National 5 Mathematics Homework
Exercise 1

Indices and Surds

1. Simplify:

(a) $\sqrt{200}$ (b) $\sqrt{2}\times\sqrt{2}\times\sqrt{5}$ (c) $5\sqrt{75}$ (d) $\sqrt{3}+4\sqrt{12}-\sqrt{27}$ **(8)**

2. Multiply out the brackets:

$\left(1+2\sqrt{3}\right)\left(2+\sqrt{3}\right)$ **(3)**

3. Rationalise the denominator and simplify where possible:

(a) $\frac{2}{\sqrt{3}}$ (b) $\frac{2}{\sqrt{8}}$ (c) $\frac{2\sqrt{3}}{3\sqrt{6}}$ **(6)**

4. Simplify and give each answer with a **positive** index:

(a) $3m^7\times 2m^2$ (b) $5x^6\times 2x^{-4}$ (c) $\frac{10x^6}{2x^3}$ (d) $\frac{a^{11}\times a^9}{a^{10}}$

(e) $\left(x^2\right)^5$ (f) $\left(2m^3\right)^3$ (g) $5y^2\times 3y^{-7}$ (h) $\frac{12d^2}{15d^4}$ **(15)**

5. Evaluate the following:

(a) $64^{\frac{1}{2}}$ (b) $8^{\frac{2}{3}}$ (c) $16^{\frac{-1}{4}}$ (d) $x^6\times x^7\times x^{-13}$ **(8)**

6. Write these numbers out in full:

(a) 5.26×10^5 (b) 4×10^4 (c) 2.24×10^{-5} **(3)**

7. Write these numbers in scientific notation:

(a) 65700000000 (b) 0.00000456 **(4)**

National 5 Mathematics Homework
Exercise 2

Algebraic Skills

1. Remove the brackets:

(a) $2(x+5)$ (b) $y(a-y)$ (c) $2x(3x-5y)$ (d) $c^2(c^2+c-4)$ **(8)**

2 Simplify the following expressions:

(a) $3(2c+d)-2d$ (b) $5p(p-2)-4p(p-6)$ **(5)**

3 Multiply out the brackets then simplify the following expressions:

(a) $(x+3)(x+2)$ (b) $(a-1)(a+3)$ (c) $(x-2)^2$ (d) $(5x-1)(4x+7)$

(e) $(3p-1)(2p+3)-2p$ (f) $(x-2)(4x^2-3x+2)$ **(13)**

4 Factorise the following expressions **completely:**

(a) $6a+3b$ (b) $4-x^2$ (c) $t^2+6t-16$ (d) $h^2-13h+36$

(e) $4a^2+4a+1$ (f) $3d^2-4d-4$ (g) $4x^3-10x^2-6x$ **(12)**

5 Complete the square for:

(a) $x^2 + 8x + 5$ (b) $t^2 + 6t - 1$ (c) $10 - 6d - d^2$ **(7)**

National 5 Mathematics Homework
Exercise 3

Algebraic Fractions

1. Copy and complete

(a) $2\frac{3}{8}+4\frac{1}{4}$ (b) $5\frac{3}{4}-1\frac{2}{3}$ (c) $\frac{3}{4}\times\frac{2}{5}$ (d) $\frac{5}{6}\div\frac{2}{3}$

(e) $1\frac{5}{6}+3\frac{3}{4}$ (f) $6\frac{1}{8}-2\frac{3}{10}$ (g) $2\frac{7}{10}\times4\frac{2}{3}$ (h) $6\frac{3}{4}\div5\frac{5}{8}$ **(20)**

2. Simplify these fractions:

(a) $\frac{y^2}{y}$ (b) $\frac{9x}{6x^2}$ c) $\frac{10a^2b}{4ab^2}$ (d) $\frac{2(x+1)(x-2)}{10(x+3)(x+1)}$ **(4)**

3. Factorise the numerator and/or the denominator, then simplify:

(a) $\frac{x+2}{4x+8}$ (b) $\frac{x^2+2x-15}{5x+25}$ **(5)**

4. Express each of the following as a single fraction and simplify where possible:

(a) $\frac{3}{8k}\times\frac{2k}{21}$ (b) $\frac{pq}{2}\times\frac{q}{p}$ (c) $\frac{3m}{7}\div\frac{15m}{56}$ (d) $\frac{h^2}{t}\div\frac{9h}{3t}$ **(8)**

5. By finding a common denominator work out these additions/subtractions.

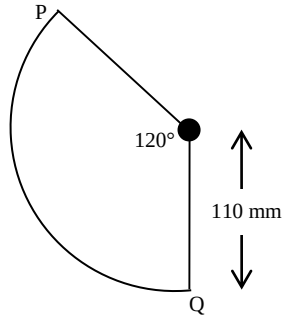
(a) $\frac{2x}{4}+\frac{5x}{3}$ (b) $\frac{3}{m}-\frac{7}{n}$ (c) $\frac{1}{g^2}+\frac{1}{g}$ (d) $\frac{x+4}{2}-\frac{x+1}{3}$ **(8)**

National 5 Mathematics Homework
Exercise 4

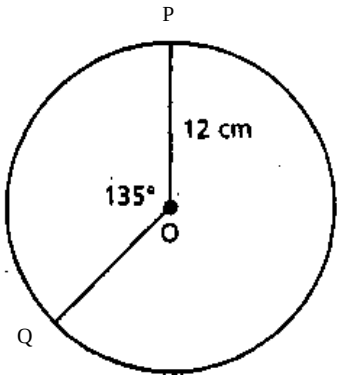
Arcs and Sectors

1 Calculate the length of the minor arc PQ in each sector. Give your answer to 3 sf.

(a



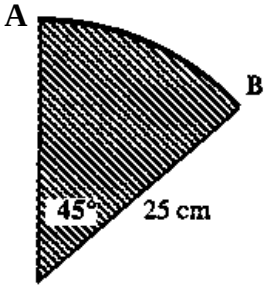
(b)



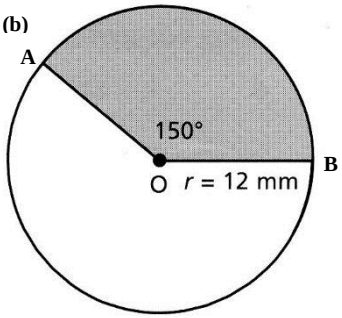
(8)

2 Calculate the area of each shaded sector AB.

(a)

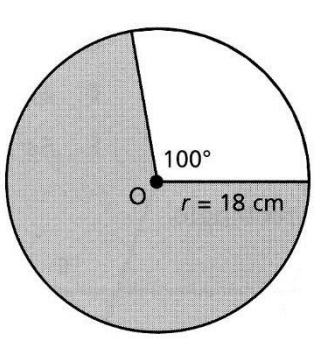


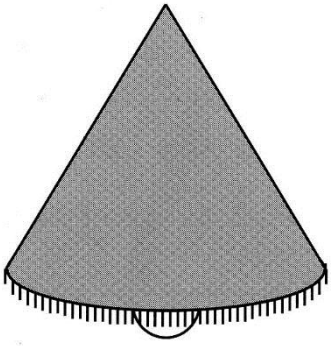
(b)



(6)

3. A lampshade is made using a sector of a circle.
   a Calculate the total area of material used for the lampshade.
   b What length of fringing is needed for the lower edge of the lampshade? **(6)**





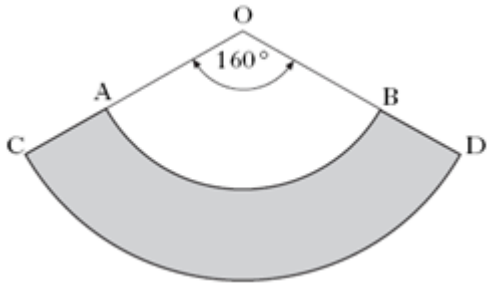
4. A pet shop manufactures protective dog collars.

In the diagram below, the shaded area represents one of these collars.

AB and CD are arcs of the circle with centre O.

The radius OA is 10 inches and the radius OC is 18 inches.

Angle AOB is 160°.



Calculate the area of the collar. **(4)**

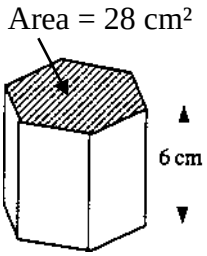
National 5 Mathematics Homework
Exercise 5

Volumes of Solids

Formulae Prism $V = A \times H$ Cylinder $V = \pi r^2 h$ Cone $V = \frac{1}{3}\pi r^2 h$ Sphere $V = \frac{4}{3}\pi r^3$

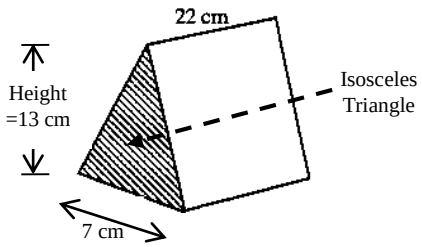
1 The globe has a diameter of 30 cm. Calculate its volume **(2)**

2 The diagram shows a hexagonal prism with a cross sectional area of 28cm² **(1)**

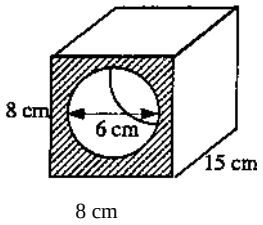


3 An aqualung is a **cylinder** of length 70 cm and radius 6 cm. **Calculate its volume**. **(1)**

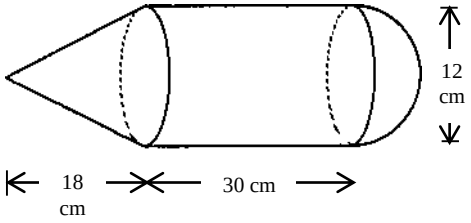
4 Calculate the volume of this triangular prism. **(2)**



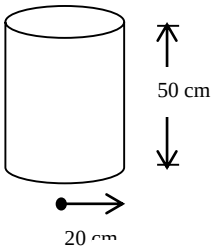
5 Calculate the volume of this prism by first working out the shaded area. **(4)**



6 This shape consists of a cone, a cylinder and a hemisphere. Calculate its total volume. **(4)**



7 A drinks container is in the shape of a cylinder with radius 20 centimetres and height 50 cm.



(a) Calculate the volume of the drinks container
Give your answer in cubic centimetres correct to two significant figures

Liquid from the full container can fill 800 cups, in the shape of cones, each of radius 3 centimetres.

(b) What will be the height of the liquid in each cup? (to 2 sf)

(7)