MATHEMATICS PRESENTATION, FEEDBACK, AND MARKING

Contents

CONTENTS

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.
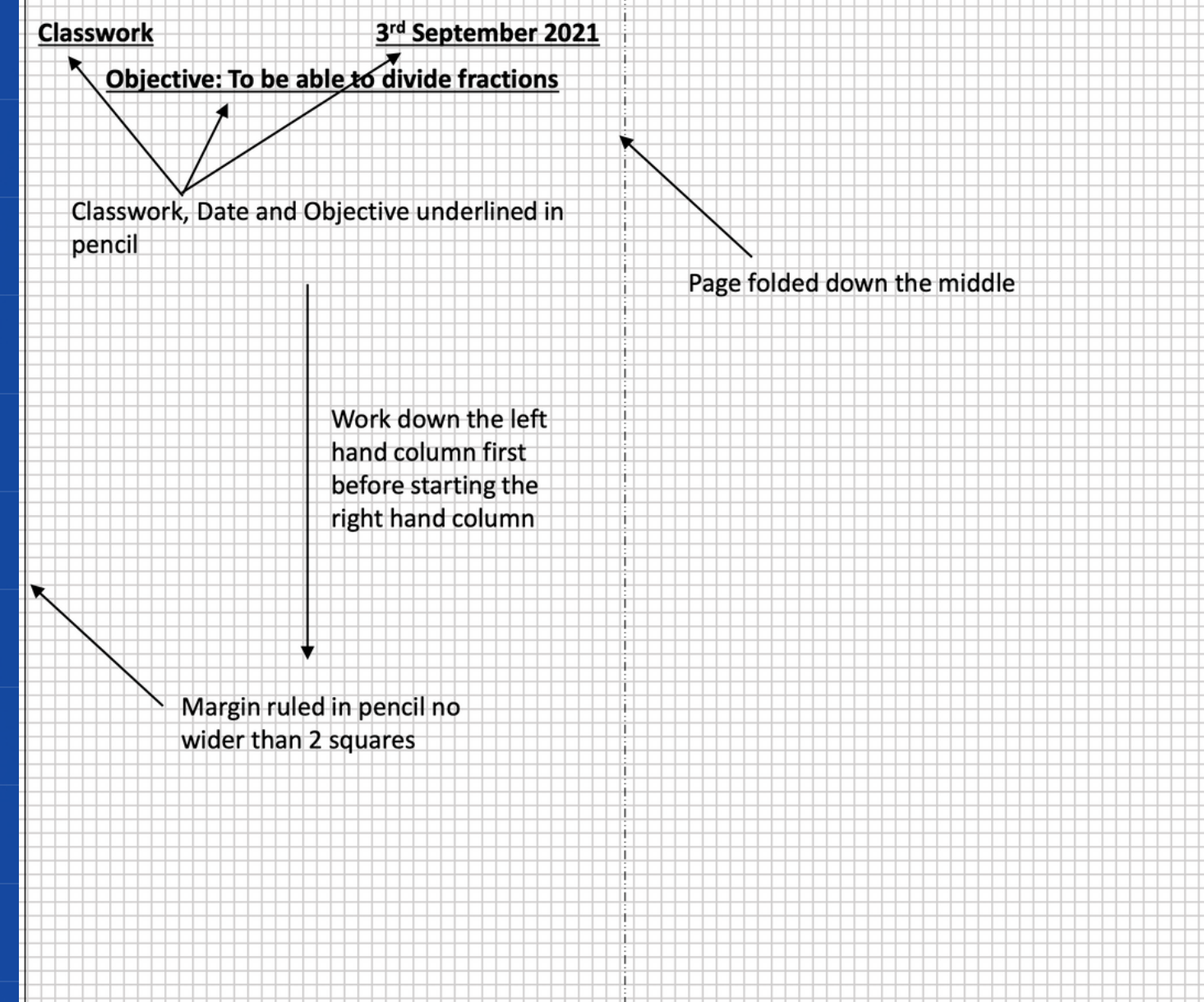
TO RECORD

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 feeback they have recived 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.

Classwork   3rd September 2021

Objective: To be able to divide fractions

Classwork, Date and Objective underlined in pencil

Page folded down the middle

Work down the left hand column first before starting the right hand column

Margin ruled in pencil no wider than 2 squares

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.

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.

3 **MARKING**

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

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).

Top-left notebook page

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

Top-middle notebook page

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

$a = -5 \quad b = 3 \quad c = -4$
1. $b^2 = 9$ ✓
2. $3b^2 = 27$ ✓
3. $-45 = ab^2$ ✓
4. $125 = 5a \cdot 5a^2$ ✓
5. $75 = ba^2$ ✓
6. $64 = 4c^2$ ✓
7. $800 = 2(ac)^2$ ✓
8. $-202 = (4c)^2 - 2b^3$ ✓

Top-right notebook page

6. $2(5x+3) - 2(x-4)$
   $10x + 6 - 2x + 8 = 8x + 14$ ✓
7. $3(x+5) + 2(x-3)$
   $3x + 15 + 2x - 6 = 5x + 9$ ✓

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

(inset worksheet)

A1 $a=3, b=2, c=5$	A2 $d=7, e=4, f=13$
Evaluate $3a + bc$ → 19 ✓	Evaluate $e(f-d)$ → 24 ✓
B1 $a=2, b=6, c=-3$	B2 $e=-1, f=4$
Evaluate $ab + 2c$ = 6 ✓	Evaluate $7(f-e)$ = 35 ✓
C1 $a=3, b=5, c=-2$	C2 $a=3, b=-4, c=-1$
Evaluate $a^2 - bc$, $9 - -10 = 19$ ✓	Evaluate $\frac{ab+bc-ac}{...}$ = -5 ✓
D1 $s=-2, t=11$	D2 $a=-7, d=4, n=21$

Top-right SKILLS CHECK

Work out $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$ ✓

Work out $\frac{3}{5} \div \frac{1}{2} = \frac{6}{5}$, $\frac{3}{5} \times \frac{2}{1} = 1\frac{1}{5}$ ✓

Question 3 Work out $11 \times 4.2 = 46.2$

Question 4 Work out $19.1 \times 5.6 = 105.96$ → 106.96, $10,596$

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 ? m/s = 25.2 km/h
2520 m/h, $.42$ m/m, 7 m/s

Question 10 Complete 9 m/s = ? km/h → 32.4 km/h
540 m/m, m/h, 32400

Question 11 Find 60% of £500
$10\% = 50$, $60\% = 300$ → £300

Question 12 Find 80% of £760
760, 152 → £608 ✓

Question 13 Solve $4x = 2x - 6$
$2x = -6$, $x = -3$ ✓

Question 14 Solve $4x + 4 = 3x - 1$
$1x + 4 = -1$, $x = -5$ ✓

Question 15 Make x the subject of the formula $y = ax^2$
$x = \sqrt{\frac{y}{a}}$

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 $5 + 2 \times 4 + 6$
$5 + 8 = 13$ → 19 ✓

Bottom-left notebook page

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

c/w Substitution 1st 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) $16 - 4 \times 3 = 16 - 12 = 4$ ✓
2. $x = 3$ and $y = -5$
   a) $2x + 3 = 6 + 3 = 9$ ✓
   b) $4y - 5 = -20 - 5 = -25$ ✓
   c) $8x + 2y = 24 - 10 = 14$ ✓
   d) $xy = 3 - 5 = -2$

3. a) b) c)
area = 2n, area = n^2, area = $5n + 4n = 7n$

Middle-bottom notebook

4. x^2 when $x = 4$ → 16 ✓
   y^2 when $y = 10$ → 100 ✓
   z^2 when $z = 0.6$ → 0.36 ✓
5. a) 162×18
   b) 81
   c) $3b + 27 = b^3$
   d) $3 + 3b = 39$
6. $c = 3$ and $d = 2$
   a) $4d + c^2 = 8 + 9 = 17$ ✓
   b) $4c^2 = 12^2 = 144$ ✓
   c) $3d^3 = 9^3 = 729$
   d) $5c^3 + 2d^3 = 15^3 + 4^3 = 3387$
   e) $10d^3 - bc = 20^3 - 18 = 7982$
   f) $2c^3 - 9 = b^3 - 9 = 207$
   g) $-5c + 2d^2 = -15 + 1b = 1$
   h) $(5d^2)^2 = 10^2 = 100$ ✓
   i) $(2c + d)^2 = 8^2 = b^4$
   j) $(5d - c)^2 + 1 = 7^2 + 1 = 49 + 1 = 50$
   k) $cd + (2c - d)^3 = 5 + b^4 = 69$
   l) $(4d - 2c)^2 - cd = 3b - 5 = 31$

(standard form work)
3. $1/13$ ✓
4. $12 - y$
5. $244 \div 4 = 61$
6. $2\frac{1}{7} - 1\frac{2}{5} = 1\frac{9}{35} \times \frac{26}{35}$
8. $\frac{3}{10} = \frac{x}{2} = \frac{b}{20} \times \frac{3}{5}$
9. $93 \cdot 93 = 93.9$ ✓

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

(right column)
$(3.2 \div 4) \times (10^5 \div 10)$
$0.8 \times 10^4 = 8 \times 10^3$
4. $(1.8 \times 10^7) \div (3 \times 10^3)$
   $(1.8 \div 3) \times (10^7 \div 10^3)$
   $= 0.6 \times 10^4 = 6 \times 10^3$
5. $(4.8 \times 10^6) \div (8 \times 10^3)$
   $(4.8 \div 8) \times (10^6 \div 10^3)$
   $0.6 \times 10^3 = 6 \times 10^2$
6. $(1.8 \times 10^{10}) \div (9 \times 10^4)$
   $(1.8 \div 9) \times (10^{10} \div 10^4)$
   $0.2 \times 10^6 = 2 \times 10^5$

Bottom-right SKILLS CHECK

Work out $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

Work out $\frac{3}{5} \div \frac{2}{...} = 5$ ✓

Question 5 Evaluate 4^4 → $4 \times 4 = 16$, $16 \times 16 = 256$ ✓

Question 6 Evaluate 3^2 → 9 ✓

Question 7 Expand $3(1 + 3x)$ → $3 + 9x$ ✓

Question 8 Expand $6x(7 - 5x)$ → $42x - 30x^2$ ✓

Question 9 Complete ? m/min = 28.8 km/...
$28,800$ m/h → $1,728,000$ m/min

Question 10 Complete 25,200 m/h, 1,512,000 m/min, ? m/s = 25.2 km/h
7 → 9072000 m/s

Question 11 Find 40% of £460 → £184 ✓

Question 12 Find 75% of £240 → £204, £180

Question 13 Solve $6x = 4x + 8$ → $x = 4$ ✓

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 $\frac{y}{x} = abc$
$x = yabc$, $x = \frac{y}{abc}$

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 $5 \times (3 + 3) \times 4$
$5 \times 6 \times 4 = 30 \times 4 = 120$ ✓

Question 20 Work out $4 + 2 \times 2 - 3$
$4 + 4 - 3 = 8 - 3 = 5$ ✓

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

1. $58000 \times 10^{-5} = 5.8 \times 10^{-1}$ ✓
2. $18 \times 10^4 = 1.8 \times 10^5$ ✓
3. $5400 \times 10^{-4} = 5.4 \times 10^7$ ✓
4. $22 \times 10^{-1} = 2.2 \times 10^0$ ✓
5. $0.4 \times 10^5 = 4 \times 10^4$ ✓

O: standard from consolidation questions.

1. $861000 = 8.61 \times 10^5$ ✓
2. $6010 = 6.01 \times 10^3$ ✓
3. $10900000 = 1.09 \times 10^7$ ✓
4. $32200000 = 3.22 \times 10^7$ ✓
5. $64800 = 6.48 \times 10^4$ ✓
6. $3540000 = 3.54 \times 10^6$ ✓
7. $15800 = 1.58 \times 10^4$ ✓
8. $76000 = 7.6 \times 10^4$ ✓
9. $213000 = 2.13 \times 10^5$ ✓
10. $1520000 = 1.52 \times 10^6$ ✓
11. $6380 = 6.38 \times 10^3$ ✓
12. $27100 = 2.71 \times 10^4$ ✓
13. $839000 = 8.39 \times 10^5$ ✓

multiplying in SF
$(2 \times 10^5) \times (8 \times 10^2)$
$= 2 \times 8 \times 10^6 \times 10^2$
$= 16 \times 10^9$
$= 1.6 \times 10^{10}$ ✓

when working in SF always give answer in SF

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

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

c) 4gw to waHs
1gw = 1000000000 w
4gw = 4000000000 w

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

O: converting to correct standard form.

1. $400 \times 10^{-5} = 4 \times 10^{-3}$ ✓
2. $350 \times 10^5 = 3.5 \times 10^7$ ✓
3. $0.0027 \times 10^6 = 2.7 \times 10^3$ ✓
4. $29 \times 10^3 = 2.9 \times 10^4$ ✓
5. $250000 \times 10^{-4} = 2.5 \times 10^5$ ✓
6. $560 \times 10^6 = 5.6 \times 10^8$ ✓

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 consise 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. $3000 = 3 \times 10^3$ ✓

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: $2^3 \times 2^7 = 2^{10}$
$a^b \times a^c = a^{b+c}$

a) $m^5 \times m^2 = m^8$
b) $n^5 \times n = n^6$
c) $w \times w^3 = w^4$
d) $g^{-2} \times g^7 = g^5$

e) $p \times p^{-9} = p^{-1}$
f) $x^{1/2} \times x^{1/2} = x^1$
g) $u \times u^{1/2} = u^{1.5}$

O: To be able to apply the laws of indices

a) $b^{-2} \div b^5 = \dfrac{5^7}{b^3} = b^{-7} \div b^3 = b^{-10}$ ✓
b) $3^{-4} \times 3^{-5} \times 3^3 = 3^{12}$ ✗ 3^{-6}
c) $\dfrac{x^4}{x^5 \times x} = \dfrac{x^4}{x^6} = x^{-2}$ ✓
d) $\dfrac{3^{-3}}{(3^{-4})^5} = \dfrac{3^{-3}}{3^{20}} = 3^{-17}$ ✓

The zero exponent – any base number or value to the power of 0 equals to 1.
$a^0 = 1$

O: To be able to understand the laws of indices.

2nd law of indices: when dividing 2 values with the same base value we subtract the indices.
eg: $7^5 \div 7^2 = 7^3$
$a^b \div a^c = a^{b-c}$

eg: $\dfrac{2^3}{2^3} = \dfrac{8}{8} = 1$
$\dfrac{2^3}{2^3} = 2^0$
equal $1 = 2^0$

negative indices
$\dfrac{2}{2 \times 2} = \dfrac{2}{4} = \dfrac{1}{2}$ ✓ $\dfrac{2^1}{2^3} = 2^{-2}$
$\dfrac{2}{2^2} = 2^{-1}$ ✓ $5^{-3} = \dfrac{1}{5^3} = \dfrac{1}{125}$ ✓

a) $7^6 \div 7^0 = 7^6$
b) $2^5 \div 2^5 = 2^0$
c) $7^4 \div 7^6 = 7^{-6}$
d) $5^9 \div 5^3 = 5^6$

e) $3^9 \div 3^8 = 3^1$
f) $3^{-2} \div 3^4 = 3^{-6}$
g) $b^3 \div b^{-1} = b^4$

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d) $\left(\dfrac{2x^4y^2}{3xy}\right)^3 \left(\dfrac{2x^2}{3y^4}\right)\left(\dfrac{2x}{3y^2}\right)$

$2^3 = 8 \quad 3^3 = 27 \quad = \dfrac{8x^9}{27y^6}$ ✓
$3 \times 3 = 9 \quad 3 \times 2 = 6$

Classwork   9th September 2021
Objective: To consolidate rules of indices

Exercise 2E (B+D)

1. B. $(6^3)^3$ $6^3 \times b^3 \times b^3 \times b^3 \times b^3 = b^{15}$
   D. $(d^2)^8$ $d^2 \times d^2 \times d^2 \times d^2 \times d^2 \times d^2 = d^{16}$
2. B. $(3g^2)^4$ $3g^2 \times 3g^2 \times 3g^2 \times 3g^2 = 81g^8$
   D. $\left(\dfrac{m^4}{2}\right)$ $m^4 \div 2 = m^2 \times m^2 \times m^2 = m^6$

Exercise 2SA

1. a. $7^0 = 1$ ✓   c. $8(-2)...(-2)^3$
   b. $8^{-1} = -\dfrac{1}{8}$
   c. $3^{-1} = -\dfrac{1}{3}$ g. $10^{-4} = -10,000 \times \dfrac{1}{10,000}$
   d. $4^0 = 1$ ✓   I. $(-3)^{-2} = 9$

E. $(0.25)^{-2} = \left(\dfrac{1}{4}\right)^{-2} = 1 \div \left(\dfrac{1}{4}\right)^2 = 1 \div \dfrac{1}{16}$
$1 \times \dfrac{16}{1} = \dfrac{16}{1} = 16$ ✓

f. $\left(\dfrac{2}{5}\right)^{-3} = 1 \div \left(\dfrac{2}{5}\right)^3 = 1 \div \left(\dfrac{8}{125}\right)$
$1 \times \dfrac{125}{8} = \dfrac{125}{8} = 19\dfrac{3}{8}$ ✓

g. $\left(\dfrac{5}{3}\right)^0 = 1$ ✓
h. $\left(\dfrac{9}{3}\right)^{-1} = 1 \div \left(\dfrac{9}{3}\right)^1 = 1 \div \dfrac{9}{5}$
$1 \times \dfrac{5}{9} = \dfrac{5}{9}$
I. $\left(1\dfrac{2}{5}\right)^{-2}$ $1 \times 5 = 5 + 2 = \dfrac{7}{5}$
$\left(\dfrac{7}{5}\right)^{-2} = 1 \div \left(\dfrac{7}{5}\right)^2 = 1 \div \dfrac{49}{25}$
$1 \times \dfrac{25}{49} = \dfrac{25}{49}$ ✓

30th September 2021

Unit 1 consolidation

1.
a. $3^5 \times 3^4 = 3^9$ b. $5^2 \times 5^5 = 5^7$
2. a. $2^3 \times 2^3 = 2^6$ b. $7^3 \times 7 = 7^4$
e. $5^3 \times 5^3 \times 5^4 = 5^9$ ✓   f. $10^4 \times 10 \times 10^3 = 10^8$ ✓
3. a. $6^5 \div 6^2 = 6^3$ ✓   b. $5^7 \div 5^5 = 5^2$ ✓
$2^7 \div 2^3 = 2^4$ ✓   d. $7^3 \div 7 = 7^2$ ✓

6.
a. 4500 mm = 4.5 m ✓
b. 80,000 nm = 0.008 mm   0.08 mm
c. 3500 km = 35 Mm ✓
7. a. 460 MHz   c. 7w
   b. 0.53 mg   d. 270000000 M/
a. 4200 KHz
8.
b. 680 nm = 0.660 μM ✓

9.
a. $4^2 \div 4^2 = \dfrac{4^2}{4^2} = 4^0$ ✓ = 1

She is wrong because she multiplied the powers instead of adding them together. ✓

b. $4^2 \div 4^2 = 4^2 - 4^2 = 4^0$ ✓
c. $4^0 = 1$ ✓

He is wrong because he divided the powers instead of taking them away. ✓

d. $5^2 \div 5^2 = \dfrac{5^2}{5^2} = 5^0$ $5^2 \div 5^2 = 2-2 = 5^0$
11) $5^0 = 3 \neq 1$ ✓

e. When you write a number to the power of 0, the answer is 1. ✓

$2^4 \times 2^3 \div 2^5 = 2^2 \div 2^5 = 2^{-3}$ 2^2
$10^7 \times 10^2 \div 10^4 = 10^5 \div 10^4 = 10^1$ 10^5
$8^5 = 8^2 \times 8^3 = 8^6 \times 8^3 = 8^9$ 8^6

10.
ai) $4^3 \div 4^5 = 4^{-2}$ ✓
ii) $4^3 \div 4^5 = \dfrac{4^3}{4^5} = \dfrac{4 \times 4 \times 4}{4 \times 4 \times 4 \times 4 \times 4} = \dfrac{1}{4^2}$ ✓

$5^3 \times 5^3 \times 5^4 = 5^9$ ✓   f. $10^4 \times 10 \times 10^3 = 10^8$ ✓
a. 4200 KHz
$6^5 \div 6^2 = 6^3$ ✓   b. $5^7 \div 5^5 = 5^2$ ✓
b. 680 nm = 0.660 μM ✓
$2^7 \div 2^3 = 2^4$ ✓   d. $7^3 \div 7 = 7^2$ ✓

9.
a. $4^2 \div 4^2 = \dfrac{4^2}{4^2} = 4^0$ ✓ = 1

She is wrong because she multiplied the powers instead of adding them together. ✓

b. $4^2 \div 4^2 = 4^2 - 4^2 = 4^0$ ✓

c. $4^0 = 1$ ✓

He is wrong because he divided the powers instead of taking them away. ✓

d. $5^2 \div 5^2 = \dfrac{5^2}{5^2} = 5^0$ $5^2 \div 5^2 = 2-2 = 5^0$
11) $5^0 = 3 \neq 1$ ✓

e. When you write a number to the power of 0, the answer is 1. ✓

$2^4 \times 2^3 \div 2^5 = 2^2 \div 2^5 = 2^{-3}$ 2^2
$10^7 \times 10^2 \div 10^4 = 10^5 \div 10^4 = 10^1$ 10^5
$8^5 = 8^2 \times 8^3 = 8^6 \times 8^3 = 8^9$ 8^6

10.
ai) $4^3 \div 4^5 = 4^{-2}$ ✓
ii) $4^3 \div 4^5 = \dfrac{4^3}{4^5} = \dfrac{4 \times 4 \times 4}{4 \times 4 \times 4 \times 4 \times 4} = \dfrac{1}{4^2}$ ✓
iii) $4^{-2} = \dfrac{1}{4^2}$ ✓
e. $3^5 \div 3^2 \div 3^2 = 3^1$ ✓
b.
i. $10^4 \div 10^7 = 10^{-3}$ ✓
ii. $10^4 \div 10^7 = \dfrac{10 \times 10 \times 10 \times 10}{10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10} = \dfrac{1}{10^3}$
0.25 Tm = 250,000,000 km

Top-left notebook page

Classwork   3rd Oct...
Objective: to be able to draw two-way tables

Exercise 6f

1. Most women asked which typing group.
   12 said plain, 7 were men, 6 women
   chose salt + vinegar, 14 men + 12 women
   said cheese.

	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 er

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, 50, 38, 44, 53, 41, 39, 45, 48, 55

working:
Stem	Leaf
3	5,8,9
4	4,1,85,8
5	3,8

Median: 5th 6th
44 45
= 44.5

Stem and leaf (first column continued)

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

Median: 15÷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
Key: 13|5 = 135

ordered:
Stem	leaf
13	5,9
14	0,0,2,4,4,5,8,9
15	3,8
16	0

median: 13÷2 = 6.5
= 144 ✓
mode: there are 2 modes, 140 and 144
range: 160 - 135 = 25 ✓

Printed worksheet (centre top)

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: 1|4 means 14 years old
1 | 4 5 8
2 | 1 3 6 9 9
3 | 0 5 7
4 | 4

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? 7/19 = 7/19 ✓

Key: 0|9 means 9cm
0 | 9
1 | 2 4 4 4 8 9
2 | 0 4 5 8
3 | 2 4 9
4 | 1 6 8 8
5 | 3

Question 5: The following stem and leaf diagram shows times taken for 15 people to complete a jigsaw.
Key: 3|1 means 31 minutes
(a) Write down the modal time taken. 57 minutes ✓
(b) Write down the median time taken. 15÷2 = 7.5 = 57 minutes ✓
(c) Write down the range of times taken. 75 - 31 = 44 ✓
(d) What fraction of the people took over one hour? = 4/15 ✓

3 | 1 9
4 | 0 3 6
5 | 1 7 7 8 9
6 | 0 3 4 6
7 | 5

75
-31
44

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

Top-right indices page

33. $(6c)^2 = 36c^2$ ✓
2. $3a^2 \times a^4 = 3a^6$ ✓
34. $(5b)^3 = 125b^3$ ✓
3. $c^3 \times 7c^3 = 7c^6$ ✓
35. $(5a^2)^2 = 25a^4$ ✓
4. $b^3 \times 4b^2 = 4b^5$ ✓
36. $(4m^2)^2 = 16m^4$ ✓
5. $5a^2 \times 4a^3 = 20a^5$ ✓
37. $(2n^2)^3 = 8n^6$ ✓
6. $6b^2 \times 4b^3 = 24b^5$ ✓
38. $(5p)^2 = 25p^6$ ✓
7. $5b^4 \times 3b^6 = 15b^{10}$ ✓
39. $(10q^3)^3 = 1000q^9$ ✓
8. $2c^5 \times 4c^7 = 8c^{12}$ ✓
40. $(10a^8)^3 = 1000a^6$ ✓
9. $3t^2 \times 4t^3 = 12t^5$ ✓
41. $(7d^8)^2 = 49d^{16}$ ✓
10. $7a^3 \times 4a^7 = 28a^{10}$ ✓
42. $(9q^4)^2 = 81q^8$ ✓
11. $5t^2 \times 7t^5 = 35t^7$ ✓
43. $(8t^5)^3 = 512t^{15}$ ✓
12. $8y^4 \times 3y^4 = 24y^8$ ✓
13. $8c^4 \times 9c^8 = 72c^{14}$ ✓
18. $6c^5 = 2c^3 = 3c^2$ ✓
19. $8b^6 = 4b^3 = 2b^3$ ✓
20. $15a^7 = 3a^3 = 5a^4$ ✓
21. $36b^8 = 4b^3 = 9b^5$ ✓
22. $9b^4 = 3b = 3b^3$ ✓

Far-right algebra page

$a = -5$ $b = 3$ $c = -4$
1. $b^2 = 9$ ✓
2. $3b^2 = 27$ ✓
3. $-45 = ab^2$ ✓
4. $125 = \text{...} 5a^2$ ✓
5. $75 = ba^2$ ✓
6. $64 = 4c^2$ ✓
7. $800 = 2(ac)^2$ ✓
8. $88 = (4c)^2 - 2b^3$ ✓

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

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

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

A1 $a=3, b=2, c=5$ Evaluate $3a+bc$	A2 $d=7, e=4, f=13$ Evaluate $e(f-d)$
19 ✓	24 ✓
B1 $a=2, b=6, c=-3$ Evaluate $ab+2c$	B2 $e=-1, f=4$ Evaluate $7(f-e)$
= 6 ✓	35 ✓
C1 $a=-3, b=5, c=-2$ Evaluate a^2-bc	C2 $a=3, b=-4, c=-1$ Evaluate $ab+bc-ac$
= -10 ✓	-8 + 3 = -5 ✓
D1 Given that ...	D2 Given that ...

Bottom-left page

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

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

$10^4 \div 10^7 = 10^{-3}$
$10^4 \div 10^7 = \frac{10^4}{10^7} = \frac{10 \times 10 \times 10 \times 10}{10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10}$
$= \frac{1}{10^3}$ ✓

CLW   Substitution   1st 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) $16 - 4 \times 3 = 16 - 12 = 4$ ✓

2. $x = 3$ and $y = -5$
   a) $2x + 3 = 6 + 3 = 9$ ✓
   b) $4y - 5 = -20 - 5 = -25$ ✓
   c) $8x + 2y = 24 - 10 = 14$ ✓
   d) $xy = 3 \times -5 = -15$

3. a)   b)
   c)

   $2n$ n

Bottom-centre-left substitution

4. x^2 when $x = 4 = 16$ ✓
   y^2 when $y = 10 = 100$ ✓
   z^2 when $z = 0.6 = 0.36$ ✓

5. a) 162×18
   b) 81 ✓
   c) $3b + 27 = b^3$ ✓
   d) $3 + 3b = 39$ ✓

   b. $c = 3$ and $d = 2$
   a) $4d + c^2 = 8 + 9 = 17$ ✓
   b) $4c^2 = 12^2 = 144$
   c) $3d^3 = 9^3 = 729$
   d) $5c^3 + 2d^3 = 15^3 + 4^3 = 3387$
   e) $10d^3 - bc = 20^3 - 18 = 7982$
   f) $2c^3 - 9 = b^3 - 9 = 207$
   g) $-5c + 2d^2 = -15 + 16 = 1$
   h) $(5d^2)^2 = 10^2 = 100$
   i) $(2c+d)^2 = 8^2 = 64$ ✓
   j) $(5d-c)^2 + 1 = 7^2 + 1 = 49 + 1 = 50$ ✓
   k) $cd + (2c-d)^3 = 5 + 64 = 69$
   l) $(4d-2c)^2 - cd = 36 - 5 = 31$

Bottom-centre fabric/standard form

2. For each 7mm of coloured fabric Paul uses to make his curtains, he also uses 2cm of white fabric. Express the amount of white fabric to coloured fabric as a ratio in its simplest form.
   2cm : 7mm
   20mm : 7mm ✓

3. $1|13$ ✓
4. $12 - y$ ✓
5. $244 \div 4$ *
   61

6. $2\frac{1}{7} - 1\frac{2}{5} = 1\frac{9}{35} \times \frac{26}{35}$

8. $\frac{3}{10} = \frac{x}{2} = \frac{6}{20} \times \frac{3}{5}$

8. $f(8f+7) = 8f^2 + 7f$ ✓
9. $93 \cdot 93$
   93.9 ✓

CLW   7th October 21
Standard form consolidation

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

0.9×10^4
$= 9 \times 10^3$

3. $(3.2 \times 10^5) \div (4 \times 10)$
   $(3.2 \div 4) \times (10^5 \div 10)$
   0.8×10^4
   $= 8 \times 10^3$ ✓

4. $(1.8 \times 10^7) \div (3 \times 10^3)$
   $(1.8 \div 3) \times (10^7 \div 10^3)$
   $= 0.6 \times 10^4$
   $= 6 \times 10^3$ ✓

5. $(4.8 \times 10^8) \div (8 \times 10^3)$
   $(4.8 \div 8) \times (10^8 \div 10^3)$
   0.6×10^5
   $= 6 \times 10^2$ ✓

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

Bottom-right fractions exam questions

$\frac{3}{4} + \frac{1}{5}$
$\frac{8}{20} + \frac{5}{20} = \frac{13}{20}$ ✓
$\frac{1}{2} + \frac{5 \times 2}{6 \times 2}$
$\frac{6}{12} + \frac{10}{12} = \frac{11}{12}$ ✓

$\frac{10}{15} - \frac{3}{15} = \frac{7}{15}$
$\frac{1}{2} + \frac{10}{12} = \frac{11}{12}$

Q2. Work out
$\frac{2\frac{4}{5}}{\frac{3}{5}} = \frac{1 \times 3}{5 \times 3}$ $= \frac{7}{12}$ ✓
$\frac{20}{24} - \frac{6}{24} = \frac{14}{24}$

Q3. Work out
a) $\frac{5}{8} \times \frac{3}{4} = \frac{15}{32}$ ✓
b) $\frac{2}{3} \times \frac{3}{4} = \frac{6}{12}$ ✓
Give your answer as a fraction in its simplest form. $= \frac{1}{2}$ ✓

Q4. Work out
a) $\frac{12 \div \frac{1}{2}}{1} = 24$
   $\frac{12}{1} \times \frac{2}{1} = 24$ ✓
b) $\frac{3}{4} \div \frac{1}{2} = 1\frac{2}{4}$
   $\frac{3}{4} \times \frac{2}{1} = \frac{6}{4}$ ✓

Q5. Work out $2\frac{1}{7} + 1\frac{1}{4}$
$\frac{15}{7} + \frac{5}{4} = \frac{60}{28} + \frac{35}{28} = \frac{95}{28}$
$= 3\frac{9}{28}$ ✓

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.
$\frac{6}{5} \div \frac{3}{4} = \frac{6}{5} \times \frac{4}{3} = \frac{8}{5}$
$= 1\frac{3}{5}$ ✓

Q9. Work out $4\frac{2}{3} + 5\frac{1}{4} + 7\frac{4}{5}$
$\frac{14}{3} + \frac{21}{4} + \frac{39}{5}$
$\frac{280}{60} + \frac{735}{60} + \frac{468}{60}$
$= \frac{1483}{60}$

280
735
468
1483

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

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

Calculate
1. $(6 \times 10^{-3}) \div (4 \times 10^7)$ 2. $(1.8 \times 10^2) + (4 \times 10^{-8})$ 3. $(2.8 \times 10^{-5}) \div (1.2 \times 10^{-14})$

1. 2×10^6 1. 5×10^4 1. $1.5 \times 10^4 \times 1.5 \times 10^{-10}$
2. 3×10^8 2. 4×10^{-3} 2. $4.5 \times 10^{-7} \times 4.5 \times 10^{9}$
3. 4×10^5 3. 4×10^{-9} 3. 2.3×10^{-19}

8th Nov — trigonometry: selecting methods

Right-angled?

Yes — No

| Involves **3 sides**? | Involves **2 sides** and **1 angle**? | Involves **2 sides** and **2 angles**? | Involves **3 sides** and **1 angle**? |

Pythagoras' Theorem $S^O_H\ C^A_H\ T^O_A$ **Sine Rule**   **Cosine Rule**

Sine Rule   **Cosine Rule**

---

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) $\dfrac{a}{\sin 73} = \dfrac{5.2}{\sin 44} = \dfrac{c}{\sin 63}$

$x = \dfrac{5.2 \times \sin 73}{\sin 44}$ $x = 7.16\text{ cm}$ ✓

(b) $\dfrac{x}{\sin 53} = \dfrac{c}{\sin 8} = \dfrac{6.4}{\sin 66}$

$x = \dfrac{6.4 \times \sin 53}{\sin 66} = 5.59\text{ cm}$

(d) $\dfrac{x}{\sin 47} = \dfrac{3.9}{\sin 100} = \dfrac{c}{\sin 33}$

$x = \dfrac{3.9 \times \sin 47}{\sin 100}$ $x = 2.90\text{ cm}$ ✓

(e) $\dfrac{x}{\sin 63} = \dfrac{4.5}{\sin 68} = \dfrac{c}{\sin 49}$

$x = \dfrac{4.5 \times \sin 63}{\sin 49} = 4.32\text{ cm}$ ✓

Rationalising Surds inc Brackets

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

Question 2 Express $\dfrac{2}{\sqrt{3}-1}$

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

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

Question 5 Show that $\dfrac{14}{3-\sqrt{2}}$ can be written in the form $a + b\sqrt{2}$.

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

Question 9 Write $\dfrac{4+2\sqrt{8}}{\sqrt{5}-1}$ In the form $\dfrac{a\sqrt{b}+c}{2}$

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

Question 11 Simplify fully $\dfrac{24-\sqrt{300}}{4\sqrt{3}-5}$

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

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Objective: To be able to solve equations involving indices.

eg. Solve $4^{x-3} = 8^{x-1}$
$(2^2)^{x-3} = (2^3)^{x-1}$
$2^{2x-6} = 2^{3x-3}$
$2x-6 = 3x-3$
$-6 = x-3$
$-3 = x$

Solve $27^{-4x} = 81^{2+x}$
$(3^3)^{-4x} = (3^4)^{2+x}$
$3^{-12x} = 3^{8+x}$
$-12x = 8+x$
$0 = 8 + 16x$

2. 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) $16^{\frac{x}{2}} = 16^{x-3}$ d) $27^{-t} = 8^t$
$\frac{x}{2} = x-3$ ...