DEPARTMENT OF MATHEMATICS

S.4 MATHEMATICS−2020

WEEK 1

2 HOURS : 30 MINUTES

- *Answer **all** the **ten** questions in section **A** and any **five** from section **B**.*
- *Any additional question(s) answered will **not** be marked.*

SECTION A: (40 MARKS)

1. Express $3.4\dot{3}\dot{2}$ as a fraction in its simplest form. (*04 marks*)

2. Find the equation of a straight line which passes through the point $(-3, 5)$ and is parallel to the line $2y + 3x + 3 = 0$. (*04 marks*)

3. In a group of 50 students, 25 play Hockey, 30 play Football and 8 play neither game. Find the number of students who play both Hockey and Footbell.

   (*04 marks*)

4. Given that $(0, 5)$ and $B(2, 3)$ are two points in a plane. Determine

   (i) the vector AB.

   (ii) $|\mathbf{AB}|$. (*04 marks*)

5. The marked price of a pair of trousers is sh.170,000. Jake allowed a discount of 5% and still made a profit of 24%. Calculate the buying price. (*04 marks*)

6. The scale of a map is given as $1 : 400,000$. A road section on the ground is 80 km. Calculate

   (i) the length representing the road on the map

(ii) the actual area of a region whose area on the map is 25 cm^2.

(*04 marks*)

7. Given that $f(x) = 2x - 8$ and $g(x) = 2x + 3$, find

(a) $gf(x)$.

(b) $gf\left(\dfrac{1}{2}\right)$.

(*04 marks*)

8. Using logarithms evaluate $(0.005691)^{\frac{1}{3}}$.

(*04 marks*)

9. Find the coordinates of the point of intersection of the lines $y = 8 - 2x$ and $y = 2x$.

(*04 marks*)

10. A Canadian tourist arrived in Uganda with $1500. She exchanged it to Uganda shillings(Ug.Sh.) at a rate of $1 for Ug.Sh.3640. She used Ug.Sh. 1,550,000 in hotel and inland travels. How much money in Uganda shillings did she remain with?

(*04 marks*)

SECTION B: (60 MARKS)

11. (a) Three men can dig a field in 3 days. How long will it take 9 men to dig the same field working at the same rate?

(*06 marks*)

(b) A variable V varies jointly as the variable A and h. When $A = 63$ and $h = 4$, $V = 84$, find

(i) the value of V when $A = 9$ and $h = 7$.

(*03 marks*)

(ii) the value of A when $V = 4.5$ and $h = 0.5$.

(*03 marks*)

12. (a) Given that $g(x) = \dfrac{x^2}{5}$, find the value of $g^{-1}(5)$.

(04 marks)

(b) Given that $f^{-1}(x) = \dfrac{5x - 3}{3}$, $g^{-1}(x) = \dfrac{1 - 3x}{2}$, find $fg(x)$.
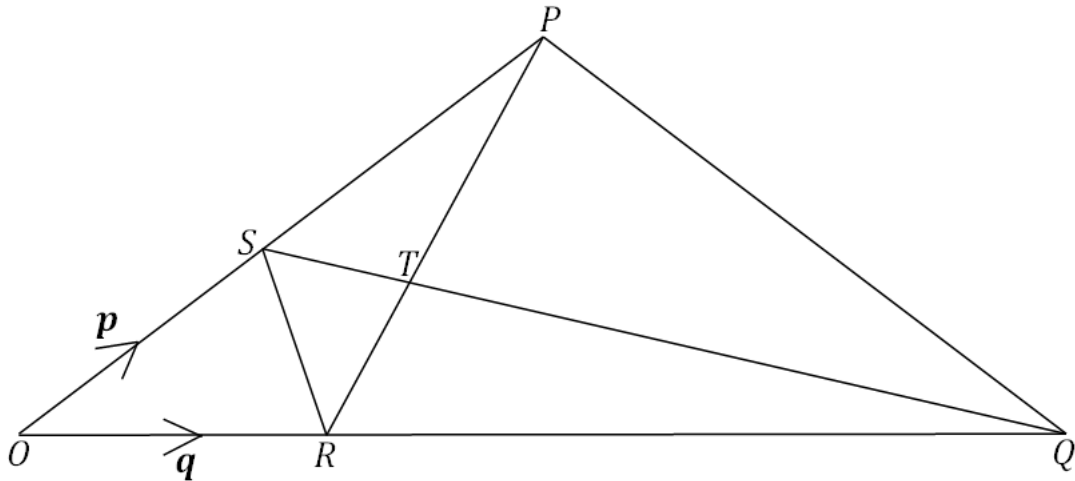
(08 marks)

13. A container with an open rectangular top is constructed from four pieces of cardboard sheet. The two end pieces are isosceles triangles with sides $6x$ cm, $5x$ cm and $5x$ cm as shown below. The two sides pieces are rectangles of length h cm and width $5x$ cm. The total amount of cardboard sheet used is 450 cm^2.
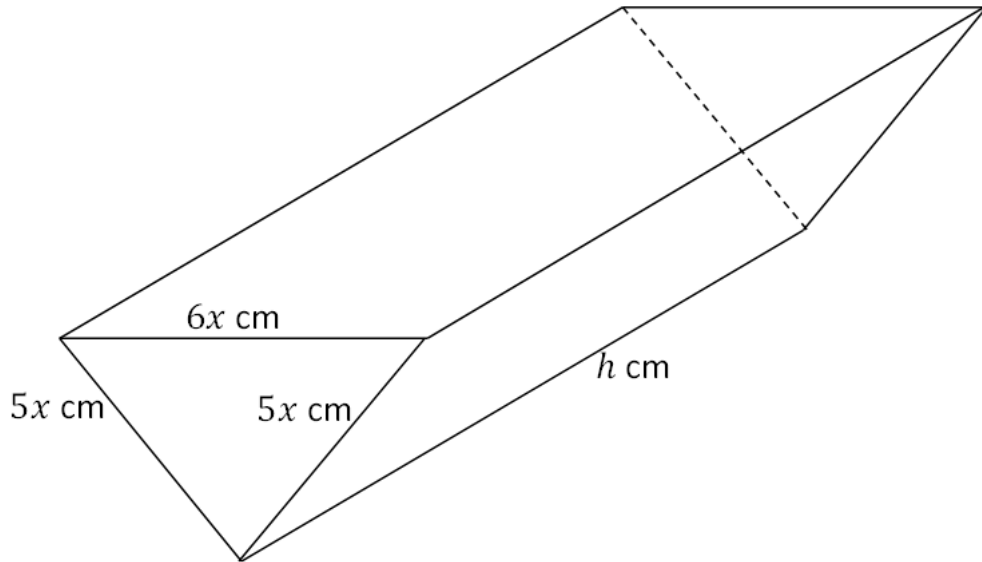
(i) Show that $h = \dfrac{45 - 2.4x^2}{x}$. (*02 marks*)

(ii) Show that the volume of the container, V cm^3 is given by $540x - 28.8x^3$. (*03 marks*)

(iii) If the value of $h = 12$ cm, use the information in 13(i) to find the value of x and the volume of the container. (*07 marks*)

14. In a form four class of a school, a pupil who studies Arts subject does one or more of the following History(H), Geography(G) and Economics(E). In a group of Arts pupils, $n(H) = 32$, $n(H \cap G' \cap E') = 16$, $n(H' \cap G \cap E') = 2$, $n(H' \cap G' \cap E) = 7$, $n(H \cap G) = 15$, $n(H \cap E) = 11$ and $G \cap E = 13$.

(a) Represent the above information on a Venn diagram. (*05 marks*)

(b) How many of these Arts pupils

(a) do all the subjects, (*01 marks*)

(b) do Geography, (*01 marks*)

(c) do Economics. (*01 marks*)

(c)   What is the probability that a pupil chosen at random is studying

      (a)   Economics but not History?   (*02 marks*)

      (b)   History and Economics but not Goegraphy?   (*02 marks*)

15.   In the diagram below OPQ is a triangle in which $\mathbf{OS} = \frac{1}{3}\mathbf{OP}$ and $\mathbf{OR} = \frac{1}{3}\mathbf{OQ}$. T is a point on QS such that $\mathbf{QT} = \frac{3}{4}\mathbf{QS}$. Given that $\mathbf{OP} = \mathbf{p}$ and $\mathbf{OQ} = \mathbf{q}$.

(a)   Express in terms of $\mathbf{p}$ and $\mathbf{q}$ the vectors

      (i) $\mathbf{SR}$.

      (ii) $\mathbf{QS}$.

      (iii) $\mathbf{PT}$.

      (iv) $\mathbf{TR}$.   (*08 marks*)

(b)   Show that P, T and R are collinear.   (*04 marks*)

16.   Tendo made a gross profit of sh. 54,000,000. 20% of the gross profit was paid in taxes. 70% of the remainder was spent on rent, wages and loan repayment in the ratio 2 : 3 : 4 respectively. Calculate the

      (i)   amount paid in taxes,   (*03 marks*)

      (ii)   amount spent on rent, wages and loan repayment,   (*02 marks*)

      (iii)   the amount of rent paid,   (*03 marks*)

      (iv)   net profit as a percentage of the gross profit.   (*04 marks*)

17. The distance from Kisoro to Mbarara is 270 km. A Tata lorry traveling at a steady non−stop speed of 40 km/hr leaves Kisoro for Mbarara at 6 : 15 am. One and a quarter hours later, a taxi mini−bus leaves Mbarara traveling at steady non−stop speed of 60 km/hr heading for Kisoro.Calculate the

(a) distance from Kisoro at which the two vehicles meet,

(b) time when the two vehicles meet,

(c) time when the taxi mini−bus arrives in Kisoro,

(d) time when the Tata lorry arrives in Mbarara,

(e) difference in the times of arrivals of the two vehicles at their respective stations. (*12 marks*)

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