Mathematics Applications Unit 1

Jenna Morgan

1. Formulae
Formula → substitute → answer

2. Percentages
Inflation
Discount
Commission
Profit and loss

3. Simple interest
$I = PRT$

4. Compound interest
$A = P\left(1 + \frac{r}{n}\right)^{nt}$

5. Other finance
Wages:
time = 1 time and a half = 1.5
double time = 2
Comparing prices
Foreign Currency
AU → (× rate) Forigen $
AU ← (÷ rate) Forigen $
Shares
- Price to earnings ratio
- dividend

Allowances + pensions
Budgeting
- fixed expenditure
- discretionary spending

6. Matrices
- Square matrix - 2×2
- Column - 3×1
- Row 1×4
- diagonal - square matrix with all zeros not in diagonal

Adding + subtracting
- same size matrices

Multiplying matrices by number
- whole matrix by 1 number.

Multiplying matrices
- same inside digit

Adding matrices

$$\begin{bmatrix} 1 & 2 & 4 \\ 0 & -4 & 5 \end{bmatrix} + \begin{bmatrix} 3 & 5 & -2 \\ 1 & 0 & -2 \end{bmatrix} = \begin{bmatrix} 4 & 7 & 2 \\ 1 & -4 & 3 \end{bmatrix}$$

Subtracting matrices

$$\begin{bmatrix} 3 & 5 & -2 \\ 1 & 0 & -2 \end{bmatrix} - \begin{bmatrix} 1 & 2 & 4 \\ 0 & -4 & 5 \end{bmatrix} = \begin{bmatrix} 2 & 3 & -6 \\ 1 & 4 & -7 \end{bmatrix}$$

Matrices × 1 number

$$5 \times \begin{bmatrix} 2 & 3 \\ 1 & -5 \end{bmatrix} = \begin{bmatrix} 10 & 15 \\ 5 & -25 \end{bmatrix}$$

Multiplying matrices

$$\begin{bmatrix} 2 & 1 \\ 3 & -1 \end{bmatrix} \times \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 0 \end{bmatrix} = \begin{bmatrix} 3 & 8 & 6 \\ 2 & 2 & 9 \end{bmatrix}$$

Equal matrices

$$\begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix} = \begin{bmatrix} 2 & 3 & -5 \\ 1 & 0 & -2 \end{bmatrix}$$

∴ $a = 2$ $b = 3$ $c = -5$
∴ $d = 1$ $e = 0$ $f = -2$

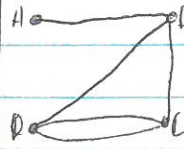
Premultiply
2nd matrice × 1st matrice
Postmultiply
1st matrice × 2nd matrice
Zero matrice
Any matrice which is full of just zeros.
eg 2×2 zero matrice

$$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

Identity matrice

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

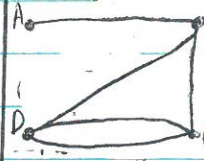
Route matrices



To

From	A	B	C	D
A	0	1	0	0
B	1	0	1	1
C	0	1	0	2
D	0	1	2	0

2 stage route matrix



To: A B C D

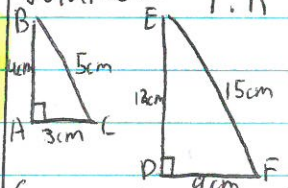
From	A	B	C	D
A	1	0	1	1
B	0	3	2	2
C	1	2	5	1
D	1	2	1	5

7. Pythagoras
$c^2 = a^2 + b^2$

8. Perimeter and area
Perimeter - outside
Area
Circle: πr^2
Sector: $\frac{\theta}{360}\pi r^2$
Triangle: $\frac{1}{2}bh$
Parallelogram bh
Trapezium $\frac{1}{2}(a+b)h$
Perimeter
Circle $C = 2\pi r$
Sector $l = \frac{\theta}{360} 2\pi r$

9. Surface area and volume
Surface area
Prisms + cylinders + Pyramids + Spheres
Cone, slant height s
$S = \pi r^2 + \pi r s$
Sphere
$S = 4\pi r^2$
Cylinder
$S = 2\pi rh + 2\pi r^2$
Volume
Prism, base area A
$V = Ah$
Pyramid
$V = \frac{1}{3}Ah$
Cylinder
$V = \pi r^2 h$
Cone
$V = \frac{1}{3}\pi r^2 h$
Sphere
$V = \frac{4}{3}\pi r^3$

10. Similarity
Length – $1 : R$
Surface area – $1 : R^2$
volume – $1 : R^3$



Corresponding lengths
AB : DE = 1 : 3
AC : DF = 1 : 3
BC : EF = 1 : 3
Corresponding angles equal
∠BAC = ∠EDF (= 90°)
∠ABC = ∠DEF
∠BCA = ∠EFD
∴ $\triangle ABC \sim \triangle DEF$