CHAPTER 15: FRACTIONS and PERCENTAGES

1%	5%	10%	20%	25%
$^1/_{100}$	$^1/_{20}$	$^1/_{10}$	$^1/_5$	$^1/_4$

$33^1/_3$%	50%	$66^2/_3$%	75%
$^1/_3$	$^1/_2$	$^2/_3$	$^3/_4$

(1) Find 4% of 250 kg

non-calculator:

1% 250 ÷ 100 = 2.5 kg
4% 2.5 x 4 = 10 kg

by calculator:

250 ÷ 100 x 4
= 10 kg

(2) Find $66^2/_3$% of 18 m

$^2/_3$ of 18 m

18 ÷ 3 = 6 m
6 x 2 = 12 m

(3) Find 35% of £240

non-calculator:

10% £240 ÷ 10 = £24

30% £24 x 3 = £72
5% £24 ÷ 2 = £12
£84

by calculator:

£240 ÷ 100 x 35
= £84

EXPRESSING CHANGE AS A PERCENTAGE

$$\% \text{ CHANGE} = \frac{\text{CHANGE}}{\text{START VALUE}} \times 100\%$$

A £15000 car is resold for £12000. Find the % loss.

actual loss = £15000 - £12000 = £3000

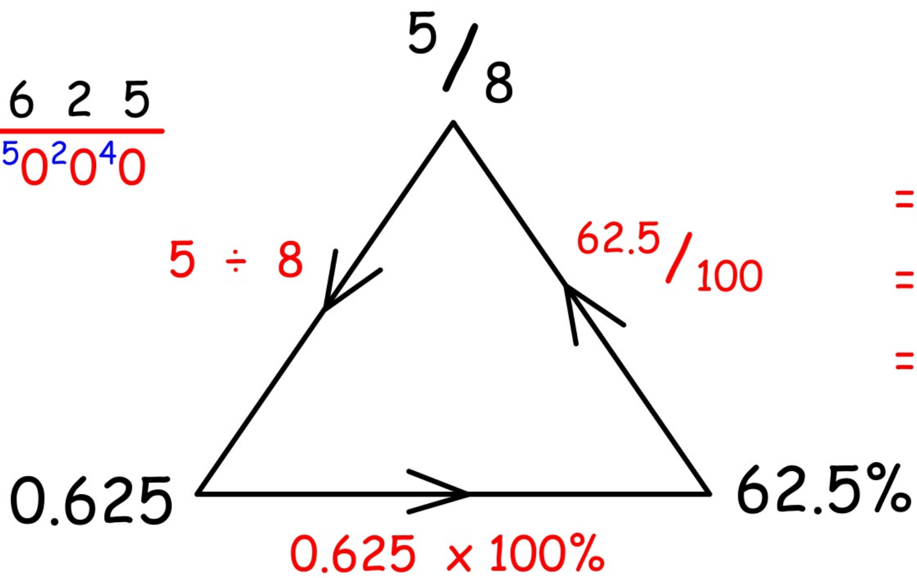
$$\% \text{ loss} = \frac{\text{loss}}{\text{start value}} \times 100\%$$

$$= \frac{\pounds 3000}{\pounds 15000} \times 100\%$$

= 20%

SWITCHING BETWEEN FORMS

$$\begin{array}{r} 0.625 \\ 8\overline{)5.{}^{5}0{}^{2}0{}^{4}0} \end{array}$$



$^{625}/_{1000}$

$= {}^{125}/_{200}$

$= {}^{25}/_{40}$

$= {}^{5}/_{8}$

EQUAL FRACTIONS

$$\frac{3}{4} = \frac{3\times6}{4\times6} = \frac{18}{24}$$

SIMPLIFYING:

$$\frac{18}{24} = \frac{18\div6}{24\div6} = \frac{3}{4}$$

MIXED NUMBERS

$$2\tfrac{3}{4} = 2 + \frac{3}{4} = \frac{8}{4} + \frac{3}{4} = \frac{11}{4}$$

$$2\tfrac{3}{4} = \frac{11}{4}$$

$4 \times 2 + 3 = 11$

$$\frac{11}{4} = \frac{8}{4} + \frac{3}{4} = 2 + \frac{3}{4} = 2\tfrac{3}{4}$$

$$\frac{11}{4} = 2\tfrac{3}{4}$$

$11 \div 4 = 2$ R 3

ADD and SUBTRACT

requires a common denominator, the LCM (least common multiple)

(1) $\frac{2}{5} + \frac{3}{10}$

$= \frac{4}{10} + \frac{3}{10}$

$= \frac{7}{10}$

(2) $\frac{5}{6} - \frac{2}{9}$

$= \frac{15}{18} - \frac{4}{18}$

$= \frac{11}{18}$

for mixed numbers treat fractions and whole numbers separately.

(3) $12\tfrac{5}{6} - 3\tfrac{2}{9}$

$= 12\tfrac{15}{18} - 3\tfrac{4}{18}$

$= 9\tfrac{11}{18}$

MULTIPLY $\frac{a}{b} \times \frac{c}{d} = \frac{a \times c}{b \times d}$

"of" means x

change mixed numbers to "top-heavy" fractions

(1) $^{3}/_{10}$ of $2\,^{3}/_{4}$

$= \, ^{3}/_{10} \times \, ^{11}/_{4}$

$= \, ^{33}/_{40}$

(2) $1\,^{2}/_{3} \times 3\,^{1}/_{5}$

$= \, ^{5}/_{3} \times \, ^{16}/_{5}$

$= \, ^{80}/_{15}$

$= \, ^{16}/_{3}$

$= 5\,^{1}/_{3}$

DIVIDE $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$

RECIPROCAL

(1) $^{5}/_{6} \div \, ^{3}/_{7}$

$= \, ^{5}/_{6} \times \, ^{7}/_{3}$

$= \, ^{35}/_{18}$

$= 1\,^{17}/_{18}$

(2) $1\,^{2}/_{7} \div 4$

$= \, ^{9}/_{7} \div \, ^{4}/_{1}$

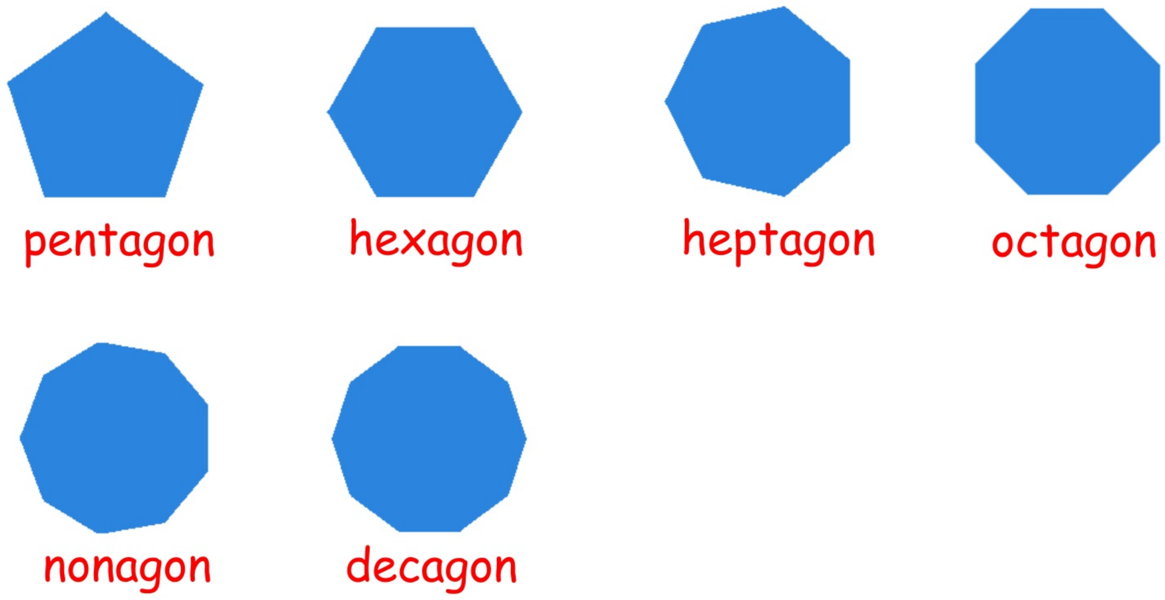
$= \, ^{9}/_{7} \times \, ^{1}/_{4}$

$= \, ^{9}/_{28}$

CHAPTER 16: 2D SHAPES

POLYGON a many sided shape.

In a REGULAR polygon all sides and angles are equal.



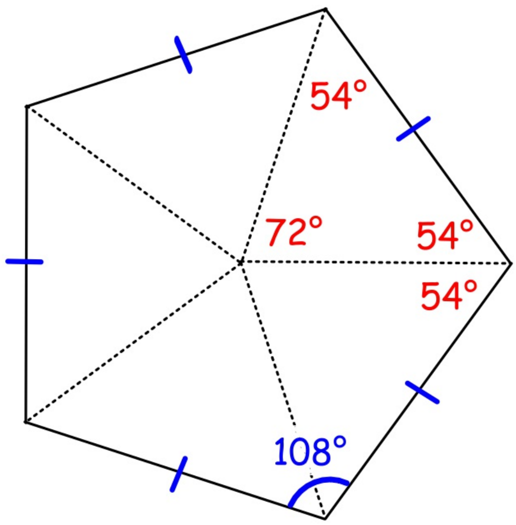
REGULAR PENTAGON

angle at the centre $360° \div 5 = 72°$

isosceles Δ $180° - 72° = 108°$

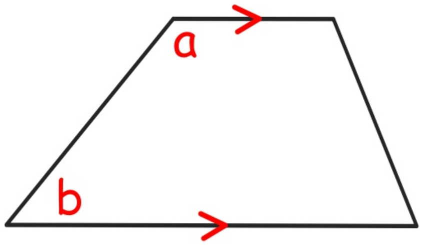
$108° \div 2 = 54°$

interior angle $54° \times 2 = 108°$



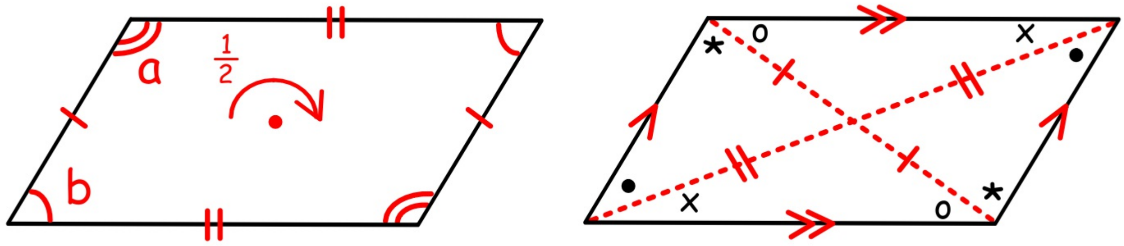
QUADRILATERALS: angle sum 360°

TRAPEZIUM:

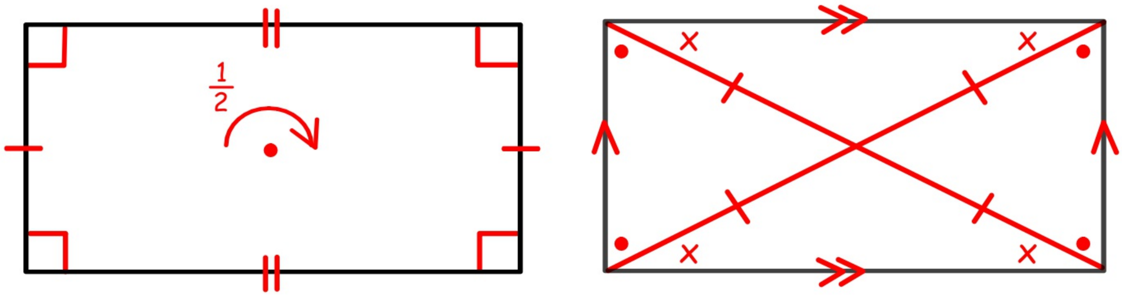


$a + b = 180°$

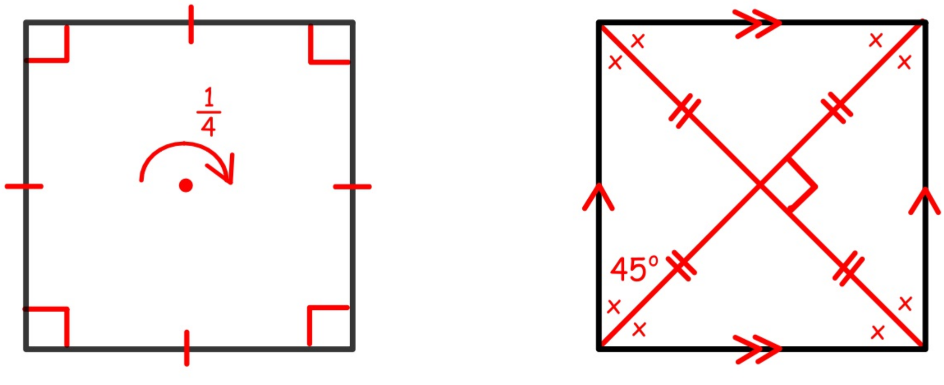
PARALLELOGRAM: a trapezium



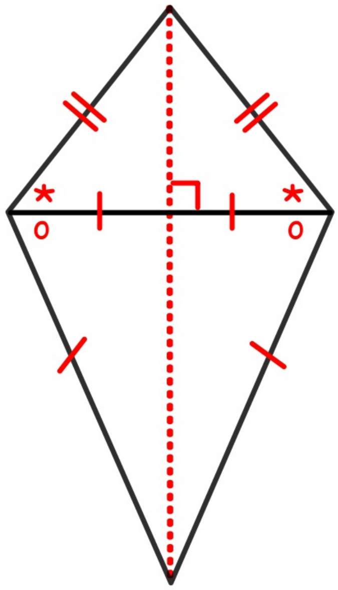
RECTANGLE: a parallelogram

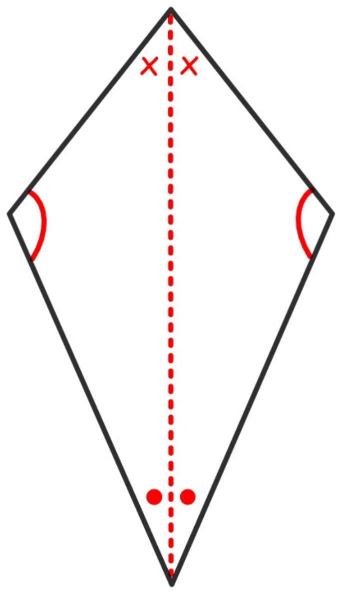


SQUARE: a rectangle

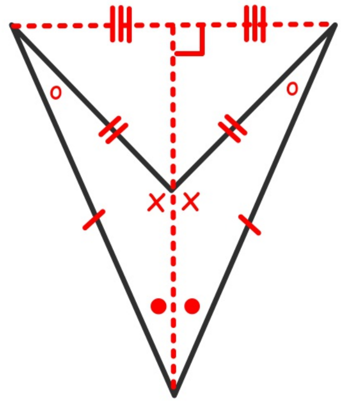


KITE

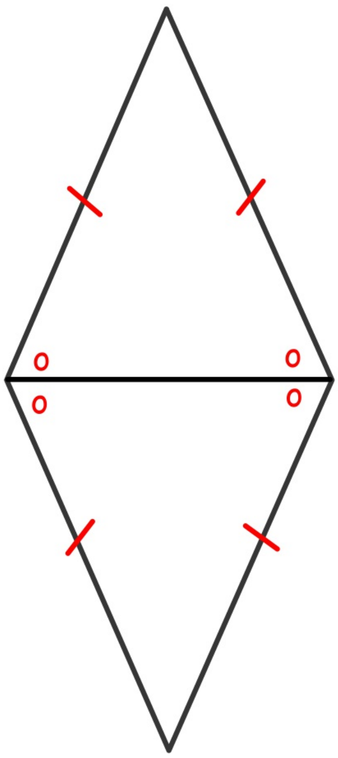


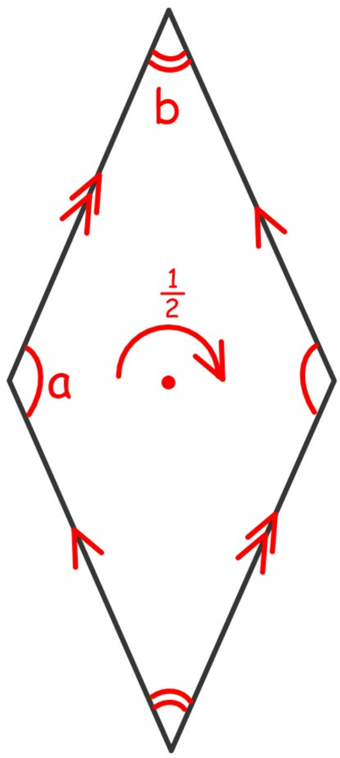


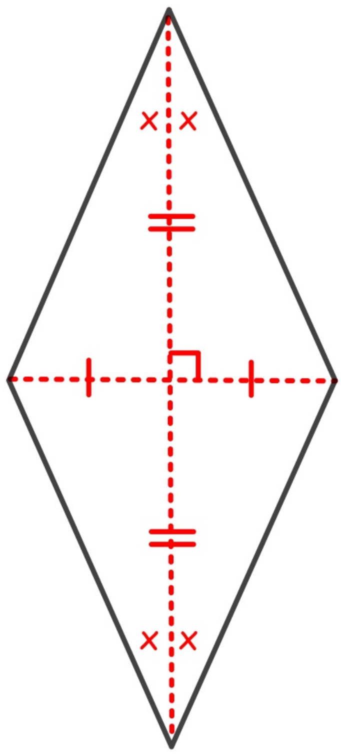
V-KITE



RHOMBUS   a kite and a parallelogram



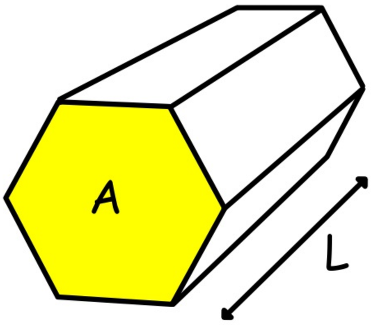




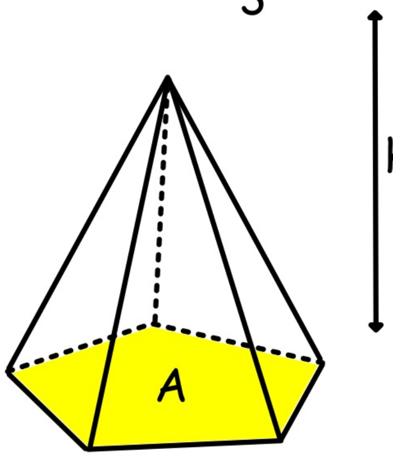
CHAPTER 17: 3D SHAPES

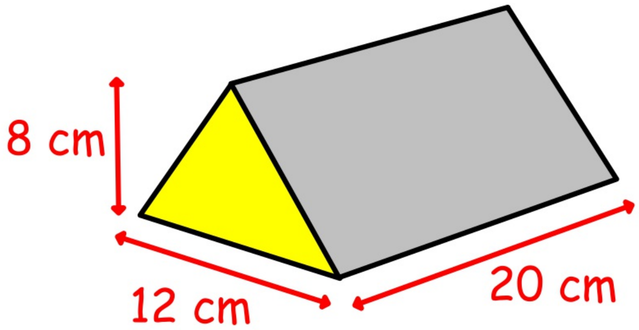
PRISM — A 3D solid which has the same cross-section throughout its length.

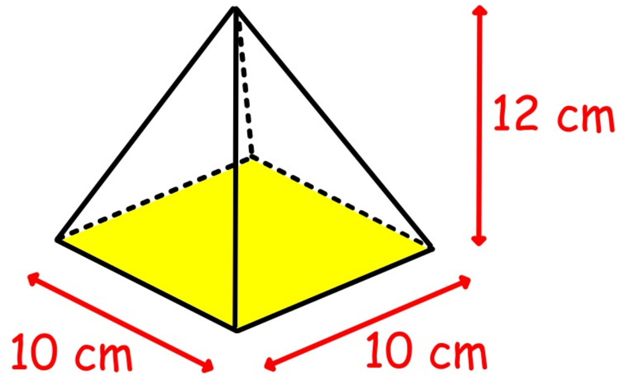
PRISM $V = AL$ (or $V = Ah$)



PYRAMID $V = \frac{1}{3}Ah$







$A = {}^1/_2\,bh$

$= 12 \times 8 \div 2$

$= 48\ cm^2$

$V = AL$

$= 48 \times 20$

$= 960\ cm^3$

$A = lb$

$= 10 \times 10$

$= 100\ cm^2$

$V = \frac{1}{3}Ah$

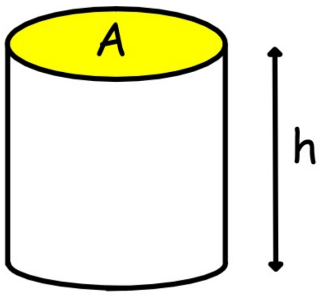
$= 100 \times 12 \div 3$

$= 400\ cm^3$

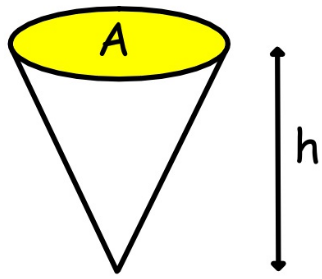
CYLINDER and CONE

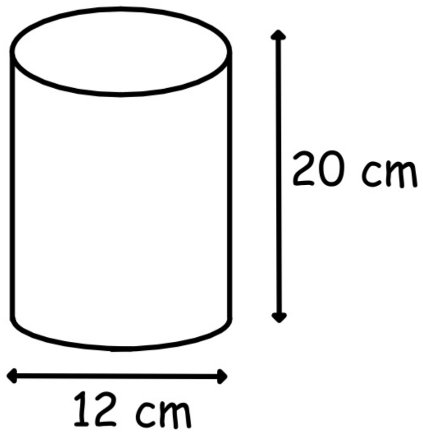
$V = Ah$ and $A = \pi r^2$

$$V = \pi r^2 h$$



$$V = \frac{1}{3}\pi r^2 h$$



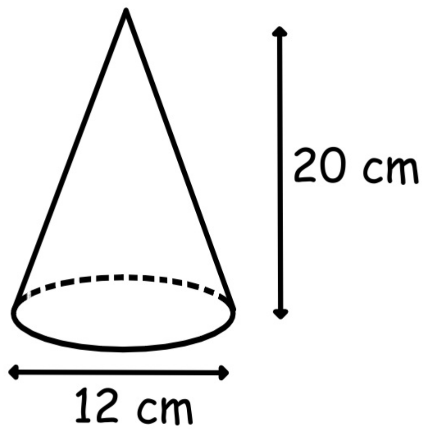


$V = \pi r^2 h$

$= \pi \times 6 \times 6 \times 20$

$= 2261.946...$

$\approx \underline{\underline{2260 \text{ cm}^3}}$



$V = \frac{1}{3}\pi r^2 h$

$= \pi \times 6 \times 6 \times 20 \div 3$

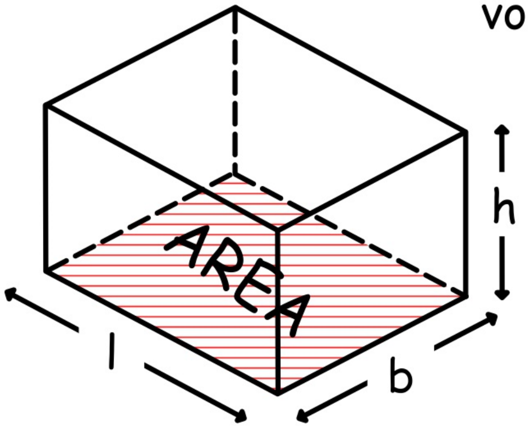
$= 753.982...$

$= \underline{\underline{754 \text{ cm}^3}}$

CUBOID

volume = length × breadth × height

volume = area of base × height

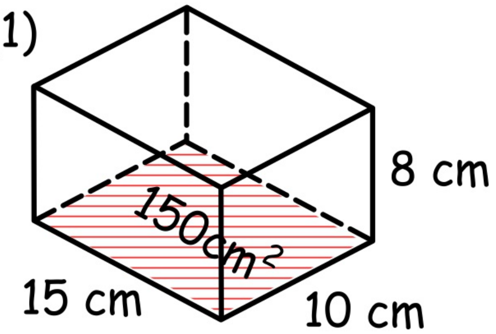


1000 cm³ = 1 litre

1000 ml = 1 litre

1 ml = 1 cm³

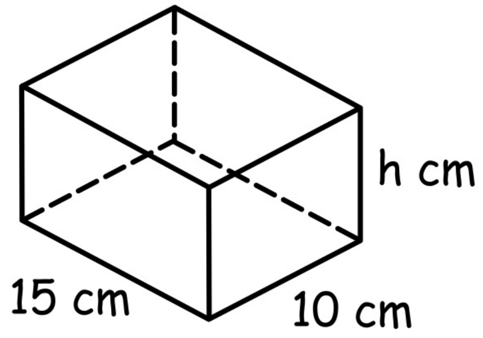
(1)



V = lbh
= 15 × 10 × 8
= 1200 cm³
= 1.2 litres

V = Ah
= 150 × 8
= 1200 cm³

(2) volume 1.2 litres



V = lbh

1200 = 15 × 10 × h

1200 = 150 × h

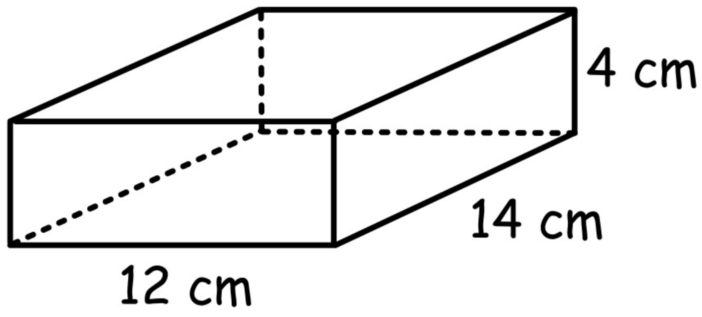
h = 1200 ÷ 150

h = 8

SKELETON MODEL

shows edges - 'hidden' edges dotted.

cuboid

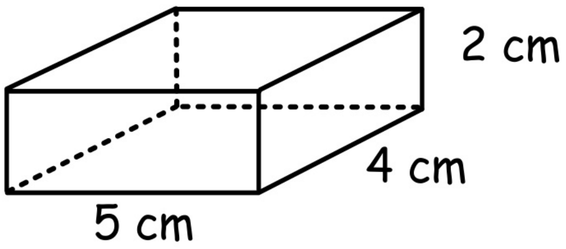


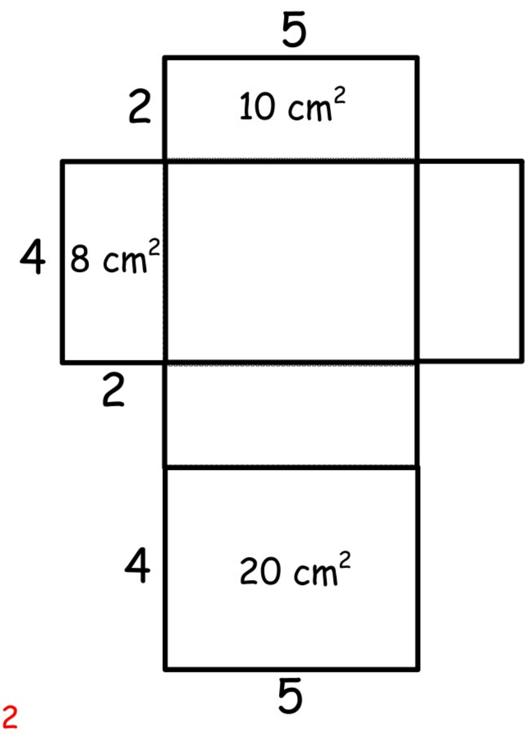
total length of edge:

$$\begin{array}{r} 12 \\ 14 \\ +\ 4 \\ \hline 30 \end{array} \times 4 = \underline{\underline{120\ cm}}$$

NET flattened out solid, showing the connected faces.

cuboid





total surface area:

$5 \times 4 = 20\ cm^2$

$5 \times 2 = 10\ cm^2$

$4 \times 2 = 8\ cm^2$

$38\ cm^2 \times 2 = \underline{\underline{76\ cm^2}}$

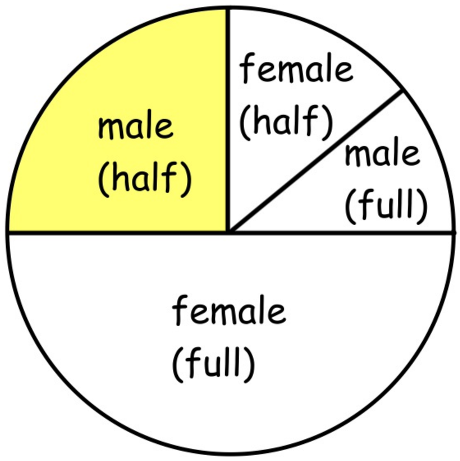
CHAPTER 18: INFORMATION HANDLING 2

CONTINUOUS DATA can take any value
DISCRETE DATA takes particular values

STATISTICAL DIAGRAMS

read information , make comparisons , identify trends

1800 tickets sold.



male(half)

$^{90}/_{360} \times 1800 = 450$ tickets

Month	Jan	Feb	Mar	April	May
Sales (£1000s)	20	40	30	10	20

PIE CHART

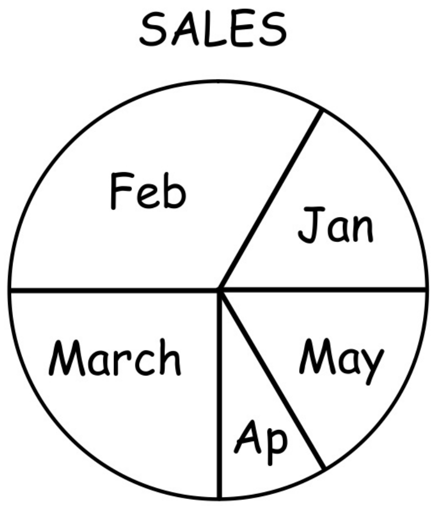
TOTAL SALES = 120

Jan,May $\frac{20}{120} \times 360° = 60°$

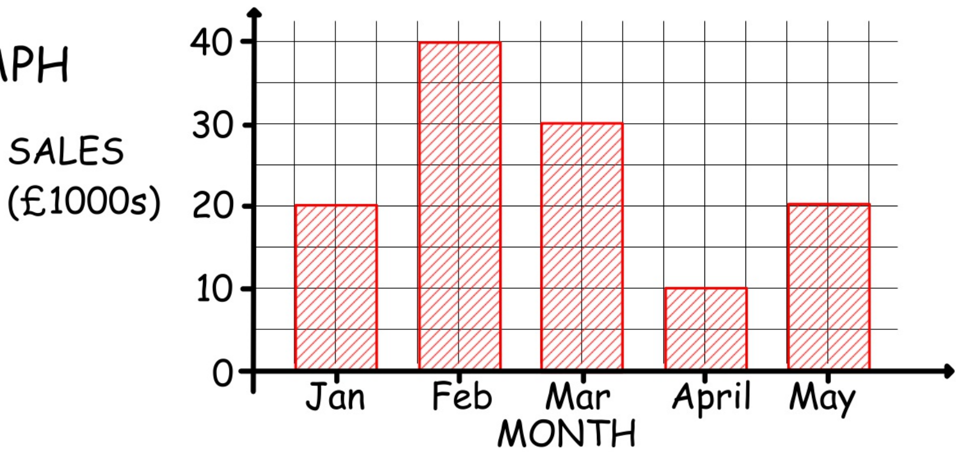
Feb $\frac{40}{120} \times 360° = 120°$

March $\frac{30}{120} \times 360° = 90°$

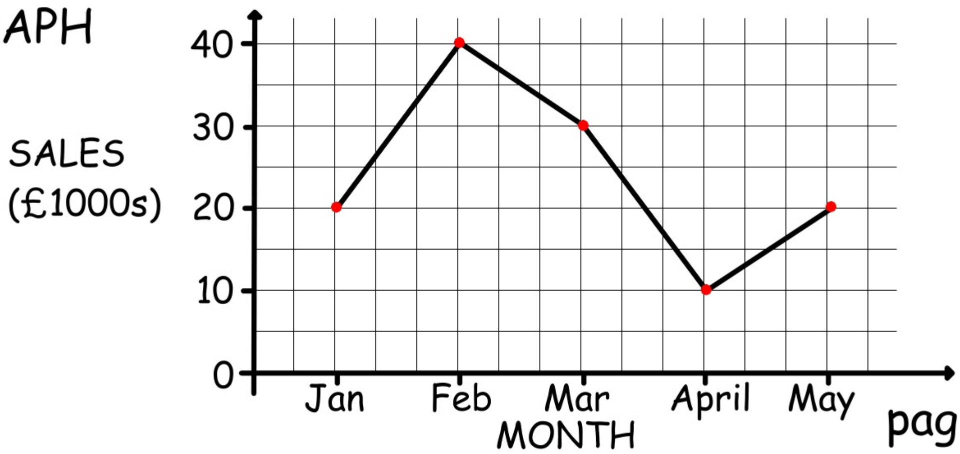
April $\frac{10}{120} \times 360° = 30°$



BAR GRAPH



LINE GRAPH



STEM-AND-LEAF DIAGRAM

Prepare unordered first

5.6 , 3.9 , 6.4 , 4.5 , 3.8 , 5.3 , 6.7 , 3.9 , 5.5 , 4.8 ,
5.0 , 5.8 , 6.2 , 4.2 , 6.1 , 5.3 , 4.9 , 7.3 , 4.4

unordered

3	9 8 9
4	5 8 2 9 4
5	6 3 5 0 8 3
6	4 7 2 1
7	3

ordered

3	8 9 9
4	2 4 5 8 9
5	0 3 3 5 6 8
6	1 2 4 7
7	3

n = 19   3|8 = 3.8

BACK-TO-BACK STEM-AND-LEAF

boys

15 15 21 22 23
25 26 31 33 34
37 39 41 46 46

girls

11 19 22 25 25
29 31 34 36 38
40 46 49 50 50

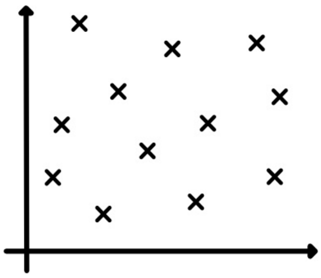
boys		girls
5 5	1	1 9
6 5 3 2 1	2	2 5 5 9
9 7 4 3 1	3	1 4 6 8
6 6 1	4	0 6 9
	5	0 0

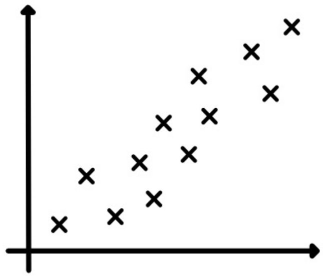
n = 15   n = 15

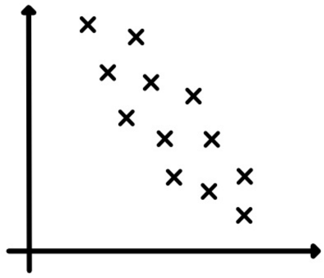
1|9 = 19

SCATTER DIAGRAMS

If the points plotted lie along a line there is a relationship between the quantities.







PROBABILITY

$$P(A) = \frac{\text{number of outcomes involving } A}{\text{number of outcomes possible}}$$

P = 0 impossible P = 1 certain

Expected outcomes = P(A) x number of trials

(1) roll two dice , score a total of five.

36 outcomes possible:

(1,1) (1,2) (1,3) ...... (1,6)
(2,1) (2,2) (2,3) ...... (2,6)
. . . .
. . . .
(6,1) (6,2) (6,3) ...... (6,6)

4 outcomes total five:

(1,4) (2,3) (3,2) (4,1)

$$P(\text{five}) = \frac{4}{36} = \frac{1}{9}$$

(2) Roll the two dice 18 times. How many fives expected ?

number of fives = $^1/_9 \times 18 = 2$