

National 5

N5 Expressions and Formulae Unit Test

Preparation Booklet 1

Exercise 1

Simplify, giving your answer in surd form:

(a) $\sqrt{12}$ (b) $\sqrt{27}$ (c) $\sqrt{32}$ (d) $\sqrt{75}$ (e) $\sqrt{20}$ (f) $\sqrt{45}$

Exercise 2

1. Simplify:

(a) $\frac{x^5}{x^3}$ (b) $x^4 \times x^3$ (c) $\frac{x^2 \times x^5}{x^3}$ (d) $\frac{x^{-3} \times x^4}{x^5}$ (e) $5x^3 \times 4x^{\frac{1}{2}}$

2. (a) There are 3.1×10^7 seconds in a solar year.

How many seconds are there in 5 solar years? Give your answer in **scientific notation**.

(b) The lotto jackpot of $\text{£}8.4 \times 10^6$ was shared equally among 3 winners.

How much did each winner receive? Give your answer in **standard form**.

Exercise 3

1. Expand and simplify where appropriate:

(a) $5(x + 4)$ (b) $4(2x - 3y)$ (c) $c(c + 5)$ (d) $(x + 3)(x + 1)$ (e) $(m - 5)(m + 3)$

Exercise 4

1. Factorise:

(a) $5a + 25$ (b) $a^2 + 6a$ (c) $b^2 - 16$ (d) $h^2 - 64$ (e) $x^2 + 2x + 1$

(f) $y^2 + 5y + 6$

Exercise 5

1. Express:

(a) $x^2 + 8x + 3$ in the form $(x + p)^2 + q$

(b) $z^2 + 8z - 10$ in the form $(x + p)^2 + q$

Exercise 6

1. Write:

(a) $\frac{(p-2)(p+3)}{(p-2)}$ ($p \neq 2$) in its simplest form.

(b) $\frac{(3x+7)^2}{(3x+6)(3x+7)}$ in its simplest form.

Exercise 7

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

(a) $\frac{2}{3} - \frac{3}{8}$ (b) $\frac{9}{x} - \frac{8}{y}$ (c) $\frac{c}{d} + \frac{d}{c}$ (d) $\frac{3}{5} \times \frac{7}{9}$ (e) $\frac{x}{6} \times \frac{2}{x}$

(f) $\frac{a}{4} \div \frac{a}{8}$ (g) $\frac{8k}{6} \div \frac{4}{3k}$ (h) $\frac{t}{6} \div \frac{u}{v}$

Exercise 8

1. Each set of points represents a straight line.

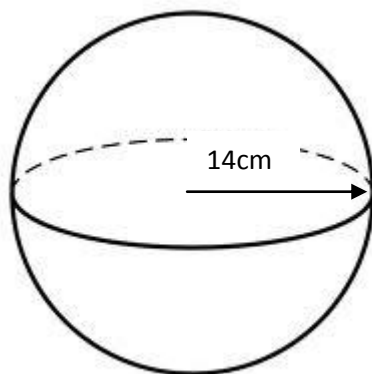
Calculate the gradient of the lines joining AB and PQ:

(a) **A**(-2, 1) and **B** (1, 4)

(b) **P** (-4, 2) and **Q** (6, 4)

Exercise 9

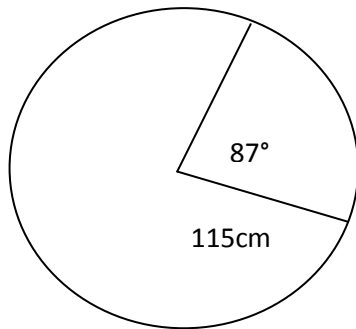
1. Calculate the volume of a sphere with radius 14 cm, giving your answer correct to **two significant figures**.



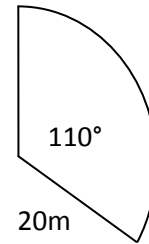
Exercise 10

1. Calculate the length of the **minor arc** in the following diagrams:

(a)

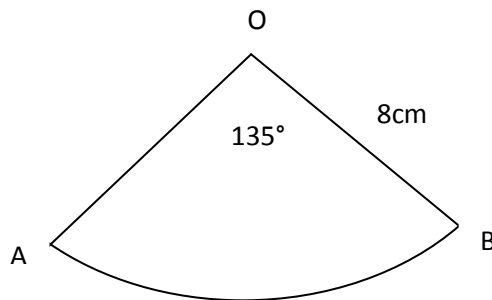


(b)

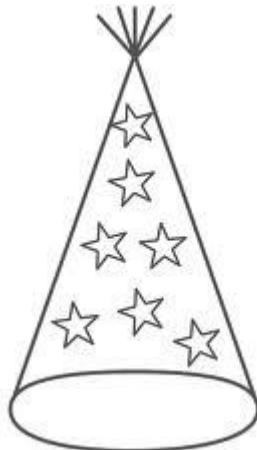


2. AB is a minor arc of the circle with centre O. The radius OB is 8cm . Angle AOB is 135°

(a) Calculate the length of the minor arc AB in the following diagram:



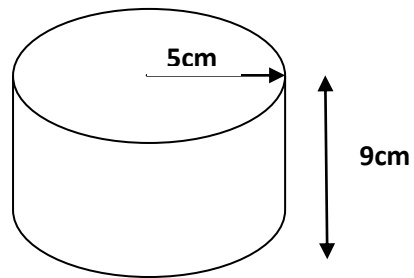
(b) The diagram above represents the base of a party hat.



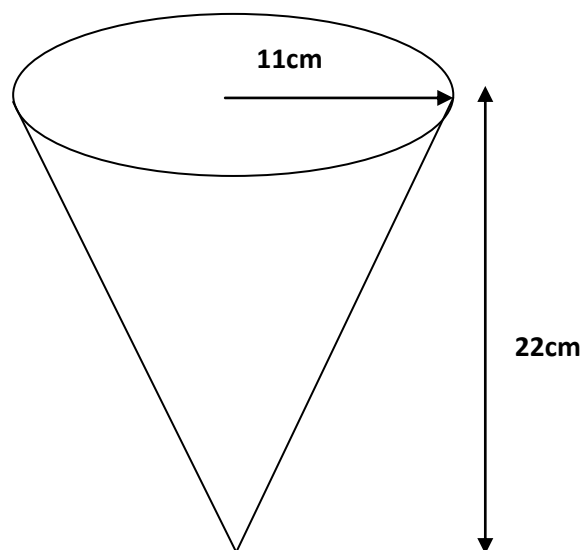
A shop wants to decorate the base with a ribbon. They have 125 metres of ribbon in stock. What is the maximum number of hats they can decorate from the 125 metres?

Exercise 11

1. Calculate the volume of the cylinder:



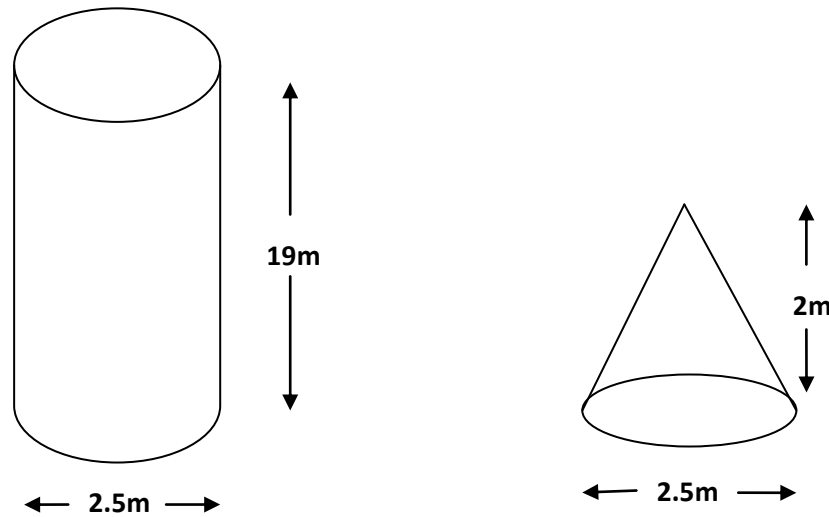
2. Calculate the volume of the cone:



3. On 12 July 1912, the battle of Largs was commemorated with the unveiling of a newly built stone tower popularly known as "The Pencil". The Pencil is made up of a cylindrical base with a conical roof.



The dimensions of the base and the roof are shown below:-



Calculate the total volume of the Pencil giving your answer to **3 significant figures**.

(End of Question Paper)

Answers

Exercise 1

- (a) $2\sqrt{3}$ (b) $3\sqrt{3}$ (c) $4\sqrt{2}$ (d) $5\sqrt{3}$ (e) $2\sqrt{5}$ (f) $3\sqrt{5}$

Exercise 2

1. (a) x^2 (b) x^7 (c) x^4 (d) x^{-4} (e) $20x^{\frac{7}{2}}$
2. (a) 1.55×10^8 (b) 2.8×10^6

Exercise 3

1. (a) $5x + 20$ (b) $8x - 12y$ (c) $c^2 + 5c$ (d) $x^2 + 4x + 3$ (e) $m^2 - 2m - 15$

Exercise 4

1. (a) $5(a + 5)$ (b) $a(a + 6)$ (c) $(b - 4)(b + 4)$ (d) $(h - 8)(h + 8)$ (e) $(x + 1)(x + 1)$
(f) $(y + 3)(y + 2)$

Exercise 5

1. (a) $(x + 4)^2 - 13$ (b) $(z + 4)^2 - 26$

Exercise 6

1. (a) $(p + 3)$ (b) $\frac{(3x+7)}{(3x+6)}$

Exercise 7

1. (a) $\frac{7}{24}$ (b) $\frac{9y-8x}{xy}$ (c) $\frac{c^2-d^2}{cd}$ (d) $\frac{7}{15}$ (e) $\frac{1}{3}$ (f) 2 (g) k (h) $\frac{tv}{6u}$

Exercise 8

1. (a) $Mab = 1$ (b) $Mpq = \frac{1}{5}$

Exercise 9

1. 11000cm^3

Exercise 10

1. (a) 174.6cm (b) $12.222\dots\text{m}$
2. (a) 18.85cm (b) 663 hats

Exercise 11

1. 706.86cm^3 2. 2787.63cm^3 3. 96.5m^3