentage of boys,

$= \frac{n_2}{\frac{3n_2}{5} + n_2} \times 100$

$= \dfrac{5n_2}{3n_2 + 5n_2} \times 100$

$= \dfrac{n_2}{n_1 + n_2} \times 100$

= 62.5

28. (a) No. of students = 39

∴ No. of trials = 39

(i) Number of students with weekly pocket expenses of Rs 59 = 10

∴ P (the weekly pocket expenses of a student are Rs 59) $= \dfrac{10}{39}$

(ii) No. of students with weekly pocket expenses of more than Rs 59 = 6+1=7

∴ P (the weekly pocket expenses of a student are more than Rs 59) $= \dfrac{7}{39}$

(iii) Number of students with weekly pocket expenses of less than Rs 59

$= 7 + 4 + 3 + 8 = 22$

∴ P (the weekly pocket expenses of a student are less than Rs 59) $= \dfrac{22}{39}$

(b) Sum of probabilities in (i), (ii), and (iii)

$= \dfrac{10}{39} + \dfrac{7}{39} + \dfrac{22}{39} = \dfrac{39}{39} = 1$