Practice Unit Assessment (3) for National 5 Expressions and Formulae

1. Simplify, giving your answer in surd form: $\sqrt{147}$

2. **(a)** Simplify **(i)** $\dfrac{x^2 \times x^8}{x^{-3}}$ **(ii)** $6x^{\frac{1}{3}} \times 3x^{-2}$

(b) A factory produces $2{\cdot}4 \times 10^4$ cakes every day. How many cakes will it produce in the month of April? Give you answer in Scientific Notation.

3. Expand and simplify where appropriate:

(a) $m(3m - n)$ **(b)** $(p + 5)(p + 8)$

4. Factorise: **(a)** $h^2 - 11h$ **(b)** $q^2 - 144$ **(c)** $a^2 - 12z + 32$

5. Express $x^2 + 7x + 9$ in the form $(x + p)^2 + q$.

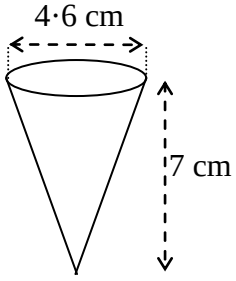
6. Write $\dfrac{(2x+5)(x+7)}{(2x+5)^2} (x \neq -2{\cdot}5)$ in its simplest form.

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

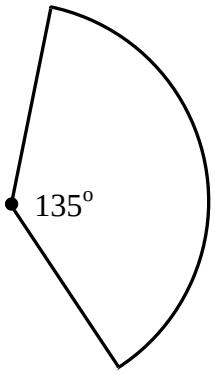
(a) $\dfrac{4}{m} - \dfrac{9}{n} \quad (m, n \neq 0)$ **(b)** $\dfrac{4}{k} \div \dfrac{k}{l} \quad (h \neq 0)$

8. Points C and D have coordinates (–8, –2) and (6, –4) respectively. Calculate the gradient of CD.

9. Calculate the volume of a cone with diameter 4·6 cm and height 7 cm giving your answer correct to 2 significant figures.



10. **(a)** Calculate the area of the sector of a circle in the diagram which has radius 6·8cm.



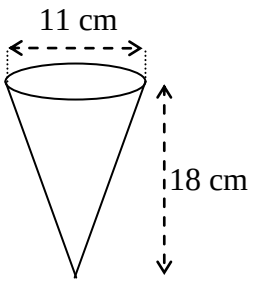
(b) These sectors have to be cut from a piece of card with an area of 6500 cm².

Assuming there is not waste, how many sectors can be cut from the card?

11. A candle is in the shape of a sphere with a diameter of 10 cm.

(a) Calculate the volume of the candle.

The candle was melted down and poured into a conical container like the one shown in this diagram.



(b) Will the cone be big enough to hold the wax? [assume there is no wax lost during the melting process]

End of Question Paper

Practice Unit Assessment (3) for Expressions and Formulae: Marking Scheme

Points of reasoning are marked # in the table.

Question	Main points of expected responses			
1	$\bullet^1$	simplify surd	$\bullet^1$	$7\sqrt{3}$
2 (a) (i)	$\bullet^1$	simplify numerator	$\bullet^1$	x^{10}
	$\bullet^2$	correct answer	$\bullet^2$	x^{13}
(ii)	$\bullet^3$	correct coefficient	$\bullet^3$	18
	$\bullet^4$	simplify indices	$\bullet^4$	$x^{-\frac{5}{3}}$ in answer $18x^{-\frac{5}{3}}$
(b)	$\bullet^5$	calculation of distance	$\bullet^5$	$30 \times 2{\cdot}4 \times 10^4$ $=72 \times 10^4$
	$\bullet^6$	express in standard form	$\bullet^6$	$7{\cdot}2 \times 10^5$
3 (a)	$\bullet^1$	multiply out brackets	$\bullet^1$	$3m^2 - mn$
(b)	$\bullet^2$	multiply out the brackets	$\bullet^2$	$p^2 + 8p + 5p + 40$
	$\bullet^3$	collect like terms	$\bullet^3$	$p^2 + 13p + 40$
4 (a)	$\bullet^1$	factorise expression	$\bullet^1$	$h(h - 11)$
(b)	$\bullet^2$	factorise difference of two squares	$\bullet^2$	$(q + 12)(q - 12)$
(c)	$\bullet^3$	start to factorise trinomial expression	$\bullet^3$	$(a \quad 4)(a \quad 8)$ ie evidence of brackets, a, 4 and 8
	$\bullet^4$	complete factorisation	$\bullet^4$	$(a - 4)(a - 8)$
5	$\bullet^1$	start of process	$\bullet^1$	$(x + 3{\cdot}5)^2$
	$\bullet^2$	complete process	$\bullet^2$	$(x + 3{\cdot}5)^2 - 3{\cdot}25$
6	$\bullet^1$	reduce to simplest form	$\bullet^1$	$\frac{x+7}{2x+5}$
7 (a)	$\bullet^1$	denominator correct	$\bullet^1$	$\frac{///}{mn}$
(b)	$\bullet^2$	numerator correct	$\bullet^2$	$\frac{4n-9m}{mn}$
	$\bullet^3$	multiply by inversion of fraction	$\bullet^3$	$\times \frac{l}{k}$
	$\bullet^4$	correct answer	$\bullet^4$	$\frac{4l}{k^2}$
8	$\bullet^1$	evidence of gradient calculation	$\bullet^1$	Uses $\frac{y_2 - y_1}{x_2 - x_1}$ or equivalent
	$\bullet^2$	correct gradient	$\bullet^2$	$-\frac{1}{7}$

9	•[1] substitute and start calculation •[2] complete calculation •[3] round calculation to 2 significant figures	•[1] $\frac{1}{3}\times\pi\times 2\cdot 3^2\times 7$ $\frac{1}{3}\times\pi\times 37\cdot 03$ or equivalent •[2] 37·75806 cm³ or equivalent •[3] 38 cm^3
10 (a) **(b)**	•[1] correct ratio and substitution •[2] calculate sector area #2.1 valid strategy #2.2 interpretation of answer	•[1] $\frac{135}{360}\times\pi\times 6\cdot 8^2$ •[2] 54·4476 cm or equivalent #2.1 eg 6 500 ÷ 54·4476 #2.2 (for 119·38) 119 sectors can be cut.
11	#2.1 uses valid strategy to find volumes of cone and sphere •[1] calculate volume of sphere •[2] calculate volume of cone # 2.2 states conclusion	# 2.1 Substitutes relevant values into correct formulae •[1] 523·33 cm^3 or equivalent •[2] 569·91 cm^3 or equivalent # 2.2 cone is big enough since 523·33 < 569·91