N5 EXPRESSIONS & FORMULAE 1.1

This resource is to support pupils in passing the appropriate National 5 Assessment Standard. The questions and marking schemes used are from SQA past papers and as such test the topics in their entirety from grade A to C and *may* include other areas from the course.

In addition the questions from **Paper 1 (P1)** should be completed **without** the use of a calculator and questions from **Paper 2 (P2)** permit the use of a calculator.

Each Assessment Standard is used to ensure pupils have the minimum competency on the specified sub-skills for the National 5 course. As such each Assessment Standard will test grade C work on that specific topic.

This resource is divided into two sections:
- Section A has an example on each sub skill for the relevant Assessment Standard and the marking scheme for these questions
- Section B has extra practice questions on this Assessment Standard and the marking scheme for these questions

<u>Unit Assessment Standard</u>	<u>Sub skills</u>	Section A – Question Number
Expressions & Formulae 1.1 Applying numerical skills to simplify surds/expressions using the laws of indices	simplifying surds simplifying expressions using the laws of indices	Q1 (Mixture) Q2 (Multiplication & Division) Q3 (Expand brackets and simplify) Q4 (Real life context)

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule: $a^2 = b^2 + c^2 - 2bc\cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

Area of a triangle: $A = \tfrac{1}{2}ab\sin C$

Volume of a sphere: $V = \tfrac{4}{3}\pi r^3$

Volume of a cone: $V = \tfrac{1}{3}\pi r^2 h$

Volume of a pyramid: $V = \tfrac{1}{3}Ah$

Standard deviation: $s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n-1}} = \sqrt{\dfrac{\Sigma x^2 - (\Sigma x)^2/n}{n-1}}$, where n is the sample size.

Section A

Section A

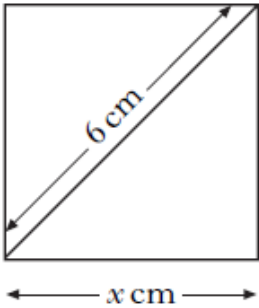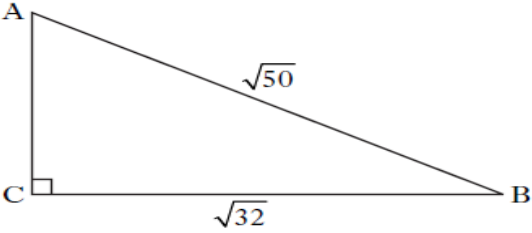| Q		Marks
1 **P1**	8. (a) Simplify $\sqrt{2} \times \sqrt{18}$.	1
	(b) Simplify $\sqrt{2} + \sqrt{18}$.	1
	(c) Hence show that $\dfrac{\sqrt{2} \times \sqrt{18}}{\sqrt{2} + \sqrt{18}} = \dfrac{3\sqrt{2}}{4}$.	2
2 **P1**	8. Simplify $\dfrac{n^5 \times 10n}{2n^2}$.	3
3 **P1**	7. Remove brackets and simplify $a^{\frac{1}{2}}(a^{\frac{1}{2}} - 2).$	2
4 **P2**	1. One atom of gold weighs $3 \cdot 27 \times 10^{-22}$ grams. How many atoms will there be in one kilogram of gold? Give your answer **in scientific notation correct to 2 significant figures**.	3

Section A

MARKING SCHEME

Section A - Marking Scheme

1	8 (a)	Ans: 6		
		• simplifying	• 6	1KU

NOTES:

	(b)	Ans: $4\sqrt{2}$		
		• simplifying	• $4\sqrt{2}$	1KU

NOTES:

	(c)	Ans: $\dfrac{3\sqrt{2}}{4}$		
		• rationalise denominator	• $\dfrac{6}{4\sqrt{2}} \times \dfrac{\sqrt{2}}{\sqrt{2}}$	
		• simplification	• $\dfrac{3\sqrt{2}}{4}$	2KU

2	Question	Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •
	8.	Ans: $5n^4$	3	
		•[1] simplify powers in numerator		•[1] $10n^6$
		•[2] cancel constants		•[2] $\dfrac{5n^6}{n^2}$
		•[3] eliminate n from denominator		•[3] $5n^4$

Notes:

1. For $5n^4$ without working   award 3/3

2. For a final answer of $\dfrac{5n^4}{1}$ award 2/3   ✓✗✓

3. For an answer of $5n^3$

     (a) (i) $\dfrac{10n^5}{2n^2} = 5n^3$ award 2/3   ✗✓✓

        (ii) $\dfrac{10n^6}{2n^2} = 5n^3$ award 2/3   ✓✓✗

     (b) (i) $\dfrac{n^4 \times 10}{2n} = \dfrac{n^4 \times 10}{2} = 5n^3$ award 1/3   ✓✗✓

        (ii) $5n^3$ without working   award 1/3

3

Question No	Give 1 mark for each •	Illustrations of evidence for awar each mark
7	Ans: $a - 2a^{\frac{1}{2}}$ • starting to expand bracket • completing expansion	• a or $-2a^{\frac{1}{2}}$ • $a - 2a^{\frac{1}{2}}$

Notes:

(i)   accept a^1

(ii) ignore any working subsequent to a correct answer

4

1	Ans: 3.1×10^{24} • method • processing • rounding	• $\dfrac{1000}{3.27 \times 10^{-22}}$ • 3.058×10^{24} • 3.1×10^{24}

NOTES:

(i) 3.1×10^{24} with or without working   award 3

(ii) 3.06×10^{24} with or without working   award 2

(iii) $3.058 \times 10^{24} \rightarrow 3.05 \times 10^{24}$ award 2

(iv) 3.05×10^{24} without working   award 1

(v) $1000 \times 3.27 \times 10^{-22} \rightarrow 3.3 \times 10^{-19}$ award 1

(vi) 3.1×10^{n} [$n = 21, 22, 23$] without working   award 1

(vii) 3.3×10^{-19} without working   award 0

(viii) for any other final answer, an unrounded solution must be stated to access the 3rd mar

Section B

Section B

Paper 1 Questions

Q		Marks
1	9. A square of side x centimetres has a diagonal 6 centimetres long. Calculate the value of x, giving your answer as a surd in its simplest form.	3
2	9. Simplify $$m^3 \times \sqrt{m}.$$	2
3	11. A right angled triangle has dimensions as shown. Calculate the length of AC, leaving your answer as a surd **in its simplest form**.	3
4	(c) Expand $$x^{\frac{1}{2}}\left(3x + x^{-2}\right).$$ 4.	2

5	**9.** (*a*) Simplify $2a \times a^{-4}$.	1
	(*b*) Solve for x, $\quad \sqrt{x} + \sqrt{18} = 4\sqrt{2}$.	3
6	**10.** (*a*) Evaluate $(2^3)^2$.	1
	(*b*) Hence find n, when $(2^3)^n = \dfrac{1}{64}$.	1
7	**8.** Express $\sqrt{40} + 4\sqrt{10} + \sqrt{90}$ as a surd in its simplest form.	3

No Paper 2 Questions

Section B

MARKING

SCHEME

Section B – Marking Scheme

Marking Scheme

Paper 1

Q			Marks
1			

Question No	Give 1 mark for each •	Illustrations of evidence for awarding each mark
9	Ans: $3\sqrt{2}$ • forming equation • solution • simplification	• $x^2 + x^2 = 6^2$ • $x = \sqrt{18}$ • $3\sqrt{2}$ **3RE**

Notes:

(i) the third mark is obtained only for the simplification of a surd

2	9	Ans: $m^{\frac{7}{2}}$		
		• correct index	• $m^{\frac{1}{2}}$	
		• solution	• $m^{\frac{7}{2}}$	
				2KU

3	11	Ans: $3\sqrt{2}$		
		• method	• $AC^2 + \left(\sqrt{32}\right)^2 = \left(\sqrt{50}\right)^2$	
		• solution	• $\sqrt{18}$	
		• simplification of a surd	• $3\sqrt{2}$	
				3KU

Notes:

(i) for a final answer of $\sqrt{82}$ with working   award $\frac{1}{3}$

(ii) the 3rd mark is available for the simplification of $\sqrt{18}$, $\sqrt{32}$ or $\sqrt{50}$

(iii) $\sqrt{18}$ without working cannot be awarded the first 2 marks

4	4.			
	(c)	Ans: $3x^{\frac{3}{2}} + x^{-\frac{3}{2}}$		
		• a correct term	• $3x^{\frac{3}{2}}$ or $x^{-\frac{3}{2}}$	
		• a second correct term with no further 'simplification'	• $3x^{\frac{3}{2}}$ or $x^{-\frac{3}{2}}$	
				2KU

NOTES:

(i) accept indices in decimal form

(ii) a further 'simplification' could be $3x^{\frac{3}{2}} + x^{-\frac{3}{2}} = 3x^0$

5	9 (a)	Ans: $2a^{-3}$			
		• solution	• $2a^{-3}$ or $\dfrac{2}{a^3}$		
				1KU	

	(b)	Ans: 2			
		• simplifying $\sqrt{18}$	• $\sqrt{x}+3\sqrt{2}=4\sqrt{2}$		
		• rearrangement	• $\sqrt{x}=\sqrt{2}$		
		• solution	• $x=2$		
				3KU	

NOTES:

    (i)   the 3rd mark is available only for the solution of an equation involving $\sqrt{x}$

6	10 (a)	Ans: 64			
		• evaluation	• 64		
				1KU	

	(b)	Ans: -2			
		• solution	• $n=-2$		
				1RE	

7	Question	Expected Answer(s) Give one mark for each •	Max Mark	Illustrations of evidence for awarding a mark at each •	
	8.	Ans: $9\sqrt{10}$	3		
		•¹ simplify $\sqrt{40}$		•¹ $2\sqrt{10}$	
		•² simplify $\sqrt{90}$		•² $3\sqrt{10}$	
		•³ state answer in simplest form		•³ $9\sqrt{10}$	

Notes:

1. For a correct answer without working   award 0/3
2. For subsequent incorrect working, the final mark is not available.