



SQA
National 4

Applications of Mathematics

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National 4 Applications of Mathematics Textbook

The book forms the basis of a one or two year course following the outcomes for **National 4 Applications of Mathematics** as outlined by Education Scotland and the SQA.

- The book is based around our very successful N4-1 and N4-2 books.
- The assumption is that pupils embarking on this course will have been successful at CfE Second Level and may have completed the **National 3 Applications of Mathematics** course.
- The book covers the three study areas: **Numeracy, Geometry/Measure** and **Finance/Statistics** in that order.
- Each study area ends with a consolidation **Assessment**.
- The book contains a short "**Chapter Zero**", which primarily revises all the relevant strands from CfE Second Level that have been covered in our CfE Books 2a and 2b.
- Each chapter has an "**Assessment**" exercise as a summary.
- There are no A and B exercises. The book covers the entire **National 4 Applications of Mathematics course** without the teacher having to pick and choose which questions to leave out and which exercises are important. They all are!
- Pupils who cope well with the contents of this **National 4 Applications of Mathematics** book should be able to be assessed at various stages throughout the course and be ready to sit a study area or course assessment or an examination.
- **Homework** is available as a photocopiable pack.
- There are two End-of-Course **Added Value Practice Assessments**
- Answers for the Exercise questions can be found at the back of this book. **Answers for the Assessments** can be found at www.hoddergibson.co.uk/answers-teejay-maths-n4-apps

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Note:

Use of calculators throughout book - We have left this as discretionary, but certain exercises are specifically designated as "calculator free", particularly for those pupils being presented for the **Added Value** Assessment.

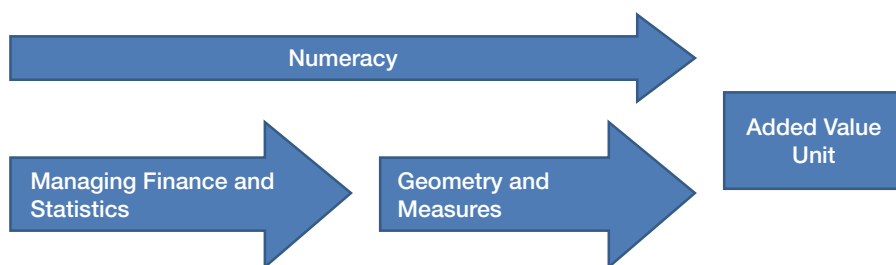
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Sequencing and integration of study areas within the N4 Applications course

According to the official SQA website, sequencing and integration of the delivery and assessment of the study areas within the course is at the discretion of the centre. The examples which follow illustrate possible approaches which may be adopted. Please note that other combinations are also possible.

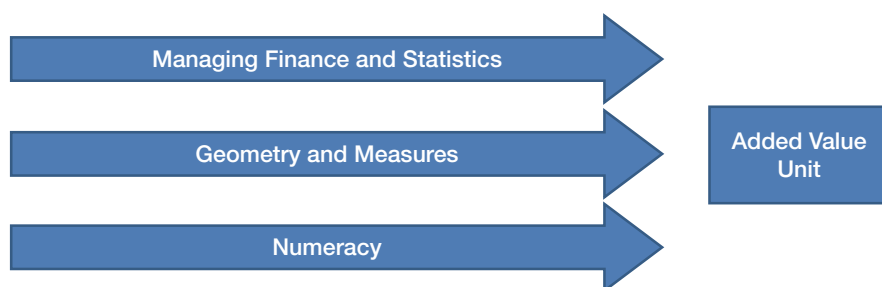
Example 1

This example shows the possibility of delivering Managing Finance and Statistics and Geometry and Measures sequentially, with Numeracy being delivered throughout. This sequence would allow more time for learning and teaching and provide the opportunity to reinforce and consolidate numerical skills through the course. The study areas on Managing Finance and Statistics and on Geometry and Measures can be delivered in any order. Completion of all three study areas would lead on to the assessment of Added Value which draws on the skills, knowledge and understanding from across the course.



Example 2

This example shows the possibility of delivering all three study areas concurrently: Managing Finance and Statistics, Geometry and Measures, and Numeracy. This approach would be particularly useful if Applications of Mathematics is delivered using a range of topics or themes which cut across all three study areas. Completion of all three at the same time would lead to the Added Value Unit which draws on the skills, knowledge and understanding from across the course.



Example 3 (This is how TeeJay has developed, ordered and presented the course)

This example shows the possibility of delivering Numeracy, Managing Finance and Statistics, and Geometry and Measures sequentially. This example could be beneficial for learners needing to reinforce and consolidate their numerical skills at the start of the course. Managing Finance and Statistics and Geometry and Measures can be delivered in any order. Completion of all three would lead on to the Added Value Unit.



Contents

Ch	Topic	Pages	Exercise Content
0	Revision	1-3	Revision (principally CfE Level 2)
NUMERACY			
1	Whole Numbers	4	Rounding to the nearest whole number
		4	Rounding to the nearest 10, 100, or 1000
		5	Significant figures and rounding to estimate
		6	Multiplying and dividing by 10, 100 and 1000
		7	Multiplying and dividing by multiples of 10, 100 and 1000
		8	Numeracy Assessment 1
2	Decimals	9-10	What is a decimal ?
		10-12	Decimal scales
		12-14	Rounding decimals
		14-15	Adding/subtracting decimals
		16-18	Multiplying and dividing decimals by single digit
		18-21	Multiplying/dividing decimals by 10, 100, 1000
		22	Numeracy Assessment 2
3	Percentages	23-24	Percentages → decimals and fractions → percentages
		24-25	Finding a percentage of a quantity with a calculator
		26-28	Percentage rise
		28-30	Percentage fall
		31	Numeracy Assessment 3
4	Fractions	32-34	Simplifying fractions
		34-35	Fractions of a quantity (calculator can be used)
		36-37	Back to percentages - connection to fractions
		37-38	A few more percentages - harder (mental) ones
		39	Numeracy Assessment 4
5	Time/Dist/Speed	40	Converting 24 hour → 12 hour & vice versa
		41	Time intervals and timetables
		42-43	Time, distance, speed - Finding DISTANCE
		43-44	Time, distance, speed - Finding SPEED
		45-46	Time, distance, speed - Finding TIME
		47-48	Time - Distance - Speed - a MIXTURE
		49	Numeracy Assessment 5
6	Area and Perimeter	50-52	Area by counting squares
		53-54	Area of a rectangle - a formula
		55	Perimeter
		56	Measuring lengths and drawing lines
		57-58	Measuring angles
		59	Numeracy Assessment 6
7	Negative Numbers	60-61	Integers in the real world
		62	Studying integers
		63	Adding and subtracting integers
		64	Numeracy Assessment 7

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Ch	Topic	Pages	Exercise Content
8	Ratio & Proportion	65-66 67-68 69-70 71-72 73-74 75	Ratio Simplifying ratios Ratio Calculations Proportion Rates Direct Proportion Numeracy Assessment 8
9	Converting Measure	76-77 78-79 79-80 81	Converting lengths Converting volumes Converting weights Numeracy Assessment 9
10	Volume	82-84 85-86 87 88	Volume by counting cubes The volume of a cuboid (a formula) Capacity Numeracy Assessment 10
11	Graphs, Charts and Tables 1	89-91 92 93-94 94-95 96-97	Interpreting graphs - pictographs, bar & line graphs, pie charts Scattergraphs Stem-and-leaf diagrams Interpreting tables Numeracy Assessment 11
12	Probability	98 99-100 101	Introductory Exercise Probability - some calculations Numeracy Assessment 12
STUDY AREA ASSESSMENT 1		102-104	NUMERACY
GEOMETRY & MEASURE			
13	Gradients	105-109 110	Gradients Geometry Assessment 1
14	Perimeters	111-112 113 114 115-117 118 119	Perimeter of a rectilinear shape The parts of a circle The perimeter of a circle The circumference of a circle (a formula) The perimeter of a compound shape Geometry Assessment 2
15	Area 1	120 121-123 124-125 126-127 128	The area of a rectangle (revision) The area of a right angled triangle The area of any triangle Composite areas Geometry Assessment 3
16	Scale Drawings 1	129-130 131-133 134	Enlargements Scale drawing (basic) Geometry Assessment 4

Ch	Topic	Pages	Exercise Content
17	Area 2	135-136 137-139 140 140-142 143	Area of a parallelogram Area of a kite and a rhombus Squaring a number Area of a circle Geometry Assessment 5
18	Volume	144-145 146 147-148 149-151 152	Volume of a cuboid Liquid volume - capacity Volume of a prism Volume of a cylinder Geometry Assessment 6
19	Pythagoras	153 154-155 155-157 158-159 160-161 162-163 164	Squares and square roots Pythagoras' Theorem (practical) Pythagoras' Theorem - a formula Problems involving Pythagoras' Theorem Finding a "smaller" side Pythagoras' Theorem - a mixture Geometry Assessment 7
20	Time & Timetables	165 166-168 169	12 & 24 hour times Interpreting timetables Measure Assessment 1
21	Rules and Formulae	170-171 172-174 175	Formulae expressed in words Formulae with symbols Measure Assessment 2
22	Scale Drawings 2	176-177 178 179-182 183	Making simple scale drawings The compass rose (revision) Three figure bearings and scale drawings Measure Assessment 3
23	Problem Solving	184-186 187-189 190	Real life problems involving area Real life problems involving volume Measure Assessment 4
24	Tolerance	191-192 193-194 195	Tolerance Using tolerance notation Measure Assessment 5
STUDY AREA ASSESSMENT 2		196-197	GEOMETRY & MEASURE
FINANCE & STATISTICS			
25	Income	198 199 200-201 202 203 204-208 208-210 211	Hourly rate Calculating hourly rate Weekly and monthly pay Wage increase and decrease (percentage work) Commission Overtime pay and bonuses Gross pay, deductions, net pay and payslips Finance Assessment 1

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Ch	Topic	Pages	Exercise Content
26	Foreign Exchange	212-213 214-215 216	Exchanging pounds for foreign currency Exchanging foreign currency for pounds Finance Assessment 2
27	Banking	217-218 219 220 221-222 223	Simple interest Bank cards - debit cards Bank cards - credit cards Borrowing money Finance Assessment 3
28	Comparing Prices	224-225 226-227 228 229	Managing your money - buying goods Managing money - paying for services Managing money - rates or contracts Finance Assessment 4
29	Budgeting	230 231-232 233 234 235	Budgeting Managing a budget - Topic 1 Managing a budget - Topic 2 Managing a budget - Topic 3 Finance Assessment 5
30	Comparing Data Sets	236-237 238-239 240	Averages Compare and contrast Statistics Assessment 1
31	Graphs, Charts and Tables 2	241-245 246-247 248-249 250-251 252-253	Drawing up frequency tables, bar graphs and line graphs Constructing pie-charts Drawing a pie-chart using a protractor Drawing a stem-and-leaf diagram Statistics Assessment 2
32	Scattergraphs	254-255 256-259 260	Drawing scattergraphs Best fitting line Statistics Assessment 3
33	Statistical Chance	261-262 263	Probability in real life Statistics Assessment 4
STUDY AREA ASSESSMENT 3		264-266	FINANCE AND STATISTICS
ADDED VALUE PRACTICE ASSESSMENT			
PRACTICE ASSESSMENT 1		267	Non Calculator
PRACTICE ASSESSMENT 2		268-269	Calculator Allowed
ANSWERS		270-280	

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Time-Distance-Speed

12 & 24 hour Time

Remember :-

12 hour time → 24 hour time

24 hour time → 12 hour time



Example :-

7:15 am → 0715

8:50 pm → 2050

Exercise 1

1. Change the following 12 hour clock times to **24 hour clock times** :-

a 1:30 am

b 4:45 am

c 6 am

d 7:30 pm

e 2:15 pm

f 3 pm

g 6:15 am

h 8:20 am

i 2:10 am

j 7:50 am

k midday

l 12:45 am

m 12:45 pm

n 9:15 pm

o 3:25 am

p 8:20 pm

q 11:55 pm

r 9:55 am

s 10:20 pm

t 11:34 am

u 8:47 pm.



0830 → 8:30 am

2040 → 8:40 pm



2. Change the following 24 hour clock times to **12 hour clock times** :-

a 0140

b 1110

c 0925

d 1430

e 1740

f 2315

g 0245

h 1915

i 1310

j 1903

k 1200

l 0630

m 0525

n 1520

o 2355

p 1935

q 0020

r 0758

s 1147

t 2030

u 2155.

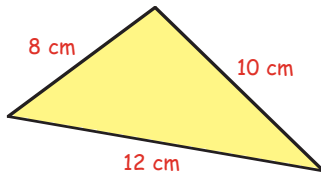


Perimeters

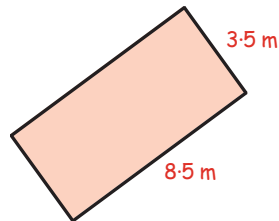
Geometry Assessment 2

1. Calculate the perimeter of each of these shapes :-

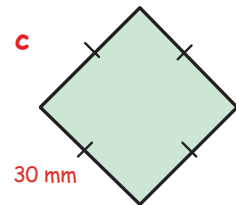
a



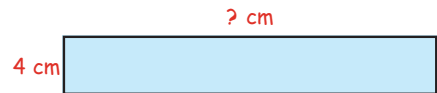
b



c



2. The perimeter of this rectangle is 62 cm.
Calculate the missing side of the rectangle.



3. The diameter of the lid of this wooden barrel is 31 cm.
What is its radius ?

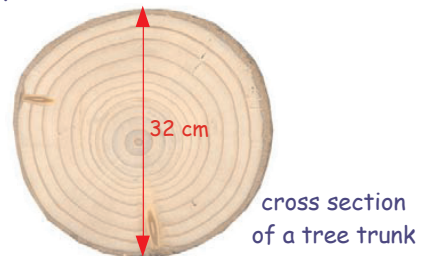


4. Calculate the circumference of each of these :-

a



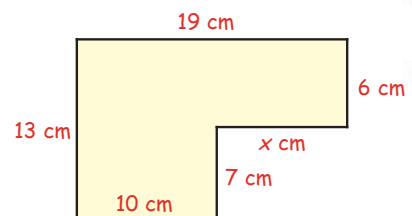
b



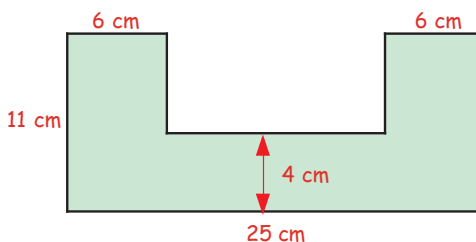
5. a Calculate the circumference of this bicycle wheel.
b How far will the bike travel if the wheel rotates 50 times ?
(Answer in metres).



6. a Calculate the length of the side marked x.
b Now calculate the perimeter of the whole shape.



7.



Calculate the perimeter of this shape.

Study Area Assessment

Numeracy

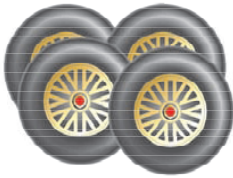
Assessment Tasks

1. I bought a guitar in 2010 for £320.
I sold it in 2014 for 25% less than this.
How much did I sell the guitar for ?



(2)

2.



Mr Jenkins owns a tyre store.
The tyres cost him £48.75 each.
How many tyres can he buy if he has £1000 ?

(2)

3. Copy and complete the bus timetable shown.

Bus	Depart	Arrive	Journey Time
Ayr to Dundee	1800	2 hrs 20 mins
Skye to Aberdeen	1130	4 hrs 50 mins

(2)

4. Max drives from London to Glasgow, a distance of 420 miles.
If his average speed is 60 miles per hour, how long will his journey take if he makes no stops ?



(2)

5.



A chemical freezer unit was switched on at noon.
The temperature in the unit was 8°C .
By midnight the unit measured -47°C .
By how many degrees had the temperature fallen ?

(1)

6. a A factory makes a tropical juice mix and uses orange and pineapple juice in a ratio of 5 : 3.
If the factory has 850 litres of orange, how many litres of pineapple will it need ?



(2)

- b The factory has orders for 1500 litres of tropical juice mix.
Does the factory have enough juice mix to fulfil this order ?
Give a reason for your answer.

(2)

Added Value

Practice Assessment 1

20 minutes



Marks

1. At his local Chinese restaurant, Joseph ordered Chicken Noodle Soup at £3.50, Sweet and Sour Chicken at £7.70 and a portion of Egg Fried Rice. When he paid his bill with a £10 and a £5 note he got £1.05 change. How much was it for the Egg Fried Rice ?



2. A model of a cruise ship is 8.5 centimetres long. The model was made using a scale of $1 \text{ cm} = 30 \text{ metres}$. What is the length of the real cruise ship ?



3. Eve laid out ten glasses, each with the same amount of water in them. She poured in the following quantities of diluting orange juice :-

50 ml, 43 ml, 55 ml, 46 ml, 40 ml, 57 ml, 54 ml, 48 ml, 60 ml, 56 ml.

She then threw out the one with least amount of orange for being too watery and also the one with the greatest amount for being too strong.

The eight quantities left were all acceptable.



- a From these eight drinks, write down the minimum and the maximum amount of diluting orange juice preferred. (1)
- b Write the desired amount of orange juice in tolerance form ($\dots \pm \dots$) ml. (2)

4. Mr Preston is considering taking out a £10 000 loan with *Jules Bank* to buy a car. With *Jules Bank's* 2% per annum interest rate, he would owe £10 200 after 1 year. The garage he is buying the car from is offering him the same car for £9800 if he takes on their interest rate of 5% per annum. Which option should Mr Preston take ? (Give a reason for your answer)



5. A survey was carried out looking into how long it took seven television companies to answer telephone calls regarding technical faults in their system. The results, in minutes, are shown below.

13 10 18 8 15 9 11

- a Calculate the mean number of minutes taken. (3)
- b How many companies took longer than the mean time ? (1)

