Cardinal Newman High School

Mathematics Department

S3 (U) Homework Booklet

Mathematics

Homework tasks should be completed in pupil's homework jotter. Please **do not** write on this booklet as it will be returned to the teacher.

Homework should be presented neatly using a pencil and all working shown.

Pupils should use their homework diary to record the given task and completion date.

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

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

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

Exercise 1

Simplify the following:

1. $a^4 \times a^3$
2. $5b^3 \times 2b^2$
3. $4a^{10} \times 2a^{-2}$
4. $\frac{b^5}{b^3}$
5. $\frac{12a^3}{4a^{-2}}$
6. $\frac{15b^6}{3b^{-6}}$
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. $\frac{b^8}{b^2}$
5. $\frac{16a^5}{2a^{-4}}$
6. $\frac{14a^2b^3}{7ab^{-2}}$
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. $\frac{b^{16}}{b^2}$
5. $\frac{16a^3}{12a^{-10}}$
6. $\frac{20a^5b^4}{15a^3b^{-4}}$
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. $\frac{b^{24}}{b^{16}}$
5. $\frac{28a^9}{6a^{-5}}$
6. $\frac{50a^9b^3}{10a^8b^{-5}}$
7. $(a^6)^7$
8. $(2b^9)^5$

E&F	Indices

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

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. $3a^4(\frac{1}{a^2}+2a^{-2})$
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. $2a^2(\frac{1}{a}+5a^{-9})$
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. $7a^8(\frac{2}{a^5}+3a^{-5})$
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. $12a^{17}(\frac{1}{2a^{15}}+3a^{-10})$
6. $15b^{\frac{5}{2}}(2b^{\frac{1}{2}}+5b^{-\frac{1}{2}})$
7. $a^{\frac{2}{5}}(4a+10a^3)$

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.

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)

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

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:

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:

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:

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:

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)

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)

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)

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. $8x^2 - 19x - 15$

Exercise 3

Factorise:

1. $15x^2 + x - 2$
2. $6x^2 - x - 12$
3. $10x^2 + x - 2$
4. $12x^2 - 13x - 4$
5. $16x^2 + 8x - 15$
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)

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)

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

Exercise 1

Simplify each of the following:

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

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

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

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

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

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

Exercise 2

Simplify each of the following:

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

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

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

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

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

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

Exercise 3

Simplify each of the following:

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

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

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

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

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

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

Exercise 4

Simplify each of the following:

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

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

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

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

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

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

Exercise 1

Multiply or divide then simplify the following:

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

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

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

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

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

Exercise 2

Multiply or divide then simplify the following:

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

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

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

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

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

Exercise 3

Multiply or divide then simplify the following:

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

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

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

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

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

Exercise 4

Multiply or divide then simplify the following:

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

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

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

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

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

Exercise 1

Simplify each of the following:

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

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

Factorise the following, then simplify:

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

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

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

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

Exercise 2

Simplify each of the following:

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

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

Factorise the following, then simplify:

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

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

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

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

Exercise 3

Simplify each of the following:

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

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

Factorise the following, then simplify:

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

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

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

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

Exercise 4

Simplify each of the following:

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

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

Factorise the following, then simplify:

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

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

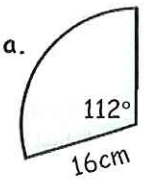
4. $\frac{a^2+7a}{a^2+4a-21}$

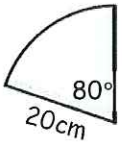
5. $\frac{b^2+12b+27}{b^2-3b-18}$

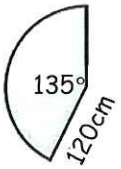
E&F	Algebraic Fractions - Simplifying

Exercise 1

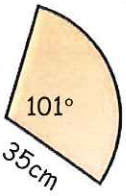
1. Find the length of the following arcs:

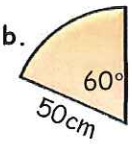
a. 

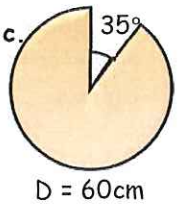
b. 

c. 

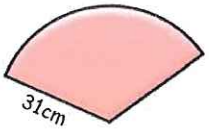
2. Find the area of the following sectors:

a. 

b. 

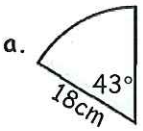
c. 

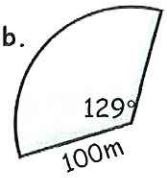
3. Find the angle at the centre of the sector:

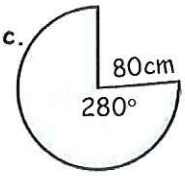


Exercise 2

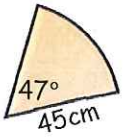
1. Find the length of the following arcs:

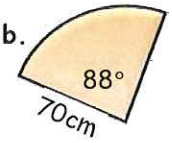
a. 

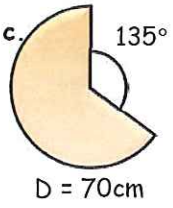
b. 

c. 

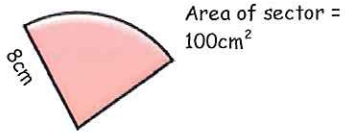
2. Find the area of the following sectors:

a. 

b. 

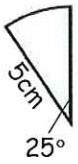
c. 

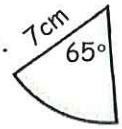
3. Find the angle at the centre of the

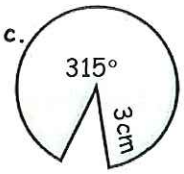


Exercise 3

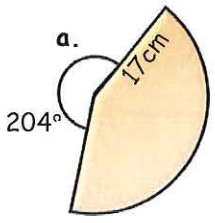
1. Find the length of the following arcs:

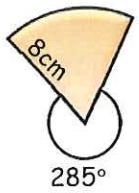
a. 

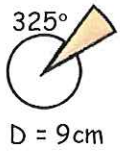
b. 

c. 

2. Find the area of the following sectors:

a. 

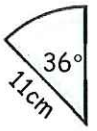
b. 

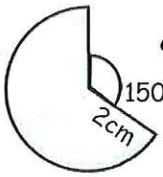
c. 

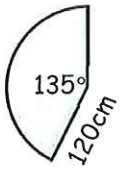
3. Find the angle at the centre of the

Exercise 4

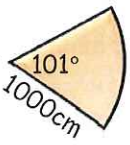
1. Find the length of the following arcs:

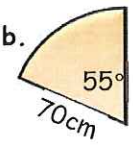
a. 

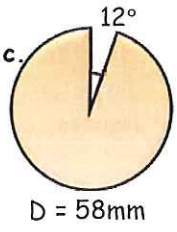
b. 

c. 

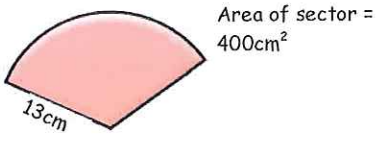
2. Find the area of the following sectors:

a. 

b. 

c. 

3. Find the angle at the centre of the



E&F	Length of Arc, Area of Sector

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.

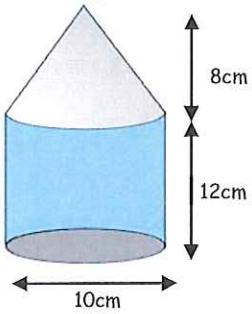
Exercise 4

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.

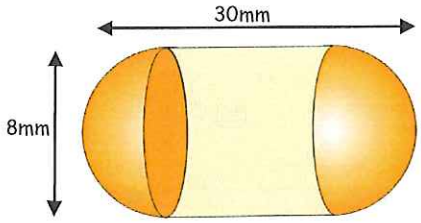
E&F	Volumes

Exercise 1

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

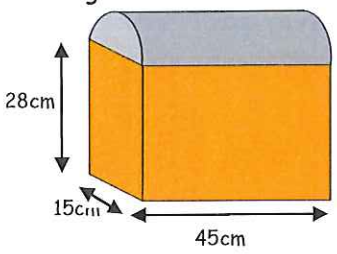


2. Find the volume of the given shape to two significant figures:

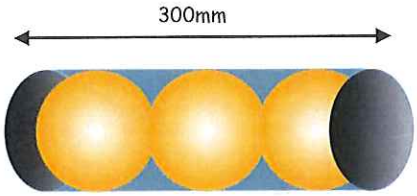


Exercise 2

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

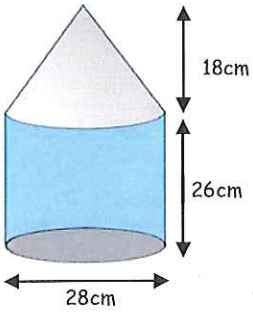


2. Three balls fit end to end exactly into a cylindrical tube, calculate the volume of empty space in the tube to two significant figures:

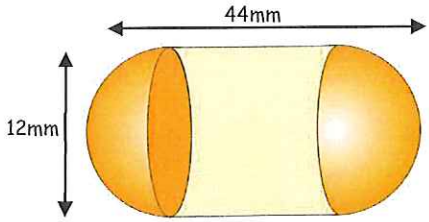


Exercise 3

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

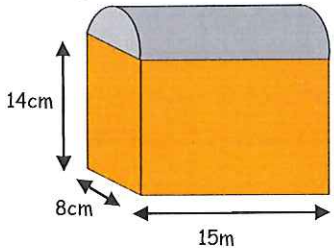


2. Find the volume of the given shape to two significant figures:

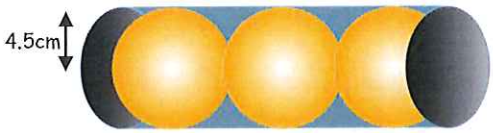


Exercise 4

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



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:



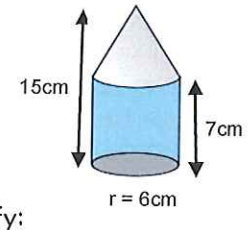
E&F	Composite Volumes

Exercise 1

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

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

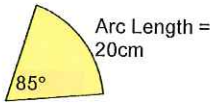
3. Find the volume of the shape.



4. Simplify:

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

5. Find the radius

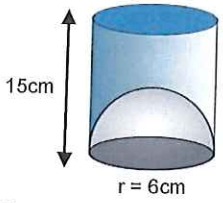


Exercise 2

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

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

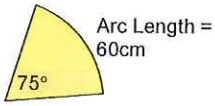
3. Find the volume of the shape.



4. Simplify:

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

5. Find the radius

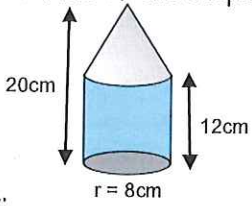


Exercise 3

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

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

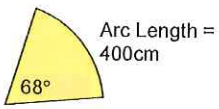
3. Find the volume of the shape.



4. Simplify:

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

5. Find the radius

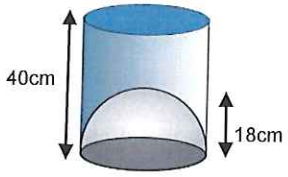


Exercise 4

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

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

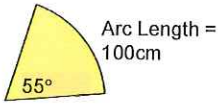
3. Find the volume of the shape.



4. Simplify:

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

5. Find the radius



E&F	Mixed Review

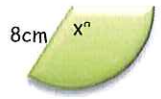
Exercise 1

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

4. Rationalise the denominator:

   a. $\frac{2}{\sqrt{7}}$ b. $\frac{3}{2\sqrt{3}}$

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

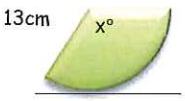
Exercise 2

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

4. Rationalise the denominator:

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

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

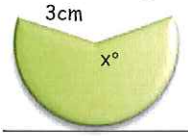
Exercise 3

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:



Sector Area = 17.5cm^2

4. Rationalise the denominator:

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

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

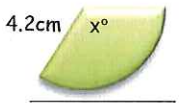
Exercise 4

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. Rationalise the denominator:

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

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

E&F	Mixed Review