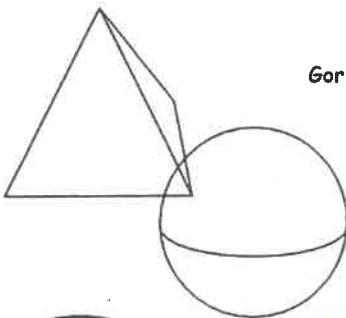
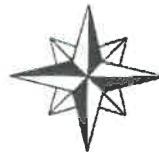


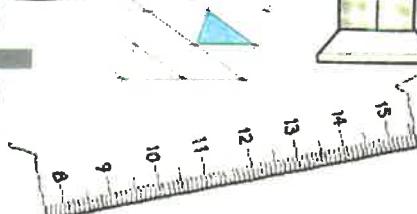
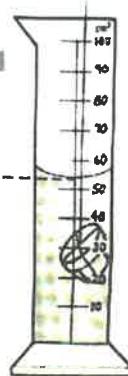
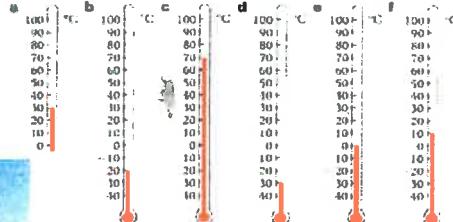
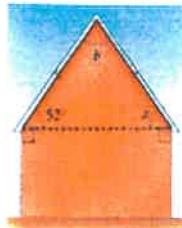
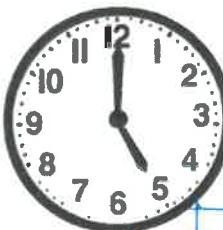
LLYFRYN RHIFEDD YSGOL EIFIONYDD



Gorllewin



Dwyrain



NUMERACY BOOKLET

Llyfrynn Rhifedd / Numeracy Booklet

Cynnwys / Contents:

Tud / Page

Dulliau Cyfrifo: Adio	1	Methods of Calculation: Addition
Tynnu	2 - 3	Subtraction
Lluosi	4 - 9	Multiplication
Rhannu	10 - 12	Division
Odrifau, Eirifau, Lluosifau, Ffactorau, Rhifau Cysefin, Rhifau Sgwâr, Rhifau Triongl	13	Odd Numbers, Even Numbers, Multiples, Factors, Prime Numbers, Square Numbers, Triangle Numbers.
Gwerth lle mewn rhifau cyfan a Degolion.	14	Place value in whole numbers and Decimals.
Ffracsynau a Canrannau.	15 - 21	Fractions and Percentages.
Rhifau Negatif.	22	Negative Numbers.
Amcangyfrif a Talgrynnu.	23 - 24	Estimating and Rounding.
Corlat.	25	Bodmas.
Amser a Tymheredd.	26	Time and Temperature.
Unedau Metrig a Imperial o Hyd a Unedau Cyfnewid.	27	Metric and Imperial Units of Length and Conversion Units.
Unedau Metrig a Imperial o Gynhwysedd.	28	Metric and Imperial Units of Capacity.
Unedau Metrig a Imperial o Bwysau (Mas).	29	Metric and Imperial Units of Weight (Mass).
Graddfeydd.	30	Scales.
Buanedd a Dwysedd.	31	Speed and Density.
Tro a Cymesuredd.	32	Turn and Symmetry.
Cylchdro Cymesuredd.	33	Rotational Symmetry.
Pwyntiau Cwmpawd a Chyfeiriannu.	34	Compass Points and Bearings.
Mesur Onglau.	35	Measuring Angles.
Onglau.	36	Angles.
Trionglau Arbenig.	37	Special Triangles.
Pedrachrâu.	38	Quadrilaterals.
Llinellau Paralel.	39	Parallel Lines.
Polygonau.	40	Polygons.
Polygonau Rheolaidd.	41	Regular Polygons.
Brithwaith.	42	Tessellation.
Siapiau Cyfath a Cyflun.		Congruent and Similar Shapes.
Y Cylch.	43	The Circle.
Siapiau 3D.	44	3D Shapes.
Rhwyd.	45	Net.
Perimedr ag Arwynebedd.	46 - 47	Perimeter and Area.
Arwynebedd Siapiau Cyfansawdd.	48	Area of Compound Shapes.
Cyfaint Hylif.	49	Volume of Liquid.
Tablau Amlder (Siartiau Tali) a Siartiau Bar.	50 - 52	Frequency Tables (Tally Charts) and Bar Charts.
Pictogram.	53	Pictogram.
Siartiau Cylch.	54 - 55	Pie Charts.
Diagramau Gwasgariad.	56	Scatter Diagrams.
Cyfesurynnau yn y Pedwar Cwadrant.	57	Co-ordinates in all four Quadrants.
Ystadegau.	58 - 59	Statistics.
Tebygolrwydd.	60	Probability.

Mae Rhifedd yn un o'r Sgiliau Allweddol. Dyma'r sgiliau hollbwysig sydd eu hangen arnoch i wneud yn dda mewn addysg a hyfforddiant, i lwyddo yn y gwaith ac i ddod ymlaen mewn bywyd.

Gall bod yn dda mewn Rhifedd eich helpu i:

- gael graddau uwch yn eich pynciau yn yr ysgol
- ennill swyddi neu le ar gyrsiau mewn colegau a phrifysgolion
- ehangu'r ystod swyddi y gallwch ddewis o'i plith yn y dyfodol.

Mae Rhifedd hefyd yn ddefnyddiol yn eich bywyd personol.

Numeracy is one of the Key Skills. They are the vital ones that you need, to do well in education and training, to succeed at work and to get on in life.

Being good at Numeracy can help you to:

- achieve higher grades in your subjects in school
- get into jobs and college or university courses
- widen your job choice in the future.

Numeracy is also useful in your everyday life.

**Noddwyd y Llyfrynn Rhifedd yma gan Fanc yr H.S.B.C.
This Numeracy Booklet has been sponsored by the
H.S.B.C.Bank.**

1. DULLIAU CYFRIFO

1. ADIO

(a) Dull adio'r digidau mwyaf ystyrlon yn gyntaf.

Yn y dull yma byddwn yn adio'r miloedd cannoedd, degau ac unedau ar wahan.

Enghraiff

$$\begin{array}{r}
 (i) \quad \begin{array}{r}
 7648 \\
 + \quad \underline{1486} \\
 8000 \quad (7000 + 1000) \\
 1000 \quad (600 + 400) \\
 + \quad \underline{120} \quad (40 + 80) \\
 \underline{14} \quad (8 + 6) \\
 \hline 9134
 \end{array}
 \end{array}$$

Wrth ddefnyddio'r dull yma
nid oes rhaid 'cario' o gwbl.

(b) Dull cario o un golofn i'r llall gan ddechrau gyda'r unedau.

Enghraiff

$$\begin{array}{r}
 (i) \quad \begin{array}{r}
 7648 \\
 + \quad \underline{1486} \\
 \hline 9134
 \end{array}
 \end{array}$$

cario
uwchben
y linell

neu

$$\begin{array}{r}
 (ii) \quad \begin{array}{r}
 7648 \\
 + \quad \underline{1486} \\
 \hline 9134
 \end{array}
 \end{array}$$

cario o dan
y linell

(c) Gallwn ddefnyddio'r dulliau uchod gydagolion ond rhaid cofio lleoli'r pwyntiau degol o dan eu gilydd a llenwi pob bwlc h yda '0' (sero) yn ôl yr angen.

Enghraiff

$$\begin{array}{r}
 124.90 \\
 + \quad \underline{73.25} \\
 100.00 \quad (\text{dim ond un rhif gyda } 100) \\
 90.00 \quad (20 + 70) \\
 7.00 \quad (4 + 3) \\
 1.10 \quad (0.9 + 0.2) \\
 \underline{0.05} \quad (\text{dim ond un rhif gyda chanfed}) \\
 \hline 198.15
 \end{array}$$

1. METHODS OF CALCULATION

1. ADDITION

(a) Adding the most significant digits first.

In this method we will add the thousands, hundreds, tens and units separately.

Example

$$\begin{array}{r}
 \text{(i)} & 7648 \\
 + & \underline{1486} \\
 8000 & \\
 1000 & (7000 + 1000) \\
 + & 120 \\
 14 & (600 + 400) \\
 \hline
 9134 & (40 + 80) \\
 & (8 + 6)
 \end{array}$$

There is no need to
'carry' at all using
this method

This is the usual method

(b) Carrying from one column to the next, starting with the units.

Example

carrying
above the line

carrying
under the
line

$$\begin{array}{r}
 \text{(i)} & 7 \ 6 \ 4 \ 8 \\
 + & \underline{1 \ 4 \ 8 \ 6} \\
 \hline
 9 \ 1 \ 3 \ 4
 \end{array}
 \quad \text{or} \quad
 \begin{array}{r}
 \text{(ii)} & 7 \ 6 \ 4 \ 8 \\
 + & \underline{1 \ 4 \ 8 \ 6} \\
 \hline
 9 \ 1 \ 3 \ 4
 \end{array}
 \quad \begin{matrix} \\ \\ 1 \ 1 \ 1 \end{matrix}$$

(c) We can use the methods above with decimals but we must remember to place the decimal points underneath each other and to fill every gap with '0' (zero) as required.

Example

$$\begin{array}{r}
 124.90 \\
 + \underline{73.25} \\
 \hline
 100.00 \quad (\text{only one number in the 100s}) \\
 90.00 \quad (20 + 70) \\
 7.00 \quad (4 + 3) \\
 1.10 \quad (0.9 + 0.2) \\
 0.05 \quad (\text{only one number in the hundredths}) \\
 \hline
 198.15
 \end{array}$$

2. TYNNU

(a) Dull adio ymlaen

Yn y dull yma byddwn yn adio at y rhif lleiaf yn raddol.

Enghraifft

6467 - 2684

dechrau gyda 2684 yna adio i gael y cant agosaf, adio i gael y mil agosaf ac yna adio i gael 6467

Ail ysgrifennu fel

$$\begin{array}{r}
 6467 \\
 - \underline{2684} \\
 16 \\
 300 \\
 + \underline{3467} \\
 \hline 3783
 \end{array}
 \quad
 \begin{array}{rcl}
 (2684 + 16) & = 2700 \\
 (2700 + 300) & = 3000 \\
 (3000 + 3467) & = 6467
 \end{array}$$

Felly $6467 - 2684 = 3783$

adio'r rhain

(b) Dull ad-dalu (compensate)

Yn y dull yma byddwn yn tynnu mwy nag sydd angen ac wedyn adio ychydig i gael y cyd-bwysedd cywir.

Enghraifft

$$\begin{array}{r}
 6467 \\
 - \underline{2684} \\
 3467 \\
 + \underline{316} \\
 \hline 3783
 \end{array}
 \quad
 \begin{array}{l}
 \text{galw hwn yn 3000} \\
 6467 - 3000 = 3467 \\
 \text{ad-dalu (+) 316} \\
 \text{gan ein bod wedi tynnu gormod}
 \end{array}$$

(c) Dull dadelennu

Yn y dull yma byddwn yn benthyg o'r golofn nesaf.

Enghraifft

$$\begin{array}{r}
 5\cancel{6}^1 4 \cancel{1}^6 7 \\
 - \underline{2 \ 6 \ 8 \ 4} \\
 \hline 3 \ 7 \ 8 \ 3
 \end{array}$$

$$\begin{array}{r}
 5\cancel{6}^1 4 \cancel{7}^8 \cancel{1}^4 \\
 - \underline{2 \ 6 \ 6 \ 7} \\
 \hline 3 \ 8 \ 1 \ 7
 \end{array}$$

(ch) Gallwn ddefnyddio'r dulliau uchod gyda degolion ond rhaid cofio lleoli'r pwntiau degol o dan eu gilydd a llenwi pob bwlc gyda 'O' (sero) yn ôl yr angen.

2. SUBTRACTION

(a) Counting on method

In this method we gradually add to the lower number.

Example

$$6467 - 2684$$

start with 2684, then add to get the nearest hundred, add to get the nearest thousand and then add to get 6467

Rewrite as

$$\begin{array}{r}
 6467 \\
 - \underline{2684} \\
 16 \qquad (2684 + 16 = 2700) \\
 300 \qquad (2700 + 300 = 3000) \\
 + 3467 \qquad (3000 + 3467 = 6467) \\
 \hline
 3783
 \end{array}$$

$$\text{Therefore } 6467 - 2684 = 3783$$

add these

(b) Compensation method

In this method we will take away more than is necessary and then add back a little to get the right balance.

Example

$$\begin{array}{r}
 6467 \\
 - \underline{2684} \\
 3467 \\
 + \underline{316} \\
 \hline
 3783
 \end{array}$$

call this 3000

$6467 - 3000 = 3467$

compensate (+) 316
because we have taken away too much

(c) Decomposition method

In this method we borrow from the next column.

Example

$$\begin{array}{r}
 \underline{5} \underline{6} \underline{1} \underline{3} \underline{4} \underline{1} \underline{6} \underline{7} \\
 - \underline{2} \underline{6} \underline{8} \underline{4} \\
 \hline
 3 \underline{7} \underline{8} \underline{3}
 \end{array}
 \qquad
 \begin{array}{r}
 \underline{5} \underline{6} \underline{1} \underline{4} \underline{7} \underline{8} \underline{1} \underline{4} \\
 - \underline{2} \underline{6} \underline{6} \underline{7} \\
 \hline
 3 \underline{8} \underline{1} \underline{7}
 \end{array}$$

(d) We can use the above methods with decimals but we must remember to place the decimal points underneath each other and to fill every gap with '0' (zero) as required.

Enghraifft

$$\begin{array}{r}
 (i) \quad 324.90 \\
 - \quad \underline{7.25} \\
 \hline
 2.75 \quad (7.25 + 2.75 = 10.00) \\
 + \quad 14.90 \quad (10 + 14.90 = 24.90) \\
 \hline
 300.00 \quad (24.90 + 300 = 324.90) \\
 \hline
 \underline{317.65}
 \end{array}$$

adio - ymlaen

$$\begin{array}{r}
 (ii) \quad 324.90 \\
 - \quad \underline{7.25} \\
 \hline
 314.90 \quad (324.90 - 10 = 314.90) \\
 + \quad \underline{2.75} \quad (10 - 7.25 = 2.75) \\
 \hline
 \underline{317.65} \\
 \quad 1
 \end{array}$$

ad-dalu

$$\begin{array}{r}
 (iii) \quad 324.890 \\
 - \quad \underline{7.25} \\
 \hline
 317.65
 \end{array}$$

dadelfennu

Example

(i) 324.90
 - 7.25
 2.75
 + 14.90
 300.00
 317.65

$$(7.25 + 2.75 = 10.00)$$

$$(10 + 14.90 = 24.90)$$

$$(24.90 + 300 = 324.90)$$

add on

(ii) 324.90
 - 7.25
 314.90
 + 2.75
 317.65
 1

$$(324.90 - 10 = 314.90)$$

$$(10 - 7.25 = 2.75)$$

compensate

(iii) 324.90
 - 7.25
 317.65

decompose

3. LLUOSI

(a) Dull dyblu

Mae angen gwybod sut i ddyblu rhifau gyda'r dull yma.

Enghraiffft

$$38 \times 25$$

Dechreuwn gyda 1 bob tro ac wedyn dyblu yn dilyn y patrwm: 1, 2, 4, 8, 16, 32 a.y.y.b.

Mae angen dyblu hyd at y dwbl agosaf sy'n LLAII na'r rhif a ddewiswyd.

Yna gosod yr atebion o dan ei gilydd mewn colofnau.

$$(i) \quad 38 \times 25$$

$$1 + 8 + 16 = 25$$

$\begin{array}{r} 1 \\ - 2 \\ - 4 \\ - 8 \\ - 16 \end{array}$	$\begin{array}{r} \times \\ \times \\ \times \\ \times \\ \times \end{array}$	$\begin{array}{r} 38 \\ 38 \\ 38 \\ 38 \\ 38 \end{array}$	$\begin{array}{r} = \\ - \\ = \\ = \\ = \end{array}$	$\begin{array}{r} 38 \\ 76 \\ 152 \\ 304 \\ 608 \end{array}$	(38×2) (76×2) (152×2) (304×2)
---	---	---	--	--	--

y dwbl
olaf sy'n
llai na
25

Y dwbl nesaf ar ôl 16 yw 32. Mae 32 yn FWY NA 25 felly gorffen y dyblu gyda 16. Yn y golofn ochr chwith (1, 2, 4, 8, 16) edrych pa rifau sy'n adio i wneud 25. Dileu y gweddill ac adio y rhifau yn y golofn ochr dde i gael yr ateb.

$$25 = 16 + 8 + 1$$

Felly cawn:-

$\begin{array}{r} 1 \\ + 8 \\ + 16 \\ + 25 \end{array}$	$\begin{array}{r} \times \\ \times \\ \times \\ \times \end{array}$	$\begin{array}{r} 38 \\ 38 \\ 38 \\ 38 \end{array}$	$\begin{array}{r} = \\ = \\ = \\ = \end{array}$	$\begin{array}{r} 38 \\ 304 \\ 608 \\ 950 \end{array}$	$38 \times 25 = 950$
---	---	---	---	--	----------------------

$$(ii) \quad 25 \times 38$$

Cawn yr un ateb trwy ddyblu gan ddechrau gyda 25.

$\begin{array}{r} 1 \\ - 2 \\ - 4 \\ - 8 \\ - 16 \\ - 32 \end{array}$	$\begin{array}{r} \times \\ \times \\ \times \\ \times \\ \times \\ \times \end{array}$	$\begin{array}{r} 25 \\ 25 \\ 25 \\ 25 \\ 25 \\ 25 \end{array}$	$\begin{array}{r} = \\ = \\ = \\ = \\ = \\ = \end{array}$	$\begin{array}{r} 25 \\ 50 \\ 100 \\ 200 \\ 400 \\ 800 \end{array}$	$2 + 4 + 32 = 38$
---	---	---	---	---	-------------------

y dwbl
olaf sy'n
llai na 38

Y dwbl nesaf yw 64 sy'n FWY NA 38, felly gorffen y dyblu yn 32.

$$38 = 32 + 4 + 2 \quad \text{felly cawn}$$

$$25 \times 38 = 50 + 100 + 800$$

$$25 \times 38 = 950$$

(a)

Doubling method

We need to know how to double numbers to use this method.

Example

$$38 \times 25$$

We always start with 1 and double following the pattern: 1, 2, 4, 8, 16, 32 etc.

We need to carry on doubling until we reach the nearest double that is LESS than the number chosen.

Then, the answers are placed underneath each other in columns.

$$(i) \quad 38 \times 25$$

the last
double
that is
less
than 25

$$\begin{array}{r}
 1 \quad \times \quad 38 \quad = \quad 38 \\
 2 \quad \times \quad 38 \quad = \quad 76 \\
 4 \quad \times \quad 38 \quad = \quad 152 \\
 8 \quad \times \quad 38 \quad = \quad 304 \\
 16 \quad \times \quad 38 \quad = \quad 608
 \end{array}$$

$$1 + 8 + 16 = 25$$

$$(38 \times 2)$$

$$(76 \times 2)$$

$$(152 \times 2)$$

$$(304 \times 2)$$

The next double after 16 is 32. 32 is MORE THAN 25, therefore we finish the doubling with 16. In the left-hand column (1, 2, 4, 8, 16) we look at which numbers add up to make 25. We cross out the rest and add the numbers in the right hand column to get the answer.

$$25 = 16 + 8 + 1$$

Therefore we have:-

$$38 \times 25 = 950$$

$$\begin{array}{r}
 1 \quad \times \quad 38 \quad = \quad 38 \\
 + \quad 8 \quad \times \quad 38 \quad = \quad 304 \quad +
 \\ \hline
 16 \quad \times \quad 38 \quad = \quad 608 \\
 \hline
 25 \quad \times \quad 38 \quad = \quad 950
 \end{array}$$

$$(ii) \quad 25 \times 38$$

We get the same answer by doubling if we start with 25.

the last
double
that is
less than
38

$$\begin{array}{r}
 1 \quad \times \quad 25 \quad = \quad 25 \\
 2 \quad \times \quad 25 \quad = \quad 50 \\
 4 \quad \times \quad 25 \quad = \quad 100 \\
 8 \quad \times \quad 25 \quad = \quad 200 \\
 16 \quad \times \quad 25 \quad = \quad 400 \\
 \hline
 32 \quad \times \quad 25 \quad = \quad 800
 \end{array}$$

$$2 + 4 + 32 = 38$$

The next double is 64, which is MORE THAN 38, therefore we stop doubling at 32.

$$\begin{array}{rcl}
 38 & = & 32 + 4 + 2 \\
 25 & \times & 38 = 50 + 100 + 800 \\
 \hline
 25 & \times & 38 = 950
 \end{array}
 \quad \text{therefore we have}$$

5

(b)

Dull bocs / (Napier)

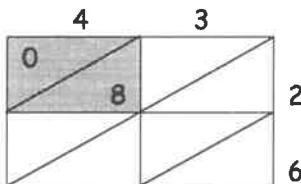
Mae'r dull yma yn gofyn i chi greu grid.

I luosi 43×26 mae angen creu grid 2 wrth 2 oherwydd fod angen lluosi rhif dau ddigid gyda rhif dau ddigid.

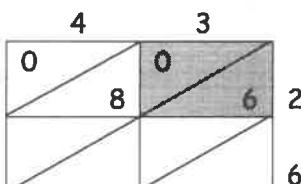
Buasai lluosi 264×53 yn golygu creu grid 3 wrth 2, a.y.y.b.

Enghraifft(i) 43×26

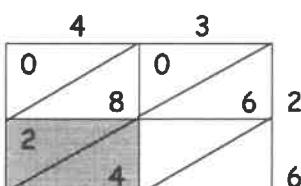
Mae'r diagramau isod yn dangos y drefn lluosi. Mae angen llunio croeslin ym mhob bocs o'r grid er mwyn lleoli degau ac unedau pan yn lluosi pob bocs unigol. Ysgrifennu'r degau UWCH BEN y groeslin ym mhob bocs bob tro.



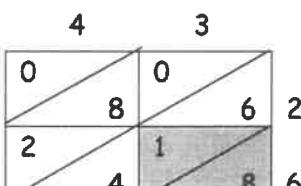
Y bocs cyntaf yn y rhes uchaf $4 \times 2 = 8$.
Ysgrifennu 08 i ddangos dim degau.



Ychwanegu $3 \times 2 = 6$ i orffen y rhes uchaf o'r grid.



Ychwanegu y bocs cyntaf yn y rhes isaf.
 $4 \times 6 = 24$ (cofio 2 uwchben y groeslin).



Cwblhau y grid gyda $3 \times 6 = 18$.

Ar ôl cwblhau y grid mae angen adio y colofnau ar hyd y croesliniau.

(b)

Box method / (Napier)

This method requires you to create a grid.

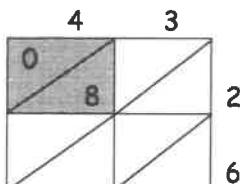
To multiply 43×26 we need to create a 2 by 2 grid, because we need to multiply a two-digit number by a two-digit number.

Multiplying 264×53 would mean creating a 3 by 2 grid etc.

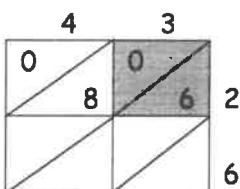
Example

i) 43×26

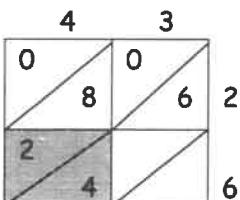
The diagrams below illustrate the multiplication method. We need to draw a diagonal in each box of the grid in order to place tens and units when multiplying each individual box. Always write the tens ABOVE the diagonal in each box.



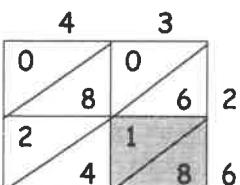
The first box in the top row $4 \times 2 = 8$.
Write 08 to show that there are no tens.



Add $3 \times 2 = 6$ to complete the top row of the grid.

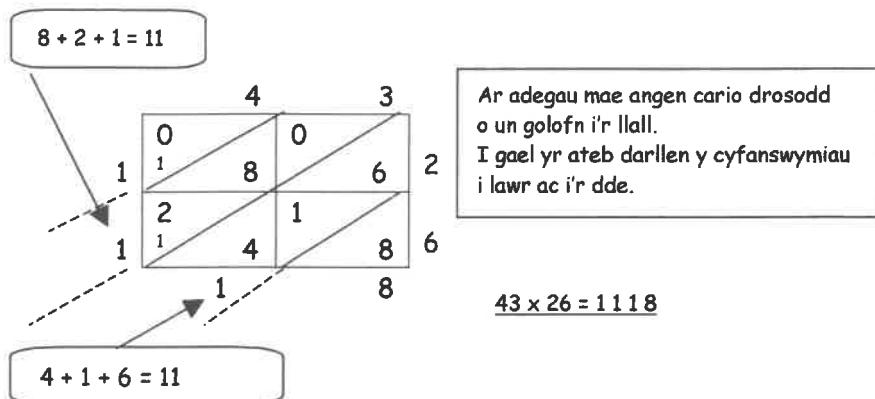


Add the first box in the bottom row.
 $4 \times 6 = 24$ (remember to put the 2 above the diagonal).

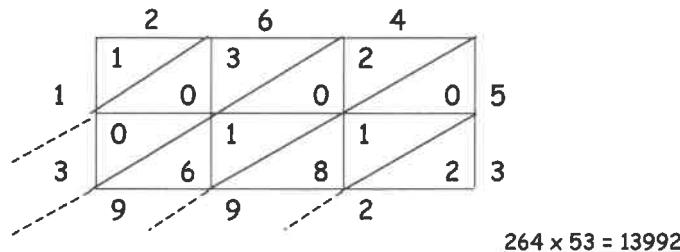


Complete the grid with $3 \times 6 = 18$.

After completing the grid, we need to add the columns along the diagonals.

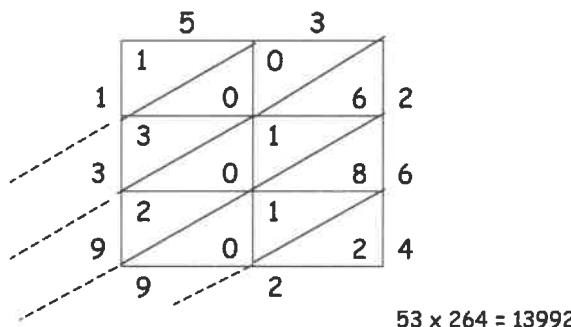


(ii) 264×53
Llunio bocs 3 wrth 2 a dilyn y canllawiau yn enghraifft (i)

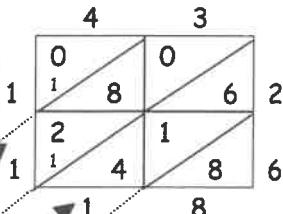


Sylwch nad oes angen cario drosodd yn yr enghraifft yma.

Mae'n bosibl llunio bocs 2 wrth 3 hefyd i luosi 264×53 (53×264).



$$8 + 2 + 1 = 11$$



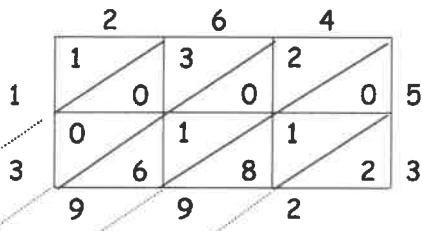
We sometimes need to carry over from one column to the next.
To get the answer, read the totals down and to the right.

$$43 \times 26 = 1118$$

$$4 + 1 + 6 = 11$$

ii) 264×53

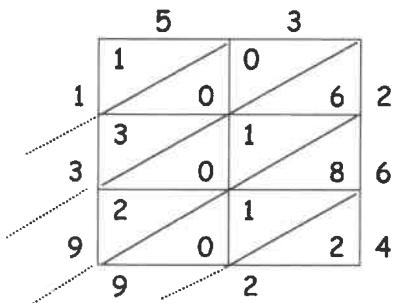
Draw a 3×2 box and follow the guidelines in example (i)



$$264 \times 53 = 13992$$

Note that there is no need to carry over in this example.

You can also draw a 2×3 box to multiply 264×53 (53×264).



$$53 \times 264 = 13992$$

(c)

Dull Ymrannu

Yn y dull yma mae'r rhif lleiaf yn cael ei ymrannu.

ei dorri'n ddegau ac unedau

Enghraiff

$$\begin{array}{r}
 (i) \qquad \qquad \qquad 352 \\
 \qquad \qquad \times \qquad \qquad \underline{27} \\
 352 \times 20 \qquad 7040 \\
 352 \times 7 \qquad \underline{2464} \\
 \hline
 352 \times 27 = \underline{\underline{9504}}
 \end{array}$$

$$\begin{array}{r}
 (ii) \qquad \text{neu} \qquad \qquad 352 \\
 \qquad \qquad \times \qquad \qquad \underline{27} \\
 352 \times 10 \qquad 3520 \\
 352 \times 10 \qquad 3520 \\
 352 \times 7 \qquad \underline{2464} \\
 \hline
 352 \times 27 = \underline{\underline{9504}}
 \end{array}$$

Mae dull ymrannu i ddegau fel yn (ii) yn symleiddio y lluosi ymhellach oherwydd lluosi gyda 10 yn olynol yw ychwanegu '0' yn ôl yr angen.

(ch)

Dull Ffactorau

Os oes gan rif (rhif dau ddigid fel arfer) ffactorau mae'n bosibl defnyddio'r ffactorau i luosi fel a ganlyn.

Enghraiff

$$21 = 3 \times 7$$

$$264 \times 21$$

Mae'n bosibl ysgrifennu 21 fel 3×7 .

Mae defnyddio $21 = 3 \times 7$ yn rhoi

$$\begin{array}{r}
 264 \times 21 \text{ fel} \qquad \qquad 264 \\
 \times \qquad \qquad \qquad \underline{3} \\
 \qquad \qquad \qquad 792 \\
 \times \qquad \qquad \qquad \underline{7} \\
 \hline
 \qquad \qquad \qquad 5544
 \end{array}$$

(luosi gyda 3)

(luosi'r ateb gyda 7)

(c)

Partition Method

In this method the smaller number is partitioned.

it is broken down
into tens and units

Example

(i) 352

$$\begin{array}{r} & \times \quad 27 \\ 352 \times 20 & \quad 7040 \\ 352 \times 7 & \quad 2464 \\ \hline 352 \times 27 = & \quad 9504 \end{array}$$

(ii) or 352

$$\begin{array}{r} & \times \quad 27 \\ 352 \times 10 & \quad 3520 \\ 352 \times 10 & \quad 3520 \\ 352 \times 7 & \quad 2464 \\ \hline 352 \times 27 = & \quad 9504 \end{array}$$

The method of partitioning into tens as in (ii) simplifies the multiplication further because to multiply successively by 10 is to add a '0' as necessary.

(d)

Factor Method

If a number (usually a two digit number) has factors, the factors can be used to multiply as follows.

Example

$$264 \times 21$$

$$21 = 3 \times 7$$

21 can be written as 3×7 .

Using $21 = 3 \times 7$ gives

$$\begin{array}{r} 264 \\ \times \quad 3 \\ \hline 792 \end{array}$$

(multiply by 3)

$$\begin{array}{r} 792 \\ \times \quad 7 \\ \hline 5544 \end{array}$$

(multiply the answer by 7)

(d)

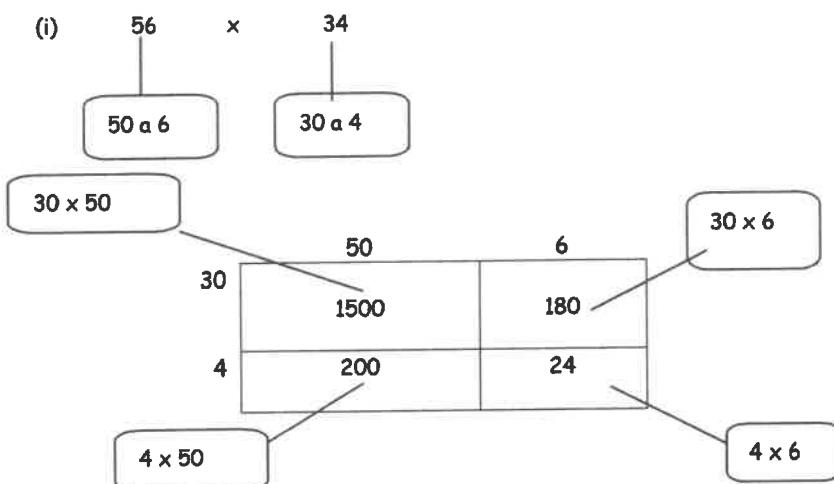
Dull Arwynebedd

Yn y dull yma byddwn yn torri'r rhifau fel ochrau petryal.

Arwynebedd y petryal fydd yr ateb i'r lloosi.

Enghraifft

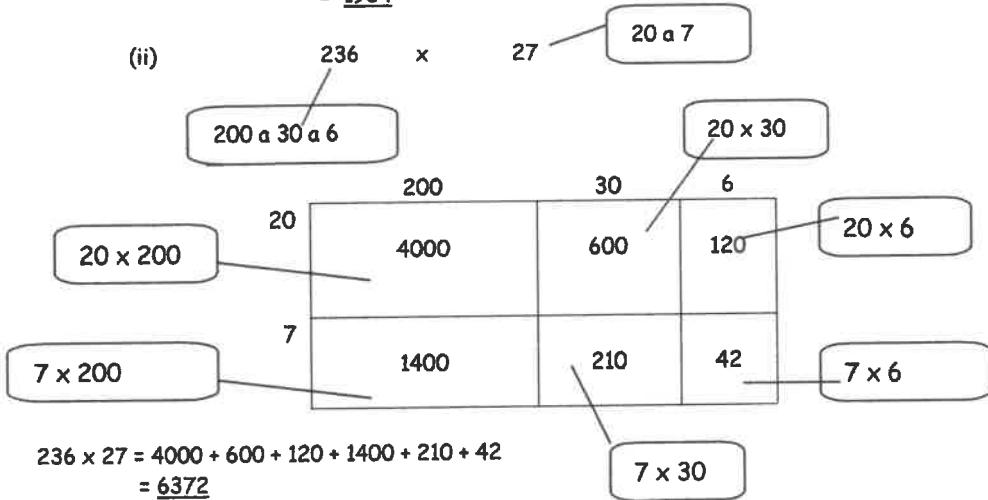
(i)



Yr ateb yw cyfanswm yr arwynebedd felly:-

$$56 \times 34 = 1500 + 180 + 200 + 24 \\ = \underline{1904}$$

(ii)



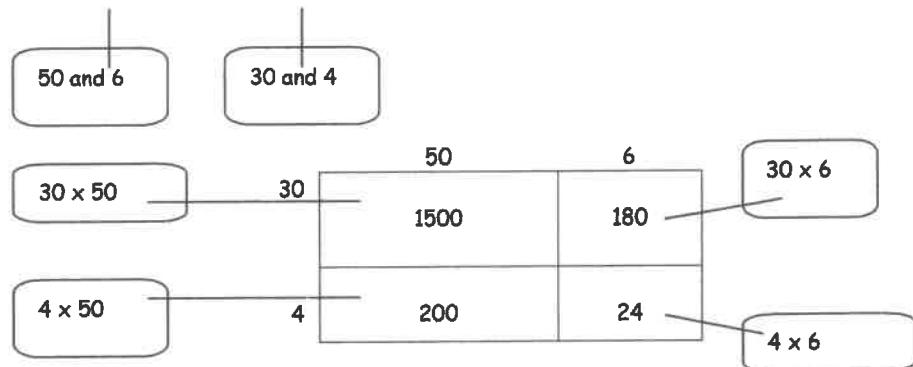
$$236 \times 27 = 4000 + 600 + 120 + 1400 + 210 + 42 \\ = \underline{6372}$$

(e) Area Method

In this method we will break down the numbers as the sides of a rectangle.
The area of the rectangle will be the answer to the multiplication.

Example

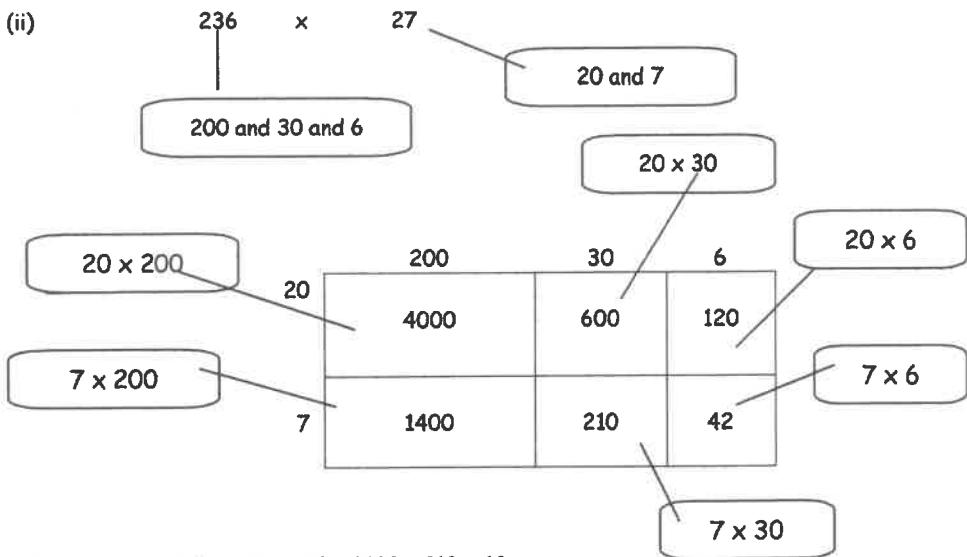
(i) 56×34



The answer is the total area therefore:-

$$\begin{aligned} 56 \times 34 &= 1500 + 180 + 200 + 24 \\ &= \underline{1904} \end{aligned}$$

(ii)



$$\begin{aligned} 236 \times 27 &= 4000 + 600 + 120 + 1400 + 210 + 42 \\ &= \underline{6372} \end{aligned}$$

(dd) Lluosi Degolion

Gallwn addasu'r dulliau lluosi blaenorol i luosi degolion.

I symleiddio'r broses lluosi byddwn yn dileu y pwynt degol ac wedyn lleoli'r pwynt ar y diwedd ar ôl lluosi.

Enghraifft

(i) 3.8×2.5

Wrth ddefnyddio'r dull dyblu i gyfrifo 38×25 cawsom $38 \times 25 = 950$.

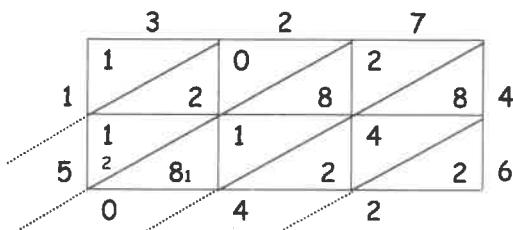
Gyda 3.8×2.5 gwelwn fod yna gyfanswm o ddau ddigid ar ôl y pwyntiau degol, sef 8 ar ôl y 3 a 5 ar ôl y 2. Mae hyn yn golygu fod angen dau ddigid ar ôl y pwynt degol yn yr ateb.

Felly mae $3.8 \times 2.5 = 9.50$ (lleoli'r pwynt degol fel bo dau ddigid ar ei ôl).

Yn yr un modd cawn	38×2.5	=	95.0
hefyd	3.8×25	=	95.0
a	3.8×0.25	=	0.950

(ii) Gyda rhifau tri digid y dull bocs yw'r mwyaf addas.

Cysidro 3.27×4.6 fel 327×46 a chreu grid 3 wrth 2.



Mae $327 \times 46 = 15042$

Felly mae $3.27 \times 4.6 = 15.042$

Mae angen 3 digid ar ôl y pwynt degol yn yr ateb i gyfateb i'r tri digid ar ôl y ddau bwynt degol yn y cwestiwn.

(iii) Mae defnyddio'r dulliau ffactorau ac ymrannu gyda degolion yn dilyn yr un patrwm.

Meddyliwch am 368×1.8 fel 2×9 (neu 3×6)

$$\begin{array}{r}
 & 368 \\
 \times & \underline{2} \\
 & 736 \\
 \times & \underline{9} \\
 \hline
 & 6624 \\
 & \underline{35}
 \end{array}
 \quad \text{Os yw } 368 \times 18 = 6624 \text{ mae } 368 \times 1.8 = 662.4 \text{ (dim ond un digid ar ôl y pwynt degol yn y cwestiwn felly mae angen un digid ar ôl y pwynt degol yn yr ateb).}$$

Yn yr un modd cawn

$$36.8 \times 1.8 = 66.24$$

$$3.68 \times 18 = 66.24$$

(f) Multiplying Decimals

We can adapt the previous methods of multiplication to multiply decimals. To simplify the multiplication process we will eliminate the decimal point and then put it back in the right place at the end, after multiplying.

Example

i) 3.8×2.5

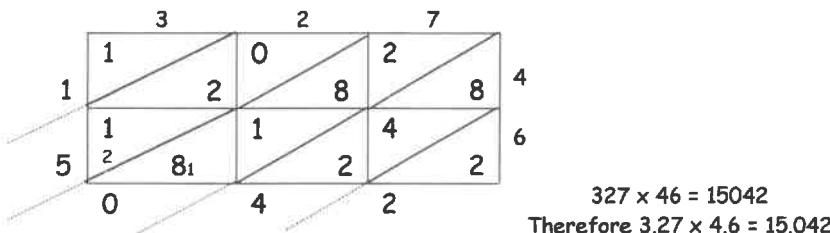
Using the doubling method to calculate 38×25 we arrived at $38 \times 25 = 950$. With 3.8×2.5 we see that there is a total of two digits after the decimal point, i.e. 8 after the 3 and 5 after the 2. This means that we need two digits after the decimal point in the answer.

Therefore $3.8 \times 2.5 = 9.50$ (place the decimal point so that there are two digits after it).

Similarly, we have	38×2.5	= 95.0
also	3.8×25	= 95.0
and	3.8×0.25	= 0.950

ii) With three digit numbers, the box method is the most suitable.

Consider 3.27×4.6 as 327×46 and create a 3 by 2 grid.



3 digits are required after the decimal point in the answer to correspond to the three digits after the two decimal points in the question.

iii) Using the factor and partition methods with decimals follows the same pattern.

Think about 368×1.8 as 2×9 (or 3×6)

$$\begin{array}{r}
 368 \\
 \times \underline{2} \\
 \hline
 736 \\
 \times \underline{9} \\
 \hline
 6624 \\
 \end{array}
 \quad \text{If } 368 \times 18 = 6624, 368 \times 1.8 = 662.4 \text{ (only one digit after the decimal point in the question, therefore one digit is required after the decimal point in the answer).}$$

Similarly we have

$$36.8 \times 1.8 = 66.24$$

$$3.68 \times 18 = 66.24$$

4. RHANNU

Rhannyn = rhif yr ydym yn ei rannu

(a) Dull Twr

Yn y dull yma mae angen gwybod sut i luosi gyda 10 a dyblu (neu luosrif arall). Byddwn yn dechrau'r twr gyda'r rhannyn (864 yn yr enghraifft isod) ac wedyn tynnu lluosrifau o'r rhannyyd (36) allan o'r rhannyn.

Enghraifft

sawl set o 36 sydd yna mewn 864?

$$(i) \quad 864 \div 36$$

864

- 360

504

10 set o 36

= 36 × 10 (mae 864 yn fwy na 360 felly × 10 ac wedyn tynnu)

10 set arall o 36

- 360

144

= 36 × 10 (mae 504 yn fwy na 360 felly × 10 a thynnu eto)

2 set o 36

- 72

72

= 36 × 2 (mae 144 yn llai na 360 felly dyblu a thynnu)

2 set o 36

72

00

= 36 × 2 (dyblu a thynnu eto)

24

I gael yr ateb 'rydym yn adio'r lluosyddion sef $10 + 10 + 2 + 2 = 24$

Felly $864 \div 36 = 24$

Os nad yw'r rhif bach yn rhannu yn union cawn ddangos yr ateb gyda gweddill neu fel rhif cymysg.

$$(ii) \quad 423 \div 32$$

423

- 320

103

- 96

7

= 32×10 (423 yn fwy na 320 felly × 10 a thynnu)

= 32×3 (103 yn llai na 320 felly × 3)

13

felly mae $423 \div 32 = 13$ g 7 neu $13\frac{7}{32}$.

13 gweddill 7 neu
 $13 \text{ a } \frac{7}{32} = 13\frac{7}{32}$.

4. DIVISION

Dividend = the number we are going to divide

(a) Tower Method

In this method, we need to know how to multiply by 10 and double (or find another multiple). We will start the tower with the dividend (864 in the example below) and then subtract multiples of the divisor (36) out of the dividend.

Example

how many sets of 36 are there in 864?

(i) $364 \div 36$

$$\begin{array}{r} 864 \\ - 360 \\ \hline 504 \end{array}$$

10 sets of 36
(864 is greater than 360, therefore $\times 10$ and then subtract)

$$\begin{array}{r} 360 \\ - 144 \\ \hline 216 \end{array}$$

10 more sets of 36
(504 is greater than 360, therefore $\times 10$ and subtract again)

$$\begin{array}{r} 72 \\ - 72 \\ \hline 0 \end{array}$$

2 sets of 36
(144 is less than 360, therefore we double and subtract)

$$\begin{array}{r} 72 \\ - 00 \\ \hline 24 \end{array}$$

2 sets of 36
(double and subtract again)

To get the answer we add the multiples, i.e. $10 + 10 + 2 + 2 = 24$

Therefore $864 \div 36 = 24$

If the small number does not divide exactly we can show the answer with a remainder or as a mixed number.

(ii) $423 \div 32$

$$\begin{array}{r} 423 \\ - 320 \\ \hline 103 \\ - 96 \\ \hline 7 \end{array}$$

32×10 (423 is greater than 320, therefore $\times 10$ and subtract)
 32×3 (103 is less than 320, therefore $\times 3$)

therefore $423 \div 32 = 13 \text{ r } 7$ or $13\frac{7}{32}$.

13 remainder 7 or
13 and $\frac{7}{32}$. = $13\frac{7}{32}$.

Hwn yw'r dull traddodiadol

(b) Dull rhannu hir

Yn y dull yma mae'n bwysig gosod allan y gwaith gyda'r colofnau degau, unedau o dan ei gilydd yn gywir.

Enghraifft

(i) $782 \div 34$

$$\begin{array}{r}
 & 23 \\
 \hline
 34 & \overline{)782} \quad (\text{llinell ateb}) \\
 - & 680 \quad (34 \times 20 = 680, \text{ rhoi } 2 \text{ yn y golofn degau ar y llinell ateb}) \\
 & 102 \\
 - & 102 \quad (34 \times 3 = 102, \text{ rhoi } 3 \text{ yn y golofn unedau ar y llinell ateb}) \\
 & 000
 \end{array}$$

Felly $782 \div 34 = 23$

(ii) $977 \div 36$

$$\begin{array}{r}
 & 27 \\
 \hline
 36 & \overline{)977} \quad (\text{llinell ateb}) \\
 - & 720 \quad (36 \times 20 = 720, \text{ rhoi } 2 \text{ yn y golofn degau ar y llinell ateb}) \\
 & 257 \\
 - & 252 \quad (36 \times 7 = 252, \text{ rhoi } 7 \text{ yn y golofn unedau ar y llinell ateb}) \\
 & \underline{5}
 \end{array}$$

Felly $782 \div 36 = 27$ gweddill 5

neu $782 \div 36 = 27\frac{5}{36}$

(c)

Rhannu degolion

Mae rhannu degolion wedi ei gyfyngu fel bod y rhannyyd yn rif cyfan, a'r rhannyn yn ddegolyn.

Gyda'r cyfuniad yma gallwn addasu'r tri dull blaenorol i rannu degolion.

Rhaid colofn u'r rhifau o dan ei gilydd fel bod y pwntiau degol o dan ei gilydd.

Mae angen cofio sut i luosi degolion fel:

$0.8 \times 10 = 8$ neu 8.0

$6 \times 10 = 60$ neu 60.0

This is the traditional method

(b)

Long division method

In this method it is important that you set out the work with the tens and units columns correctly underneath each other

Example

(i) $782 \div 34$

$$\begin{array}{r}
 & 23 & \text{(answer line)} \\
 34 & \overline{)782} \\
 - & 680 & (34 \times 20 = 680, \text{ put } 2 \text{ in the tens column on the answer line}) \\
 & 102 \\
 - & 102 & (34 \times 3 = 102, \text{ put } 3 \text{ in the units column on the answer line}) \\
 & \underline{000}
 \end{array}$$

Therefore $782 \div 34 = 23$

(ii) $977 \div 36$

$$\begin{array}{r}
 & 27 & \text{(answer line)} \\
 36 & \overline{)977} \\
 - & 720 & (36 \times 20 = 720, \text{ put } 2 \text{ in the tens column on the answer line}) \\
 & 257 \\
 - & 252 & (36 \times 7 = 252, \text{ put } 7 \text{ in the units column on the answer line}) \\
 & \underline{5}
 \end{array}$$

Therefore $782 \div 36 = 27$ remainder 5

or $782 \div 36 = 27 \frac{5}{36}$

(c)

Dividing decimals

Dividing decimals has been limited to cases where the divisor is a whole number, and the dividend is a decimal.

With this combination we can adapt the previous three methods to divide decimals. The numbers must be placed in columns underneath each other so that the decimal points are aligned underneath each other.

We must remember how to multiply decimals such as:

$0.8 \times 10 = 8$ or 8.0 $6 \times 10 = 60$ or 60.0

Enghraifft

(i) $87.5 \div 7$

Dyma'r dull twr

$$\begin{array}{r}
 87.5 \\
 - \frac{70.0}{17.5} \\
 - \frac{14.0}{3.5} \\
 = 7 \times 2 \\
 = 7 \times 0.5
 \end{array}
 \quad
 \begin{array}{l}
 (87.5 \text{ yn fwy na } 70.0 \text{ felly } \times 10 \text{ ac wedyn tynn}) \\
 (17.5 \text{ yn llai na } 70.0 \text{ felly dyblu a thynn}) \\
 (3.5 \text{ yn llai na } 7 \text{ felly } \times 0.5 \text{ a thynn})
 \end{array}$$

I gael yr ateb terfynol adio'r lloosyddion,

$$\begin{array}{rcl}
 \text{Sef } 10 + 2 + 0.5 & = & 12.5 \\
 \text{Felly } 875 \div 7 & = & \underline{\underline{12.5}}
 \end{array}$$

(ii) $75.4 \div 29$

Wrth ddefnyddio'r dull rhannu hir gan gofio colofnu'r pwyntiau degol cawn y canlynol:-

29 $\overline{75.4}$ (llinell ateb)

$$\begin{array}{r}
 2.6 \\
 - \frac{58.0}{17.4} \\
 - \frac{17.4}{0.0}
 \end{array}
 \quad
 \begin{array}{l}
 (29 \times 2 = 58.0, \text{ rhoi } 2 \text{ yn y golofn unedau ar y llinell ateb}) \\
 (29 \times 6 = 174, \text{ felly } 29 \times 0.6 = 17.4, \text{ rhoi } 6 \text{ yn y golofn degfedau ar y llinell ateb})
 \end{array}$$

Felly $75.4 \div 29 = 2.6$

Example

(i) $87.5 \div 7$

This is the tower method

$$\begin{array}{r}
 87.5 \\
 - 70.0 \\
 \hline
 17.5 \\
 - 14.0 \\
 \hline
 3.5
 \end{array}
 \begin{array}{l}
 = 7 \times 10 \quad (87.5 \text{ is greater than } 70.0, \text{ therefore } \times 10 \text{ and then subtract}) \\
 = 7 \times 2 \quad (17.5 \text{ is less than } 70.0, \text{ therefore we double and subtract}) \\
 = 7 \times 0.5 \quad (3.5 \text{ is less than } 7, \text{ therefore } \times 0.5 \text{ and subtract})
 \end{array}$$

To arrive at the final answer, we add the multipliers,

i.e. $10 + 2 + 0.5 = 12.5$
therefore $875 \div 7 = \underline{12.5}$

(ii) $75.4 \div 29$

Using the long division method and remembering to put the decimal points in a column, we arrive at the following:-

29	$\overline{)75.4}$ (answer line)
-	$\underline{58.0}$ ($29 \times 2 = 58.0$, put 2 in the units column on the answer line)
	$\underline{17.4}$
-	$\underline{17.4}$ ($29 \times 6 = 174$, therefore $29 \times 0.6 = 17.4$, put 6 in the tenths column on the answer line)
	$\underline{00.0}$

Therefore $75.4 \div 29 = 2.6$

13

1

3

5

ODRIFAU:

Rhifau sydd ddim yn rhannu
gyda 2.

11

9

7

LLUOSRIFAU:

LLUOSRIFAU 2 yw

2, 4, 6, 8, 10, 12, 14,

LLUOSRIFAU 4 yw

4, 8, 12, 16, 20, 24, 28,

4

6

8

2

EILRIFAU:

Rhifau mae 2 yn rhannu
iddynt yn union.

12

10

FFATOR: Gelwir rhif sy'n
rhannu'n UNION i fewn i rif arall yn

FFATOR o'r rhif.

e.e.
 $24 = 1 \times 24$
 $24 = 2 \times 12$
 $24 = 3 \times 8$
 $24 = 4 \times 6$

Mae 1, 2, 3, 4, 6, 8, 12, 24 yn
FFATORAU o 24.

RHIFAU CYSEFIN:

Rhifau nad oes ond eu hunain ag 1
yn rhannu iddynt.

e.e. 2, 3, 5, 7, 11, 13, 17, 19

NID yw 1 yn RHIF CYSEFIN

RHIFAU SGWÂR:

$1 \times 1 = 1$

$4 \times 4 = 16$

$2 \times 2 = 4$

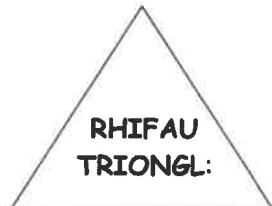
$5 \times 5 = 25$

$3 \times 3 = 9$

$6 \times 6 = 36$

Gelwir 1, 4, 9, 16, 25, 36 yn RHIFAU SGWÂR

1, 3, 6, 10, 15, 21 yn RHIFAU TRIONGL



1	= 1
$1 + 2$	= 3
$1 + 2 + 3$	= 6
$1 + 2 + 4$	= 10
$1 + 2 + 3 + 4 + 5$	= 15
$1 + 2 + 3 + 4 + 5 + 6$	= 21

1 ODD NUMBERS:

Numbers that are not
divisible by 2

11

9

7

3

5

4

6

8

2

12

10

13

MULTIPLES:

The MULTIPLES of 2 are
2, 4, 6, 8, 10, 12, 14,

The MULTIPLES of 4 are
4, 8, 12, 16, 20, 24, 28,

The MULTIPLES of 3 are
3, 6, 9, 12, 15, 18, 21, ...

FACTOR: A number that divides
EXACTLY into ANOTHER NUMBER is
called a FACTOR of that number.

e.g. $24 = 1 \times 24$
 $24 = 2 \times 12$
 $24 = 3 \times 8$
 $24 = 4 \times 6$

1, 2, 3, 4, 6, 8, 12, 24 are all
factors of 24

PRIME NUMBERS:
Numbers which are divisible only
by themselves and 1

e.g. 2, 3, 5, 7, 11, 13, 17, 19

1 is NOT a Prime Number

SQUARE NUMBERS:

$$1 \times 1 = 1$$

$$2 \times 2 = 4$$

$$3 \times 3 = 9$$

$$4 \times 4 = 16$$

$$5 \times 5 = 25$$

$$6 \times 6 = 36$$

1, 4, 9, 16, 25, 36 are called SQUARE NUMBERS

TRIANGLE NUMBERS:

1, 3, 6, 10, 15, 21 are called TRIANGLE NUMBERS

$$\begin{array}{ll} 1 & = 1 \\ 1 + 2 & = 3 \\ 1 + 2 + 3 & = 6 \\ 1 + 2 + 4 & = 10 \\ 1 + 2 + 3 + 4 + 5 & = 15 \\ 1 + 2 + 3 + 4 + 5 + 6 & = 21 \end{array}$$

GWERTH LLE MEWN RHIFAU CYFAN A DEGOLION

14

MILIWN	CAN MIL	DEG MIL	MIL	CANT	DEG	UNED	DEGFED	CANFED	MIL FED
1 000 000	100 000	10 000	1000	100	10	1	0.1	0.01	0.001

MAE POB COLOFN 10 GWAITH YR UN I'W DDE.

MAE'R PWYNT DEGOL yn dangos ble mae'r rhifau cyfan yn gorffen a'r ffracsiau neu rannau o rifau yn cychwyn.

MAE $\times 10$ YN ACHOSI I'R DIGIDAU SYMUD UN GOLOFN I'R CHWITH.

MAE $\times 100$ YN ACHOSI I'R DIGIDAU SYMUD DWY GOLOFN I'R CHWITH.

MAE $\div 10$ YN ACHOSI I'R DIGIDAU SYMUD UN GOLOFN I'R DDE.

MAE $\div 100$ YN ACHOSI I'R DIGIDAU SYMUD DWY GOLOFN I'R DDE.

ENGHREFFTIAU

56	$\times 10$	560	$\times 100$	5600	$\times 1000$	56000	$\times 10000$	560000	$\times 100000$
56	$\div 10$	56	$\div 100$	56	$\div 1000$	56	$\div 10000$	56	$\div 100000$

56	$\times 10$	560	$\times 100$	5600	$\times 1000$	56000	$\times 10000$	560000	$\times 100000$
56	$\div 10$	56	$\div 100$	56	$\div 1000$	56	$\div 10000$	56	$\div 100000$

PLACE VALUE IN WHOLE NUMBERS AND DECIMALS

MILLION	HUNDRED THOUSAND	TEN THOUSAND	THOUSAND	HUNDRED	TEN	UNIT	TENTH	HUNDREDTH	THOUSANDTH
1 000 000	100 000	10 000	1000	100	10	1	0.1	0.01	0.001

$\times 10$ $\div 10$ $\times 10$ $\div 10$ $\times 10$ $\div 10$ $\times 10$ $\div 10$ $\times 10$ $\div 10$

EACH COLUMN IS 10 TIMES THE ONE ON ITS RIGHT.

THE DECIMAL POINT marks where whole numbers end and fractions or parts of numbers begin.

MULTIPLYING BY 10 CAUSES THE DIGITS TO MOVE ONE COLUMN TO THE LEFT.

MULTIPLYING BY 100 CAUSES THE DIGITS TO MOVE TWO COLUMNS TO THE LEFT.

DIVIDING BY 10 CAUSES THE DIGITS TO MOVE ONE COLUMN TO THE RIGHT.

DIVIDING BY 100 CAUSES THE DIGITS TO MOVE TWO COLUMNS TO THE RIGHT.

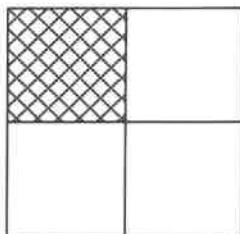
EXAMPLES

$$\begin{array}{r}
 56 \\
 \times 10 \\
 \hline
 560
 \end{array}
 \quad
 \begin{array}{r}
 56 \\
 \times 100 \\
 \hline
 5600
 \end{array}
 \quad
 \begin{array}{r}
 3.486 \\
 \times 100 \\
 \hline
 348.6
 \end{array}$$

$$\begin{array}{r}
 5600 \\
 \div 100 \\
 \hline
 56
 \end{array}
 \quad
 \begin{array}{r}
 3.486 \\
 \div 100 \\
 \hline
 0.03486
 \end{array}$$

FFRACSIYNAU

Rhan o un cyfan yw FFRACSIWN e.e.



$$\frac{1}{4} = \frac{\text{Nifer o rannau wedi eu lliwio}}{\text{Nifer o rannau hafal}} = \frac{\text{Rhifiadur}}{\text{Enwadur}}$$

FFRACSIYNAU PENDRWM

e.e. $\frac{7}{4}$ neu $2\frac{1}{2}$ Mae'r rhif top yn fwy na'r rhif gwaelod.

RHIFAU CYMYSG

e.e. $1\frac{1}{2}$ neu $2\frac{4}{7}$ Rhifau gyda rhif cyfan a ffracswn.

NEWID

FFRACSIWN PENDRWM \longrightarrow RHIF CYMYSG

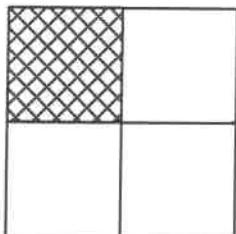
$$\frac{7}{4} = 7 \div 4 = 1\frac{3}{4}$$

RHIF CYMYSG \longrightarrow FFRACSIWN PENDRWM

$$2\frac{4}{7} = \frac{(7 \times 2) + 4}{7} = \frac{14 + 4}{7} = \frac{18}{7}$$

FRACTIONS

A FRACTION is part of a whole e.g.



$$\frac{1}{4} = \frac{\text{Number of shaded parts}}{\text{Number of equal parts}} = \frac{\text{Numerator}}{\text{Denominator}}$$

IMPROPER FRACTIONS

e.g. $\frac{7}{4}$ or $\frac{9}{2}$ Top number is greater than the bottom number.

MIXED NUMBERS

e.g. $1\frac{1}{2}$ or $2\frac{4}{7}$ Numbers that have a whole number and a fraction.

CHANGE

IMPROPER FRACTION \longrightarrow MIXED NUMBER

$$\frac{7}{4} = 7 \div 4 = 1\frac{3}{4}$$

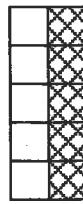
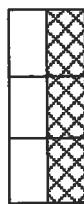
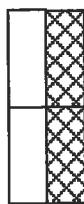
MIXED NUMBER \longrightarrow IMPROPER FRACTION

$$2\frac{4}{7} = \frac{(7 \times 2) + 4}{7} = \frac{14 + 4}{7} = \frac{18}{7}$$

FFRACSIYNAU CYWERTH

Ffracsynau sy'n HAFAL MEWN GWERTH ond yn edrych yn wahanol.

e.e.



$$\text{e.e. } \frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$$

Mae'r rhifau top a'r rhifau gwaelod wedi eu LLUOSI (X) gyda'r UN RHIF.

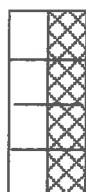
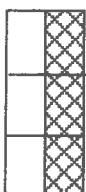
SYMLEIDDIO FFRACSIYNAU neu CANSLO I LAWR

I symleiddio ffracsyn rhaid RHANNUR (\div) top a'r gwaelod gyda'r UN RHIF.

e.e.

$$\frac{3}{21} \xrightarrow{\div 3} \frac{1}{7}$$

EQUIVALENT FRACTIONS are fractions that are EQUAL IN VALUE, but look different.



$$\text{e.g. } \frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10}$$

Top and bottom have been MULTIPLIED (X) by the SAME NUMBER

SIMPLIFYING FRACTIONS or CANCELLING DOWN

To simplify a fraction DIVIDE (÷) TOP AND BOTTOM by the SAME NUMBER.

e.g.

$$\frac{3}{21} \xrightarrow{\div 3} \frac{1}{7}$$

ADIO NEU DYNNU FFRACSIYNAU

Os yw'r RHIF GWAELOD yr UN FATH yn y ddau ffracciwn adiwlch neu dynnwch y rhifau top.

$$\text{e.e. } \frac{2}{8} + \frac{3}{8} = \frac{5}{8}$$

NEU

$$\frac{5}{9} - \frac{1}{9} = \frac{4}{9}$$

Os yw'r RHIF GWAELOD yn WAHANOL yn y ddau ffracciwn newidiwlch hwy fel eu bod yr un fath trwy ddefnyddio FFRACSIYNAU CYWERTH.

$$\begin{array}{rcl} & & \times 2 \\ & & \curvearrowright \\ \text{e.e. } \frac{1}{5} + \frac{7}{10} & = & \frac{1}{5} = \frac{2}{10} \\ & & \curvearrowleft \\ & & \times 2 \\ = \frac{2}{10} + \frac{7}{10} & = & \frac{9}{10} \end{array}$$

NEU

$$\begin{array}{rcl} & & \times 2 & & \times 3 \\ & & \curvearrowright & & \curvearrowright \\ \frac{6}{15} + \frac{2}{10} & = & \frac{6}{15} = \frac{12}{30} & & \frac{2}{10} = \frac{6}{30} \\ & & \curvearrowleft & & \curvearrowleft \\ & & \times 2 & & \times 3 \\ \frac{12}{30} + \frac{6}{30} & = & \frac{18}{30} = \frac{3}{5} & & \end{array}$$

SYMLEIDDIO

ADDING OR SUBTRACTING FRACTIONS

If the BOTTOM NUMBER is the SAME in both fractions,
add or subtract the top numbers.

e.g. $\frac{2}{8} + \frac{3}{8} = \frac{5}{8}$

OR

$$\frac{5}{9} - \frac{1}{9} = \frac{4}{9}$$

If the BOTTOM NUMBER is DIFFERENT in both fractions,
change them so they are both the same by using
EQUIVALENT FRACTIONS

e.g. $\frac{1}{5} + \frac{7}{10} = \frac{2}{10}$

$$\begin{array}{ccc} & \times 2 & \\ \frac{1}{5} & = & \frac{2}{10} \\ & \curvearrowright & \end{array}$$

$$= \frac{2}{10} + \frac{7}{10} = \frac{9}{10}$$

OR

$$\frac{6}{15} + \frac{2}{10} =$$

$$\begin{array}{ccc} & \times 2 & \\ \frac{6}{15} & = & \frac{12}{30} \\ & \curvearrowright & \end{array}$$

$$\begin{array}{ccc} & \times 3 & \\ \frac{2}{10} & = & \frac{6}{30} \\ & \curvearrowright & \end{array}$$

$$\frac{12}{30} + \frac{6}{30} =$$

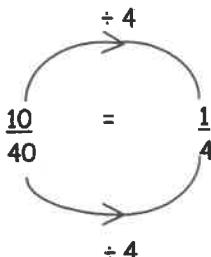
$$\begin{array}{ccc} & \div 6 & \\ \frac{18}{30} & = & \frac{3}{5} \\ & \curvearrowright & \end{array}$$

$\div 6$ SIMPLIFYING

LLUOSI FFRACSIYNAU

- (i) X RHIFAU TOP
 (ii) X RHIFAU GWAELOD
 (iii) SYMLEIDDIO'R ATEB OS YN BOSIBL

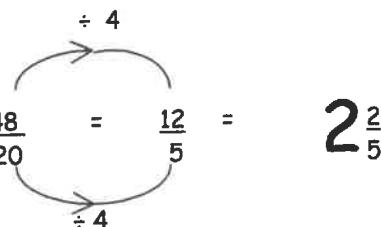
e.e. $\frac{2}{5} \times \frac{5}{8} =$



RHANNU FFRACSIYNAU

- (i) TROI YR AIL FFRACSIWN A'I BEN I WAERED.
 (ii) X RHIFAU TOP
 (iii) X RHIFAU GWAELOD
 (iv) SYMLEIDDIO'R ATEB OS YN BOSIBL

$$\frac{3}{4} \div \frac{5}{16} = \frac{3}{4} \times \frac{16}{5} =$$



CANFOD FFRACSIWN O RIF

e.e. Canfuwch $\frac{2}{5} \circ 25$

$$\frac{1}{5} \circ 25 = \frac{1}{5} \times 25 = 5 \quad (\div \text{gyda } 5 \text{ i ganfod } \frac{1}{5})$$

$$\frac{2}{5} \circ 25 = 2 \times 5 = 10 \quad (\text{yna } \times \text{gyda } 2 \text{ i ganfod } \frac{2}{5})$$

MULTIPLYING FRACTIONS

- (i) X TOP NUMBERS
- (ii) X BOTTOM NUMBERS
- (iii) SIMPLIFYING ANSWER IF POSSIBLE

e.g.

$$\frac{2}{5}$$

x

$$\frac{5}{8}$$

=

$$\frac{10}{40}$$

÷ 4

$$\frac{1}{4}$$

÷ 4

DIVIDING FRACTIONS

- (i) TURN THE SECOND FRACTION UPSIDE DOWN.
- (ii) X TOP NUMBERS
- (iii) X BOTTOM NUMBERS
- (iv) SIMPLIFY ANSWER IF POSSIBLE

$$\frac{3}{4} \div \frac{5}{16}$$

=

$$\frac{3}{4}$$

x

$$\frac{16}{5}$$

=

$$\frac{48}{20}$$

÷ 4

$$\frac{12}{5}$$

=

$$2\frac{2}{5}$$

÷ 4

FIND FRACTION OF A NUMBER

e.g. Find $\frac{2}{5}$ of 25

$$\frac{1}{5} \text{ of } 25 = \frac{1}{5} \times 25 = 5 \quad (\div \text{ by } 5 \text{ to find } \frac{1}{5})$$

$$\frac{2}{5} \text{ of } 25 = 2 \times 5 = 10 \quad (\text{then } \times \text{ by } 2 \text{ to find } \frac{2}{5})$$

CANRANNAU %

Beth yw Canran?

Ffordd o ysgrifennu ffraciwn hefo enwadur o 100 yw canran e.e.

$$5\% = \frac{5}{100} \quad (\text{neu} \quad \frac{1}{20} \quad \text{ar ôl di rhif top a'r rhif gwaelod gyda 5})$$

NEWID

$$\begin{array}{ccc} \text{Canran} & \xrightarrow{+ 100} & \text{FFraciwn} \end{array}$$

$$4\% = \frac{4}{100} \xrightarrow{\div 2} = \frac{2}{50} \xrightarrow{\div 2} = \frac{1}{25}$$

$$12\% = \frac{12}{100} \xrightarrow{\div 2} = \frac{6}{50} \xrightarrow{\div 2} = \frac{3}{25}$$

$$32\frac{1}{2}\% = \frac{32\frac{1}{2}}{100} \times 2 = \frac{65}{200} \xrightarrow{\div 5} = \frac{13}{40}$$

$$\begin{array}{ccc} \text{FFraciwn} & \xrightarrow{\times 100} & \text{Canran} \end{array}$$

$$\frac{6}{10} \times 100 = 60\%$$

$$\begin{array}{ccc} \text{Canran} & \xrightarrow{\div 100} & \text{FFraciwn} \\ & & \text{Degol} \end{array}$$

$$3\% = \frac{3}{100} = 0.03$$

$$28\% = \frac{28}{100} = 0.28$$

$$136\% = \frac{136}{100} = 1.36$$

$$\begin{array}{ccc} \text{FFraciwn} & \xrightarrow{\times 100} & \text{Canran} \\ \text{Degol} & \xrightarrow{\quad} & \quad \end{array}$$

$$0.13 \times 100 = 13\%$$

$$0.025 \times 100 = 2.5\%$$

$$1.05 \times 100 = 105\%$$

PERCENTAGES %

What is a Percentage?

It is the way of writing a fraction with a denominator of 100 e.g.

$$5\% = \frac{5}{100} \quad (\text{or} \quad \frac{1}{20} \quad \text{after } \div \text{ top and bottom by 5})$$

CHANGE

Percentage $\xrightarrow{\div 100}$ Fraction

$$4\% = \frac{4}{100} \xrightarrow{\div 2} = \frac{2}{50} \xrightarrow{\div 2} = \frac{1}{25}$$

$$12\% = \frac{12}{100} \xrightarrow{\div 2} = \frac{6}{50} \xrightarrow{\div 2} = \frac{3}{25}$$

$$32\frac{1}{2}\% = \frac{32\frac{1}{2}}{100} \times 2 \xrightarrow{=} \frac{65}{200} \xrightarrow{\div 5} = \frac{13}{40}$$

Fraction $\xrightarrow{\times 100}$ Percentage

$$\frac{6}{10} \times 100 = 60\%$$

Percentage $\xrightarrow{\div 100}$ Decimal Fraction

$$3\% = \frac{3}{100} = 0.03$$

$$28\% = \frac{28}{100} = 0.28$$

$$136\% = \frac{136}{100} = 1.36$$

Decimal Fraction $\xrightarrow{\times 100}$ Percentage

$$0.13 \times 100 = 13\%$$

$$0.025 \times 100 = 2.5\%$$

$$1.05 \times 100 = 105\%$$

DARGANFOD CANRAN O RIF

1) 5% o £80.00

$$= \frac{5}{100} \times 80 = \underline{\underline{\text{£4.00}}}$$

2) 12½% o 2.4m

$$= \frac{12.5}{100} \times 2.4 \text{m} \quad (\text{x rhifau top a gwaelod gyda 2 i gael gwared o'r } \frac{1}{2})$$

$$= \frac{25}{200} \times 2.4$$

$$= \frac{25}{200} \times 240 \quad (\text{Newid 2.4m i 240cm i gael gwared o'r pwynt degol})$$

$$= 30\text{cm}$$

YSGRIFENNU SWM FEL CANRAN O SWM ARALL

Cam 1 : Ffurio ffracsiwn

Cam 2 : Newid y ffracsiwn yn ganran

1) £36 fel canran o £600

$$\frac{36}{600} \times \frac{1}{100} = 6\%$$

2) 15 eiliad fel canran o 2 funud.

RHAID cael yr un unedau.
e.e. 2 funud = 120 o eiliadau

$$\frac{15}{120} \times \frac{100}{2} = \frac{25}{2} = \underline{\underline{12.5\% \text{ neu } 12\frac{1}{2}\%}}$$

DISCOVERING THE PERCENTAGE OF A NUMBER

1) 5% o £80.00

$$= \frac{5}{100} \times 80 = \underline{\underline{\text{£4.00}}}$$

2) $12\frac{1}{2}\%$ o 2.4m

$$= \frac{12.5}{100} \times 2.4m \quad (\times \text{ top and bottom numbers with 2 to get rid of the } \frac{1}{2})$$

$$= \frac{25}{200} \times 2.4$$

$$= \frac{25}{200} \times \cancel{240}^{\underline{30}} \quad (\text{Change 2.4m to 240cm to get rid of the decimal point})$$

$$= 30\text{cm}$$

WRITING ONE SUM AS A PERCENTAGE OF ANOTHER

Step 1 : Form a fraction

Step 2 : Change fraction to percentage

1) £36 as a percentage of £600

$$\frac{36}{600} \times \cancel{100}^{\underline{1}} = 6\%$$

2) 15 seconds as a percentage of 2 minutes

MUST have the same units e.g. 2 minutes = 120 seconds

$$\frac{15}{120} \times \cancel{100}^{\underline{25}} = \frac{25}{2} = \underline{\underline{12.5\% \text{ or } 12\frac{1}{2}\%}}$$

ELW A CHOLLED

PRIS PRYNU = y pris gwreiddiol (cyntaf) a delir.

PRIS GWERTHU = y pris terfynol (olaf)

ELW = PRIS GWERTHU - PRIS PRYNU

COLLED = PRIS PRYNU - PRIS GWERTHU

$$1) \quad \text{Pris Pryn} = £15.30 \qquad \text{Pris Gwerthu} = £16.80$$

$$\text{ELW} = £16.80 - £15.30 = £1.50$$

$$2) \quad \text{Pris Pryn} = £12.20 \qquad \text{Pris Gwerthu} = £9.10$$

$$\text{COLLED} = £12.20 - £9.10 = £3.10$$

CANRAN ELW NEU GOLLED

$$\text{CANRAN ELW / COLLED} = \frac{\text{ELW/COLLED} \times 100}{\text{PRIS PRYNU}}$$

$$1) \quad \text{Pris Pryn} = £120 \qquad \text{Pris Gwerthu} = £150$$

$$\text{Elw} = £150 - £120 = £30.00$$

$$\text{CANRAN ELW} = \frac{30}{120} \times \frac{100}{1} = 25\%$$

$$2) \quad \text{Pris Pryn} = £48 \qquad \text{Pris Gwerthu} = £36$$

$$\text{Colled} = £48 - £36 = £12$$

$$\text{CANRAN COLLED} = \frac{12}{48} \times \frac{100}{1} = 25\%$$

PROFIT AND LOSS

21

BUYING PRICE = original (first) price paid.

SELLING PRICE = final (last) price paid

PROFIT = SELLING PRICE - BUYING PRICE

LOSS = BUYING PRICE - SELLING PRICE

$$1) \quad \text{Buying Price} = \text{£}15.30 \quad \text{Selling Price} = \text{£}16.80$$

$$\text{PROFIT} = \text{£}16.80 - \text{£}15.30 = \text{£}1.50$$

$$2) \quad \text{Buying Price} = \text{£}12.20 \quad \text{Selling Price} = \text{£}9.10$$

$$\text{LOSS} = \text{£}12.20 - \text{£}9.10 = \text{£}3.10$$

PERCENTAGE PROFIT OR LOSS

$$\text{PERCENTAGE PROFIT / LOSS} = \frac{\text{PROFIT/LOSS}}{\text{BUYING PRICE}} \times 100$$

$$1) \quad \text{Buying Price} = \text{£}120 \quad \text{Selling Price} = \text{£}150$$

$$\text{Profit} = \text{£}150 - \text{£}120 = \text{£}30.00$$

$$\text{PERCENTAGE PROFIT} = \frac{30}{120} \times \frac{25}{100} = 25\%$$

$$2) \quad \text{Buying Price} = \text{£}48 \quad \text{Selling Price} = \text{£}36$$

$$\text{Loss} = \text{£}48 - \text{£}36 = \text{£}12$$

$$\text{PERCENTAGE LOSS} = \frac{12}{48} \times \frac{25}{100} = 25\%$$

RHIFAU NEGATIF (NEYDDOL)

Gelwir rhifau gyda minws o'u blaen yn rifau NEGATIF.

Mae pob rhif arall ar wahân i 0 yn BOSITIF.

Weithiau ysgrifennir rhifau positif gyda plws o'i blaen.

Nid yw 0 yn bositif nac yn negatif.

Rhifau negatif

-2, -5, -32.

Rhifau positif

7, +3, 25

Y LLINELL RIF

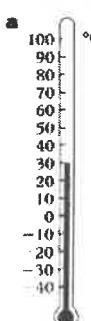
← RHIFAU NEGATIF

RHIFAU POSITIF →

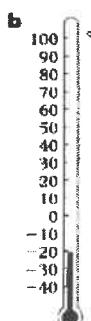


Sylwch fod -3 yn uwch na -7.

Gellir cael tymheredd negatif pan yw'n oer iawn yn y gaeaf.



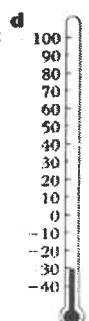
a = 30°



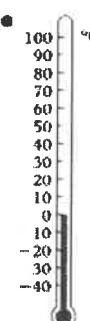
b = -20°



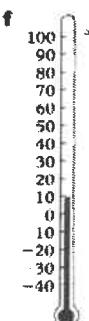
c = 70°



d = -30°



e = 0°



f = 10°

NEGATIVE NUMBERS

Numbers with minus signs in front are called NEGATIVE numbers.

All other numbers except 0 are POSITIVE.

Positive numbers are sometimes written with a plus sign in front.

0 is not positive or negative.

Negative numbers
-2, -5, -32.

Positive numbers
7, +3, 25

THE NUMBER LINE

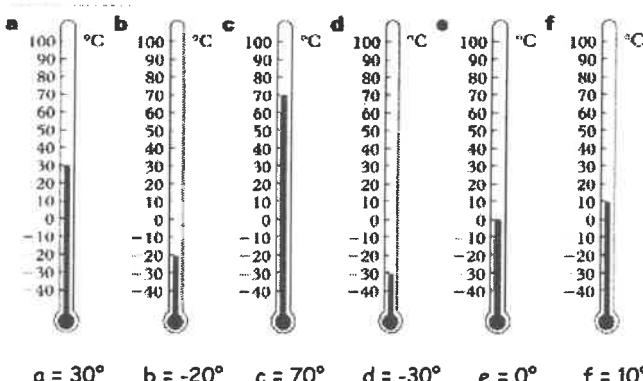
← NEGATIVE NUMBERS

POSITIVE NUMBERS →



You will notice that -3 is higher than -7.

It is possible to have negative temperatures when it is very cold in winter.



AMCANGYFRIF

Os byddwch yn pwysor botwm anghywir mewn camgymeriad bydd y cyfrifiannell yn dangos yr ateb anghywir.

Dylech bob amser dalgrynnu rhifau i'r 10 neu'r 100 agosaf ac amcangyfrif yr ateb yn eich pen.

$$\text{e.e. } 21 \times 39 \quad \begin{array}{l} \text{AMCANGYFRIF} \\ \text{CYFRIFIAD} \end{array} \quad \begin{array}{l} 20 \times 40 = 800 \\ 21 \times 39 = 819 \end{array}$$

$$494 \div 19 \quad \begin{array}{l} \text{AMCANGYFRIF} \\ \text{CYFRIFIAD} \end{array} \quad \begin{array}{l} 500 \div 20 = 25 \\ 494 \div 19 = 26 \end{array}$$

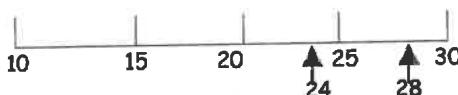
TALGRYNNU

I dalgrynnu rhif i'r 10 agosaf rydym yn edrych ar linell rhif ac yn penderfynu at ba luosrif o 10 mae'r rhif agosaf.

Os yw'r rhif hanner ffordd rhwng y ddau luosrif o 10 rydym bob amser yn dewis yr un uchaf.

I'r 10 agosaf mae:

24 yn 20
25 yn 30
28 yn 30



I dalgrynnu rhif i'r 100 agosaf rydym yn penderfynu at ba luosrif o 100 mae'r rhif agosaf.

Os yw'r rhif hanner ffordd rhwng y ddau luosrif o 100 rydym bob amser yn dewis yr un uchaf.

I'r 100 agosaf mae:

240 yn 200
250 yn 300
280 yn 300



ESTIMATING

A calculator will show the wrong answer if you key in the wrong number by mistake.

You should always round the numbers to the nearest 10 or 100 and make an estimate of the answer in your head.

e.g. 21×39	ESTIMATE	$20 \times 40 = 800$
	CALCULATION	$21 \times 39 = 819$
$494 \div 19$	ESTIMATE	$500 \div 20 = 25$
	CALCULATION	$494 \div 19 = 26$

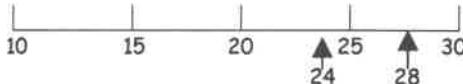
ROUNDING

To round a number to the nearest 10 we look at a number line.
We decide which multiple of 10 it is closer to.

If the number is half way between two multiples of 10 we always choose the higher one.

To the nearest 10:

- 24 becomes 20
- 25 becomes 30
- 28 becomes 30



To round a number to the nearest 100 we decide which multiple of 100 it is closer to.

If it is half way between two multiples of 100 we always choose the higher one.

To the nearest 100:

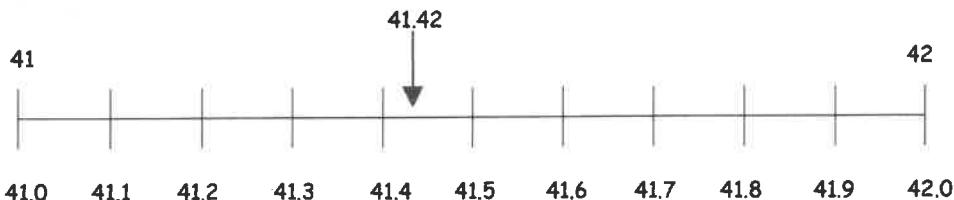
- 240 becomes 200
- 250 becomes 300
- 280 becomes 300



TALGRYNNU I 1 NEU 2 LE DEGOL

Mae talgrynnu i 1 lle degol yn golygu y bydd yna un rhif ar ôl y pwynt degol yn yr ateb.

e.e. 41.42



Mae 41.42 yn agosach i 41.4 na 41.5

Felly i 1 lle degol yr ateb yw 41.4

Mae talgrynnu i 2 le degol yn golygu y bydd yna ddu'r rif ar ôl y pwynt degol yn yr ateb.

e.e. $5.683 = 5.68$

$5.685 = 5.69$ ← Os yw'r rhif hanner ffordd rhwng y ddau
ddegolyn rydym bob amser yn dewis
yr un uchaf

$5.689 = 5.69$

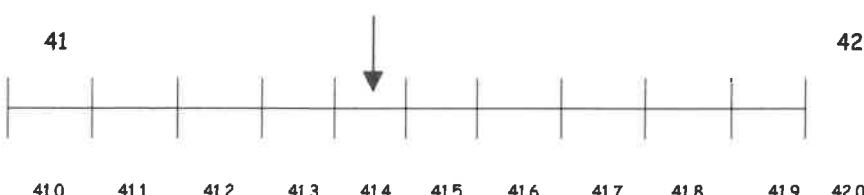


ROUNDING TO 1 OR 2 DECIMAL PLACES

Rounding to 1 decimal place means that there will be one number after the decimal point in the answer.

e.g. 41.42

41.42



41.42 is nearer to 41.4 than 41.5

So to 1 decimal place the answer is 41.4

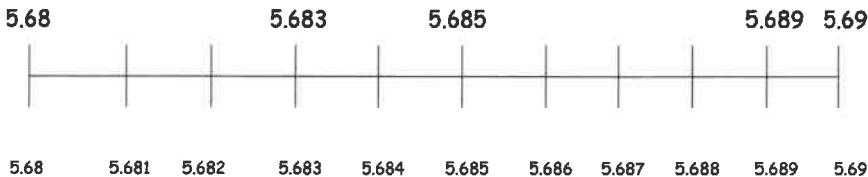
Rounding to 2 decimal places means that there will be two numbers after the decimal point in the answer.

e.g. $5.683 = 5.68$

$5.685 = 5.69$

← If the number is exactly half way between the two decimals then we always choose the highest.

$5.689 = 5.69$



CORLAT

25

Mae'r arwyddol CORLAT yn eich atgoffa o ba drefn y dylech wneud swm gyda mwy nag un arwydd.

Cromfachau, pwerau O, Rhannu, Lluosi, Aelio, Tynnu.

e.e.

- 1) $2 + 7 \times 10 = 2 + 70 = 72$ \times gyntaf
- 2) $15 \div 3 - 2 = 5 - 2 = 3$ \div gyntaf
- 3) $22 - (6 + 4) = 22 - 10 = 12$ () Cromfachau
gyntaf
- 4) $5^2 - 3 \times 6 = 25 - 3 \times 6 = 25 - 18 = 7$ \times wedyn, yna -
- Pwer gyntaf, \times wedyn, yna -
- POWER(AU)

4³ Mae'r POWER 3 yn dweud wrthych faint o 4 sydd wedi eu lloosi gyda'i gilydd. e.e. $4 \times 4 \times 4 = 64$.

BODMAS

The codeword **BODMAS** reminds you in what order to do a sum which has more than one sign.

Brackets, powers Of, Divide, Multiply, Add, Subtract.

e.g.

1) $2 + 7 \times 10 = 2 + 70 = 72$ \times first

2) $15 \div 3 - 2 = 5 - 2 = 3$ \div first

3) $22 - (6 + 4) = 22 - 10 = 12$ () Bracket first

4) $5^2 - 3 \times 6 = 25 - 3 \times 6 = 25 - 18 = 7$

Do the power first, \times next, then $-$

POWER

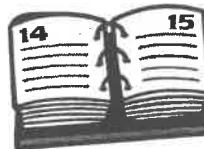
4³ The POWER 3 tells you how many fours are multiplied together. e.g. $4 \times 4 \times 4 = 64$.

AMSER

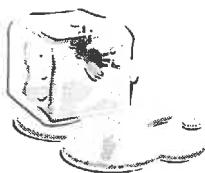
60 eiliad	=	1 munud
60 munud	=	1 awr
24 awr	=	1 diwrnod
7 diwrnod	=	1 wythnos
12 mis	=	1 flwyddyn
52 wythnos	=	1 flwyddyn
365 diwrnod	=	1 flwyddyn
366 diwrnod	=	1 flwyddyn naid
10 mlynedd	=	1 degawd
100 mlynedd	=	1 canrif
1000 mlynedd	=	1 mileniwm



Tri deg o ddyddiau 'nôl rhifedi
 Sy'n Ebrill, Mehefin, Tachwedd a Medi,
 Mewn saith o'r lleill mae un yn rhagor
 Ond dau ddeg wyth sydd ym mis Chwefror,
 A chyfrif un yn fwy sydd raid
 Pan y bydd hi'n flwyddyn naid.

TYMHEREDD

Pwynt berwi ar gyfer dŵr: 100°C (212°F)



Pwynt rhewi ar gyfer dŵr : 0°C (32°F)

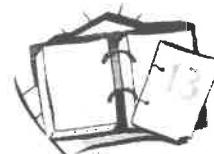
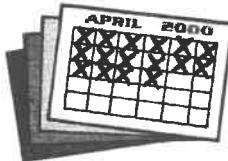
$$\text{Cyfnewid } {}^{\circ}\text{C} \quad 20^{\circ} \quad \begin{array}{c} \rightarrow \\ \times 9 \end{array} \quad 180 \quad \begin{array}{c} \rightarrow \\ \div 5 \end{array} \quad 36 \quad \begin{array}{c} \rightarrow \\ + 32 \end{array} \quad = 68^{\circ}\text{F}$$

$$\text{Cyfnewid } {}^{\circ}\text{F} \quad 50^{\circ} \quad \begin{array}{c} \rightarrow \\ - 32 \end{array} \quad 18 \quad \begin{array}{c} \rightarrow \\ \times 5 \end{array} \quad 90 \quad \begin{array}{c} \rightarrow \\ \div 9 \end{array} \quad = 10^{\circ}\text{C}$$

TIME

60 seconds	=	1 minute
60 minutes	=	1 hour
24 hours	=	1 day
7 days	=	1 week
12 months	=	1 year
52 weeks	=	1 year
365 days	=	1 year
366 days	=	1 leap year
10 years	=	1 decade
100 years	=	1 century
1000 years	=	1 millennium

Thirty days hath September,
 April, June and November,
 All the rest have thirty one,
 Except February alone,
 Which has twenty eight days clear
 And twenty nine each leap year.

TEMPERATURE

Boiling point for water : 100°C (212°F)



Freezing point for water : 0°C (32°F)

$$\text{To convert } {}^{\circ}\text{C} \quad 20^{\circ} \quad \begin{array}{l} \xrightarrow{\times 9} \\ \xrightarrow{+ 32} \end{array} \quad 180 \quad \begin{array}{l} \xrightarrow{- 32} \\ \xrightarrow{\div 5} \end{array} \quad 36 \quad = 68^{\circ}\text{F}$$

$$\text{To convert } {}^{\circ}\text{F} \quad 50^{\circ} \quad \begin{array}{l} \xrightarrow{- 32} \\ \xrightarrow{\times 5} \end{array} \quad 18 \quad \begin{array}{l} \xrightarrow{\div 9} \\ \xrightarrow{+ 32} \end{array} \quad 90 \quad = 10^{\circ}\text{C}$$

UNEDAU METRIG O HYD

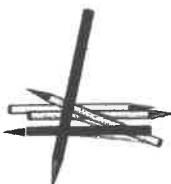


milimedr	mm	
centimedr	cm	10mm = 1cm
medr	m	100cm = 1m
kilomedr	km	1000m = 1km

Mae pren mesur bur yn mesur 15cm ag un hir yn mesur 30cm.
Taldra cyfartalog dynes yn y DU yw tua 1.6m.
Mae hi'n tua 660km o Lundain i Gaeredin.



UNEDAU IMPERIAL O HYD



modfeddi	mod neu "	12 modfedd = 1 troedfedd 12" = 1'
troedfedd	ft neu '	3' = 1 llathen
llathen	yd	1760 llathen = 1 milltir

Mae pensel newydd yn mesur tua 7 modfedd.
Mae pren mesur hir yn mesur tua 12 modfedd neu 1 troedfedd.
Taldra cyfartalog dyn yw tua 6 troedfedd.



UNEDAU CYFNEWID

1kg	=	2.2 pwys
8km	=	5 milltir
1 milltir	=	1.6km
1 litr	=	1.75peint

METRIC UNITS OF LENGTH

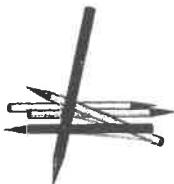


millimetre	mm	
centimetre	cm	10mm = 1cm
metre	m	100cm = 1m
kilometre	km	1000m = 1km

A short ruler measures 15 cm and a long ruler 30cm.
The average height of a woman in the UK is about 1.6m.
It is about 660 kilometres from London to Edinburgh.

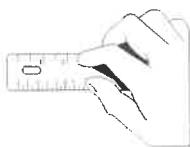


IMPERIAL UNITS OF LENGTH



inches	ins or "	12 ins = 1 ft 12" = 1'
feet	ft or '	3ft = 1yd
yards	yd	1760yd = 1 mile

A new pencil measures about 7 inches.
A long ruler is 12 inches or 1 foot long.
The average height of a man is about 6 feet.



CONVERSION UNITS

1kg	=	2.2lbs
8km	=	5 miles
1 mile	=	1.6 km
1 litre	=	1.75pints

UNEDAU METRIG O GYNHWYSEDD

mililitr	ml	1ml = 1cm ³
litr	l	1000ml = 1l
<i>Mae llwy de yn dal 5ml.</i>		
<i>Mae tin o ddiod fizzy yn dal 330ml.</i>		
<i>Mae potel lemoned yn dal 2 l. (litr)</i>		



UNEDAU IMPERIAL O GYNHWYSEDD

peint	pt	8 beint = 1 galwyn
<i>Rydym yn dal i brynu llefrith wrth y peint.</i>		
<i>Mae 1 galwyn o betrol ychydig o dan 5 litr.</i>		



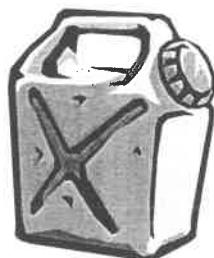
METRIC UNITS OF CAPACITY

millilitre	ml	$1\text{ml} = 1\text{cm}^3$
litre	l	$1000\text{ml} = 1\text{l}$
A tea spoon holds 5ml.		
A can of fizzy drink holds 330ml.		
An average bottle of lemonade holds 2 l. (litre)		



IMPERIAL UNITS OF CAPACITY

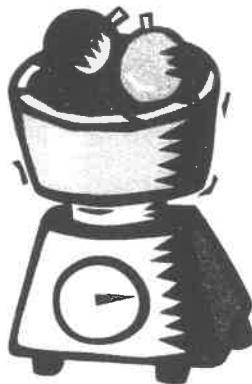
pint	pt	$8 \text{ pints} = 1 \text{ gallon}$
We still buy milk by the pint.		
1 gallon of petrol is just under 5 litres.		



UNEDAU METRIG MAS (Cyfeirir ar lafar fel PWYSAU)



miligram	mg	
gram	g	$1000\text{mg} = 1\text{g}$
kilogram	kg	$1000\text{g} = 1\text{ kg}$
tunnell	t	$1000\text{kg} = 1\text{ tunnell fetrig}$
<i>Mae un Rice Krispie yn pwysa tua 20mg.</i>		
<i>Mae pysen fawr yn pwysa tua 1g.</i>		
<i>Mae bagiad o siwgwr yn pwysa 1kg.</i>		
<i>Mae sach fawr o datws yn pwysa 25kg.</i>		
<i>Mae car Ford Focus yn pwysa tua 1 tunnell.</i>		



UNEDAU IMPERIAL O BWYSAU (Mas)

owns	oz	$16\text{oz} = 1\text{ lb}$
pwys	lb	$14\text{lb} = 1\text{ st}$
<i>Mae tamaid o fenyn yn pwysa tua 1 owns.</i>		
<i>Mae cacen spwng i deulu yn pwysa 1 pwys.</i>		
<i>Mae dyn arferol yn pwysa tua 12 stôn (tua 75kg)</i>		

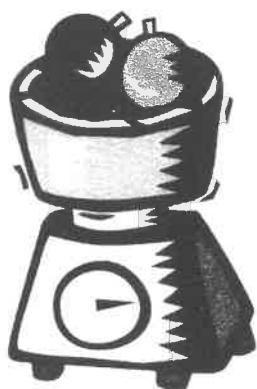


METRIC UNITS OF MASS (Commonly referred to as WEIGHT)



milligram	mg	
gram	g	$1000\text{mg} = 1\text{g}$
kilogram	kg	$1000\text{g} = 1\text{ kg}$
tonne	t	$1000\text{kg} = 1\text{ tonne}$

One Rice Krispie weighs about 20mg.
A large pea weighs about 1g.
A bag of sugar weighs 1kg.
A large sack of potatoes weighs 25kg.
A Ford Focus Car weighs about 1 tonne.



IMPERIAL UNITS OF WEIGHT (Mass)

ounces	oz	$16\text{oz} = 1\text{ lb}$
pound	lb	$14\text{lb} = 1\text{st}$

A knob of butter weighs about 1 ounce.
A family size sponge cake weighs 1 pound.
An average man weighs 12 stone (about 75kg).



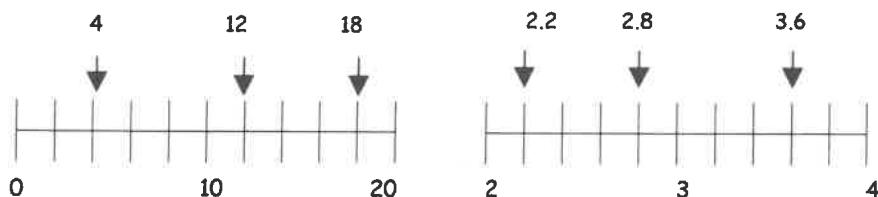
GRADDFEYDD

Mae gan raddfeydd wahanol niferoedd o raniadau.

Cychwynnwch drwy weithio allan beth mae pob rhaniad yn ei gynrychioli.

Mae pob rhaniad yn 2

Mae pob rhaniad yn 0.2

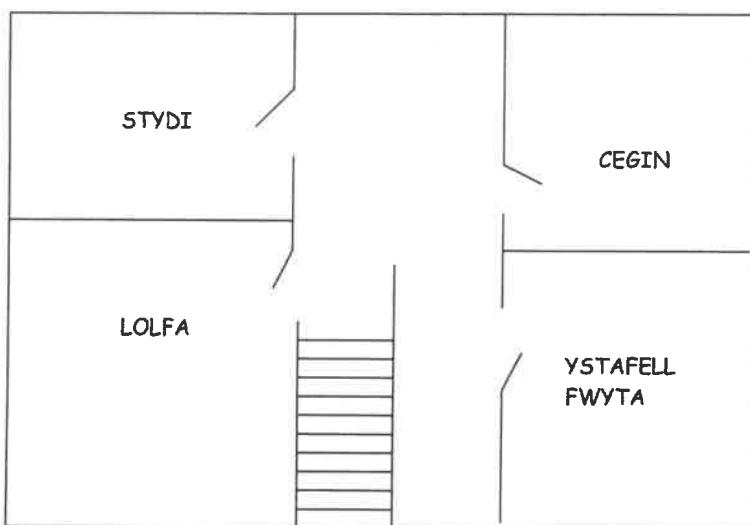


LLUNIAU WRTH RADDFA

Mae LLUN WRTH RADDFA yr un siap â'r gwreiddiol ond o faint gwahanol.

Mae graddfa llun yn rhoi maint cymhareb y gwir hyd i'r hyd sydd wedi ei lunio.

e.e.



Lolfa : Lled 3.9cm \equiv 3.9m
Hyd 4.1cm \equiv 4.1m

Gellir canfod gwir hyd o luniau wrth raddfa.
Defnyddir bapur neu lilyn i fesur hyd cromliniau.

GRADDFA
1cm i 1m
1 : 100

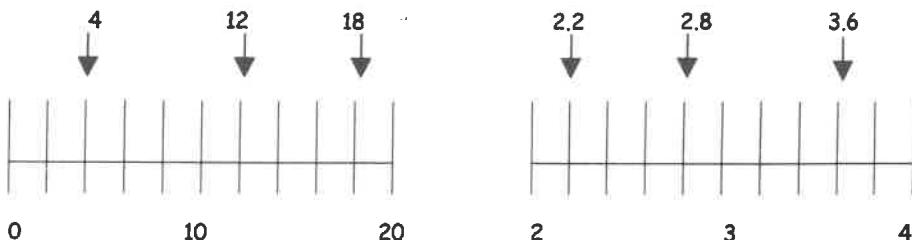
Mae 1cm o bapur yn sefyll am 100cm (neu 1m) yn y gwreiddiol.

SCALES have different numbers of divisions.

Start by working out what one division represents.

Here each division is 2

Here each division is 0.2

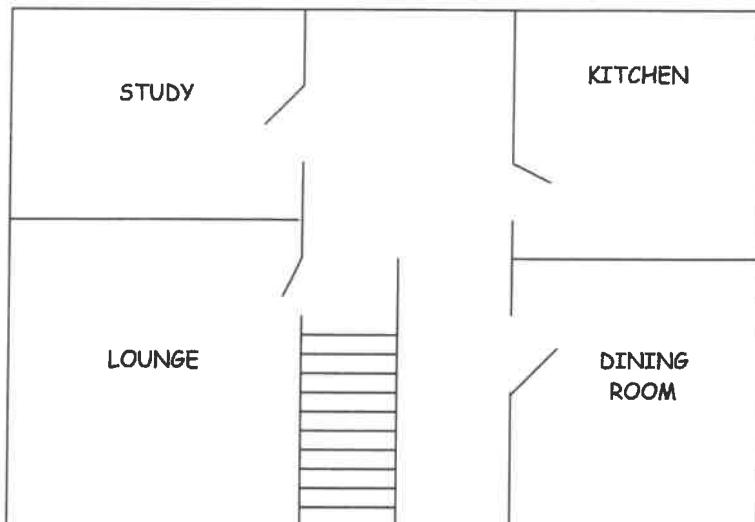


SCALE DRAWINGS

A **SCALE DRAWING** is the same shape as the original but different in size.

The scale of a drawing gives the relative size of the actual length to the drawn length.

e.g.



Lounge : Width 3.9cm \equiv 3.9m
Length 4.1cm \equiv 4.1m

Actual lengths can be found from Scale drawings.
Paper or String can be used to measure the length
of curved lines.

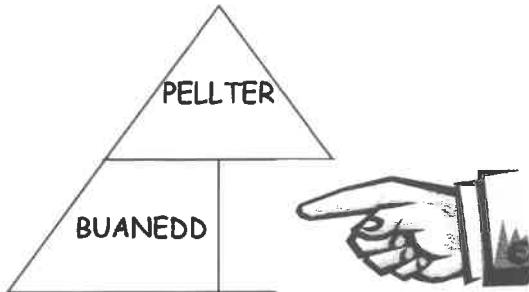
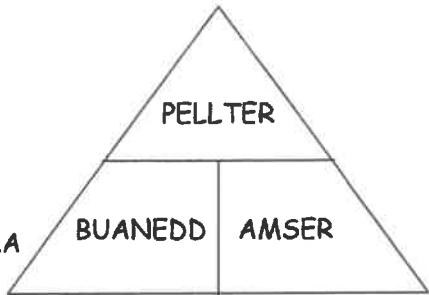
SCALE
1cm to 1m
1 : 100

1cm on paper
stands for 100cm
(or 1m) in real life.

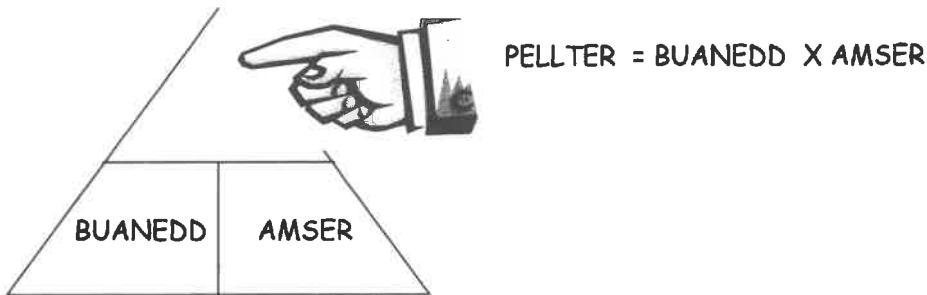
BUANEDD

BUANEDD = PELLTER
AMSER

Defnyddiwch y TRIONGL FFORMIWLA

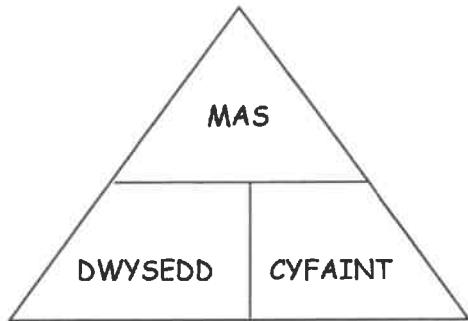


AMSER = PELLTER
AMSER

DWYSEDD

DWYSEDD = MAS
CYFAINT

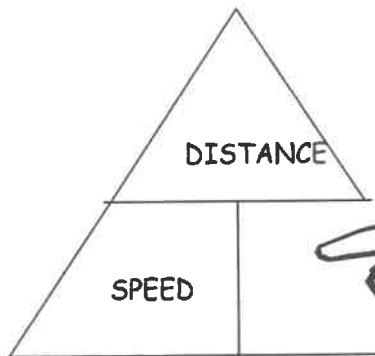
Gelli'r defnyddio'r FFORMIWLA
TRIONGL yma i ganfod MAS a
CYFAINT.



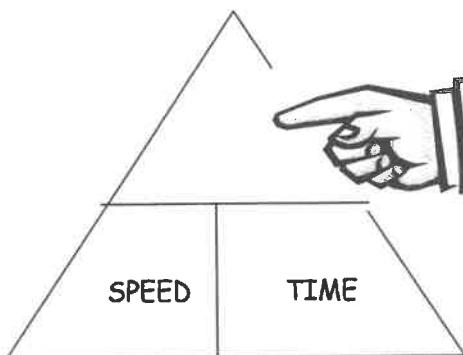
SPEED

$$\text{SPEED} = \frac{\text{DISTANCE}}{\text{TIME}}$$

Use the FORMULA TRIANGLE



$$\text{TIME} = \frac{\text{DISTANCE}}{\text{SPEED}}$$

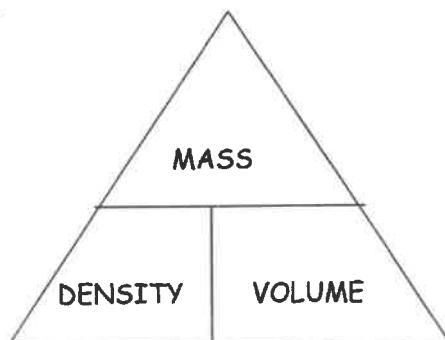


$$\text{DISTANCE} = \text{SPEED} \times \text{TIME}$$

DENSITY

$$\text{DENSITY} = \frac{\text{MASS}}{\text{VOLUME}}$$

This FORMULA TRIANGLE can also be used to find MASS and VOLUME.



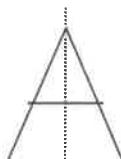
CYMEASUREDD

LLINELL CYMEASUREDD

Mae llinell cymesuredd yn rhannu siap i ddwy ran hafal. Mae un rhan yn adlewyrchiad o'r llall.

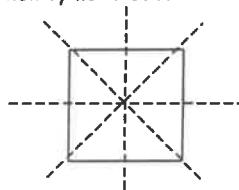
Petaech yn plygu'r siap ar hyd y llinell yma byddai un rhan yn ffitio'n union ar ben y llall.

e.e.



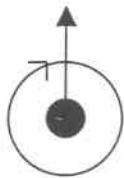
Mae gan sgwâr 4 llinell cymesuredd.

e.e.



TRO

MAN CYCHWYN



Un tro cyflawn

MAN CYCHWYN

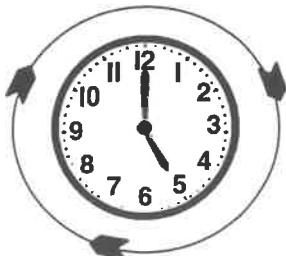


Hanner tro

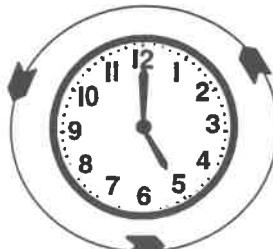


Chwarter tro

Defnyddir y geiriau CLOCWEDD a GWRTHGLOCWEDD i ddisgrifio pa ffordd i droi.



SYMUDIAD CLOCWEDD



SYMUDIAD
GWRTHGLOCWEDD

SYMMETRY

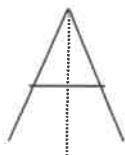
32

LINE OF SYMMETRY

A line of symmetry divides a shape into two equal parts. Each part is a reflection of the other.

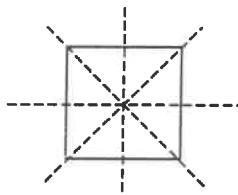
If you fold the shape along this line, each part fits exactly on top of the other.

e.g.



A square has 4 lines of symmetry.

e.g.



TURN

START



1 full turn

START



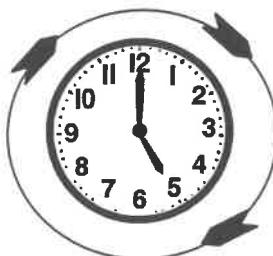
half turn

START

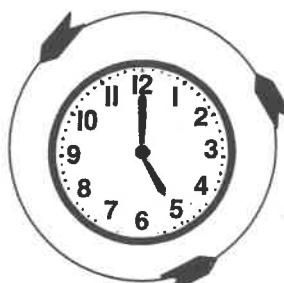


quarter turn

CLOCKWISE and ANTI-CLOCKWISE are used to say which way to turn.



CLOCKWISE MOVEMENT



ANTI-CLOCKWISE MOVEMENT

CYMESUREDD CYLCHDRO

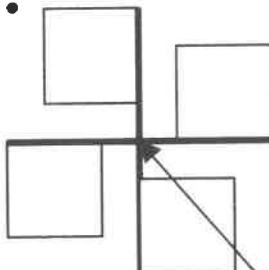
Mae gan siap GYMESUREDD CYLCHDRO os yw'n ffitio arno'i hun mwy nag unwaith pan yw'n gwneud un tro cyflawn.

TREFN CYMESUREDD CYLCHDRO yw'r nifer o weithiau mae siap yn ffitio ar ben ei hun. Gall hyn fod yn 2 neu fwy.

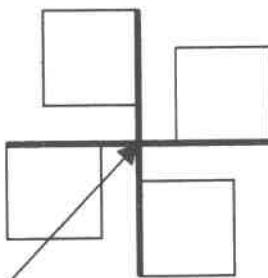
CANOL CYLCHDRO yw'r pwynt oddi amgylch 'prun mae'r siap yn troi.

e.e. Mae gan y diagram canlynol Drefn Cymesuredd Cylchdro o 4 fel y dangosir isod:

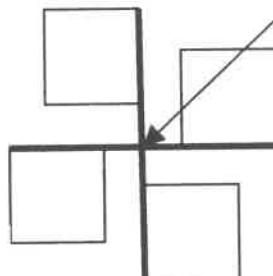
1



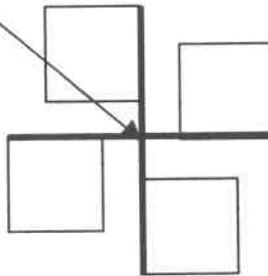
2



4



3



Canol cylchdro

ROTATIONAL SYMMETRY

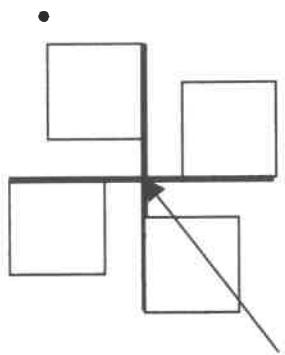
A shape has ROTATIONAL SYMMETRY if it fits on top of itself more than once as it makes a complete turn.

The ORDER OF ROTATIONAL SYMMETRY is the number of times that the shape fits on top of itself. This must be 2 or more.

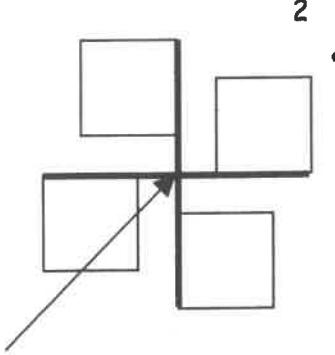
The CENTRE OF ROTATION is the point about which the shape turns.

e.g. The following diagram has an Order of Rotational Symmetry of 4 as shown below:

1

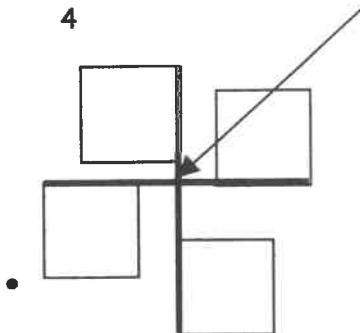


2

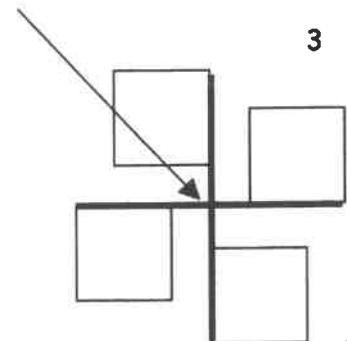


Centre of Rotation

4

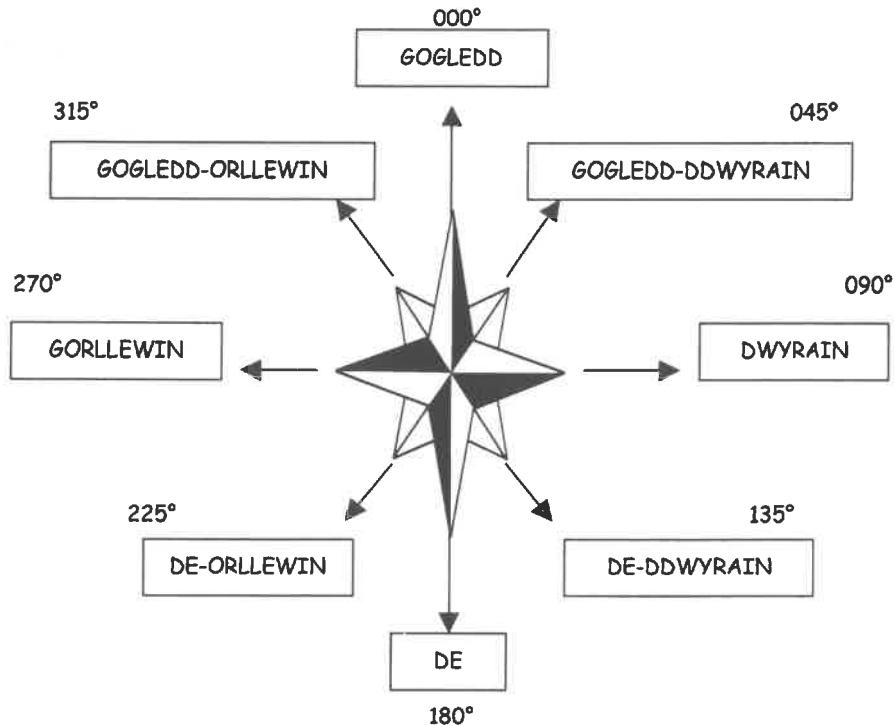


3



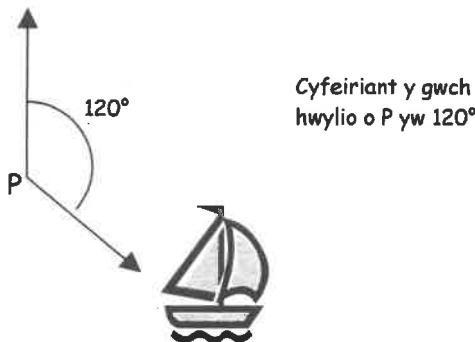
PWYNTIAU'R CWMPAWD A CHYFEIRIANNAU

Defnyddiwn gyfeiriannau i gynrychioli cyfeiriad.



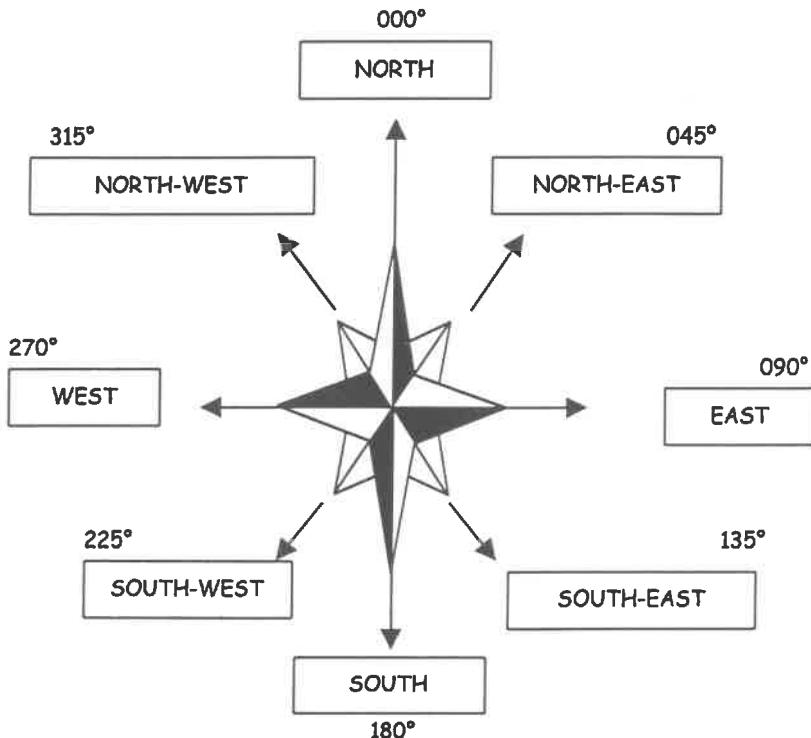
Mae cyfeiriant bob amser yn cael ei fesur clocwedd o'r gogledd gan ddefnyddio tri ffigwr.

e.e. G



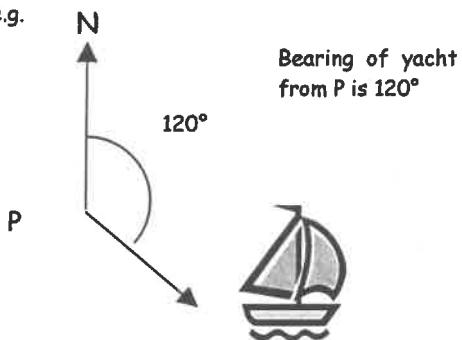
COMPASS POINTS AND BEARINGS

We use bearings to indicate directions.



Bearings are always measured from the north in a clockwise direction using three figures.

e.g.

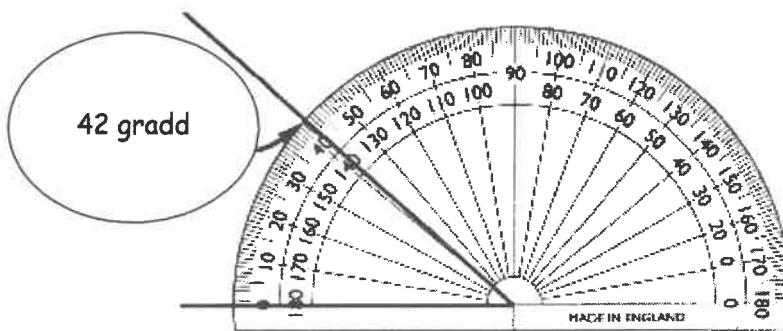


MESUR ONGLAU

- 1) Gosodwch y groes sydd yng nghanol yr onglydd ar bwynt yr ongl gyda llinell waelod yr ongl ar y linell sero.
- 2) Defnyddiwr y graddfa mewnol os yn mesur yr ongl gwrthglocwedd. Y raddfa allanol os yn mesur yr ongl clocwedd.



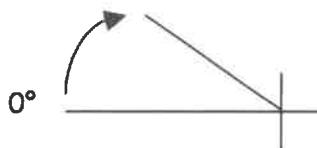
- 3) Darllenwrch yr ongl yn ofalus oddi ar yr onglydd.



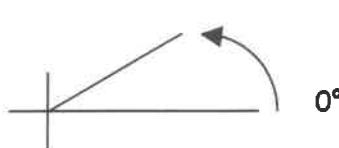
MEASURING ANGLES

- 1) Line up the cross at the centre of the protractor with the point of the angle and the base line of the angle with the zero line.
- 2) If measuring the angle anticlockwise use the inside scale.
If measuring the angle clockwise use the outside scale.

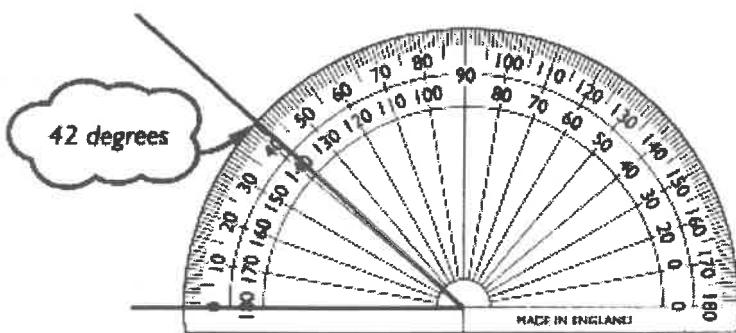
clockwise



anticlockwise



- 3) Read the angle from the protractor carefully.



ONGLAU

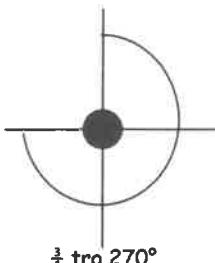
Defnyddir GRADDAU i fesur onglau.



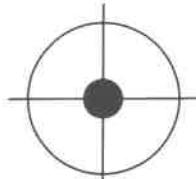
$\frac{1}{4}$ tro 90°
ONGL SGWÂR



$\frac{1}{2}$ tro 180°
LLINELL SYTH
ONGL SYTH

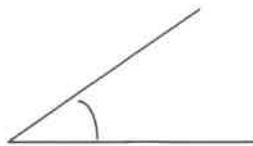


$\frac{3}{4}$ tro 270°



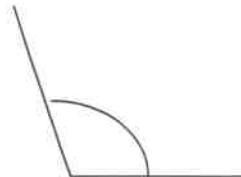
Tro cyflawn 360°
1 CYLCHDRO

ONGL LEM



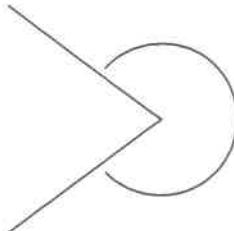
Llai na 90°

ONGL AFLEM



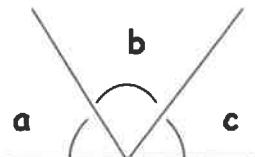
Rhwng 90° a 180°

ONGL ATBLYG



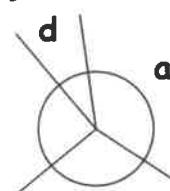
Rhwng 180° a 360°

COFIWCH:

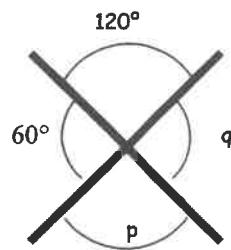


Mae onglau ar linell syth yn
adio i 180°
 $a + b + c = 180^\circ$

Mae onglau o amgylch
pwnt yn addio i 360°



$$a + b + c + d = 360^\circ$$

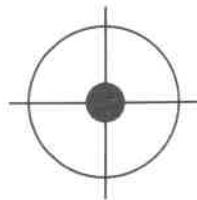
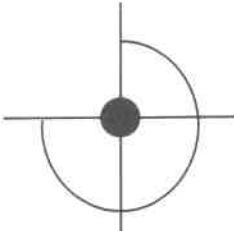
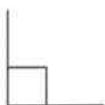


Mae onglau croesfetrig
yn hafal
 $p = 120^\circ$
 $q = 60^\circ$

Chwiliwch am y siap X

ANGLES

DEGREES are used to measure angles.



$\frac{1}{4}$ turn 90°
RIGHT ANGLE

$\frac{1}{2}$ turn 180°
STRAIGHT LINE
STRAIGHT ANGLE

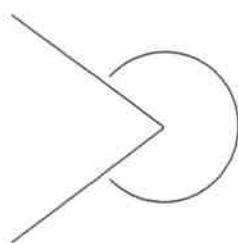
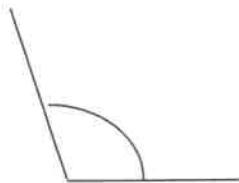
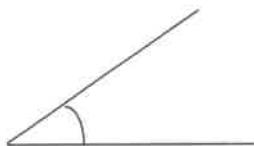
$\frac{3}{4}$ turn 270°
REFLEX ANGLE

Full turn 360°
1 REVOLUTION

ACUTE ANGLE

OBTUSE ANGLE

REFLEX ANGLE

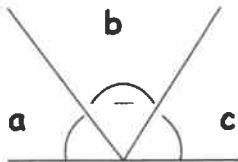


Less than 90°

Between 90° and 180°

Between 180° and 360°

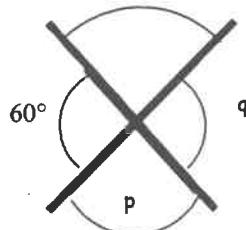
REMEMBER:



Angles on a straight line
add up to 180°
 $a + b + c = 180^\circ$

Angles around a point add up to 360° degrees.
Vertically opposite angles are equal.

$$a + b + c + d = 360^\circ$$

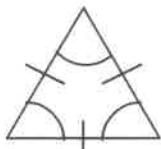


Vertically Opposite Angles
are equal
 $p = 120^\circ$
 $q = 60^\circ$

Look for the X shape

TRIONGLAU ARBENNIG

TRIONGL
HAFALOCHROG



3 ochr hafal
3 ongl 60°

TRIONGL
ISOSGELES



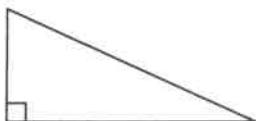
2 ochr hafal
2 ongl hafal

TRIONGL
ANGHYFOCHROG



Dim ochrau hafal
Dim onglau hafal

TRIONGL ONGL SGWÂR



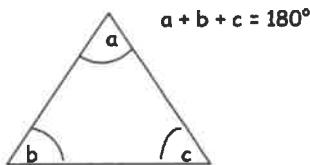
1 ongl sgwâr

COFIWCH

Mae onglau UNRHYW driongl yn
adio i fyny i 180°

TRIONGLAU ARBENNIG DOSBARTHU TRIONGLAU

Yn ôl ochrau	Yn ôl onglau
Triongl Hafalochrog	Triongl Ongl Lem
Triongl Isosgeles	Triongl Ongl Sgwâr
Triongl Anghyfochrog	Triongl Ongl Aflem



FERTIGAU

Gelwir pob pwynt neu gornel yn FERTIG.
Gelwir mwy nag un pwynt yn FERTIGAU.

Gweler enghreifftiau bob dydd o'r
defnydd o drionglau ac onglau.



Giât

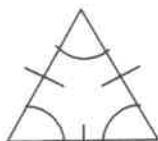


Ochr
byngalo

SPECIAL TRIANGLES

37

EQUILATERAL
TRIANGLE



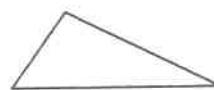
3 equal sides
3 60° angles

ISOCELES
TRIANGLE



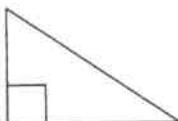
2 equal sides
2 equal angles

SCALENE
TRIANGLE



No equal sides
No equal angles

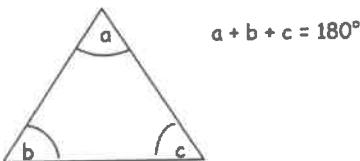
RIGHT ANGLED TRIANGLE



1 right angle

REMEMBER

Angles of ANY triangle add up to 180° .



$$a + b + c = 180^\circ$$

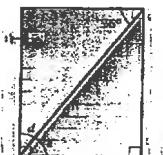
SPECIAL TRIANGLES
CLASSIFYING TRIANGLES

According to sides	According to angles
Equilateral Triangle	Acute Angled Triangle
Isosceles Triangle	Right Angled Triangle
Scalene Triangle	Obtuse Angled Triangle

VERTICES

Each point or corner is called a VERTEX.
More than one point are called VERTICES.

Below are everyday examples of
the uses of triangles and angles.



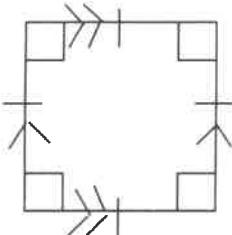
Gate



The side of
a bungalow

PEDROCHRAU

PEDROCHR - siâp gyda phedair ochr. Isod mae rhai pedrochrau arbennig.
Mae onglau mewnol POB PEDROCHR yn adio i fyny i 360°

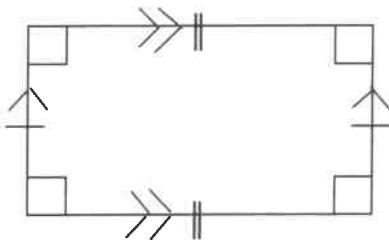


SGWÂR

4 ochr hafal

4 ongl 90°

Ochrau cyferbyn yn baralel

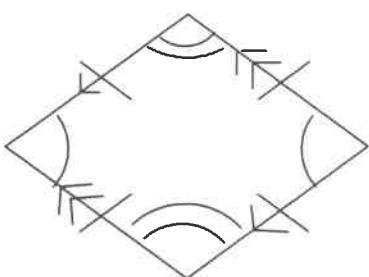


PETRYAL

Ochrau cyferbyn yn hafal

4 ongl 90°

Ochrau cyferbyn yn baralel

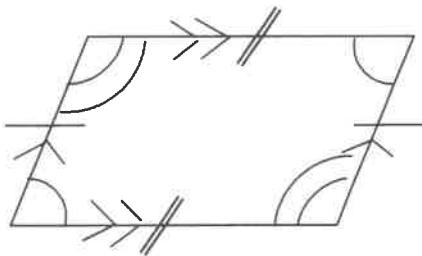


RHOMBWS

4 ochr hafal

Onglau cyferbyn yn hafal

Ochrau cyferbyn yn baralel

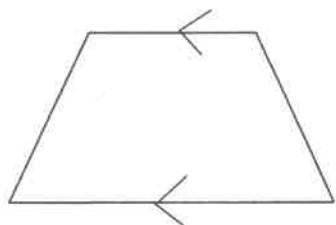


PARALELOGRAM

Ochrau cyferbyn yn hafal

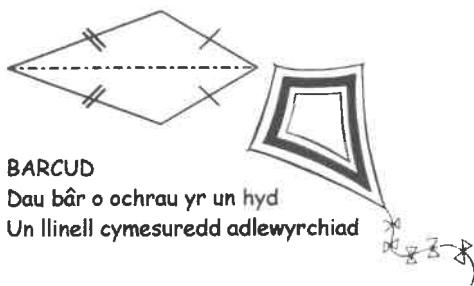
Onglau cyferbyn yn hafal

Ochrau cyferbyn yn baralel



TRAPESIWM

Un pâr o ochrau cyferbyn yn baralel



BARCUD

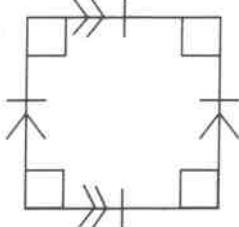
Dau bâr o ochrau yr un hyd

Un llinell cymesuredd adlewyrchiad

QUADRILATERALS

A QUADRILATERAL has four sides. Below are some special quadrilaterals.

The internal angles of ALL QUADRILATERALS add up to 360° .

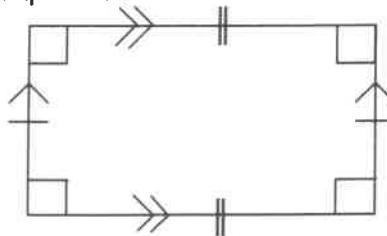


SQUARE

4 equal sides

4 90° angles

Opposite sides parallel

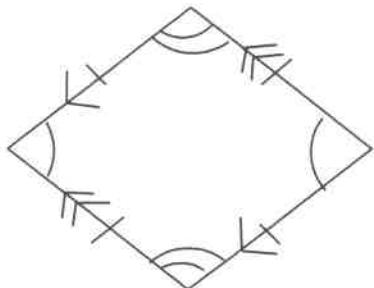


RECTANGLE

Opposite sides equal

4 90° angles

Opposite sides parallel

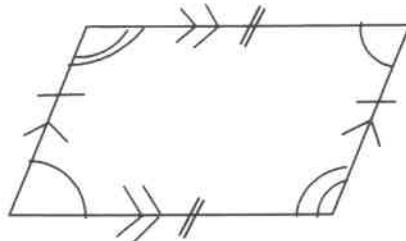


RHOMBUS

4 equal sides

Opposite angles equal

Opposite sides parallel

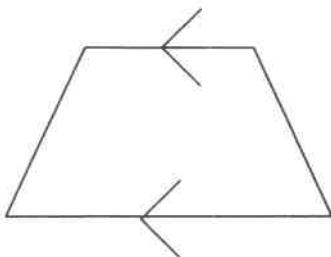


PARALLELOGRAM

Opposite sides equal

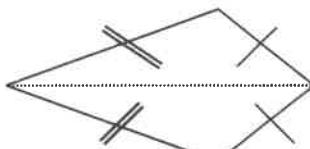
Opposite angles equal

Opposite sides parallel



TRAPEZIUM

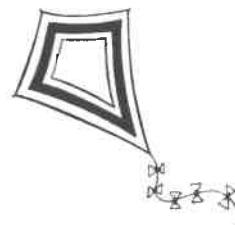
One pair of opposite sides are parallel



KITE

Two pairs of sides are the same length

One line of symmetry

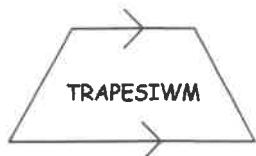


LLINELLAU PARALEL - byth yn cyfarfod

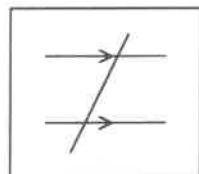
Maent yn aros yr un pellter ar wahân.



Ar ddiagramau dangosir llinellau paralel gyda saethau.



ARDRAWSLIN yw'r enw a roddir i linell sy'n croesi pâr o llinellau paralel.

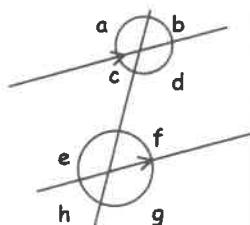


Onglau Cyfatebol

Mae onglau cyfatebol yn hafal.

(Edrychwrch am y siap F)

$$\begin{aligned} a &= e \\ b &= f \\ c &= h \\ d &= g \end{aligned}$$

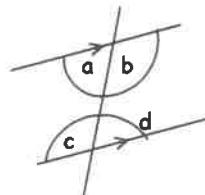


Onglau Eiledol

Mae onglau eiledol yn hafal

(Edrychwrch am y siap Z).

$$\begin{aligned} a &= d \\ b &= c \end{aligned}$$

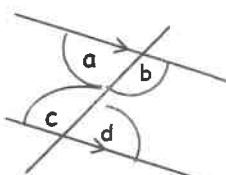


Onglau Perthynol

Mae onglau perthynol yn adio i fyny i 180°

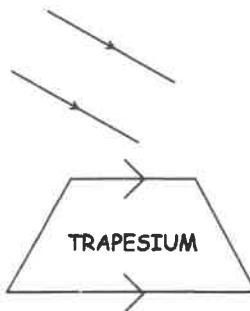
(Edrychwrch am y siap C)

$$\begin{aligned} a + c &= 180^\circ \\ b + d &= 180^\circ \end{aligned}$$



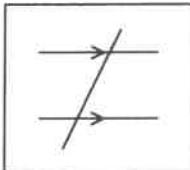
PARALLEL LINES - never meet

They stay the same distance apart.



On diagrams parallel lines are shown with arrows.

TRANSVERSAL is the name given to the line crossing a pair of parallel lines.

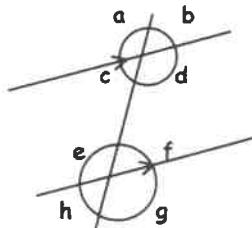


Corresponding Angles

All corresponding angles are equal.

(Look for the F shape)

$$\begin{aligned} a &= e \\ b &= f \\ c &= h \\ d &= g \end{aligned}$$

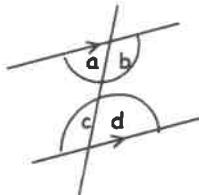


Alternate Angles

Alternate angles are equal.

$$\begin{aligned} a &= d \\ b &= c \end{aligned}$$

(Look for the Z shape).

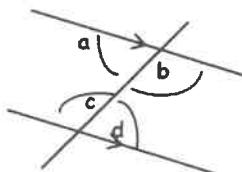


Allied Angles

Allied angles add up to 180°

(Look for the C shape).

$$\begin{aligned} a + c &= 180^\circ \\ b + d &= 180^\circ \end{aligned}$$



POLYGONAU

Siap gydag ochrau syth yw POLYGON.
 Mae trionglau a phedrochrau yn bolygonau.
 Mae gan rhai polygonau eraill enwau arbennig.

Mewn POLYGON RHEOLAIDD
 mae pob ongl a phob ochr yr un
 maint.

SIAP

NIFER O OCHRAU

ENW'R POLYGON



3

TRIONGL



4

PEDROCHR



5

PENTAGON



6

HECSAGON



7

HEPTAGON



8

OCTAGON

9

NONAGON

10

DECAGON

12

DODECAGON

POLYGONS

A POLYGON is a shape with straight sides.
Triangles and quadrilaterals are polygons.
Some other polygons have special names.

In a REGULAR POLYGON
every angle and every
side is the same size.

SHAPE	NUMBER OF SIDES	NAME OF POLYGON
-------	-----------------	-----------------



3

TRIANGLE



4

QUADRILATERAL



5

PENTAGON



6

HEXAGON



7

HEPTAGON



8

OCTAGON

9

NONAGON

10

DECAGON

12

DODECAGON

**POLYGONAU RHEOLAID - mewn POLYGONAU RHEOLAID mae
POB OCHR a PHOB ONGL yn HAFAL**

CROESLIN

Croeslin yw llinell sy'n cysylltu dau fertig. Mae gan hecsagon 9 croeslin.

ENWR SIÂP	NIFER O OCHRAU (n)	CYFANSWM ONGLAU MEWNOL $180^\circ \times (n - 2)$	UN ONGL FEWNOL	UN ONGL ALLANOL $360^\circ \div n$
TRIONGL HAFALOCHROG	3	180°	60°	120°
SGWÂR	4	360°	90°	90°
PENTAGON	5	540°	108°	72°
HECSAGON	6	720°	120°	60°
HEPTAGON	7	900°	128.6°	51.4°
OCTAGON	8	1080°	135°	45°
NONAGON	9	1260°	140°	40°
DECAGON	10	1440°	144°	36°
DODECAGON	12	1800°	150°	30°

REGULAR POLYGONS - have ALL THEIR SIDES and ALL THEIR ANGLES EQUAL

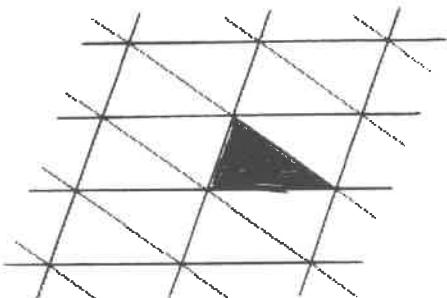
A DIAGONAL is a line joining two vertices. A hexagon has 9 diagonals.

NAME OF SHAPE	NUMBER OF SIDES (n)	TOTAL OF INTERIOR ANGLES $180^\circ \times (n - 2)$	ONE INTERIOR ANGLE	ONE EXTERNAL ANGLE $360^\circ \div n$
EQUILATERAL TRIANGLE	3	180°	60°	120°
SQUARE	4	360°	90°	90°
PENTAGON	5	540°	108°	72°
HEXAGON	6	720°	120°	60°
HEPTAGON	7	900°	128.6°	51.4°
OCTAGON	8	1080°	135°	45°
NONAGON	9	1260°	140°	40°
DECAgon	10	1440°	144°	36°
DODECAGON	12	1800°	150°	30°

BRITHWAITH

Patrwm yw BRITHWAITH sydd wedi ei wneud drwy ail adrodd yr un siap drosodd a throsodd.

Does dim gwagle mewn brithwaith.



Mae'r siap trionglau yma wedi ei ail adrodd dro ar ôl thro.

SIAPIAU CYFLUN

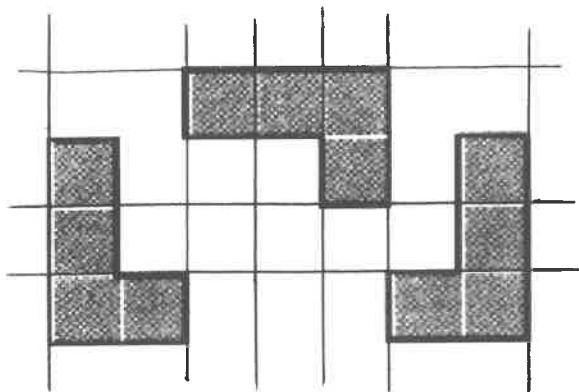
Yr un siap ond o faint gwahanol.

SIAPIAU CYFATH

Yr un siap a maint.

Pan mae siapiau yn union yr un fath dywedwn eu bod yn GYFATH.

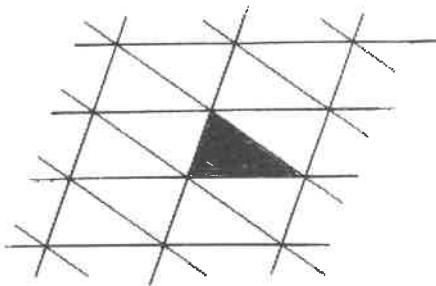
Gall siapiau CYFATH fod yn adlewyrchiad o'i gilydd.



TESSELLATION

A TESSELLATION is a pattern made by repeating the same shape over and over again.

There are no gaps in a tessellation.



The triangle shape has been repeated over and over again.

SIMILAR SHAPES

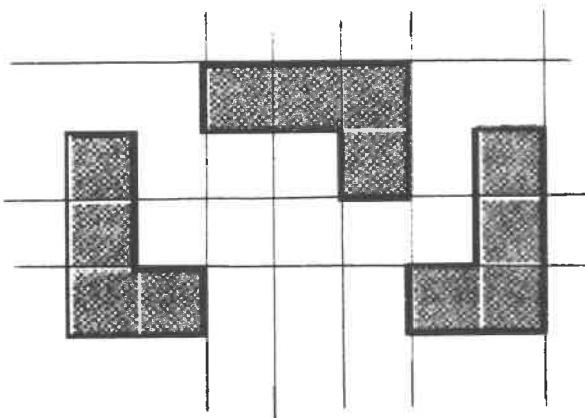
Same shape, different size.

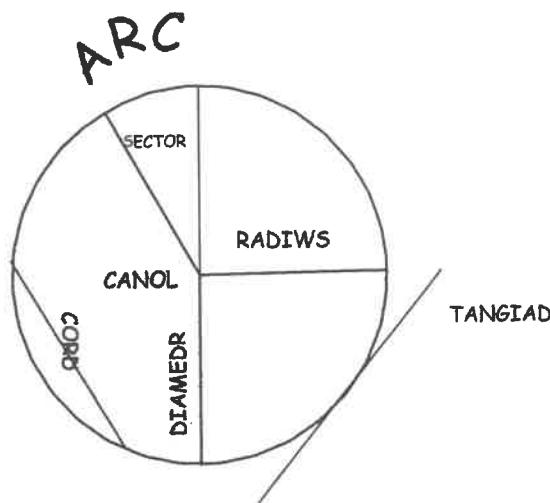
CONGRUENT SHAPES

Same size and shape.

When shapes are identical we say they are CONGRUENT.

Congruent shapes can be reflections of each other.



Y CYLCH

ARC :

Rhan o'r ffordd oddi amgylch y cylch.

DIAMEDR:

Llinell wedi ei llunio o un ochr i ochr arall y cylch trwy'r canol.

RADIWS:

Llinell wedi ei llunio o ganol y cylch i un ochr.

CORD:

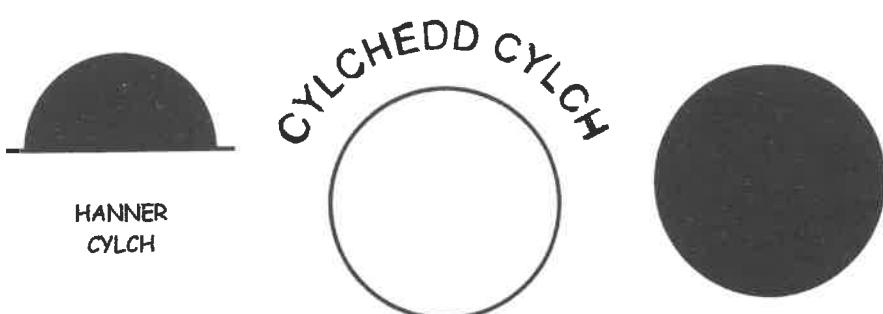
Llinell wedi ei llunio o un ochr i ochr arall y cylch heb fynd trwy'r canol.

TANGIAD:

Llinell wedi ei llunio sy'n cyffwrdd â'r cylchedd tu allan i'r cylch mewn un lle yn unig.

SECTOR:

Y siap sydd rhwng arc a'r ddau radiws sydd bob pen i'r arc.



Pellter oddi amgylch y cylch.

$$C = 2\pi r \text{ neu } \pi d$$

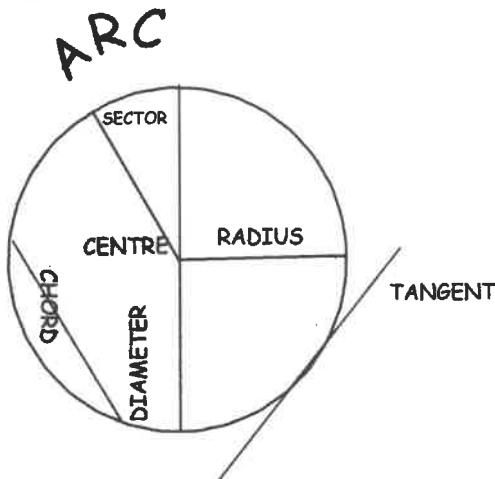
r = radiws

d = diamedr

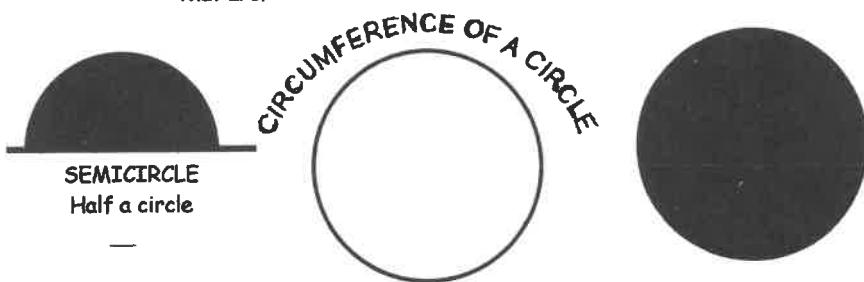
$$\pi = 3.14$$

ARWYNEBEDD CYLCH

$$A = \pi r^2 \\ = \pi \times r \times r$$

THE CIRCLE

- ARC :** Part of the way round the circle.
- DIAMETER:** Line drawn from edge to edge through the centre.
- RADIUS:** Line drawn from the centre to the edge.
- CHORD:** Line drawn missing the centre from edge to edge.
- TANGENT:** Line drawn to touch the outside circumference of the circle in one place only.
- SECTOR:** Shape enclosed between an arc and the two radius either end of that arc.



Distance around the circle.

$$C = 2\pi r \text{ or } \pi d$$

r = radius

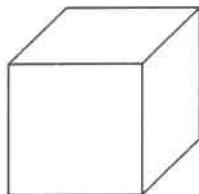
d = diameter

$$\pi = 3.14$$

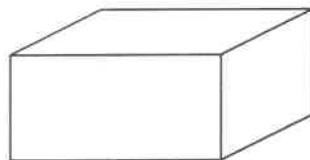
AREA OF A CIRCLE

$$A = \pi r^2$$

$$= \pi \times r \times r$$

SIAPIAU 3D

CIWB



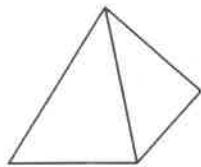
CIWBOID



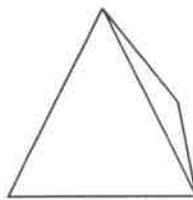
CÔN



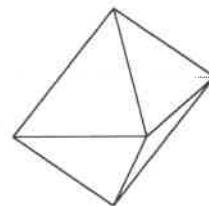
SILINDR

 PRISM TRIONGLOG
 (Trawsoriad cyson ar ei hyd)


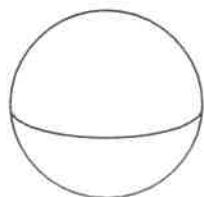
PYRAMID



TETRAHEDRON



OCTAHEDRON

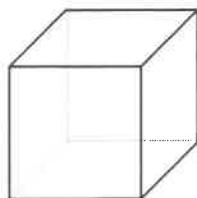


SFFER

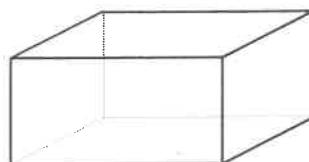


HEMISFFER

3D SHAPES



CUBE



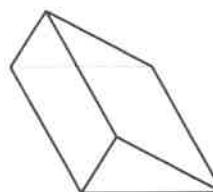
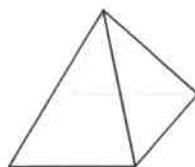
CUBOID



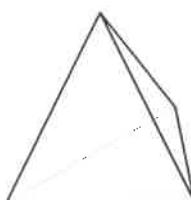
CONE



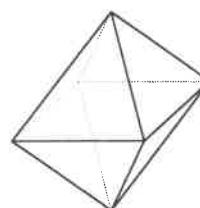
CYLINDER

TRIANGULAR PRISM
(Regular cross-section along its length)

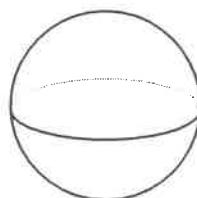
PYRAMID



TETRAHEDRON



OCTAHEDRON



SPHERE

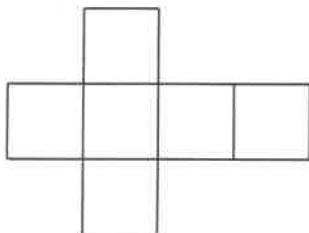


HEMISPHERE

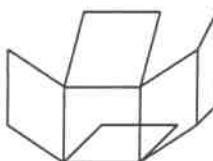
RHWYD

Patrwm o siapiau ar ddarn o bapur neu gerdyn yw RHWYD.

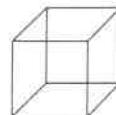
Mae'r siapiau wedi eu trefnu fel y gellir plyngru'r RHWYD i wneud bocs.



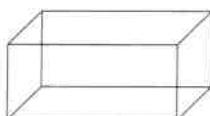
Byddai'r rhwyd yma



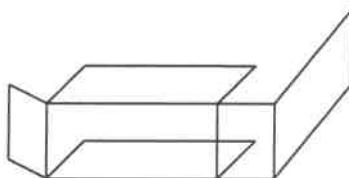
yn gwneud



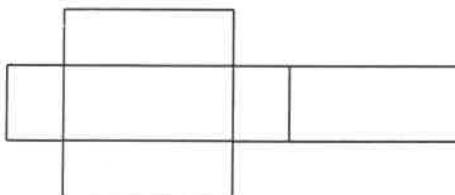
y ciwb yma.



Mae'n ciwboid yma



wedi ei wneud

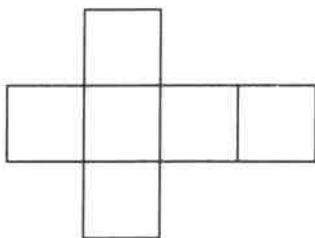


o'r rhwyd yma.

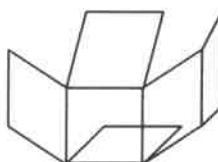
NET

A NET is a pattern of shapes on a piece of paper or card.

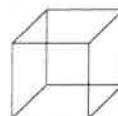
The shapes are arranged so that the net can be folded to make a hollow box.



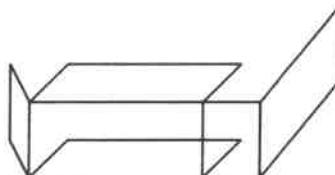
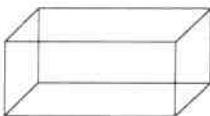
This net



would make

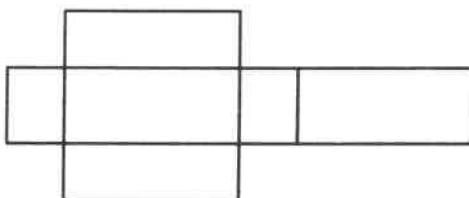


this cube



This cuboid

is made from



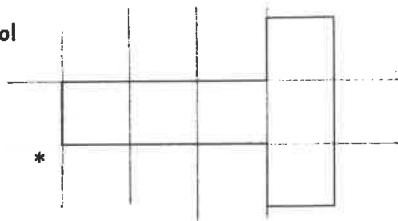
this net

PERIMEDR

CYFANSWM y PELLTER oddi amgylch ochrau allanol unrhyw siap yw ei BERIMEDR.

PERIMEDR y SIAP yma yw:

$$1 + 3 + 1 + 1 + 3 + 1 + 1 + 3 = 14\text{cm}$$



ARWYNEBEDD

Gelwir faint o le sydd tu mewn i siap 2-ddimensiwn yn ARWYNEBEDD y siap.

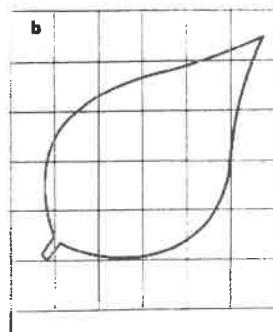
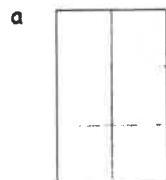
UNEDAU ARWYNEBEDD

Mesurir arwynebedd mewn unedau sgwâr, mm^2 , cm^2 , m^2 or km^2 .

Gellir mesur arwynebedd trwy:

1) GYFRIS SGWARIOU

SIAPIAU RHEOLIADD ac AFREOLAIDD



Bydd
rhannau o
sgwariau yn
cael eu hadio
i wneud
sgwariau
cyfan.

2) DDEFNYDDIO FFORMIWLA

ARWYNEBEDD SGWÂR NEU PETRYAL

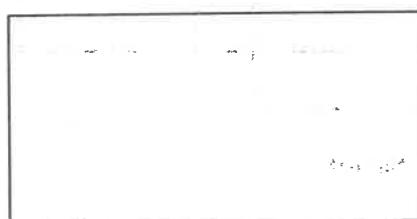
$$A = hl$$

$$A = h \times l = \text{HYD} \times \text{LLED}$$

$$A = hl$$

$$A = 15 \times 3$$

$$A = 45\text{cm}^2$$



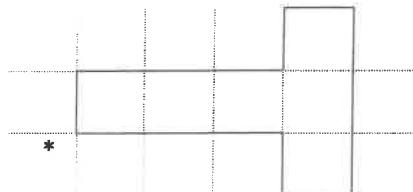
15cm

PERIMETER

The TOTAL DISTANCE around the outside edges of any shape is its PERIMETER.

The PERIMETER of this shape is:

$$1 + 3 + 1 + 1 + 3 + 1 + 1 + 3 = 14\text{cm}$$



AREA

The amount of space inside a 2-D shape is called the AREA of the shape.

UNITS OF AREA

Area is measured in square units: mm^2 , cm^2 , m^2 or km^2 .

Area can be measured by:

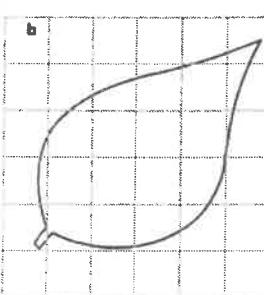
1) COUNTING SQUARES

REGULAR SHAPE

a



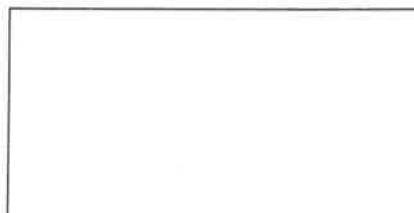
IRREGULAR SHAPE



Parts of squares are added together to make whole squares.

2) USING FORMULAE

AREA OF A SQUARE OR RECTANGLE $A = l \times w = \text{LENGTH} \times \text{WIDTH}$
 $A = lw$



$$\begin{aligned} A &= lw \\ A &= 15 \times 3 \\ A &= 45\text{cm}^2 \end{aligned}$$

3cm

15cm

Gellir hefyd defnyddio'r fformiwlau i ganfod yr hyd neu'r lled.

e.e.

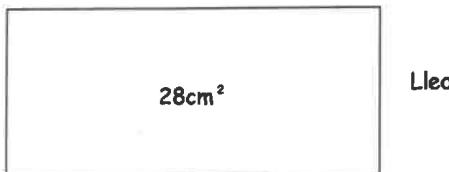
Canfyddwch led y petryal yma.

$$\text{Arwynebedd} = \text{hyd} \times \text{lled}$$

$$28 = 7 \times \text{lled}$$

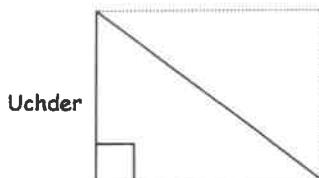
$$\text{lled} = \frac{28}{7}$$

$$\text{lled} = 4\text{cm}$$



$$\text{ARWYNEBEDD TRIONGL} = \frac{\text{sail} \times \text{uchder}}{2}$$

$$= \frac{\text{sail} \times \text{uchder perpendicular}}{2}$$

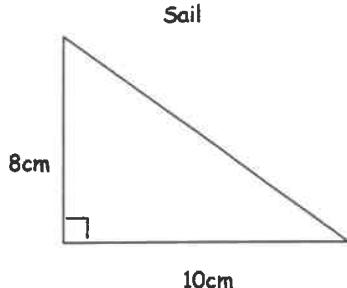


e.e.

$$\text{Arwynebedd triongl} = \frac{\text{sail} \times \text{uchder}}{2}$$

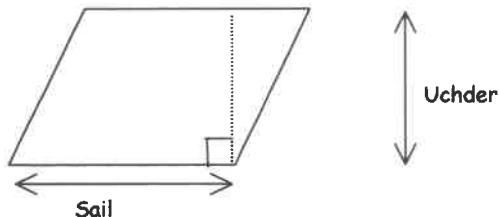
$$= \frac{10 \times 8}{2}$$

$$= 40\text{cm}^2$$



$$\text{ARWYNEBEDD PARALELOGRAM} = \text{ARWYNEBEDD PETRYAL}$$

$$= \text{sail} \times \text{uchder perpendicular}$$

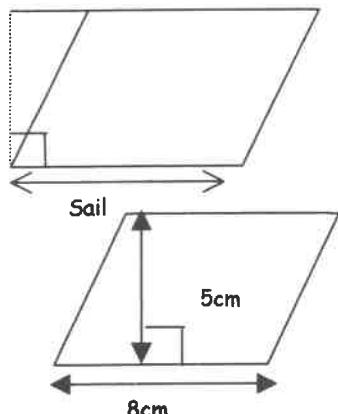


e.e. Arwynebedd paralelogram

$$= \text{sail} \times \text{uchder}$$

$$= 8 \times 5$$

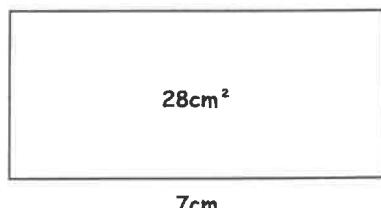
$$= 40\text{cm}^2$$



The formula can also be used to find the length or width.

e.g.

Find the width of this rectangle



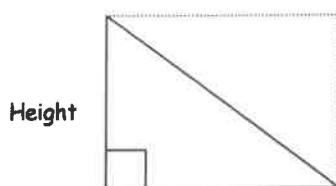
$$\begin{aligned} \text{Area} &= \text{length} \times \text{width} \\ 28 &= 7 \times \text{Width} \end{aligned}$$

$$\text{Width} = \frac{28}{7}$$

$$\text{Width} = 4\text{cm}$$

$$\text{AREA OF TRIANGLE} = \frac{\text{AREA OF RECTANGLE}}{2}$$

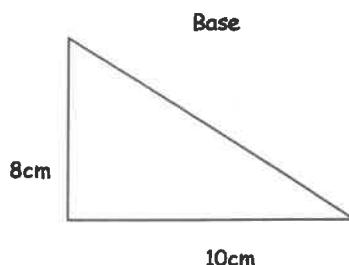
$$= \frac{\text{BASE} \times \text{PERPENDICULAR HEIGHT}}{2}$$



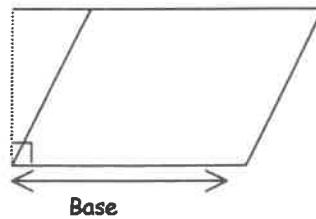
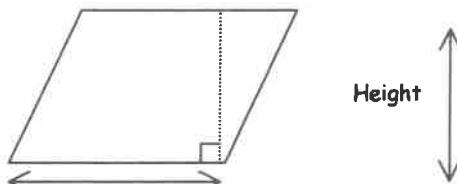
$$\text{e.g. Area of triangle} = \frac{\text{base} \times \text{height}}{2}$$

$$= \frac{10 \times 8}{2}$$

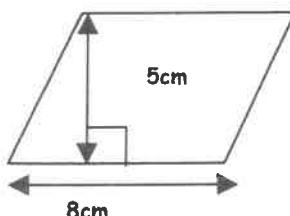
$$= 40\text{cm}^2$$



$$\begin{aligned} \text{AREA OF PARALLELOGRAM} &= \text{AREA OF RECTANGLE} \\ &= \text{BASE} \times \text{PERPENDICULAR HEIGHT} \end{aligned}$$



$$\begin{aligned} \text{e.g. Area of parallelogram} &= \text{base} \times \text{height} \\ &= 8 \times 5 \\ &= 40\text{cm}^2 \end{aligned}$$



ARWYNEBEDD SIAPIAU CYFANSAWDD

Rhannwch y siap cyfansawdd i siapiau y gallwch ganfod eu harwynebeddau.

e.e

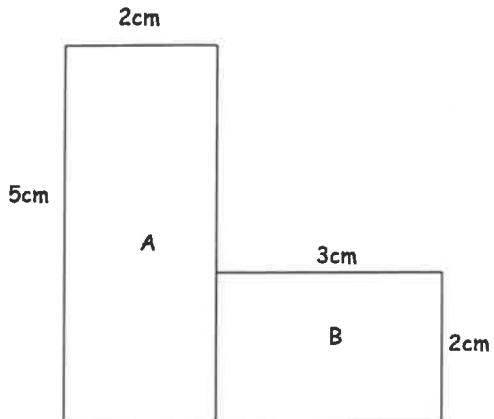
Arwynebedd o'r Siap Cyfansawdd =

Arwynebedd A + Arwynebedd B

$$= (2 \times 5) + (3 \times 2)$$

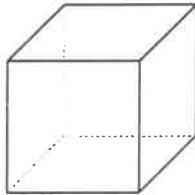
$$= 10 + 6$$

$$= 16\text{cm}^2$$

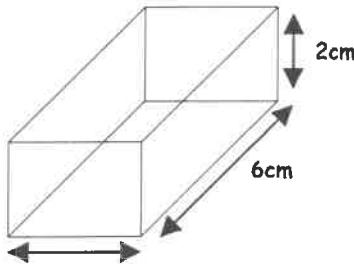


CYFAINT

CYFAINT CIWB NEU GIWBOID



CIWB



CIWBOID

$$\begin{aligned}\text{CYFAINT} &= \text{HYD} \times \text{LLED} \times \text{UCHDER} \\ &= 6 \times 3 \times 2 \\ &= 36\text{cm}^3\end{aligned}$$

UNEDAU CYFAINT

Mesurir cyfaint mewn unedau ciwbig mm^3 , cm^3 , m^3 neu km^3

AREA OF COMPOUND SHAPES

Divide the Compound Shape into shapes you can find the area of

e.g.

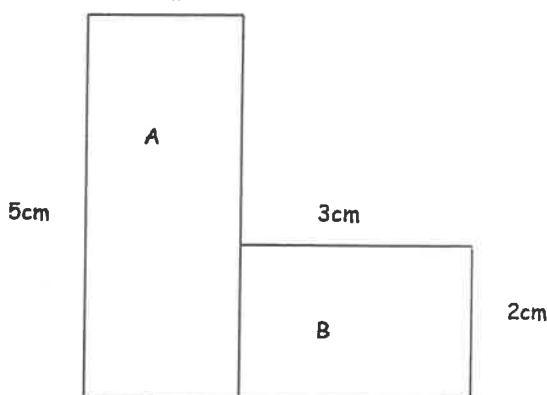
Area of Compound Shape =

Area of A + Area of B

$$= (2 \times 5) + (3 \times 2)$$

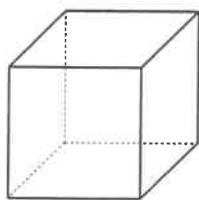
$$= 10 + 6$$

$$= 16 \text{ cm}^2$$

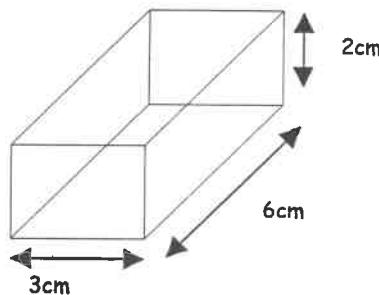


VOLUME

VOLUME OF A CUBE OR CUBOID



CUBE



CUBOID

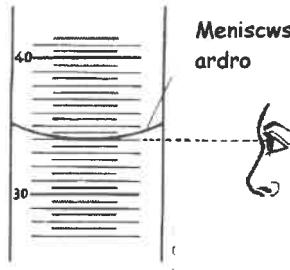
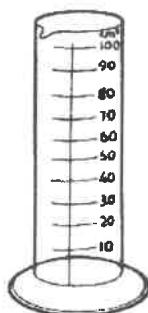
$$\begin{aligned} \text{VOLUME} &= \text{LENGTH} \times \text{BREADTH} \times \text{HEIGHT} \\ &= 6 \times 3 \times 2 \\ &= 36 \text{ cm}^3 \end{aligned}$$

UNITS OF VOLUME

Volume is measured in cubic units mm^3 , cm^3 , m^3 or km^3

CYFEINTIAU

MESURIR CYFAINT HYLIF GYDA SILINDR MESUR

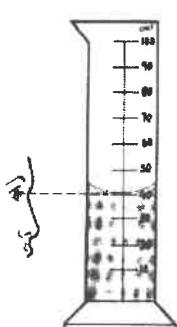


I ddarllen cyfaint yr hylif yn y silindr, rhaid i chwi ddal eich llygaid yr un lefel â gwaelod yr wyneb ardo (gelwir yn 'meniscws' yr hylif).

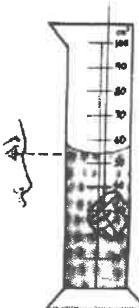
Cyfaint yr hylif yn y silindr yw 34cm^3 .

MESUR CYFEINTIAU SOLIDAU AFREOLAIDD (SIAP OD)

Cofnodwch lefel y dwr cyn ac ar ôl i'r solid suddo.



Darllenwch y lefel
heb y solid.
DARLENIAD A

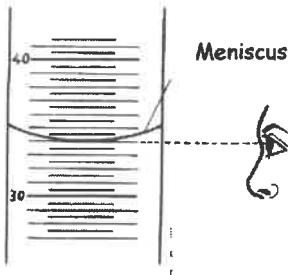
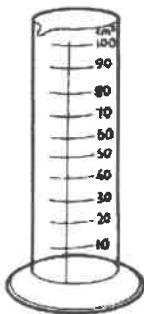


Darllenwch y lefel efo'r
soled wedi suddo.
DARLENIAD B

$$\text{CYFAINT SOLED AFREOLAIDD} = \text{DARLENIAD B} - \text{DARLENIAD A}$$

VOLUMES

MEASURING THE VOLUME OF A LIQUID USING A MEASURING CYLINDER

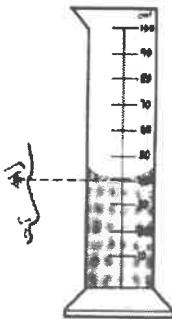


With your eye at the level at the bottom of the curve - this is called a MENISCUS in a liquid, take the reading

Volume of the liquid in the cylinder = 34cm^3 .

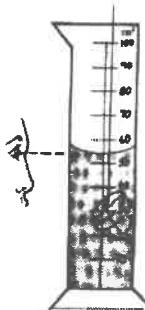
MEASURING THE VOLUME OF AN IRREGULAR SOLID

Record the level of the water before and after the solid has sunk.



Read the level of the water without the solid.
READING A

then



Read the level of the water with the solid in it.
READING B

$$\text{VOLUME OF IRREGULAR SOLID} = \text{READING B} - \text{READING A}$$

TABLAU AMLDER (Siartiau Tali) a SIARTIAU BAR

Defnyddiwn siart tali i rifo gwerthoedd data

Y nifer o Smarties mewn 20 tiwb yw

35	36	35	37	36
36	36	37	36	35
35	38	38	37	36
36	37	36	36	35



Nifer o Smarties	Tali	Amlder
35		5
36		9
37		4
38		2

Cyfanswm 20

Dyma daldra disgylion
Blwyddyn 8 mewn cm.

... neu yn werthoedd
data wedi'i grwpio

159, 167, 169, 161, 175, 143, 157, 169, 171, 165,
160, 163, 155, 170, 166, 168, 172, 154, 179, 151,
170, 158, 163, 179, 160, 171, 160, 159, 155, 160,
160, 173, 156, 151, 160, 172, 173, 164, 153, 168,
158, 166, 170, 160, 173, 162, 161, 176, 160, 168,
169, 172, 160, 164, 168, 165, 169, 172, 158, 168.

Amrediad marciau	Tali / Marciau rhifo	Amlder
$140 \leq u < 150$		1
$150 \leq u < 160$		13
$160 \leq u < 170$		30
$170 \leq u < 180$		16

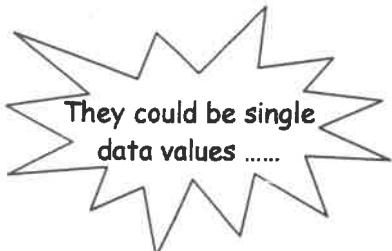
Cyfanswm 60

FREQUENCY TABLES (tally charts) AND BAR CHARTS

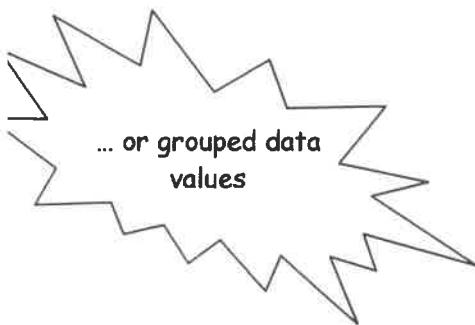
Tally charts are used to count data values

The number of Smarties in 20 tubes are

35	36	35	37	36
36	36	37	36	35
35	38	38	37	36
36	37	36	36	35



Number of Smarties	Tally	Frequency
35		5
36	+	9
37		4
38		2
	Total	20



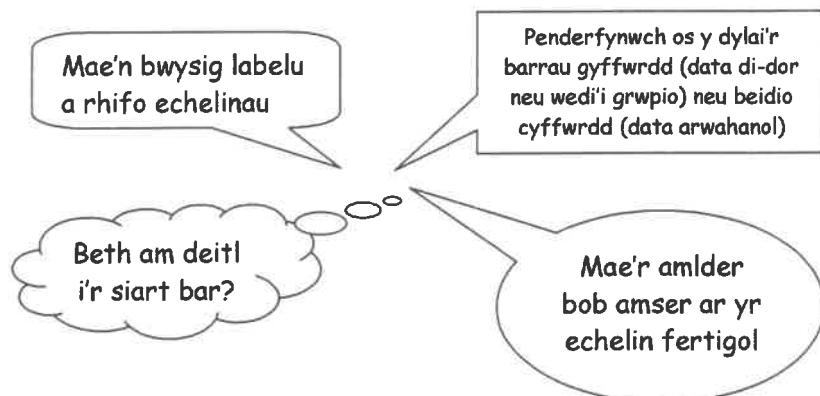
... or grouped data values

These are the heights of Year 8 pupils in cm.

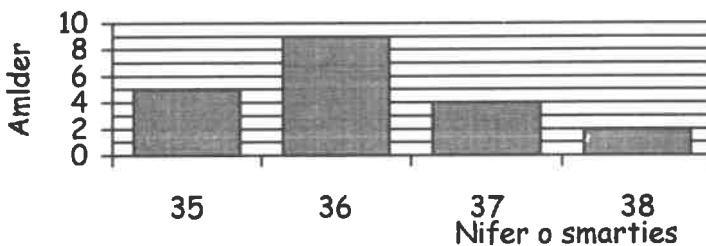
159, 167, 169, 161, 175, 143, 157, 169, 171, 165, 160, 163, 155, 170, 166, 168, 172, 154, 179, 151, 170, 158, 163, 179, 160, 171, 160, 159, 155, 160, 160, 173, 156, 151, 160, 172, 173, 164, 153, 168, 158, 166, 170, 160, 173, 162, 161, 176, 160, 168, 169, 172, 160, 164, 168, 165, 169, 172, 158, 168.

Range of marks	Tally	Frequency
$140 \leq h < 150$		1
$150 \leq h < 160$		13
$160 \leq h < 170$		30
$170 \leq h < 180$		16
	Total	60

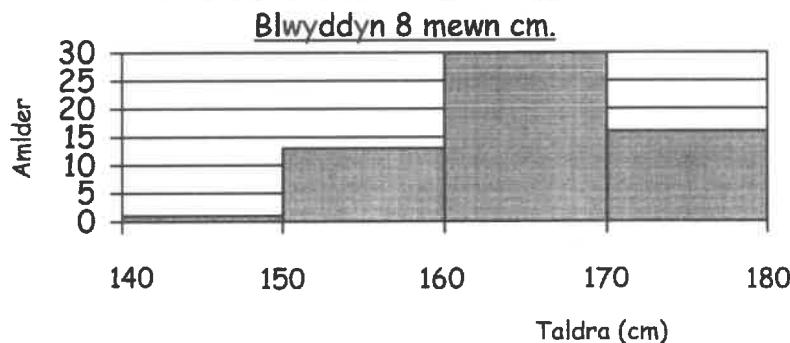
Defnyddiwn siart bar i arddangos y data



Siart yn dangos nifer y smarties mewn tiwb



Siart yn dangos taldra disgyblion



Bar charts are used to display the data

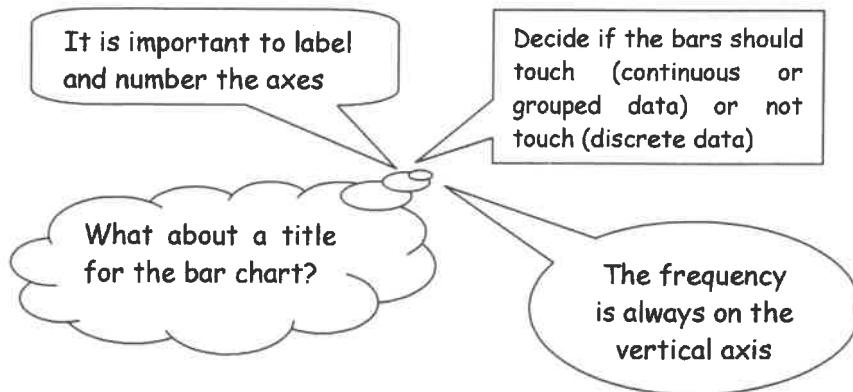


Chart showing the number of smarties in a tube

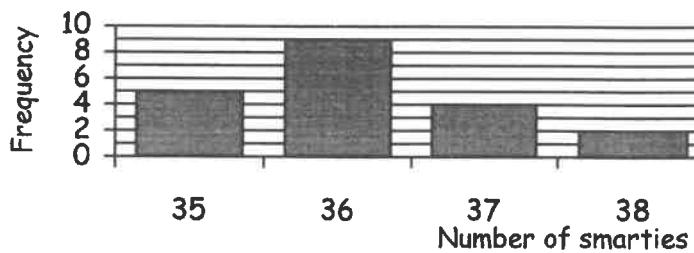
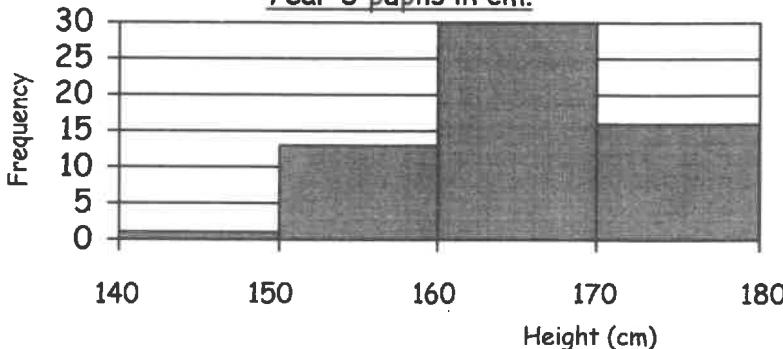


Chart showing the height of Year 8 pupils in cm.

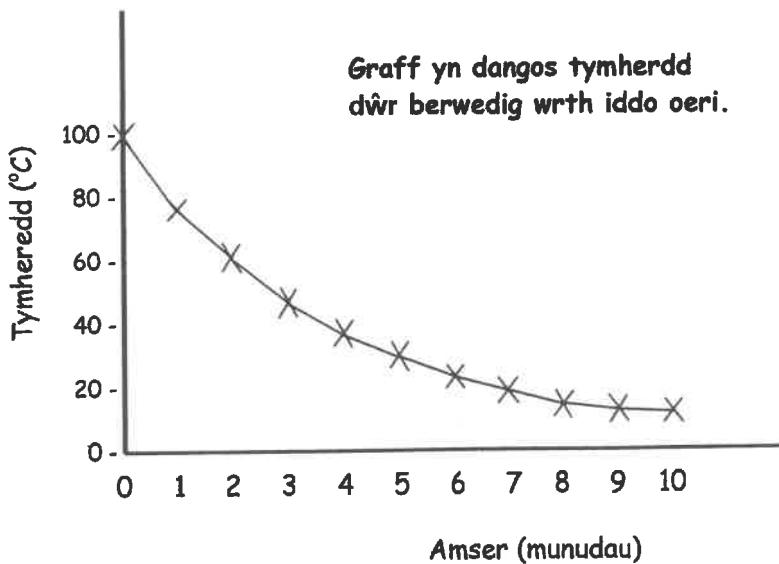


GRAFFIAU LLINELL (NEU POLYGONAU AMLDER)

I lunio graff llinell rhaid plotio pwyntiau (gyda chroes), ac wedyn cysylltu'r pwyntiau gyda llinellau syth.

Mewn arbrawf yng ngwyddoniaeth fe gymerwyd tymheredd dŵr berwedig fesul munud wrth iddo oeri.

Amser (mun)	0	1	2	3	4	5	6	7	8	9	10
Tymheredd (°C)	100	77	61	47	37	29	23	18	14	12	11

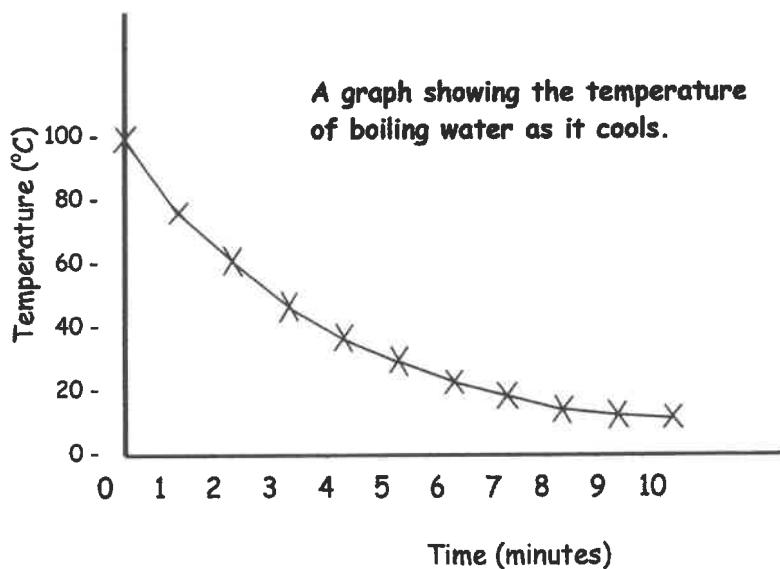


LINE GRAPHS (OR FREQUENCY POLYGONS)

To draw a line graph plot the points (with a cross), and then join the points with straight lines.

In a scientific experiment the temperature of boiling water was taken every minute as it cooled.

Time (min)	0	1	2	3	4	5	6	7	8	9	10
Temperature ($^{\circ}\text{C}$)	100	77	61	47	37	29	23	18	14	12	11



PICTOGRAM

Diagram yw PICTOGRAM sy'n defnyddio lluniau yn lle bariau. Rhaid i pictogram gael ALLWEDD bob amser i ddangos beth mae pob llun yn ei gynrychioli.

e.e.

ALLWEDD



yn cynrychioli 2 blentyn



yn cynrychioli 1 plentyn

Rhaid i'r lluniau fod

- i) yr un maint
- ii) wedi eu gosod un o dan y llall
fel y gellir eu cymharu'n hawdd.

Dyma sut mae 7M yn teithio i'r ysgol

Car



Bws



Trên



Cerdded



Mae hyn yn golygu fod 4 plentyn yn teithio gyda car, 12 ar fws, 2 ar drên a 3 yn cerdded.

PICTOGRAM

A PICTOGRAM is a diagram which uses pictures instead of bars.
A pictogram must always have a KEY to show what each picture represents.

e.g.

KEY



represents 2 children



represents 1 child

Each picture must be i) the same size
 ii) placed one under the other
 so they can be easily compared

How Class 7M travel to school

Car



Bus



Train



Walk



This means that 4 children travel by car, 12 by bus, 2 by train and 3 walk.

SIARTIAU CYLCH

Ffordd arall o gynrychioli data mewn diagramau yw Siartiau Cylch.
 Mae ongl y darn yn cynrychioli y nifer o wrthrychau.

LLUNIO SIART CYLCH

Mewn maes parcio mae yna 13 car coch, 10 car glas, 5 car gwyn a 2 gar arall.

CAM 1

$$\text{CYFANSWM O GEIR} = 13 + 10 + 5 + 2 = 30$$

CAM 2

$$\text{ONGL O'R SIART CYLCH SYN CYNRYCHIOLI 1 CAR} = \frac{360^\circ}{30} = 12^\circ$$

CAM 3

Cyfrifo'r ongl i gynrychioli pob lliw o gar.

$$13 \text{ car coch} = 13 \times 12^\circ = 156^\circ$$

$$10 \text{ car glas} = 10 \times 12^\circ = 120^\circ$$

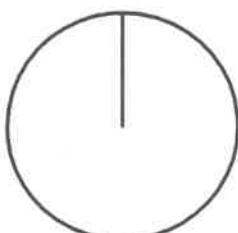
$$5 \text{ car gwyn} = 5 \times 12^\circ = 60^\circ$$

$$2 \text{ car arall} = 2 \times 12^\circ = 24^\circ$$

$$\text{Gwirio: } 156^\circ + 120^\circ + 60^\circ + 24^\circ = 360^\circ$$

CAM 4

Lluniwch y **SIART CYLCH**.



Lluniwch gylch.

Lluniwch un radiws yn pwyntio'n syth i fyny.

PIE CHARTS

Pie-charts are another way of representing data diagrammatically.
The angle of the slice represents the number of items.

DRAWING A PIE CHART

In a car park there are 13 red cars, 10 blue cars, 5 white cars, and 2 other cars.

STEP 1

$$\text{TOTAL NUMBER OF CARS} = 13 + 10 + 5 + 2 = 30$$

STEP 2

$$\text{ANGLE OF PIE CHART REPRESENTING 1 CAR} = \frac{360^\circ}{30} = 12^\circ$$

STEP 3

Evaluating the angle to represent each colour of car.

$$13 \text{ red cars} = 13 \times 12^\circ = 156^\circ$$

$$10 \text{ blue cars} = 10 \times 12^\circ = 120^\circ$$

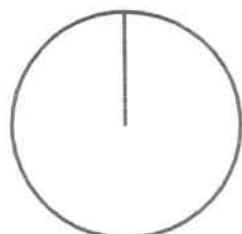
$$5 \text{ white cars} = 5 \times 12^\circ = 60^\circ$$

$$2 \text{ other cars} = 2 \times 12^\circ = 24^\circ$$

$$\text{Check: } 156^\circ + 120^\circ + 60^\circ + 24^\circ = 360^\circ$$

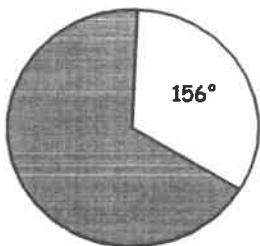
STEP 4

Draw the PIE CHART.



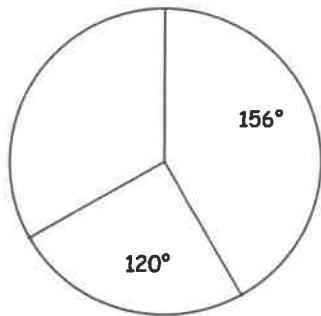
Draw a circle.

Draw one radius pointing directly upwards.



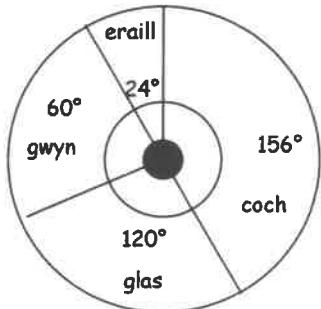
Mesurir yr ongl i'r categori arall ddiwethaf. Arwahan i hyn gosodir yr onglydd ar y radiws a mesurir yr ongl fwyaf gyntaf.

Angle for other category is measured last. Otherwise the protractor is placed on the radius and the largest angle measured first.



Symudir yr onglydd i'r llinell a luniwyd a mesurir yr ongl sydd fwyaf nesaf.

Protractor is moved to the drawn line and the next largest angle measured.



Gorffennwch lunio'r onglau mewn trefn o'r mwyaf i'r lleiaf.
Mesurwch y categori 'ARALL' ddiwethaf.
Labelwch y rhannau.

Finish drawing the angles in order from largest to smallest.
Measure OTHER category last.
Label the segments.

DIAGRAMAU GWASGARIAD / SCATTER DIAGRAMS

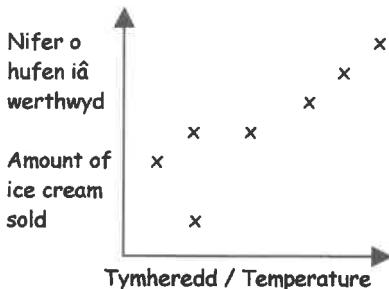
Mae DIAGRAMAU GWASGAR yn cymharu dau set o ddata.

Mae patrwm y pwyntiau yn dangos os oes yna berthynas neu CYDBERTHYNIAID rhwng y ddau set o ddata.

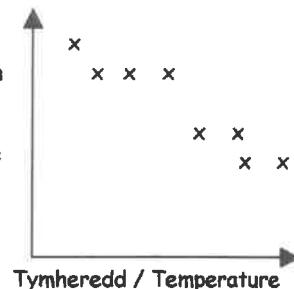
SCATTER DIAGRAMS compare two sets of data.

The arrangement of the points can show whether there is a relationship or CORRELATION between the two sets of data.

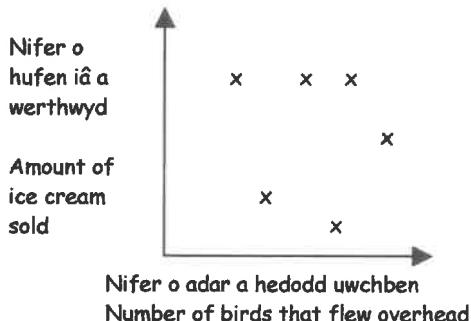
e.e / e.g.



CYDBERTHYNIAID POSITIF
POSITIVE CORRELATION

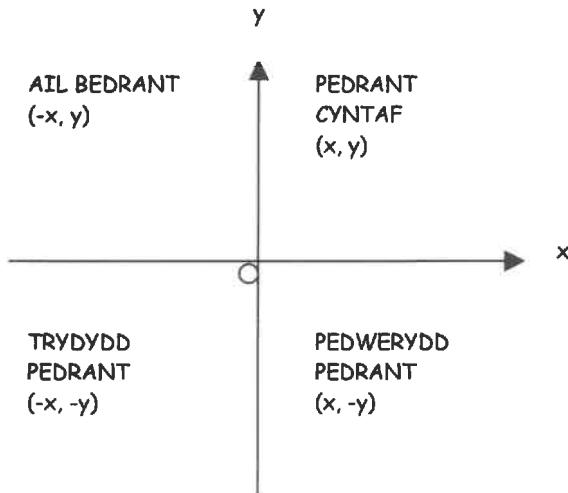


CYDBERTHYNIAID NEGATIF
NEGATIVE CORRELATION



DIM CYDBERTHYNIAID
NO CORRELATION

CYFESURYNNAU YN Y PEDWAR PEDRANT



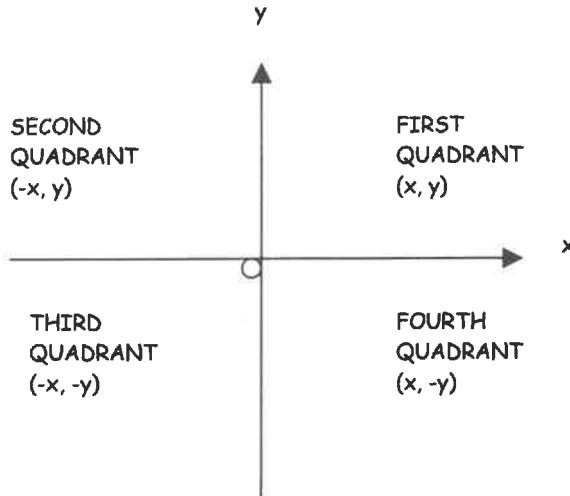
$O =$ Y TARDD. Y pwynt ble mae'r echelin x a'r echelin y yn croesi.
Cyfesurynnau'r pwynt yma yw $(0,0)$.

PEDRANT. Mae'r echelin x a'r echelin y yn rhannu'r lle i bedwar PEDRANT.

Pan yn ysgrifennu lleoliad pwynt nodir ei leoliad ar yr echelin x yn gyntaf BOB AMSER ac yna ei leoliad ar yr echelin y . (Ysgrifennir cyfesurynnau mewn cromfachau).

Yn y Gymraeg gallwn gofio TRAWSFYNYDD i'n hatgoffa i fynd ar DRAWS yn gyntaf, ac wedyn i FYNY.

CO-ORDINATES IN ALL FOUR QUADRANTS



O = ORIGIN. The point where the x axis and the y axis cross.
The co-ordinates of this point are (0,0).

QUADRANT. The x axis and the y axis divide the space into four QUADRANTS.

When writing down the location of a point its position on the x axis is **ALWAYS** noted
FIRST and then its position on the y axis. (Co-ordinates are written in brackets).

YSTADEGAUCYFARTALEDDAU

Mae tri gwahanol gyfartaledd sef y cymedr, y canolrif a'r modd.

CYMEDR (Mewn Gwyddoniaeth, Daearyddiaeth a Dylunio a Thechnoleg defnyddir y gair CYFARTALEDD)

I ganfod CYMEDR set o ddata rhaid:

1. Canfod cyfanswm gwerthoedd y data.
2. Rhannu'r cyfanswm gyda'r nifer o ddata.

e.e. CYMEDR y rhifau 2, 4, 7, 9 a 13 yw

$$\frac{2 + 4 + 7 + 9 + 13}{5} = \frac{35}{5} = 7$$

Pan mae'r data mewn TABL, dylid ychwanegu colofn arall i weithio allan y cyfansymiau.

e.e. Nifer o Smarties mewn 100 tiwb.

Nifer o Smarties mewn tiwb	Nifer o diwbiau	Nifer o Smarties
34	13	$13 \times 34 = 442$
35	24	$24 \times 35 = 840$
36	27	$27 \times 36 = 972$
37	22	$22 \times 37 = 814$
38	<u>14</u>	$14 \times 38 = 532$
	100	TOTAL = 3600

$$\text{Cymedr y nifer o Smarties} = \frac{3600}{100} = 36$$

AVERAGES

There are three different averages, the mean, the median and the mode.

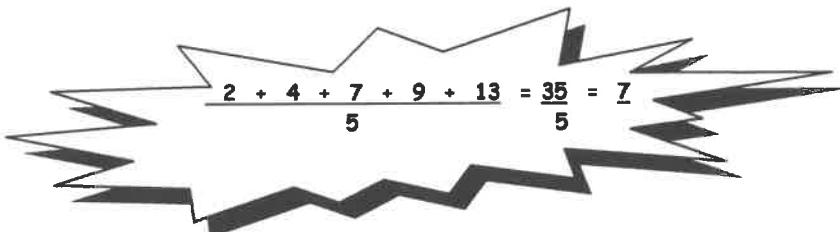
THE MEAN

(In Science, Geography and Design and Technology the word AVERAGE is used instead of the MEAN.)

To find the MEAN of a set of data:

1. Find the total of all the data values.
2. Divide by the number of values.

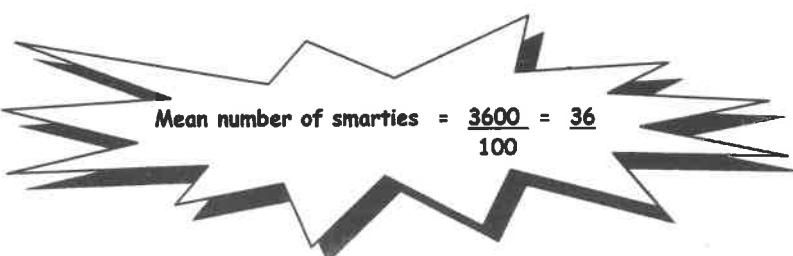
e.g. the mean of the numbers 2, 4, 7, 9 and 13 is



When data is in a TABLE, add another column to work out the total.

e.g. Number of Smarties in 100 tubes

No of Smarties in a tube	Number of tubes	Number of Smarties
34	13	$13 \times 34 = 442$
35	24	$24 \times 35 = 840$
36	27	$27 \times 36 = 972$
37	22	$22 \times 37 = 814$
38	<u>14</u> 100	$14 \times 38 = 532$ TOTAL = 3600



CANOLRIF - Dyma werth canol y data pan mae wedi ei drefnu o'r lleiaf i'r mwyaf.

I EILRIFAU o werthoedd:

1. Canfyddwch y ddau rif canol.
2. Adiwch y ddau.
3. Rhannwch y cyfanswm gyda dau.

EILRIF O WERTHOEDD 2, 4, 4, 5, 5, 6, 6, 7, 7, 7, 8, 8, 8, 9

$$\text{CANOLRIF} = \frac{6 + 7}{2} = \frac{13}{2} = 6.5$$

- e.e. I ODRIF O WERTHOEDD 2, 4, 4, 5, 5, 6, 6 7, 7, 8, 8, 8, 9
canfyddwch y rhif canol.

CANOLRIF = 6

MODD - Dyma'r data sy'n ymddangos mwyaf aml.

- e.e. 2, 4, 6, 7, 8, 5, 9, 6, 4, 8, 5, 8. Y MODD yw 8 gan fod yna fwy o'r ffigwr 8 na'r gweddill.

AMREDIAD - Yr amrediad yw'r gwahaniaeth rhwng y gwerthoedd mwyaf a'r lleiaf.

Amrediad = Rhif mwyaf - Rhif lleiaf

Mae'r Amrediad yn dweud wrthym sut mae'r data wedi'i wasgari.

- e.e. 2, 4, 6, 7, 8, 7, 8, 5, 9, 6, 4, 8, 5, 8

$$\text{AMREDIAD} = 9 - 2 = 7$$

YSTADEGAU CAMARWEINIOL

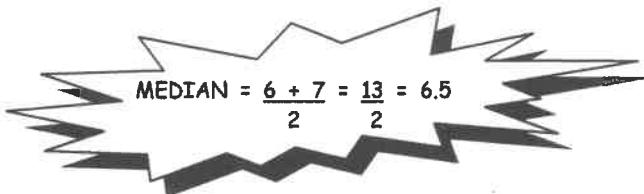
Gall ystadegau fod yn GAMARWEINIOL os nad ydych yn llunio echelinau sy'n cychwyn yn 0. Cofiwch fod gwahanol bobl yn defnyddio ystadegau i wneud gwahanol bwyntiau felly edrychwch yn ofalus ar y raddfa pan yn darllen unrhyw fath o ddiagram.

THE MEDIAN - This is the middle value of the data when it is in order from smallest to largest.

For an EVEN NUMBER of values:

1. Find the middle two numbers.
2. Add both together.
3. Divide the total by two.

EVEN NUMBERS OF VALUES 2, 4, 4, 5, 5, 6, 6, 7, 7, 7, 8, 8, 8, 9



e.g. FOR AN ODD NUMBER OF VALUES 2, 4, 4, 5, 5, 6, 6, 7, 7, 8, 8, 8, 9
find the middle number.

MEDIAN = 6

THE MODE - This is the data value which appears the most.

e.g. 2, 4, 6, 7, 8, 5, 9, 6, 4, 8, 5, 8. The MODE is 8 because there are more 8's than anything else.

THE RANGE - This is the biggest value minus the smallest value.

RANGE = Biggest value - Smallest value

The range tells us how spread out the data is.

e.g. 2, 4, 6, 7, 8, 7, 8, 5, 9, 6, 4, 8, 5, 8



MISLEADING STATISTICS

Statistics can be MISLEADING if you do not draw axes which start at 0. Remember that different people use statistics to make different points, so look very carefully at the scale when you are reading any type of diagram.

TEBYGOLRWYDD

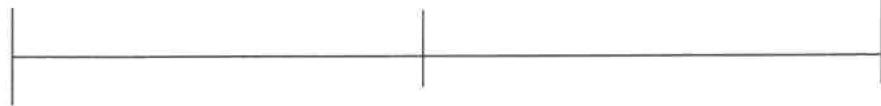
Mae'n mesur pa mor debyg yw rhywbeth o ddigwydd.

GRADDFA TEBYGOLRWYDD

0

 $\frac{1}{2}$

1



AMHOSIBL	ANHEBYGOL IAWN	ANHEBYGOL CYFARTAL	SIAWNS	TEBYGOL	TEBYGOL IAWN	SICR
----------	-------------------	-----------------------	--------	---------	-----------------	------

Ysgrifennir TEBYGOLRWYDD fel ffracsiau fel arfer.

$$\text{TEBYGOLRWYDD} = \frac{\text{Nifer y canlyniadau cadarnhaol}}{\text{Nifer y canlyniadau posibl}}$$

$$\text{e.e. Tebygolrwydd o daflu 2 ar ddis} = p(2 \text{ ar ddis}) = \frac{1}{6}$$

Gellir:

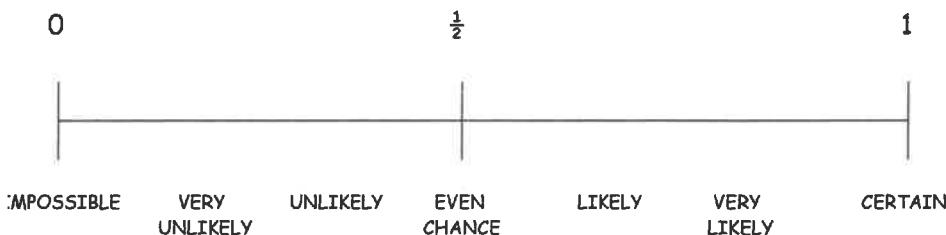
- i. Gyfrifo tebygolrwydd
- ii. Amcangyfrif Tebygolrwydd drwy edrych ar ddata sydd wedi ei gasglu'n barod.
- iii. Amcangyfrif Tebygolrwydd drwy wneud arbrawf. Y mwyaf o weithiau yr ail-adroddir yr arbrawf y mwyaf cywir fydd yr amcangyfrif.

$$\text{TEBYGOLRWYDD NAD yw} = 1 - \text{Tebygolrwydd fod digwyddiad yn cymryd lle}$$

PROBABILITY

This measures how likely something is to happen.

THE PROBABILITY SCALE



PROBABILITIES are usually written as fractions

$$\text{PROBABILITY} = \frac{\text{Number of favourable outcomes}}{\text{Number of possible outcomes}}$$

$$\text{e.g. Probability of throwing a 2 on a die} = p(2 \text{ on die}) = \frac{1}{6}$$

PROBABILITIES can be:

- i. Calculated.
- ii. Estimated by looking at data that has already been collected.
- iii. Estimated by doing an experiment. The more times the experiment is repeated the more accurate the estimation.

$$\begin{array}{lcl} \text{PROBABILITY of an event} & & \text{Probability of the} \\ \text{NOT HAPPENING} & = 1 - & \text{event happening} \end{array}$$

