Practice Unit Assessment (2) for National 5 Expressions and Formulae

- 1. Simplify, giving your answer in surd form: $\sqrt{54}$
- 2. (a) Simplify (i) $\frac{x^7 \times x^{-3}}{x^2}$ (ii) $2x^{\frac{1}{2}} \times 3x^{-3}$
 - (b) The number of people attending a musical was 2.64×10^3 . If each person paid £34, how much was collected. Give you answer in Scientific Notation.
- **3.** Expand and simplify where appropriate:
 - (a) g(6g h) (b) (d+3)(d-7)
- **4.** Factorise: (a) $k^2 7k$ (b) $x^2 81$ (c) $z^2 + 10z + 21$
- 5. Express $x^2 8x + 1$ in the form $(x + p)^2 + q$.

6. Write
$$\frac{(3x-1)(x+3)}{(x+3)^2}$$
 ($x \neq -3$) in its simplest form.

- 7. Write each of the following as a single fraction:
 - (a) $\frac{5}{c} + \frac{7}{d}$ $(c, d \neq 0)$ (b) $\frac{k}{7} \div \frac{k}{h}$ $(h \neq 0)$
- 8. Points R and S have coordinates (3, -2) and (-6, -3) respectively. Calculate the gradient of RS.
- **9.** Calculate the volume of a sphere with radius 3.7 cm, giving your answer correct to 2 significant figures.



10. The diagram shows a sector of a circle with radius 5.6 cm and angle at the centre 230° .



- (a) Calculate the length of the arc AB.
- (b) The sector has to be made up into a cone with a fur trim round its base. How many cones could be trimmed from 40 metres of fur?
- **11.** During a cross country race, juice is distributed to the runners in conical containers with diameter 6 cm and height 8 cm as shown in *diagram 1*.



At the end of the race juice from 60 cones is poured into a cylinderical container with dimensions as shown in *Diagram 2*.



Will this container be large enough to hold the juice?

End of Question Paper

Question	Main points of expected response	Ses
1	• ¹ simplify surd	● ¹ 3√6
2 (a) (i) (ii) (b)	 simplify numerator correct answer correct coefficient simplify indices calculation of amount express in standard form 	• ¹ x^4 • ² x^2 • ³ 6 • ⁴ $x^{-\frac{5}{2}}$ in answer $6x^{-\frac{5}{2}}$ • ⁵ $34 \times 2.64 \times 10^3$ =89.76 × 10 ³ • ⁶ 8.976×10^4
3 (a) (b)	 ¹ multiply out brackets ² multiply out the brackets ³ collect like terms 	• ¹ $6g^2 - gh$ • ² $d^2 - 7d + 3d - 21$ • ³ $d^2 - 4d - 21$
4 (a) (b) (c)	 factorise expression factorise difference of two squares start to factorise trinomial expression complete factorisation 	• ¹ $k(k-7)$ • ² $(x+9)(x-9)$ • ³ $(z \ 3)(z \ 7)$ is evidence of brackets, <i>z</i> , 3 and 7 • ⁴ $(z+3)(z+7)$
5	 start of process complete process 	• ¹ $(x-4)^2$ • ² $(x-4)^2 - 15$
6	• ¹ reduce to simplest form	$\bullet^1 \qquad \frac{3x-1}{x+3}$
7 (a) (b)	 denominator correct numerator correct 	
	 ³ multiply by inversion of fraction ⁴ correct answer 	• ³ $\times \frac{h}{k}$ • ⁴ $\frac{k}{7}$
8	 evidence of gradient calculation correct gradient 	• Uses $\frac{y_2 - y_1}{x_2 - x_1}$ or equivalent • $\frac{1}{9}$

Points of reasoning are marked # in the table.

9	• ¹ substitute and start calculation	• ¹ $\frac{4}{3} \times \pi \times 3 \cdot 7^{3}$ $\frac{4}{3} \times \pi \times 50 \cdot 653$ or
	\bullet^2 complete calculation	• ² equivalent • ² 212.067 cm ³ or equivalent
	• ³ round calculation to 2 significant figures	• ³ 210 cm ³
10 (a)	• ¹ correct ratio and substitution	$\bullet^1 \qquad \frac{230}{360} \times \pi \times 11 \cdot 2$
(b)	\bullet^2 calculate arc length	• ² 22.468 cm or equivalent
	#2.1 valid strategy#2.2 interpretation of answer	#2.1 eg 4 000 ÷ 22·468 #2.2 (for 178·02) 178 cones can be trimmed.
11	#2.1 uses valid strategy to find volumes of cone and cylinder	# 2.1 Substitutes relevant values into correct formulae
	 calculate volume of cone calculate volume of cylinder 	• ¹ $75 \cdot 36 \text{ cm}^3 \text{ or equivalent}$ • ² $4415 \cdot 625 \text{ cm}^3 \text{ or equivalent}$
	# 2.2 states conclusion	# 2.2 cylinder is not big enough since $75 \cdot 36 \times 60 >$ volume of cylinder