ALGEBRA

2002 Oct/Nov Exams

1. (a) Solve the equation 2x + 5 = 10 – 3x.

   (b) Given that $\frac{cb-a}{c}$ = 1, express c in terms of a and b.

   (c) Factorise completely $3w^2$ – 12.

   (d) Express as a single fraction $\frac{5}{2x-3}$ - $\frac{1}{x+5}$ in its lowest terms

2003 Oct/Nov Exams

2. (a) Given that p = 2(l + b), find the value of p when l = 8 and b = 3.

2004 Oct/Nov Exams

3. (a) Given that a = 3, b = 2 and c = 4, find the value of $\frac{a}{b} + \frac{b}{c}$.

   (b) Solve 3(m – 5) = 7 – 2(m – 3)

   (c) Factorise completely 4 - $16x^2$.

   (d) Express as a single fraction, in its simplest form $\frac{3}{2} - \frac{1-2x}{4x}$.

2005 Oct/Nov Exams

4. (a) Given that a = $\frac{3a+b}{b}$,

   (b) Find the value of a when b = 2

   (c) Express b in terms of a.

   (d) Express $\frac{3}{p-1}$ - $\frac{2}{1-p}$ as a single fraction in its lowest form.

   (e) Solve the equation $(x + 3)^2$ = 64.

   (f) Simplify $\frac{1-x^2}{5-3x-2x^2}$.

2006 Oct/Nov Exams

5. (a) Solve the equation 2x – 6 = 4 – 3(x – 5).

   (b) Simplify $\frac{2x^2-2}{2x^2-x-3}$.

   (c) Express $\frac{1}{2-x}$ - $\frac{2}{x-4}$ as a single fraction in its simplest form.

2007 Oct/Nov Exams

6. (a) Given that x = 8 and y = -2, find x - y^2.

   (b) Factorise completely 3x - 12x^3.

   (c) Express as a single fraction $\frac{x+5}{3}-\frac{x+2}{4}$.

2008 Oct/Nov Exams

7. (a) Factorise mn – km – hn + hk.

   (b) Simplify $\frac{8\pi r^2-2\pi r^4}{4\pi r+2\pi r^2}$.

   (c) Express $\frac{x-3}{3}$ - $\frac{2x-3}{5}$ as a single fraction.

2009 Oct/Nov Exams

8. (a) Solve the inequation 1 - $\frac{3}{5}$x < 4.

   (b) Simplify $\frac{a-2}{a^2-4}$.

   (c) Given that p = 7 and q = -3, find p^2 - q^2.

   (d) Express as a single fraction $\frac{5}{2x-1}$ - $\frac{7}{3x-2}$.

2010 Oct/Nov Exams

9. (a) Factorise completely 5 - 20x^2.

   (c) Solve the equation 2(2x – 5) + 2 = x + 7.

   (d) Express $\frac{2}{1-3x}$ + $\frac{4}{5+x}$ as a single fraction.

(c) Given that d = $\frac{p+y}{5y}$, express y in terms of d and p.

(c) Given that x = 7 and y = -9, find the value of 3x – y.

(c) Simplify $\frac{3y^2-5y-12}{y^2-9}$.

2011 Oct/Nov Exams

10. (a) Factorise $3x^2$ - 3.

(b) Express $\frac{x+2}{3}$ - $\frac{2x-3}{4}$ as a single fraction in its simplest form.

(c) Solve the equation $\frac{12}{x+2}$ =$\frac{3}{5}$.

(d) Solve the inequation 7 – 2t < 9

(e) Simplify 3x – 4y – 2(x – 4y) – 2y.

2012 Oct/Nov Exams

11. (a) Solve the equation $\frac{6}{x-2}$ = $\frac{2}{3}$.

(b) Simplify $\frac{x+2}{x^2-4}$.

(c) Express as a single fraction in its simplest form $\frac{4}{2x-1}$ - $\frac{3}{x-1}$.

(d) Solve the inequation 4b – 3 < 6b + 4.

(e) Factorise completely 2xy + x – 10y – 5.

2013 Oct/Nov Exams

12.(a) Factorise completely $3y^2$ - 12.

(b) Express $\frac{2a}{x-1}$ - $\frac{a}{x-2}$ as a single fraction in its lowest terms.

(c) Solve the equation x^2 + 6x = -2.

2014 Oct/Nov Exams

13.(a) Solve the equation 5x – 8 – 3(x + 1) = -7.

(b) Simplify 5(2y – 3) – 2(5 – 2y).

(c) Express $\frac{5}{2y-1}$ - $\frac{6}{3y-1}$ as a single fraction in its lowest form.

(d) Solve the inequation 9t – 4 < 12t – 10.

2015 GCE Exams

14.(a) Solve the equation $\frac{x+4}{2} = \frac{2x-1}{3}$.

(b) Simplify $\frac{h^2-k^2}{h+k}$.

(c) Express $\frac{2}{b-2} - \frac{3}{1-2b}$ as a single fraction in its simplest form.

(d) Solve the inequation 4(1 – 2x) > 32.

2015 Oct/Nov Exams

15.(a) Factorise completely 5px – 5py + 3qx – 3qy.

(b) Simplify $\frac{2y^2-3y-5}{y^2-1}$.

(c) Express as a single fraction in its simplest form $\frac{4}{x-2} - \frac{2}{x+3}$.

2016 GCE

16. (a) Simplify $\frac{x-1}{x^2-1}$.

(b) Simplify $\frac{17k^2}{20a^2} \div \frac{51k^2}{5a}$.

(c) Express $\frac{2}{2x-1} - \frac{1}{3x+1}$ as a single fraction in its simplest form.

2017 GCE

17. (a) Simplify $\frac{m^2-1}{m^2-m}$.

(b) Simplify $\frac{p^2q^3}{4} \times \frac{8}{pq} \div 2p^2$q.

(c) Express $\frac{3}{5x-2} - \frac{2}{x+3}$ as a single fraction in its simplest form.

2017 INTERNAL

18. (a) Simplify $\frac{14x^3}{9y^2} \frac{7x^4}{18y^3}$.

(b) Simplify $\frac{2x^2-8}{x+2}$.

(c) Express $\frac{1}{x-4} - \frac{2}{5x-1}$ as a single fraction in its lowest terms.

2018 INTERNAL

19.(a) Simplify $\frac{b-a}{a^2-b^2}$.

(b) Simplify $\frac{12dn^3}{15cd^3} \div \frac{9c^3n}{10c^2d^2}$.

(c) Express $\frac{3}{x+1} - \frac{4}{x-1}$ as a single fraction in its lowest terms.

2018 GCE

1. (a) Simplify $\frac{7st^3}{15u^3v^2} \times \frac{5u^3v}{28s^3t^2}$.
2. (c) Express $\frac{3}{2x-5} - \frac{4}{x-3}$ as a single fraction in its simplest form.

SETS

2003

1. In a class of 40 pupils, 16 like Physics, 17 like Mathematics, 24 like Chemistry and the rest like other subjects not stated.
5 like all the three subjects.
4 like Mathematics and Physics only.
6 like Physics and Chemistry only.
3 like Mathematics and Chemistry only.
(i) Illustrate this information on a clearly labeled Venn diagram.
(ii) Hence or otherwise find:
(a) The number of pupils who like one subject only.
(b) The number of pupils who do not like any of the three subjects.

2005

2. At showground, there were several traditional dances taking place. Among these traditional dances were Siyomboka, Ngoma and Kalela.
8 people watched all three dances.

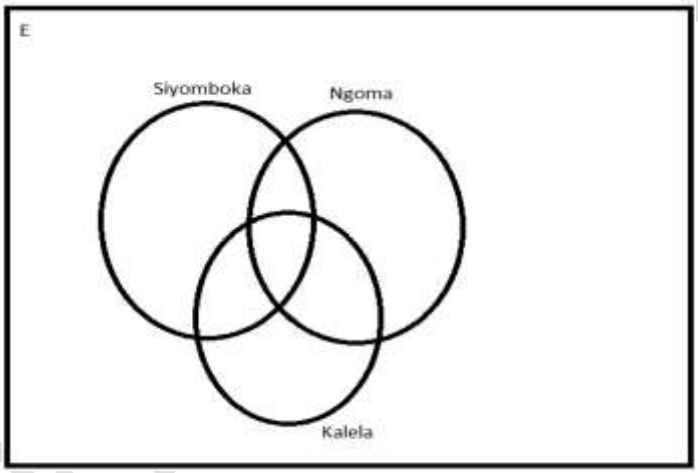
34 people watched Siyomboka and Ngoma but not Kalela.
42 people watched Ngoma and Kalela but not Siyomboka.
24 people watched Kalela and Siyomboka but not Ngoma.
84 people watched Siyomboka only.
Y people watched Ngoma only.
(y – 2) people watched Kalela only.
32 people did not watch any of the three dances.

(i) Copy the diagram below and show the number of people in each region.

(ii) Given that 500 people went to the show ground, calculate:

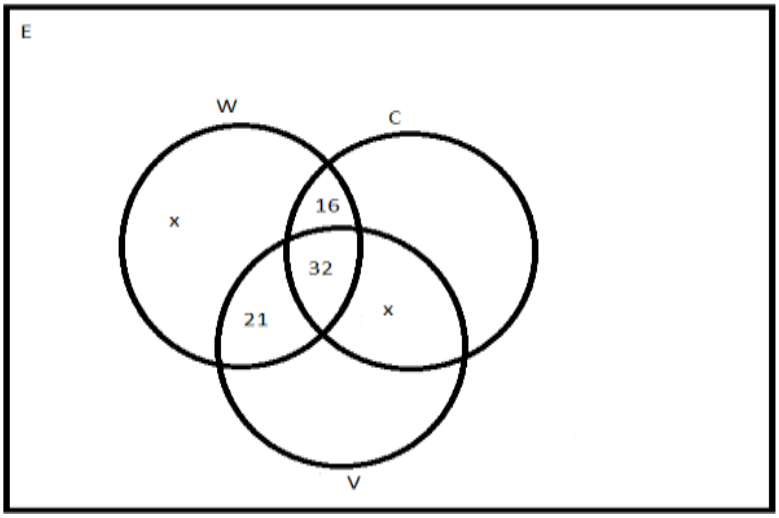
(a) The value of y.

(b) The number of people who did not watch Ngoma dance.



2006

3. Pupils at City School were questioned about the type of transport they use when going to school. Their responses were as shown below.
W=(pupils who walk).
C= (pupils who cycle).
V= (pupils who use vehicles).



(i) Given that there were 80 pupils who walk and 75 pupils who cycle.

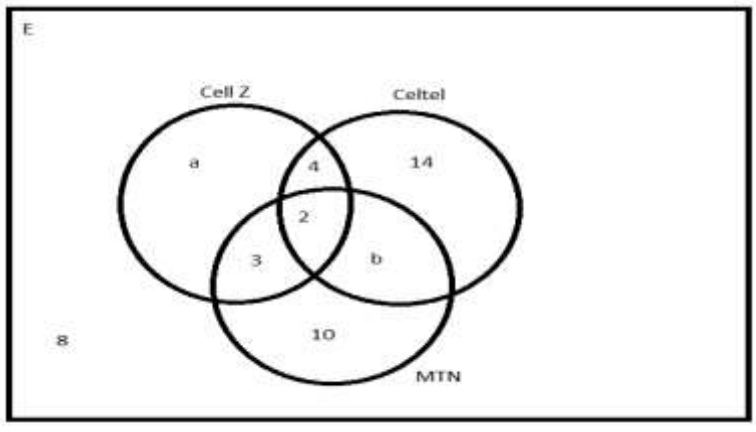
(a) Find the value of x.

(b) Find the number of pupils who cycle only.

(ii) Given also that 43 pupils use vehicles only, find the total number of pupils at this school.

2007

4. A survey was conducted on 60 women concerning the types of Sim cards used in their Cell phones for the past 2 years. Their responses are given in the diagram below.



(a) Given that 23 women have used Cell Z Sim cards, find the values of a and b.

(b) How many women have used only two different types of Sim cards?

(c) If a woman is selected at radom from the group, what is the probability that:

(i) She has no Cell phone

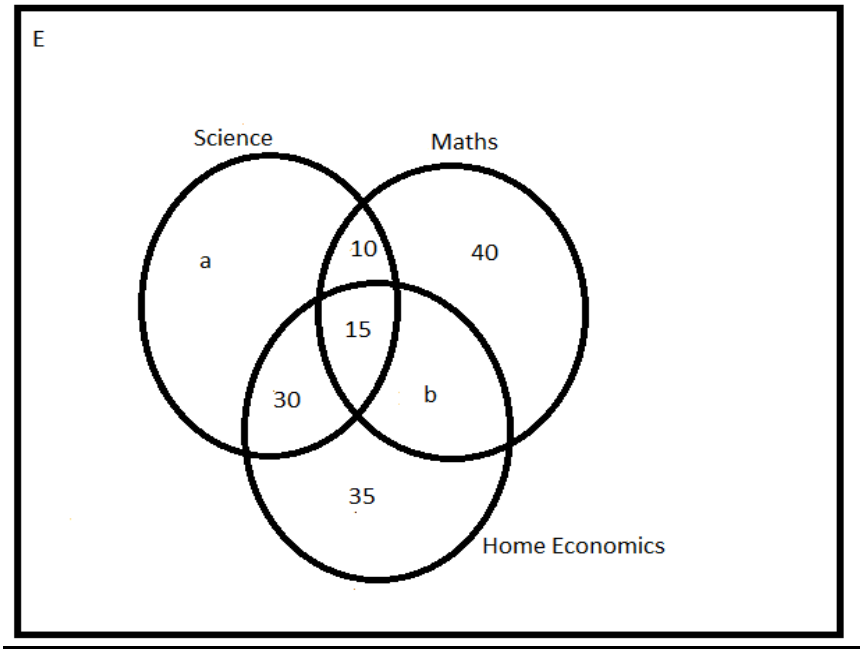
(ii) She has used only one type of Sim card.

(d) How many women did not use MTN and Cell Z Sim cards?

(e) How many women used either Celtel or MTN but not Cell Z?

2009

5. In a particular year, 150 candidates applied for training as teachers of Mathematics, Science and Home Economics at COSETCO. The Venn diagram below illustrates the number of candidates for each subject.



(i) Given that 70 candidates applied for Science, find the values of a and b.

(ii) How many candidates applied for two different subjects?

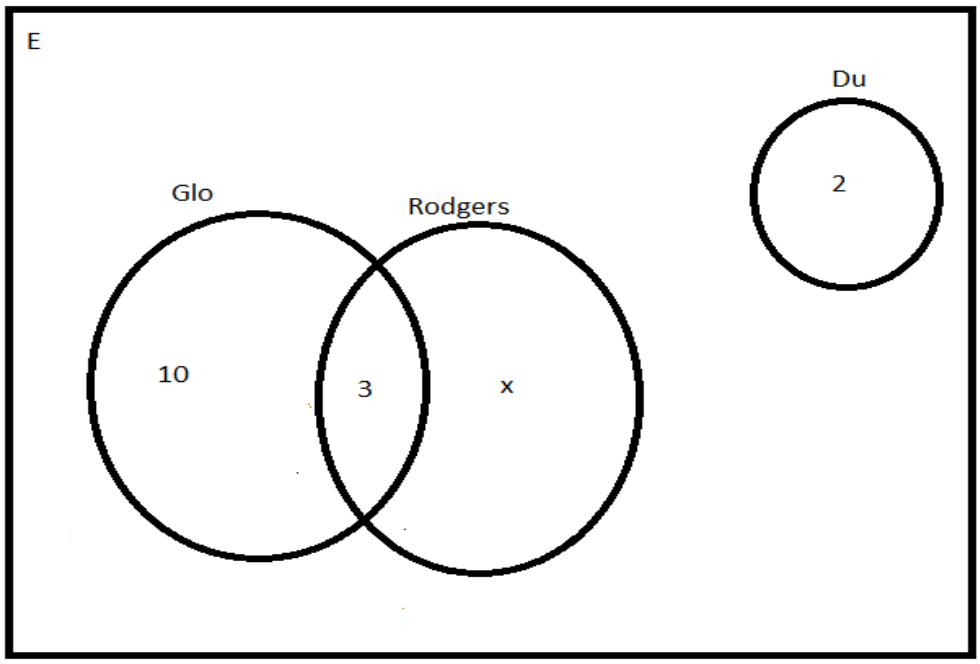
(iii) How many candidates did not apply for Science or Mathematics?

(iv) How many candidates applied for either Science or Home Economics but not Mathematics?

(v) If a candidate is selected at random from the group, what is the probability that the candidate applied for one subject only?

2010

6. At one college, a group of 25 students were asked which Cell phone service providers they subscribed to. The results are shown in the Venn diagram below.



(i) Calculate the value of x.

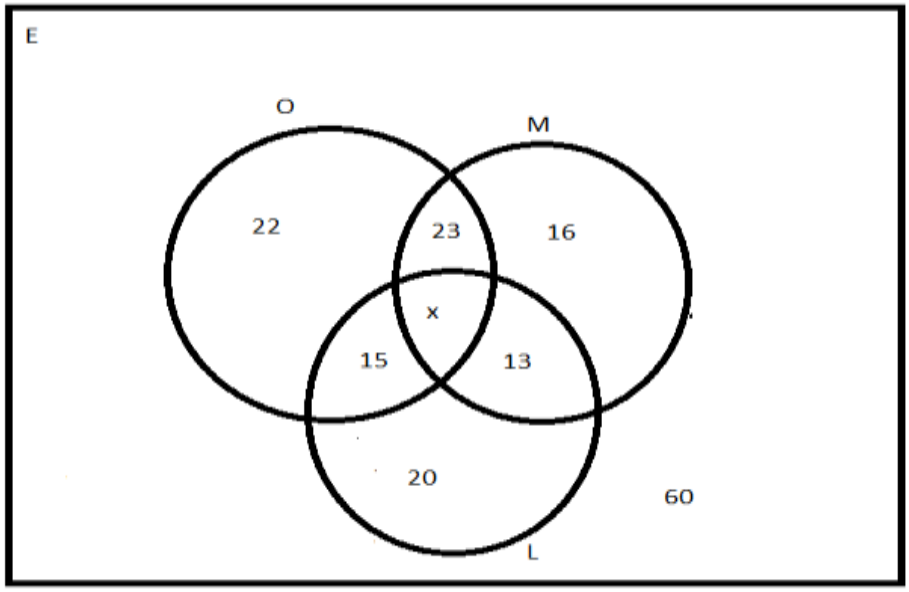
(ii) Given that G= (Glo), R= (Rodgers) and D= (Du), find;

(a) n(G∩ R),

(b) n(D ∪ G')

2011

7. In a certain month, a survey was conducted on 250 High School pupils to find out the number of pupils that bought Oranges(O), Mangoes(M), and Lemons(L). Their responses were as shown in the Venn diagram below.



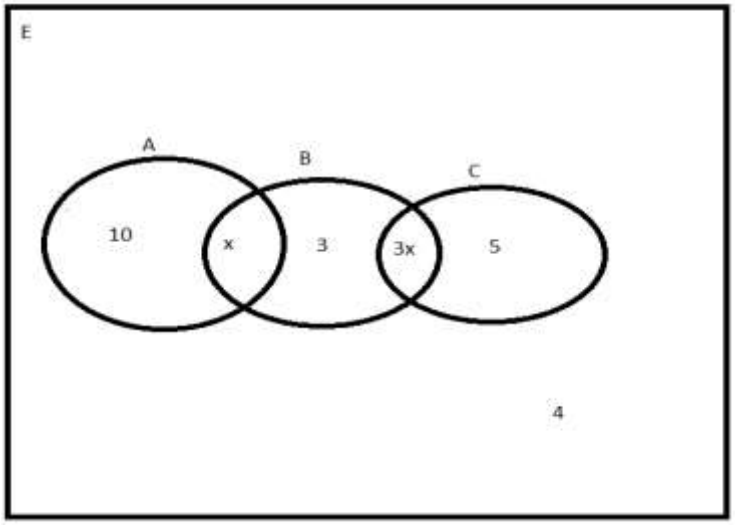
(i) Find the value of x.

(ii) How many pupils bought Mangoes and Lemons but not Oranges?

(iii) How many pupils bought one type of fruit only?

2013

8. The diagram below shows three sets A, B and C.



Given that n($A \cup B \cup C$) = 50, find;

(i) The value of x.

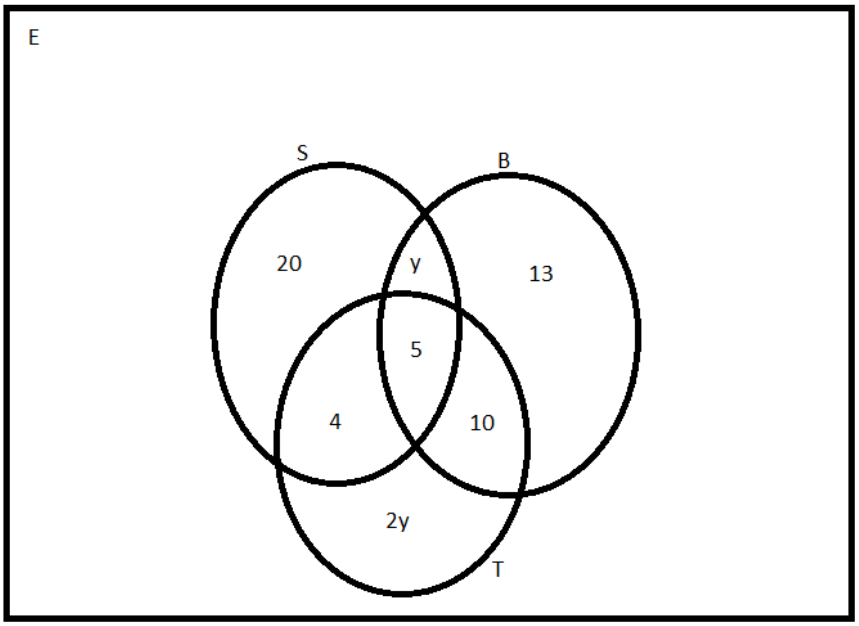
(ii) n(A∪ B)

(iii) n$(B \cup C)'$

(iv) n(A$'$∩ C$'$)

2014

9. Tokozan Sports Club offers Squash(S), Badminton (B) and Tennis (T). The Venn diagram below shows choices of the 37 members of the Club.



(i) Calculate the value of y.

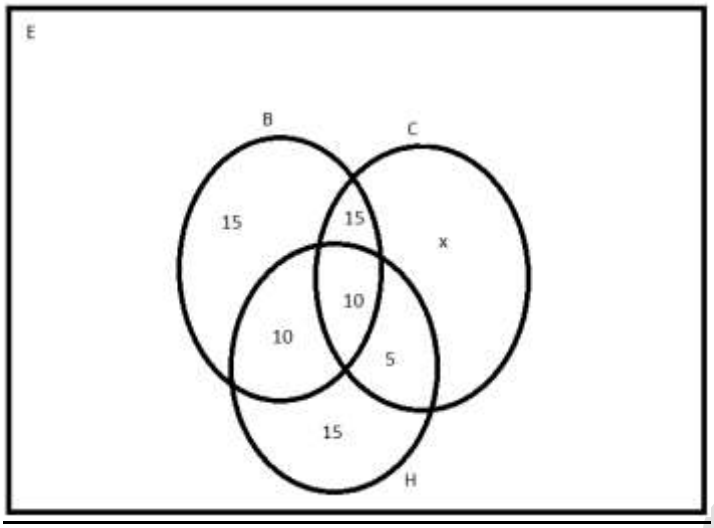
(ii) Find the number of members who played Squash or Tennis but not Badminton.

(iii) How many members played two different sports only?

(iv) Find the number of members who played one sport only.

2015 OCT/NOV

10. The Venn diagram below shows the number of students who took Business(B), Human Resources(H) and Community Development(C) at Mafundisho College. 100 students took all these three courses.



(a) Find

(i) The value of x.

(ii) The number of students who took Human Resources.

(iii) n(B∩ C) ∩ H$'$

(iv) n(B ∪ C) ∩ H$'$

(b) If a student is chosen at random, what is the probability that he/she took;

(i) One course,

(ii) At least two courses.

2016 OCT/NOV

11. Of the 50 villagers who can tune in to Kambani Radio Station, 29 listen to news, 25 listen to sports, 22 listen to music, 11 listen to both news and sports, 9 listen to both sports and music, 12 listen to both news and music, 4 listen to all the three programs and 2 do not listen to any program.

(i) Draw a Venn diagram to illustrate this information.

(ii) How many villagers

(a) Listen to music only

(b) Listen to one type of program only

(c) Listen to two types of programs only.

2017 OCT/NOV

12. A survey carried out at Kamulima Farming Block showed that 44 farmers planted maize, 32 planted sweet potatoes, 37 planted cassava, 14 planted both maize and sweet potatoes, 24 planted both sweet potatoes and cassava, 20 planted both maize and cassava, 9 planted all the three crops and 6 did not plant any of these crops.

(i) Illustrate this information on a Venn diagram.

(ii) How many farmers

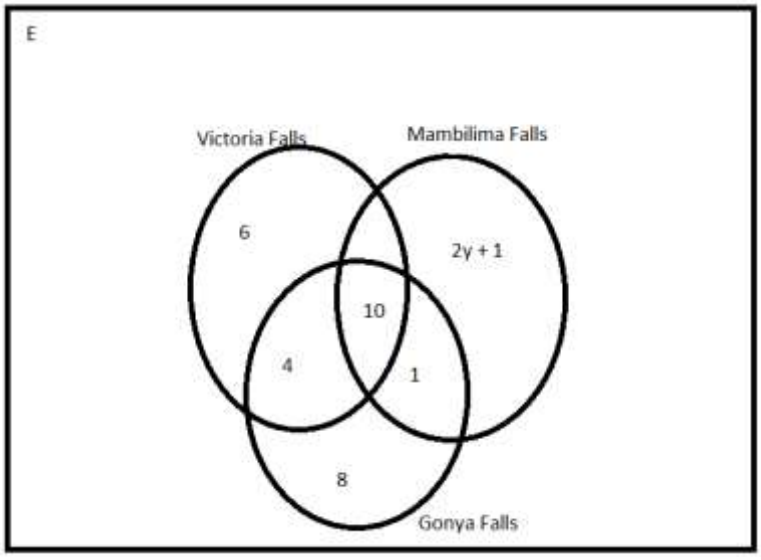
(a) Were at this farming block,

(b) Planted maize only,

(c) Planted two different crops.

2017 GCE

13. The Venn diagram below shows tourist attractions visited by certain students in a certain week.



(i) Find the value of y if 7 students visited Mambilima Falls only.

(ii) How many students visited

(a) Victoria Falls but not Gonya Falls,

(b) Two tourist attractions only,

(c) One tourist attraction only?

2018 OCT/NOV

14. At Sambililene College, 20 students study at least one of the three subjects; Mathematics(M), Chemistry(C) and Physics(P). All those who study Chemistry also study Mathematics, 3 students study all the three subjects, 4 students study Mathematics only, 8 students study Chemistry and 14 students study Mathematics.

(i) Draw a Venn diagram to illustrate this information

(ii) How many students study

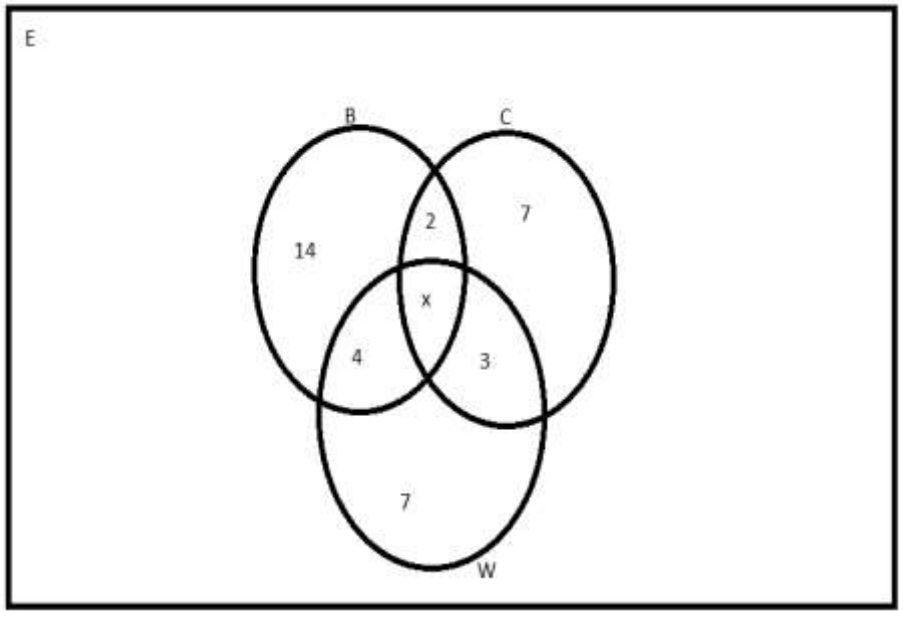
(a) Physics only

(b) Two types of subjects only

(c) Mathematics and Physics but not Chemistry.

2018 GCE

15. The diagram below shows how learners at Twatenda School travel to school. The learners uses either buses(B), cars(C) or walk(W) to school.



(i) If 22 learners walk to school, find the value of x.

(ii) How many learners use

(a) Only one mode of transport

(b) Two different mode of transport.

SEQUENCE AND SERIES

2016 OCT/NOV

1. The first three terms of a geometric progression are x + 1, x – 3 and x – 1. Find;

(a) The value of x

(b) The first term

(c) The sum to infinity.

2017 GCE

2. The first three terms of a geometric progression are 6 + n,10 + n and 15 + n. Find;

(a) The value of n

(b) The common ratio

(c) The sum of the first 6 terms of this sequence.

2017 INTERNAL

3. For the geometric progression 20, 5, $1\frac{1}{4}$…,find

(a) The common ratio,

(b) The n^{th} term,

(c) The sum of the first 8 terms.

2018 GCE

4. In a geometric progression, the third term is $\frac{2}{9}$ and the fourth term is $\frac{2}{27}$. Find ;

(a) The first term and the common ratio,

(b) The sum of the first 5 terms,

(c) The sum to infinity.

2018 INTERNAL

5. The first three terms of a geometric progression are k + 4, k and 2k – 15 where k is a positive integer.

(a) Find the value of k,

(b) List the first three terms of the geometric progression,

(c) Find the sum to infinity.

CALCULUS

2018 INTERNAL

1. (a) Evaluate $\int_{-1}^{2}(2+x-x^2)$dx.

(b) Find the equation of the normal to the y = x + $\frac{4}{x}$ at the point where x = 4.

2018 GCE

2. (a) Evaluate $\int_{0}^{1}(x^2-2x+3)dx$.

(b) Determine the equation of the normal to the curve y = $2x^2-3x-2$ which passes through (3,7).

2017 INTERNAL

3. (a) Find the coordinates of the points on the curve y = $2x^3-3x^2-36x$-3 where the gradient is zero.

(b) Evaluate $\int_{-1}^{3}(3x^2-2x)dx$.

2017 GCE

4. (a) Evaluate $\int_{2}^{5}(3x^2+2)dx$.

(b) Find the equation of the tangent to the curve y = x^2-3x-4 as a point where x = 2.

2016 INTERNAL

5. The equation of the curve is y = $x^3-\frac{3}{2}x^2$. Find

(a) The equation of the normal where x = 2,

(b) The coordinates of the stationary points.

MATRICES

2002 Oct/Nov Exams

1. Given that M =$\begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix}$ and N =$\begin{pmatrix} 3 & -5 \\ -1 & 2 \end{pmatrix}$, find the following matrices:
   (i) MN (ii) NM

2003 Oct/Nov Exams

1. Given that A =$\begin{pmatrix} 2 & 1 \\ -5 & -3 \end{pmatrix}$ and B =$\begin{pmatrix} 6 & 2 \\ 4 & 0 \end{pmatrix}$, find;
   (i) B – 2A (ii) BA^{-1}

2005 Oct/Nov Exams

2. If A =$\begin{pmatrix} 1 & x \\ -1 & 2 \end{pmatrix}$, find;
   (i) A^2

   (ii) the values of x for which the determinant of A^2 is 9.

2006 Oct/Nov Exams

3. Given that M=$\begin{pmatrix} -1 & 3 \\ 1 & 2 \end{pmatrix}$, find
   (i) M^2 (ii)S M^{-1}

2007 Oct/Nov Exams

4. A =$\begin{pmatrix} 5 & -2 \\ 3 & x \end{pmatrix}$ and B =$\begin{pmatrix} 6 \\ 4 \end{pmatrix}$
   (i) Given that the determinant of A is 21, find x. Hence find;
   (ii) A^{-1} (ii) AB

2008 Oct/Nov Exams

5. Given that P =$\begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix}$ and Q =$\begin{pmatrix} 3 & -5 \\ -1 & 2 \end{pmatrix}$, evaluate;
   (i) PQ (ii) PQ$\begin{pmatrix} -3 \\ 1 \end{pmatrix}$

2009 Oct/Nov Exams

6. Given that A =$\begin{pmatrix} 3 & 7 \\ 2 & 5 \end{pmatrix}$, find the
   (i) Determinant of A (ii) A^{-1} (iii) value of $A^{-1}\begin{pmatrix} -2 \\ 1 \end{pmatrix}$

2010 Oct/Nov Exams

7. If P =$\begin{pmatrix} 2 & 0 \\ 6 & 1 \end{pmatrix}$ and Q =$\begin{pmatrix} a & 0 \\ 1 & b \end{pmatrix}$, find;

(i) PQ (ii) the value of a and b given that PQ = P – Q

2011 Oct/Nov Exams

8. Given that matrix A =$\begin{pmatrix} 1 & x \\ -1 & 2 \end{pmatrix}$.

(i) Write an expression in terms of x for the determinant of A.

(ii) Find the value of x, given that the determinant of A is 5.

(iii) Write A^{-1}

2012 Oct/Nov Exams

9. Given that A =$\begin{pmatrix} 2 & 3 \\ -1 & 5 \end{pmatrix}$ and B =$\begin{pmatrix} 2 \\ 3 \end{pmatrix}$, find the

(i) Determinant of A (ii) A^{-1} (iii) value of AB

2013 Oct/Nov Exams

10. Given that A =(2 2 -1), P =$\begin{pmatrix} -1 & -1 \\ 4 & 2 \\ 2 & 0 \end{pmatrix}$ and Q =$\begin{pmatrix} 2 & -1 \\ 4 & 1 \end{pmatrix}$, find;

(i) 2P (ii) determinant of Q (iii) AP

2014 Oct/Nov Exams

11. Given that A =$\begin{pmatrix} 5 & 2 \\ 1 & 0 \end{pmatrix}$ and B =$\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$, find;

(i) A^{-1} (ii) 3A – B (iii) AB

2015 Oct/Nov Exams

12. Given that matrix Q =$\begin{pmatrix} a & 2 \\ 3 & -2 \end{pmatrix}$.

(i) Write an expression in terms of a, for the determinant of Q.

(ii) Find the value of a, given that the determinant of Q is 2.

(iii) Write Q^{-1}

2016 Oct/NOV Exams

13. Given that Q =$\begin{pmatrix} 3 & -2 \\ x & 4 \end{pmatrix}$, find

(i) the value of x, given that the determinant of Q is 2

(ii) Q^{-1}

2017 GCE

14. Given that K =$\begin{pmatrix} 10 & -2 \\ 11 & -2 \end{pmatrix}$, find

(i) the determinant of K (ii) K^{-1}

2017 Oct/Nov Exams

15. Given that M =$\begin{pmatrix} 3 & -2 \\ 5 & x \end{pmatrix}$.

(i) Find the value of x, for which the determinant of M is 22.

(ii) Hence, find the inverse of M.

2018 GCE

16. Given that A =$\begin{pmatrix} 2x & 2 \\ 3 & x \end{pmatrix}$,

(i) find the positive value of x, for the determinant of A is 12.

(ii) hence, find the inverse of A.

2018 Oct/Nov Exams

17. Given that A =$\begin{pmatrix} 4 & -5 \\ 1 & 2 \end{pmatrix}$ and B =$\begin{pmatrix} 8 & y \\ 3 & 5 \end{pmatrix}$,

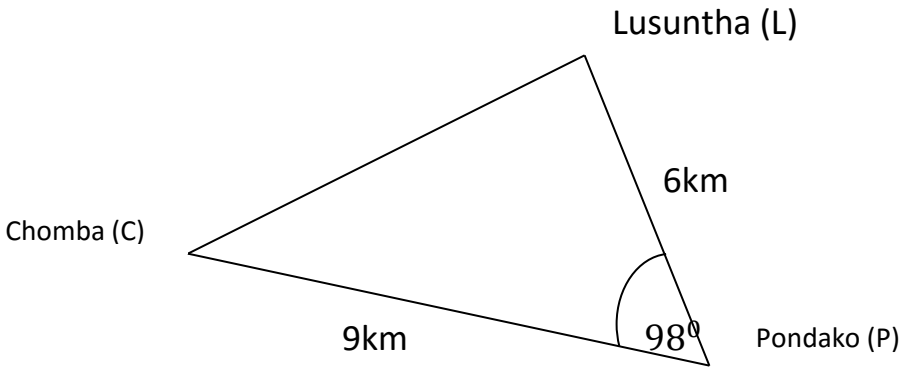
(i) find the value of y, given that the determinants of A and B are equal,

(i) hence, find the inverse of B.

TRIGONOMETRY

2005

1. Three villages Lusuntha(L),Pondako(P) and Chomba(C) are linked up by three straight paths as shown in the diagram below.



Given thatLP =6km, PC = 9km and angle LPC =98^0.

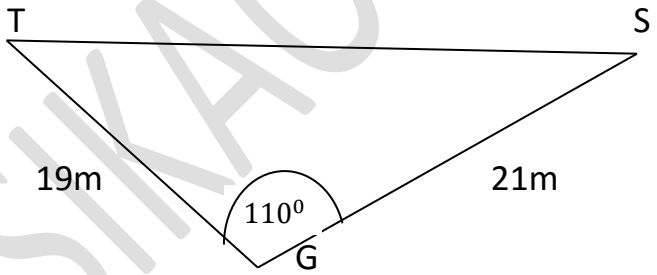
(a) Calculate how far Lusuntha is from Chomba correct to 1 decimal place.

(b) What is the area bounded by the three footpaths correct to 1 decimal place.

(c) Headman of Pondako village wants to create a short cut path from his village to the footpath CL. Calculate this distance correct to 1 decimal place.

2008 Oct/Nov Exams

2. During a soccer training session, the goal keeper (G) was standing at the centre of the goal posts, a shooting player(S) was 21m from the goal keeper's position, the trainer (T) was 19m from the goal keeper and angle TGS = 110^0 as shown in the diagram below.



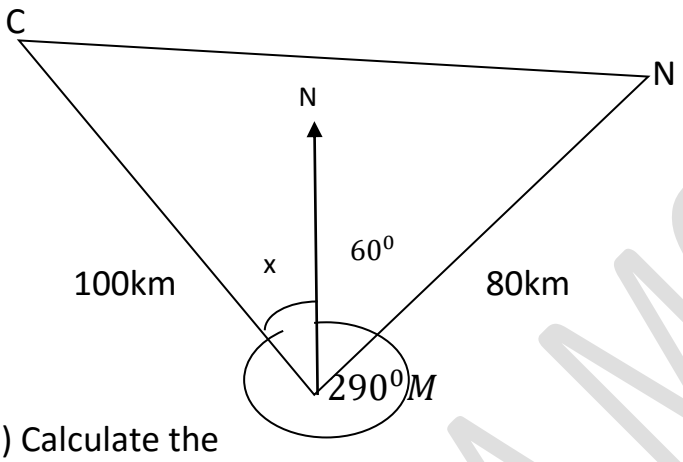
(a) Calculate the area of GST to the nearest square meter.

(b) The trainer T rolls a ball along TS for a shooting player 9(S) to kick to the mouth. Calculate the distance TS.

(c) The goal keeper (G) is free to intercept the ball at any point along TS before it reaches the player at S. Find the shortest distance which the goal keeper could run in order to intercept the ball.

2009 Oct/Nov Exams

3. Three towns Choma (C), Monze (M) and Namwala (N) are such that the distance from Monze to Choma is 100km and Monze to Namwala 80km. The bearing of Namwala from Monze is 060^0 and the bearing of Choma from Monze is 290^0.



(a) Calculate the

(i) Value of x

(ii) Distance from Choma to Namwala correct to 2 decimal places.

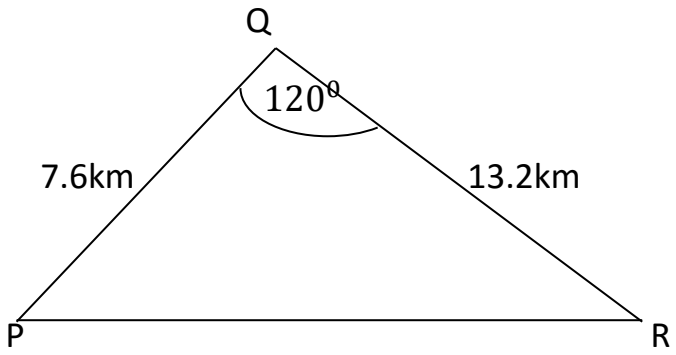
(iii) Area covered by triangle CMN correct to 2 decimal places.

(b) Given that Nikoh (H) is a bus station on the Choma – Namwala route such that MH is the shortest distance from Monze to Nikoh, calculate this shortest distance MH correct to 2 decimal places.

(c) Hence, find how far Nikoh is from Namwala, giving your answer correct to 2 decimal places.

2010 Oct/Nov Exams

3. P, Q and R are fishing camps along the banks of Lake Kariba joined by straight paths PQ, QR and RP. P is 7.6km from Q and Q is 13.2km from R and angle PQR=120^0.



(a) Calculate

(i) The distance PR

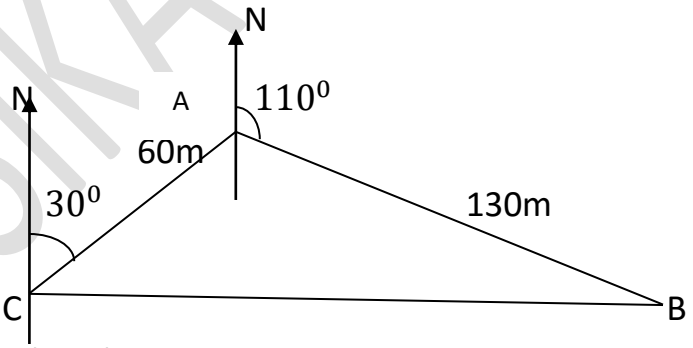
(ii) The area of triangle PQR

(b) Find the shortest distance from Q to PR.

(c) A fisherman takes 30 minutes to move from R to P. Calculate his average speed in km/h.

2011 Oct/Nov Exams

5. A girls' high school has been built in such a way that the Administration block (A), dormitories (B) and classes (C) are connected by straight corridors. A is 60m from C and 130m from B. The bearing of B from A is 110^0 and the bearing of A from C is 030^0 as shown in the diagram below.



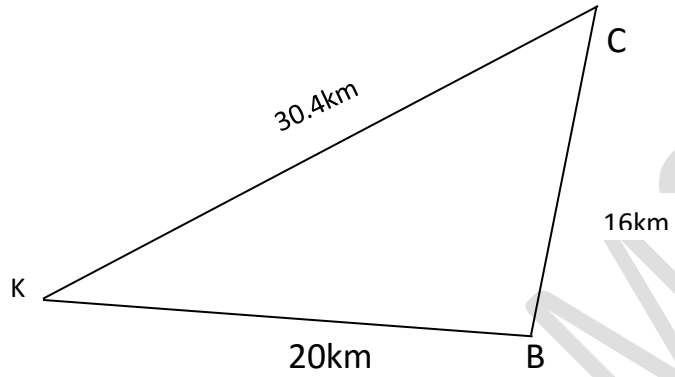
(i) Find angle BAC

(ii) Calculate the distance BC

(iii) TheAdministration decided to build a tuckshop at point T along BC such that T is the shortest distance from A. Given that the area of triangle ABC IS 3840.75cm^2, calculate AT.

2012 Oct/Nov Exams

6. The diagram below shows Kapenta (K), Bream (B) and Chisense (C) fishing camps on Lake Manzi. B is 20km due east of K, BC=16km and KC = 30.4km.



(i) Calculate,

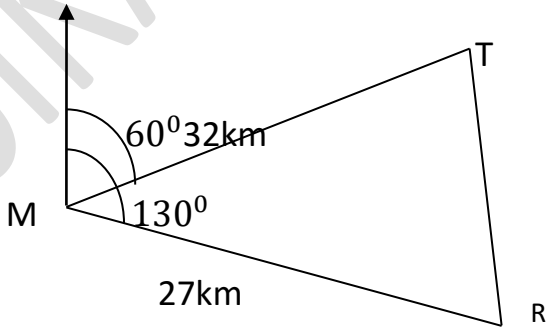
(a) Angle KBC to the nearest degree.

(b) The area of triangle KBC.

(ii) Another fishing camp Ndombe (N) is on KB produced, such that angle BNC =90^0. Calculate the distance between C and N.

2013 Oct/Nov Exams

7. M, T and R are Food Reserve Agency Maize buying points in a given district. T is 32lm from M on a bearing of 060^0 and R is 27km from M on a bearing of 130^0 as shown in the diagram below.



Calculate;

(i) Angle RMR.

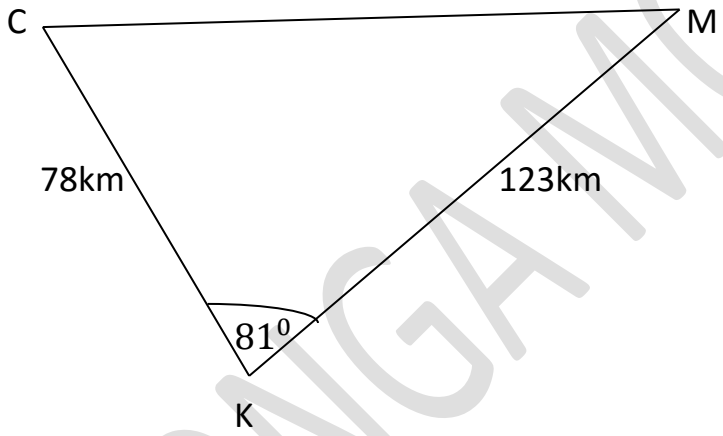
(ii) The area of triangle MTR

(ii) RT to the nearest kilometer.

(ii) MS, given that there is a shopping Centre S along RT such that MS is the shortest distance from M.

2014 Oct/Nov Exams

8. Positions of Kabwela (K), Chapa (C) and Muzi (M) are as shown in the diagram below. Chapa is 78km from Kabwela and Muzi is 123km from Kabwela.



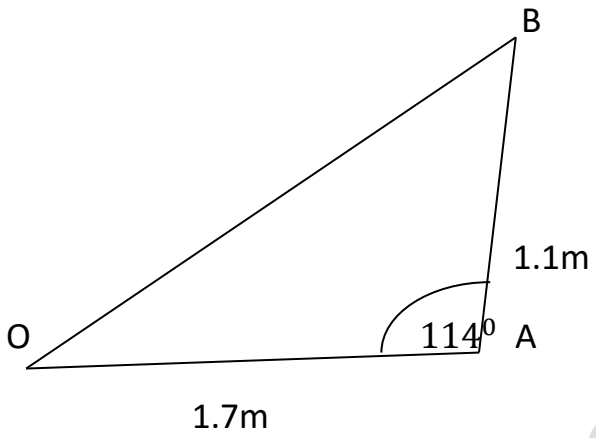
(i) Given that angle CKM is 81^0, calculate the area of triangle CMK.

(ii) Calculate the distance CM.

(iii) A company has been contracted to construct a road from Muzi (M) to Chapa (C). Find the total cost of constructing this road, if the company charges K21 000.00 per kilometer.

2015 Oct/Nov Exams

9. The diagram below shows a triangular garden OAB where OA= 1.7m, AB= 1.1m and angle OAB = 114^0

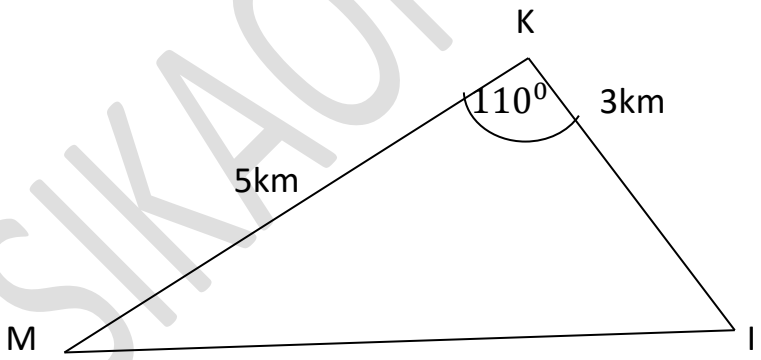


Calculate

(i) The area of triangle AOB correct to 1 decimal place.
(ii) The distance OB.
(iii) The shortest distance from A to OB.

2016 Oct/Nov Exams

10. The diagram below shows the locations of three secondary schools , namely Mufulira (M), Kantanshi (K) and Ipusukilo (I) in Mufulira district. M is 5km from K, I is 3km from K and angle MKIis 110^0.



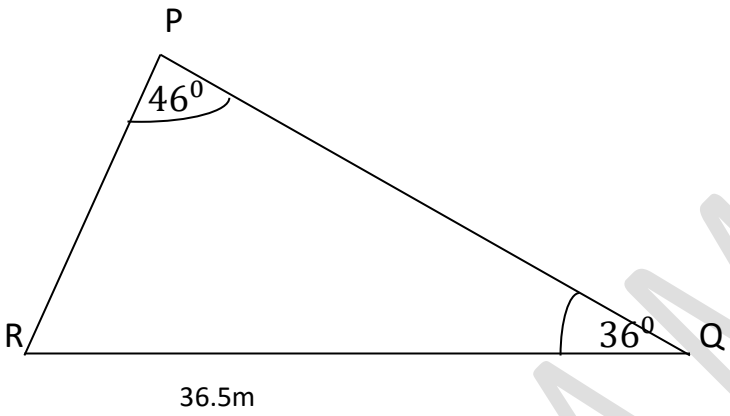
Calculate

(i) MI
(ii) The area of triangle MKI
(iii) The shortest distance from K to MI.

(b) Solve the equation tanθ = 0.7 for $0^0 \leq \theta \leq 180^0$.

2017 GCE Exams

11. (a) In the triangle PQR below, QR = 36.5m, angle PQR =36^0 and angle QPR=46^0.

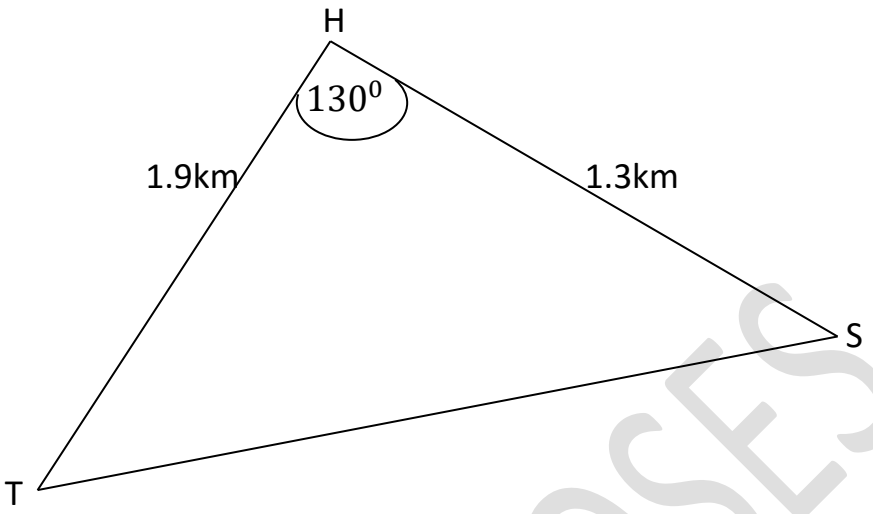


Calculate

(i) PQ
(ii) the area of triangle PQR
(iii) the shortest distance from R to PQ.

2017 Oct/Nov Exams

12. (a) The diagram below shows the location of houses for a village Headman (H), his secretary (S) and a trustee (T). H is 1.3km from S. T is 1.9km from H and angle THS = 130^0.



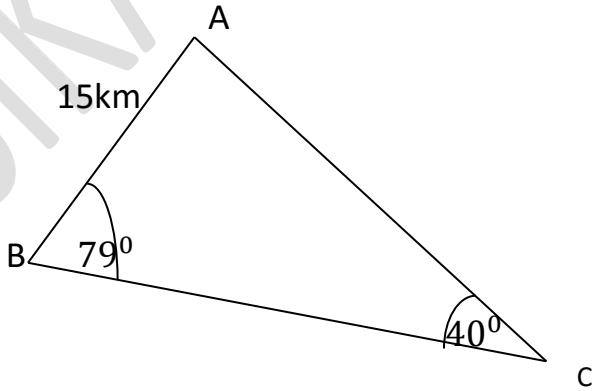
Calculate

(i) the area of triangle THS
(ii) the distance TS
(iii) the shortest distance from H to TS.

(b) Find the angle between 0^0 and 90^0 which satisfies the equation $\cos\theta = \frac{2}{3}$.

2018 GCE Exams

13. (a) Three villages A, B and are connected by straight paths as shown in the diagram below.



Given that AB = 15km, angle ABC = 79^0 angle ACB = 40^0, calculate the

(i) Distance AB

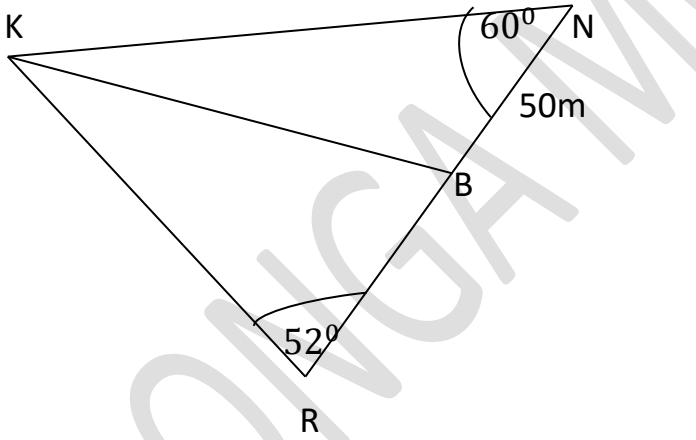
(ii) Area of triangle ABC.

(iii) Shortest distance from B to AC

(b) Solve the equation $\cos\theta = 0.937$ for $0^0 \leq \theta \leq 360^0$.

2018 Oct/Nov Exams

14. In the diagram below, K, N, B and R are places on horizontal surface. Kn = 80m, NB = 50m and angle angle KRN = 52^0.



(a) Calculate

1. (i)KR
2. (ii) the area of triangle KNB.

(b) Given that the area of triangle KNR is equal to 3 260cm^2, calculate the shortest distance from R to KN.

ANSWERS

2002

1. **(a)** $2x + 5 = 10 - 3x$

$2x + 3x = 10 - 5$

$\frac{5x}{5} = \frac{5}{5}$

X = 1

(b) $\frac{cb-a}{c} \times \frac{1}{1}$

$cb - a = c$

$cb - c = a$

$\frac{c(b-1)}{b-1} = \frac{a}{b-1}$

c = $\frac{a}{b-1}$ Answer

(c) $\frac{5}{2x-3} - \frac{1}{x+5}$

$\frac{5(x+5)-1(2x-3)}{(2x-3)(x+5)}$

$\frac{5x+25-2x+3}{(2x-3)(x+5)}$

$\frac{5x-2x+25+3}{(2x-3)(x+5)}$

$\frac{\mathbf{3x+28}}{\mathbf{(2x-3)(x+5)}}$

(c) $3w^2 - 12$

$3(w^2 - 4)$

$3(w^2 - 2^2)$

$\mathbf{3[(w+2)(w-2)]}$

2003

2. **(a)** $p = 2(l + b)$

$P = 2(8 + 3)$

$P = 2(11)$

P = 22

2004

3. **(a)** $\frac{a}{b} + \frac{b}{c}$

$= \frac{3}{2} + \frac{2}{4}$

$=\frac{3}{2}+\frac{\mathbf{1}}{\mathbf{2}}$

$=\frac{3+1}{2}=\frac{4}{2}$

=2

(b) 3(m -5) = 7 – 2(m – 3)

3m – 15 = 7 – 2m + 6

3m + 2m =7 +6 + 15

$\frac{5m}{5}=\frac{28}{5}$

m = $\frac{\mathbf{28}}{\mathbf{5}}$ **or** $\mathbf{5\frac{3}{5}}$

(c) $4 - 16x^2$

$= 4(1 - 4x^2)$

$= 4(1^2 - 2^2x^2)$

$= \mathbf{4}[(\mathbf{1}+\mathbf{2}\boldsymbol{x})(\mathbf{1}-\mathbf{2}\boldsymbol{x})]$

(d) $\frac{3}{2}-\frac{1-2x}{4x}$

$=\frac{3(2x)-1(1-2x)}{4x}$

$=\frac{6x-1+2x}{4x}$

$=\frac{\mathbf{6}\boldsymbol{x}+\mathbf{2}\boldsymbol{x}-\mathbf{1}}{\mathbf{4}\boldsymbol{x}}=\frac{\mathbf{8}\boldsymbol{x}-\mathbf{1}}{\mathbf{4}\boldsymbol{x}}$

2005

4. **(a)** $\frac{a}{1}=\frac{3a+b}{2}$

2a = 3a + b

2a – 3a = 2

-a = 2

a = -2

(b) $\frac{a}{1}=\frac{3a+b}{b}$

ab = 3a + b

ab – b = 3a

$\frac{b(a-1)}{a-1}=\frac{3a}{a-1}$

b = $\frac{\mathbf{3}\boldsymbol{a}}{\boldsymbol{a}-\mathbf{1}}$

(c) $\frac{3}{p-1}-\frac{2}{1-p}$

$=\frac{3(1-p)-2(p-1)}{(p-1)(1-p)}$

$=\frac{3-3p-2p+2}{(p-1)(1-p)}$

(d) $(x+3)^2 = 64$

$\sqrt{(x+3)^2}=\pm\sqrt{64}$

$x + 3 = \mp 8$

X = 8 – 3 or x = -8 – 3

$=\frac{3+2-5p}{(p-1)(1-p)}$

x = 5 or x = -11

$=\frac{5-5p}{(p-1)(1-p)}$

$=\frac{5(1-p)}{(p-1)(1-p)}$

$=\frac{\mathbf{5}}{(\boldsymbol{p-1})}$

(e) $\frac{1-x^2}{5-3x-2x^2}$

$=\frac{1-x^2}{2x^2+3x-5}$ prod= -10 sum= 3 factors= -2, 5

$=\frac{1-x^2}{2x^2-2x+5x-5}$

$=\frac{1-x^2}{2x(x-1)+5(x-1)}$

$=\frac{(1^2-x^2)}{(2x+5)(x-1)}$

$=\frac{(1+x)(1-x)}{(2x+5)(x-1)}$

$=\frac{(\mathbf{1}+\boldsymbol{x})}{(\mathbf{2}\boldsymbol{x}+\mathbf{5})}$

2006

5. (a) 2x – 6 = 4 – 3(x – 5)

2x – 6 = 4 – 3x + 15

2x + 3x = 4 + 15 + 6

5x = 25

X = 5

(b) $\frac{\mathbf{1}}{\mathbf{2}-\boldsymbol{x}} - \frac{\mathbf{2}}{\boldsymbol{x}-\mathbf{4}}$

$$= \frac{\mathbf{1}(\boldsymbol{x}-\mathbf{4})-\mathbf{2}(\mathbf{2}-\boldsymbol{x})}{(\mathbf{2}-\boldsymbol{x})(\boldsymbol{x}-\mathbf{4})}$$

$$=\frac{x-4-4+2x}{(2-x)(x-4)}$$

$$=\frac{x+2x-8}{(2-x)(x-4)}$$

$$=\frac{\mathbf{3}\boldsymbol{x}-\mathbf{8}}{(\mathbf{2}-\boldsymbol{x})(\boldsymbol{x}-\mathbf{4})}$$

2007

6. (a) x - y^2

=8 – (-2^2)

=8 – 4

=4

(b) 3x - 12x^3

=3x(1 - 4x^2)

=3x(1^2 - 2^2x^2)

=3x$[(\mathbf{1}+\mathbf{2}\boldsymbol{x})(\mathbf{1}-\mathbf{2}\boldsymbol{x})]$

(b) $\frac{x+5}{3}-\frac{x+2}{4}$

$$=\frac{4(x+5)-3(x+2)}{12}$$

$$=\frac{4x+20-3x-6}{12}$$

$$=\frac{\boldsymbol{x}+\mathbf{14}}{\mathbf{12}}$$

2008

7. (a) mn – km – hn + hk

=m(n – k) – h(n – k)

=(m – h)(n – k)

(b) $\frac{8\pi r^2-2\pi r^4}{4\pi r+2\pi r^2}$

$$=\frac{2\pi r^2(4-r^2)}{2\pi r(2+r)}$$

(c) $\frac{x-1}{3}$ - $\frac{2x-3}{5}$

$$=\frac{5(x-1)-3(2x-3)}{15}$$

$$=\frac{5x-5-6x+9}{15}$$

$$=\frac{-\boldsymbol{x}+\mathbf{4}}{\mathbf{15}}$$

$=\frac{2\pi r^2(2^2-r^2)}{2\pi r(2+r)}$

$=\frac{2\pi r^2[(2+r)(2-r)]}{2\pi r(2+r)}$

=r(2 –r)

2009

8. (a) $1 - \frac{3}{5}x < 4$

$-\frac{3}{5}x < 4 - 1$

$-\frac{3}{5}x \times -\frac{3}{1}$

$\frac{-3x}{-3} < \frac{15}{-3}$

X > -5

(b) $\frac{a-2}{a^2-4}$

$=\frac{a-2}{a^2-2^2}$

$=\frac{a-2}{(a+2)(a-2)}$

$=\frac{\mathbf{1}}{(\boldsymbol{a}+\mathbf{2})}$

(c) $p^2 - q^2$

$=(7)^2 - (-3)^2$

=49 -9

=40

(d) $\frac{5}{2x-1} - \frac{7}{3x-2}$

$=\frac{5(3x-2)-7(2x-1)}{(2x-1)(3x-2)}$

$=\frac{15x-10-14x+7}{(2x-1)(3x-2)}$

$=\frac{\boldsymbol{x-3}}{(\boldsymbol{2x-1})(\boldsymbol{3x-2})}$

2010

9. (a) $5 - 20x^2$

$=5(1 - 4x^2)$

$=5(1^2 - 2^2x^2)$

$=\mathbf{5}[(\mathbf{1}+\mathbf{2}\boldsymbol{x})(\mathbf{1}-\mathbf{2}\boldsymbol{x})]$

(b) 2(2x – 5) + 2 = x + 7

4x – 10 + 2 = x + 7

4x – x =7 + 10 - 2

$\frac{\mathbf{3}\boldsymbol{x}}{\mathbf{3}} = \frac{\mathbf{15}}{\mathbf{3}}$

X = 5

(c) $\frac{2}{1-3x} + \frac{4}{5+x}$

$=\frac{2(5+x)+4(1-3x)}{(1-3x)(5+x)}$

$=\frac{10+2x+4-12x}{(1-3x)(5+x)}$

$=\frac{\mathbf{14-10x}}{\mathbf{(1-3x)(5+x)}}$

(d) $\frac{d}{1} = \frac{p+y}{5y}$

5dy = p + y

5dy – y = p

$\frac{y(5d-1)}{5d-1} = \frac{p}{5d-1}$

y = $\frac{\boldsymbol{p}}{\mathbf{(5d-1)}}$

(c) 3x – y

=3(7) – (-9)

=21 + 9

=30

(d) $\frac{3y^2-5y-12}{y^2-9}$ prod=-36 sum= -5 factors = -9,4

$\frac{3y^2-9y+4y-12}{y^2-9}$

$=\frac{3y(y-3)+4(y-3)}{y^2-9}$

$=\frac{(3y+4)(y-3)}{y^2-3^2}$

$=\frac{(3y+4)(y-3)}{(y+3)(y-3)}$

$=\frac{\mathbf{(3y+4)}}{\mathbf{(y+3)}}$

2011

10. (a) $3x^2 - 3$

$=3(x^2 - 1$

$=3(x^2 - 1^2)$

$=\mathbf{3[(x+1)(x-1)]}$

(b) $\frac{x+2}{3} - \frac{2x-3}{4}$

$=\frac{4(x+2)-3(2x-3)}{12}$

$=\frac{4x+8-6x+9}{12}$

$=\frac{\mathbf{-2x+17}}{\mathbf{12}}$

(c) $\frac{12}{x+2} = \frac{3}{5}$

3x +6 = 60

3x = 60 - 6

$\frac{\mathbf{3x}}{\mathbf{3}} = \frac{\mathbf{54}}{\mathbf{3}}$

X = 18

(d) 7 – 2t < 9

-2t < 9 – 7

$\frac{-2t}{-2} < \frac{2}{-2}$ **=t > -1**

(e) 3x – 4y – 2(x – 4y) – 2y

=3x – 4y – 2x + 8y – 2y

=3x – 2x – 4y + 8y – 2y

=x + 2y

2012

11. **(a)** $\frac{6}{x-2} = \frac{2}{3}$

2x – 4 = 18

2x = 18 + 4

$\frac{2x}{2} = \frac{22}{2}$

X = 11

(b) $\frac{x+2}{x^2-4}$

$=\frac{x+2}{(x+2)(x-2)}$

$=\frac{1}{x-2}$

(c) 4b – 3 < 6b + 4

=4b – 6b < 4 + 3

$\frac{-2b}{-2} < \frac{7}{-2}$

b > -3$\frac{1}{2}$

(d) 2xy + x – 10y – 5

=x(2y +1) – 5(2y + 1)

=(x – 5)(2y + 1)

2013

12. (a) $3y^2 - 12$

$=3(y^2 - 4)$

$=3(y^2 - 2^2)$

(b) $\frac{2a}{x-1} - \frac{a}{x-2}$

$\frac{2a(x-2) - a(x-1)}{(x-1)(x-2)}$

$\frac{2ax-4a-ax+a}{(x-1)(x-2)}$

=3$[(y+2)(y-2)]$ $\frac{ax-3a}{(x-1)(x-2)}$

2014

13. (a) 5x – 8 – 3(x + 1) = -7

5x – 8 – 3x – 3 = -7

5x – 3x – 8 – 3 = -7

2x – 11 = -7

2x = -7 + 11

$\frac{2x}{2} = \frac{4}{2}$

X = 2

(d) 9t – 4 < 12t – 10

9t – 12t < -10 + 4

$\frac{-3t}{-3} < \frac{-6}{-3}$

t > 2

(b) 5(2y – 3) – 2(5 – 2y)

=10y – 15 – 10 + 4y

=10y + 4y – 25

=**14y – 25**

(c) $\frac{5}{2y-1} - \frac{6}{3y-1}$

$\frac{5(3y-1)-6(2y-1)}{(2y-1)(3y=1)}$

$\frac{15y-5-12y+6}{(2y-1)(3y-1)}$

$\frac{15y-12y-5+6}{(2y-1)(3y-1)}$

$\frac{3y+1}{(2y-1)(3y-1)}$

(e) 2xy + 8x – 3y - 12

2x(y + 4) – 3(y + 4)

=(2x – 3)(y + 4)

2015

14.(a) 5px – 5py + 3qx – 3qy

=5p(x – y) +3q(x – y)

=(5p + 3q)(x – y)

(b) $\frac{2y^2-3y-5}{y^2-1}$ prod=-10 sum=-3 factors=-5,2

$= \frac{2y^2+2y-5y-5}{y^2-1}$

$= \frac{2y(y+1)-5(y+1)}{y^2-1^2}$

$$= \frac{(2y-5)\cancel{(y+1)}}{\cancel{(y+1)}(y-1)}$$

$$= \frac{\mathbf{(2y-5)}}{\mathbf{(y-1)}}$$

(c) $\frac{4}{x-2} - \frac{2}{x+3}$

$$= \frac{4(x+3) - 2(x-2)}{(x-2)(x+3)}$$

$$= \frac{4x+12-2x+4}{(x-2)(x+3)}$$

$$= \frac{4x-2x+12+4}{(x-2)(x+3)}$$

$$= \frac{\mathbf{2x+16}}{\mathbf{(x-2)(x+3)}}$$

2015 GCE

2. **(a)** $\frac{x+4}{2} = \frac{2x-1}{3}$

$3(x + 4) = 2(2x - 1)$

$3x + 12 = 4x - 2$

$3x - 4x = -2 - 12$

$\frac{-x}{-1} = \frac{-14}{-1}$

X = 14

(b) $\frac{h^2-k^2}{h+k}$

$= \frac{\cancel{(h+k)}(h-k)}{\cancel{h+k}}$

$= (h - k)$

(c) $4(1 - 2x) > 32$

$4 - 8x > 32$

$-8x > 32 - 4$

$\frac{-8x}{-8} > \frac{28}{-8}$

$\mathbf{x < \frac{-7}{2}}$

2016

3. (a) $\frac{x-1}{x^2-1}$

$$= \frac{x-1}{x^2-1^2}$$

$$= \frac{\cancel{x-1}}{(x+1)\cancel{(x-1)}}$$

$$= \frac{\mathbf{1}}{\mathbf{x+1}}$$

(b) $\frac{17k^2}{20a^2} \div \frac{51k^2}{5a}$

$$= \frac{17k^2}{20a^2} \times \frac{5a}{51k^2}$$

$$= \frac{17 \times k \times k}{20 \times a \times a} \times \frac{5 \times a}{51 \times k \times k}$$

$$= \frac{\mathbf{1}}{\mathbf{12a}}$$

(c) $\frac{2}{2x-1} - \frac{1}{3x+1}$

$$= \frac{2(3x+1) - 1(2x-1)}{(2x-1)(3x+1)}$$

$$= \frac{6x+2-2x+1}{(2x-1)(3x+1)}$$

$$= \frac{6x-2x+2+1}{(2x-1)(3x+1)}$$

$$= \frac{\mathbf{4x+3}}{\mathbf{(2x-1)(3x+1)}}$$

2017 GCE

4. (a) $\frac{m^2-1}{m^2-m}$

$=\frac{m^2-1^2}{m(m-1)}$

$=\frac{(m+1)(m-1)}{m(m-1)}$

$=\boldsymbol{\frac{m+1}{m}}$

(b) $\frac{p^2q^3}{4} \times \frac{8}{pq} \div 2p^2q$

$=\frac{p^2q^3}{4} \times \frac{8}{pq} \times \frac{1}{2p^2q}$

$=\frac{p \times p \times q \times q \times q}{4} \times \frac{8}{p \times q} \times \frac{1}{2 \times p \times p \times q}$

$=\boldsymbol{\frac{q}{p}}$

(c) $\frac{3}{5x-2} - \frac{2}{x+3}$

$=\frac{3(x+3)-2(5x-2)}{(5x-2)(x+3)}$

$=\frac{3x+9-10x+4}{(5x-2)(x+3)}$

$=\frac{3x-10x+9+4}{(5x-2)(x+3)}$

$=\boldsymbol{\frac{-7x+13}{(5x-2)(x+3)}}$

2017 INTERNAL

5. (a) $\frac{14x^3}{9y^2} \div \frac{7x^4}{18y^3}$

$=\frac{14x^3}{9y^2} \times \frac{18y^3}{7x^4}$

$=\frac{14 \times x \times x \times x}{9 \times y \times y} \times \frac{18 \times y \times y \times y}{7 \times x \times x \times x \times x}$

$=\boldsymbol{\frac{4y}{x}}$

(b) $\frac{2x^2-8}{x-2}$

$=\frac{2(x^2-4)}{x-2}$

$=\frac{2(x^2-2^2)}{x-2}$

$=\frac{2[(x+2)(x-2)]}{x-2}$

=2(x + 2)

(c) $\frac{1}{x-4} - \frac{2}{5x-1}$

$=\frac{1(5x-1)-2(x-4)}{(x-4)(5x-1)}$

$=\frac{5x-1-2x+8}{(x-4)(5x-1)}$

$=\frac{5x-2x-1+8}{(x-4)(5x-1)}$

$=\boldsymbol{\frac{3x+7}{(x-4)(5x-1)}}$

2018 GCE

6. (a) $\frac{7st^3}{15u^3v^2} \times \frac{5u^3v}{28s^3t^2}$

$=\frac{7 \times s \times t \times t \times t}{15 \times u \times u \times u \times v \times v} \times \frac{5 \times u \times u \times u \times v}{28 \times s \times s \times s \times t \times t}$

$=\boldsymbol{\frac{t}{12vs^2}}$

(b) $\frac{3}{2x-5} - \frac{4}{x-3}$

$=\frac{3(x-3)-4(2x-5)}{(2x-5)(x-3)}$

$=\frac{3x-9-8x+20}{(2x-5)(x-3)}$

$=\frac{3x-8x-9+20}{(2x-5)(x-3)}$

$=\boldsymbol{\frac{-5x+11}{(2x-5)(x-3)}}$

2018 INTERNAL

7. (a) $\frac{b-a}{a^2-b^2}$

$=\frac{-1(a-b)}{(a+b)(a-b)}$

$=\boldsymbol{\frac{-1}{a+b}}$

(b) $\frac{12dn^3}{15cd^3} \div \frac{9c^3n}{10c^2d^2}$

$=\frac{12dn^3}{15cd^3} \times \frac{10c^2d^2}{9c^3n}$

$=\frac{12 \times d \times n \times n \times n}{15 \times \times c \times d \times d \times d} \times \frac{10 \times c \times c \times c \times c}{9 \times c \times c \times c \times n}$

(c) $\frac{3}{x+1} - \frac{4}{x-1}$

$=\frac{3(x-1)-4(x+1)}{(x+1)(x-1)}$

$=\frac{3x-3-4x-4}{(x+1)(x-1)}$

$=\frac{8n^2}{9c^2}$

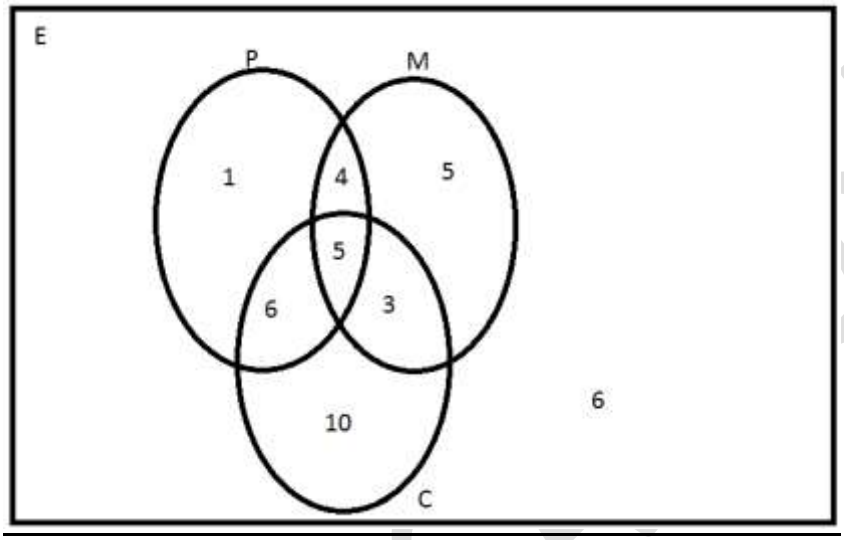
$=\frac{3x-4x-3-4}{(x+1)(x-1)}$

$=\frac{-x-7}{(x+1)(x-1)}$

SETS

2003

1.



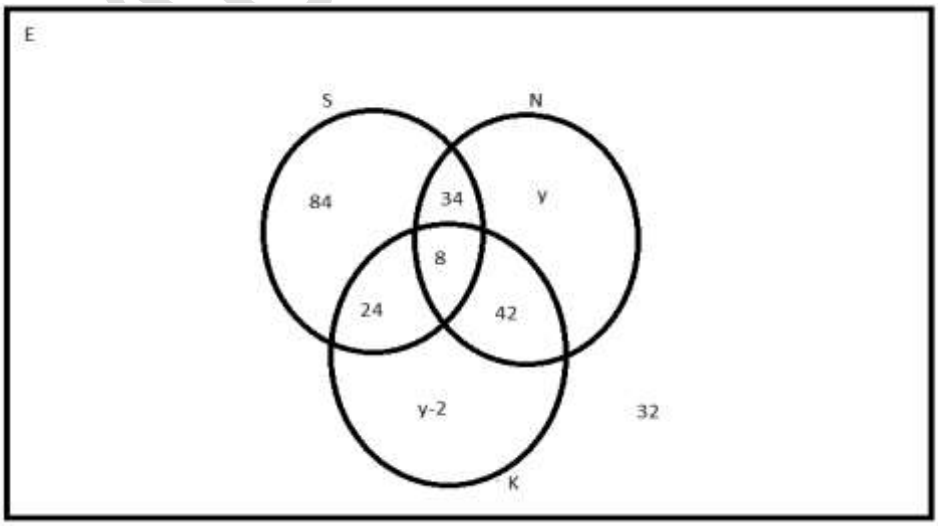
(i) (a) 1+ 5 + 10

= 16 pupils

(c) 6 pupils

2005

2. (i)



(ii) (a) 84 + 34 + 8 + 24 + 42 + 32+ y + y – 2=500

2y + 222 = 500

2y = 500 – 222

$\frac{2y}{2} = \frac{278}{2}$

y = 139

(b)84 + 24 + (139 – 2) + 32

= 177 people

2006

3. (i) x + 21 + 16 + 32 = 80 16 + 32 + x = 75 (b) **0 pupils**

x +69 = 80 48 + x = 75

x = 80 – 69 x = 75 – 48

x = 11 pupils **x = 27**

(iii) 43 + 11 + 27 + 32 + 16

=129 pupils

2007

4. (a) a + 3 + 2 + 4 = 23 b +14 + 3 + 2 + 4 + 14 + 10 +8 = 60

a + 9 = 23 b + 55 = 60

a = 23 – 9 b = 60 - 55

a = 14 **b = 5**

(b)5 + 3 + 4

= 12 women

(c)(i) $\frac{8}{60} = \frac{\mathbf{2}}{\mathbf{15}}$

(d))14 + 8

= 22 women

(e)14 + 5 + 10

= 29 women

(ii)$\frac{10+14+14}{60}$

$\frac{38}{60} = \frac{\mathbf{19}}{\mathbf{30}}$

2009

5. (i) a + 10 + 15 + 30 = 70 b + 15 + 10 + 15 + 30 + 35 + 40 = 150

a + 55 = 70 b + 145 = 150

a = 70 – 55

a = 15

b = 150 - 145

b = 5

(ii)5 + 30 +10

= 45 students

(iii) **35 students**

(v) $\frac{40+35+15}{150}$

$=\frac{90}{150}$

$=\frac{3}{5}$

(iv)15 + 30 + 35

= 80 students

2010

6. (i)10 + 3 + x + 2 = 25

x + 15 = 25

x = 25 – 15

x = 10

(ii)(a) **3**

(b) n(D ∪G′)=2 + 10 + 2 =**14**

2011

7. (i) 22 + 23 + 51 + x + 13 + 16 + 20 + 60 = 250

x+ 205 = 250

x = 250 – 205

x = 45

(ii) 16 + 13 + 20 + 60

= 109 pupils

(iii)20 + 16 + 22

58 pupils

2013

8. (i) 10 + x + 3 + 3x + 5 + 4 = 50

4x + 22 = 50

4x = 50 – 22

$\frac{4x}{4} = \frac{28}{4}$

x= 7

(ii)n(A∪ B) = 10+7+3 +3(7)=**41**

(iii) n(B∪ C)′= 10 + 4 **=14**

(iv)n(A′∩C′) = 3 + 4=**7**

2014

9. (i) y + 2y + 4 + 20 + 5 + 10 + 13 = 73

3y + 52 = 73

3y = 73 – 52

$\frac{3y}{3} = \frac{21}{3}$

y = 7

(ii) S or T = 20 + 4 + 2(7)=**38**

(iii) two different sports = 4 + 10 + 7=**21**

(iv) one sport only=14 + 13 + 20 = **47**

2015

10.(a) (i) 15 + 15 + 10 + x + 15 + 5 = 100

70 + x = 100

x = 100 – 70

x = 30

(ii)Human resource= 10 + 10 + 15 + 5 = **40**

(iii)n(B∩ C) ∩H$'$=$\{15,10\} \cap \{15,15,30\}$

= 15

(iv) n(B∪ C) ∩H$'$=$\{15,30,10\} \cap \{15,15,30\}$= 15 + 30 = **45**

(b)(i) p(one course) = $\frac{total\ number\ of\ those\ who\ took\ one\ course}{total\ number\ of\ all\ students}$

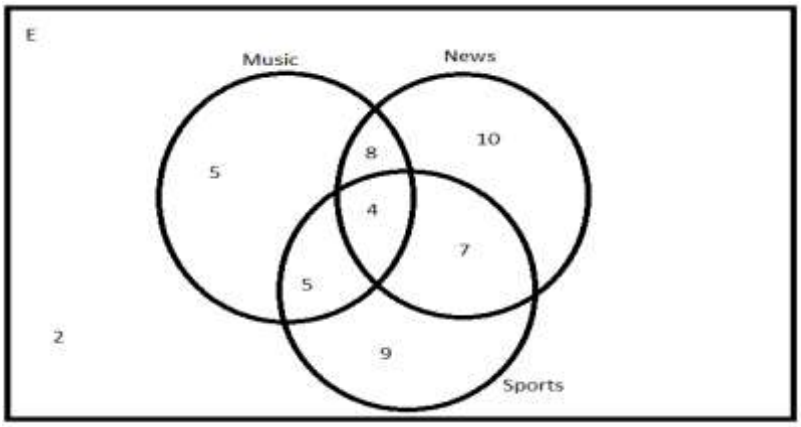
$=\frac{15+15+30}{100} = \frac{60}{100} = \mathbf{\frac{3}{5}}$

(ii)p(at least two courses)= $\frac{total\ number\ of\ those\ who\ took\ at\ least\ two\ courses}{total\ number\ of\ all\ students}$

$= \frac{10+10+5+15}{100} = \frac{40}{100} = \mathbf{\frac{2}{5}}$

2016

11.(i)

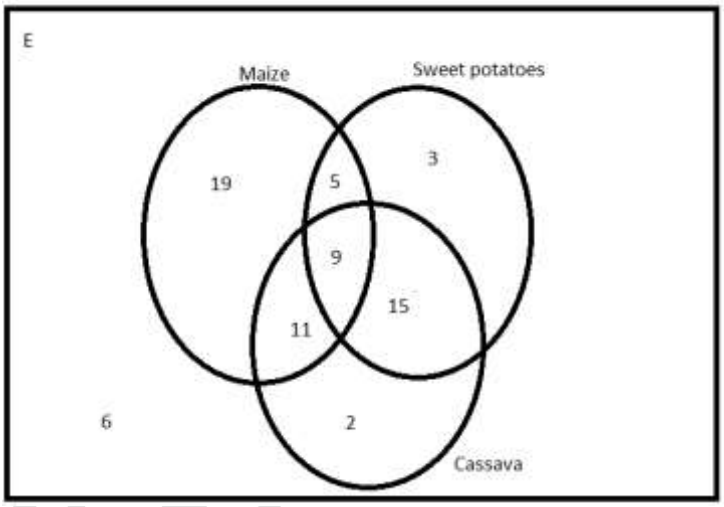


(ii)(a)Music only=5 (b) one type of program=5 + 9 + 10 = **24**

(c)two types of programs=8 + 7 + 5=**20**

2017GCE

12.(i)



(ii)(a)total number of farmers=19 + 5 + 3 + 9 + 11 + 15 + 2 + 6 = **70 farmers**

(b)Maize only= **19 farmers**

(c)two different crops= 11 + 5 + 15 = **31**

2017 OCT/NOV

13.(i)2y + 1 = 7 (ii)(a)6 + 2 =**8** (b)4 + 1 + 2 = **7** (c) 6 + 2(3) + 1 + 8=**21**

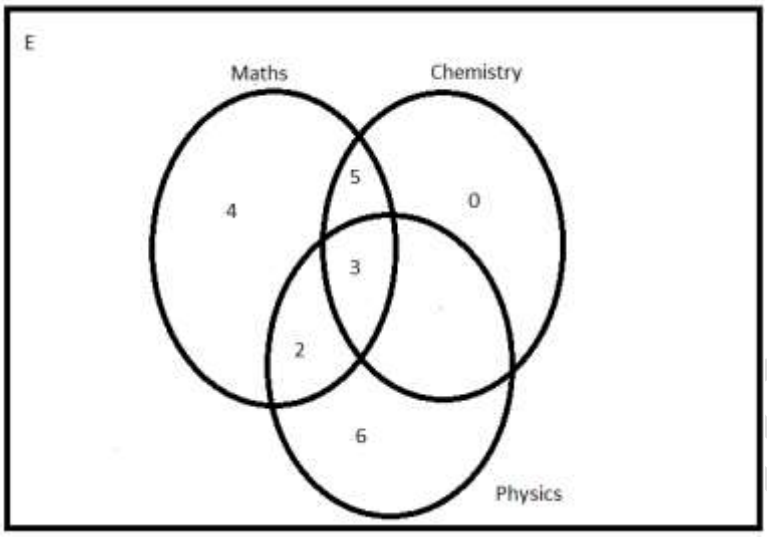
2y = 7 – 1

2y = 6

y = 3

2018GCE

14.(i)



(ii)Physics ony = **6 students** (b) two subjects only=2 + 5 = **7**

(c)Maths and Physics not Chemistry = **2**

2018 Oct/Nov

15.(i)4 + x + 3 + 7= 22

x + 14 = 22

x = 22 – 14

x= 8

(ii)(a) one mode of transport= 7 + 14 + 7=**28**

(b) two different mode of transport

=4 + 2 + 3 + 8

= 17

SEQUENCE AND SERIES

2016 INTERNAL

1. (a) To find the common ratio, we use $\frac{T_2}{T_1} = \frac{T_3}{T_2}$

$\frac{X-3}{x+1} = \frac{x-1}{x-3}$

(x – 3)(x – 3) = (x + 1)(x – 1)

$x^2 - 3x - 3x + 9 = x^2 - x + x - 1$

(c) $S_\infty = \frac{a}{1-r}$

$S_\infty = \frac{\frac{8}{3}}{1-(-\frac{1}{2})}$

$S_\infty = \frac{\frac{8}{3}}{1+\frac{1}{2}}$

$x^2 - 6x + 9 = x^2 - 1$

$x^2 - x^2 - 6x = -1 - 9$

$-6x = -10$

$\frac{-6x}{-6} = \frac{-10}{-6}$

$\mathbf{x = \frac{5}{3}}$

$\therefore \boldsymbol{the\ GP\ is};\ \mathbf{\frac{5}{3}+1, \frac{5}{3}-3, \frac{5}{3}-1}$

$= \frac{8}{3}, \frac{-4}{3}, \frac{2}{3}$

(b)the first term = $\mathbf{\frac{8}{3}}$

$S_\infty = \frac{8}{3} \div \frac{3}{2} +$

$S_\infty = \frac{8}{3} \times \frac{2}{3}$

$\mathbf{S_\infty = \frac{16}{9}}$

2017 GCE

2. (a) will use the same formula we use when calculating the common ratio.

$\frac{T_2}{T_1} = \frac{T_3}{T_2}$

$\frac{10+n}{6+n} \neq \frac{15+n}{10+n}$

$(10 + n)(10 + n) = (6 + n)(15 + n)$

$100 + 10n + 10n + n^2 = 90 + 6n + 15n + n^2$

$100 + 20n + n^2 = 90 + 21n + n^2$

$100 - 90 = 21n - 20n + n^2 - n^2$

$10 = n$

$\therefore$ n = 10

The GP is (6 + 10), (10 + 10),(15 + 10)

= 16, 20, 25…

(b)common ratio(r) = $\frac{20}{16} = \mathbf{\frac{5}{4}}$ **or 1.25.**

(c) $S_n = \frac{a(r^n-1)}{r-1}$ for r> 1

$S_6 = \frac{16((1.25)^6-1)}{1.25-1}$

$S_6 = \frac{16(3.814697266-1}{0.25}$

$S_6 = \frac{16(2.814697266)}{0.25}$

$S_6 = \frac{45.03515625}{0.25}$

$S_6 = 180.140625$

S_6 =180

2017 INTERNAL

3. (a) $r = \frac{5}{20}$

$\mathbf{r = \frac{1}{4}}$

(b) $T_n = ar^{n-1}$

$T_n = 20\left(\frac{1}{4}\right)^{n-1}$

$T_n = 20\frac{1^{n-1}}{4^{n-1}}$

$\mathbf{T_n = \frac{20}{4^{n-1}}}$

(c) $S_n = \frac{a(1-r^n)}{1-r}$

$S_8 = = \frac{20(1-\left(\frac{1}{4}\right)^8)}{1-\frac{1}{4}}$

$S_8 = \frac{20(1-0.00001558906)}{0.75}$

$S_8 = \frac{20(0.9999847412)}{0.75}$

$S_8 = \frac{19.99969482}{0.75}$

$S_8 = 26.66625977$

$\mathbf{S_8 = 27}$

2018 GCE

4. (a) $T_n = ar^{n-1}$

$T_3 = ar^{3-1}$

$\frac{2}{9} = ar^2$

$A = \frac{2}{9r^2}$ ……equation (i)

$T_4 = ar^{4-1}$

$\frac{2}{27} = ar^3$…….equation (ii)

Substitute a with $\frac{2}{9r^2}$ in equation (ii)

$\frac{2}{27} = \frac{2}{9r^2} \times r^3$

$\frac{2}{27} = \frac{2r}{9}$

$54r = 18$

$\frac{54r}{54} = \frac{18}{54}$

$\mathbf{r = \frac{1}{3}}$

(b) $S_n = \frac{a(1-r^n)}{1-r}$ for $r < 1$

$S_5 = \frac{2(1-\left(\frac{1}{3}\right)^5)}{1-\frac{1}{3}}$

$S_5 = \frac{2(1-\frac{1}{243})}{\frac{2}{3}}$

$S_5 = 2\times \frac{242}{243} \div \frac{2}{3}$

$S_5 = 2 \times \frac{242}{243} \times \frac{3}{2}$

$S_5 = 3 \times \frac{242}{243}$

$S_5 = \frac{242}{81}$

$S_5 = 2.987654321$

$\mathbf{S_5 = 2.99}$

(C) $S_\infty = \frac{a}{1-r}$

$S_\infty = \frac{2}{1-\frac{1}{3}}$

$\mathbf{S_\infty = 3}$

$a = \frac{2}{9\times\left(\frac{1}{3}\right)^2}$

$a = \frac{2}{9\times\frac{1}{9}}$ = **2**

∴ the first term = 2 and the common ratio is $\frac{1}{3}$

2018 INTERNAL

5. (a) $\frac{T_2}{T_1} = \frac{T_3}{T_2}$

$\frac{k}{k+4} \times \frac{2k-15}{k}$

(k)(k) = (k + 4)(2k – 15)

$K^2 = 2k^2 – 15k + 8k – 60$

$2k^2 – k^2 – 7k - 60 = 0$

$K^2 – 7k – 60 = 0$ product= -60 sum = -7 factors = 5, -12

$K^2 + 5k – 12k – 60 = 0$

K(k + 5) – 12(k + 5) = 0

(k – 12)(k + 5)= 0

K – 12 = 0 or k + 5 = 0

K = 12 or k = -5

K = 12

(b)k + 4, k, 2k – 15

12 + 4, 12, 2(12) – 15

16, 12, 9…….

(c)$S_\infty = \frac{a}{1-r}$, $r = \frac{12}{16} = \frac{3}{4}$

$S_\infty = \frac{16}{1-\frac{3}{4}}$

$S_\infty = \frac{16}{\frac{4-3}{4}}$

$S_\infty = \frac{16}{\frac{1}{4}}$

$S_\infty = 16 \times \frac{4}{1}$

S_∞ = 64

CALCULUS

2018INTERNAL

1. (a) $\int_{-1}^{2}(2+x-x^2)dx$

$= \left[2x+\frac{x^2}{2}-\frac{x^3}{3}\right]_{-1}^{2}$

$= \left(\frac{2(2)}{1}+\frac{2^2}{2}-\frac{2^3}{3}\right)-\left(2(-1)-\frac{(-1)^2}{2}-\frac{(-1)^3}{3}\right)$

$= \left(4+2-\frac{8}{3}\right)-\left(-2-\frac{1}{2}+\frac{1}{3}\right)$

$= \left(\frac{6}{1}-\frac{8}{3}\right)-\left(\frac{-2}{1}-\frac{1}{2}+\frac{1}{3}\right)$

$= \left(\frac{18-8}{3}\right)-\left(\frac{-12-3+2}{6}\right)$

$=\frac{10}{3}+\frac{13}{6}$

$=\frac{20+13}{6}$

$=\frac{33}{6}=5.5$

(b) $y = x+\frac{4}{x}$

$\frac{dy}{dx} = 1 - \frac{4}{x^2}$

at x = 4, $\frac{dy}{dx} = 1 - \frac{4}{4^2}$

$=\frac{1}{1}-\frac{4}{16}$

$=\frac{16-4}{16} \quad =\frac{12}{16}=\frac{3}{4}$

gradient of the normal

$=\frac{-1}{\frac{dy}{dx}}=\frac{-1}{\frac{3}{4}}$

$=-\frac{4}{3}$

to find y replace x value in the original equation

$y = 1+\frac{4}{4}=5$

$y - y_1 = m(x - x_1)$

$y-5=-\frac{4}{3}(x-4)$

$y-5=\frac{-4}{3}x+\frac{16}{3}$

$y=\frac{-4x+16+15}{3}$

$\frac{y}{1}=\frac{-4x+31}{3}$

3y = -4x + 31

2018GCE

2. (a) $\int_{0}^{1}(x^2-2x-3)dx$

$$\left[\frac{x^2}{3}-\frac{2x^2}{2}-3x\right]_0^1$$

$=\left(\frac{1^3}{3}-\frac{2(1)^2}{2}-3(1)\right)-\left(\frac{0^3}{3}+\frac{2(0)^2}{2}-3(0)\right)$

$=\left(\frac{1}{3}-1-3\right)-0$

$=\frac{1}{3}-4$

$=\frac{1-12}{3}$

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

$=-3\frac{2}{3}$

(b)$y = 2x^2 - 3x - 2$

$\frac{dy}{dx} = 4x - 3$

at x = 3, 4(3)- 3 = 9

gradient of the normal

$=\frac{-1}{\frac{dy}{dx}} = -\frac{1}{9}$

$y - y_1 = m(x - x_1)$

$y - 7 = -\frac{1}{9}(x - 3)$

$y - 7 = -\frac{1}{9}x + \frac{1}{3}$

$y = -\frac{1}{9}x + \frac{1}{3} + \frac{7}{1}$

$y = \frac{-x+3+63}{9}$

$\frac{y}{1} = \frac{-x+66}{9}$

9y = -x + 66

2017 INTERNAL

3. (a)$y = 2x^3 - 3x^2 - 36x - 3$

$\frac{dy}{dx} = 6x^2 - 6x - 36$

$\frac{6x^2}{6} - \frac{6x}{6} - \frac{36}{6} = 0$

$x^2 - x - 6 = 0$ product=-6, sum= -1 factors = 2, -3

$x^2 + 2x - 3x - 6 = 0$

$x(x + 2) - 3(x + 2) = 0$

$(x - 3)(x + 2) = 0$

$X - 3 = 0$ or $x + 2 = 0$

x = 3 or x = -2

When x = 3

$y = 2(3)^3 - 3(3)^2 - 36(3) - 3$

$y = 54 - 27 - 108 - 3$

when x = -2

$y = 2(-2)^3 - 3(-2)^2 - 36(-2) - 3$

$y = -16 - 12 + 72 - 3$

y = 41

∴coordinates to the curve are:

(3, -84) and (-2, 41)

y = -84

(b) $\int_{-1}^{3}(3x^2 - 2x)dx$

$\left[\frac{3x^3}{3} - \frac{2x^2}{2}\right]_{-1}^{3}$

$=[x^3 - x^2]_{-1}^{3}$

$=[(3)^3 - (3)^2] - [(-1)^3 - (-1)^2]$

=(27 – 9) – (-1 – 1)

=18 – (-2)

=18 + 2

= 20

2017 GCE

4. (a) $\int_{2}^{5}(3x^2 + 2)dx$

$=\left[\frac{3x^3}{3} + \frac{2x^{0+1}}{1}\right]_{2}^{5}$

$=[x^3 + 2x]_{2}^{5}$

$= [(5)^3 + 2(5)] - [(2)^3 + 2(2)]$

= (125 + 10) – (8 + 4)

=135 – 12

= 123

(b) $y = x^2 - 3x - 4$

$\frac{dy}{dx} = 2x - 3$

at x = 2, $\frac{dy}{dx}$ = 2(2) – 3 =1

replace x-value in the equation

$y = (2)^2 - 3(2) - 4$

y =-6

$y - y_1 = m(x - x_1)$

y – (-6) = 1(x – 2)

y + 6 = x – 2

y = x – 2 – 6

y = x – 8

2016

5. (a) $y = x^3 - \frac{3}{2}x^2$

$\frac{dy}{dx} = 3x^2 - 3x$

At x = 2,

$\frac{dy}{dx} = 3(2)^2 - 3(2)$

= 6

Gradient of the normal= $\frac{-1}{\frac{dy}{dx}}$

$= -\frac{1}{6}$

$y - y_1 = m(x - x_1)$

$y - 2 = -\frac{1}{6}(x - 2)$

$y - 2 = -\frac{1}{6}x + \frac{1}{3}$

$y = -\frac{1}{6}x + \frac{1}{3} + \frac{2}{1}$

$y = \frac{-x+2+12}{6}$

$\frac{y}{1} = \frac{-x+14}{6}$

6y = -x + 14

(**b**)At the stationary point, $\frac{dy}{dx} = 0$

$3x^2 - 3x = 0$

$3x(x - 1) = 0$

$3x = 0$ or $x - 1 = 0$

$x = 0$ or $x = 1$

when x = 0, $y = (0)^3 - \frac{3}{2}(0)^2$

$y = 0$

when x = 1, $y = (1)^3 - \frac{3}{2}(1)^2$

$y = \frac{2-3}{2} = -\frac{1}{2}$

∴ the stationary points are:

$(0, 0)$ and $(1, -\frac{1}{2})$

MATRICES

2002

1. (i) $MN = \begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix}\begin{pmatrix} 3 & -5 \\ -1 & 2 \end{pmatrix}$

$= \begin{pmatrix} 2\times3+5\times-1 & 2\times-5+5\times2 \\ 1\times3+3\times-1 & 1\times-5+3\times2 \end{pmatrix}$

$MN = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

(ii)$NM = \begin{pmatrix} 3 & -5 \\ -1 & 2 \end{pmatrix}\begin{pmatrix} 2 & 5 \\ 1 & 3 \end{pmatrix}$

$= \begin{pmatrix} 3\times2\pm5\times1 & 3\times5+5\times3 \\ -1\times2+2\times1 & -1\times5+2\times3 \end{pmatrix}$

$NM = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

2003

2. (i) $B - 2A = \begin{pmatrix} 6 & 2 \\ 4 & 0 \end{pmatrix} - 2\begin{pmatrix} 2 & 1 \\ -5 & -3 \end{pmatrix}$

$= \begin{pmatrix} 6 & 2 \\ 4 & 0 \end{pmatrix} - \begin{pmatrix} 4 & 2 \\ -10 & -6 \end{pmatrix}$

$= \begin{pmatrix} 6-4 & 2-2 \\ 4+10 & 0+6 \end{pmatrix}$

$B - 2A = \begin{pmatrix} 2 & 0 \\ 14 & 6 \end{pmatrix}$

(ii)BA^{-1}

deterA=$(2\times -3)-(-5\times 1)$

=-6 + 5

=-1

$$\boldsymbol{A^{-1}} = \frac{\mathbf{1}}{\mathbf{-1}}\begin{pmatrix}\mathbf{-3} & \mathbf{-1}\\ \mathbf{5} & \mathbf{2}\end{pmatrix}$$

$$=\begin{pmatrix}3 & 1\\ -5 & -2\end{pmatrix}$$

Therefore, B$A^{-1} = \begin{pmatrix}6 & 2\\ 4 & 0\end{pmatrix}\begin{pmatrix}3 & 1\\ -5 & -2\end{pmatrix}$

$$=\begin{pmatrix}6\times3+2\times-5 & 6\times1+2\times-2\\ 4\times3+0\times-5 & 4\times1+0\times-2\end{pmatrix}$$

$$=\begin{pmatrix}\mathbf{8} & \mathbf{2}\\ \mathbf{12} & \mathbf{4}\end{pmatrix}$$

2005

2. (i) $A^2 = \begin{pmatrix}1 & x\\ -1 & 2\end{pmatrix}\begin{pmatrix}1 & x\\ -1 & 2\end{pmatrix}$

$$=\begin{pmatrix}1\times1+x\times-1 & 1\times x+x\times2\\ -1\times1+2\times-1 & -1\times x+2\times2\end{pmatrix}$$

$$=\begin{pmatrix}1-x & x+2x\\ -1-2 & -x+4\end{pmatrix}$$

$$=\begin{pmatrix}\mathbf{1-x} & \mathbf{3x}\\ \mathbf{-3} & \mathbf{-x+4}\end{pmatrix}$$

(ii) deter of A^2 =9

9=(1-x ×-x+4) – (-3×3x)

9 =-x +4 +x^2 - 4x +9x

9 -4 = -x – 4x + 9x +x^2 prod=-5 sum=4 factors=-1, 5

5 = 4x + x^2

x^2 + 4x – 5= 0

x^2 -x +5x – 5= 0

X(x – 1) +5(x – 1) = 0

(x + 5)(x – 1) = 0

X + 5 = 0 or x – 1 = 0

X = -5 or x = 1

2006

3. (i) $M^2 = \begin{pmatrix}-1 & 3\\ 1 & 2\end{pmatrix}\begin{pmatrix}-1 & 3\\ 1 & 2\end{pmatrix}$

$=\begin{pmatrix}-1\times-1+3\times1 & -1\times3+3\times2\\ 1\times-1+2\times1 & 1\times3+2\times2\end{pmatrix}$

$\boldsymbol{M^2} = \begin{pmatrix}\mathbf{4} & \mathbf{3}\\ \mathbf{1} & \mathbf{7}\end{pmatrix}$

(ii)deter M=(-1× 2) − (1 × 3)

=-2 - 3

=-5

$M^{-1} = \frac{1}{-5}\begin{pmatrix}2 & -3\\ -1 & -1\end{pmatrix}$

$\boldsymbol{M^{-1}} = -\frac{\mathbf{1}}{\mathbf{5}}\begin{pmatrix}\mathbf{2} & \mathbf{-3}\\ \mathbf{-1} & \mathbf{-1}\end{pmatrix}$

2007

4. (i)deter A =21

A $=\begin{pmatrix}5 & -2\\ 3 & x\end{pmatrix}$

21= (5× x) –(3× -2)

21 = 5x +6

21 – 6 = 5x

$\frac{15}{5} = \frac{5x}{5}$

x = 3

(ii) $\boldsymbol{A^{-1}} = \frac{\mathbf{1}}{\mathbf{21}}\begin{pmatrix}\mathbf{3} & \mathbf{2}\\ \mathbf{-3} & \mathbf{5}\end{pmatrix}$

(iii) AB $=\begin{pmatrix}5 & -2\\ 3 & 3\end{pmatrix}\begin{pmatrix}6\\ 4\end{pmatrix}$

$=\begin{pmatrix}5\times6+4\times-2\\ 3\times6+3\times4\end{pmatrix}$

AB $=\begin{pmatrix}\mathbf{22}\\ \mathbf{30}\end{pmatrix}$

2008

5. (i) PQ$=\begin{pmatrix}2 & 5\\ 1 & 3\end{pmatrix}\begin{pmatrix}3 & -5\\ -1 & 2\end{pmatrix}$

$=\begin{pmatrix}2\times3+5\times-1 & 2\times-5+5\times2\\ 1\times3+3\times-1 & 1\times-5+3\times2\end{pmatrix}$

PQ$=\begin{pmatrix}\mathbf{1} & \mathbf{0}\\ \mathbf{0} & \mathbf{1}\end{pmatrix}$

(ii)PQ$\begin{pmatrix}-3\\ 1\end{pmatrix}$

$=\begin{pmatrix}1 & 0\\ 0 & 1\end{pmatrix}\begin{pmatrix}-3\\ 1\end{pmatrix}$

$=\begin{pmatrix}1\times-3+0\times1\\ 0\times-3+1\times1\end{pmatrix}$

PQ$\begin{pmatrix}\mathbf{-3}\\ \mathbf{1}\end{pmatrix}=\begin{pmatrix}\mathbf{-3}\\ \mathbf{1}\end{pmatrix}$

2009

6. (i) deter A =(3× 5) − (2 × 7)

(ii) $A^{-1} = \frac{1}{deter\ A}\begin{pmatrix}3 & 7\\ 2 & 5\end{pmatrix}$

=15 – 14

=1

$A^{-1} = \frac{1}{1}\begin{pmatrix} 5 & -7 \\ -2 & 3 \end{pmatrix}$

$\boldsymbol{A^{-1}} = \begin{pmatrix} \mathbf{5} & \mathbf{-7} \\ \mathbf{-2} & \mathbf{3} \end{pmatrix}$

(ii) $A^{-1}\begin{pmatrix} -2 \\ 1 \end{pmatrix} = \begin{pmatrix} 5 & -7 \\ -2 & 3 \end{pmatrix}\begin{pmatrix} -2 \\ 1 \end{pmatrix}$

$= \begin{pmatrix} 5\times-2+1\times-7 \\ -2\times-2+3\times1 \end{pmatrix}$

$= \begin{pmatrix} \mathbf{-17} \\ \mathbf{7} \end{pmatrix}$

2010

7. (i) PQ $= \begin{pmatrix} 2 & 0 \\ 6 & 1 \end{pmatrix}\begin{pmatrix} a & 0 \\ 1 & b \end{pmatrix}$

$= \begin{pmatrix} 2\times a+0\times1 & 2\times0+0\times b \\ 6\times a+1\times1 & 6\times0+1\times b \end{pmatrix}$

PQ $= \begin{pmatrix} \boldsymbol{2a} & \mathbf{0} \\ \mathbf{6a+1} & \boldsymbol{b} \end{pmatrix}$

(ii) PQ = P- Q

$\begin{pmatrix} 2a & 0 \\ 6a+1 & b \end{pmatrix} = \begin{pmatrix} 2 & 0 \\ 6 & 1 \end{pmatrix} - \begin{pmatrix} a & 0 \\ 1 & b \end{pmatrix}$

2a = 2 – a b = 1- b

2a +a =2 b+b =1

$\frac{3a}{3} = \frac{2}{3}$ $\frac{2b}{2} = \frac{1}{2}$

a $= \frac{\mathbf{2}}{\mathbf{3}}$ **b** $= \frac{\mathbf{1}}{\mathbf{2}}$

2011

8. (i) deter A $= \begin{pmatrix} 1 & x \\ -1 & 2 \end{pmatrix}$

Deter A $= (1\times 2) - (x \times -1)$

Deter A =2 + x

(ii) dter A = 5

5 = 2 + x

5 -2 =x, **x = 3**s

(iii) $\boldsymbol{A^{-1}} = \frac{1}{deter\ A}\begin{pmatrix} 1 & 3 \\ -1 & 2 \end{pmatrix}$

$= \frac{\mathbf{1}}{\mathbf{5}}\begin{pmatrix} \mathbf{2} & \mathbf{-3} \\ \mathbf{1} & \mathbf{1} \end{pmatrix}$

2012

9. (i) deter A $= (2\times 5) - (-1 \times 3)$

Deter A =10 +3

=13

(ii) $A^{-1} = \frac{1}{deter\ A}\begin{pmatrix} 2 & 3 \\ -1 & 5 \end{pmatrix}$

$\boldsymbol{A^{-1}} = \frac{\mathbf{1}}{\mathbf{13}}\begin{pmatrix} \mathbf{5} & \mathbf{-3} \\ \mathbf{1} & \mathbf{2} \end{pmatrix}$

(ii) AB $=\begin{pmatrix} 2 & 3 \\ -1 & 5 \end{pmatrix}\begin{pmatrix} 2 \\ 3 \end{pmatrix}$

$=\begin{pmatrix} 2\times2+3\times3 \\ -1\times2+5\times3 \end{pmatrix}$

$=\begin{pmatrix} \mathbf{13} \\ \mathbf{13} \end{pmatrix}$

2013

10.(i) 2P $=2\begin{pmatrix} -1 & -1 \\ 4 & 2 \\ 2 & 0 \end{pmatrix}$

2P$=\begin{pmatrix} \mathbf{-2} & \mathbf{-2} \\ \mathbf{8} & \mathbf{4} \\ \mathbf{4} & \mathbf{0} \end{pmatrix}$

(ii) deter Q$=\begin{pmatrix} 2 & -1 \\ 4 & 1 \end{pmatrix}$

deter Q$=(2\times1)-(4\times-1)$

Deter Q=2+4

Deter Q = 6

(iii) AP$=(2 \quad 2 \quad -1)\begin{pmatrix} -1 & -1 \\ 4 & 2 \\ 2 & 0 \end{pmatrix}$

$=(2\times-1+2\times4+2\times-1 \quad 2\times-1+2\times2+0\times-1)$

$=(-2+4-2 \quad -2+4-0)$

$=(\mathbf{4} \quad \mathbf{2})$

2014

11.(i) A^{-1}

Deter A $=\begin{pmatrix} 5 & 2 \\ 1 & 0 \end{pmatrix}$

Deter A $=(5\times0)-(1\times2)$

Deter A = 0 – 2

Deter A = -2

$\boldsymbol{A^{-1}}=-\frac{\mathbf{1}}{\mathbf{2}}\begin{pmatrix} \mathbf{0} & \mathbf{-2} \\ \mathbf{-1} & \mathbf{4} \end{pmatrix}$

(ii) 3A – B= $3\begin{pmatrix} 5 & 2 \\ 1 & 0 \end{pmatrix}$ - $\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$

$=\begin{pmatrix} 15 & 6 \\ 3 & 0 \end{pmatrix}-\begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$

$=\begin{pmatrix} 15+1 & 6-0 \\ 3-0 & 0+1 \end{pmatrix}$

$=\begin{pmatrix} \mathbf{16} & \mathbf{6} \\ \mathbf{3} & \mathbf{1} \end{pmatrix}$

(iii) AB $=\begin{pmatrix}5 & 2\\ 1 & 0\end{pmatrix}\begin{pmatrix}-1 & 0\\ 0 & -1\end{pmatrix}$

$=\begin{pmatrix}5\times-1+2\times0 & 5\times0+2\times-1\\ 1\times-1+0\times0 & 1\times0+0\times-1\end{pmatrix}$

$=\begin{pmatrix}-5+0 & 0-2\\ -1+0 & 0+0\end{pmatrix}$

$=\begin{pmatrix}\mathbf{-5} & \mathbf{-2}\\ \mathbf{-1} & \mathbf{0}\end{pmatrix}$

2015

12.(i) deter Q$=\begin{pmatrix}a & 2\\ 3 & -2\end{pmatrix}$

Deter Q $=(a\times-2)-(3\times2)$

Deter Q = -2a – 6

(ii) deter Q = 2

2 = -2a - 6

2a = -6 – 2

$\frac{\mathbf{2a}}{\mathbf{2}}=\frac{\mathbf{-8}}{\mathbf{2}}$

a = -4

(iii) $Q^{-1}=\frac{1}{Deter\ Q}\begin{pmatrix}-4 & 2\\ 3 & -2\end{pmatrix}$

$\boldsymbol{Q^{-1}}=-\frac{\mathbf{1}}{\mathbf{4}}\begin{pmatrix}\mathbf{-2} & \mathbf{-2}\\ \mathbf{-3} & \mathbf{-4}\end{pmatrix}$

2016

13.(i) deter Q $(3\times4)-(x\times-2)$

2 = 12 +2x

2 – 12 = 2x

$\frac{-10}{2}=\frac{2x}{2}$

x = -5

(ii)Q^{-1}

$\boldsymbol{Q^{-1}}=\frac{\mathbf{1}}{\mathbf{2}}\begin{pmatrix}\mathbf{4} & \mathbf{2}\\ \mathbf{5} & \mathbf{3}\end{pmatrix}$

2017 GCE

14.(i) deter K =$(10\times-2)-(11\times-2)$

= -20 –(-22)

= -20 + 22

Deter K =2

(ii)$\boldsymbol{K^{-1}}=\frac{\mathbf{1}}{\mathbf{2}}\begin{pmatrix}\mathbf{-2} & \mathbf{2}\\ \mathbf{-11} & \mathbf{10}\end{pmatrix}$

2017 Oct/Nov Exams

15.(i) deter M =$(3\times x)-(5\times -2)$

22 =3x – (-10)

22=3x + 10

22- 10 = 3x

$\frac{12}{3}=\frac{3x}{3}$

x = 4

(ii) M^{-1} =$\frac{1}{Deter\ M}\begin{pmatrix}3 & -2\\ 5 & 4\end{pmatrix}$

$\boldsymbol{M^{-1}=\frac{1}{22}\begin{pmatrix}4 & 2\\ -5 & 3\end{pmatrix}}$

2018 GCE

16.(i) deter A =$(2x\times x)-(2\times 3)$

12 = $2x^2$ – 6

12 + 6 = $2x^2$

$\frac{18}{2}=\frac{2x^2}{2}$

x^2 = 9

$\sqrt{x^2}=\pm\sqrt{9}$

x = ± 3

∴ x = 3

(ii) A^{-1}

A= $\begin{pmatrix}2\times 3 & 2\\ 3 & 3\end{pmatrix}$

=$\begin{pmatrix}6 & 2\\ 3 & 3\end{pmatrix}$

$\boldsymbol{A^{-1}=\frac{1}{12}\begin{pmatrix}3 & -2\\ -3 & 6\end{pmatrix}}$

2018 Oct/Nov Exams

17.(i) deter A =$(4\times 2)-(1\times -5)$

Deter A =8 –(-5)

Deter A = 8 + 5

Deter A = 13

(ii) B^{-1}

Deter B =$(8\times 5)-(3\times y)$

13 = 40 – 3y

3y = 40 – 13

$\frac{3y}{3}=\frac{27}{3}$

y = 9

$\therefore \boldsymbol{B^{-1}=\frac{1}{13}\begin{pmatrix}5 & -9\\ -3 & 8\end{pmatrix}}$

TRIGONOMETRY

2005

1. (a) $(LC)^2 = l^2 + c^2 - 2lc\cos\theta$

$(LC)^2 = (8)^2 + (6)^2) - 2(8)(6)\cos 98^0$

$(LC)^2 = 64 + 36 - 96\cos 98^0$

$(LC)^2 = 100 + 13.36061769$

$\sqrt{(LC)^2} = \sqrt{113.3606177}$

LC = 10.64709433

LC = 10.6km

(b) $A = \frac{1}{2}lc\sin P$

$A = \frac{1}{2} \times 8 \times 6 \sin 98^0$

$A = \frac{47.5328673}{2}$

A = 23.76643365

A = 23.8km^2

(c) Shortest distance

$A = \frac{1}{2}bh$

$23.8 = \frac{1}{2}10.6 \times h$

$\frac{23.8}{5.3} = \frac{5.3h}{5.3}$

h = 4.490566038

h = 4.5km

2008

2. **(a)** $A = \frac{1}{2}st\sin\theta$

$A = \frac{1}{2} \times 19 \times 21 \sin 110^0$

$A = \frac{1}{2} \times 399 \times \sin 110^0$

$A = \frac{374.9373557}{2}$

(b) $(TS)^2 = s^2 + t^2 - 2st\cos\theta$

$(TS)^2 = (21)^2 + (19)^2 - 2(21)(19)\cos 110^0$

$(TS)^2$ =441 +361 - 789cos 110^0

$(TS)^2$ = 802 + 272.9320744

A = 187.4686778

A = 187m^2

$\sqrt{(TS)^2} = \sqrt{1074.932074}$

TS = 32.78615675

TS = 33m (to the nearest meter)

(c) Shortest distance

A = $\frac{1}{2}$bh

A = $\frac{1}{2} \times 33 \times h$

187 = $\frac{1}{2} \times 33h$

$\frac{187}{16.5} = \frac{16.5h}{16.5}$

h = 11.33333333

S.D = 11m(to the nearest metre)

2009

3. (a) (i) 360^0 - 290^0

X = 70^0

(ii) $(CN)^2$ =$n^2 + c^2$ -2nccos θ

$(CN)^2 = (100)^2 + (8O)^2 - 2(100)(80)\cos 130^0$

$(CN)^2$ = 10 000 + 6400 - 16000cos 130^0

$(CN)^2$ 16400 + 10284.60176

$\sqrt{(CN)^2} = \sqrt{26684.60176}$

CN = 163.3542217

CN = 163.35km

(iii) A = $\frac{1}{2} ab \sin C$

A = $\frac{1}{2} \times nc \sin m$

A = $\frac{1}{2} \times 100 \times 80 \times \sin 130^0$

A=4000 × sin 130^0

A=3064.177772

A =3064.18km^2

(b) Shortest distance

A = $\frac{1}{2}$bh

A = $\frac{1}{2} \times 163.35 \times h$

$\frac{3064.18}{81.675} = \frac{81.675h}{81.675}$

h = 37.51674319

S.D = 37.52km

(c) $h^2 = m^2 + n^2$

$(80)^2 = m^2 + (37.52)^2$

6400 = m^2 + 1407.7504

m^2 = 6400 – 1407.7504

$\sqrt{m^2} = \sqrt{4992.2496}$

m = 70.65585326

HN =70.65km

2010

4. (a) (i) $(PR)^2 = p^2 + r^2 - 2pr\cos\theta$

$(PR)^2 = (13.2)^2 + (7.6)^2 - 2(13.2)(7.6)\cos 120^0$

$(PR)^2$ = 174.24 + 57.76 – 200.64cos 120^0

$(PR)^2$ = 232 + 100.32

$\sqrt{(PR)^2} = \sqrt{332.32}$

PR = 18.22964618

PR = 18.2km

(ii) A = $\frac{1}{2}pr\sin\theta$

A = $\frac{1}{2} \times 13.2 \times 7.6 \times \sin 120^0$

A = $\frac{86.87966851}{3}$

A = 43.43983425

A = 43.4km^2

(b) Shortest distance

S.D = $\frac{2 \times A}{base}$

S.D = $\frac{2 \times 43.4}{18.2}$

S.D = 4.769230769

S.D = 4.8km

(c) Speed = $\frac{Distance}{Time}$, 30 minutes= 0.5hours

S = $\frac{43.4km}{0.5h}$

S = 86.8km/h

2011

5. (i) $B\hat{A}C = 70^0 + 30^0$

$B\hat{A}C = 100^0$

(ii) $(BC)^2 = b^2 + c^2 - 2bc\cos\theta$

$(BC)^2 = (60)^2 + (130)^2 - 2(60)(130)\cos 100^0$

$(BC)^2$ = 3600 + 16900 - 15600cos 100^0

$(BC)^2$ = 20500+ 2708.911572

$\sqrt{(BC)^2} = \sqrt{23208.91157}$

BC =152.344713

BC = 152km

(ii) Shortest distance

S.D = $\frac{2A}{b}$

S.D = $\frac{2(3840.75)}{152}$

S.D = $\frac{7681.5}{152}$

S.D = 50.53618421

S.D = 51km

2012

6. (a) $(KC)^2 = c^2 + k^2 - 2ck\cos\theta$

$(30.4)^2 = 20^2 + 16^2 - 2(20)(16)\cos\theta$

924.16 = 400 + 256 - 640cos θ

924.16 – 656 = -640cos θ

(b) A = $\frac{1}{2}ck\sin B$

A = $\frac{1}{2} \times 20 \times 16\sin 115^0$

A = $160 \times \sin 115^0$

A = 145.0092459

$\frac{268.16}{-640} = \frac{-6640\cos\theta}{-640}$

$\cos\theta$ = -0.419

$\theta = \cos^{-1}(-0.419)$

θ = 114.7714694

K$\widehat{B}C$ = 115^0

A = 145km

(ii) S.D = $\frac{2A}{b}$

S.D = $\frac{2(145)}{20}$

S.D = $\frac{290}{20}$

S.D = 14.5km

2013

7. **(i)** R$\widehat{M}T$ = 130^0 - 60^0

R$\widehat{M}$T = 70^0

(ii) A = $\frac{1}{2}ab\sin C$

A = $\frac{1}{2} \times 32 \times 27 \times \sin 70^0$

A = 16 ×25.37170076

A = 405.9472122

A = 406km^2

(iv) Shortest distance

S.D = $\frac{2A}{b}$

S.D = $\frac{2(406)}{34}$

S.D = $\frac{812}{34}$

S.D = 23.885294

S.D =24km

(ii) $(RT)^2 = r^2 + t^2$ - 2rtcos M

(RT$)^2$ = $32^2 + 27^2$ -2(32)(27)cos 70^0

$(RT)^2$ = 1024 + 729 -1728cos 70^0

$(RT)^2$ = 1753 – 591.0108077

$\sqrt{(RT)^2}$ =$\sqrt{1161.989192}$

RT = 34.08796257

RT = 34km

2014

8. (i) A = $\frac{1}{2}ab\sin\theta$

A = $\frac{1}{2} \times 78 \times 123\sin 81^0$

A = $\frac{9475.88194}{2}$

A = 4737.940997

A = 4738km^2

(iii) K215 000 × 135

= K29 025 000.00

(i) $(CM)^2 = c^2 + m^2 - 2(c)(m)\cos K$

$(CM)^2 = (123)^2 + (78)^2 - 2(123)(78)\cos 81^0$

$(CM)^2$ = 15129 + 6084 -3001.664515

$(CM)^2$ = 21213 - 3001.664515

$\sqrt{(CM)^2} = \sqrt{18211.33549}$

CM = 134.9493812

CM = 135km

2015

9. (i) A = $\frac{1}{2}ob\sin A$

A = $\frac{1}{2} \times 1.7 \times 1.1 \times \sin 114^0$

A = $\frac{1.708330006}{2}$

A = 0.854165002

A = 0.9m^2

(ii) Shortest distance

S.D = $\frac{2A}{b}$

S.D = $\frac{2(0.9)}{2.4}$

S.D = $\frac{1.8}{2.4}$

S.D = 0.75km

(ii) $(OB)^2 = o^2 + b^2$ - 2obcos A

$(OB)^2 = 1.7^2 + 1.1^2 - 2(1.7)(1.1)\cos 114^0$

$(OB)^2$ = 2.89 + 1.21 + 1.521195045

$\sqrt{(OB)^2} = \sqrt{5.621195045}$

OB = 2.370905954

OB = 2.4m

(iii) Shortest distance

S.D = $\frac{2A}{b}$

S.D = $\frac{2(0.8)}{2.4}$

S.D = $\frac{1.6}{2.4}$

S.D = 0.666666667

S.D = 0.7m

2016 Exams

10. (a) $(MI)^2 = i^2 + m^2 - 2im\cos\theta$

$(MI)^2 = 5^2 + 3^2 - 2(5)(3)\cos 110^0$

$(MI)^2 = 25 + 9 - 30\cos 110^2$

$(MI)^2 = 34 - (-10.2606043)$

$(MI)^2 = 34 + 10.2606043$

$\sqrt{(MI)^2} = \sqrt{44.2606043}$

MI = 6.656864368

MI = 6.65 km

(ii) $A = \frac{1}{2} \times m \times i \sin K$

$A = \frac{1}{2} \times 5 \times 3 \sin 110^0$

$A = \frac{14.09538931}{2}$

A = 7.047694656

A = 7.05km^2

(iii) Shortest distance

$S.D = \frac{2A}{b}$

$S.D = \frac{2(7.05)}{6.65}$

$S.D = \frac{14.1}{6.65}$

S.D = 2.120300752

S.D = 2.12km

2017 GCE

11. (a) (i) We need to find and R first

$180 - (46^0 + 36^0)$

$180^0 - 82^0$

$\hat{R} = 98^0$

$\frac{\sin R}{r} = \frac{\sin P}{p}$

$\frac{\sin 98^0}{r} = \frac{\sin 46^0}{36.5}$

$r\sin 46^0 = 36.5\sin 98^0$

$r = \frac{36.5 \sin 98^0}{\sin 46^0}$

(ii) $A = \frac{1}{2} \times p \times r \sin Q$

$A = \frac{1}{2} \times 36.5 \times 50.2 \sin 36^0$

$A = 916.15\sin 36^0$

A = 538.4994589

A = 538.5km^2

(iii) Shortest distance

$S.D = \frac{2A}{b}$

$S.D = \frac{2(538.5)}{50.2}$

r = 50.24716343

∴ **PQ = 50.2km**

S.D = $\frac{1077}{50.2}$

S.D = 21.45418327

S.D = 21.5km

2017 INTERNAL

12. (a) (i) A = $\frac{1}{2}$ts sin H

A = $\frac{1}{2} \times 1.3 \times 1.9 \sin 130^0$

A = $\frac{1.892129775}{2}$

A = 0.946064887

A = 0.95km^2

(ii) $(TS)^2 = t^2 + s^2 - 2ts\cos H$

$(TS)^2$ = $1.3^2 + 1.9^2 - 2(1.3)(1.9)\cos 130^0$

$(TS)^2$ = 1.69 + 3.61 -4.94(-0.642787609)

$(TS)^2$ = 5.3 + 3.175370792

$\sqrt{(TS)^2} = \sqrt{8.47537079}$

TS = 2.911249009

TS = 2.91km

(iii) Shortest distance

S.D = $\frac{2A}{b}$

S.D = $\frac{2(0.95)}{2.91}$

S.D = $\frac{1.9}{2.91}$

S.D =0.652920962

S.D = 0.65km

2018 GCE

13. (a) (i) $\frac{b}{\sin B} = \frac{c}{\sin C}$

$\frac{b}{\sin 79^0} = \frac{15}{\sin 40^0}$

$\frac{b \sin 40^0}{\sin 40^0} = \frac{15 \sin 79^0}{\sin 40^0}$

b = $\frac{14.72440775}{0.642787609}$

b = 22.90711197

(ii) A = $\frac{1}{2} \times b \times c \sin A$

but we need to find angle A first

BAC + 79 + 40 = 180

BAC = 180 - 119

BAC = 61^0

∴AC = 22.9km

(iii) Shortest distance

S.D = $\frac{2A}{b}$

S.D = $\frac{2(150.2)}{22.9}$

S.D = $\frac{300.4}{22.9}$

S.D = 13.11790393

S.D = 13.1km

A = $\frac{1}{2} \times 15 \times 22.9 \sin 61^0$

A = $\frac{300.4318694}{2}$

A = 150.2159347

A = 150.2km^2

2018 INTERNAL

18.(a) $\frac{n}{\sin N} = \frac{r}{\sin R}$

$\frac{n}{\sin 60^0} = \frac{80}{\sin 52^0}$

$\frac{n \sin 52^0}{\sin 52^0} = \frac{80 \sin 60^0}{\sin 52^0}$

n = 87.92016097

∴KR = 87.9m

(b) Shortest distance from R to KN

s.d = $\frac{2A}{b}$

s.d = $\frac{3260}{80}$

s.d = 40.8m

(ii) Area of ΔKNB

A = $\frac{1}{2} kn \sin N$

A = $\frac{1}{2}(50)(80) \sin 60^0$

A = $2000 \sin 60^0$

A= 1732.050808

A = 1732m^2