

Hands-on: Number, shape and transformations



ERA Distributors

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MATHOMAT®
Drawing Template

In conjunction with **2φ Publishers**

Fractions, Decimals and percentages

Fraction	Decimal	Percent
$\frac{1}{2}$	0,5	50%
$\frac{1}{4}$	0,25	25%
$\frac{3}{4}$	0,75	75%
$\frac{1}{10}$	0,1	10%
$\frac{1}{100}$	0,01	1%
$\frac{1}{1\,000}$	0,001	0.1%
$\frac{1}{5}$	0,2	20%
$\frac{2}{5}$	0,4	40%
$\frac{3}{5}$	0,6	60%
$\frac{4}{5}$	0,8	80%
$\frac{1}{3}$	$\approx 0,33$	$33\frac{1}{3}\%$
$\frac{2}{3}$	$\approx 0,67$	$66\frac{2}{3}\%$
$\frac{1}{6}$	$\approx 0,17$	$16\frac{2}{3}\%$

Converting fractions to decimals

$$\frac{7}{25} = 7 \div 25 = 0,28$$

Converting percentages to decimals

$$72\% = \frac{72}{100} = 72 \div 100 = 0,72$$

Rounding decimals

5,3824 \approx 5,382 (to 3 dec. places)
 \approx 5,38 (to 2 dec. places)
 \approx 5,4 (to 1 dec. place)
 \approx 5 (to nearest whole number)

Percentages and money

Discount

7,5% taken off R212

$$\text{Discount} = 0,075 \times 212 = \text{R}15,90$$

$$\begin{aligned} \text{New Price} &= 212 - 15,90 \\ &= \text{R}196,10 \end{aligned}$$

Commission

2% commission on R130 000

$$\begin{aligned} \text{Commission} &= 0,02 \times \text{R}130\,000 \\ &= \text{R}2\,600 \end{aligned}$$

Ratio and proportion

Ratio

$$l = 15 \text{ cm}$$

$$w = 5 \text{ cm}$$



Ratio of width to length

$$\begin{aligned} &= w : l \\ &= 5 : 15 \\ &= 1 : 3 \\ &= \frac{1}{3} \end{aligned}$$

Proportion

Five out of 80 people are left-handed:

$$\begin{aligned} \text{Proportion of left-handed people} \\ &= \frac{5}{80} = \frac{1}{16} = 0,0625 = 6,25\% \end{aligned}$$

Unit cost

$$\begin{aligned} \text{If } 380 \text{ g costs R}11,97, \\ 1 \text{ g costs } \text{R}11,97 \div 380 \\ = 0,0315 \text{ Rand} = 3,15 \text{ cents} \end{aligned}$$

Factors and multiples

Factors of 12: 1, 2, 3, 4, 6, 12

Multiples of 12: 12, 24, 36, 48, ...

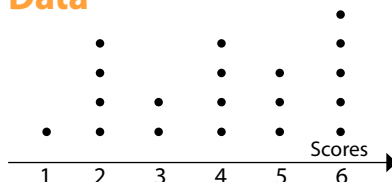
Patterns

3, 5, 7, 9, 11, 13, ...

$$\text{Algebraic rule: } T_n = 2n + 1$$

$$\begin{aligned} \text{Recursive rule: } T_{n+1} &= T_n + 2 \\ \text{and } T_1 &= 3 \end{aligned}$$

Data



Measures of central tendency

$$\text{Mean} = \frac{\text{Sum of scores}}{\text{No. of scores}} = \frac{76}{19} = 4$$

$$\begin{aligned} \text{Median} &= \text{middle score} \\ &= 50\text{th percentile} = 4 \end{aligned}$$

$$\text{Mode} = \text{most frequent score} = 6$$

Measures of dispersion

$$\begin{aligned} \text{Range} &= \text{highest score} - \text{lowest score} \\ &= 6 - 1 = 5 \end{aligned}$$

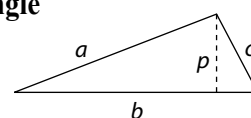
Square

$$\begin{aligned} \text{Perimeter} &= 4s \\ \text{Area} &= s \times s = s^2 \\ s &= \sqrt{\text{Area}} = \text{Perim} \div 4 \end{aligned}$$

Rectangle

$$\begin{aligned} \text{Perimeter} &= 2w + 2l \\ \text{Area} &= l \times w \\ l &= \text{Area} \div w \\ w &= \text{Area} \div l \end{aligned}$$

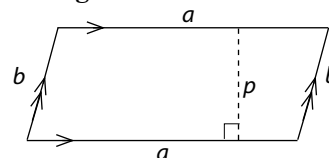
Triangle



$$\text{Perimeter} = a + b + c$$

$$\begin{aligned} \text{Area} &= \frac{1}{2} \times \text{base} \times \text{perp. height} \\ &= \frac{1}{2} bp \end{aligned}$$

Parallelogram



$$\text{Perimeter} = 2a + 2b$$

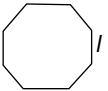
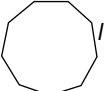
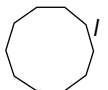
$$\text{Area} = a \times p$$

Circle

$$\begin{aligned} \text{Circumference} &= 2\pi r \\ \text{Area} &= \pi r^2 \\ r &= \text{Circumf.} \div 2\pi \\ r &= \sqrt{(\text{Area} \div \pi)} \end{aligned}$$

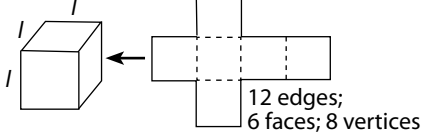
Regular polygons

No. of sides	Polygons	Area	Tessellate
Equilateral Triangle (3)		$0,4330l^2$	✓
Square (4)		l^2	✓
Pentagon (5)		$1,7205l^2$	✗
Hexagon (6)		$2,598l^2$	✓
Heptagon (7)		$3,6339l^2$	✗

No. of sides	Polygons	Area	Tessellate
Octagon (8)		$4,8284l^2$	×
Nonagon (9)		$6,1818l^2$	×
Decagon (10)		$7,6942l^2$	×

3D objects and formulae

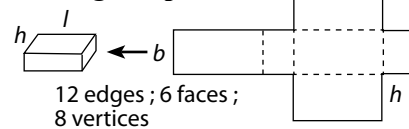
Cube



$$\text{Surface area} = 6l^2$$

$$\text{Volume} = l^3 \quad \text{Will tessellate}$$

Rectangular prism

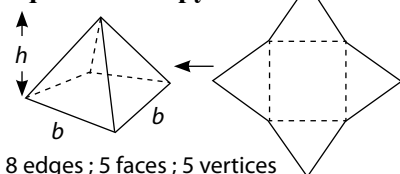


$$\text{Surface area} = 2lb + 2bh + 2lh$$

$$\text{Volume} = l \times b \times h$$

Will tessellate

Square based pyramid



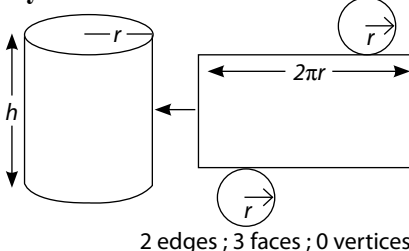
Surface area

$$= b^2 + 2b\sqrt{h^2 + 0.25b^2}$$

$$\text{Volume} = b^2 \times h \div 3$$

Will not tessellate

Cylinder

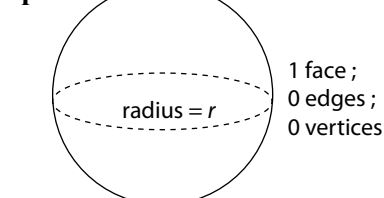


$$\text{Surface area} = 2\pi r^2 + 2\pi rh$$

$$\text{Volume} = \pi r^2 h$$

Will not tessellate

Sphere



$$\text{Surface area} = 4\pi r^2$$

$$\text{Volume} = \frac{4}{3}\pi r^3$$

Will not tessellate

Measurements

Abbreviations

mm	→	millimetres
cm	→	centimetres
m	→	metres
km	→	kilometres
g	→	grams
kg	→	kilograms
ℓ	→	litres

Prefixes

Bigger

hecto	→	100
kilo	→	1 000
mega	→	1 000 000
giga	→	1 000 000 000

Smaller

deci	→	$\frac{1}{10}$
centi	→	$\frac{1}{100}$
milli	→	$\frac{1}{1 000}$
micro	→	$\frac{1}{1 000 000}$
nano	→	$\frac{1}{1 000 000 000}$

Time

1 minute	=	60 seconds
1 hour	=	60 minutes
	=	3 600 seconds
1 day	=	24 hours
	=	1 440 minutes
1 year	=	12 months
	=	52 weeks + 1 day
	=	365 days

Leap years are 2004, 2008, 2012, 2016, 2020, 2024, 2028, 2032, ...

24-Hour Clock

Morning

5.00 a.m.	=	05:00
8.30 a.m.	=	08:30
11.25 a.m.	=	11:25
noon	=	12:00

Afternoon

2.00 p.m.	=	14:00
4.56 p.m.	=	16:56
10.30 p.m.	=	22:30
midnight	=	00:00

Distance and length

10 mm	=	1 cm
1 000 mm	=	1 m
100 cm	=	1 m
1 000 m	=	1 km

Area

$$1 \text{ cm} \times 1 \text{ cm} = 1 \text{ square centimetre} = 1 \text{ cm}^2$$

$$1 \text{ cm}^2 = 10 \times 10 = 100 \text{ mm}^2$$

$$1 \text{ m}^2 = 100 \times 100 = 10 000 \text{ cm}^2$$

$$1 \text{ hectare} = 100 \text{ m} \times 100 \text{ m} = 10 000 \text{ m}^2$$

Volume and capacity

$$1 \text{ cm} \times 1 \text{ cm} \times 1 \text{ cm} = 1 \text{ cubic centimetre} = 1 \text{ c.c.} = 1 \text{ cm}^3 = 1 \text{ millilitre} = 1 \text{ ml}$$

$$1 \text{ litre} = 1 \ell = 1000 \text{ c.c.} = 1000 \text{ ml}$$

Angles

Acute: less than 90°

Right: exactly 90°

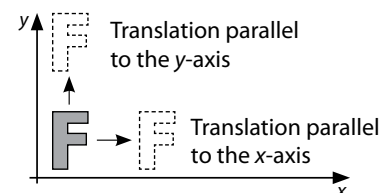
Obtuse: between 90° and 180°

Straight: exactly 180°

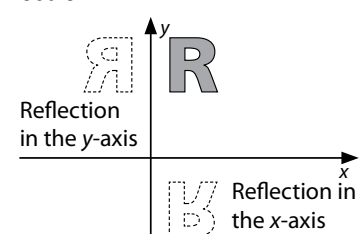
Reflex: between 180° and 360°

Transformations

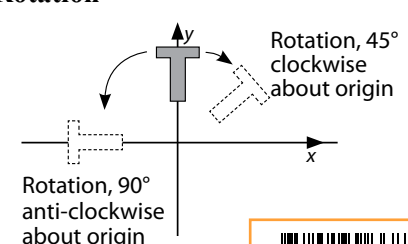
Translation



Reflection



Rotation



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