

S.3 REVISION QUESTIONS ON SELECTED TOPICS.

PROPORTIONS.

1. Given that y varies directly as the square of x and $y = 80$ when $x = 4$, find x when $y = 20$.
2. Given that A is directly proportional to B , copy and complete the table below.

| | | | | | |
|---|------|-----|------|----|-------|
| A | - | - | 12.5 | 13 | - |
| B | 0.64 | 1.2 | 10 | - | 10.48 |

3. The table below shows the time and distance covered by Davis walking at a constant speed. Study the table and answer the questions that follow.

| | | | | |
|----------------------|---|---|---|----|
| Time (t sec) | 1 | 2 | 3 | 4 |
| Distance (d, metres) | 3 | 6 | 9 | 12 |

- (a) Show that d is directly proportional to t .
 - (b) Find an equation connecting d and t .
4. Given that y is inversely proportional to the square root of x and that $x = 2$ when $y = 1.5$. Find the value of y when $x = 3$.
 5. A quantity H is directly proportional to V and inversely proportional to A . If $H = 100$, $V = 60$ and $A = 288$, find H when $V = 35$ and $A = 3$.
 6. Quantity P partly varies as the square of x and partly varies as x . When $x = 3$, $P = 48$ and when $x = 5$, $P = 110$.
 - a) Form an equation relating P and x .
 - b) Determine the value of P when $x = 6$.
 7. A quantity, y , varies partly as the square of x and partly as x . When $y = 20$, $x = 2$ and when $y = 36$, $x = 3$. Find the equation showing the relation between x and y .
 8. (a) (i) Complete the table below based on $n \propto \frac{1}{t}$.

| | | | | | | | |
|------------|---|----|---|---|---|---|---|
| Time (t) | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Number (n) | - | 16 | - | - | 8 | - | 6 |

- (ii). Find the value of the constant of proportionality connecting t and n in the above table.

(b). The volume (V) of a cone varies jointly with its height and the square of its radius (r).

If $V = 616 \text{ cm}^3$ when $r = 7$ and $h = 12 \text{ cm}$, calculate;

(i). the volume V when $r = 3.5 \text{ cm}$ and $h = 9 \text{ cm}$.

(ii). The percentage change in V , when r increases by 30%.

(iii). The change in volume V , when r increases to 10 and h decreases to 4 cm.

9. P varies directly as the square of V and inversely as R . If $P = 50$ and $V = 10$ and $R = 4$, find;

a) The value of P when $V = 15$ and $R = 8$.

b) An expression for V in terms of P and R .

10. Given that C varies as the square of x and inversely as the cube of y , and that $C = 18$ when $x = 3$ and $y = 2$, find the value of C when $x = 2$ and $y = 4$ and the value of x when $C = 48$ and $y = x$.

11. It is given that y varies partly as x and partly inversely as the square of x . It is also given that $y = 3$ when $x = 1$ and that $y = 5$ when $x = \frac{1}{2}$. Find y when $x = 1\frac{1}{2}$.

12. R varies partly as the square of V and partly as the cube of V . When $V = 20$, $R = 416$ and when $V = 40$, $R = 3264$. Find R when $V = 30$.

13. The time (t) taken to sink a well consists of the sum of two parts.

One of these parts varies as the depth (d) of the well and the other varies as the square of the depth.

If $t = 80$ when $d = 20$ and $t = 150$ when $d = 30$, find t when $d = 40$.

14. 20 pupils can plant 1000 eucalyptus tree seedlings in four hours. How many could 30 pupils have planted in six hours?

15. 18 men can plant 30 hectares of cotton in six hours. How long will 14 men take to plant 35 hectares?

BUSINESS MATHEMATICS.

1. A radio is bought at **Shs 15,000** and sold at **Shs 16,200**. Find the percentage profit

2. A trader sold an item at **Shs 4.8 million** and made a profit of **15%**. Find the cost price of the item
3. A trader buys an old radio at **Shs 65,000** and spends **Shs 15,000** on its repair. If he sells it at **Shs 100,000**, find his percentage profit.
4. A carpenter incurs a loss of **20%** by selling a chair at **Shs 240,000**. Find the percentage he would gain by selling it at **Shs 360,000**.
5. By selling an item at **Shs 2400**, a trader would gain **4%**. Find how much he must sell it in order to gain **12%**.
6. The cost of an item is **Shs 4,800** after a discount of **20%**. Find its original cost price
7. A bicycle priced **Shs 200,000** was sold at a discount of **15%**. Find:
 - (i) how much was paid for it
 - (ii) cash value of the discount
8. Find the percentage discount allowed when an item costing **Shs 60,000** is sold at **Shs 48,000**
9. Find a single percentage discount equivalent to successive discounts of **20%** and **15%**.
10. An item costing **Shs 80,000** was sold at successive discounts of **10%** and **5%**. Find its final cost price after the discounts
11. An item whose cash price is **Shs 60,000** can also be bought on hire purchase by paying a deposit of **Shs 20,000** followed by **4** equal weekly instalments of **Shs 13,000**. Find how much is saved by paying cash than using hire purchase
12. A Smartphone company had the following advertisement:

| BUY A PHONE NOW WHILE STOCK LASTS | |
|--|---|
| CASH VALUE: | Shs 320, 000 LESS 15% DICOUNT |
| HIRE PURCHASE: | DEPOSIT 15% OF THE CASH VALUE AND PAY EITHER Shs 82, 000 |
| MONTHLY | FOR 4MONTHS OR Shs 25, 000 |
| WEEKLY | FOR 12WEEKS |

- (a) Calculate the:
 - (i) saving made by paying cash than using monthly hire purchase.

(ii) saving made by using weekly hire purchase than monthly hire purchase

(b) If the trader had bought the phone at **20%** below cash value and sold it on monthly hire purchase, find the percentage profit he made.

13. A salesman gets commission as follows:

10% on the first **Shs 100,000**

12% on the next **Shs 400,000**

15% on the remainder

Find his:

(i) commission for sales worth **Shs 800,000**

(ii) sales when he receives **Shs 52,000** as commission

14. Bank of Uganda buys and sells foreign currencies as follows:

| Foreign currency | Exchange rate | |
|----------------------|---------------|-----------|
| | Buying | Selling |
| 1 US Dollar (\$) | Shs 2,900 | Shs 3,000 |
| 1 Pound sterling (£) | Shs 4,650 | Shs 4,700 |

A tourist arrived in Uganda with **\$4,500** which he exchanged for Uganda shillings. During his stay he spent **Ug Shs 10,230,000** and converted the remainder in to pound sterling before he left. Calculate the amount he received on his departure.

15. A man borrowed **Shs 14.85** million from a bank at a compound interest rate of **12%** per annum. He has to repay the loan within **2** years in **6** equal instalments. Calculate the:

(i) total amount he paid to the bank

(ii) interest he paid to the bank

(iii) amount he paid per instalment

16. Five members of a self-supporting enterprise Tom, Bob, Ben, Sam and Tim were given a certain amount of money to share amongst themselves. Tom got $\frac{3}{8}$ of the total amount while Bob got $\frac{2}{5}$ of the remainder. The remaining amount was shared equally among Ben, Sam and Tim each of which received **Shs 600,000**

(i) How much was shared among the five business men?

(ii) How much did Bob get?

(iii) Tom, Bob and Tim invested their money and earned a profit of **Shs 1,200,000**. A third of the profit was reinvested and the rest was shared in the ratio of their investments. Find how much each got.

17. The table below shows the income tax rates of a certain country for government employees

| Taxable income | Tax |
|----------------|-----|
|----------------|-----|

| | |
|-------------------|----|
| 1-100,000 | 5 |
| 100,001-200,000 | 13 |
| 200,001-300,000 | 20 |
| 300,001-400,000 | 30 |
| 400,001-500,000 | 40 |
| 500,001 and above | 45 |

An employee has a gross monthly income of shs 753,500. He is entitled to the following monthly allowances

Marriage and children shs 115,500

Housing and transport 10% of the gross income

Medical care of shs81,600

Insurance premium of shs25,500

Calculate the

a) taxable income

b) income tax

c) net income

MATRICES

1. Given the matrices $A = \begin{pmatrix} 4 & 5 & 1 \\ 0 & 7 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & -1 \\ 3 & 1 \end{pmatrix}$, find matrix M such that

$3M - 2I = 2A - B$, where I is a 2×2 identity matrix

2. Given that $m A = \begin{pmatrix} 2 & -1 \\ 0 & -1 \end{pmatrix}$ $B = \begin{pmatrix} 6 & 8 \\ 10 & -12 \end{pmatrix}$, find $(AB)^{-1}$ and $B^{-1}A^{-1}$

3. Tom, Bob and Ben went to a supermarket for shopping .

Tom bought **3** pens and **5** books and **4** rulers

Bob bought **4** pens and **3** books and **2** rulers

Ben bought **6** pens and **3** rulers

The cost of a pen is **Shs 500**, a book is **Shs 800** and a ruler is **Shs 1500**.

(a) Write down:

(i) a 3×3 matrix for the items bought by the three boys.

(ii) a 3×1 cost matrix for each item

(b) Use matrix multiplication to find the amount of money spent by each boy

4. Find the inverse of $\begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix}$, hence solve the simultaneous equations

$$3x + 2y = 12$$

$$4x + 5y = 23$$

5. Tom bought 3 pens and 2 books at Shs 4,800. Bob bought 5 pens and 4 books from the same shop at Shs 9,000.

(i) Form two equations to represent the above information

(ii) Use matrix method to find the cost of each pen and that of each book

(iii) How much would Ben pay for 10 pens and 6 books

6. Find the values of x for which the matrix $\begin{pmatrix} x & x+9 \\ 2 & x+5 \end{pmatrix}$ has no inverse

7. Find the values of x for which the matrix $\begin{pmatrix} x & x-2 \\ 3x-6 & 4x-11 \end{pmatrix}$ is singular

PROBABILITY.

1. An integer between 1 and 10 inclusive is chosen at random. Find the probability that the chosen integer is:

(i) more than 4

(ii) an even number

(iii) a multiple of 3

(iv) a triangular number

2. A box contains red, green and blue pens. The probability of picking a blue pen from the box is $\frac{4}{9}$ and that of a green pen is $\frac{1}{3}$. Find the probability of picking a red pen .

3. Two fair dice are thrown together.

(a) Draw a table for the possible outcomes

(b) Find the probability that:

(i) both show even numbers

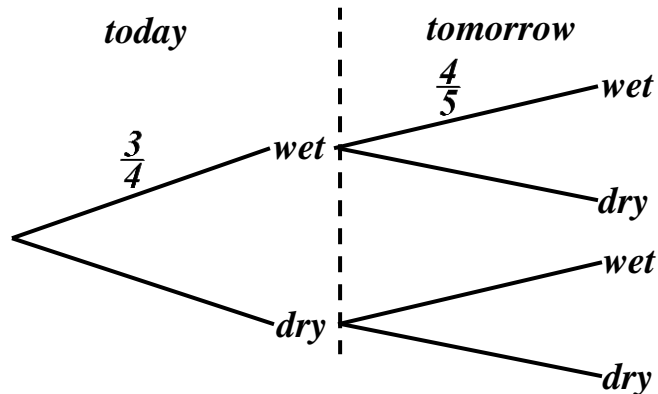
(ii) both show similar faces

(iii) one shows an even number and the other odd

(iv) the sum of the scores is 9

4. The weather forecast says the probability that it will be wet today is $\frac{3}{4}$ and that of tomorrow is $\frac{4}{5}$.

(i) Copy and complete the probability tree diagram below:



ii) Find the probability that it will be wet on just one of the two days.

5. A box contains 8 red and 3 blue pens. Two pens are drawn in succession at random from the box without replacement.

(a) Draw a tree diagram showing the possible outcomes

(b) Find the probability of picking:

(i) pens of different colours

(ii) exactly one red pen

(iii) at least one red pen

(iv) at most one blue pen

6. A box contains 5 red and 3 blue balls. Three balls are selected in succession at random from it without replacement. Find the probability that:

(i) they are of the same colour

(ii) the first and last are of the same colour

(iii) at most one blue ball is drawn.

QUADRATIC GRAPHS.

1. (a) Draw a graph of $y = x^2 - 4x + 3$ for $0 \leq x \leq 4$

(use a scale of 2cm:1 unit on both axes)

(b) Use your graph to solve the equations:

(i) $x^2 - 4x + 3 = 0$

(ii) $x^2 - 5x + 4 = 0$

(c) State the:

(i) equation of the line of symmetry

(ii) minimum value of y

(iii) value of x at which the minimum value of y occurs

(iv) range of values of x for which $x^2 - 4x + 3 < 0$

2. (a) Draw a graph of $y = x^2 - x - 6$ for $-3 \leq x \leq 4$

(use a scale of **1cm:1 unit** on both axes)

(b) Use your graph to solve the equations:

(i) $x^2 - x - 6 = 0$

(ii) $x^2 - x - 2 = 0$

(iii) $x^2 + x - 2 = 0$

(iv) $2x^2 - 5x - 3 = 0$

(c) State the:

(i) equation of the line of symmetry

(ii) range of values of x for which $x^2 - x - 6 < 0$

3. (a) Copy and complete the table below for the function $y = 3 - 3x - x^2$

| | | | | | | | | |
|--------|----|----|----|----|----|---|---|----|
| x | -5 | -4 | -3 | -2 | -1 | 0 | 1 | 2 |
| $-x^2$ | | | | -4 | | | | -4 |
| $-3x$ | | | | 6 | | | | -6 |
| 3 | | | | 3 | | | | 3 |
| y | | | | 5 | | | | -7 |

(b) Draw a graph of $y = 3 - 3x - x^2$ for $-5 \leq x \leq 2$

(use a scale of **1cm:1 unit** on both axes)

(c) Use your graph to solve the equations:

(i) $3 - 3x - x^2 = 0$ (ii) $x^2 + 3x - 4 = 0$ (iii) $x^2 + 4x + 3 = 0$

(iv) $x^2 + 2x - 8 = 0$ (v) $2x^2 + x - 6 = 0$

4. (a) Copy and complete the table below for the function $y = (x - 2)(x + 1)$

| | | | | | | | | |
|----------------|-----------|-----------|-----------|-----------|----------|----------|----------|-----------|
| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
| (x - 2) | | -4 | | -4 | | | | 2 |
| (x + 1) | | -1 | | 6 | | | | 5 |
| y | | 4 | | 3 | | | | 10 |

(b) Draw a graph of $y = (x - 2)(x + 1)$ for $-3 \leq x \leq 4$

(use a scale of **1cm:1 unit** on both axes)

(c) Use your graph to solve the equations:

(i) $x^2 - x - 2 = 0$ (ii) $x^2 - 2x - 5 = 0$

(iii) $2x^2 - x - 15 = 0$

(d) State the:

(i) equation of the line of symmetry

(ii) minimum value of the function

(iv) range of values of **x** for which $(x - 2)(x + 1) < 0$

BEARING.

1. The bearing of point **P** from point **Q** is **060°**. Find the bearing of **Q** from **P**
2. The bearing of point **N** from point **M** is **310°**. Find the bearing of **M** from **N**
3. Find the angle between the direction **N70°E** and **S70°W**
4. A boat sails **15km** on a bearing of **000°**. It then sails **8km** due East. Calculate how far it is from the starting point
5. Two ships **P** and **Q** leave port **K** at the same time. **P** sails **9km** on a bearing of **030°** and **Q** sails **12km** on a bearing of **120°** . Calculate how far apart the ships are.
6. A plane flies **300km** from airport **A** to airport **B** on a bearing of **060°**. It then flies **450km** to airport **C** on a bearing of **150°** .

(a) Use a scale of **1cm** to represent **50km**, make a scale drawing to

show the route of the plane.

(b) Find the distance and bearing of airport **A** from **C**.

(c) If the plane flies directly back to **A** at a speed of 200kmh^{-1} , determine how long it takes to fly back to **A**.

7. . The bearing of tower **A** from point **O** is 060° and that of tower **B** from **O**, is 200° . Given that distance $\text{OA} = 24\text{km}$, $\text{OB} = 33\text{km}$ and tower **C** is exactly half way between towers **A** and **B**,

(a) Use a scale of **1cm** to represent **5km**, draw an accurate diagram to show the relative positions of the towers.

(b) Find the:

(i) distances **AB** and **OC**

(ii) bearing of **B** from **A**

(iii) bearing of **C** from **O**

(c) Find:

(i) the average speed of the cyclist who takes $2\frac{1}{4}$ hours to travel directly from **A** to **O**

(ii) how long it takes another cyclist to travel from **A** to **B** via **O** at a speed of 4.5kmh^{-1} faster than that of the cyclist in (c) (i) above

8. A plane left airport **K** at **0600** hours and flew on a bearing of 090° at a speed of 300kmh^{-1} . It landed at airport **R** at **0830** hours. At exactly **0900** hours, it left **R** and flew on a bearing of 340° , at the same original speed. It then landed at airport **M** at **1200** hours

(a) Use a scale of **1cm** to represent **100km**, draw an accurate diagram to show the route of the plane.

(b) Find the:

(i) distance of **M** from **K**

(ii) bearing of **K** from **M**

9. A rally car travels from point **R** to point **S** which is **260km** away on a bearing of 060° from **R**. The car is then set off from **S** at **9:30 am** towards **T** at an average speed of 150kmh^{-1} where it is expected to reach at **11:30 am**. After travelling for one hour and twenty minutes, it broke down at **P**. The bearing of **T** and **P** from **S** is 300° .

(a) Using a scale of **1cm:40km**, show positions of points **R**, **S**, **P** and **T**

(b) Determine the:

(i) distance from **R** to **P**

(ii) bearing of **P** from **R**

(c) Given that the repair took ten minutes and later the car is set off to complete the journey to **T**. Find the speed at which the car must be driven to reach **T** on time.

THE END