NATIONAL 5 HOMEWORK EXERCISE PACK A

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Exercise 1

1. Round to 1 significant figure:

    a. 9853   b. 5649   c. 10,944

    d. 0.0826   e. 3.928   f. 18.044

2. Round the answers above to 2 significant figures.

3. Round to 2 decimal places:

    a. 8.283   b. 2.788   c. 42.833

    d. 0.0746   e. 2.937   f. 0.02891

4. By rounding to 1 figure accuracy, estimate:

    a. 4288 x 1398   b. 2762 x 0.4365

Exercise 2

1. Round to 1 significant figure:

    a. 8243   b. 1688   c. 11,954

    d. 0.0826   e. 1.941   f. 29.047

2. Round the answers above to 2 significant figures.

3. Round to 2 decimal places:

    a. 6.4531   b. 3.679   c. 1.1843

    d. 0.0635   e. 1.137   f. 16.0481

4. By rounding to 1 figure accuracy, estimate:

    a. 8987 x 1287   b. 3581 x 0.3272

Exercise 3

1. Round to 1 significant figure:

    a. 5664   b. 3687   c. 12,908

    d. 0.0839   e. 2.966   f. 51.027

2. Round the answers above to 2 significant figures.

3. Round to 2 decimal places:

    a. 86.731   b. 4.677   c. 16.993

    d. 0.0844   e. 1.806   f. 13.007

4. By rounding to 1 figure accuracy, estimate:

    a. 4087 x 2199   b. 2652 x 0.2972

Exercise 4

1. Round to 1 significant figure:

    a. 1237   b. 6319   c. 22,945

    d. 0.0446   e. 1.776   f. 17.338

2. Round the answers above to 2 significant figures.

3. Round to 2 decimal places:

    a. 5.5834   b. 2.4592   c. 16.933

    d. 0.0116   e. 1.766   f. 10.039

4. By rounding to 1 figure accuracy, estimate:

    a. 2266x 4294   b. 3382 x 0.8888

E&F	Rounding and Estimation

Exercise 1

Simplify these surds as far as possible:

1. $3\sqrt{5} + 6\sqrt{5}$

2. $6\sqrt{7} + 2\sqrt{7} - \sqrt{7}$

3. $\sqrt{12}$

4. $\sqrt{20}$

5. $\sqrt{75}$

6. $\sqrt{6} \times \sqrt{3}$

7. $\sqrt{2} \times \sqrt{5} \times \sqrt{4}$

8. $\sqrt{3} \times \sqrt{10} \times \sqrt{2}$

Exercise 2

Simplify these surds as far as possible:

1. $2\sqrt{3} + 8\sqrt{3}$

2. $4\sqrt{11} + 3\sqrt{11} - \sqrt{11} + 5\sqrt{11}$

3. $\sqrt{24}$

4. $\sqrt{50}$

5. $\sqrt{128}$

6. $\sqrt{11} \times \sqrt{4}$

7. $\sqrt{4} \times \sqrt{2} \times \sqrt{10}$

8. $\sqrt{20} \times \sqrt{5} \times \sqrt{5}$

Exercise 3

Simplify these surds as far as possible:

1. $\sqrt{13} + 2\sqrt{13}$

2. $5\sqrt{3} + 2\sqrt{3} - 8\sqrt{3} - 2\sqrt{3}$

3. $\sqrt{8}$

4. $\sqrt{32}$

5. $\sqrt{48}$

6. $\sqrt{3} \times \sqrt{24}$

7. $\sqrt{5} \times \sqrt{3} \times \sqrt{4}$

8. $\sqrt{30} \times \sqrt{3} \times \sqrt{10}$

Exercise 4

Simplify these surds as far as possible:

1. $7\sqrt{2} + 9\sqrt{2}$

2. $2\sqrt{19} - \sqrt{19} - \sqrt{19} - 12\sqrt{19}$

3. $\sqrt{90}$

4. $\sqrt{300}$

5. $\sqrt{96}$

6. $\sqrt{2} \times \sqrt{8}$

7. $\sqrt{3} \times \sqrt{7} \times \sqrt{2}$

8. $\sqrt{2} \times \sqrt{8} \times \sqrt{7}$

E&F	Surds –Simplifying

Exercise 1

Simplify these surds as far as possible:

1. $6 + \sqrt{400}$

2. $\sqrt{32} + \sqrt{8}$

3. $2\sqrt{5} + \sqrt{20} + \sqrt{45}$

Rationalise the denominator:

4. $\dfrac{2}{\sqrt{5}}$

5. $\dfrac{6}{\sqrt{3}}$

6. $\dfrac{7}{2\sqrt{5}}$

Exercise 2

Simplify these surds as far as possible:

1. $\sqrt{200} + \sqrt{300}$

2. $\sqrt{12} + \sqrt{8}$

3. $\sqrt{18} + \sqrt{2} + \sqrt{72}$

Rationalise the denominator:

4. $\dfrac{3}{\sqrt{7}}$

5. $\dfrac{8}{\sqrt{6}}$

6. $\dfrac{3}{4\sqrt{11}}$

Exercise 3

Simplify these surds as far as possible:

1. $6\sqrt{3} + \sqrt{27}$

2. $\sqrt{18} + 3\sqrt{2}$

3. $6\sqrt{5} + \sqrt{20} + \sqrt{80}$

Rationalise the denominator:

4. $\dfrac{3}{\sqrt{7}}$

5. $\dfrac{8}{\sqrt{15}}$

6. $\dfrac{5}{2\sqrt{13}}$

Exercise 4

Simplify these surds as far as possible:

1. $20 + \sqrt{1600}$

2. $\sqrt{27} + 2\sqrt{3}$

3. $\sqrt{12} + 7\sqrt{3} + \sqrt{27}$

Rationalise the denominator:

4. $\dfrac{5}{\sqrt{2}}$

5. $\dfrac{12}{\sqrt{13}}$

6. $\dfrac{8}{3\sqrt{3}}$

| **E&F** | Surds – Simplifying and Rationalising Denominator |

Exercise 1

Multiply out the brackets and simplify:

1. $\sqrt{3}(\sqrt{3}+2)$

2. $\sqrt{5}(2\sqrt{5}+4)$

3. $(\sqrt{3}+1)^2$

Simplify:

4. $\dfrac{\sqrt{40}}{\sqrt{2}}$

5. $\sqrt{50}$

6. $\dfrac{\sqrt{750}}{\sqrt{3}}$

Exercise 2

Multiply out the brackets and simplify:

1. $\sqrt{2}(\sqrt{6}+5)$

2. $\sqrt{3}(3\sqrt{3}+6)$

3. $(\sqrt{2}-1)^2$

Simplify:

4. $\dfrac{\sqrt{24}}{\sqrt{3}}$

5. $\sqrt{72}$

6. $\dfrac{\sqrt{120}}{\sqrt{5}}$

Exercise 3

Multiply out the brackets and simplify:

1. $\sqrt{8}(\sqrt{8}+8)$

2. $\sqrt{2}(5\sqrt{2}+1)$

3. $(\sqrt{4}+6)^2$

Simplify:

4. $\dfrac{\sqrt{63}}{\sqrt{7}}$

5. $\sqrt{225}$

6. $\dfrac{\sqrt{45}}{9}$

Exercise 4

Multiply out the brackets and simplify:

1. $\sqrt{6}(7\sqrt{6}+10)$

2. $\sqrt{5}(7\sqrt{5}+11)$

3. $(\sqrt{6}-3)^2$

Simplify:

4. $\dfrac{\sqrt{80}}{\sqrt{2}}$

5. $\sqrt{196}$

6. $\dfrac{\sqrt{96}}{\sqrt{3}}$

| **E&F** | Surds – Multiplying and Simplifying |

Exercise 1

Simplify the following:

1. $a^4 \times a^3$

2. $5b^3 \times 2b^2$

3. $4a^{10} \times 2a^{-2}$

4. $\dfrac{b^5}{b^3}$

5. $\dfrac{12a^3}{4a^{-2}}$

6. $\dfrac{15b^6}{3b^{-6}}$

7. $(a^3)^2$

8. $(2b^2)^4$

Exercise 2

Simplify the following:

1. $a^2 \times a^7$

2. $2b^5 \times 2b^6$

3. $5a^{-3} \times 7a^6$

4. $\dfrac{b^8}{b^2}$

5. $\dfrac{16a^5}{2a^{-4}}$

6. $\dfrac{14a^2b^3}{7ab^{-2}}$

7. $(a^6)^3$

8. $(3b^3)^2$

Exercise 3

Simplify the following:

1. $a^5 \times a^{10}$

2. $8b^4 \times 3b^7$

3. $3a^{20} \times 6a^{-4}$

4. $\dfrac{b^{16}}{b^2}$

5. $\dfrac{16a^3}{12a^{-10}}$

6. $\dfrac{20a^5b^4}{15a^3b^{-4}}$

7. $(a^8)^5$

8. $(5b^5)^3$

Exercise 4

Simplify the following:

1. $a^3 \times a^6 \times a^4$

2. $6b^{-1} \times b^2 \times b^{-1}$

3. $7a^{15} \times 4a^{-18}$

4. $\dfrac{b^{24}}{b^{16}}$

5. $\dfrac{28a^9}{6a^{-5}}$

6. $\dfrac{50a^9b^3}{10a^8b^{-5}}$

7. $(a^6)^7$

8. $(2b^9)^5$

E&F	Indices

National 5 Homework Booklet

Exercise 1
Simplify the following:

1. $6a^{-5} \times 2a^{-6}$

2. $\dfrac{20a^5b^7}{6a^3b^{-3}}$

3. $\dfrac{5a^2 \times 2a^3}{a^4}$

4. $\dfrac{2b^{-3} \times 6b^8}{3b^2}$

5. $18a^5 \div 3a^{-4}$

6. $\dfrac{(2a)^3}{a^2}$

7. $a^{\frac{1}{2}} \times a^2$

Exercise 2
Simplify the following:

1. $12a^{-2} \times 3a^{-4}$

2. $\dfrac{36a^4b^2}{3ab^{-6}}$

3. $\dfrac{3a^4 \times 4a^2}{a^2}$

4. $\dfrac{7b^{-3} \times 2b^{10}}{2b^6}$

5. $20a^4 \div 2a^{-3}$

6. $\dfrac{(3a)^2}{a}$

7. $a^{\frac{1}{3}} \times a^2$

Exercise 3
Simplify the following:

1. $8a^{-7} \times 3a^{-2}$

2. $\dfrac{18a^8b^{12}}{4a^2b^{-10}}$

3. $\dfrac{20a^2 \times 4a^5}{a^{-2}}$

4. $\dfrac{4b^{-8} \times 5b^{20}}{5b^6}$

5. $75a^{25} \div 5a^{-20}$

6. $\dfrac{(5a^2)^3}{a^2}$

7. $a^{\frac{1}{5}} \times a^3$

Exercise 4
Simplify the following:

1. $11a^{-10} \times 3a^{-5}$

2. $\dfrac{25a^8b^{14}}{35a^2b^{-12}}$

3. $\dfrac{16a^{17} \times 3a^{-12}}{a^3}$

4. $\dfrac{3b^{-12} \times 8b^5}{2b^{-9}}$

5. $50a^{40} \div 10a^{-30}$

6. $\dfrac{(2a^4)^3}{2a^7}$

7. $a^{\frac{1}{2}} \times a^{\frac{1}{3}}$

E&F	Fractional Indices

National 5 Homework Booklet

Exercise 1

Change these to a fractional index:

1. (a) $\sqrt[4]{a^3}$ (b) $\sqrt[5]{b^4}$

Find the value of these:

2. (a) $\sqrt[3]{27^2}$ (b) $\sqrt[2]{4^3}$

Expand the brackets:

3. $a^2(a^3 - 3)$

4. $2b^{-5}(b^2 - 6b^8)$

5. $3a^4(\dfrac{1}{a^2} + 2a^{-2})$

6. $3b^{\frac{1}{2}}(2b^{\frac{1}{2}} + 5b^{-\frac{3}{2}})$

7. $a^{\frac{1}{4}}(2a + 5)$

Exercise 2

Change these to a fractional index:

1. (a) $\sqrt[7]{a^5}$ (b) $\sqrt[8]{b^{11}}$

Find the value of these:

2. (a) $\sqrt[3]{64^2}$ (b) $\sqrt[4]{16^3}$

Expand the brackets:

3. $a^6(a^5 + 2)$

4. $3b^{-2}(b^2 - 10b^{12})$

5. $2a^2(\dfrac{1}{a} + 5a^{-9})$

6. $4b^{\frac{1}{2}}(b^{-\frac{1}{2}} + 2b^{\frac{3}{2}})$

7. $a^{\frac{1}{3}}(3a + 2)$

Exercise 3

Change these to a fractional index:

1. (a) $\sqrt[9]{a^2}$ (b) $\sqrt[13]{b^7}$

Find the value of these:

2. (a) $\sqrt[3]{125^2}$ (b) $\sqrt[5]{32^2}$

Expand the brackets:

3. $a^{15}(a^{16} + 2a)$

4. $6b^{-9}(3b^{-5} + 2b^{20})$

5. $7a^8(\dfrac{2}{a^5} + 3a^{-5})$

6. $8b^{\frac{3}{2}}(4b^{\frac{1}{2}} + 6b^{-\frac{3}{2}})$

7. $a^{\frac{1}{5}}(6a - 5a^2)$

Exercise 4

Change these to a fractional index:

1. (a) $\sqrt[21]{a^{11}}$ (b) $\sqrt[18]{b^{19}}$

Find the value of these:

2. (a) $\sqrt[9]{1^5}$ (b) $\sqrt[3]{1000^2}$

Expand the brackets:

3. $5a^4(2a^9 - 3a^{-4})$

4. $10b^{-20}(3b^{25} + 7b^{-21})$

5. $12a^{17}(\dfrac{1}{2a^{15}} + 3a^{-10})$

6. $15b^{\frac{5}{2}}(2b^{\frac{1}{2}} + 5b^{-\frac{1}{2}})$

7. $a^{\frac{2}{5}}(4a + 10a^3)$

E&F	Fractional Indices

National 5 Homework Booklet

Exercise 1

1. Write the following numbers in scientific notation:

   a. 5,445,000   b. 6,543   c. 0.005417

   d. 140,200   e. 0.0000802   f. 20.353

2. Write the following numbers in normal form:

   a. 5.32×10^5 b. 3.08×10^{-2} c. 7×10^{-3}

   d. 2.55×10^{11} e. 8.03×10^{-9} f. 3.3×10^3

3. Calculate $(9.65 \times 10^6) \times (6.3 \times 10^{-2})$ giving your answer in normal form.

4. Calculate $(6.45 \times 10^{11}) \times (1.25 \times 10^8)$ giving your answer in scientific notation.

Exercise 2

1. Write the following numbers in scientific notation:

   a. 7,236,000   b. 6,645   c. 0.0003372

   d. 1,170,800   e. 0.000508   f. 13.381

2. Write the following numbers in normal form:

   a. 4.24×10^4 b. 3.009×10^{-3} c. 6×10^{-6}

   d. 2.004×10^{10} e. 5.43×10^{-7} f. 3.2×10^7

3. Calculate $(9.55 \times 10^7) \times (4.5 \times 10^{-3})$ giving your answer in normal form.

4. Calculate $(7.34 \times 10^9) \times (8.05 \times 10^6)$ giving your answer in scientific notation.

Exercise 3

1. Write the following numbers in scientific notation:

   a. 62,260   b. 8,554   c. 0.000064

   d. 140.8   e. 0.00109   f. 21.3

2. Write the following numbers in normal form:

   a. 8.63×10^7 b. 4.25×10^{-3} c. 8×10^{-4}

   d. 1.005×10^{10} e. 1.953×10^{-6} f. 4.005×10^8

3. Calculate $(7.57 \times 10^6) \times (5.5 \times 10^{-5})$ giving your answer in normal form.

4. Calculate $(4.32 \times 10^5) \times (5.85 \times 10^5)$ giving your answer in scientific notation.

Exercise 4

1. Write the following numbers in scientific notation:

   a. 27,900,000   b. 47,000   c. 0.0000065

   d. 133,300   e. 0.1201   f. 15.54

2. Write the following numbers in normal form:

   a. 9.23×10^4 b. 5.3×10^{-3} c. 9.1×10^{-4}

   d. 4.505×10^6 e. 1.4301×10^{-5} f. 7.2×10^5

3. Calculate $(5.22 \times 10^7) \times (4.5 \times 10^{-3})$ giving your answer in normal form.

4. Calculate $(8.08 \times 10^6) \times (6.65 \times 10^7)$ giving your answer in scientific notation.

E&F	Scientific Notation

National 5 Homework Booklet

Exercise 1

1. Expand the brackets:

   a. $5(3x - 3)$ b. $6(2x + 4)$

   c. $8(2x - 2)$ d. $2x(6x - 7)$

   e. $4x(8x + 8)$ f. $5x(5x - 3y)$

   g. $-2x(2x - 2)$ h. $-7(7 - 7x)$

   i. $-11(13y - x)$ j. $-4x(5y - 4x + 2z)$

2. Expand the brackets and simplify where possible:

   a. $3(7x + 3) + 13x$ b. $5(2x + 15) - 20$

   c. $6 + 7(3x + 5)$ d. $8x + 3(2x - 4)$

Exercise 2

1. Expand the brackets:

   a. $6(4x - 2)$ b. $3(3x + 3)$

   c. $9(3x - 6)$ d. $2x(6x - 6)$

   e. $4x(4x + 4)$ f. $7x(4x - 2y)$

   g. $-2x(8x - 1)$ h. $-3(6 - 6x)$

   i. $-13x(3y - 3x)$ j. $-8x(3y - 3x - z)$

2. Expand the brackets and simplify where possible:

   a. $4(5x + 3) - 12x$ b. $3(2x + 5) + 15$

   c. $11 + 5(9x - 15)$ d. $9x - 3(3x + 14)$

Exercise 3

1. Expand the brackets:

   a. $3(2x - 3)$ b. $15(3x - 5)$

   c. $6(x - 4)$ d. $2x(4x + 4)$

   e. $11x(x + 3)$ f. $6x(7x - y)$

   g. $-3x(x - 13)$ h. $-5(3 - 4x + y)$

   i. $-1x(4y + x)$ j. $-7x(2y + 4x + 2z)$

2. Expand the brackets and simplify where possible:

   a. $6(4x - 3) + 7x$ b. $4(7x - 5) + 5$

   c. $7 + 2(2x - 15)$ d. $6x - 3(2x - 6)$

Exercise 4

1. Expand the brackets:

   a. $5(2x - 12)$ b. $5(4x + 9)$

   c. $6(6x - 6)$ d. $4x(2x - 8)$

   e. $7x(7x + 8)$ f. $7x(4x + 5y)$

   g. $-4x(5x - 3)$ h. $-3(1 - 3x)$

   i. $-2x(13y - 2x)$ j. $-8x(2y + 3x - z)$

2. Expand the brackets and simplify where possible:

   a. $7(2x - 3) + 10x$ b. $6(2x + 15) - 8$

   c. $9 + 5(2x + 15)$ d. $3x - 4(2x - 4)$

E&F	Expanding Brackets

National 5 Homework Booklet

Exercise 1	Exercise 2
Expand the brackets and simplify your answer:	Expand the brackets and simplify your answer:

Exercise 1

Expand the brackets and simplify your answer:

1. $(x + 4)(x + 2)$

2. $(x + 6)(x + 3)$

3. $(x + 1)(x – 6)$

4. $(x - 5)(x – 3)$

5. $(x – 5)(x – 5)$

6. $(x – 6)(x – 3)$

7. $(x – 8)(x + 2)$

8. $(x – 9)(x + 2)$

9. $3(x + 4)(x – 3)$

Exercise 2

Expand the brackets and simplify your answer:

1. $(x + 6)(x + 6)$

2. $(x + 2)(x + 3)$

3. $(x + 7)(x – 8)$

4. $(x + 4)(x – 7)$

5. $(x – 4)(x – 2)$

6. $(x – 3)(-x – 8)$

7. $2(x – 2)(x + 3)$

8. $3(x – 5)(2x + 1)$

9. $2(x - 3)(x + 2)$

Exercise 3

Expand the brackets and simplify your answer:

1. $(x + 4)(x + 1)$

2. $(x + 6)(x + 3)$

3. $(x + 2)(x – 2)$

4. $(x - 6)(x – 2)$

5. $(x + 4)(-x – 5)$

6. $(x – 3)(2x – 4) + 2x$

7. $2(x – 4)(3x + 1) – 5x$

8. $(2x + 5)(x - 13) + 6x$

9. $3(x + 1)(x – 3) – x + 1$

Exercise 4

Expand the brackets and simplify your answer:

1. $(x + 6)(x + 2)$

2. $(x + 7)(x + 3)$

3. $(x + 1)(x – 8)$

4. $(x + 5)(x – 9)$

5. $(x – 1)(4 – x)$

6. $(x – 6)(9 – x) – 6x$

7. $(5x – 6)(2x + 1) - 17$

8. $3(x – 5)(x + 5) – 3x$

9. $2(x - 5)(6 – 2x) + x - 3$

E&F	Expanding Brackets

National 5 Homework Booklet

Exercise 1

1. Expand the brackets and simplify your answer:

   a. $(x + 4)(x^2 + 4x + 1)$

   b. $(3x + 2)(x + 1)^2$

   c. $(x^2 - 3x + 2)(x - 2)$

   d. $(x + 3)^3$

2. Find an expression for the area of the rectangle:

   4x

   (x + 5)
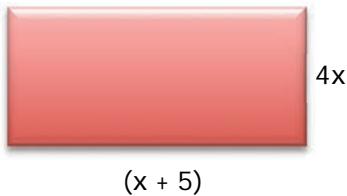
Exercise 2

1. Expand the brackets and simplify your answer:

   a. $(x + 4)(x^2 + 6x + 5)$

   b. $(4x + 5)(x + 3)^2$

   c. $(x^2 - 2x + 4)(x - 1)$

   d. $(x + 2)^3$

2. Find an expression for the area of the rectangle:

   (2x – 3)

   (x + 4)
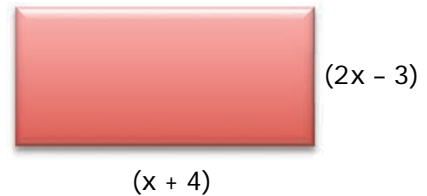
Exercise 3

1. Expand the brackets and simplify your answer:

   a. $(x - 5)(x^2 - 3x + 2)$

   b. $(3x + 5)(x - 4)^2$

   c. $(x^2 - 4x + 2)(x + 3)$

   d. $(x - 5)^3$

2. Find an expression for the area of the rectangle:

   (5x + 2)

   (3x - 2)
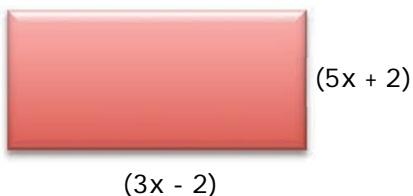
Exercise 4

1. Expand the brackets and simplify your answer:

   a. $(x + 3)(x^2 + 3x + 6)$

   b. $(2x + 5)(x + 4)^2$

   c. $(x^2 - 3x + 2)(x - 4)$

   d. $(x - 4)^3$

2. Find an expression for the area of the rectangle:

   (3x – 8)

   (2x - 9)

E&F	Expanding Brackets
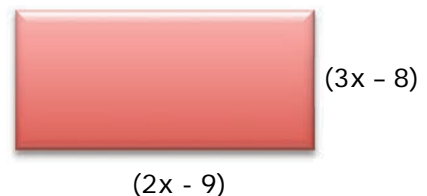
National 5 Homework Booklet

Exercise 1

Factorise the following expressions:

1. $6x + 3$

2. $16x - 8$

3. $7x^2 - 21x$

4. $36x^3 - 12x$

5. $24x^2 - 8x$

6. $9yx^2 - 3xy$

7. $6x^2y^3 + 12xy + 6xy^2$

8. $18x^3yz^2 + 9xy^2z - 27xyz^2$

Exercise 2

Factorise the following expressions:

1. $5x + 15$

2. $12x - 2$

3. $6x^2 - 18x$

4. $60x^2 - 12x$

5. $15x^2 - 5x$

6. $7xy^3 + 56xy$

7. $13x^2y^2 + 26xy + 13x^2y$

8. $15x^2yz^3 + 5xy^2z - 25xyz$

Exercise 3

Factorise the following expressions:

1. $10x + 10$

2. $14x - 2$

3. $6x^2 - 24x$

4. $50x^2 - 25x$

5. $120x^2 + 12x$

6. $6y^2 - 2xy - 2y$

7. $44x^3y^3 + 4xy^2$

8. $16x^3yz^2 - 2xy^2z - 48xyz^2$

Exercise 4

Factorise the following expressions:

1. $6x + 3$

2. $20x - 2$

3. $8x^2 - 40x$

4. $32x^2 + 12x$

5. $150x^2 - 20x$

6. $6xy^2 + 4xy$

7. $14x^2y^2 - 7xy$

8. $20x^2yz^2 + 32xy^3z - 12xyz^2$

E&F	Factorising (common factor)

National 5 Homework Booklet

Exercise 1

Factorise the following expressions:

1. $x^2 - 25$

2. $x^2 - 16$

3. $x^2 - 9$

4. $2x^2 - 200$

5. $4x^2 - 16$

6. $5x^2 - 125$

7. $6x^2 - 96$

8. $10x^2 - 1000$

Exercise 2

Factorise the following expressions:

1. $x^2 - 36$

2. $x^2 - 64$

3. $x^2 - 81$

4. $2x^2 - 162$

5. $2x^2 - 50$

6. $3x^2 - 27$

7. $5x^2 - 180$

8. $8x^2 - 392$

Exercise 3

Factorise the following expressions:

1. $x^2 - 100$

2. $x^2 - 4$

3. $x^2 - 121$

4. $3x^2 - 12$

5. $4x^2 - 484$

6. $5x^2 - 45$

7. $2x^2 - 72$

8. $128 - 2x^2$

Exercise 4

Factorise the following expressions:

1. $x^2 - 400$

2. $x^2 - 169$

3. $3x^2 - 75$

4. $4x^2 - 144$

5. $4x^2 - 64$

6. $5x^2 - 405$

7. $6x^2 - 600$

8. $2000 - 5x^2$

E&F	Factorising (difference of two squares)

National 5 Homework Booklet

Exercise 1

Factorise:

1. a. $x^2 + 5x + 6$ **b.** $x^2 + 2x + 1$

c. $x^2 + 4x + 4$ **d.** $x^2 + 7x + 12$

2. a. $x^2 + x - 2$ **b.** $x^2 + 3x - 4$

d. $x^2 + x - 12$ **d.** $x^2 + x - 20$

3. a. $x^2 - 2x - 3$ **b.** $x^2 - 3x - 4$

c. $x^2 - 17x - 18$ **d.** $x^2 - 8x - 9$

4. a. $x^2 - 5x + 6$ **b.** $x^2 - 8x + 12$

c. $x^2 - 16x + 15$ **d.** $x^2 - 9x + 20$

Exercise 2

Factorise:

1. a. $x^2 + 7x + 6$ **b.** $x^2 + 3x + 2$

d. $x^2 + 5x + 4$ **d.** $x^2 + 8x + 12$

2. a. $x^2 + 2x - 8$ **b.** $x^2 + 4x - 5$

c. $x^2 + 17x - 18$ **d.** $x^2 + 8x - 9$

3. a. $x^2 - 4x - 5$ **b.** $x^2 - 6x - 7$

c. $x^2 - 5x - 14$ **d.** $x^2 - 3x - 10$

4. a. $x^2 - 7x + 6$ **b.** $x^2 - 13x + 12$

c. $x^2 - 8x + 15$ **d.** $x^2 - 12x + 20$

Exercise 3

Factorise:

1. a. $x^2 + 4x + 3$ **b.** $x^2 + 6x + 5$

c. $x^2 + 8x + 15$ **d.** $x^2 + 11x + 18$

2. a. $x^2 + 6x - 16$ **b.** $x^2 + 10x - 11$

c. $x^2 + 5x - 24$ **d.** $x^2 + 4x - 32$

3. a. $x^2 - x - 12$ **b.** $x^2 - 15x - 16$

c. $x^2 - 5x - 24$ **d.** $x^2 - 5x - 36$

4. a. $x^2 - 10x + 16$ **b.** $x^2 - 4x + 4$

c. $x^2 - 20x + 36$ **d.** $x^2 - 11x + 30$

Exercise 4

Factorise:

1. a. $x^2 + 13x + 22$ **b.** $x^2 + 19x + 18$

c. $x^2 + 19x + 60$ **d.** $x^2 + 17x + 72$

2. a. $x^2 + 2x - 48$ **b.** $x^2 + 9x - 36$

c. $x^2 + 21x - 72$ **d.** $x^2 + 10x - 39$

3. a. $x^2 - 3x - 54$ **b.** $x^2 - 18x - 63$

c. $x^2 - 8x - 48$ **d.** $x^2 - x - 132$

4. a. $x^2 - 25x + 66$ **b.** $x^2 - 19x + 70$

c. $x^2 - 19x + 84$ **d.** $x^2 - 29x + 100$

E&F	Factorising (trinomials)

National 5 Homework Booklet

Exercise 1

Factorise:

1. $2x^2 + 3x + 1$

2. $3x^2 + 7x + 2$

3. $6x^2 + 13x + 6$

4. $8x^2 + 22x + 5$

5. $12x^2 + 17x + 6$

6. $12x^2 + 20x + 3$

7. $24x^2 + 38x + 15$

Exercise 2

Factorise:

1. $3x^2 - 2x - 1$

2. $2x^2 + x - 3$

3. $2x^2 - x - 10$

4. $5x^2 - 3x - 2$

5. $7x^2 + 18x - 9$

6. $4x^2 - 5x - 6$

7. $8x^2 - 19x - 10$

Exercise 3

Factorise:

1. $15x^2 + x - 2$

2. $6x^2 - x - 12$

3. $10x^2 + x - 2$

4. $12x^2 - 13x - 4$

5. $16x^2 - 3x - 15$

6. $24x^2 - 31x - 15$

7. $36x^2 - 19x - 6$

Exercise 4

Factorise:

1. $x^2 - 8x + 7$

2. $x^2 - 8x + 15$

3. $5x^2 - 34x + 24$

4. $6x^2 - 23x + 20$

5. $5x^2 - 31x + 6$

6. $18x^2 - 45x + 28$

7. $24x^2 - 46x + 15$

E&F	Factorising (trinomials)

National 5 Homework Booklet

Exercise 1	Exercise 2

Exercise 1

Factorise:

1. $x^2 - 16$

2. $3x^2 - 12$

3. $2x^2 + 8x + 8$

4. $16x^2 + 24x$

5. $4x^2 + 12x + 8$

6. $10x^2 - 25x - 15$

7. $36x^2 - 69x + 30$

Exercise 2

Factorise:

1. $y^2 + 2y$

2. $y^2 - 16$

3. $5y^2 - 45$

4. $y^2 + 4y - 12$

5. $4y^2 - 9z^2$

6. $12y^2 - 16y - 60$

7. $48y^2 - 70y + 8$

Exercise 3

Factorise:

1. $m^2 - 100$

2. $mn^2 - 2m^2n$

3. $6m^2 - 54$

4. $9m^2 - 64n^2$

5. $m^2 - 6m - 16$

6. $64m^3 + 32m^2 + 4m$

7. $m^4 - 1$

Exercise 4

Factorise:

1. $n^2 - 144$

2. $5n^2 p^3 - 25np$

3. $3n^2 - 12p^2$

4. $3n^2 p^3 - 12n^2p$

5. $n^2 - 19n - 20$

6. $4n^3 + 16n^2 + 15n$

7. $n^4 - 16$

E&F	Factorising (mixed)

National 5 Homework Booklet

Exercise 1

Change each trinomial to the form $y = (x + a)^2 + b$:

1. $y = x^2 + 4x + 7$

2. $y = x^2 + 8x + 18$

3. $y = x^2 + 2x + 7$

4. $y = x^2 + 16x + 69$

5. $y = x^2 + 20x + 103$

6. $y = x^2 + 14x + 50$

Exercise 2

Change each trinomial to the form $y = (x \pm a)^2 + b$:

1. $y = x^2 - 10x + 27$

2. $y = x^2 - 4x + 12$

3. $y = x^2 - 6x + 18$

4. $y = x^2 - 14x + 53$

5. $y = x^2 - 22x + 123$

6. $y = x^2 - 24x + 145$

Exercise 3

Change each trinomial to the form $y = b - (x \pm a)^2$

1. $y = -x^2 - 2x + 3$

2. $y = -x^2 - 4x - 1$

3. $y = -x^2 + 2x + 4$

4. $y = -x^2 + 6x + 1$

5. $y = 7 - 2x - x^2$

6. $y = 8 + 4x - x^2$

Exercise 4

Change each trinomial to the form $y = (x \pm a)^2 + b$:

1. $y = x^2 + 12x + 43$

2. $y = x^2 - 10x + 19$

3. $y = x^2 - 8x + 18$

Change each trinomial to the form $y = b - (x \pm a)^2$

4. $y = -x^2 - 4x + 3$

5. $y = -x^2 + 8x + 6$

6. $y = -x^2 + 2x + 10$

E&F	Completing the Square

National 5 Homework Booklet

Exercise 1

Simplify each of the following:

1. a. $\dfrac{3}{a} + \dfrac{4}{a}$ b. $\dfrac{5}{a} + \dfrac{6}{b}$ c. $\dfrac{9}{h} - \dfrac{7}{h^3}$

2. a. $\dfrac{3}{a} + \dfrac{5}{a+2}$ b. $\dfrac{2}{b-3} - \dfrac{5}{b}$

3. $\dfrac{8}{a+5} + \dfrac{1}{a-2}$

4. $\dfrac{3}{b^5} + \dfrac{7}{b^6}$

5. $\dfrac{2}{h+3} - \dfrac{7}{h+5}$

6. $\dfrac{a}{a+2} - \dfrac{4}{3a}$

Exercise 2

Simplify each of the following:

1. a. $\dfrac{6}{t} + \dfrac{7}{t}$ b. $\dfrac{7}{a} + \dfrac{2}{b}$ c. $\dfrac{10}{a^2} - \dfrac{9}{a^7}$

2. a. $\dfrac{4}{a} + \dfrac{3}{a+5}$ b. $\dfrac{1}{b-4} - \dfrac{6}{b}$

3. $\dfrac{2}{a+11} + \dfrac{3}{a-1}$

4. $\dfrac{9}{ab^3} + \dfrac{2}{b^2}$

5. $\dfrac{5}{h+1} - \dfrac{2}{h+9}$

6. $\dfrac{b}{b+3} - \dfrac{8}{5b}$

Exercise 3

Simplify each of the following:

1. a. $\dfrac{8}{y} + \dfrac{2}{y}$ b. $\dfrac{2}{p} + \dfrac{3}{t}$ c. $\dfrac{5}{m^2} - \dfrac{10}{m^{10}}$

2. a. $\dfrac{2}{a} + \dfrac{13}{a+5}$ b. $\dfrac{6}{b-1} - \dfrac{3}{b}$

3. $\dfrac{11}{a+2} + \dfrac{2}{a-2}$

4. $\dfrac{6}{b^8} + \dfrac{17}{b^{11}}$

5. $\dfrac{4}{h+5} - \dfrac{2}{h+2}$

6. $\dfrac{m}{m+1} - \dfrac{9}{8m}$

Exercise 4

Simplify each of the following:

1. a. $\dfrac{7}{f} + \dfrac{12}{f}$ b. $\dfrac{8}{x} + \dfrac{3}{y}$ c. $\dfrac{12}{b^7} - \dfrac{3}{b^{11}}$

2. a. $\dfrac{1}{a} + \dfrac{14}{a+4}$ b. $\dfrac{7}{b-2} - \dfrac{9}{b}$

3. $\dfrac{3}{a+7} + \dfrac{4}{a-5}$

4. $\dfrac{10}{b^9} + \dfrac{11}{b^{10}}$

5. $\dfrac{1}{h+9} - \dfrac{2}{h+6}$

6. $\dfrac{y}{y+2} - \dfrac{11}{10y}$

E&F	Algebraic Fractions – Adding and Subtracting

National 5 Homework Booklet

Exercise 1

Multiply or divide then simplify the following:

1. a. $\dfrac{1}{3} \times \dfrac{2}{5}$ b. $\dfrac{6}{7} \times \dfrac{2}{18}$ c. $\dfrac{15}{24} \times \dfrac{12}{35}$

2. a. $\dfrac{1}{4} \div \dfrac{3}{7}$ b. $\dfrac{3}{8} \div \dfrac{6}{16}$ c. $\dfrac{12}{14} \div \dfrac{36}{21}$

3. a. $\dfrac{5}{2a} \times \dfrac{3a}{4}$ b. $\dfrac{6b}{10} \times \dfrac{5a}{12b}$ c. $\dfrac{10a^2}{6b^2} \times \dfrac{3b}{40}$

4. a. $\dfrac{b}{2} \div \dfrac{b}{10}$ b. $\dfrac{5a}{9} \div \dfrac{10}{18a^2}$ c. $\dfrac{50a}{12b} \div \dfrac{10b}{24}$

5. a. $\dfrac{20b^5}{a} \div \dfrac{25b^6}{2a}$ b. $\dfrac{2a^2b}{10} \times \dfrac{5}{4a^3b^2}$

Exercise 2

Multiply or divide then simplify the following:

1. a. $\dfrac{2}{5} \times \dfrac{1}{7}$ b. $\dfrac{9}{10} \times \dfrac{2}{27}$ c. $\dfrac{20}{24} \times \dfrac{16}{30}$

2. a. $\dfrac{1}{5} \div \dfrac{1}{3}$ b. $\dfrac{7}{12} \div \dfrac{14}{3}$ c. $\dfrac{24}{30} \div \dfrac{32}{40}$

3. a. $\dfrac{2}{5a} \times \dfrac{3a}{6}$ b. $\dfrac{7b}{9} \times \dfrac{a}{14b}$ c. $\dfrac{3a^2}{7b^2} \times \dfrac{14b}{6}$

4. a. $\dfrac{p}{14} \div \dfrac{p}{3}$ b. $\dfrac{7a}{11} \div \dfrac{21}{22a^3}$ c. $\dfrac{20a}{21b} \div \dfrac{30b}{42}$

5. a. $\dfrac{10b^5}{2a} \div \dfrac{2b^4}{5a}$ b. $\dfrac{3a^2b^2}{8} \times \dfrac{2}{3ab^2}$

Exercise 3

Multiply or divide then simplify the following:

1. a. $\dfrac{3}{8} \times \dfrac{3}{5}$ b. $\dfrac{3}{7} \times \dfrac{4}{15}$ c. $\dfrac{16}{21} \times \dfrac{14}{32}$

2. a. $\dfrac{1}{8} \div \dfrac{2}{5}$ b. $\dfrac{8}{9} \div \dfrac{16}{18}$ c. $\dfrac{35}{50} \div \dfrac{40}{70}$

3. a. $\dfrac{1}{4a} \times \dfrac{2a}{3}$ b. $\dfrac{2b}{13} \times \dfrac{2a}{6b}$ c. $\dfrac{8a^2}{6b^2} \times \dfrac{3b^3}{16}$

4. a. $\dfrac{p}{14} \div \dfrac{p}{1}$ b. $\dfrac{3a}{12} \div \dfrac{6}{24a^2}$ c. $\dfrac{15a}{30b} \div \dfrac{45b}{50}$

5. a. $\dfrac{6b^2}{3a} \div \dfrac{12b^6}{6a}$ b. $\dfrac{7ab^4}{9} \times \dfrac{3}{2a^3}$

Exercise 4

Multiply or divide then simplify the following:

1. a. $\dfrac{2}{11} \times \dfrac{4}{10}$ b. $\dfrac{8}{9} \times \dfrac{3}{40}$ c. $\dfrac{50}{35} \times \dfrac{25}{100}$

2. a. $\dfrac{1}{3} \div \dfrac{3}{11}$ b. $\dfrac{3}{4} \div \dfrac{9}{11}$ c. $\dfrac{60}{80} \div \dfrac{120}{200}$

3. a. $\dfrac{5}{9a} \times \dfrac{11a}{2}$ b. $\dfrac{6b}{4} \times \dfrac{2a}{24b}$ c. $\dfrac{2a^2}{6b^6} \times \dfrac{12b^5}{4}$

4. a. $\dfrac{m}{13} \div \dfrac{m}{2}$ b. $\dfrac{2a}{7} \div \dfrac{8}{28a^4}$ c. $\dfrac{13a}{20b} \div \dfrac{26b}{40}$

5. a. $\dfrac{11b^5}{5a} \div \dfrac{22b^6}{20a}$ b. $\dfrac{10a}{13} \times \dfrac{5a}{20a^4b^4}$

E&F	Algebraic Fractions – Multiplying and Dividing

National 5 Homework Booklet

Exercise 1

Simplify each of the following:

1. a. $\dfrac{12a^5}{2a}$ b. $\dfrac{a^4b^6}{a^2b}$ c. $\dfrac{(a+9)^7}{(a+9)^3}$

   d. $\dfrac{(b^6+8)^9}{(b^6+8)^3}$ e. $\dfrac{(b^4+2)^2}{(b^4+2)^5}$

Factorise the following, then simplify:

2. $\dfrac{5}{5a-20}$

3. $\dfrac{b+4}{b^2-16}$

4. $\dfrac{a^2+6a}{a^2+8a+12}$

5. $\dfrac{b^2+4b+4}{b^2-3b-10}$

Exercise 2

Simplify each of the following:

1. a. $\dfrac{10a^3}{2a^2}$ b. $\dfrac{a^5b^4}{a^6b^2}$ c. $\dfrac{(a-4)^8}{(a-4)^{-2}}$

   d. $\dfrac{(b^7-1)^6}{(b^7-1)^2}$ e. $\dfrac{(b^{11}+2b)^2}{(b^{11}+2b)^7}$

Factorise the following, then simplify:

2. $\dfrac{2}{12a-16}$

3. $\dfrac{b-3}{b^2-9}$

4. $\dfrac{a^2-5a}{a^2-8a+15}$

5. $\dfrac{b^2+5b+6}{b^2+13b+30}$

Exercise 3

Simplify each of the following:

1. a. $\dfrac{24a^{10}}{8a^3}$ b. $\dfrac{ab^2}{a^2b^{-5}}$ c. $\dfrac{(a-18)^{11}}{(a-18)^2}$

   d. $\dfrac{(3b^3+5)^8}{(3b^3+5)^2}$ e. $\dfrac{(b^7+2)^3}{(b^7+2)^{12}}$

Factorise the following, then simplify:

2. $\dfrac{7}{35a-14}$

3. $\dfrac{b+2}{b^2-4}$

4. $\dfrac{a^2+10a}{a^2+8a-20}$

5. $\dfrac{b^2+3b+2}{b^2-4b-5}$

Exercise 4

Simplify each of the following:

1. a. $\dfrac{30a^6}{10a}$ b. $\dfrac{a^{15}b^3}{a^2b^{-4}}$ c. $\dfrac{(a+15)^{20}}{(a+15)^{15}}$

   d. $\dfrac{(5b^6+17)^4}{(5b^6+17)^2}$ e. $\dfrac{(b^3-14)^3}{(b^3-14)^9}$

Factorise the following, then simplify:

2. $\dfrac{10}{15a-40}$

3. $\dfrac{b-7}{b^2-49}$

4. $\dfrac{a^2+7a}{a^2+4a-21}$

5. $\dfrac{b^2+12b+27}{b^2-3b-18}$

| **E&F** | Algebraic Fractions – Simplifying |

National 5 Homework Booklet

Exercise 1

1. Find the length of the following arcs:

   a. 112° 16cm

   b. 80° 20cm

   c. 135° 120cm

2. Find the area of the following sectors:

   a. 101° 35cm

   b. 60° 50cm

   c. 35° D = 60cm
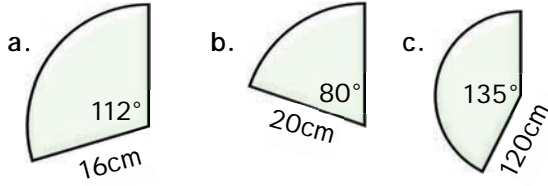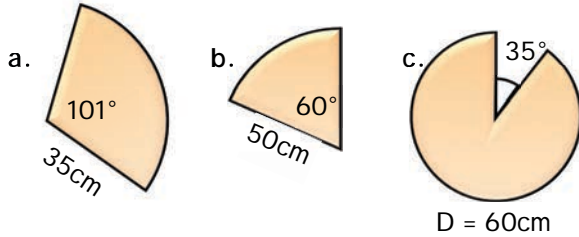
3. Find the angle at the centre of the sector:

   Arc Length = 60cm

   31cm
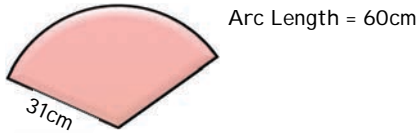
Exercise 2

1. Find the length of the following arcs:
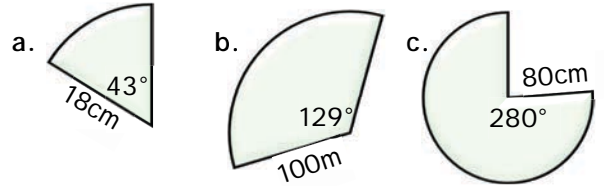
   a. 43° 18cm

   b. 129° 100m

   c. 80cm 280°

2. Find the area of the following sectors:

   a. 47° 45cm

   b. 88° 70cm

   c. 135° D = 70cm

3. Find the angle at the centre of the

   Area of sector = 100cm²

   8cm
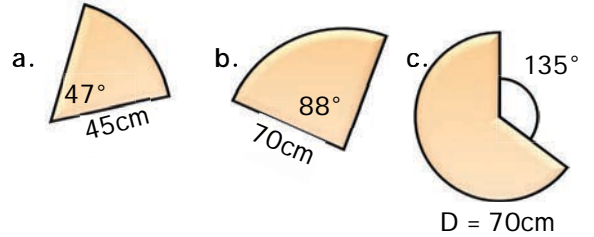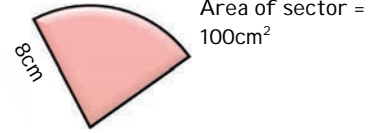
Exercise 3

1. Find the length of the following arcs:
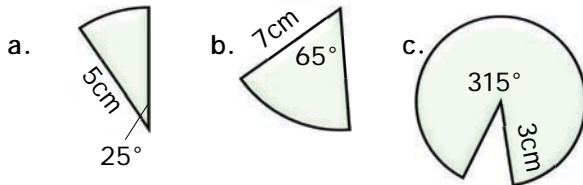
   a. 5cm 25°

   b. 7cm 65°

   c. 315° 3cm

2. Find the area of the following sectors:

   a. 17cm 204°

   b. 8cm 285°

   c. 325° D = 9cm

3. Find the angle at the centre of the

   Arc Length = 80cm

   11cm
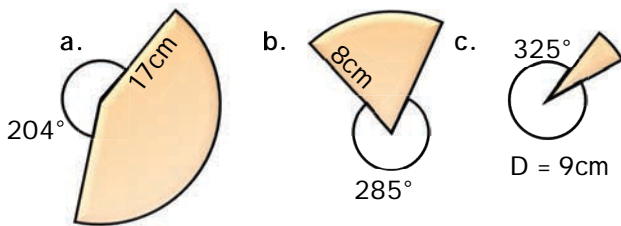
Exercise 4

1. Find the length of the following arcs:

   a. 36° 11cm

   b. 150° 2cm

   c. 135° 120cm

2. Find the area of the following sectors:

   a. 101° 1000cm

   b. 55° 70cm

   c. 12° D = 58mm

3. Find the angle at the centre of the

   Area of sector = 400cm²

   13cm

E&F	Length of Arc, Area of Sector

National 5 Homework Booklet

Exercise 1

1. Find the volume of a sphere with diameter 16cm; give your answer to 2 significant figures.

2. Find the volume of cone with height 8cm and radius 4cm; give your answer to 2 significant figures.

3. Find the volume of a cylinder of height 5cm and diameter 8cm give your answer to 2 significant figures.

4. Find the height of cylinder with volume 600cm^3 and radius 9cm.

5. Find the radius of a hemisphere of volume 2000cm^3.

Exercise 2

1. Find the volume of a sphere with diameter 25cm; give your answer to 2 significant figures.

2. Find the volume of cone with height 20cm and radius 5cm; give your answer to 2 significant figures.

3. Find the volume of a cylinder of height 120cm and diameter 40cm; give your answer to 2 significant figures.

4. Find the height of cylinder with volume 1200cm^3 and radius 12cm.

5. Find the radius of a hemisphere of volume 16000cm^3.

Exercise 3

1. Find the volume of a sphere with diameter 60cm; give your answer to 2 significant figures.

2. Find the volume of cone with height 250cm and radius 60cm; give your answer to 2 significant figures.

3. Find the volume of a cylinder of height 18cm and diameter 3cm give your answer to 2 significant figures.

4. Find the height of cylinder with volume 16cm3 and radius 3cm.

5. Find the radius of a hemisphere of volume 250cm3.

Exercise 4

1. Find the volume of a sphere with diameter 12cm; give your answer to 2 significant figures.

2. Find the volume of cone with height 10cm and radius 6cm; give your answer to 2 significant figures.

3. Find the volume of a cylinder of height 9cm and diameter 14cm give your answer to 2 significant figures.

4. Find the height of cylinder with volume 260cm^3 and radius 7cm.

5. Find the radius of a hemisphere of volume 56cm^3.

E&F	Volumes
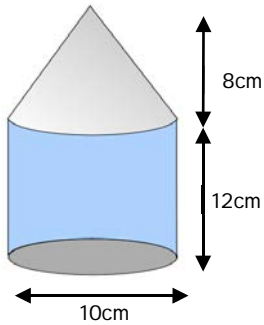
National 5 Homework Booklet

Exercise 1

1. Find the volume of the given shape to two significant figures:

8cm

12cm

10cm

2. Find the volume of the given shape to two significant figures:

30mm

8mm

Exercise 2

1. Find the volume of the given shape to two significant figures:

28cm

15cm

45cm

2. Three balls fit end to end exactly into a cylindrical tube, calculate the volume of empty space in the tube to two significant figures:

300mm
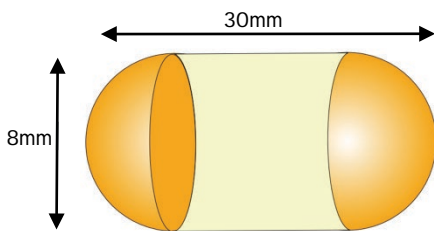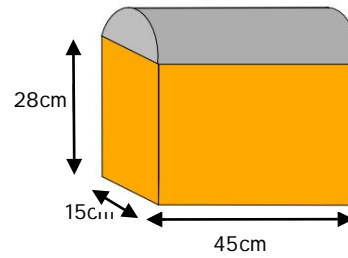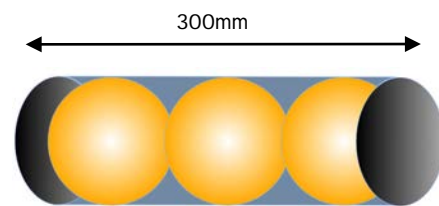
Exercise 3

1. Find the volume of a the given shape to two significant figures:
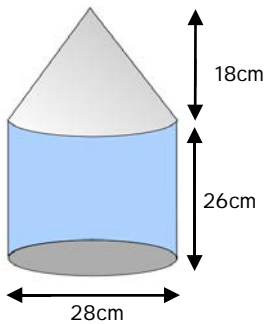
18cm

26cm

28cm

2. Find the volume of the given shape to two significant figures:

44mm

12mm

Exercise 4

1. Find the volume of the given shape to two significant figures:

14cm

8cm

15m

2. Three balls fit end to end exactly into a cylindrical tube, calculate the volume of empty space in the tube to two significant figures:

4.5cm

| E&F | Composite Volumes |
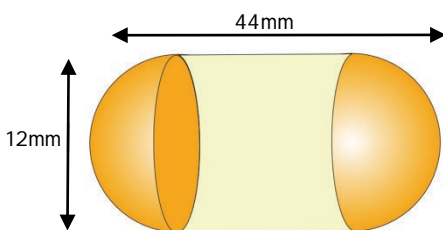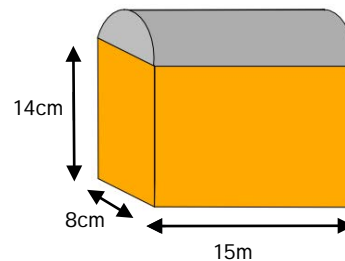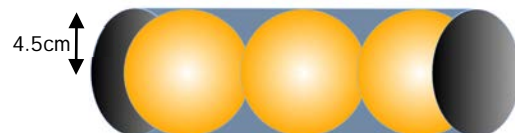
National 5 Homework Booklet

Exercise 1

1. Find the gradient of line passing through the points (2, 5) and (10, 29).

2. Simplify: (a) $\dfrac{x^2 - 4}{x^2 - x - 2}$ (b) $\dfrac{x}{x - 1} + \dfrac{2}{x + 2}$

3. Find the volume of the shape.

15cm

7cm

r = 6cm
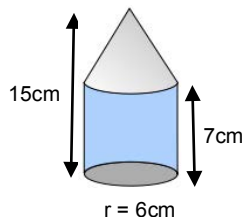
4. Simplify:

(a) $\sqrt{32} + \sqrt{8}$ (b) $\dfrac{x^2 \times x^4}{x^3}$

5. Find the radius

Arc Length = 20cm

85°
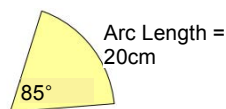
Exercise 2

1. Find the gradient of line passing through the points (-2, 5) and (10, -31).

2. Simplify: (a) $\dfrac{x^2 - 2x}{x^2 + 2x - 8}$ (b) $\dfrac{x}{x - 1} - \dfrac{2}{x - 2}$

3. Find the volume of the shape.

15cm

r = 6cm
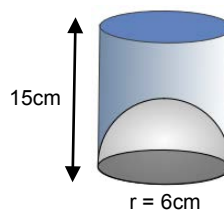
4. Simplify:

(a) $4\sqrt{50} + 3\sqrt{8}$ (b) $\dfrac{x^5 \times x^7}{x^3}$

5. Find the radius

Arc Length = 60cm

75°

Exercise 3

1. Find the gradient of line passing through the points (12, 4) and (-2, 32).

2. Simplify: (a) $\dfrac{x^2 - x - 6}{x^2 - 9}$ (b) $\dfrac{x}{x - 2} + \dfrac{3}{x - 4}$

3. Find the volume of the shape.

20cm

12cm

r = 8cm
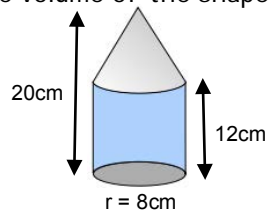
4. Simplify:

(a) $5\sqrt{72} - 5\sqrt{18}$ (b) $\dfrac{x^9 \times x^3}{x^5}$

5. Find the radius

Arc Length = 400cm

68°
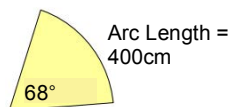
Exercise 4

1. Find the gradient of line passing through the points (8, 4) and (10, 20).

2. Simplify: (a) $\dfrac{4x^2 - 16}{x^2 + 2x - 8}$ (b) $\dfrac{3x}{x - 1} - \dfrac{2x}{x - 5}$

3. Find the volume of the shape.

40cm

18cm
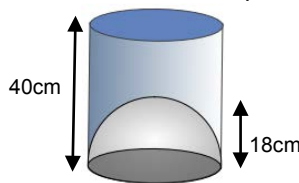
4. Simplify:

(a) $6\sqrt{200} - 12\sqrt{50}$ (b) $\dfrac{x^8 \times x^9}{x^{10}}$

5. Find the radius

Arc Length = 100cm

55°

E&F	Mixed Review
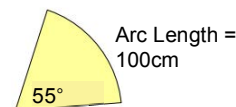
National 5 Homework Booklet

Exercise 1

1. Multiply out the brackets and simplify:

   a. $(x + 2)(x^2 - 2x + 3)$ **b.** $3x(x - 2) - 2(x^2 - 4)$

2. Factorise: **a.** $3x^2 - 75$ **b.** $2x^2 - 9x - 5$

3. Find the angle of the sector below:

   Arc Length = 19cm

   8cm   x°

4. Rationalise the denominator:

   a. $\dfrac{2}{\sqrt{7}}$ **b.** $\dfrac{3}{2\sqrt{3}}$

5. Simplify: **a.** $\dfrac{3a^3}{7b^4} \times \dfrac{21b}{9a^2}$ **b.** $\dfrac{15t^2r}{8} \div \dfrac{5t^3}{r^4}$

Exercise 2

1. Multiply out the brackets and simplify:

   a. $(x - 1)(x^2 - 5x + 2)$ **b.** $7x^2(3x - 1) - 8(x^2 - 9)$

2. Factorise: **a.** $2x^2 - 18$ **b.** $3x^2 - 5x - 2$

3. Find the angle of the sector below:

   Arc Length = 28cm

   13cm   x°

4. Rationalise the denominator:

   a. $\dfrac{4}{\sqrt{3}}$ **b.** $\dfrac{7}{5\sqrt{2}}$

5. Simplify: **a.** $\dfrac{10a^2}{26b^4} \times \dfrac{13b}{15a^4}$ **b.** $\dfrac{24t^3r^2}{5} \div \dfrac{16t}{r^3}$

Exercise 3

1. Multiply out the brackets and simplify:

   a. $(x + 1)(2x^2 - 5x + 1)$ **b.** $2x(x - 1) - 3(x^2 - 5)$

2. Factorise: **a.** $5x^2 - 125$ **b.** $5x^2 - 4x - 1$

3. Find the angle of the sector below:

   3cm

   Sector Area = 17.5cm^2

   x°

4. Rationalise the denominator:

   a. $\dfrac{6}{\sqrt{11}}$ **b.** $\dfrac{10}{3\sqrt{5}}$

5. Simplify: **a.** $\dfrac{12a^4}{14b^3} \times \dfrac{7b}{24a^2}$ **b.** $\dfrac{18tr^2}{3} \div \dfrac{12t^3}{9r}$

Exercise 4

1. Multiply out the brackets and simplify:

   a. $(x - 2)(3x^2 - x - 1)$ **b.** $9x(x - 3) - 7(x^2 - 1)$

2. Factorise: **a.** $6x^2 - 24$ **b.** $2x^2 - 3x + 1$

3. Find the angle of the sector below:

   Sector Area = 20.1cm

   4.2cm   x°

4. Rationalise the denominator:

   a. $\dfrac{8}{\sqrt{13}}$ **b.** $\dfrac{2}{5\sqrt{7}}$

5. Simplify: **a.** $\dfrac{8a^7}{40b^2} \times \dfrac{20b}{16a^2}$ **b.** $\dfrac{5t^2}{7} \div \dfrac{50t^8}{r^2}$

| E&F | Mixed Review |

National 5 Homework Booklet

Exercise 1

1. Calculate the gradient of the line joining the two points:

   a. (0, –11), (6, -5)   b. (9, -30), (19, -40)

   c. (6, -2), (-6, -1)   d. (-5, -3), (2, 2)

2. From the diagram determine the equation of each line:

Exercise 2

1. Calculate the gradient of the line joining the two points:

   a. (-4, –5), (-5, -5)   b. (9, 0), (5, -4)

   c. (0, 0), (5, -8)   d. (-6, 3), (-12, 7)

2. From the diagram determine the equation of each line:

Exercise 3

1. Calculate the gradient of the line joining the two points:

   a. (4, –3), (6, -5)   b. (2, 4), (7, 14)

   c. (3, 4), (5, -6)   d. (-8, 5), (-2, 2)

2. From the diagram determine the equation of each line:

Exercise 4

1. Calculate the gradient of the line joining the two points:

   a. (4, –13), (6, -5)   b. (1, 4), (7, 12)

   c. (6, 9), (5, -6)   d. (-8, -3), (-2, -2)

2. From the diagram determine the equation of each line:

Relationships	Straight Line

National 5 Homework Booklet

Exercise 1

1. Determine the equation of the line joining the following two points:

   a. (6, 10), (4, 8)

   b. (-2, -3), (-5, -12)

   c. (3, -3), (-2, 7)

   d. (-4, -1), (12, 7)

2. On a suitable set of axes, draw the lines of the following equations:

   a. $y = 2x + 3$ **b.** $y = 5x + 5$

   c. $y = -\dfrac{5}{2}x + 4$ **d.** $y = 3 + 3x$

Exercise 2

1. Determine the equation of the line joining the following two points:

   a. (5, 5), (10, 10)

   b. (3, -2), (5, -11)

   c. (6, 3), (4, 4)

   d. (4, -2), (6, 3)

2. On a suitable set of axes, draw the lines of the following equations:

   a. $y = 4x - 6$ **b.** $y = x + 5$

   c. $y = \dfrac{1}{4}x + 4$ **d.** $y = -3 + 2x$

Exercise 3

1. Determine the equation of the line joining the following two points:

   a. (3, 7), (3, 5)

   b. (3, -3), (7, -5)

   c. (-7, 11), (-5, 9)

   d. (-10, -4), (-3, 3)

2. On a suitable set of axes, draw the lines of the following equations:

   a. $y = x + 6$ **b.** $y = -2x - 1$

   c. $y = -\dfrac{1}{3}x - 3$ **d.** $y = 5 - 3x$

Exercise 4

1. Determine the equation of the line joining the following two points:

   a. (3, 9), (4, 6)

   b. (5, -8), (7, -12)

   c. (-3, 4), (5, 14)

   d. (-8, -9), (-4, -6)

2. On a suitable set of axes, draw the lines of the following equations:

   a. $y = 6x + 3$ **b.** $y = 2x - 3$

   c. $y = \dfrac{1}{2}x - 4$ **d.** $y = -2 - x$

| Relationships | Equation of lines, drawing lines |

National 5 Homework Booklet

Exercise 1

1. Determine the gradient and y-intercept of the following lines:

   a. $y = 6x + 13$

   b. $3y = -6x + 1$

   c. $9y + 12 = 3x$

   d. $4x - 8y + 2 = 0$

2. Sketch a line that satisfies the conditions $m > 0$ and $c < 0$

3. Find the equation of the following lines:

   a. Gradient 4, passing through (3, 7)

   b. Gradient $-\dfrac{5}{2}$, passing through (8, 1)

Exercise 2

1. Determine the gradient and y-intercept of the following lines:

   a. $y = 8x - 20$

   b. $6y = 2x + 4$

   c. $5y - 15 = 5x$

   d. $6x + 24y - 4 = 0$

2. Sketch a line that satisfies the conditions $m < 0$ and $c < 0$

3. Find the equation of the following lines:

   a. Gradient 0, passing through (2, 4)

   b. Gradient $-\dfrac{1}{2}$, passing through (-3, -1)

Exercise 3

1. Determine the gradient and y-intercept of the following lines:

   a. $y = 9x - 9$

   b. $3y = 9x - 4$

   c. $3y - 12 = 3x$

   d. $8x + 8y - 16 = 0$

2. Sketch a line that satisfies the conditions $m < 0$ and $c > 0$

3. Find the equation of the following lines:

   a. Gradient 4, passing through (0, 1)

   b. Gradient -0.25, passing through (10, 15)

Exercise 4

1. Determine the gradient and y-intercept of the following lines:

   a. $y = 4x + 4$

   b. $2y = 5x + 10$

   c. $-3y + 2 = 3x$

   d. $3x - 6y + 1 = 0$

2. Sketch a line that satisfies the conditions $m = 0$ and $c < 0$

3. Find the equation of the following lines:

   a. Gradient 6, passing through (2, 8)

   b. Gradient 0.5, passing through (3, 6)

Relationships	Equation of lines, drawing lines

National 5 Homework Booklet

Exercise 1

Solve the following equations:

1. $4(x-2) = 3(x+3)$

2. $5(x+2) = 2(x-2)$

3. $6(x-4) = 3(x+1)$

4. $3(x+2) + 4 = 2(x+3)$

5. $4(x-2) - 5 = 2 + 3(x+3)$

6. $4(2x-2) - 8 = 3(x-4)$

Exercise 2

Solve the following equations:

1. $5(x+4) = 3(x+5)$

2. $5(2x-3) = 2(3x+2)$

3. $3(2x-6) = 6(3x+2)$

4. $2(2x+6) + 4 = 2(5x+4)$

5. $4(2x-6) - 5 = 2 - 3(2x+3)$

6. $6(2x-3) = 4 - 5(x-5)$

Exercise 3

Solve the following equations:

1. $7(x+4) = 5x+2$

2. $5x - 10 = 8(x-2)$

3. $7(x-4) = 6(x+1)$

4. $4(2x+2) - 10 = 5(2x+3)$

5. $5(x-2) - 5 = 8 - 3(2x+7)$

6. $4(8x-2) - 8 = 3(7x-4) - 20$

Exercise 4

Solve the following equations:

1. $3(x+3) = 8(x+10)$

2. $6(3x-2) = 5(2x+6)$

3. $9(2x-12) = 6(6x+9)$

4. $3(2x-5) - 12 = 2(8x+4)$

5. $9(3x-5) + 14 = 2 - 5(5x+3)$

6. $7(2x+12) = 4 - 10(x-5)$

Relationships	Solving Equations

National 5 Homework Booklet

Exercise 1

Solve the following equations:

1. $\frac{1}{2}(x - 12) = 4(x - 8)$

2. $\frac{1}{4}(x - 3) = \frac{1}{2}(x - 2)$

3. $\frac{1}{3}(2x - 3) = \frac{1}{6}(x - 2)$

4. $\frac{1}{4}(x - 5) = \frac{1}{8}(x - 2)$

5. $\frac{1}{3}(x + 12) = \frac{1}{4}(x - 2)$

6. $\frac{3}{4}(x + 5) = \frac{1}{5}(x - 4)$

Exercise 2

Solve the following equations:

1. $\frac{1}{3}(x - 9) = 5(x - 3)$

2. $\frac{1}{4}(x + 2) = \frac{1}{2}(x - 4)$

3. $\frac{1}{3}(4x - 4) = \frac{1}{6}(x - 3)$

4. $\frac{1}{4}(x - 5) = \frac{1}{12}(2x - 12)$

5. $\frac{1}{3}(2x + 3) = \frac{1}{4}(3x - 6)$

6. $\frac{3}{4}(x - 6) = \frac{2}{5}(x - 5)$

Exercise 3

Solve the following equations:

1. $\frac{1}{5}(2x - 12) = \frac{1}{5}(x - 5)$

2. $\frac{1}{5}(2x + 4) = \frac{1}{6}(x - 2)$

3. $\frac{1}{3}(2x - 3) = \frac{2}{7}(2x - 5)$

4. $\frac{3}{4}(x - 2) = \frac{1}{3}(x - 2)$

5. $\frac{(x + 12)}{3} = \frac{(x - 2)}{4}$

6. $\frac{(x - 3)}{5} = \frac{(x - 2)}{4}$

Exercise 4

Solve the following equations:

1. $\frac{1}{8}(x - 13) = 4(x - 8)$

2. $\frac{1}{4}(x - 5) = \frac{1}{5}(x - 3)$

3. $\frac{3}{4}(5x - 3) = \frac{5}{6}(x - 2)$

4. $\frac{3}{4}(x - 4) = \frac{5}{8}(x - 2)$

5. $\frac{(x + 9)}{3} = \frac{(x + 5)}{7}$

6. $\frac{(x + 10)}{4} = \frac{(x + 8)}{9}$

Relationships	Solving Equations

National 5 Homework Booklet

Exercise 1

Solve the following inequations:

1. $5x + 1 < 26$

2. $2x + 6 > 30$

3. $4x + 3 \leq 23$

4. $8x - 2 \geq 38$

5. $4(2x + 3) < 28$

6. $\frac{1}{2}x + 6 > 14$

7. $5(2x - 1) \leq 2x + 19$

8. $7x + 5 > 4(5x - 2)$

Exercise 2

Solve the following inequations:

1. $6x + 2 < 32$

2. $7x + 8 > 50$

3. $3x + 2 \leq 25$

4. $9x - 4 \geq 32$

5. $6(5x + 3) < 48$

6. $\frac{1}{3}x + 3 > 33$

7. $6(2x - 2) \leq 2x + 8$

8. $5x + 6 > 4(3x - 2)$

Exercise 3

Solve the following inequations:

1. $3x + 9 < 27$

2. $2x + 10 > 40$

3. $8x + 5 \leq 45$

4. $10x - 5 \geq 60$

5. $7(2x + 3) < 63$

6. $\frac{1}{4}x + 2 > 20$

7. $8(x - 2) \leq 2x + 18$

8. $x + 4 > 2(x - 2)$

Exercise 4

Solve the following inequations:

1. $8x + 7 < 71$

2. $16x + 2 > 34$

3. $4x + 1 \leq 17$

4. $20x - 20 \geq 100$

5. $9(x + 5) < 72$

6. $\frac{1}{5}x + 6 > 8$

7. $3(2x - 2) \leq 2x + 5$

8. $x + 7 > 2(x - 2)$

Relationships	Solving Inequations

National 5 Homework Booklet

Exercise 1

Solve the following equations:

1. $3a + 3b = -3$
   $4a - b = 11$

2. $5a - 3b = -7$
   $3a + b = 7$

3. $4a - 3b = 22$
   $5a + 2b = 16$

4. $6a + 4b = 2$
   $3a - 2b = -19$

5. $3a + 0.5b = 25$
   $2a - 4b = 8$

6. $2a + 2b = 7$
   $6a - 5b = -12$

Exercise 2

Solve the following equations:

1. $3c + d = 1$
   $4c - 3d = 10$

2. $5c - 3d = -2$
   $3c + d = -4$

3. $3c - 3d = 18$
   $5c + 2d = 16$

4. $6c + 4d = -34$
   $3c - 2d = -13$

5. $3c + 0.5d = 4$
   $2c - 4d = -6$

6. $2c + 2d = 3$
   $6c - 5d = -2$

Exercise 3

Solve the following equations:

1. $3e + 3f = -6$
   $4e - f = -3$

2. $5e - 3f = -1$
   $3e + f = -9$

3. $4e - 3f = -11$
   $5e + 2f = -8$

4. $6e + 4f = -22$
   $3e - 2f = -7$

5. $3e + 0.5f = 3.5$
   $2e - 4f = -2$

6. $2e + 2f = -4$
   $6e - 5f = -1$

Exercise 4

Solve the following equations:

1. $3g + 3h = 3$
   $4g - h = 9$

2. $5g - 3h = 9$
   $3g + h = -3$

3. $4g - 3h = 2$
   $5g + 2h = 14$

4. $6g + 4h = 6$
   $3g - 2h = 27$

5. $3g + 0.5h = 9$
   $2g - 4h = 32$

6. $2g + 2h = 22$
   $6g - 5h = -44$

Relationships	Simultaneous Equations

National 5 Homework Booklet

Exercise 1

1. Three pencils and two rubbers cost £0.95, four pencils and five rubbers cost £1.85.

    By forming two equations, calculate how much one pencil and one rubber costs.

2. The local cinema has standard and superior seats. On Thursday they sell 50 standard and 5 superior seats for the X-Men and tickets sales amount to £366. On Friday they sell 100 standard and 20 superior seats and ticket sales amount to £814.

    By forming two equations, calculate how much 1 standard and 1 superior seat cost.

Exercise 2

1. A plane seats 180 passengers. A standard class ticket costs £120 and a business class ticket costs £250. If the plane is full, the ticket sales are £27,450.

    By forming two equations, calculate how many standard and business class tickets there are.

2. James has a pay-as-you-go phone. One day he sends 30 text messages and uses 45 minutes and it costs him £9.45. Another day he sends 25 text messages and uses 9 minutes and it costs him £4.17.

    By forming two equations, calculate how much 1 text message and 1 minute costs.

Exercise 3

1. Five pencils and three rubbers cost £1.90, four pencils and five rubbers cost £2.30.

    By forming two equations, calculate how much one pencil and one rubber costs.

2. The local cinema has standard and superior seats. On Thursday they sell 25 standard and 8 superior seats for the X-Men and tickets sales amount to £238. On Friday they sell 150 standard and 32 superior seats and ticket sales amount to £1292.

    By forming two equations, calculate how much 1 standard and 1 superior 1 minute costs.

Exercise 4

1. A plane seats 200 passengers. A standard class ticket costs £150 and a business class ticket costs £250. If the plane is full, the ticket sales are £38,000.

    By forming two equations, calculate how many standard and business class tickets there are.

2. James has a pay-as-you-go phone. One day he sends 100 text messages and uses 5 minutes and it costs him £8.50. Another day he sends 25 text messages and uses 20 minutes and it costs him £4.

    By forming two equations, calculate how much 1 text message and 1 minute costs.

Relationships	Simultaneous Equations

National 5 Homework Booklet

Exercise 1

1. By sketching the following lines on a suitable set of axes, solve the following equations:

    a. $y = 2x - 1$
        $2x + y = 11$

    b. $y = 3x - 11$
        $x + 2y = 13$

    c. $y = -3x + 4$
        $5x + y = 2$

    d. $y = -2x + 5$
        $2x + 4y = 2$

2. Solve the following algebraically:

    $2x + 3y = -1$
    $5x - 5y = 35$

Exercise 2

1. By sketching the following lines on a suitable set of axes, solve the following equations:

    a. $y = 3x - 4$
        $2x + y = -14$

    b. $y = 5x - 1$
        $x + y = 17$

    c. $y = -6x - 6$
        $9x - y = -24$

    d. $y = -3x - 2 5$
        $x + 4y = 10$

2. Solve the following algebraically:

    $3x + 3y = -9$
    $5x - 5y = 5$

Exercise 3

1. By sketching the following lines on a suitable set of axes, solve the following equations:

    a. $y = 4x - 2$
        $x - 3y = -16$

    b. $y = 4x - 10$
        $5x - y = 9$

    c. $y = -5x + 15$
        $-x + 0.5y = 18$

    d. $y = -8x + 19$
        $4x + 4y = 20$

2. Solve the following algebraically:

    $5x - 5y = 5$
    $7x - 2y = 17$

Exercise 4

1. By sketching the following lines on a suitable set of axes, solve the following equations:

    a. $y = 2x - 6$
        $6x - y = -6$

    b. $y = -5x - 11$
        $-x + 3y = -17$

    c. $y = 7x - 7$
        $5x - y = 1$

    d. $y = -8x - 32$
        $3x + 0.25 y = -10$

2. Solve the following algebraically:

    $4x + 7y = 6$
    $3x - 8y = 31$

| Relationships | Equation of lines, drawing lines |

National 5 Homework Booklet

Exercise 1

Change the subject of the formula:

1. $m = pq + b$ [p]

2. $a = \dfrac{rp}{c}$ [p]

3. $V = \pi r^2 h$ [r]

4. $C = \sqrt{t - 5}$ [t]

5. $S = \sqrt{\dfrac{a}{\pi b}}$ [a]

6. $V = \dfrac{1}{3}\pi r^2 h$ [h]

Exercise 2

Change the subject of the formula:

1. $d = ab + c$ [b]

2. $e = \dfrac{fg}{w}$ [g]

3. $T = \pi r^2 w$ [r]

4. $Z = \sqrt{4 + 2x}$ [x]

5. $p = \sqrt{\dfrac{a}{\pi c}}$ [c]

6. $V = \dfrac{1}{3}\pi r^2 h$ [r]

Exercise 3

Change the subject of the formula:

1. $p = k - mn$ [n]

2. $b = \dfrac{4dw}{a}$ [d]

3. $y = 5d^2 s$ [d]

4. $Sector = \dfrac{x}{360} \times \pi r^2$ [x]

5. $S = \sqrt{\dfrac{a}{\pi b}}$ [b]

6. $V = \dfrac{4}{3}\pi r^3$ [r]

Exercise 4

Change the subject of the formula:

1. $e = tq - r$ [r]

2. $t = \dfrac{sr}{w}$ [s]

3. $C = \pi a^2 b$ [a]

4. $T = \sqrt{9 - 3x}$ [x]

5. $c = 2 + \sqrt{\dfrac{a}{\pi b}}$ [a]

6. $Arc = \dfrac{x}{360} \times \pi D$ [x]

Relationships	Change the Subject

National 5 Homework Booklet

Exercise 1	Exercise 2
Change the subject of the formula:	Change the subject of the formula:

Exercise 1

Change the subject of the formula:

1. $y = 2r + c$ [r]

2. $u = \dfrac{nf}{w}$ [n]

3. $V = \dfrac{4}{3}\pi r^3$ [r]

4. $w = \sqrt{c - 6}$ [c]

5. $s = \sqrt{\dfrac{m}{\pi b}}$ [m]

6. $V = \dfrac{1}{3}\pi r^2 h$ [r]

Exercise 2

Change the subject of the formula:

1. $6 = 2a + c$ [c]

2. $k = \dfrac{5g}{w}$ [w]

3. $\pi = \dfrac{r^2}{2q}$ [q]

4. $Z = \sqrt{4r + 2x}$ [r]

5. $y = \sqrt{\dfrac{4}{\pi c}}$ [c]

6. $V = \dfrac{1}{3}bh$ [b]

Exercise 3

Change the subject of the formula:

1. $m = nw - r$ [n]

2. $b = \dfrac{6dw}{13}$ [d]

3. $j = 15d^2 s$ [d]

4. $S = \dfrac{m}{360} \times \pi r^2$ [m]

5. $v = \sqrt{\dfrac{n}{\pi k}}$ [n]

6. $V = \dfrac{4}{3}\pi (m + n)^3$ [n]

Exercise 4

Change the subject of the formula:

1. $y = tq - 5$ [q]

2. $(t + j) = \dfrac{2r}{w}$ [w]

3. $k = \pi a^2 p$ [a]

4. $h = \sqrt{9 - 4x}$ [x]

5. $d = 5 + \sqrt{\dfrac{a}{\pi e}}$ [a]

6. $A = \dfrac{y}{360} \times \pi f$ [f]
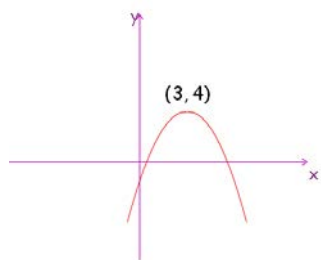
Relationships	Change the Subject

Exercise 1

1. State the equation of the quadratic functions in the form $y = a(x \pm b)^2 \pm c$ (assume $a = \pm 1$)

(a)

(-2, -3)

(b)

(2, 4)

(c)

(6, 1)

(d)

(-5, 15)
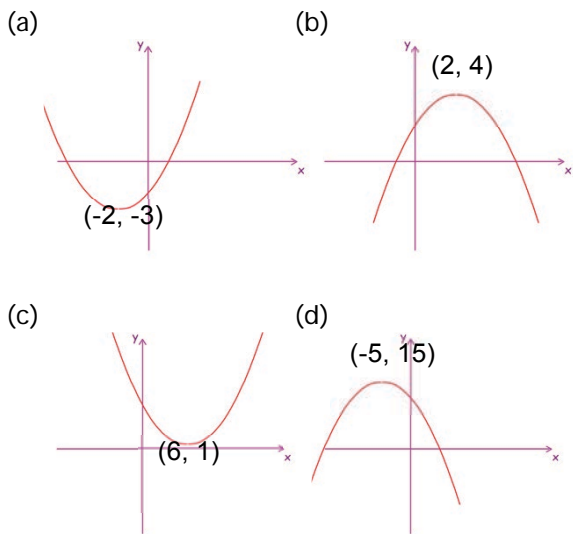
2. Sketch the quadratic $y = (x + 3)(x + 5)$ showing the y-intercept and turning point

Exercise 2

1. State the equation of the quadratic functions in the form $y = a(x \pm b)^2 \pm c$ (assume $a = \pm 1$)

(a)

(-4, 2)

(b)

(-3, -1)

(c)

(5, -8)

(d)

(12, -6)
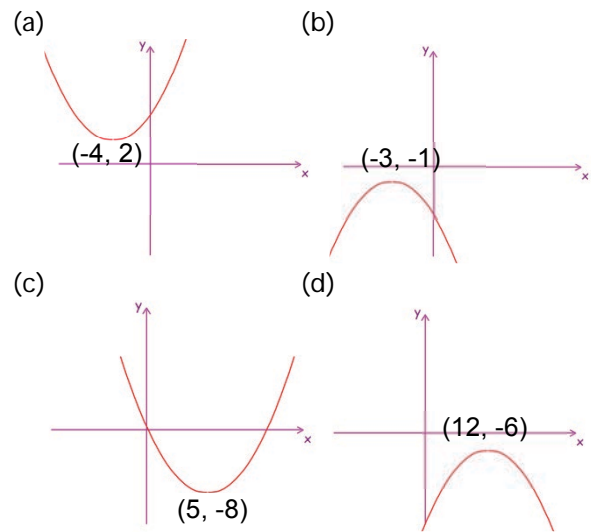
2. Sketch the quadratic $y = (x - 3)(x + 5)$ showing the y-intercept and turning point.

Exercise 3

1. State the equation of the quadratic functions in the form $y = a(x \pm b)^2 \pm c$ (assume $a = \pm 1$)

(a)

(-6, -9)

(b)

(10, 28)

(c)

(15, 3)

(d)

(-9, 28)
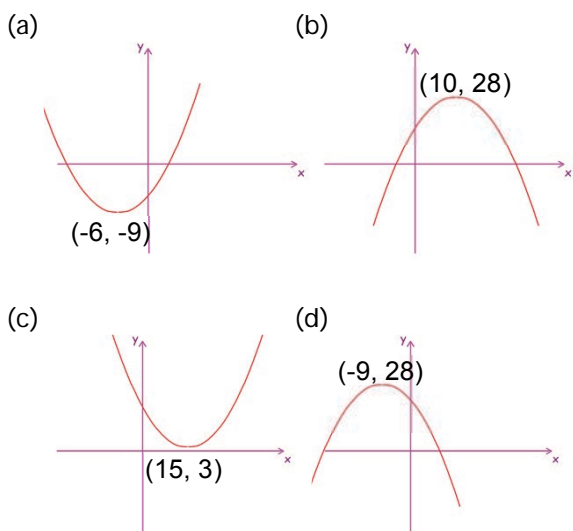
2. Sketch the quadratic $y = (x - 12)(x - 4)$ showing the y-intercept and turning point

Exercise 4

1. State the equation of the quadratic functions in the form $y = a(x \pm b)^2 \pm c$ (assume $a = \pm 1$)

(a)

(-29, 25)

(b)

(-12, -4)

(c)

(16, -24)

(d)

(50, -10)
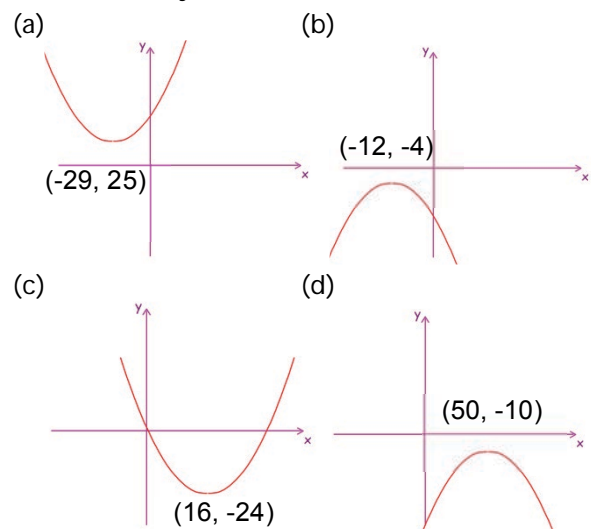
2. Sketch the quadratic $y = (x - 6)(x + 10)$ showing the y-intercept and turning

| Relationships | Quadratics – Equations and sketching |

National 5 Homework Booklet

Exercise 1

1. Solve the following quadratic equations:

    a. $x^2 + 7x = 0$ b. $x^2 - 5x = 0$

    c. $x^2 - 25 = 0$ d. $4x^2 - 49 = 0$

    e. $x^2 + 4x + 3 = 0$ f. $x^2 + 13x + 30 = 0$

    g. $x^2 - 9x + 14 = 0$ h. $x^2 - 12x + 20 = 0$

    i. $x^2 + 3x - 10 = 0$ j. $x^2 - 4x - 32 = 0$

2. Solve the following quadratic equations to 2.d.p

    a. $2x^2 + 7x + 1 = 0$

    b. $2x^2 - 5x + 2 = 0$

    c. $4x^2 + 6x + 2 = 0$

Exercise 2

1. Solve the following quadratic equations:

    a. $x^2 + 3x = 0$ b. $x^2 - 12x = 0$

    c. $x^2 - 64 = 0$ d. $9x^2 - 81 = 0$

    e. $x^2 + 6x + 5 = 0$ f. $x^2 + 15x + 44 = 0$

    g. $x^2 - 5x + 6 = 0$ h. $x^2 - 12x + 32 = 0$

    i. $x^2 + x - 20 = 0$ j. $x^2 - x - 20 = 0$

2. Solve the following quadratic equations to 2.d.p

    a. $3x^2 + 9x + 5 = 0$

    b. $2x^2 - 3x - 7 = 0$

    c. $7x^2 + x - 2 = 0$

Exercise 3

1. Solve the following quadratic equations:

    a. $x^2 + 9x = 0$ b. $x^2 - 20x = 0$

    c. $x^2 - 100 = 0$ d. $16x^2 - 25 = 0$

    e. $x^2 + 10x + 16 = 0$ f. $x^2 + 12x + 35 = 0$

    g. $x^2 - 10x + 9 = 0$ h. $x^2 - 17x + 70 = 0$

    i. $x^2 + 7x - 30 = 0$ j. $x^2 - 4x - 21 = 0$

2. Solve the following quadratic equations to 2.d.p

    a. $2x^2 + 9x + 3 = 0$

    b. $x^2 - 6x - 1 = 0$

    c. $3x^2 + 4x - 5 = 0$

Exercise 4

1. Solve the following quadratic equations:

    a. $x^2 + 14x = 0$ b. $x^2 - 24x = 0$

    c. $x^2 - 144 = 0$ d. $64x^2 - 9 = 0$

    e. $x^2 + 11x + 18 = 0$ f. $x^2 + 17x + 30 = 0$

    g. $x^2 - 8x + 12 = 0$ h. $x^2 - 15x + 36 = 0$

    i. $x^2 + 10x - 24 = 0$ j. $x^2 - 48x - 49 = 0$

2. Solve the following quadratic equations to 2.d.p

    a. $2x^2 + 11x + 3 = 0$

    b. $x^2 - 7x - 7 = 0$

    c. $5x^2 + x - 3 = 0$

Relationships	Quadratic Equations

National 5 Homework Booklet

Exercise 1

1. State the equation of the quadratic functions in the form $y = a(x \pm b)^2 \pm c$ (assume $a = \pm 1$)

   (4, -2)
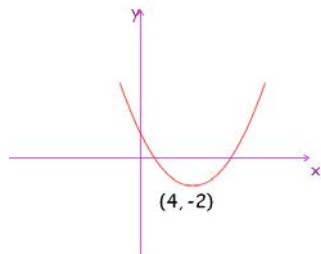
2. Sketch the quadratic $y = 2(x-3)(x+3)$ showing the y-intercept and turning point.

3. Solve $y = x^2 - 6x + 8$

4. Solve $y = 2x^2 - 6x + 3$ to 1.d.p.

5. Determine p where $3x^2 + 5x + p = 0$ has no real roots.

Exercise 2

1. State the equation of the quadratic functions in the form $y = a(x \pm b)^2 \pm c$ (assume $a = \pm 1$)

   (-3, 1)
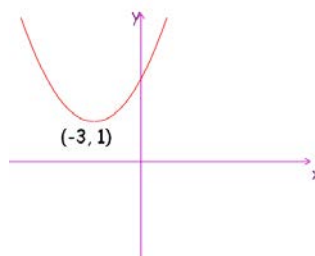
2. Sketch the quadratic $y = (x + 3)^2 - 3$ showing the y-intercept and turning point.

3. Solve $y = 2x^2 - 6x$

4. Solve $y = x^2 - x - 3$ to 1.d.p.

5. Determine p where $x^2 + 5x + p = 0$ has two distinct roots.

Exercise 3

1. State the equation of the quadratic functions in the form $y = a(x \pm b)^2 \pm c$ (assume $a = \pm 1$)

   (3, 4)

2. Sketch the quadratic $y = -(x + 3)^2 + 5$ showing the y-intercept and turning point.

3. Solve $y = 2x^2 - 18$

4. Solve $y = 2x^2 - 5x - 3$ to 1.d.p.

5. Determine p where $x^2 + 8x + p = 0$ has equal roots.

Exercise 4

1. State the equation of the quadratic functions in the form $y = a(x \pm b)^2 \pm c$ (assume $a = \pm 1$)

   (-2, -4)
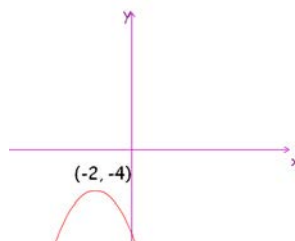
2. Sketch the quadratic $y = -(x - 4)^2 + 2$ showing the y-intercept and turning point.

3. Solve $y = 2x^2 + 5x - 12$

4. Solve $y = x^2 - x - 3$ to 1.d.p.

5. Determine p where $2x^2 + 12x + p = 0$ has two distinct roots.

Relationships	Quadratic Equations

National 5 Homework Booklet

Exercise 1	Exercise 2

Exercise 1

1. For each of the parabolas below, state the nature of the roots and whether the parabola is positive or negative:

   a.   b.
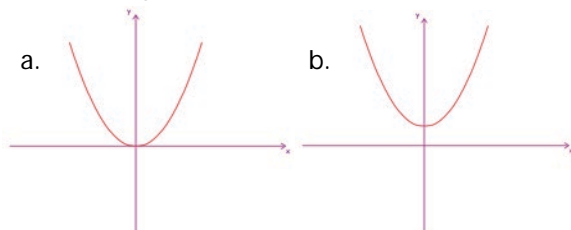
2. Use the discriminant to determine the nature of the roots in the quadratics below:

   a. $x^2 + 6x - 1 = 0$ b. $x^2 + 7 = 0$

   c. $x^2 - 100 = 0$ d. $x^2 + 6x + 9 = 0$

   e. $-x^2 + 2x - 3 = 0$ f. $-x^2 + 9 = 0$

Exercise 2

1. For each of the parabolas below, state the nature of the roots and whether the parabola is positive or negative:

   a.   b.
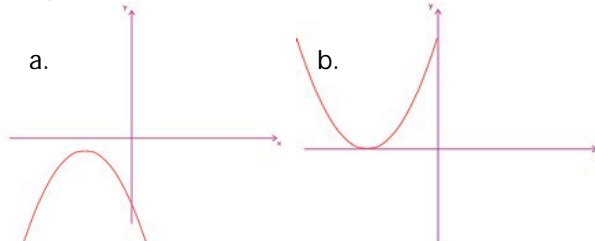
2. Use the discriminant to determine the nature of the roots in the quadratics below:

   a. $x^2 + 3x + 6 = 0$ b. $x^2 + 8x = 0$

   c. $x^2 - 25 = 0$ d. $-x^2 + 5x - 2 = 0$

   e. $x^2 + 4x + 4 = 0$ f. $-x^2 + 2x - 9 = 0$

Exercise 3

1. For each of the parabolas below, state the nature of the roots and whether the parabola is positive or negative:

   a.   b.
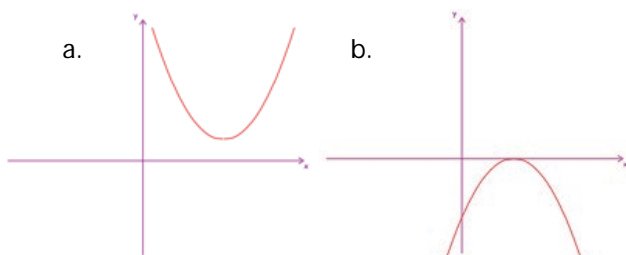
2. Use the discriminant to determine the nature of the roots in the quadratics below:

   a. $x^2 + 3x = 0$ b. $x^2 - 8x + 16 = 0$

   c. $x^2 + 5x + 6 = 0$ d. $-x^2 - 3 = 0$

   e. $x^2 + x + 6 = 0$ f. $-x^2 - x - 1 = 0$

Exercise 4

1. For each of the parabolas below, state the nature of the roots and whether the parabola is positive or negative:

   a.   b.
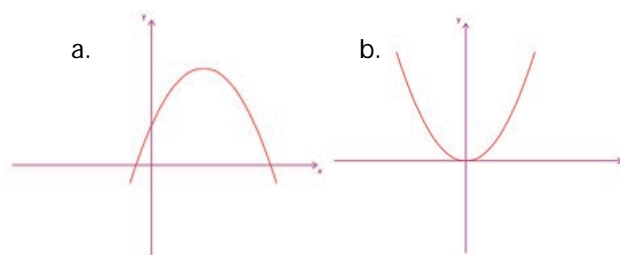
2. Use the discriminant to determine the nature of the roots in the quadratics below:

   a. $4x^2 - 25 = 0$ b. $2x^2 + 7x = 0$

   c. $x^2 - 3x - 18 = 0$ d. $x^2 + 12x + 36 + 0$

   e. $-x^2 - 5 = 0$ f. $-x^2 + 2 = 0$

Relationships	Quadratic Equations

National 5 Homework Booklet

Exercise 1

1. (a) Solve the quadratic.
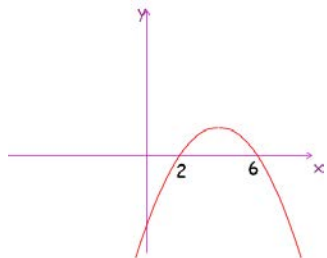
   (b) State the equation of the axis of symmetry.

2. Sketch the quadratic $y = (x - 2)(x + 4)$ showing the y-intercept and turning point.

3. Solve $a^2 = 10a$

4. Find the height of a cone with volume 400cm^3 and radius 5cm.

Exercise 2

1. (a) Solve the quadratic.
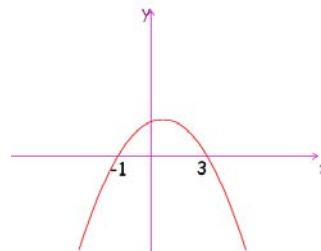
   (b) State the equation of the axis of symmetry.

2. Sketch the quadratic $y = -(x - 5)(x + 3)$ showing the y-intercept and turning point.

3. Solve $8x = 2x^2$

4. Find the radius of a sphere with volume 800cm^3.

Exercise 3

1. (a) Solve the quadratic.
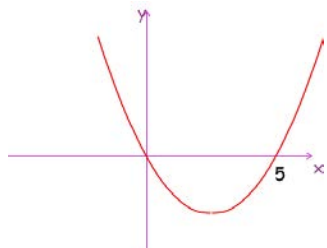
   (b) State the equation of the axis of symmetry.

2. Sketch the quadratic $y = (x + 4)(x + 2)$ showing the y-intercept and turning point.

3. Solve $n^2 = 24 - 2n$

4. Find the radius of a cylinder with volume 200cm^3 and height 20cm.

Exercise 4

1. (a) Solve the quadratic.
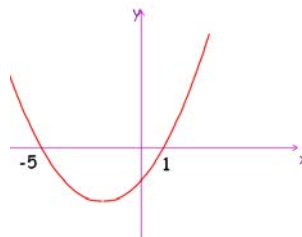
   (b) State the equation of the axis of symmetry.

2. Sketch the quadratic $y = -(x + 4)(x - 8)$ showing the y-intercept and turning point.

3. Solve $y^2 + 12 = 7y$

4. Find the radius of a hemisphere with volume 300cm^3.

Relationships	Quadratic Equations

National 5 Homework Booklet

Exercise 1

1. The lid of the ice cream tub below has a diameter of 14cm and the base has diameter 12cm. Find the height 'h' of the ice cream tub

$h$cm ⋮ 10cm
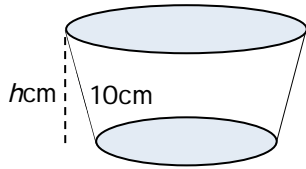
2. Find the 'x' in each question:

    a. Radius = 10m

    x m

    8 m

    b. Radius = 6m

    9 m
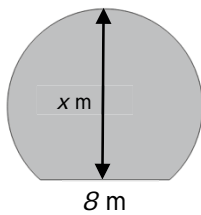
    x m
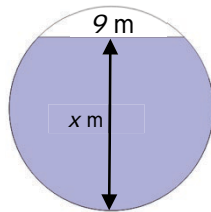
Exercise 2

1. In the diagram below, CD = 6cm, DE = 12cm and BD = 8cm. Find the length of the line AE.
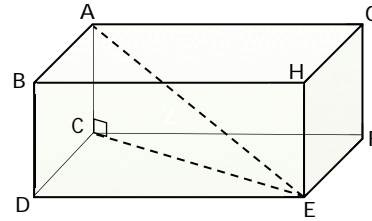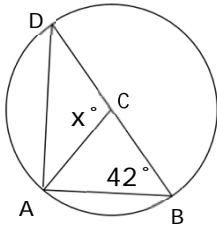
2. Find the 'x' in each question:

    a. Radius = 11m

    18 m

    x m

    b. Radius = 5m

    7 m
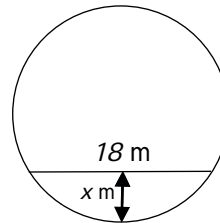
    x m
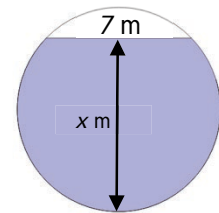
Exercise 3

1. The lid of the ice cream tub below has a diameter of 18cm and the base has diameter 15cm. Find the slope height 's' of the ice cream tub

15cm ⋮ $s$cm
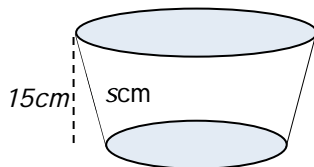
2. Find the 'x' in each question:

    a. Radius = 36cm

    50cm

    x cm

    b. Radius = 3m

    x m
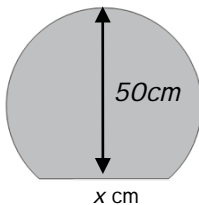
    5 m
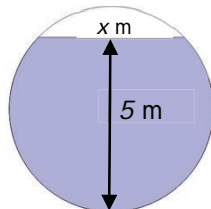
Exercise 4

1. In the diagram below, CD = 50cm, DE = 80cm and BD = 35cm. Find the length of the line AE.

2. Find the 'x' in each question:

    a. Radius = 30mm

    50mm

    x m

    b. Radius = 20m

    x m

    30 m

| Relationships | Pythagoras |

National 5 Homework Booklet
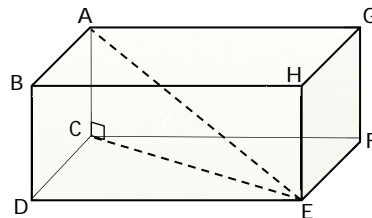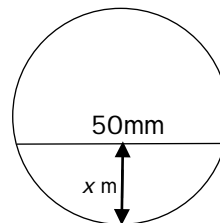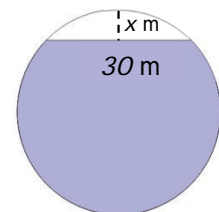
Exercise 1

1. Find the size of angle x:

2. In the diagram below, CD = 20cm, DE = 60cm and BD = 40cm. Find the length of the line AE.
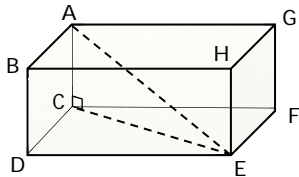
3. The shapes are similar. If the smaller shape is 150cm^2. Find the area of the larger shape:

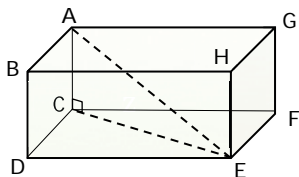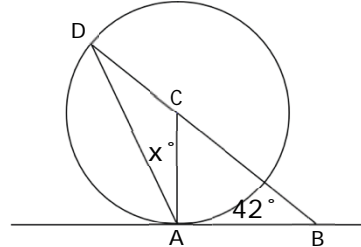10cm   20cm

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Exercise 2

1. Find the size of angle x:
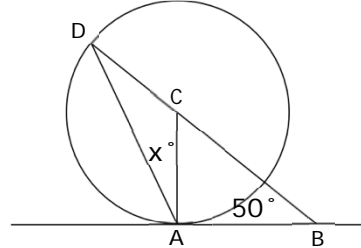
2. In the diagram below, CD = 65cm, DE = 63cm and BD = 85cm. Find the length of the line AE.
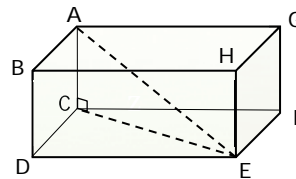
3. The shapes are similar. If the smaller shape is 800cm^3. Find the volume of the larger shape:

10cm   15cm

Exercise 3

1. Find the size of angle x:
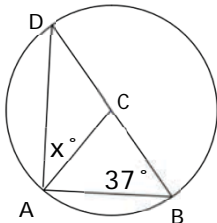
2. In the diagram below, CD = 2cm, DE = 3cm and BD = 4cm. Find the length of the line AE.

4. The shapes are similar. If the smaller shape is 560cm^2. Find the area of the larger shape:

25cm   40cm

Exercise 4

1. Find the size of angle x:

2. In the diagram below, CD = 4.5cm, DE = 4.8cm and BD = 6.7cm. Find the length of the line AE.
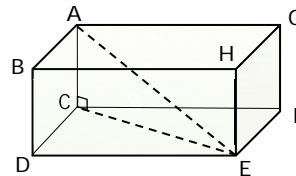
3. The shapes are similar. If the smaller shape is 600cm^3. Find the volume of the larger shape:

10cm   25cm

Relationships	Angle Properties and Similar Figures

National 5 Homework Booklet
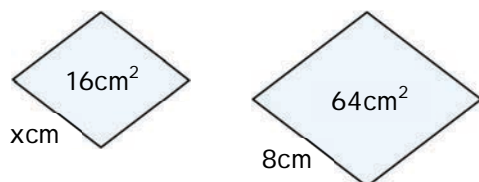
Exercise 1

1. These two rectangles below are similar. Find (a) the area scale factor and (b) the unknown area.
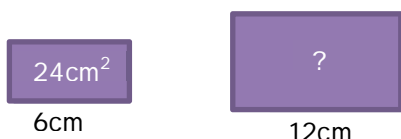
   24cm^2 ?
   6cm   12cm

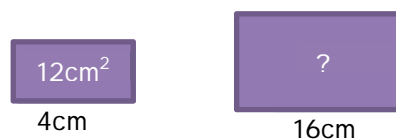2. The two trapeziums are similar. Find (a) the area scale factor and (b) the unknown area.

   6cm   400cm^2
          12cm

3. The two shapes are similar. Calculate (a) the area scale factor (b) find side x:
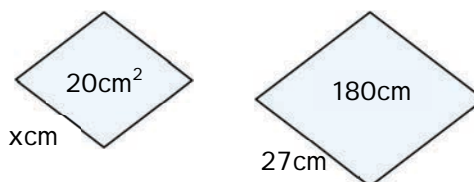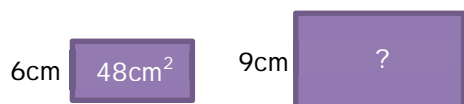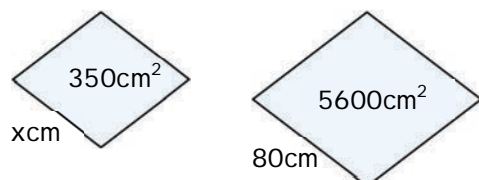
   16cm^2 64cm^2
   xcm   8cm

Exercise 2

1. These two rectangles below are similar. Find (a) the area scale factor and (b) the unknown area.

   12cm^2 ?
   4cm   16cm

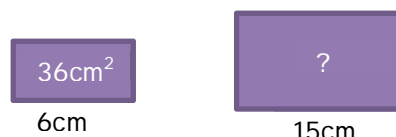2. The two trapeziums are similar. Find (a) the area scale factor and (b) the unknown area.

   5cm   450cm^2
          15cm

3. The two shapes are similar. Calculate (a) the area scale factor (b) find side x:

   20cm^2 180cm
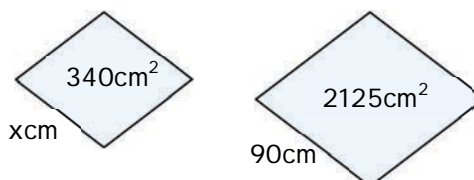   xcm   27cm

Exercise 3

1. These two rectangles below are similar. Find (a) the area scale factor and (b) the unknown area.

   6cm 48cm^2 9cm   ?

2. The two trapeziums are similar. Find (a) the area scale factor and (b) the unknown area.

   10cm   135cm^2
           15cm

3. The two shapes are similar. Calculate (a) the area scale factor (b) find side x:

   350cm^2 5600cm^2
   xcm   80cm

Exercise 4

1. These two rectangles below are similar. Find (a) the area scale factor and (b) the unknown area.

   36cm^2 ?
   6cm   15cm

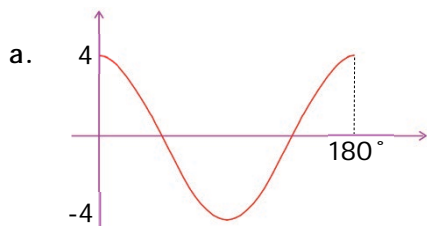2. The two trapeziums are similar. Find (a) the area scale factor and (b) the unknown area.

   28cm   3000cm^2
           140cm

3. The two shapes are similar. Calculate (a) the area scale factor (b) find side x:

   340cm^2 2125cm^2
   xcm   90cm

Relationships	Similar Figures

National 5 Homework Booklet

Exercise 1

1. Determine the equation and state the period of each trig graph:
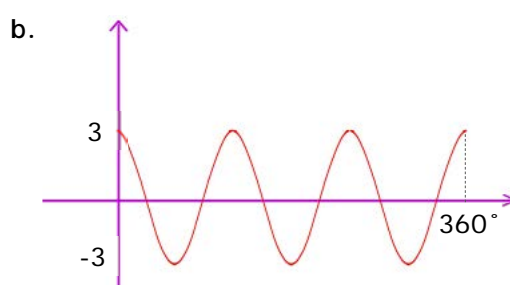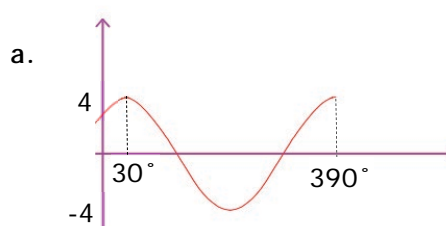
a.

b.
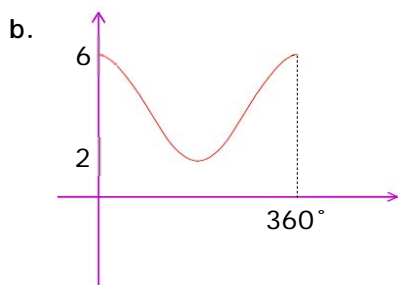
2. Solve the following equations for $0 \leq x \leq 360$:

a. $2\cos x - 1 = 0$
b. $3\tan x + 1 = 0$

Exercise 2

1. Determine the equation and state the period of each trig graph:
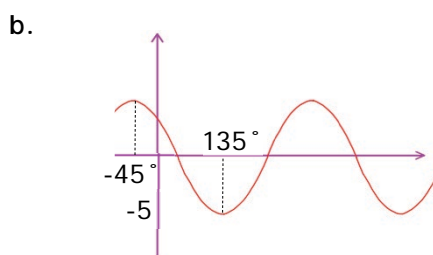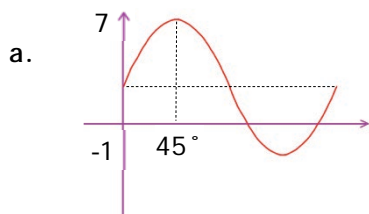
a.

b.

2. Solve the following equations for $0 \leq x \leq 360$:

a. $3\sin x + 1 = 0$
b. $5\tan x - 4 = 0$

Exercise 3

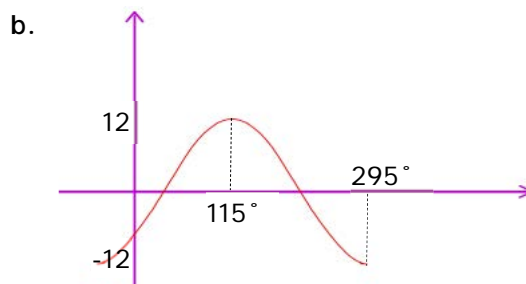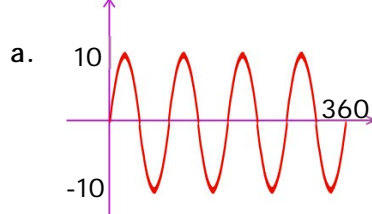1. Determine the equation and state the period of each trig graph:

a.

b.

2. Solve the following equations for $0 \leq x \leq 360$:

a. $\sqrt{2}\cos x - 1 = 0$
b. $2\sin x - \sqrt{3} = 0$

Exercise 4

1. Determine the equation and state the period of each trig graph:

a.

b.

2. Solve the following equations for $0 \leq x \leq 360$:

a. $5\cos x + 1 = -3$
b. $3\tan x - 5 = 0$

| Relationships | Trig Graphs |

National 5 Homework Booklet

Exercise 1

1. On a suitable set of axes, sketch each of the following graphs:

   a. y = 2sinx   b. y = -3cosx

   c. y = cosx + 2   d. y = sin(x – 30)

2. Solve the following equations for $0 \leq x \leq 360$:

   a. 4cosx – 1 = 0   b. 2tanx - 1 = 0

   c. 3sin x + 3 = 4   d. 4tan x – 1 = 2

3. Prove that $\tan x \cos x = \sin x$

Exercise 2

1. On a suitable set of axes, sketch each of the following graphs:

   a. y = 3sinx   b. y = 3cosx +1

   c. y = cosx + 2   d. y = sin(x – 45)

2. Solve the following equations for $0 \leq x \leq 360$:

   a. 3cosx + 1 = 2   b. 2tanx - 2 = 0

   c. $\frac{1}{3} \sin x = \frac{\sqrt{3}}{6}$ d. 3tan x – 1 = 1

3. Prove that $\tan x \sin x = \cos x$

Exercise 3

1. On a suitable set of axes, sketch each of the following graphs:

   a. y = sinx - 2   b. y = 4cos3x

   c. y = -cosx -1   d. y = sin(x – 60)

2. Solve the following equations for $0 \leq x \leq 360$:

   a. 10cosx + 1 = -1   b. tanx + 1 = 1 + $\sqrt{3}$

   c. -2sin x = 1   d. 3tan x + 1 = 2

3. Prove that $\tan x \cos^2 x = \sin x \cos x$

Exercise 4

1. On a suitable set of axes, sketch each of the following graphs:

   a. y = -4sin2x   b. y = 5cos4x

   c. y = sin3x + 2   d. y = 2sin(x + 25)

2. Solve the following equations for $0 \leq x \leq 360$:

   a. 2cosx – 1 = 1   b. 5tanx + 1 = 0

   c. 2sin x - 3 = -4   d. 2tan x + 3 = 1

3. Prove that $\frac{\sin^2 x}{\cos x} = \tan x \sin x$

Relationships	Trig Graphs, Trig Equations and Trig Identities

National 5 Homework Booklet

Exercise 1

1. Solve the following equations for 0 ≤ x ≤ 360:

   a. cosx + 0.5 = 0

   b. 3tanx - 0.9 = 0

   c. 10sin x - 5 = 5

   d. $\frac{1}{2}$ tan x + 6 = 2

2. Prove that $1 - \sin^2 x = \cos^2 x$

3. Prove that $\frac{1 - \cos^2 x}{\cos^2 x} = \tan^2 x$

4. Sketch the graph of y = -cosx + 2

Exercise 2

1. Solve the following equations for 0 ≤ x ≤ 360:

   a. cosx – 0.8 = 0

   b. 2tanx + 0.8 = 0

   c. sin x + 0.5 = 1

   d. 3tan x – 8 = 1

2. Prove that $2 - 2\cos^2 x = 2\sin^2 x$

3. Prove that $\frac{1 - \sin^2 x}{\cos^2 x} = 1$

4. Sketch the graph of y = -sin - 2

Exercise 3

1. Solve the following equations for 0 ≤ x ≤ 360:

   a. cosx – 0.2 = 0

   b. 5tanx – 0.6 = 0

   c. 5sin x + 5 = 0

   d. 3tan x - 4 = 8

2. Prove that $\sin^2 x - 1 = \cos^2 x$

3. Prove that $\frac{1 - \sin^2 x}{1 - \cos^2 x} = \frac{1}{\tan^2 x}$

4. Sketch the graph of y = -3cosx + 2

Exercise 4

1. Solve the following equations for 0 ≤ x ≤ 360:

   a. cosx - 0.4 =0.5

   b. 4tanx + 0.6 = 0

   c. 12sin x - 5 = 6

   d. 5tan x – 3 = 4

2. Prove that $(\sin x + \cos x)^2 = 1 + 2\sin x \cos x$

3. Prove that $\frac{1 - \cos^2 x}{\sin^2 x} = 1$

4. Sketch the graph of y = -2sinx - 2

Relationships	Trig Graphs, Trig Equations and Trig Identities

National 5 Homework Booklet

Exercise 1

1. Prove that $2 - \cos^2 x = \sin^2 x + 1$

2. Prove that $\dfrac{\sin^2 x + \cos^2 x}{\cos^2 x} = \tan^2 x + 1$

3. Prove that $1 - \text{sine}^2 x = \dfrac{\sin^2 x}{\tan^2 x}$

4. Prove that $\dfrac{\sin^2 x + \cos^2 x}{\tan^2 x} = \dfrac{\cos^2 x}{\sin^2 x}$

5. Solve: $2\sin x = \sin^2 x + \cos^2 x \quad 0 \le x \le 360$

Exercise 2

1. Prove that $3 + \cos^2 x = -\sin^2 x + 4$

2. Prove that $\dfrac{1}{\cos^2 x} = \tan^2 x + 1$

3. Prove that $\sin^2 x - \text{sine}^4 x = \sin^2 x \cos^2 x$

4. Prove that $\dfrac{\sin^2 x + \cos^2 x}{\cos^2 x \tan^2 x} = \dfrac{1}{\sin^2 x}$

5. Solve: $2\sin x = 1 + \sin^2 x + \cos^2 x \quad 0 \le x \le 360$

Exercise 3

1. Prove that $2 + \cos^2 x = \sin^2 x + 1 + 2\cos^2 x$

2. Prove that $\dfrac{\sin^2 + \cos^2 x}{\cos^2 x} = \tan^2 x + \sin^2 + \cos^2$

3. Prove that $1 - \text{sine}^2 x = \dfrac{1 - \cos^2 x}{\tan^2 x}$

4. Prove that $\dfrac{\sin^2 x + \cos^2 x}{\tan^2 x} = \dfrac{\cos^2 x}{\sin^2 x}$

5. Solve: $3\sin x - 1 = \sin^2 x + \cos^2 x \quad 0 \le x \le 360$

Exercise 4

1. Prove that $2 - \sin^2 x = \cos^2 x + 1$

2. Prove that $(\sin x + \cos x)^2 = 1 + 2\sin x \cos x$

3. Prove that $1 = \dfrac{\sin^2 x}{\tan^2 x} + \sin^2 x$

4. Prove that $\dfrac{1}{\tan^2 x} = \dfrac{1 - \sin^2 x}{\sin^2 x}$

5. Solve: $-\sin x - \sin^2 x = \cos^2 x \quad 0 \le x \le 360$

Relationships	Trig Identities