***PIE CHART***

***Summary:***

*A pie chart shows information using sectors of a circle.*

***EXAMPLES:***

***1.*** *The pie chart below shows the various items sold by a certain shop*

 **80°**

***120°***

***Pens***

***Bibles***

***Books***

 *If the total sale value of the items was* ***sh 720,000,*** *find the sales value of****:***

 ***(i)*** *pens*

***(ii)*** *books*

***2.*** *The pie-chart below shows the daily expenditure of a certain family.*

**130°**

***150°***

***Food***

***Others***

***Bread***

 *If* ***sh 2000*** *is spent on bread, find that:*

***(i)*** *total daily expenditure of the family*

***(ii)*** *daily expenditure of the family on food*

***3.*** *The pie chart below shows the number of students taking various subjects in a certain class*

 **90°**

***150°***

***CRE***

***ECON***

***MATH***

 *If the number of students taking* ***C⋅R⋅E*** *is* ***120,*** *find the****:***

 ***(i)*** *population of the students in the class*

***(ii)*** *number of students taking mathematics*

***4.*** *The pie chart below shows the number of voters for party* ***A, B*** *and* ***C*** *in an election*

 **66°**

***144°***

***B***

 ***A***

 ***C***

 *Find the**percentage of voters for party* ***C***

***6.*** *A family spends its income on the following items in a month*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Items***  | ***food*** | ***wages*** | ***travel*** | ***others*** |
| ***Amount (sh)*** | ***42,000*** | ***9,000*** | ***6,000*** | ***4,000*** |

 *Show the family’s expenditure in a pie chart*

***EER:***

***1.*** *The pie chart below shows the number of voters for party* ***A, B*** *and* ***C*** *in an election*

**120°**

***150°***

***B***

 ***A***

 ***C***

 *If the total number of votes is* ***300,*** *find the**number**of votes for party* ***C***

***2.*** *A family spends its income on the following items in a month*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Items***  | ***food*** | ***wages*** | ***travel*** | ***Others*** |
| ***Amount (sh)*** | ***35,000*** | ***12,000*** | ***10,000*** | ***15,000*** |

 *Show the family’s expenditure in a pie chart*

***3.*** *The pie chart below shows the number of voters from polling stations* ***A, B, C,******D*** *and* ***E*** *in a constituency****.***

***A***

***B***

***C***

***D***

***E***

***93º***

***18º***

***106º***

***82º***

 *If the number of voters in station* ***A*** *is* ***6,231,*** *determine the****:***

***(i)*** *voter population in the constituency.*

***(ii)*** *number of voters in polling station* ***C.***

***4.*** *A company’s cost is split as follows****:***

 *Wages* ***45%***

 *Food* ***30%***

 *Travel* ***15%***

 *Others* ***10%***

*Show this information in a pie chart*

***7.*** *The pie-chart below shows the daily expenditure of a certain family.*

***150o***

***Food***

***Bread***

***Others***

***130o***

 *If* ***sh 2000*** *is spent on bread, find the****:***

***(i)*** *total daily expenditure of the family*

***(ii)*** *daily expenditure of the family on food*

***5.*** *The expenditure of a certain football club is as follows****:***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Items***  | ***food*** | ***wages*** | ***travel*** | ***others*** |
| ***Amount (sh)*** | ***35,000*** | ***12,000*** | ***10,000*** | ***15,000*** |

 *Draw a pie chart showing the club’s expenditure*

***STATISTICS***

***Summary:***

 ***1.*** *For a set of* ***n*** *values****:***

***(i)*** *mean* ***(Average)***

 ***(ii)*** *Median is the middle value when the given data is listed in order of*

 *magnitude. If the number of items is even, the average of the middle two is*

 *used.*

 ***(iii)*** *Mode is the value that occurs most frequently.*

 *There can be more than one mode in a given data.*

 ***(iv)*** *Range is the difference between the largest and smallest values*

***EXAMPLES:***

***1.*** *Find the mean, mode and median of the following numbers****: 7, 8, 10, 12*** *and* ***8.***

***2.*** *Find the mean, mode and median of the following numbers****: 31, 28, 30, 33, 25*** *and* ***30.***

***3.*** *The mean of* ***3, 7, 10, 8*** *and* ***x*** *is* ***6.*** *Find* ***x***

***4.*** *The marks scored by a boy in four tests were* ***45, 70, 35*** *and* ***40.*** *When he does a fifth test the mean mark**of the five tests is* ***50.*** *Find his scored mark in the fifth test*

***5.*** *If the mean of* ***6*** *numbers is* ***30,*** *find the sum of these numbers*

***6.*** *The mean marks for a French test in a class of* ***30*** *boys and* ***20*** *girls are* ***60*** *and* ***70*** *respectively. Find the mean mark for the whole class*

***Soln:***

*Required mean*

***7.*** *In a class of boys and girls, the average age is The class has* ***12*** *boys whose average age is Find the size of the class, if the average age of the girls is* ***15*** *years.*

***Soln:***

*If n = number of girls*

*⇒*

***n = 30***

***∴*** *Class size = 12 + 30 =* ***42***

***8.*** *The mean age of a class of* ***30*** *students is* ***16*** *years* ***3*** *months****.*** *If* ***12*** *students whose mean age is* ***14*** *years* ***6*** *months left the class****,*** *find the mean age of those who remained****.***

***Soln:***

*Required mean*

***9.*** *The mean weight of a class of* ***30*** *boys is* ***x kg.*** *When two boys with a total weight of* ***150kg*** *are absent****,*** *the mean weight of those present is* ***2kg*** *less than the mean weight of the whole class. Find the value of* ***x.***

***Soln:***

*If mean for those present = x − 2*

 *⇒*

***∴******x*** *=* ***47***

***EER:***

***1.*** *The mean of* ***n*** *numbers is* ***5.*** *If the number* ***13*** *is included with the* ***n*** *numbers,*

 *the new mean is* ***6.*** *Find the value of* ***n.***

***2.*** *In a set of* ***10*** *numbers****,*** *the mean of* ***6*** *numbers is* ***64.5*** *and that of the* ***10***

*numbers is* ***68.*** *Find the mean of the other four numbers.*

*3. The mean of* ***3, 7, 3, x, 8, 10*** *and* ***x*** *is* ***7.*** *Find* ***x***

***4.***  *The mean heights of* ***20*** *boys and* ***15*** *girls are* ***1⋅60m*** *and* ***1⋅52m*** *respectively.*

 *Find the mean height of the* ***35*** *boys and girls.*

***5.*** *The average age of* ***6*** *men is* ***45*** *and* ***5*** *of the men are* ***47, 40, 38, 46*** *and* ***43***

*years old. Find the age of the sixth man.*

***6.*** *The average age of* ***6*** *men is* ***37*** *and one of them is* ***42*** *years old. Find the average age of the other five men.*

***7.*** *The average age of a class of* ***30*** *boys is* ***14*** *years* ***4*** *months. If five boys whose*

*average age is* ***15*** *years* ***2*** *months leave the class, find the average age of the* ***25***

*remaining boys****.***

***8.*** *In a class of* ***30*** *students, there are* ***20*** *boys whose average age is* ***19*** *years* ***7*** *months and the rest are girls****.*** *Given that the mean age for the whole class is* ***18*** *years* ***4*** *months****,*** *find the mean age of the girls in the class****.***

***9.*** *A class of* ***15*** *boys took an examination in which* ***7*** *boys got an average mark of* ***40*** *and* ***7*** *others got an average mark of* ***50.*** *The average mark for the whole class was* ***46.***  *How many marks did the other boy get****?***

***10.*** *The mean of four numbers is* ***20.*** *If two other numbers* ***(x + 3)*** *and* ***(x + 2)*** *are added****,*** *the new mean is* ***30.*** *Find the value of* ***x.***

***FREQUENCY DISTRIBUTION TABLES***

***Summary:***

***1.*** *A frequency table shows a summary of values and their frequency*

***2. (i)*** *Data that is listed is called ungrouped data*

***(ii)*** *Data that is grouped together in classes is called grouped data*

***3.*** *The following terms may be needed****:***

 ***(i)*** *Class boundaries are class groups in continuous form*

 ***(ii)*** *Class width = upper class boundary − lower class boundary*

 ***(iii)*** *Cumulative frequency is obtained by adding frequencies as you go along*

***4.*** *In a frequency distribution table****,*** *mean can be computed as follows****:***

 ***(i)*** *mean* *where*

 ***f = f****requency* ***(****number of times of occurrence****)***

 ***x =*** *class mid values*

***(ii)*** *mean * *where*

 ***A =*** *assumed mean or working mean*

 ***d = x − A*** *(deviation)*

***5. (i)*** *The class which contains the mode is called the modal class*

 ***(ii)*** *The modal class is the one with the highest frequency*

*6****.*** *For grouped data****,*** *mode is calculated as follows****:***

 ***(i)*** *Determine the modal class*

***(ii)*** * where*

***L =*** *lower boundary of the modal class*

*****=*** *modal frequency − premodal frequency*

 *****=*** *modal frequency − post modal frequency*

***C =*** *modal class width*

***7. (i)*** *The class which contains the median is called the median class*

***(ii)*** *The median class corresponds to a cumulative frequency of *

***8.*** *For grouped data****,*** *median is calculated as follows****:***

 ***(i)*** *Determine the median class*

***(ii)*** ***where*

 ***L =*** *lower boundary of the median class*

 ***=*** *total frequency*

 *****=*** *cumulative frequency before the median class*

 *****=*** *frequency within the median class*

***C =*** *median class width*

***9 (i)*** *The cumulative frequency curve* ***or*** *an ogive is a curve where cumulative frequencies are plotted against the upper class boundaries. It can estimate the median*

 ***(ii)*** *A histogram consists of bars with frequency as the vertical and class boundaries as the horizontal. It can estimate the mode*

 ***(iii)*** *A frequency polygon is a line graph drawn by plotting frequency against class mid values.*

***NOTE:***

***(a)*** *The points are joined by straight lines.*

***(b)*** *The polygon extends to the next lower and higher classes with zero frequencies*

 ***EXAMPLES:***

***1.*** *The marks of students in a test were as follows****:***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Marks*** | ***4*** | ***5*** | ***6*** | ***7*** | ***8*** |
| ***No of students*** | ***2*** | ***6*** | ***4*** | ***5*** | ***3*** |

***(a)*** *State the modal mark*

***(b)****Find the****:***

***(i)*** *mean mark*

***(ii)*** *median mark*

***2.*** *The marks of students in a test were as follows****:***

|  |  |  |  |
| --- | --- | --- | --- |
| ***Marks*** | ***3*** | ***4*** | ***5*** |
| ***No of students*** | ***3*** | ***x*** | ***4*** |

 *Given that the mean mark is* ***4⋅1,*** *find* ***x***

***3.*** *The ages in years of* ***40*** *students were as follows****:***

 ***12 13 14 12 15 14 13 16 14 15***

 ***13 14 16 15 14 12 13 14 15 13***

 ***15 16 15 14 15 12 15 13 12 15***

 ***13 15 12 15 16 14 15 14 16 14***

***(a)*** *Form an ungrouped frequency distribution table for the data*

 ***(b)*** *State the modal mark*

 ***(c)*** *Find the****:***

***(i)*** *mean mark*

***(ii)*** *median mark*

***4.*** *The marks of students in a test were as follows****:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Marks*** | ***5*** | ***8*** | ***10*** | ***14*** | ***18*** | ***20*** |
| ***No of students*** | ***2*** | ***5*** | ***12*** | ***3*** | ***11*** | ***7*** |

 *Calculate the mean mark using an assumed mean of* ***10,***

***5.*** *The age distribution of* ***40*** *adults were as follows****:***

|  |  |  |
| --- | --- | --- |
| ***Age*** | ***Frequency*** | ***Cumulative frequency*** |
| ***20 − 29*** | ***4*** | ***4*** |
| ***30 − 39*** | ***12*** | ***16*** |
| ***40 − 49*** | ***8*** | ***…………*** |
| ***50 − 59*** | ***9*** | ***…………*** |
| ***60 − 69*** | ***7*** | ***…………*** |

 ***(a)*** *Copy and complete the cumulative frequency column*

 ***(b)*** *State the****:***

 ***(i)*** *class width*

 ***(ii)*** *modal class*

 ***(c)*** *Determine the median class*

***(d)*** *Calculate the****:***

***(i)*** *mean*

 ***(ii)*** *mode*

 ***(iii)*** *median*

***(c)*** *Display the data on a histogram and use it to estimate the mode.*

***(d)*** *Draw an ogive for the data and use it to estimate the median*

 ***(e)*** *Display the data on a frequency polygon*

***6.*** *The marks of* ***40*** *students were as follows****:***

***26 11 10 12 14 16 20 25***

***21 22 13 17 18 27 30 32***

***27 35 40 44 39 28 37 26***

***44 37 36 39 28 46 32 15***

***16 19 34 43 26 38 48 40***

 ***(a)*** *Form a frequency distribution table with a lower class of* ***10 − 14.***

 ***(b)*** *Calculate the****:***

***(i)*** *mean*

 ***(ii)*** *mode*

 ***(iii)*** *median*

***(c)*** *Display the data on a histogram and use it to estimate the mode.*

***(d)*** *Plot an ogive for the data and use it to estimate the median*

***7.*** *The age distribution of* ***40*** *adults were as follows****:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Ages*** | ***2⋅0− 2⋅4*** | ***2⋅5− 2⋅9*** | ***3⋅0− 3⋅4*** | ***3⋅5− 3⋅9*** | ***4⋅0− 4⋅4*** | ***4⋅5− 4⋅9*** |
| ***Frequency*** | ***8*** | ***9*** | ***10*** | ***6*** | ***12*** | ***5*** |

 ***(a)*** *State the****:***

 ***(i)*** *class width*

 ***(ii)*** *modal class*

 ***(b)*** *Determine the median class*

***(c)*** *Calculate the****:***

***(i)*** *mean*

 ***(ii)*** *mode*

 ***(iii)*** *median*

***(d)*** *Display the data on a histogram and use it to estimate the mode.*

***(e)*** *Draw an ogive for the data and use it to estimate the median*

***8.*** *The cumulative distribution table shows the marks scored by* ***50*** *students.*

|  |  |
| --- | --- |
| ***Marks*** | ***Cumulative frequency*** |
| ***30 − 39*** | ***5*** |
| ***40 − 49*** | ***13*** |
| ***50 − 59*** | ***23*** |
| ***60 − 69*** | ***39*** |
| ***70 − 79*** | ***46*** |
| ***80 − 89*** | ***50*** |

***(a)*** *Draw an ogive for the above data and use it to estimate the****:***

***(i)*** *median mark*

***(ii)*** *pass mark of the test if* ***39*** *students passed*

***(iii)*** *number of students who scored* ***75*** *marks and above*

***(b)*** *Form a frequency distribution table for the above data to calculate the mean* *mark*

***9.*** *The weights in kg of* ***40*** *students were as follows****:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Weights*** | ***30 − 39*** | ***40 − 49*** | ***50 − 59*** | ***60 − 69*** | ***70 − 79*** | ***80 − 89*** |
| ***Frequency*** | ***1*** | ***7*** | ***9*** | ***8*** | ***10*** | ***5*** |

*Calculate the mean weight using an assumed mean of* ***54⋅5***

***10.*** *The weights of* ***40*** *students were as follows****:***

***50 51 50 52 54 56 60 65***

***61 62 53 57 58 64 70 72***

***67 75 67 70 56 66 65 69***

***72 77 76 57 66 68 62 55***

***56 59 74 73 78 66 67 74***

 ***(a)*** *Form a frequency distribution table with class width of* ***5*** *starting with**class of* ***50 − 54***

 ***(b) (i)*** *Display the data on a histogram and use it to estimate the mode*

***(c)*** *Calculate the****:***

***(i)*** *mean using a working mean of* ***62***

 ***(ii)*** *mode*

***(iii)*** *median*

***EER:***

***1.*** *The weights in kg of* ***50*** *babies in a maternity ward were as follows:*

|  |  |  |
| --- | --- | --- |
| ***Age*** | ***Frequency*** | ***Cumulative frequency*** |
| ***2⋅0 − 2⋅4*** | ***8*** | ***…………*** |
| ***2⋅5 − 2⋅9*** |  ***9*** | ***…………*** |
| ***3⋅0 − 3⋅4*** | ***10*** | ***…………*** |
| ***3⋅5 − 3⋅9*** | ***6*** | ***…………*** |
| ***4⋅0 − 4⋅4*** | ***12*** | ***…………*** |
| ***4⋅5 − 4⋅9*** | ***5*** | ***…………*** |

***(a)*** *Copy and complete the cumulative frequency column*

 ***(b)*** *State the****:***

 ***(i)*** *class width*

 ***(ii)*** *modal class*

 ***(c)*** *Determine the median class*

***(b)*** *Calculate the****:***

***(i)*** *mean*

 ***(ii)*** *mode*

 ***(iii)*** *median*

***(c)*** *Display the data on a histogram and use it to estimate the mode.*

***(d)*** *Plot an ogive for the data and use it to estimate the median*

***(e)*** *Display the data on a frequency polygon*

***2.*** *The weights in kg of* ***50*** *students were as follows****:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  ***Weights*** | ***20 − 24*** | ***25 − 29*** | ***30 − 34*** | ***35 − 39*** | ***40 − 44*** | ***45 − 49*** |
| ***Frequency*** | ***8*** | ***9*** | ***10*** | ***6*** | ***12*** | ***5*** |

 ***(a)*** *Calculate the****:***

***(i)*** *mean*

***(ii)*** *mode*

***(iii)*** *median*

 ***(b)*** *Display the data on a histogram and use it to estimate the mode*

***(c)*** *Display the data on an ogive and use it to estimate the median*

***3.*** *The age distribution of* ***40*** *adults were as follows****:***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Age*** | ***F*** | ***x*** | ***fx*** | ***Cumulative frequency*** |
| ***20 − 29*** | ***4*** | ***24⋅5*** | ***98*** | ***4*** |
| ***30 − 39*** | ***12*** | ***……...*** | ***…………*** | ***16*** |
| ***40 − 49*** | ***……......*** | ***44⋅5*** | ***356*** | ***…………*** |
| ***50 − 59*** | ***9*** | ***……...*** | ***…………*** | ***…………*** |
| ***60 − 69*** | ***……......*** | ***64⋅5*** | ***451⋅5*** | ***…………*** |
|  | ***∑f = ……*** |  | ***∑fx =……..*** |  |

 ***(a)*** *Copy and complete the frequency distribution table above*

 ***(b)*** *State the****:***

 ***(i)*** *class width*

 ***(ii)*** *modal class*

 ***(c)******(i)*** *Determine the median class*

***(ii)*** *Calculate the mean age*

***4.*** *The cumulative distribution table shows the marks scored by* ***50*** *students.*

|  |  |
| --- | --- |
| ***Marks*** | ***Cumulative frequency*** |
| ***30 − 39*** | ***5*** |
| ***40 − 49*** | ***13*** |
| ***50 − 59*** | ***23*** |
| ***60 − 69*** | ***39*** |
| ***70 − 79*** | ***46*** |
| ***80 − 89*** | ***50*** |

 ***(a)*** *Draw an ogive for the above data and use it to estimate the****:***

***(i)*** *median mark*

***(ii)*** *pass mark of the test if* ***39*** *students passed*

***(iii)*** *number of students who scored* ***75*** *marks and above*

***(b)*** *Form a frequency distribution table for the above data to calculate the mean* *mark*

***5.*** *The ages in years of* ***40*** *students were as follows****:***

 ***12 13 14 12 15 14 13 16 14 15***

 ***13 14 16 15 14 12 13 14 15 13***

 ***15 16 15 14 15 12 15 13 12 15***

 ***13 15 12 15 16 14 15 14 16 14***

 ***(a)*** *Form an ungrouped frequency distribution table for the data*

 ***(b)*** *Find the:*

 *(i) mode*

 *(ii) median*

***6.*** *The weights in kg of* ***50*** *babies in a maternity ward were as follows:*

 ***4⋅2 3⋅1 2⋅8 4⋅0 2⋅3 3⋅7 3⋅3 4⋅4 2⋅5 3⋅0***

***3⋅6 4⋅3 3⋅2 2⋅4 4⋅1 3⋅4 2⋅7 4⋅2 4⋅8 2⋅6***

***2⋅2 3⋅0 4⋅1 4⋅6 3⋅7 2⋅9 4⋅3 2⋅0 3⋅2 4⋅0***

***4⋅7 2⋅6 3⋅8 2⋅3 4⋅0 3⋅3 2⋅7 4⋅5 2⋅4 3⋅6***

***2⋅0 3⋅5 2⋅7 3⋅2 2⋅1 4⋅2 3⋅0 4⋅1 2⋅8 4⋅7***

 ***(a)*** *Form a frequency distribution table with class width* ***0⋅5*** *starting from* ***2⋅0− 2⋅4***

 ***(b)*** *Calculate the:*

 *(i) mean using an assumed mean of* ***3⋅2***

 *(ii) mode*

 *(iv) median*

***7.*** *The marks of* ***40*** *students were as follows****:***

***11 17 35 34 42 45 28 66***

***16 21 14 36 41 31 49 37***

***20 33 37 38 18 38 39 27***

***26 28 40 33 43 32 29 47***

***29 32 41 24 44 35 36 23***

 ***(a)*** *Form a frequency distribution table for the data starting with a class of* ***10− 14***

 ***(b)*** *State the****:***

***(i)*** *class width*

***(ii)*** *modal class*

***(c)*** *Determine the****:***

***(i)*** *mean mark*

***(ii)*** *median class*

 ***(d)*** *Display the data on a histogram and use it to estimate the mode*

***(e)*** *Draw an ogive for the data and use it to estimate the median*

***8.*** *The heights in* ***cm*** *of plants in a garden were as follows****:***

***10.3 9.7 10.2 9.8 10.1***

 ***9.9 10.1 9.9 10.1 10.2***

 ***10.3 10.0 10.2 10.1 9.8***

 ***9.9 10.1 10.0 10.1 9.9***

 ***10.1 10.1 10.1 10.1 9.9***

 ***9.8 9.8 10.0 9.9 10.2***

***(a)*** *Copy and complete the frequency distribution table below****:***

|  |  |  |  |
| --- | --- | --- | --- |
| *Time* ***(x)*** | *Frequency****(f)*** | *Cumulative frequency* | ***fx*** |
| ***9.7*** | ***…..*** | ***1*** | ***…..*** |
| ***9.8*** | ***4*** | ***5*** | ***…..*** |
| ***9.9*** | ***…..*** | ***…..*** | ***…..*** |
| ***10.0*** | ***3*** | ***…..*** | ***…..*** |
| ***10.1*** | ***…..*** | ***…..*** | ***…..*** |
| ***10.2*** | ***…..*** | ***…..*** | ***…..*** |
| ***10.3*** | ***…..*** | ***…..*** | ***…..*** |
|  |  |  |  |

***( b)*** *Use the table to;*

***(i)*** *State the modal height*

***(ii)*** *Calculate the mean and median height*

***9.*** *The marks of students in a test were as follows****:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Marks*** | ***3*** | ***4*** | ***5*** | ***6*** | ***7*** | ***8*** |
| ***No of students*** | ***2*** | ***3*** | ***6*** | ***4*** | ***3*** | ***2*** |

***(a)*** *State the modal mark*

***(b)****Find the****:***

***(i)*** *mean mark*

***(ii)*** *median mark*

***10.*** *The ages in years of* ***100*** *students were as follows****:***

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Age*** | ***12*** | ***14*** | ***16*** | ***18*** | ***20*** | ***22*** |
| ***Frequency*** | ***15*** | ***25*** | ***18*** | ***22*** | ***12*** | ***8*** |

 *Find the****:***

***(i)*** *mean age*

***(ii)*** *mode*

***(iii)*** *median*