***PERCENTAGES***

***Summary:***

***1. (i)*** *Percentage is a fraction whose denominator is* ***100.***

***(ii)*** *The symbol for percentage is written as* ***%.***

***2. (i)*** *To change a percentage into a fraction or decimal divide by* ***100.*** *Thus*

***75%*** *=  = * ***= 0⋅75***

***(ii)*** *To change a fraction or decimal into a percentage multiply by* ***100.*** *Thus*

* =  =****75%*** *and* ***0⋅75 = 0⋅75 × 100 = 75%***

***EXAMPLES:***

***1.*** *Express each percentage as a fraction in its simplest form*

***(i) 20% (ii) 25% (iii) 24% (iv) 12⋅5% (v)*** **

***2.*** *Express each percentage as a decimal*

***(i) 20% (ii) 25% (iii) 45% (iv) 48⋅5% (v)*** **

***3.*** *Express each fraction as a percentage*

***(i)*** ** ***(ii)*** ** ***(iii)*** ** ***(iv)*** ** ***(v)*** **

***4.*** *Express each decimal as a percentage*

***(i) 0⋅2 (ii) 0⋅25 (iii) 0⋅45 (iv) 0⋅125 (v)******0⋅4825***

***5. (i)*** *Find* ***35%*** *of* ***80***

***(ii)*** *Find* ***25%*** *of* ***120***

***6.*** *Express* ***20*** *as a percentage of* ***80***

***7.*** *In a bag of* ***120*** *eggs* ***30*** *are rotten. Find the percentage of rotten eggs*

***8.*** *In a test marked out of* ***60,*** *a student obtained* ***48****marks****.*** *Find his percentage mark*

***9.*** *In a class,* ***90*** *students are boys and* ***25%*** *are girls****.*** *Find the number of girls in the class*

***10.*** *In a school with a population of* ***4,000*** *students****,******60%*** *are boys****.******80%*** *of the boys and* ***25%*** *of the girls are day scholars****.*** *Find the****:***

***(i)*** *male students in the school*

***(ii)*** *female boarding students*

***(iii)*** *ratio of male day scholars to female day scholars*

***(iv)*** *number of boarders in the school*

***11.***  *A man spent* ***40%*** *of his salary on food****, 30%*** *of the remainder on fees and* ***25%*** *of the remainder on rent. If he was left with* ***Shs 252,000,*** *find****:***

***(i)*** *the man’s salary*

***(ii)*** *how much did he spend on rent*

***12.*** *The population in a village with three zones* ***A, B*** *and* ***C*** *is in the ratio* ***9:8:4. 80%*** *of the people in zone* ***A*** *are literate****, 40%*** *of the people in zone* ***B*** *are illiterate and* ***90%*** *of the people in zone* ***C*** *are literate. Find the percentage of literacy in the village.*

***Soln:***

***A : B: C = 9:8:4= 9y: 8y:4y***

***⇒*** *Population in****: A= 9y, B = 8y*** *and* ***C = 4y***

*Village population* ***=*** *9y + 8y + 4y* ***= 20y***

*Village literate population* ***=*** 

***Required percentage =*** 

***EER:***

***1.*** *Calculate* ***25%*** *of* ***1600***

***2.***  *If* ***20%*** *of a number is* ***80,*** *find* ***30%*** *of that number*

***3.*** *In a class of* ***45*** *students* ***18*** *are girls. Find the percentage of boys in the class*

***4.*** *A farmer sold* ***40%*** *of the eggs and still has* ***420*** *eggs left****.*** *Find how many eggs were sold*

***5.*** *Candidates* ***P, Q*** *and* ***R*** *contested in an election and received* ***1,200, 7,600*** *and* ***11,200*** *votes respectively****.*** *Find the percentage of the total votes each of them got*

***6.*** *In a farm,* ***40%*** *of the cows died and* ***1200*** *were left****.*** *Find how many cows died*

***7. 7500*** *voters polled in an election between two candidates* ***P*** *and* ***Q. 20%*** *of the votes were declared invalid and* ***55%*** *of the valid votes were for* ***P.*** *Find the number of valid votes obtained by* ***Q***

***8.*** *A farmer vaccinated* ***540*** *of his* ***720*** *cows against a disease. A few days later****, 5%*** *of the vaccinated and* ***80%*** *of the unvaccinated cows contracted the disease. Find how many chicken contracted the disease.*

***9.*** *In a class****, 60%*** *of the students passed French and* ***50%*** *of the students passed Arabic. All the students passed at least one subject. Find the percentage of students who passed both subjects*

***10.*** *In a class****, 80%*** *of the students passed French****, 70%*** *passed Arabic while* ***15%*** *failed both subjects. If* ***325*** *students passed both subjects****,*** *find the number of students in the class****.***

***11.*** *The gross monthly salary of Tom is* ***Shs 800,000.*** *He contributes* ***5%*** *of his salary to a retirement account and then pays* ***25%*** *of the remainder in taxes. Finally he pays a monthly health insurance of* ***Shs 40,000.*** *Find Tom’s monthly take home pay*

***12.*** *In a French test one student scored* ***9*** *marks more than the other and his marks was* ***56%*** *of the sum of their marks. Find the marks obtained by each of them*

***13.*** *In a school with a population of* ***4,000*** *students****,******75%*** *are boys****.******80%*** *of the boys and* ***60%*** *of the girls are day scholars****.*** *Find the****:***

***(i)*** *male students in the school*

***(ii)*** *female boarding students*

***(iii)*** *ratio of male day scholars to female day scholars*

***(iv)*** *number of boarders in the school*

***14.***  *A man spent* ***35%*** *of his salary on food****, 20%*** *of the remainder on fees and* ***25%*** *of the remainder on rent. If he was left with* ***Shs 351,000,*** *find****:***

***(i)*** *the man’s salary*

***(ii)*** *how much did he spend on fees*

***15.*** *In a country with a population of* ***14 million*** *people****,******55%*** *are females****.******75%*** *of the males and* ***40%*** *of the females are employed****.*** *Find the****:***

***(i)*** *male population in the country*

***(ii)*** *female population unemployed*

***(iii)*** *ratio of male population employed to female population employed*

***(iv)*** *number of people employed in the country*

***PERCENTAGE CHANGE***

***Summary:***

***1. (i) Percentage change =*** **

***(ii) Change in value = |*** *New value − Old value****|***

***3. (i) Percentage increase =*** **

***(ii)*** *An increase of* ***20%*** *means the new value is* ***120%*** *of the old value*

***4. (i) Percentage decrease =*** **

***(ii)*** *A decrease of* ***20%*** *means the new value is* ***80%*** *of the old value*

***5. (i) Percentage error =*** **

***(ii) Error in value = |*** *Exact**value − Inexact value****|***

***EXAMPLES:***

***1.*** *The price of an item increased from* ***Shs 5,000*** *to* ***Shs 6,000.*** *Find the percentage increase in the price of the item*

***Soln:***

*Percentage increase* ***=*** **

***Percentage increase =*** **

***2.*** *The price of an item reduced from* ***Shs 8,000*** *to* ***Shs 6,000.*** *Find the percentage decrease in the price of the item*

***Soln:***

*Percentage decrease* ***=*** **

***Percentage increase =*** **

***3.*** *The depth of a river was measured as* ***1⋅8m*** *instead of* ***1⋅6m.*** *Find the percentage error in the measurement*

***Soln:***

*Percentage error* ***=*** **

***Percentage error =*** **

***4.*** *Find the percentage error made in evaluating*  *instead of* *when* ***x = 5*** *and* ***y = 10***

***Soln:***

*Exact value =* 

*Inexact value =* 

*Percentage error* ***=*** **

***Percentage error =*** **

***5. (i)*** *Increase* ***500*** *by* ***20%***

***(ii)*** *Decrease* ***400*** *by* ***10%***

***Soln:***

***(i)*** *New value =* 

***(ii)*** *New value =* 

***6.*** *An item costing* ***Shs 2,400*** *is increased by* ***25%.*** *Find its new cost price*

***Soln:***

*New cost price =* 

***7.*** *An item costing* ***Shs 4,000*** *is reduced by* ***20%.*** *Find its new cost price*

***Soln:***

*New cost price =* 

***8.*** *The cost of an item is* ***Shs 4,600*** *after increasing it by* ***15%.*** *Find its original cost price*

***Soln:***



***∴ CP = 4,000***

***9.*** *The cost of an item is* ***Shs 4,500*** *after a reduction of* ***10%.*** *Find its original cost price*

***Soln:***



***∴ CP = 5,000***

***10.*** *A trader sells* ***30*** *pens at* ***Shs 75,000.*** *If the cost of a pen is increased by* ***20%,*** *find how many pens can be bought with the same amount of money after the increase*

***Soln:***

*Original cost price of a pen =* 

*New cost price =* 

***∴*** *Number of pens bought =* 

***11.*** *A salary of* ***Shs 50,000*** *was increased by* ***8%*** *and then by a further* ***20%.*** *Find the final salary after the increments*

***Soln:***

*New salary =* 

***∴*** *Final salary =* 

***12.*** *An item costing* ***Shs 80,000*** *was reduced by* ***10%*** *and then by a further* ***5%.*** *Find its final cost price after the reductions*

***Soln:***

*New cost price =* 

***∴*** *Final cost price =* 

***13.*** *An item costing* ***Shs 25,000*** *was increased by* ***12%*** *and then later reduced by* ***20%.*** *Find its final cost price after the changes*

***Soln:***

*New cost price =* 

***∴*** *Final cost price =* 

***14.*** *The length and width of a rectangle were increased and reduced by* ***20%*** *and* ***5%*** *respectively****.*** *Find the percentage change in the area of the rectangle*

***Soln:***

*Original area = lw*

*New area =* 

*Percentage change* ***=*** **

***Percentage change =*** **

***15.*** *Give that* ***y*** *varies directly as*  *find the percentage change in* ***y*** *when* ***x*** *increases by* ***10%***

***Soln:***

*Original value of* ***y*** *=* 

*New value of* ***y*** *=* 

*percentage change*  ***=*** **

***Percentage change =*** **

***16.*** *The volume* ***v*** *of a cylinder varies jointly as its height* ***h*** *and the square of it radius* ***r.*** *find the percentage change in* ***v*** *when* ***r*** *increases by* ***20%*** *and* ***h*** *decreases by* ***15%***

***Soln:***

*Original value of* ***v*** *=* 

*New value of* ***v*** *=* 

*percentage change*  ***=*** **

***Percentage change =*** **

***17.*** *The salaries of* ***A, B*** *and* ***C*** *are in the ratio* ***2:3:5.*** *If their salaries are increased by* ***15%, 10%*** *and* ***20%*** *respectively, find the new ratio of their salaries.*

***Soln:***

***A : B: C = 2:3:5= 2y: 3y:5y***

***⇒ Salary for: A= 2y, B = 3y*** *and* ***C = 5y***

***New ratio =*** 

***Required ratio =*** * =* ***23:33:60***

***18.*** *The length, width and height of a cuboid are in the ratio* ***1:2:3.*** *If the dimensions of the cuboid are**increased by* ***10%, 20%*** *and* ***25%*** *respectively****,*** *find the percentage change in the volume of the cuboid*

***Soln:***

***L : W: H = 1:2:3= y: 2y:3y***

***⇒ Dimension for: L= y, W = 2y*** *and* ***H = 3y***

*Original volume = y(2y)(3y) =* 

*New cost price =* 

*Percentage change* ***=*** **

***Percentage change =*** **

***EER:***

***1. (i)*** *Increase* ***800*** *by* ***25%***

***(ii)*** *Decrease* ***600*** *by* ***15%***

***2.*** *The population of a school increased from* ***1,200*** *to* ***1,500*** *students****.*** *Find the percentage increase in the population of the school*

***3.*** *The price of an item reduced from* ***Shs 4,000*** *to* ***Shs 3,400.*** *Find the percentage decrease in the price of the item*

***4.*** *A student wrote* *as*  *Find the percentage error the student made in evaluating*  *when* ***p = 5*** *and* ***q = 7***

***5.*** *A man’s salary was increased by* ***10 %*** *and then by a futher* ***20 %****. Find the****:***

***(i)*** *single percentage representing the two increments.*

***(ii)*** *original salary if the man’s final salary is* ***Sh.660,000.***

***6.*** *Given that*  *find the percentage error made in approximating*  *when* ***x = 1⋅56***

***7.*** *A student multiplied a number by*  *instead of*  *Find the percentage error in the calculation*

***8.*** *A trader sells* ***5*** *cakes at* ***Shs 7,000.*** *If the cost of a cake is increased by* ***25%,*** *find how many cakes can be bought with the same amount of money after the increase*

***9.*** *A trader sells* ***9*** *books at* ***Shs 4,500.*** *If the cost of a book is reduced by* ***40%,*** *find how many books can be bought with the same amount of money after the reduction*

***10.*** *A trader sells* ***12*** *pens at* ***Shs 3,000.*** *If the cost of a pen is increased by* ***50%,*** *find how many pens can be bought with the same amount of money after the increase*

***11.*** *Give that* ***y*** *varies directly as*  *find the percentage change in* ***y*** *when* ***x*** *increases by* ***10%***

***12.*** *The length, width and height of a cuboid were increased by* ***10%, 20%*** *and* ***15%*** *respectively****.*** *Find the percentage change in the volume of the cuboid*

***13.*** *The area of a triangle is given by*  *Find the percentage change in* ***A*** *when* ***b*** *increases by* ***40%*** *and* ***h*** *decreases by* ***10%***

***14.*** *Give that* ***z*** *varies directly as* ***x*** *and inversely as the square of* ***y,*** *find the percentage change in* ***z*** *when* ***x*** *increases by* ***25%*** *and* ***y*** *decreases by* ***20%***

***15.*** *Give that* ***p*** *varies directly as the square of* ***x*** *and inversely as the square root of* ***y,*** *find the percentage change in* ***p*** *when* ***x*** *increases by* ***40%*** *and* ***y*** *decreases by* ***36%***

***16.*** *In a stock of drinks****,*** *beer, wine and soda are in the ratio* ***5:7:8.*** *If this stock is increased by* ***40%, 50%*** *and* ***75%*** *respectively****,*** *find the new ratio of the drinks.*

***17.*** *The ratio of boys to girls in a class is* ***7:8.*** *If the boys and girls are increased by*  ***20%*** *and* ***10%*** *respectively****,*** *find the new ratio of boys to girls in the class.*

***18.*** *An item costing* ***Shs 8,000*** *is increased by* ***15%.*** *Find its new cost price*

***19.*** *An item costing* ***Shs 5,000*** *is reduced by* ***10%.*** *Find its new cost price*

***20.*** *The cost of an item is* ***Shs 7,200*** *after increasing it by* ***20%.*** *Find its original cost price*

***21.*** *The cost of an item is* ***Shs 3,000*** *after a reduction of* ***25%.*** *Find its original cost price*

***22.*** *A salary of* ***Shs 80,000*** *was increased by* ***5%*** *and then by a further* ***15%.*** *Find the final salary after the increments*

***23.*** *An item costing* ***Shs 12,000*** *was reduced by* ***10%*** *and then by a further* ***5%.*** *Find its final cost price after the reductions*

***24.*** *An item costing* ***Shs 60,000*** *was increased by* ***8%*** *and then later reduced by* ***15%.*** *Find its final cost price after the changes*

***25.*** *The population of a school is* ***800*** *students****.*** *If it annually increases by* ***20%,*** *find the population of the school after two years*

***26.*** *The population of a school is* ***1000*** *students****.*** *If it annually decreases by* ***20%,*** *find the population of the school after two years*

***27.*** *A cow and a calf cost* ***Shs 500,000*** *and* ***Shs 200,000*** *respectively. If the price of the cow and that of the calf is increased by* ***24%*** *and* ***15%*** *respectively, find the cost of* ***one*** *dozen cows and* ***2*** *dozen calves*