OXFORD

SCHOOL Improvement

CAPS

PLANNER & TRACKER

Mathematics

Grade 9

- *Progress tracker*
- *Intervention strategies*
- *Worksheets and exam papers*
- *Assessment support*
- *Key vocabulary*

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The worksheets in this Teacher's Resource Book were compiled for use with the *Oxford Successful Mathematics* Grade 9 Learner's Book. The worksheets were adapted from the *Oxford Let's Practise Mathematics* Grade 9 Practice Book.

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(The page numbers in brackets refer to the *Oxford Successful Mathematics* Grade 9 Learner's Book.)

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TERM 1

Progress tracker for Oxford Successful Mathematics Grade 9

Week	Contents and concepts (based on 2023/24 ATPs)	Worksheet name and page number	Learner's Book chapter and page reference	Planned time allocation	Date of completion	Teacher reflection
1–2	**Whole numbers** • Properties of numbers • Multiples and factors • Solving problems	**Worksheet:** Properties, multiples, factors and calculations with whole numbers (p. 8)	Chapter 1 LB: pp. 12–25	8,5 hours		
3–4	**Integers** • Calculations with integers • Properties of integers	**Worksheet:** Integers, properties and calculations (p. 9)	Chapter 1 LB: pp. 12–21	9 hours		
5	**Formal assessment task**			2 hours		
6–7	**Exponents** • Calculations using numbers in exponential form	**Worksheet:** Laws of exponents; calculations (p. 10)	Chapter 3 LB: pp. 96–107	9 hours		
8–9	**Numeric and geometric patterns** • Investigate and extend patterns	**Worksheet:** Consecutive terms in a sequence (p. 11)	Chapter 4 LB: pp. 118–122	9 hours		
10	**Revision**			4,5 hours OR 2,5 hours		
11	**Assessment**			2,5 hours OR 4,5 hours		

TERM 2

Progress tracker for Oxford Successful Mathematics Grade 9

Week	Contents and concepts (based on 2023/24 ATPs)	Worksheet name and page number	Learner's Book chapter and page reference	Planned time allocation	Date of completion	Teacher reflection
1–5	**Algebraic expressions** • Algebraic language • Expand and simplify algebraic expressions • Factorise algebraic expressions	**Worksheet:** Simplify more complex algebraic expressions (p. 12)	Chapter 5 LB: pp. 146–155	13,5 hours		
6–7	**Algebraic equations** • Revision • Solve equations	**Worksheet:** Solving equations by factorising (p. 13)	Chapter 10 LB: pp. 287–289	9 hours		
8	**Functions and relationships** • Input and output values • Equivalent forms	**Worksheet:** Input values; output values (p. 16)	Chapter 9 LB: pp. 253–256	4,5 hours		
9	**Revision**			4,5 hours		
10–11	**Assessment**			8 hours		

TERM 3

Progress tracker for Oxford Successful Mathematics Grade 9

Week	Contents and concepts (based on 2023/24 ATPs)	Worksheet name and page number	Learner's Book chapter and page reference	Planned time allocation	Date of completion	Teacher reflection
1–3	**Graphs** • Interpreting graphs • Drawing graphs (Take time to allocate and explain the formal assessment task: Project)	**Worksheet:** Drawing linear graphs using equations (p. 15)	Chapter 11 LB: pp. 306–313	9 hours		
3–5	**Geometry of straight lines** • Angle relationships • Solving problems	**Worksheet:** Perpendicular and intersecting lines (p. 16)	Chapter 7 LB: pp. 209–212	9 hours		
6–9	**Geometry of 2D shapes and construction of geometric figures** • Classifying 2D shapes (triangles) • Constructions (triangles) • Classifying 2D shapes (quadrilaterals) • Constructions (quadrilaterals) • Similar and congruent triangles • Constructions (congruent triangles) • Solving problems (triangles and quadrilaterals)	**Worksheet:** Bisecting angles of a triangle; constructing special angles (p. 17)	Chapter 6 LB: pp. 167–174	15 hours		
10	**Revision**			4.5 hours		
11	**Assessment**			4 hours		

TERM 4

Progress tracker for Oxford Successful Mathematics Grade 9

Week	Contents and concepts (based on 2023/24 ATPs)	Worksheet name and page number	Learner's Book chapter and page reference	Planned time allocation	Date of completion	Teacher reflection
1–2	**Transformation geometry** • Transformations	**Worksheet:** Mixed transformations (p. 18)	Chapter 13 LB: pp. 345–361	7 hours		
3–4	**Area and perimeter of 2D shapes** • Perimeter and area of polygons and circles	**Worksheet:** Perimeter and area of 2D shapes (p. 19)	Chapter 8 LB: pp. 246–248	9 hours		
5–6	**Surface area and volume of 3D objects** • Surface area, volume and capacity of rectangular prisms, triangular prisms and cylinders	**Worksheet:** Surface area, volume and capacity (p. 20)	Chapter 12 LB: pp. 323–328	9 hours		
7	**Revision**			4,5 hours		
8–10	**Assessment**			12,5 hours		

Properties, multiples, factors and calculations with whole numbers

Learner's Book pages 12–25

1. Explain the difference between the following concepts.

a) Natural numbers ($\mathbb{N}$) and whole numbers ($\mathbb{N}_0$)

b) Prime numbers and composite numbers

2. Find the factors of 110 and write down the following.

a) The largest odd number

b) Pairs of consecutive numbers

c) The largest prime number

d) The smallest composite number

e) The largest multiple of 5

3. Use prime factorisation to find the LCM and HCF of 36 and 63.

4. If x and y are two whole numbers explain the condition under which:

a) $x - y$ will be a whole number

b) $x \div y$ will be a whole number

5. Write down open number sentences that reflect:

a) Properties of 0

b) Properties of 1

Tip

An open number sentence contains at least one variable.

6. Calculate without using a calculator.

a) 135 246 087
$-$ 46 578 189

b) 12 345 679
$\times$ 36

c) $18 \overline{)\,222\,222\,222}$

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Integers: properties and calculations

Learner's Book pages 12–21

1. Write down the set of integers ($\mathbb{Z}$).

> **Tip**
> If $x > 0$ and $y > 0$ then $x \times y = +xy$;
> $x \times -y = -xy$; $-x \times y = -xy$; $-x \times -y = +xy$

2. Calculate without using a calculator.

a) $27 + (+19)$ **b)** $27 + (-19)$

c) $27 - (+19)$ **d)** $27 - (-19)$

e) $-27 + (+19)$ **f)** $-27 + (-19)$

g) $-27 - (+19)$ **h)** $-27 - (-19)$

3. Calculate without using a calculator.

a) 24×6 **b)** 24×-6

c) $24 \div 6$ **d)** $24 \div -6$

e) -24×6 **f)** -24×-6

g) $-24 \div 6$ **h)** $-24 \div -6$

4. Fill in $<$, $=$ or $>$.

a) 7×-8 ☐ -8×7 **b)** $-9 \div -3$ ☐ $-3 \div -9$

c) $(6 \times -3) \times -2$ ☐ $6 \times (-3 \times -2)$ **d)** $(12 \div -6) \div -2$ ☐ $12 \div (-6 \div -2)$

5. Calculate without using a calculator.

a) $(-12)^2$ **b)** -12^2

c) -5^3 **d)** $(-5)^3$

e) $(16 + 9)^2$ **f)** $(-16 + 9)^3$

g) $(7x^2y)^2$ **h)** $(-5p^2q^5)^3$

i) $(-6a^3b^7)^2$ **j)** $(4m^6n^4)^3$

k) $\sqrt{64}$ **l)** $\sqrt[3]{64}$

m) $\sqrt{4^2 + 3^2}$ **n)** $\sqrt[3]{6^3 - 4^3 - 3^3}$

o) $\sqrt{a^6b^{12}}$ **p)** $\sqrt[3]{a^6b^{12}}$

q) $\sqrt{144m^{18}n^{24}}$ **r)** $\sqrt[3]{216x^{18}y^{24}}$

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Laws of exponents; calculations

Learner's Book pages 96–107

1. Simplify the following expressions. Write all answers with positive exponents.

a) $x^4 \times x^3$ **b)** $x^4 \div x^3$ **c)** x^0

d) $y^2 \times y^5$ **e)** $y^2 \div y^5$ **f)** y^{-3}

g) $a^{-7} \times a^3$ **h)** $\frac{b^3}{b^{-3}}$ **i)** $(2x)^3$

j) $\frac{1}{a^{-7} \times a^3}$ **k)** $\frac{3^0 a^4 b^5}{a^5 b^6}$ **l)** $((x^2)^3)^2$

m) $\frac{(3x)^5}{(3x)^3}$ **n)** $(3^0 x^2 y)^4$ **o)** $\frac{26m^2n^3}{13mn}$

2. Simplify the following expressions. Write all answers with positive exponents.

a) $x^5y^9x^6y^{-8}$

b) $\left[(xy^2z^3)^2\right]^3$

c) $\frac{x^5y^9}{x^6y^8}$

d) $\frac{-24x^5}{16x^4}$

e) $(2s)^4.(-7s^2)^2$

f) $\frac{y^2y^{-3}y^4}{y^{-2}}$

g) $\frac{-5a^3}{2a.5a^4}$

h) $a^4b^3c^2 \times a^{-2}b^4c^{-6}$

i) $(ab)^2(a^2b)$

j) $\frac{y^4z^{-9}}{x^5y^{-7}}$

k) $\frac{6x^3y^4 \times -2x^2y}{xy^3 \times 4x^3}$

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Consecutive terms in a sequence

Learner's Book pages 118–122

Examples

Describe the relationship between the consecutive terms in the following number sequences.

1. $-1; -1{,}5; -2; -2{,}5; \ldots$ (To get the next term, add $-0{,}5$ to the previous term.)
2. $2; -1; 0{,}5; -0{,}25; 0{,}125; \ldots$ (To get the next term, multiply the previous term by $-\frac{1}{2}$.)
3. $1; 0; -2; -5; -9; -14; \ldots$ (To get the next term, subtract 1 more than was subtracted to get the previous term.)

1. Describe the relationship between consecutive terms in the following number sequences and use your answer to extend each pattern to 10 terms.

a) 1; 5; 9; 13; 17

b) 5; 10; 20; 40; 80

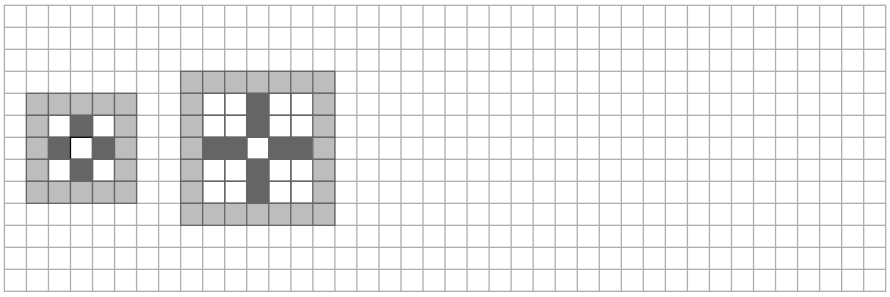
c) 1; 4; 9; 16; 25

d) 2; 5; 10; 17; 26

e) 0; 3; 8; 15; 24

f) 2; 8; 18; 32; 50

2. Look at the two arrangements of squares below.



Tip

The relationship between consecutive terms of a number sequence is shown by the pattern of that sequence.

a) Draw the next two arrangements of squares on the grid.

b) Write down the number sequence show by the following numbers of squares.

Black ____ White ____ Grey ____

c) Describe the relationship between consecutive terms in each of the three sequences.

Black squares

White squares

Grey squares

d) For each sequence, write down the term that can be obtained from the fifth arrangement of squares. Explain each answer.

Black squares

White squares

Grey squares

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Simplify more complex algebraic expressions

Learner's Book pages 146–155

Remember

* $(a + b)(c + d) = ac + ad + bc + bd$
* $(a + b)^2 = a^2 + 2ab + b^2$
* $(a - b)^2 = a^2 - 2ab + b^2$
* $(a + b)(a - b) = a^2 - b^2$

1. Simplify the following.

a) $(x + 2)(x - 3)$

b) $(x + 2)(x - 2)$

c) $(x - 3)^2$

d) $3(2x - 3y)(3x + 4y)$

e) $4(10 - 6t)(10 + 6t)$

f) $-6(ab + c)^2$

g) $2x(4x^2 - 6)(3x^2 + 2)$

h) $-4p(5p - 3)(3 + 5p)$

i) $2y(3y - 10)^2$

j) $(x + 2)^2 - (x - 2)^2$

k) $(y - 5)^2 + (y + 5)^2$

l) $(z - 2)(z + 2)(z^2 + 4)$

2. Simplify the following.

a) $x(2x - 4) - 3(x^2 - 2x)$

b) $a^2(5a - 2) - a(a^2 + 3a) + 6a$

c) $2(x - 3)^2 - 3(x + 1)(2x - 5)$

d) $3(x^3 + 2x^2 - x) - x^2(3x + 1)$

e) $\frac{6x^4 - 8x^3 - 2x^2 + 4}{2x^2}$

f) $\frac{8x^3 - (-x^3)(2x)}{-x^2}$

g) $\frac{7a}{10} + \frac{a}{2} - \frac{4a}{5}$

h) $\frac{2x}{3} - \frac{4x - 1}{5} - \frac{x}{15}$

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Solving equations by factorising

Learner's Book pages 287–289

1. Calculate the value of x that makes the following equations true.

a) $x(x - 7) = 0$

b) $3x(4x - 1) = 0$

c) $(2x - 8)(x + 5) = 0$

d) $(9 - x)(x - 11) = 0$

e) $(3x + 8)(3x - 8) = 0$

f) $(7 - 8x)(7 - 8x) = 0$

2. Solve for x.

a) $x^2 - 49 = 0$

b) $3x^2 + 4x = 0$

c) $3x^2 - 108 = 0$

d) $x^2 = 121$

e) $6x^2 + 18x = 0$

f) $6x^3 - 150x = 0$

g) $x^3 = 16x$

h) $3x^2 - 18x = 0$

i) $7x^2 = 5x$

3. The equation $y = x^2 - 9$ is given. Complete the table alongside for y.

x	−5	−4	−3	−1	0	1	2	3	5
y									

4. Use your completed table in question 3 to write down the solutions to:

a) $x^2 - 9 = 0$

b) $x^2 - 9 = -9$

c) $x^2 - 9 = -8$

d) $x^2 - 9 = 16$

e) $x^2 - 9 = -5$

f) $x^2 - 9 = 7$

5. Solve the following equations for x.

a) $2x^2 - 8 = 10$

b) $2x^2 - 8 = -8$

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Input values; output values

Learner's Book pages 253–256

1. Use these flow diagrams to find the output values if the input values are -1; 3; 5.

a) $x \rightarrow \times 3 \rightarrow +2 \rightarrow y$

b) $x \rightarrow \times -5 \rightarrow -2 \rightarrow y$

c) $x \rightarrow +3 \rightarrow \times 2 \rightarrow y$

d) $x \rightarrow -5 \rightarrow \times 2 \rightarrow y$

e) $x \rightarrow \div 4 \rightarrow y$

f) $x \rightarrow \times -\frac{1}{5} \rightarrow y$

2. Use these equations to find the output values if the input values are -2; 0; 4.

a) $y = 2x + 5$

b) $y = x^2 + 2$

c) $y = 3x - 2$

d) $y = \frac{1}{2}x - 8$

e) $y = (x + 1)^2$

f) $y = 2^x$

3. Use these equations to find the input values (x) if the output values are 15; 24; 33; 63.

a) $y = 3x$

b) $y = x - 11$

c) $y = 2x - 24$

d) $y = \frac{1}{2}(x + 1)$

4. Find the missing input and/or output values in each of these tables.

a)

Input	1	2	3	4	5	6	7	8	9	10
Output	0	3	6						24	

b)

Input	1	2	3		8		13	15		20
Output	2	4		12		22	26		36	

c)

Input	−1	0	1	2	3	4		6	7	
Output			2	4		16	32			256

d)

Input	1	2	3	4	5				12	15
Output	1	4	9			36	81	121		

5. Find the missing values in each of the following cases.

a) A notebook costs R7. Use a reverse flow diagram or formula to find out how many notebooks Mary bought if she paid: R56; R84; R175.

b) How much did Mary pay for 9; 15; 30 notebooks if one book costs R8,50?

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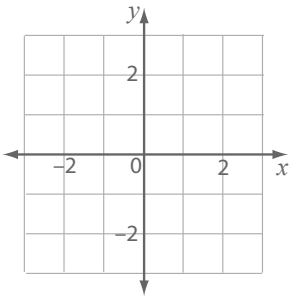
Drawing linear graphs using equations

Learner's Book pages 306–313

1. **a)** Complete the table for $y = \frac{1}{2}x - 1$

x	−2	−1	0	1	2
y					



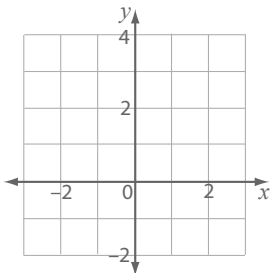
b) Plot the points on the system of axes alongside.

c) Write down the:

x-intercept: ; y-intercept: ; gradient:

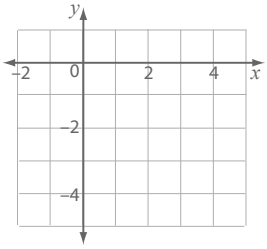
2. Write down the x and y intercepts of the graphs of the equations below and then draw the graphs using only the intercepts.

a) $y = -2x + 3$



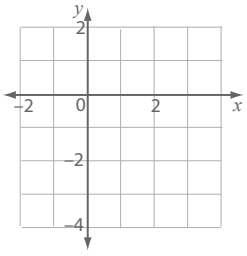
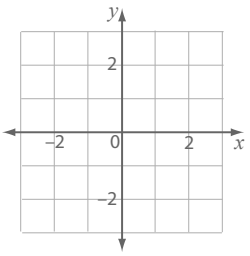
x-intercept: y-intercept:

b) $y = 3x - 5$



x-intercept: y-intercept:

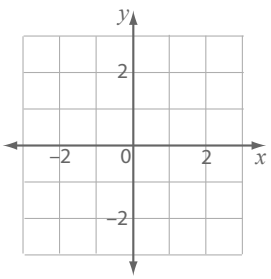
3. For each of the following equations:

	$y = x - 4$	$y = -\frac{1}{2}x + 1$
a) Write down the gradient		
b) Write down the y-intercept		
c) Draw the graph		
d) Use your graph to find y when $x = 2$		

4. Draw and label the following on the same system of axes:

a) $x = 1$ **b)** $y = 2$

c) $y = x$ **d)** $y = -x$



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Perpendicular and intersecting lines

Learner's Book pages 209–212

1. Explain the meaning of the following pairs of angles.

a) Complementary angles

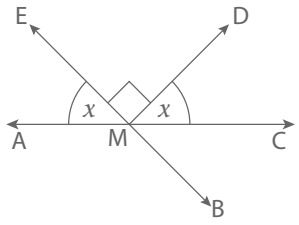
b) Supplementary angles

c) Adjacent angles

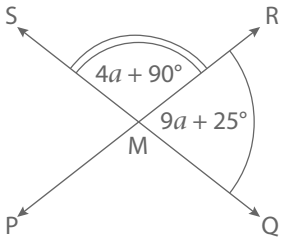
d) Vertically opposite angles

2. Calculate, with reasons, the unknown values in each diagram below.

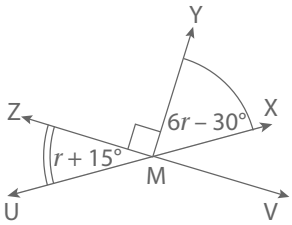
a)



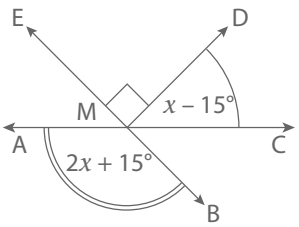
b)



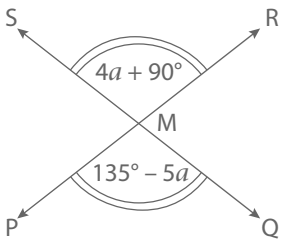
c)



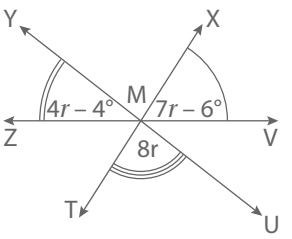
d)



e)



f)



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Bisecting angles of a triangle; constructing special angles

Learner's Book pages 167–174

1. Bisect the interior angles of the following types of triangles.

a) Acute-angled

b) Right-angled

c) Obtuse-angled

d) Equilateral

e) Isosceles

f) Scalene

2. Construct the following pairs of adjacent angles without using a protractor.

a) 60° and 45°

b) 60° and 15°

3. Complete the following construction without using a protractor.

a) Construct $\triangle PQR$ with PQ = 60 mm, $\hat{Q} = 60°$ and QR = 60 mm.

b) Find point S so that $Q\hat{P}S = 105°$ and $Q\hat{R}S = 75°$.

c) Measure the length of PS.

d) Measure the length of RS.

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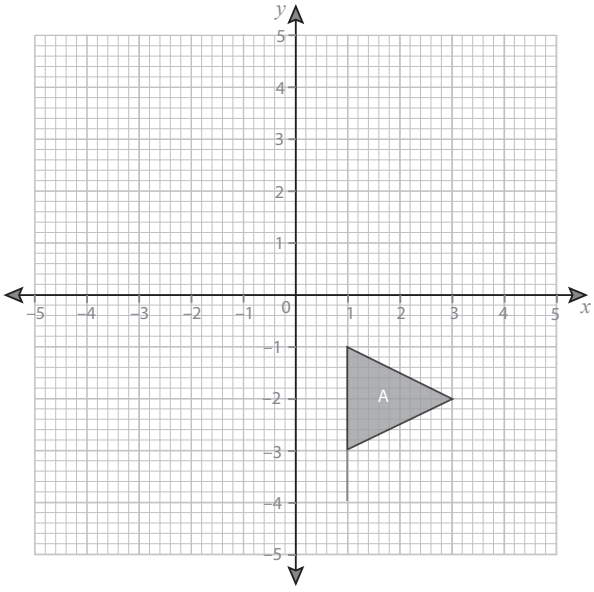
Mixed transformations

Learner's Book pages 345–361

1. Transform shape A on the coordinate system as required in each case below.



a) Translate shape A 5 units upward to shape B.

b) Describe the translation as the change in the coordinates $(x; y) \rightarrow$

c) Translate shape A 4 units left to shape C.

d) Describe the translation as the change in the coordinates $(x; y) \rightarrow$

e) Reflect Shape A in the line $y = x$ to give shape D.

f) Describe the translation as the change in the coordinates $(x; y) \rightarrow$

g) Reflect shape A in the x-axis and then translate the new shape 2 units to the right and 1 unit left to give shape E.

h) Describe the translation as the change in the coordinates $(x; y) \rightarrow$

2. Describe the transformation given by each of the rules below.

a) $(x; y) \rightarrow (x; -y)$

b) $(x; y) \rightarrow (-x; y - 2)$

c) $(x; y) \rightarrow (x + 3; y)$

d) $(x; y) \rightarrow (x; y - 3)$

e) $(x; y) \rightarrow (x + 2; y - 1)$

f) $(x; y) \rightarrow (y; x)$

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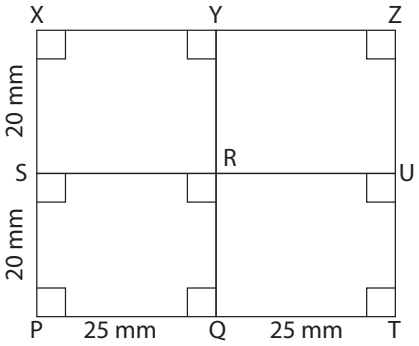
Perimeter and area of 2D shapes

Learner's Book pages 246–248

1. In the drawing below, rectangle PQRS is transformed into rectangle PQYX. Explain how this transformation affects its perimeter and area.

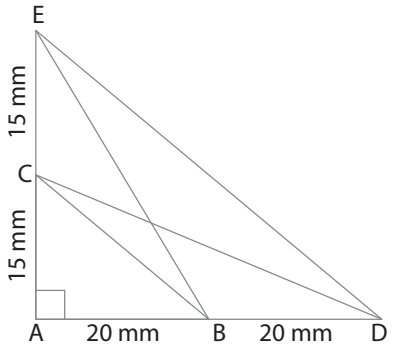


Shape	Length	Breadth	Perimeter	Area
PQRS				
PQYX				

2. In the drawing in Question 1 above, rectangle PQRS is transformed into rectangle PTZX. Explain how this transformation affects its perimeter and area.

Shape	Length	Breadth	Perimeter	Area
PQRS				
PTZX				

3. Explain the effect on the perimeter and area if:



a) △ABC is transformed into △ADC.

b) △ABC is transformed into △ABE.

c) △ABC is transformed into △ADE.

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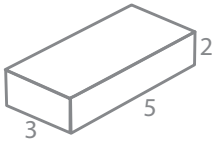
Surface area, volume and capacity

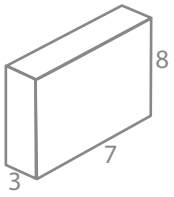
Learner's Book pages 323–328

1. Calculate the surface area of the following prisms. All measurements are in centimetres.

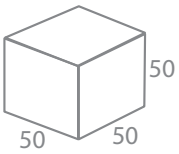
a)



b)



c)



2. Calculate the volume of the three prisms in the drawings in Question 1.

a) **b)** **c)**

3. Convert the volumes of the three prisms to millilitres (capacity).

a) **b)** **c)**

4. Convert the volume of the prism in Question 1(c) to litres.

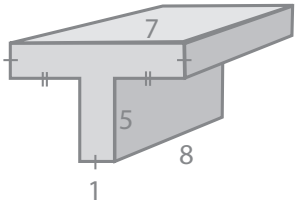
5. A rectangular prism has a volume of 200 cm^3. The base has dimensions 4 cm by 10 cm.

a) Write the capacity of the prism first in millilitres and then in litres.

b) Calculate the height of the prism.

c) Calculate the surface area of the prism.

6. The prism alongside has measurements in centimetres.



a) Calculate the volume of the prism.

b) Calculate the surface area of the prism.

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How to develop rubric and checklist assessment tools

Rubrics

A rubric is a tool teachers use to assess a learner's performance on a specific task. It is presented in the form of a grid that clearly outlines the criteria used for assessment as well as different levels of performance per criterion.

Benefits of using a rubric

- A rubric helps learners to understand objectives. Developing rubrics with your learners will help them to understand the purpose and content and help them to prepare for the assessment.
- A rubric has a clear and standardised approach to assessment, which ensures that learners are assessed consistently and fairly.
- A rubric allows teachers to provide specific feedback to learners, highlighting areas of strength and areas for improvement.
- A rubric helps learners get a clear idea on how to improve their performance after assessment.
- A rubric allows learners to self-improve. Encourage learners to use the rubric before they hand in their work.
- A rubric is easy to use and can be easily adapted to meet changing needs.

Steps to creating a rubric

Step 1: Clearly define the purpose of the assessment.
Use the assessment guidelines in the curriculum documents to determine what task/assignment the learners are required to complete.

Step 2: Define the criteria.
Use the objectives in the curriculum documents to consider what skills, knowledge or behaviours the assessment will evaluate.

Make sure that:

- criteria can be observed and measured
- criteria are important to the task at hand
- each criteria assesses a single aspect of the task.

Each criteria contains levels of performance. When creating these, consider:

- what will constitute outstanding achievement
- how will you define moderate or adequate achievement
- how would you define work that falls below expectations.

Ask yourself: Are there key criteria points that should carry a greater weight than others?

Step 3: Design a rating scale that clearly defines the levels of performance.
Check your mark allocation to ensure that your rubric falls in line with curriculum expectations.

Make sure you use language and terminology that the learner is familiar with so that they have a clear understanding of what is required of them.

Provide a scale of achievement that can assess the learners' overall competency in completing the task. For example, you can provide an overall mark according to the seven-point rating code or scale of achievement:

Rating code	Description of Competence	Percentage
7	Outstanding achievement	80–100
6	Meritorious achievement	70–79
5	Substantial achievement	60–69
4	Adequate achievement	50–59
3	Moderate achievement	40–49
2	Elementary achievement	30–39
1	Not achieved	0–29

Step 4: Write descriptions of expected performance at each level of the rating scale.
Describe observable and measurable behaviour and use parallel language across the scale. Indicate the degree to which the standards are met. Ensure that learners understand the expectations before and during the assessment.

Step 5: Create the rubric.
For ease of use, keep it to one page. Ask your colleagues for feedback and consider testing it before you use it for assessment. After you use the rubric, consider how effective it was and make any necessary revisions.

Checklists

A checklist is a simple assessment tool that provides a list of items or criteria to be checked off. It differs from a rubric in that it provides learners with the criteria of the requirements of an assignment rather than a means of assessing acquired knowledge. A checklist can be used solely by you as a teacher, or you can give your learners a checklist that they can refer to in order to make sure that they have included the required components for a task.

Checklists usually consist of a number of statements that refer to specific criteria and where the answer will be, for example, “Yes” or “No”, or “Achieved”, “Not yet” or “Almost”.

Benefits of using a checklist

- A checklist ensures that all relevant criteria are assessed and evaluated.
- A checklist helps to ensure consistent assessment of specified criteria.
- A checklist can be used by learners as a self-assessment tool.
- A checklist identifies learning needs in a clear and simple way.
- A checklist is easy to create and use and provides an uncomplicated guide for assessment.

Steps to create a checklist

Step 1: Define the purpose and what you want to assess.
This could be specific skills or a general assessment.

Step 2: Identify the criteria.
What specific elements or content will be assessed?

Step 3: Create your checklist.
Check that it contains everything you want to assess.

Exemplar:
Planning a questionnaire

Planning a questionnaire checklist			
Did the learner:	**Yes 2**	**Partially 1**	**No 0**
specify the topic and purpose of the project?			
identify the population that he/she chose?			
identify the sample that he/she chose?			
explain how he/she chose that particular sample?			
make a credible attempt to choose a sample that fairly represented the whole population?			
plan a coherent, well thought-out questionnaire?			
Total	**_____/ 12**		

Intervention strategies

Baseline assessment and intervention strategies

Some learners may experience academic backlogs for various reasons, including the impact on learning due to the COVID-19 pandemic, underlying learning barriers or special education needs such as visual or hearing impairments or intellectual barriers. Baseline assessment will help you identify learners that may be experiencing these barriers.

Analysing baseline assessment questions will provide insight into learners' current knowledge and skills regarding certain topics, as well as their preparedness for the work ahead. The results of baseline assessments can help to identify the areas where learners require support and/or intervention.

Learners may require support and/or intervention for the following reasons:

- barriers to learning
- class size
- reading comprehension (the ability to understand what they have read).

Barriers to learning

Some learners may face barriers to learning. It is important to accommodate learners with barriers to learning to ensure that our classrooms remain inclusive. These learners may require and should be granted more time for completing tasks, acquiring thinking skills (own strategies), and completing assessment activities. Adapt the number of activities to be completed without interfering with learners gaining the required skills. Learners experiencing barriers to learning can also be paired with others who may be able to support them.

Class size

- Peer tutoring can be an effective intervention method when class size is problematic.
- Quieter learners often struggle in a large class, as they tend not to ask questions. Organising learners into groups or pairs can help to create a more inclusive and enabling learning environment.
- Ensure that groups are made up of learners with varying ability, so that learners who may be struggling are supported by their peers.
- Peer assessment can also be used successfully during informal assessment and allows you to gauge learners' understanding in a less intimidating manner than a formal test or assignment.
- The following strategies can be used in a large class:
    - *Thumbs up/thumbs down:* Check understanding by a show of thumbs. Thumbs up indicate that learners have understood; thumbs down show that they have not understood; thumbs sideways could show that they are not sure.
    - *Response boards:* These are small chalkboards or whiteboards where learners record their response to a question. When you say "Show your answers" they all hold up the board. This way you can quickly see who is struggling.
    - *Show fingers 1-2-3:* Ask learners to show fingers to indicate if they understand activity instructions before working in a group. 1 = I do not understand; 2 = I sort of understand but I need some help; 3 = I understand completely.

Reading comprehension

- Support learners by giving them pre-reading questions and post-reading strategies to organise what they have learnt. Pre-reading questions could include asking the learners what they already know about the topic. Teach learners to summarise the content into bullet points and make use of mind maps. This requires the learners to rewrite the content in their own words.
- Write difficult terminology on the board and give simple explanations.
- Diagrams can be very useful to explain concepts in a way that learners can visualise the situation.

General teaching intervention strategies

Teach from the learner's point of view

- Put yourself in the learner's position: If you were the learner, what would you like the teacher to explain or show you that you could not learn previously?
- Remember that learners might still have emotional issues related to the COVID-19 pandemic, which you may need to address.

Reteach topic(s) for which learners achieved low scores (closing the gap)

- Focus on concepts, and not only on factual content. Then use illustrations to support learners' understanding and avoid superficial rote learning. The more "real-life" examples used, the easier it will be for the learners to conceptualise the topic.
- Make the structure of your lessons and teaching materials clear: State specific, achievable goals, provide graphic organisers to link parts of the lesson and give frequent summaries of sections of the lesson. A graphic organiser can be any visual representation of content that gives an immediate overview of main points.
- Refer frequently to your progress in terms of the lesson structure. This will help learners to develop an overall and cohesive (holistic) grasp of the content.
- Skills, knowledge and concepts run like threads through the previous grades. Explain these threads to learners, as you begin teaching a new topic or module – it will help learners to link the new content to what they already know.

Metacognition

Metacognition is the ability to understand our own thought processes. It is essential that metacognition takes place during lessons.

Learners retain information best when they can visualise situations. Visual aids, such as flash cards and mind maps, and practical work can aid with developing metacognition, or getting learners to think about and understand their own thought processes. After completing practical tasks, give learners sentence starters to complete. For example: I learnt . . .; I wonder . . .; I still want to know . . .; I still don't understand . . .; I still have a question about . . . .

Retaining information

- Flash cards and mind maps can be useful tools to help learners memorise facts.
- Encourage learners to break down content into more manageable sections. They can then create a mind map for each sub-topic. Tables can also help learners summarise content into more manageable sections.
- A mnemonic is a word, sentence or poem that helps you remember something. Mnemonics help learners to memorise content. Use the first letter of each word to create a sentence that the learners can memorise easily. For example, a mnemonic such as "**E**at **A**n **A**pple **A**s **A** **N**ice **S**nack" can help learners to memorise the names of the continents: **E**urope, **A**sia, **A**frica, **A**ustralia, **A**ntarctica, **N**orth America, **S**outh America.

Develop presentation skills

Many learners find it challenging to speak in front of the class, but this improves with practice. Encourage learners to answer questions in class and take part in class discussions by using one or more of the following strategies:

- *Use the think-pair-share method:* Posing a question and giving learners a short time to think about it, followed by discussion with a partner and then sharing with others. Learners who are shy will find it easier to share ideas with a partner first.
- *Tell-check-say:* A learner tells the answer to a friend, together they check if the answer is correct by referring to the textbook, and then the first learner says the answer out loud to the class or writes it down.
- *Target basic and then more advanced questions to specific learners based on their readiness to answer them*: A good strategy is to first ask the question to the whole class. This ensures that everyone thinks about it. Then, ask a specific learner the question.
- *Keywords on cards:* These can be used to help the learner remember their presentation. Eye contact is essential, so emphasise to learners that they should not read their presentation.

Interventions for learners with special education needs

- Special educational needs may include visual or hearing impairments or intellectual barriers. Do not form an opinion about a learner too early This could lead to an inaccurate assessment of a learner's barrier, or an inaccurate assessment of the existence of a barrier (when in fact there may not be one). If the barrier is obvious after the first term and becomes a serious obstacle to the learner, seek professional help from the district office.
- Immediate steps could include: observing the learner inside and outside of the classroom, contacting the learner's previous teachers and consulting learner progress reports to understand their needs.

Memoranda

Page 8

1. a) Natural numbers start at 1. Whole numbers start at 0. **b)** Prime numbers only have 2 factors. Composite numbers can have more than 2 factors.
2. $F_{110} = \{1; 2; 5; 10; 11; 22; 55; 110\}$
a) 55 **b)** 1 and 2; 10 and 11
c) 11 **d)** 10 **e)** 110
3. LCM $= 2 \times 2 \times 3 \times 3 \times 7 = 252$; HCF $= 3 \times 3 = 9$
4. a) $x \geq y$ **b)** x is a multiple of y; $y \neq 0$
5. a) $a + 0 = a; a - 0 = a; a \times 0 = 0$
b) $a \times 1 = a; \frac{a}{1} = a; \frac{a}{a} = 1$
6. a) 88 667 898 **b)** 444 444 444
c) 12 345 679

Page 9

1. $\mathbb{Z} = \{\ldots; -3; -2; -1; 0; 1; 2; 3; \ldots\}$
2. a) 46 b) 8 c) 8 d) 46 e) -8 f) -46 g) -46 h) -8
3. a) 144 b) -144 c) 4 d) -4 e) -144 f) 144 g) -4 h) 4
4. a) $=$ b) $>$ c) $=$ d) $<$
5. a) 144 b) -144 c) -125 d) -125 e) 625 f) -343 g) $49x^4y^2$ h) $-125p^6q^{15}$ i) $36a^6b^{14}$ j) $64m^{18}n^{12}$ k) 8 l) 4 m) 5 n) 5 o) a^3b^6 p) a^2b^4 q) $12m^9n^{12}$ r) $6x^6y^8$

Page 10

1. a) x^7 b) x c) 1 d) y^7 e) $\frac{1}{y^3}$ f) $\frac{1}{y^3}$ g) $\frac{1}{a^4}$ h) b^6 i) $8x^3$ j) a^4 k) $\frac{1}{ab}$ l) x^{12} m) $9x^2$ n) x^8y^4 o) $2mn^2$
2. a) $x^{11}y$ b) $x^6y^{12}z^{18}$ c) $\frac{y}{x}$ d) $-1\frac{1}{2}x$ e) $784s^8$ f) y^5 g) $-\frac{1}{2a^2}$ h) $\frac{a^2b^7}{c^4}$ i) a^4b^3 j) $\frac{y^{11}}{x^5z^9}$ k) $-3xy^2$

Page 11

1. a) Add 4 each time: 21; 25; 29; 33; 37
b) Multiply by 2 each time: 2 160; 320; 640; 1 280; 2 560 **c)** Add 2 more than previous add: 36; 49; 64; 81; 100 **d)** Add 2 more than previous add: 37; 50; 65; 82; 101 **e)** Add 2 more than previous add : 35; 48; 63; 80; 99 **f)** Add 4 more than previous add: 72; 98; 128; 162; 200
2. a) Extend the patterns. **b)** B: 4; 8; 12; 16; W: 5; 17; 37; 65; G: 16; 24; 32; 40 **c)** B: Add 4 each time; W: Add 8 more than previous add; G: Add 8 each time.
d) B: 20 (16 + 4); W: 101 (65 + 36); G: 48 (40 + 8)

Page 12

1. a) $x^2 - x - 6$ b) $x^2 - 4$ c) $x^2 - 6x + 9$ d) $18x^2 - 3xy - 36y^2$ e) $400 - 144t^2$ f) $-6a^2b^2 - 12abc - 6c^2$ g) $24x^5 - 20x^3 - 24x$ h) $-100p^2 + 36p$ i) $18y^3 - 120y^2 + 200y$ j) $8x$ k) $2y^2 + 50$ l) $z^4 - 16$
2. a) $-x^2 + 2x$ b) $4a^3 - 5a^2 + 6a$ c) $-4x^2 - 3x + 33$ d) $5x^2 - 3x$ e) $3x^2 - 4x - 1 + \frac{2}{x^2}$ f) $-8x - 2x^2$ g) $\frac{2}{5}a$ h) $\frac{1-x}{5}$

Page 13

1. a) $x = 0$ or $x = 7$ b) $x = 0$ or $x = \frac{1}{4}$ c) $x = 4$ or $x = -5$ d) $x = 9$ or $x = 11$ e) $x = \frac{-8}{3}$ or $x = \frac{8}{3}$ f) $x = \frac{7}{8}$ or $x = \frac{7}{8}$
2. a) $x = 7$ or -7 b) $x = 0$ or $x = \frac{-4}{3}$ c) $x = 6$ or -6 d) $x = 11$ or -11 e) $x = 0$ or -3 f) $x = 0$ or 5 or -5 g) $x = 0$ or 4 or -4 h) $x = 0$ or 6 i) $x = 0$ or $\frac{5}{7}$
3. y: 16; 7; 0; -8; -9; -8; -5; 0; 16
4. a) $x = 3$ or -3 b) $x = 0$ c) $x = 1$ or -1 d) $x = 5$ or -5 e) $x = 2$ or -2 f) $x = -4$
5. a) $x = 3$ or -3 b) $x = 0$

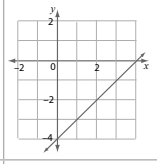
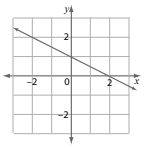
Page 14

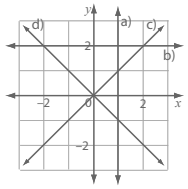
1. a) -1; 11; 17 b) 3; -17; -27 c) 4; 12; 16 d) -12; -4; 0 e) $-\frac{1}{4}; \frac{3}{4}; \frac{5}{4}$ f) $\frac{1}{5}; \frac{-3}{5}; -1$
2. a) 1; 5; 13 b) 6; 2; 18 c) -8; -2; 10 d) -9; -8; -6 e) 1; 1; 25 f) $\frac{1}{4}$; 1; 16
3. a) 5; 8; 11; 21 b) 26; 35; 44; 74 c) 19,5; 24; 28,5; 43,5 d) 29; 47; 65; 125
4. a) Input: n/a Output: 9, 12, 15, 18, 21, 27
b) Input: 6, 11, 18 Output: 6, 16, 30, 40
c) Input: 5, 8 Output: $\frac{1}{2}$, 1, 8, 64, 128
d) Input: 6, 9, 11 Output: 16, 25, 144, 225
5. a) $x = y \div 7$: 8, 12 and 25 books respectively
b) R76,50; R127,50; R255,00

Page 15

1. a) y: -2; $-1\frac{1}{2}$; -1; $-\frac{1}{2}$; 0 **b)** and **c)** Str. line graph: x-int: (2; 0); y-int.: (0; -1); grad. $(m) = \frac{1}{2}$
2. a) Str. line: x-int.: $(1\frac{1}{2}; 0)$; y-int.: (0; 3)
b) Str. line: x-int.: $(1\frac{2}{3}; 0)$; y-int.: (0; -5)

3.

	$y = x - 4$	$y = -\frac{1}{2}x + 1$
a)	$m = 1$	$m = -\frac{1}{2}$
b)	(0; -4	(0; 1)
c)		
d)	$y = -2$	$y = 0$

4.


Page 16

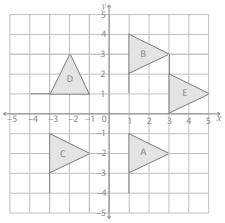
1. a) Add up to 90°. **b)** Add up to 180°.
c) Have same vertex; lie on opp. sides of a common side. **d)** Have same vertex; non-adjacent when 2 str. lines intersect.
2. a) $x = 45°$ (sum of $\angle$s on line AMC = 180°)
b) $a = 5°$ (sum of $\angle$s on line QMS = 180°)
c) $r = 15°$ (sum of $\angle$s on line UMX = 180°)
d) $x = 60°$ (vert. opp. $\angle$s =)
e) $a = 5°$ (vert. opp. $\angle$s =)
f) $r = 10°$ ($\angle$M vertically opposite to $8r$; sum of $\angle$s on line VMZ = 180°)

Page 17

1. a) All int. $\angle$s should be acute. b) 1 int. $\angle$ should be 90°. c) 1 int. $\angle$ should be obtuse. d) 3 sides should be equal. e) 2 sides should be equal. f) All sides should differ in length.
2. Own constructions.
3. c) 17,93 mm $\approx$ 18 mm d) 48,99 mm $\approx$ 49 mm

Page 18

1. a) See grid.
b) $(x; y) \rightarrow (x; y + 5)$
c) See grid.
d) $(x; y) \rightarrow (x - 4; y)$
e) See grid.
f) $(x; y) \rightarrow (y; x)$
g) See grid.



h) $(x; y) \rightarrow (x; -y) \rightarrow (x + 2; y - 1)$
2. a) Reflection in x-axis. b) Reflection in y-axis; translation 2 down. c) Horizontal translation 3 right. d) Vertical translation 3 down. e) translation 2 right; 1 down. f) Reflection in $y = x$.

Page 19

1.

Shape	Length	Breadth	Perimeter	Area
PQRS	25 mm	20 mm	90 mm	5 cm²
PQYX	25 mm	40 mm	130 mm	10 cm²

If the breadth is doubled, the perimeter increases by twice the change in breadth, and the area is doubled.

2.

Shape	Length	Breadth	Perimeter	Area
PQRS	25 mm	20 mm	90 mm	5 cm²
PTZX	50 mm	40 mm	180 mm	20 cm²

If the length and breadth are doubled, the perimeter is doubled and the area is quadrupled.

3. BC = 25 mm; CD = 42,72 mm; BE = 36,06 mm; DE = 50 mm
a) If the base is doubled, the perimeter increases and the area is doubled.
b) If the height is doubled, the perimeter increases and the area is doubled.
c) If the base and height are doubled, the perimeter is doubled and the area is quadrupled.

Page 20

1. a) 62 cm² b) 202 cm² c) 15 000 cm²
2. a) 30 cm³ b) 168 cm³ c) 125 000 cm³
3. a) 30 ml b) 168 ml c) 125 000 ml
4. 125 ℓ
5. a) 200 ml; 0,2 ℓ b) 5 cm c) 220 cm²
6. a) 96 cm³ b) 232 cm²

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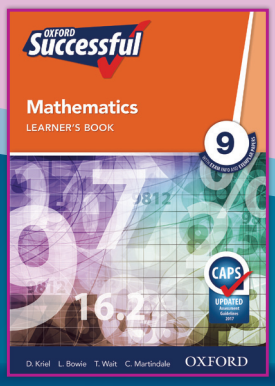

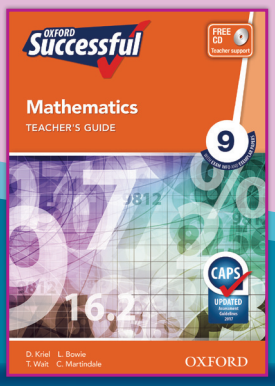

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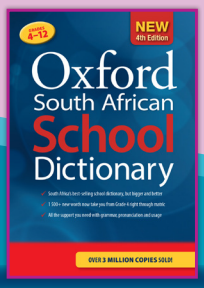

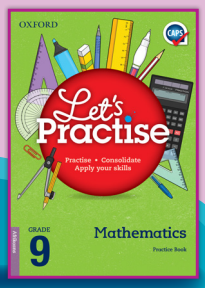

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