

BROUGHTON HIGH SCHOOL

**MATHEMATICS
PRESENTATION,
FEEDBACK, AND
MARKING
EBOOK**

UPDATED DECEMBER 2021

Contents

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Principles

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Presentation expectations

How staff give feedback in Maths lessons

Examples of feedback in Maths

PRINCIPLES

- Feedback must help pupils to improve
 - Feedback must be useful to teachers
 - The benefits must outweigh the costs
-

The Exercise Book's Purpose

TO MODEL

Pupils record rigorous and mathematically sound models in their book which have been demonstrated by their teacher.

TO PRACTISE

Pupils use their exercise book to practise the skills and concepts that are being explored within lessons.

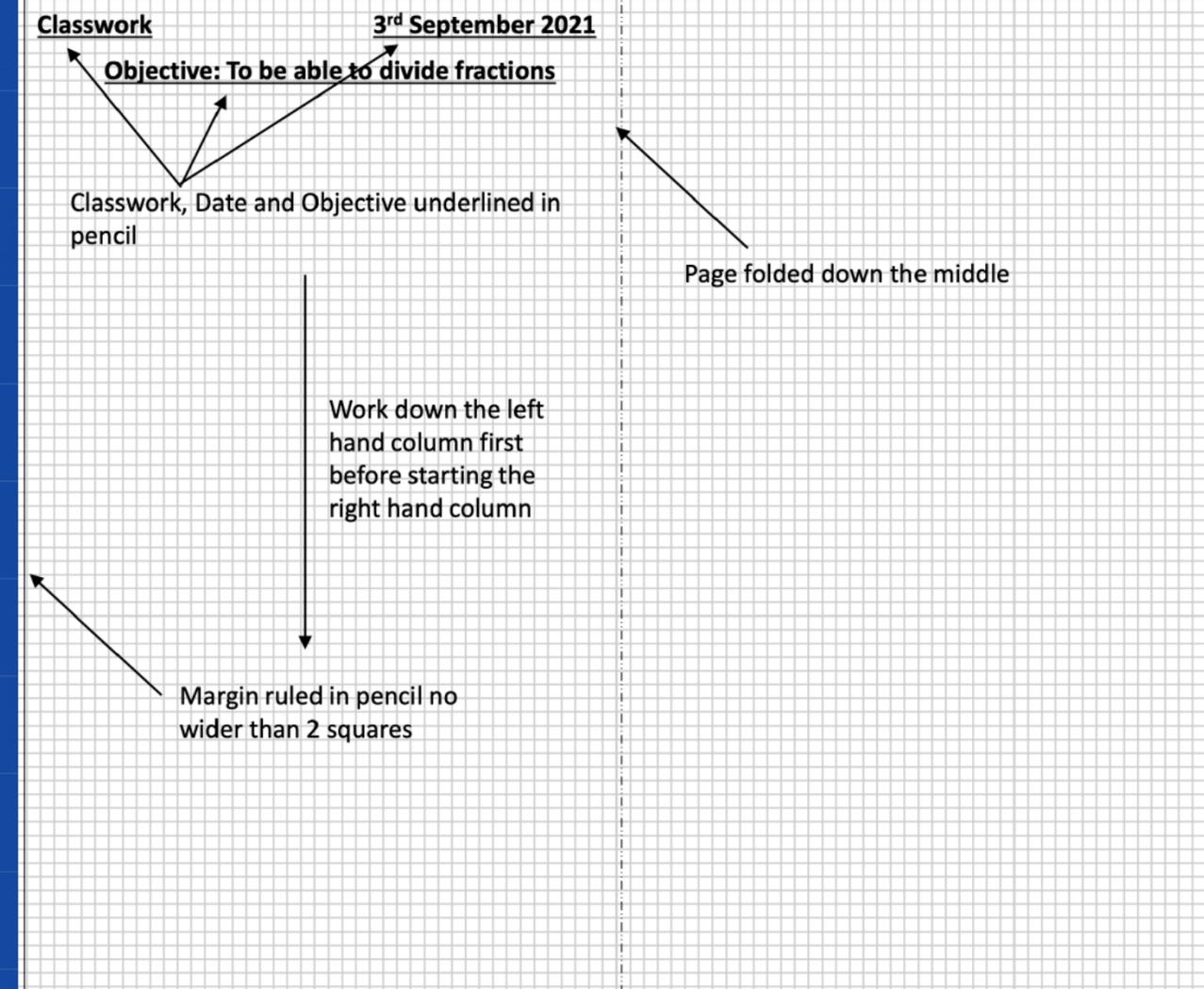
TO RECORD

Pupils use the back of their book to catalogue the various skills checks that they undertake throughout a year. This should show areas they are struggling to remember and feedback they have received to address this.

PRESENTATION

STUCK IN THE INSIDE FRONT COVER OF BOOKS

All pupils have a copy of the image to the right stuck on the inside front cover of their book. This document clearly outlines the presentation expectations when pupils are working in their books. As well as the expectations there is a clear model of what pupil books should look like.



1. Always draw a margin, one square in down the left of the page.
2. Fold your page down the middle unless told not to by your teacher.
3. Always start each lesson with the heading CLASSWORK and the left and the DATE on the right.
4. Copy the lesson objective.
5. Copy worked examples exactly as your teacher has presented them. They are not optional.
6. Always write in blue or black ink.
7. Always use a pencil and ruler for diagrams, margins and underlining.
8. Always start each homework with the heading HOMEWORK on the left and DATE on the right.
9. Rule off at the end of classwork/homework.
10. Work at the back of the exercise book should be as neat as work at the front.
11. No graffiti anywhere in or on your book.
12. You can cover your book in clear plastic.
13. Mark your work accurately in purple pen when the answers are given out.
14. Cross out mistakes neatly with one line and a ruler
15. Underline answers when appropriate.
16. Show all working out.
17. Include your units.
18. Write out the important parts of a question.
19. Complete all corrections in purple pen.
20. Ask for help if you don't understand.
21. Do not tear out pages in the book.

How we give feedback in Maths

1 **FEEDBACK EVERY LESSON**

Teachers give feedback every lesson, to individual pupils or to the whole class. Teachers circulate and monitor presentation of pupil work regularly.

3 **MARKING**

All homework and class work to be self-marked (in purple pen), teacher to check completion and quality regularly.

2 **CHECKING PUPIL UNDERSTANDING**

We take advantage of opportunities to assess pupils understanding – quick quizzes, whiteboards, for instance. Regular low-stakes testing helps them to remember what they've learnt, and helps us to see what they can remember.

4 **ASSESSMENTS**

All assessments are marked by the teacher. Pupils receive whole class feedback and correct their answers accordingly.

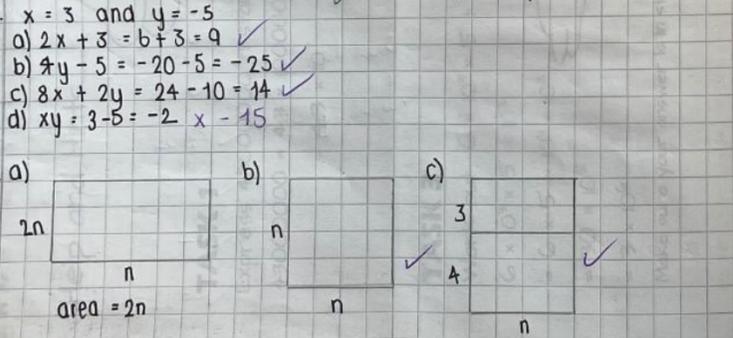
EXAMPLES OF PUPIL WORK

Please see the image in the subsequent slides which show examples of excellent presentation in pupil exercise books, teacher models, as well as pupils acting on feedback they have received (in purple pen).

$33. (6c)^3 = 36c^3$
 $34. (5b)^3 = 125b^3$
 $35. (5a^2)^2 = 25a^4$
 $36. (4m^2)^2 = 16m^4$
 $37. (2n^2)^3 = 8n^6$
 $38. (5p^3)^4 = 25p^{12}$
 $39. (10q^3)^3 = 1000q^9$
 $40. (10a^3)^3 = 1000a^9$
 $41. (7d^3)^2 = 49d^6$
 $42. (9g^4)^2 = 81g^8$
 $43. (2f^5)^3 = 8f^{15}$

$44. x^{-2}$ when $x = 10 = \frac{1}{100}$
 y^2 when $y = 10 = 100$
 z^2 when $z = 0.6 = 0.36$
 $4^{-2} = \frac{1}{4}$
 $10^4 \div 10^7 = 10^{-3}$
 $10^4 \div 10^7 = \frac{10^4}{10^7} = \frac{10 \times 10 \times 10 \times 10}{10 \times 10 \times 10 \times 10 \times 10}$
 $= \frac{1}{10^3}$

c/w Substitution 18th October 2021
 1. a) $12 + 3 \times 5 = 12 + 15 = 27$
 b) $20 - \frac{8}{2} = 20 - 4 = 16$
 c) $3 \times 4 + 4 \times 5 = 12 + 20 = 32$
 d) $2 \times 3^2 = 2 \times 9 = 18$
 e) $4(9-2) = 4 \times 7 = 28$
 f) $16 - 4 \times 3 = 16 - 12 = 4$



$1. b^2 = 9$
 $2. 3b^2 = 27$
 $3. -45 = ab^2$
 $4. 125 = 5a^3$
 $5. 75 = 6a^2$
 $6. 64 = 4c^2$
 $7. 800 = 2(ac)^2$
 $8. 80^2 = (4c)^2 - 2b^3$

15th October 2021
 To be able to expand brackets and collect like terms.
 1. $3(x+1) - 2(x-1)$
 $3x + 3 - 2x + 2 = x + 5$
 2. $2(3x+1) - 2(x+2)$
 $6x + 2 - 2x - 4 = 4x - 2$
 3. $4(x+2) - 3(2x-1)$
 $4x + 8 - 6x + 3 = -2x + 11$

amount of white fabric as a ratio in its simplest form.
 2cm : 7mm
 20mm : 7mm
 $\frac{2}{20} = \frac{1}{10}$
 $\frac{7}{7} = 1$
 $\frac{1}{10} : 1 = 1 : 10$

2. $\frac{1}{13}$
 4. $12 - y$
 5. $244 \div 4 = 61$
 6. $2\frac{1}{7} - 1\frac{2}{5} = \frac{14}{35} - \frac{14}{35} = 0$
 7. $\frac{3}{10} = \frac{x}{2} = \frac{b}{20} = \frac{3}{5}$
 $x = \frac{3 \times 2}{10} = \frac{6}{10} = \frac{3}{5}$

7th October 21
 Standard form consolidation
 1. $(8 \times 10^4) \times (8 \times 10^4)$
 $(8 \times 8) \times (10^4 \times 10^4)$
 $= 64 \times 10^8$
 $= 6.4 \times 10^9$

A1 a=3, b=2, c=5 Evaluate $3a+bc$ 19 ✓	A2 d=7, e=4, f=13 Evaluate $e(f-d)$ 24 ✓
B1 a=2, b=6, c=-3 Evaluate $ab+2c$ $12-6=6$ ✓	B2 e=-1, f=4 Evaluate $7(f-e)$ 35 ✓
C1 a=-3, b=5, c=-2 Evaluate a^2-bc $9-10=-1$ ✓	C2 a=3, b=-4, c=-1 Evaluate $ab+bc-ac$ $-12+4-3=-11$ ✓
D1 a=-2, t=11 Given that $H = \frac{t-3t^2}{t^2+20}$ Find H $H = \frac{11-3(121)}{121+20} = \frac{11-363}{141} = \frac{-352}{141}$	D2 a=-7, d=4, n=21 Given that $S = \frac{n}{2}(2a+(n-1)d)$ Find S $S = \frac{21}{2}(2(-7)+(21-1)4) = \frac{21}{2}(-14+80) = \frac{21}{2}(66) = 693$

Work out $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$ ✓
 Question 2 Work out $\frac{3}{5} \div \frac{1}{2} = \frac{6}{5}$
 $\frac{3}{5} \times \frac{2}{1} = \frac{6}{5}$ ✓
 Question 3 Work out $11 \times 4.2 = 46.2$ ✓
 $4 \times \frac{42}{22} = \frac{440}{22} = 20$
 $9 + 33x$ ✓
 Question 4 Work out $19.1 \times 5.6 = 105.96$
 $191 \times 56 = 10596$
 $10596 \div 100 = 105.96$
 Question 5 Evaluate $2^4 = 16$ ✓
 Question 6 Evaluate $3^3 = 27$ ✓
 Question 7 Expand $3(3+11x) = 9+33x$ ✓
 Question 8 Expand $6x(7x-3) = 42x^2-18x$ ✓
 Question 9 Complete
 $? \text{ m/s} = 25.2 \text{ km/h}$
 $2520 \text{ m/h} \div 60 = 42 \text{ m/m} = 7 \text{ m/s}$ ✓
 Question 10 Complete
 $9 \text{ m/s} = ? \text{ km/h}$
 $9 \times \frac{3600}{1000} = 32.4 \text{ km/h}$ ✓
 Question 11 Find 60% of £500
 $10\% = 50$
 $60\% = 300$
 $\underline{\underline{£300}}$ ✓
 Question 12 Find 80% of £760
 $10\% = 76$
 $80\% = 608$
 $\underline{\underline{£608}}$ ✓
 Question 13 Solve $4x = 2x - 6$
 $2x = -6$
 $x = -3$ ✓
 Question 14 Solve $4x + 4 = 3x - 1$
 $x + 4 = -1$
 $x = -5$ ✓
 Question 15 Make x the subject of the formula $y = ax^2$
 $x = \sqrt{\frac{y}{a}}$
 $y = ax^2$
 $x = \sqrt{\frac{y}{a}}$
 Question 16 Make x the subject of the formula $y = a - x$
 $y - a = -x$
 $x = a - y$
 Question 17 Find the nth term: 6, 15, 24, 33, ...
 $9n - 3$ ✓
 Question 18 Find the nth term: 14, 22, 30, 38, ...
 $8n + 6$ ✓
 Question 19 Work out $12 \times (14 - 6)$
 $12 \times 8 = 96$ ✓
 Question 20 Work out $5 + 2 \times 4 + 6$
 $5 + 8 + 6 = 19$ ✓

SKILLS CHECK Score www.mathsbox.org.uk

Work out $\frac{3}{5} \times \frac{2}{3} = \frac{2}{5}$ ✓
 Work out $\frac{5}{7} \div \frac{2}{3} = 5$ ✓
 Question 5 Evaluate $4^4 = 256$ ✓
 $4 \times 4 = 16$
 $16 \times 4 = 64$
 $64 \times 4 = 256$
 Question 6 Evaluate $3^2 = 9$ ✓
 Question 7 Expand $3(1+3x) = 3+9x$ ✓
 Question 8 Expand $6x(7-5x) = 42x-30x^2$ ✓
 $25,200 \div 6 = 4,200$
 $1512,000 \div 6 = 252,000$
 $907,200 \div 6 = 151,200$
 Question 9 Complete
 $? \text{ m/min} = 28.8 \text{ km/h}$
 $28,800 \text{ m/h} \div 60 = 480 \text{ m/min}$ ✓
 Question 10 Complete
 $? \text{ m/s} = 25.2 \text{ km/h}$
 $25,200 \text{ m/h} \div 3600 = 7 \text{ m/s}$ ✓
 Question 11 Find 40% of £460
 $10\% = 46$
 $40\% = 184$ ✓
 $\frac{46}{18^24}$
 Question 12 Find 75% of £240
 $10\% = 24$
 $75\% = 180$
 $\underline{\underline{£204}}$ ✓
 Question 13 Solve $6x = 4x + 8$
 $2x = 8$
 $x = 4$ ✓
 Question 14 Solve $7x + 5 = 3x + 13$
 $4x + 5 = 13$
 $4x = 8$
 $x = 2$ ✓
 Question 15 Make x the subject of the formula $ay = bx + c$
 $ay - c = bx$
 $x = \frac{ay - c}{b}$
 Question 16 Make x the subject of the formula $\frac{y}{x} = abc$
 $x = \frac{y}{abc}$
 Question 17 Find the nth term: 8, 20, 32, 44, ...
 $12n - 4$ ✓
 Question 18 Find the nth term: 5, 14, 23, 32, ...
 $9n - 4$ ✓
 Question 19 Work out $5 \times (3+3) \times 4$
 $5 \times 6 \times 4 = 120$ ✓
 Question 20 Work out $4 + 2 \times 2 - 3$
 $4 + 4 - 3 = 5$ ✓

SKILLS CHECK Score www.mathsbox.org.uk

O: to be able to multiply and divide in standard form.

- $58000 \times 10^{-5} = 5.8 \times 10^{-1}$ ✓
- $18 \times 10^4 = 1.8 \times 10^5$ ✓
- $5400 \times 10^4 = 5.4 \times 10^7$ ✓
- $22 \times 10^{-1} = 2.2 \times 10^0$ ✓
- $0.4 \times 10^5 = 4 \times 10^4$ ✓

multiplying in s.f
 $(2 \times 10^4) \times (8 \times 10^9)$

$$= 2 \times 8 \times 10^4 \times 10^9$$

$$= 16 \times 10^9$$

$$= 1.6 \times 10^{10}$$

when working in SF always give answer in SF

dividing in SF
 $(2.12 \times 10^9) \div (4 \times 10^{-5})$

$$d. \frac{(2x^4y^2)^3}{(3xy^4)^2} \div \frac{(2x^2y^2)^2}{(3y^2)^2}$$

$$2^3 = 8 \quad 3^3 = 27 = 8 \times 9$$

$$3 \times 3 = 9 \quad 3 \times 2 = 6 \quad 27 \times 6$$

classwork 9th September 2021
 objective: To consolidate rules of indices

Exercise 2E (B+D)

- $B. (6^3)^3 = 6^3 \times 6^3 \times 6^3 \times 6^3 \times 6^3$
 $= 6^{15}$ ✓
- $D. (d^2)^8 = d^2 \times d^2$
 $\times d^2 = d^{16}$ ✓
- $B. (3q^2)^4 = 3q^2 \times 3q^2 \times 3q^2 \times 3q^2$
 $= 81q^8$ ✓
- $D. (m^4)^3 = m^4 \times m^4 \times m^4$
 $= m^{12}$ ✓

Exercise 2SA

- a. $7^0 = 1$ ✓
- b. $8^{-1} = \frac{1}{8}$ ✓
- c. $3^{-4} = \frac{1}{3^4} = \frac{1}{81}$ ✓
- d. $4^0 = 1$ ✓
- e. $8 \times 2 \times 3 \times (-2)^3 = 8 \times 2 \times 3 \times (-8) = -384$ ✓
- f. $10^{-4} = \frac{1}{10^4} = \frac{1}{10,000}$ ✓
- g. $10^{-4} = -10,000 \times \frac{1}{10,000}$ ✓
- h. $(-3)^{-2} = \frac{1}{(-3)^2} = \frac{1}{9}$ ✓

O: Standard from consolidation questions.

- $861000 = 8.61 \times 10^5$ ✓
- $6010 = 6.01 \times 10^3$ ✓
- $10900000 = 1.09 \times 10^7$ ✓
- $32200000 = 3.22 \times 10^7$ ✓
- $64800 = 6.48 \times 10^4$ ✓
- $3540000 = 3.54 \times 10^6$ ✓
- $15800 = 1.58 \times 10^4$ ✓
- $76000 = 7.6 \times 10^4$ ✓
- $213000 = 2.13 \times 10^5$ ✓
- $1520000 = 1.52 \times 10^6$ ✓
- $6380 = 6.38 \times 10^3$ ✓
- $27100 = 2.71 \times 10^4$ ✓
- $839000 = 8.39 \times 10^5$ ✓



b) convert 2.5g to mg
 $1g = 1000mg$
 $2.5g = 2500mg$ ✓

c) gw to wAhS
 $1gw = 1000000000w$
 $4gw = 4000000000w$ ✓

d) 1.9s to nanoseconds
 $1ms = 1000000000ns$
 $1.9s = 1900000000ns$ ✓

c/w 21st September 21

O: To be able to convert between ordinary numbers and standard form.

Standard form is a way to write very big numbers and very small numbers in a concise way.

eg: $90,000,000 = 9 \times 10^7$
 number must be between 1 and 10.

This number must be 10 to the power of an integer.

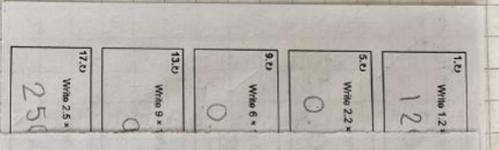
a. $3000 = 3 \times 10^3$ ✓

×	⊗	⊙	⊕	×
×	×	×	×	⊕
×	×	×	×	×

c/w 23rd September

O: converting to correct standard form.

- $400 \times 10^{-5} = 4 \times 10^{-3}$ ✓
- $350 \times 10^5 = 3.5 \times 10^7$ ✓
- $0.0027 \times 10^6 = 2.7 \times 10^3$ ✓
- $29 \times 10^3 = 2.9 \times 10^4$ ✓
- $250000 \times 10^{-4} = 2.5 \times 10^5$ ✓
- $560 \times 10^6 = 5.6 \times 10^8$ ✓



30th September 2021

Unit 1 consolidation

- a. $3^5 \times 3^4 = 3^9$ ✓ b. $5^2 \times 5^3 = 5^5$ ✓
- c. $2^5 \times 2^3 = 2^8$ ✓ d. $7^3 \times 7 = 7^4$ ✓
- e. $5^2 \times 5^3 \times 5^4 = 5^9$ ✓ f. $10^4 \times 10 \times 10^3 = 10^8$ ✓
- a. $6^3 \div 6^2 = 6^1 = 6$ ✓ b. $5^7 \div 5^5 = 5^2 = 25$ ✓
- c. $2^7 \div 2^3 = 2^4 = 16$ ✓ d. $7^3 \div 7 = 7^2 = 49$ ✓
- a. She is wrong because she multiplied the powers instead of adding them together. ✓
- b. He is wrong because he divided the powers instead of taking them away. ✓
- a. $2^4 \times 2^3 \div 2^5 = 2^2 \div 2^2 = 2^0 = 1$ ✓
- b. $10^7 \times 10^2 \div 10^4 = 10^5 \div 10^4 = 10^1 = 10$ ✓
- c. $8^5 \div 8^2 \times 8^3 = 8^3 \times 8^3 = 8^6$ ✓

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c/w 3rd September 2021 c/w

O: to understand the laws of indices.

- 1st law of indices: when multiplying 2 values with the same base number we can add the indices.
 eg: $2^3 \times 2^7 = 2^{10}$
 $a^b \times a^c = a^{b+c}$
- $b^{-2} \div b^5 = \frac{b^{-2}}{b^5} = b^{-7} = b^{-7} \div b^3 = b^{-10}$ ✓
- $3^{-4} \times 3^{-5} \times 3^3 = 3^{-12} \times 3^3 = 3^{-9}$ ✓
- $\frac{x^4}{x^5 \times x} = \frac{x^4}{x^6} = x^{-2}$ ✓
- $\frac{3^{-3}}{(3^4)^5} = \frac{3^{-3}}{3^{20}} = 3^{-23}$ ✓

a) $m^5 \times m^2 = m^7$	e) $p \times p^{-9} = p^{-8}$
b) $n^5 \times n = n^6$	f) $x^{1/2} \times x^{1/2} = x^1$
c) $w \times w^3 = w^4$	g) $u \times u^{1/2} = u^{1.5}$
d) $g^2 \times g^7 = g^9$	

9th September

O: To be able to apply the laws of indices

- The zero exponent - any base number or value to the power of 0 equal to 1.
 eg: $\frac{2^5}{2^5} = \frac{8}{8} = 1$ ✓ $a^0 = 1$
- 2nd law of indices: when dividing 2 values with the same base value we subtract the indices.
 $\frac{2^3}{2^3} = 2^0 = 1$ ✓ equal $1 = 2^0$

negative indices

- eg: $7^5 \div 7^2 = 7^3$
 $a^b \div a^c = a^{b-c}$
- $\frac{2}{2 \times 2} = \frac{2}{4} = \frac{1}{2}$ ✓ $\frac{2^1}{2^2} = 2^{-1} = \frac{1}{2}$ ✓
- $\frac{2^1}{2^2} = 2^{-1}$ ✓ $5^{-3} = \frac{1}{5^3} = \frac{1}{125}$ ✓
- eg: $7^5 \div 7^2 = 7^3$
 $a^b \div a^c = a^{b-c}$
- a) 4200 kHz
- b) $680 \text{ nm} = 0.680 \mu\text{m}$ ✓
- a. $4^2 \div 4^2 = \frac{4^2}{4^2} = 4^0 = 1$ ✓
- b. $4^2 \div 4^2 = \frac{4^2}{4^2} = 4^0 = 1$ ✓
- c. $4^0 = 1$ ✓
- d. $5^2 \div 5^2 = \frac{5^2}{5^2} = 5^0 = 1$ ✓ $5^4 \div 5^2 = 5^{4-2} = 5^2 = 25$ ✓
- ii) $5^0 = 1$ ✓
- e. When you write a number to the power of 0, the answer is 1. ✓
- a. $4^3 \div 4^5 = 4^{-2} = \frac{1}{4^2} = \frac{1}{16}$ ✓
- ii) $4^3 \div 4^5 = \frac{4^3}{4^5} = \frac{4 \times 4 \times 4}{4 \times 4 \times 4 \times 4 \times 4} = \frac{1}{4^2} = \frac{1}{16}$ ✓
- iii) $4^{-2} = \frac{1}{4^2} = \frac{1}{16}$ ✓
- a. $0.25 \text{ Tm} = 250,000,000 \text{ km}$ ✓
- ii) $10^4 \div 10^7 = 10^{-3} = \frac{1}{1000}$ ✓
- ii) $10^4 \div 10^7 = \frac{10 \times 10 \times 10 \times 10}{10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10} = \frac{1}{10^3} = \frac{1}{1000}$ ✓



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Class work
Objective: to be able to draw two-way tables.

Exercise 6f

1. Most women asked which type of soap?
12 said plain, 7 were men, 6 women chose Salt + vinegar, 14 men + 12 women said check.

	P	S	C	Total
M	7	7	14	28
W	5	6	12	23
Total	12	13	26	51

- a. two way table, see above ✓
- b. 13 people liked Salt + vinegar ✓
- c. 51 people were asked in total ✓

2. orange juice or

classwork 6th December 2021

Objective: to be able to draw and use Stem and leaf diagrams

Question: draw a Stem and leaf diagram for the set of data.

35, 80, 38, 44, 53, 41, 39, 45, 48, 55

working: Stem | Leaf

3	5, 8, 9
4	4, 1, 8, 5, 8
5	0, 2, 5

Median: 5th 6th = 44.5

e) when you write a number to the power 0 the answer is 1.

10. $4^3 \div 4^5 = 4^{-2}$
 $4^3 \div 4^5 = \frac{4^3}{4^5} = \frac{4 \times 4 \times 4}{4 \times 4 \times 4 \times 4 \times 4} = \frac{1}{4^2}$
 $4^{-2} = \frac{1}{4^2}$
 $10^4 \div 10^7 = 10^{-3}$
 $10^4 \div 10^7 = \frac{10^4}{10^7} = \frac{10 \times 10 \times 10 \times 10}{10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10}$
 $= \frac{1}{10^3}$

c/w Substitution 15th October 2021

- a) $12 + 3 \times 5 = 12 + 15 = 27$ ✓
 - b) $20 - \frac{8}{2} = 20 - 4 = 16$ ✓
 - c) $3 \times 4 + 4 \times 5 = 12 + 20 = 32$ ✓
 - d) $2 \times 3^2 = 2 \times 9 = 18$ ✓
 - e) $4(9-2) = 4 \times 7 = 28$ ✓
 - f) $16 - 4 \times 3 = 16 - 12 = 4$ ✓

- a) $2x + 3 = 6 + 3 = 9$ ✓
 - b) $7y - 5 = -20 - 5 = -25$ ✓
 - c) $8x + 2y = 24 - 10 = 14$ ✓
 - d) $xy = 3 - 5 = -2$ ✓

3. a) b) c)

2n	n	3
----	---	---

working: Stem | Leaf

0	5, 9, 9
1	8, 5, 1
2	8, 4, 9, 4
3	8, 8, 2
4	2, 0

Ordered: Stem | Leaf

0	5, 9, 9
1	1, 5, 8
2	4, 4, 8, 9
3	2, 3, 8
4	0, 2

Median: $15 \div 2 = 7.5$
 $= 24$
 Mode: there are 2 modes, 24 and 9
 Range: $42 - 5 = 37$

3. 153, 144, 148, 140, 149, 145, 144, 142, 158, 135, 140, 139, 160

working: Stem | Leaf

13	5, 9
14	4, 8, 0, 9, 5, 4, 2, 0
15	3, 8
16	0

Median: $13 \div 2 = 6.5$
 $= 144$
 Mode: there are 2 modes, 140 and 144
 Range: $160 - 135 = 25$

working: Stem | Leaf

13	5, 9
14	4, 8, 0, 9, 5, 4, 2, 0
15	3, 8
16	0

Median: $13 \div 2 = 6.5$
 $= 144$
 Mode: there are 2 modes, 140 and 144
 Range: $160 - 135 = 25$

working: Stem | Leaf

13	5, 9
14	0, 0, 2, 4, 4, 5, 8, 9
15	3, 8
16	0

Median: $13 \div 2 = 6.5$
 $= 144$
 Mode: there are 2 modes, 140 and 144
 Range: $160 - 135 = 25$

Median: $13 \div 2 = 6.5$
 $= 144$
 Mode: there are 2 modes, 140 and 144
 Range: $160 - 135 = 25$

Question 2: The stem and leaf diagram below shows the ages of a group of people.

(a) How many people are there in the group? 12 ✓
 (b) How old is the youngest member of the group? 14 ✓
 (c) How old is the oldest member of the group? 44 ✓
 (d) How many people are under 20? 3 ✓
 (e) How many people are over 25? 7 ✓

Key: 114 means 14 years old

Question 3: The stem and leaf diagram below shows heights of Mrs Smith's flowers.

(a) How many flowers does Mrs Smith have? 19 ✓
 (b) What is the height of the shortest flower? 9cm ✓
 (c) What is the height of the tallest flower? 53cm ✓
 (d) How many flowers have a height of 14cm? 3 flowers ✓
 (e) How many flowers have a height greater than 40cm? 5 ✓
 (f) What fraction of the flowers have a height under 20cm? $\frac{7}{19} = \frac{7}{19}$ ✓

Key: 019 means 19cm

Question 5: The following stem and leaf diagram shows times taken for 15 people to complete a jigsaw.

(a) Write down the modal time taken. 37 minutes ✓
 (b) Write down the median time taken. $15 \div 2 = 7.5$ = 37 minutes ✓
 (c) Write down the range of times taken. $75 - 31 = 44$ ✓
 (d) What fraction of the people took over one hour? $\frac{4}{15}$ ✓

Key: 3|1 means 31 minutes

Apply

Question 1: The stem and leaf diagram shows the weights of 10 books that are placed on a book shelf.

Key: 0|3 means 0.3kg

2. For each 7mm of colour fabric Paul uses to make his curtains, he also uses 2cm of white fabric. Express the amount of white fabric to colour fabric as a ratio in its simplest form.

2cm : 7mm
 20mm : 7mm

- $\frac{1}{15}$ ✓
- $12 - y$ ✓
- $244 \div 4 = 61$ ✓
- $\frac{2}{7} - \frac{1}{5} = \frac{10}{35} - \frac{7}{35} = \frac{3}{35}$ ✓
- $\frac{3}{10} = \frac{x}{2} = \frac{6}{20} = \frac{3}{10}$ ✓
- $\frac{1}{7} - \frac{1}{5} = \frac{10}{35} - \frac{7}{35} = \frac{3}{35}$ ✓
- $\frac{3}{10} = \frac{x}{2} = \frac{6}{20} = \frac{3}{10}$ ✓
- $f(8f+7) = 8f^2 + 7f$ ✓
- 93.93 ✓

c/w 7th October 21 standard form consolidation

1. $(8 \times 10^4) \times (8 \times 10^4)$
 $(8 \times 8) \times (10^4 \times 10^4)$
 $= 64 \times 10^8$

2. $(1.8 \times 10^{10}) \div (9 \times 10^4)$
 $(1.8 \div 9) \times (10^{10} \div 10^4)$
 $= 0.2 \times 10^6$
 $= 2 \times 10^5$

33. $(6c)^2 = 36c^2$ ✓
 34. $(5b)^3 = 125b^3$ ✓
 35. $(5a^2)^2 = 25a^4$ ✓
 36. $(4m^2)^2 = 16m^4$ ✓
 37. $(2n^3)^3 = 8n^9$ ✓
 38. $(5p^2)^2 = 25p^4$ ✓
 39. $(10q^3)^3 = 1000q^9$ ✓
 40. $(10a^2)^3 = 1000a^6$ ✓
 41. $(7d^2)^3 = 49d^6$ ✓
 42. $(9g^4)^2 = 81g^8$ ✓
 43. $(2f^5)^3 = 8f^{15}$ ✓

1. $3a^2 \times 4a^3 = 12a^5$ ✓
 2. $3a^2 \times a^4 = 3a^6$ ✓
 3. $c^3 \times 7c^3 = 7c^6$ ✓
 4. $b^3 \times 4b^2 = 4b^5$ ✓
 5. $5a^2 \times 4a^3 = 20a^5$ ✓
 6. $6b^2 \times 4b^3 = 24b^5$ ✓
 7. $5b^4 \times 3b^6 = 15b^{10}$ ✓
 8. $2c^5 \times 4c^7 = 8c^{12}$ ✓
 9. $3t^2 \times 4t^3 = 12t^5$ ✓
 10. $7a^3 \times 4a^7 = 28a^{10}$ ✓
 11. $5t^2 \times 7t^5 = 35t^7$ ✓
 12. $8y^4 \times 3y^4 = 24y^8$ ✓
 13. $8e^4 \times 9e^9 = 72e^{13}$ ✓
 18. $6c^5 \div 2c^3 = 3c^2$ ✓
 19. $8b^5 \div 4b^2 = 2b^3$ ✓
 20. $15a^7 \div 3a^3 = 5a^4$ ✓
 21. $36b^8 \div 4b^3 = 9b^5$ ✓
 22. $9b^4 \div 3b = 3b^3$ ✓

- 5a² x 4a³
- 7a² x 4a⁷
- 6h² x 8h⁷
- 15a⁷ + 3a⁷
- 35a¹² + 5a⁷
- 12a¹² + 72a⁷
- (5a³)²
- (10a³)³
- (100t¹²)³

1. $b^2 = 9$ ✓
 2. $3b^2 = 27$ ✓
 3. $-45 = ab^2$ ✓
 4. $125 = 5a^3$ ✓
 5. $75 = 6a^2$ ✓
 6. $64 = 4c^2$ ✓
 7. $800 = 2(ac)^2$ ✓
 8. $58 = (4c)^2 - 2b^3$ ✓

6. $2(5x+3) - 2(x-4)$
 $10x+6 - 2x+8$
 $= 8x+14$ ✓

7. $3(x+5) + 2(x-3)$
 $3x+15+2x-6$
 $= 5x+9$ ✓

A1 a=3, b=2, c=5 Evaluate 3a+bc 19 ✓	A2 d=7, e=4, f=13 Evaluate e(f-d) 24 ✓
B1 a=2, b=6, c=-3 Evaluate ab+2c -12 ✓	B2 e=-1, f=4 Evaluate 7(f-e) 35 ✓
C1 a=-3, b=5, c=-2 Evaluate a ² -bc q=-10 19 ✓	C2 a=3, b=-4, c=-1 Evaluate ab+bc-ac -12+4-3 -8+3=-5 ✓
D1 a=-2, t=11 Given that H = $\frac{t-3}{7+20}$ Find H 12 ✓	D2 a=-7, d=4, n=21 Given that 10s[4+20+4] 693 = $\frac{n}{2}(2a+(n-1)d)$ Find s 47 ✓

15th October 2021
 To be able to expand brackets and collect like terms.

1. $3(x+1) - 2(x-1)$
 $3x+3 - 2x+2$
 $= x+5$ ✓

2. $2(3x+1) - 2(x+2)$
 $6x+2 - 2x-4$
 $= 4x-2$ ✓

3. $4(x+2) - 3(2x-1)$
 $4x+8 - 6x+3$
 $= -2x+11$ ✓

Q2. Work out $\frac{10}{15} - \frac{3}{15} = \frac{7}{15}$ ✓

Q3. Work out a) $\frac{5}{8} \times \frac{3}{4} = \frac{15}{32}$ ✓

Q4. Work out a) $12 \div \frac{1}{2} = 24$ ✓

Q5. Work out $\frac{15}{24} + \frac{5}{4} = \frac{60}{96} + \frac{120}{96} = \frac{180}{96} = \frac{15}{8}$ ✓

Q7. Work out $1\frac{3}{4} \times 1\frac{1}{3}$
 Give your answer as a mixed number.
 $\frac{7}{4} \times \frac{4}{3} = \frac{28}{12} = 2\frac{4}{12} = 2\frac{1}{3}$ ✓

Q8. Work out $1\frac{1}{5} \div \frac{3}{4}$
 Give your answer as a mixed number in its simplest form.
 $\frac{6}{5} \div \frac{3}{4} = \frac{6}{5} \times \frac{4}{3} = \frac{24}{15} = 1\frac{9}{15} = 1\frac{3}{5}$ ✓

Q9. Work out $4\frac{2}{3} + 5\frac{1}{4} + 7\frac{1}{6}$
 $\frac{14}{3} + \frac{21}{4} + \frac{39}{6}$
 $\frac{14}{3} + \frac{21}{4} + \frac{39}{6}$
 $\frac{14 \times 4}{12} + \frac{21 \times 3}{12} + \frac{39 \times 2}{12}$
 $\frac{56}{12} + \frac{63}{12} + \frac{78}{12}$
 $\frac{197}{12}$
 $16\frac{5}{12}$ ✓

$2 \times 10^7 \times 3 \times 10^5 = 6 \times 10^{12}$
 $3 \times 10^{-2} \times 4 \times 10^{-3} = 12 \times 10^{-5} = 1.2 \times 10^{-4}$
 2.438×10^{-7}

Calculate

1. $(6 \times 10^8) + (3 \times 10^8)$ 2. $(9 \times 10^{12}) + (3 \times 10^4)$ 3. $(8 \times 10^7) + (2 \times 10^5)$

Calculate

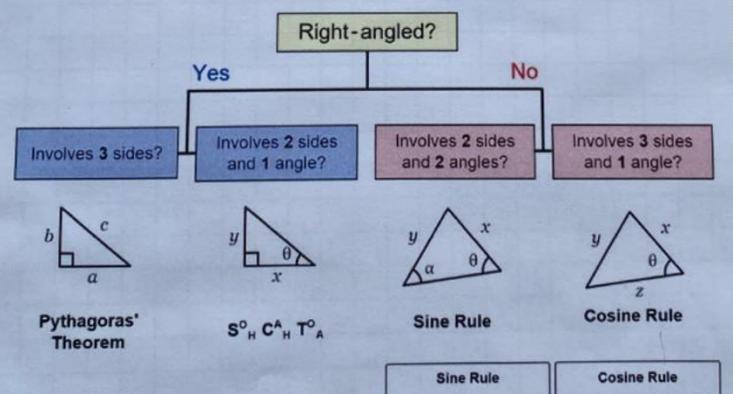
1. $(1.5 \times 10^9) + (3 \times 10^4)$ 2. $(1.2 \times 10^4) + (3 \times 10^6)$ 3. $(3.6 \times 10^{-5}) + (9 \times 10^3)$

Calculate

1. $(6 \times 10^{-3}) + (4 \times 10^3)$ 2. $(1.8 \times 10^5) + (4 \times 10^{-8})$ 3. $(2.8 \times 10^{-5}) + (1.2 \times 10^{-14})$

1×10^6 ✓ 5×10^4 ✓ $1.5 \times 10^4 \times 1.5 \times 10^{-10}$ ✓
 2×10^8 ✓ 2.4×10^{-3} ✓ $2.4 \times 10^{-7} \times 4.5 \times 10^9$ ✓
 3×10^5 ✓ 3×10^{-9} ✓ $3 \times 2.3 \times 10^{-10}$ ✓

8th Nov **Trigonometry: selecting methods**



Sine Rule **Cosine Rule**

Question 9 Write $\frac{4+2\sqrt{5}}{\sqrt{5}-1}$ in the form $\frac{a\sqrt{b}+c}{d}$

Question 10 Show that $\frac{6-\sqrt{8}}{\sqrt{2}-1}$ can be written in the form $a+b\sqrt{2}$ where a and b are integers.

Question 11 Simplify fully $\frac{24-\sqrt{300}}{4\sqrt{3}-5}$. Give your answer in the form $a\sqrt{b}$ where a and b are integers.

Question 12 Find the value of a and the value of b. $\frac{1+\sqrt{2}}{(3-\sqrt{2})^2}$ can be written in the form $a+b\sqrt{2}$.

$(\sqrt{2}-1)(\sqrt{2}+1) = 2-1 = 1$
 $(\sqrt{2}-1)(2+1) = 2\sqrt{2}+2-\sqrt{2}-1 = \sqrt{2}+1$
 $\frac{4+2\sqrt{5}}{\sqrt{5}-1} \times \frac{\sqrt{5}+1}{\sqrt{5}+1} = \frac{4\sqrt{5}+4+2\sqrt{5}-2}{5-1} = \frac{6\sqrt{5}+2}{4} = \frac{3\sqrt{5}+1}{2}$
 $\frac{6-\sqrt{8}}{\sqrt{2}-1} \times \frac{\sqrt{2}+1}{\sqrt{2}+1} = \frac{6\sqrt{2}+6-\sqrt{8}-\sqrt{8}}{2-1} = 6\sqrt{2}+6-2\sqrt{2}-2 = 4\sqrt{2}+4$
 $\frac{24-\sqrt{300}}{4\sqrt{3}-5} \times \frac{4\sqrt{3}+5}{4\sqrt{3}+5} = \frac{24 \cdot 4\sqrt{3} + 24 \cdot 5 - \sqrt{300} \cdot 4\sqrt{3} - \sqrt{300} \cdot 5}{(4\sqrt{3})^2 - 25} = \frac{96\sqrt{3} + 120 - 4\sqrt{900} - 5\sqrt{300}}{48-25} = \frac{96\sqrt{3} + 120 - 120 - 5\sqrt{300}}{23} = \frac{96\sqrt{3} - 5\sqrt{300}}{23}$
 $\frac{1+\sqrt{2}}{(3-\sqrt{2})^2} \times \frac{(3+\sqrt{2})^2}{(3+\sqrt{2})^2} = \frac{(1+\sqrt{2})(9+6\sqrt{2}+2)}{(9-2\sqrt{2}+2)^2} = \frac{(1+\sqrt{2})(11+6\sqrt{2})}{(11-2\sqrt{2})^2}$
 $\frac{1+\sqrt{2}}{(3-\sqrt{2})^2} = \frac{1+\sqrt{2}}{11-2\sqrt{2}}$
 $\frac{1+\sqrt{2}}{11-2\sqrt{2}} \times \frac{11+2\sqrt{2}}{11+2\sqrt{2}} = \frac{(1+\sqrt{2})(11+2\sqrt{2})}{121-8} = \frac{11+2\sqrt{2}+11\sqrt{2}+4}{113} = \frac{15+13\sqrt{2}}{113}$

$n^{\text{th}} \text{ term} = \frac{n+1}{4}$
 $200^{\text{th}} \text{ term} = \frac{201}{4}$
 $n^{\text{th}} \text{ term} = \frac{n+3}{9}$
 $200^{\text{th}} \text{ term} = \frac{203}{9}$
 $n^{\text{th}} \text{ term} = \frac{n+1}{3}$
 $200^{\text{th}} \text{ term} = \frac{201}{3} = 67$
 $n^{\text{th}} \text{ term} = \frac{n+5}{12}$
 $200^{\text{th}} \text{ term} = \frac{205}{12}$
 $n^{\text{th}} \text{ term} = \frac{n+1}{2}$
 $200^{\text{th}} \text{ term} = \frac{201}{2} = 100.5$
 $n^{\text{th}} \text{ term} = \frac{n+3}{4}$
 $200^{\text{th}} \text{ term} = \frac{203}{4} = 50.75$
 $n^{\text{th}} \text{ term} = \frac{n+1}{12}$
 $200^{\text{th}} \text{ term} = \frac{201}{12} = 16.75$
 $n^{\text{th}} \text{ term} = \frac{n+1}{2}$
 $200^{\text{th}} \text{ term} = \frac{201}{2} = 100.5$
 $n^{\text{th}} \text{ term} = \frac{n+3}{4}$
 $200^{\text{th}} \text{ term} = \frac{203}{4} = 50.75$
 $n^{\text{th}} \text{ term} = \frac{n+1}{12}$
 $200^{\text{th}} \text{ term} = \frac{201}{12} = 16.75$
 $n^{\text{th}} \text{ term} = \frac{n+1}{2}$
 $200^{\text{th}} \text{ term} = \frac{201}{2} = 100.5$
 $n^{\text{th}} \text{ term} = \frac{n+3}{4}$
 $200^{\text{th}} \text{ term} = \frac{203}{4} = 50.75$
 $n^{\text{th}} \text{ term} = \frac{n+1}{12}$
 $200^{\text{th}} \text{ term} = \frac{201}{12} = 16.75$

Rationalising

Question 1 Show that $\frac{\sqrt{8}}{\sqrt{8}-2}$ can be written in the form $n + \sqrt{n}$, where n is an integer.

Question 2 Express $\frac{2}{\sqrt{3}-1}$ in the form $p + \sqrt{q}$ where p and q are integers.

Question 3 Rationalise the denominator of $\frac{8}{3-\sqrt{5}}$. Give your answer in the form $a + b\sqrt{5}$ where a and b are integers.

Question 4 Rationalise the denominator and simplify $\frac{5\sqrt{5}-2}{2\sqrt{5}-3}$.

Question 5 Show that $\frac{14}{\sqrt{2}}$ can be written in the form $a + b\sqrt{2}$.

Question 6 Write $\frac{5\sqrt{2}}{3\sqrt{6}-7}$ in the form $\sqrt{w} + \sqrt{x}$ where w and k are integers.

$2\sqrt{5}-3$ $2\sqrt{5}+3$ $20-9=11$
 $(2\sqrt{5}-3)(2\sqrt{5}+3) = 20-9=11$
 $(2\sqrt{5}+3)(5\sqrt{5}-2) = 50+15\sqrt{5}-6-4\sqrt{5} = 44+11\sqrt{5}$
 $\frac{14}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}} = \frac{14(3+\sqrt{5})}{9-5} = \frac{42+14\sqrt{5}}{4} = 10.5 + 3.5\sqrt{5}$
 $\frac{5\sqrt{2}}{3\sqrt{6}-7} \times \frac{3\sqrt{6}+7}{3\sqrt{6}+7} = \frac{15\sqrt{12}+35\sqrt{2}}{54-49} = \frac{30\sqrt{3}+35\sqrt{2}}{5}$
 $7 \cdot \frac{\sqrt{2}-1}{2-\sqrt{3}} = \frac{\sqrt{2}-1}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{2\sqrt{2}+2\sqrt{3}-2-\sqrt{3}}{4-3} = 2\sqrt{2}+\sqrt{3}-2$
 $\frac{2-\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{4+2\sqrt{3}-2\sqrt{3}-3}{4-3} = 1$
 $(\sqrt{2}-1)(2+\sqrt{3}) = 2\sqrt{2}+\sqrt{6}-2-\sqrt{3} = 2\sqrt{2}+\sqrt{6}-2-\sqrt{3}$
 $4+2\sqrt{2} = (4+2\sqrt{2})(2+\sqrt{2}) = 12+8\sqrt{2}+4+2\sqrt{2} = 16+10\sqrt{2}$
 $(2-\sqrt{2})(2+\sqrt{2}) = 4-2 = 2$

$\sin 108^\circ = \sin 36^\circ = \frac{1}{2}$
 $\sin 36^\circ = \frac{1}{2}$
 $x = 9.0 \times \frac{\sin 108^\circ}{\sin 37^\circ} = 15.2 \text{ cm}$

the sine rule Diagrams not drawn to scale

1. Work out the lengths of the sides marked x. Round your answers to the nearest 0.1cm.

a) b) c)

d) e) f)

a) $\frac{6}{\sin 73} = \frac{5.2}{\sin 44} = \frac{x}{\sin 63}$
 $x = \frac{5.2 \times \sin 73}{\sin 44} = 7.16 \text{ cm}$
 b) $\frac{x}{\sin 47} = \frac{6.4}{\sin 66} = \frac{a}{\sin 63}$
 $x = \frac{6.4 \times \sin 47}{\sin 66} = 5.59 \text{ cm}$
 c) $\frac{x}{\sin 67} = \frac{6.4}{\sin 41} = \frac{6.4}{\sin 67}$
 $x = 6.4 \times \frac{\sin 67}{\sin 41} = 9.9 \text{ cm}$
 d) $\frac{x}{\sin 33} = \frac{3.9}{\sin 100} = \frac{a}{\sin 47}$
 $x = \frac{3.9 \times \sin 33}{\sin 100} = 2.90 \text{ cm}$
 e) $\frac{x}{\sin 68} = \frac{4.5}{\sin 63} = \frac{a}{\sin 49}$
 $x = \frac{4.5 \times \sin 68}{\sin 63} = 5.32 \text{ cm}$
 f) $\frac{x}{\sin 50} = \frac{2.7}{\sin 80} = \frac{a}{\sin 50}$
 $x = \frac{2.7 \times \sin 50}{\sin 80} = 2.1 \text{ cm}$

Objective: To be able to solve equations involving indices.

eg. Solve $4^{x-3} = 8^{x-1}$

$2^{2(x-3)} = 2^{3(x-1)}$
 $2^{2x-6} = 2^{3x-3}$
 $2x-6 = 3x-3$
 $-6 = x-3$
 $-3 = x$

a) $4^3 = 2^6$ ✓ d) $16^{\frac{3}{2}} = 4^{2 \times \frac{3}{2}} = 4^3$ ✓
 b) $8^{\frac{2}{3}} = 2^2$ ✓ e) $81^{\frac{2}{3}} = 3^4 \sqrt[3]{27} = 27$ ✓
 c) $16^{\frac{5}{2}} = 2^{4 \times \frac{5}{2}} = 2^{10} = 1024$ ✓ f) $8^5 = 2^{3 \times 5} = 2^{15}$ ✓
 g) $9^5 = 3^{2 \times 5} = 3^{10}$ ✓ h) $5^9 = 5^{(2 \times 9)}$
 $9 = x^2$
 $\sqrt{9} = 3 \text{ or } -3$
 $x = \pm 3$

i) $4^7 = 2^{14}$ ✓ j) $27^{\frac{4}{3}} = 3^{3 \times \frac{4}{3}} = 3^4$ ✓
 k) $8^{\frac{5}{2}} = 2^{3 \times \frac{5}{2}} = 2^{\frac{15}{2}}$ ✓ l) $27^{\frac{2}{3}} = (3^{\frac{3}{2}})^{\frac{2}{3}} = 3^1 = 3$ ✓
 m) $16^{\frac{3}{2}} = 2^{4 \times \frac{3}{2}} = 2^6 = 64$ ✓ n) $27^{\frac{2}{3}} = 3^{3 \times \frac{2}{3}} = 3^2 = 9$ ✓

quadratic equation
 $x^2 + 8 - 6x = 0$
 $(x-2)(x-4) = 0$
 $x-2=0 \quad x-4=0$
 either $x=2$ or $x=4$

a) $6^{n+4} = 6^{3n}$ b) $5^{a+2} = 5^{2a-1}$
 $n+4 = 3n$ $a+2 = 2a-1$
 $4 = 2n$ $2 = a-1$
 $n = 2$ ✓ $a = 3$ ✓

c) $16^{\frac{a}{2}} = 16^{a-3}$ d) $2^{7-t} = 8^t$
 $\frac{a}{2} = a-3$ $2^{7-t} = (2^3)^t$
 $a = a-6$ $2^{7-t} = 2^{3t}$
 $0 = a-6$ $7-t = 3t$
 $a = 6$ ✓ $7 = 4t$
 $t = \frac{7}{4}$ ✓

e) $16^{x+1} = 128^{x-5}$ f) $(\frac{1}{3})^x = 3^{x-1}$
 $(2^4)^{x+1} = (2^7)^{x-5}$
 $4(x+1) = 7(x-5)$
 $4x+4 = 7x-35$
 $-3x = -39$
 $x = 13$