(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

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 = $\begin{pmatrix} 2 & -1 \\ 1 & \end{pmatrix}$, find;

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

2014 Oct/Nov Exams

11. Given that A = $\begin{pmatrix} 5 & 2 \\ 1 & \end{pmatrix}$ 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.

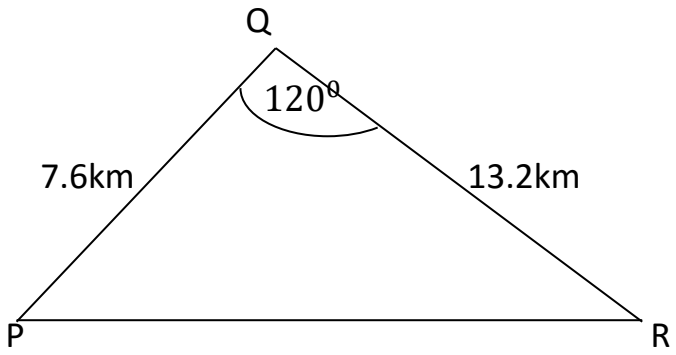
(ii) Find the value of a, given that the determinant of Q is 2.

(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



(a) Calculate

(i) The distance PR

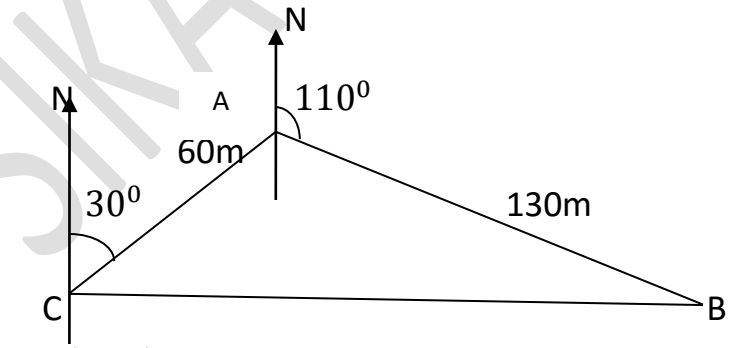
(ii) The area of triangle PQR

(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.



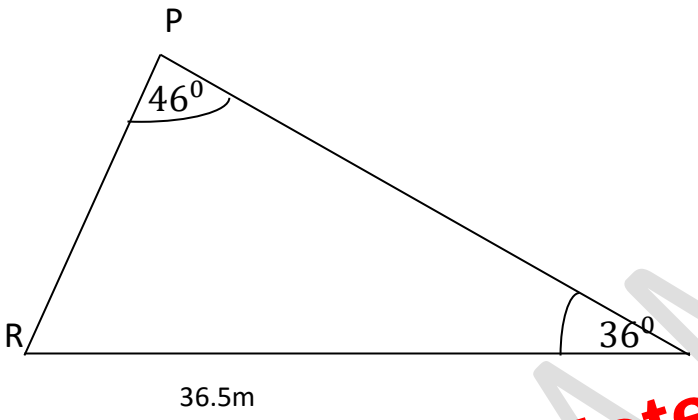
(i) Find angle BAC

(ii) Calculate the distance BC

(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.

=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

(b) 5(2y – 3) – 2(5 – 2y)

=10y – 15 – 10 + 4y

=10y + 4y – 25

=14y – 25

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

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

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

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

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

(d) 9t – 4 < 12t – 10

9t – 12t < -10 + 4

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

t > 2

(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)

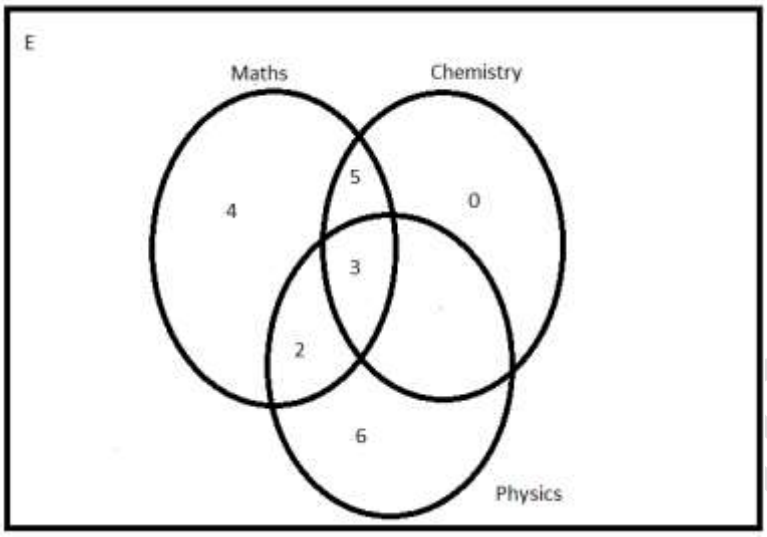
(b) $\frac{2y^2-3y-5}{y^2-1}$ prod=-10 sum=-3 factors=-5,2

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

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

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

x + 14 = 22 (b) two different mode of transport

x = 22 – 14 = 4 + 2 + 3 + 8

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

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

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

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× −3)-(-5× 1)

=-6 + 5

=-1

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

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

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

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

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

2005

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

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

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

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

(ii) det of $A^2 = 9$

$9 = (1-x \times -x+4) - (3\times3x)$

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

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

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

$=(2\times-1+2\times4+2\times-1 \quad 2\times-1+2\times2+1\times1)$

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

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

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

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

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

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

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

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

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

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

(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) $(PR)^2 = p^2 + r^2 - 2pr\cos\theta$

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

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

$(PR)^2 = 232 + 100.32$

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

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