Practice Unit Assessment (1) for National 5 Expressions and Formulae

1. Simplify, giving your answer in surd form: $\sqrt{32}$

2. **(a)** Simplify **(i)** $\dfrac{x^4 \times x^6}{x^3}$ **(ii)** $5x^4 \times 4x^{-\frac{5}{2}}$

(b) The number of people attending a football match was $3{\cdot}12 \times 10^4$. If each person paid £27, how much was collected? Give you answer in Scientific Notation.

3. Expand and simplify where appropriate:

(a) $d(4d - e)$ **(b)** $(g + 4)(g + 9)$

4. Factorise: **(a)** $y^2 - 6y$ **(b)** $t^2 - 49$ **(c)** $x^2 + 7x + 12$

5. Express $x^2 + 6x + 7$ in the form $(x + p)^2 + q$.

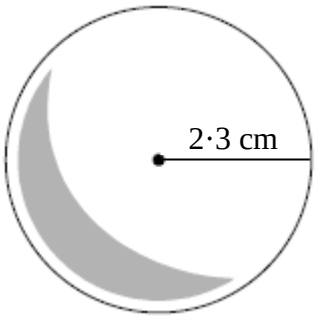
6. Write $\dfrac{(4x-3)(x+4)}{(x+4)^2}\,(x \neq -4)$ in its simplest form.

7. Write each of the following as a single fraction:

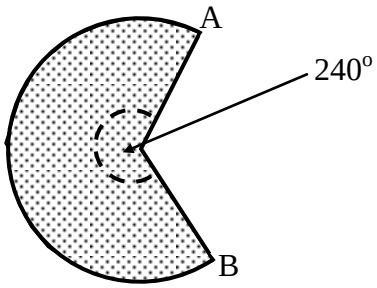
(a) $\dfrac{3}{a} - \dfrac{5}{b} \quad (a, b \neq 0)$ **(b)** $\dfrac{f}{5} \div \dfrac{e}{g} \quad (g \neq 0)$

8. Points P and Q have coordinates (–5, –4) and (6, 3) respectively. Calculate the gradient of PQ.

9. Calculate the volume of a sphere with radius 2·3 cm, giving your answer correct to 2 significant figures.



10. The logo for Cyril's Cars is shown below. The logo is a sector of a circle of radius 6·2 cm. The reflex angle at the centre is 240^o.



(a) Calculate the length of the arc AB.

(b) Cyril wants to jazz up the logo by outlining it with coloured rope. He buys 20 metres of rope. How many logos would he be able to makeup?

11. Sherbet in a sweet shop is stored in a cylindrical container like the one shown in *diagram 1*.

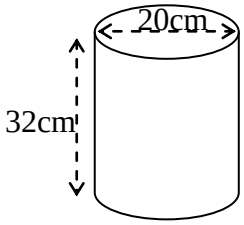


Diagram 1

The sherbet is sold in conical containers with diameter 5 cm and height 6 cm as shown in *diagram 2*.

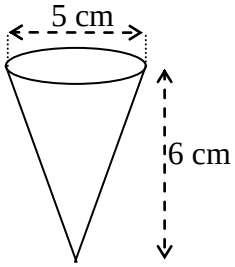


Diagram 2

The shop owner thinks he can fill 260 cones from the cylinder. Is he correct?

End of Question Paper

Practice Unit Assessment (1) for Expressions and Formulae: Marking Scheme

Points of reasoning are marked # in the table.

Question	Main points of expected responses	
1	•[1] start of process •[2] simplified surd	•[1] $\sqrt{16}\sqrt{2}$ (or equivalent) •[2] $4\sqrt{2}$
2 (a) (i) **(ii)** **(b)**	•[1] simplify numerator •[2] correct answer •[3] correct coefficient •[4] simplify indices •[5] calculation of amount •[6] express in standard form	•[1] x^{10} •[2] x^{7} •[3] 20 •[4] $x^{3/2}$ in answer 20 $x^{3/2}$ •[5] $27 \times 3{\cdot}12 \times 10^4$ $=84{\cdot}24 \times 10^4$ •[6] £$8{\cdot}424 \times 10^5$
3 (a) **(b)**	•[1] multiply out brackets •[2] multiply out the brackets •[3] collect like terms	•[1] $4d^2 - de$ •[2] $g^2 + 4g + 9g + 36$ •[3] $g^2 + 13g + 36$
4 (a) **(b)** **(c)**	•[1] factorise expression •[2] factorise difference of two squares •[3] start to factorise trinomial expression •[4] complete factorisation	•[1] $y(y - 6)$ •[2] $(t + 7)(t - 57)$ •[3] $(x \quad 3)(x \quad 4)$ ie evidence of brackets, x, 3 and 4 •[4] $(x + 3)(x + 4)$
5	•[1] start of process •[2] complete process	•[1] $(x + 3)^2$ •[2] $(x + 3)^2 - 2$
6	•[1] reduce to simplest form	•[1] $\dfrac{4x-3}{x+4}$
7 (a) **(b)**	•[1] denominator correct •[2] numerator correct •[3] multiply by inversion of fraction •[4] correct answer	•[1] $\dfrac{///}{ab}$ •[2] $\dfrac{3b-5a}{ab}$ •[3] $\times \dfrac{g}{e}$ •[4] $\dfrac{fg}{5e}$
8	•[1] evidence of gradient calculation •[2] correct gradient	•[1] Uses $\dfrac{y_2 - y_1}{x_2 - x_1}$ or equivalent •[2] $\dfrac{7}{11}$

9	•[1] substitute and start calculation •[2] complete calculation •[3] round calculation to 2 significant figures	•[1] $\frac{4}{3}\times\pi\times 2\cdot 3^3$ $\frac{4}{3}\times\pi\times 12\cdot 167$ or equivalent •[2] 50·939 cm³ or equivalent •[3] 51 cm^3
10 (a) **(b)**	•[1] correct ratio and substitution •[2] calculate arc length #2.1 valid strategy #2.2 interpretation of answer	•[1] $\frac{240}{360}\times\pi\times 12\cdot 4$ •[2] 25·957 cm or equivalent #2.1 eg 2 000 ÷ 38 #2.2 (for 52·63) 52 logos can be made.
11	#2.1 uses valid strategy to find volumes of cone and cylinder •[1] calculate volume of cylinder •[2] calculate volume of cone # 2.2 states conclusion	# 2.1 Substitutes relevant values into correct formulae •[1] 10 048 cm^3 or equivalent •[2] 39·25 cm^3 or equivalent # 2.2 Shop owner is wrong because only 256 cones can be filled