

Week 3

This week in a nutshell:

This week is about changing the presentation of a mathematical object; your students need to be aware that changing how we display or structure information should not alter the intrinsic properties.

Question 1: Powers and Roots

Question 2: Prime factor decomposition

Question 3: Factorising

Question 4: Substitution

Question 5: Frequency tables

The questions deal with how to write the same information in various ways. It is worth talking to your students about why this flexibility is important, and how it generates a greater number of opportunities when applying these skills to solve larger problems.

This week's ideas for class discussion include:

Question 1: **Powers and roots**

- The powers of 2 are used in computer science; can you suggest any examples? Can you explain why this is the case?

Question 2: **Prime factor decomposition**

- Why might it be useful to use index notation for a product of prime factors?

Question 3: **Factorising**

- Does factorising have to be done in one step with the highest common factor, or can smaller factors be taken one at a time?

Question 4: **Substitution**

- Can you think of ways to make negative numbers easier to deal with when substituting into expressions?
- When do we not use brackets but know they are implied? (Day 5, Q4b)

Question 5: **Frequency tables**

- Why do we have to be careful when interpreting averages from tables? (Day 5, Q5)

Week 3: Day 1

1) Write down the missing index number.

a) $7 \times 7 \times 7 = 7^{\square}$

b) $4 \times 4 \times 4 \times 4 \times 4 = 4^{\square}$

2) Write as a product of prime factors:

a) **18**

b) **15**

3) a) Factorise:

$$3x + 15$$

b) Factorise:

$$2y - 12$$

4) Given that $x = 3$ and $y = 8$, evaluate:

a) $7 + y$

b) $2x + 5$

5) Which numbers replace a, b and c?

Colour	Tally	Frequency
Blue	///	a
Red	//// //	b
Green	//// ////	c

Week 3: Day 1 Answers

1) Write down the missing index number.

a) $7 \times 7 \times 7 = 7^3$

b) $4 \times 4 \times 4 \times 4 \times 4 = 4^5$

2) Write as a product of prime factors:

a) $18 = 2 \times 3 \times 3$

b) $15 = 3 \times 5$

3) Factorise:

a) $3x + 15 = 3(x + 5)$

b) $2y - 12 = 2(y - 6)$

4) Given that $x = 3$ and $y = 8$, evaluate:

a) $7 + y = 15$

b) $2x + 5 = 11$

5) Which numbers replace a, b and c? $a = 3, b = 7, c = 10$

Colour	Tally	Frequency
Blue	///	a
Red	//// //	b
Green	//// ////	c

Week 3: Day 2

1) a) Evaluate:
 5^2

b) Evaluate:
 3^3

2) Write as a product of prime factors:

a) **24**

b) **36**

3) a) Factorise:
 $6a + 21$

b) Factorise:
 $4d - 14$

4) Given that $x = 9$ and $y = -2$, evaluate:

a) **$12 + \frac{x}{3}$**

b) **$2x + y$**

5) Hamish is investigating the eye colour of people in his class. How many people did he survey in total?

Eye Colour	Tally	Frequency
Green		12
Blue		10
Brown		7
Grey		4

Week 3: Day 2 Answers

1) Evaluate

a) $5^2 = 25$

b) $3^3 = 27$

2) Write as a product of prime factors:

a) $24 = 2 \times 2 \times 2 \times 3$

b) $36 = 2 \times 2 \times 3 \times 3$

3) a) Factorise:

$$6a + 21 = 3(2a + 7)$$

b) Factorise:

$$4d - 14 = 2(2d - 7)$$

4) Given that $x = 9$ and $y = -2$, evaluate:

a) $12 + \frac{x}{3} = 15$

b) $2x + y = 16$

5) Hamish is investigating the eye colour of people in his class. How many people did he survey in total? **33**

Eye Colour	Tally	Frequency
Green		12
Blue		10
Brown		7
Grey		4

Week 3: Day 3

1) a) If $2^n = 32$, find n

b) What is the positive square root of 36?

2) Write as a product of prime factors:

a) 72

b) 42

3) a) Factorise:

$$2 - 4x + 6y$$

b) Factorise:

$$5g^2 + 10g$$

4) Given that $x = 0.5$ and $y = -3$, evaluate:

a) $2xy$

b) $2x + y$

5) The following frequency table gives information on the number of siblings students in Class 7b have. Write down the mode.

Number of siblings	Frequency
0	2
1	6
2	4
3	6
4	1

Week 3: Day 3 Answers

1) a) If $2^n = 32$, find n $n = 5$

b) What is the positive square root of 36? 6

2) Write as a product of prime factors:

a) $72 = 2 \times 2 \times 2 \times 3 \times 3$

b) $42 = 2 \times 3 \times 7$

3) a) Factorise:

$$2 - 4x + 6y$$

$$= 2(1 - 2x + 3y)$$

b) Factorise:

$$5g^2 + 10g$$

$$= 5g(g + 2)$$

4) Given that $x = 0.5$ and $y = -3$, evaluate:

a) $2xy = -3$

b) $2x + y = -2$

5) The following frequency table gives information on the number of siblings students in Class 7b have. Write down the mode? $1 \text{ and } 3$

Number of siblings	Frequency
0	2
1	6
2	4
3	6
4	1

Week 3: Day 4

1) a) If $4^n = 64$, find n

b) What is the **positive square root of 81**?

2) Write as a product of prime factors using index notation:

a) 108

b) 32

3) a) Factorise:

$$xy + 2y$$

b) Factorise:

$$3x^2y + xy$$

4) Given that $x = -7$ and $y = 4$, evaluate:

a) $x^2 - y$

b) $x(y - 2)$

5) Anissa researches the number of tracks on newly released albums on Spotify. What is the range?

Number of tracks	Frequency
10	27
11	32
12	21
13	24
14	19

Week 3: Day 4 Answers

1) a) If $4^n = 64$, find n

$n = 3$

b) What is the positive square root of 81? 9

2) Write as a product of prime factors using index notation:

a) $108 = 2^2 \times 3^3$

b) $32 = 2^5$

3) a) Factorise:

$$\begin{aligned} xy + 2y \\ = y(x + 2) \end{aligned}$$

b) Factorise:

$$\begin{aligned} 3x^2y + xy \\ = xy(3x + 1) \end{aligned}$$

4) Given that $x = -7$ and $y = 4$, evaluate:

a) $x^2 - y = 45$

b) $x(y - 2) = -14$

5) Anissa researches the number of tracks on newly released albums on Spotify. What is the range? 4

Number of tracks	Frequency
10	27
11	32
12	21
13	24
14	19

Week 3: Day 5

1) a) Evaluate

$$\sqrt[3]{(125)}$$

b) Evaluate

$$\sqrt{(225)}$$

2) Write as a product of prime factors using index notation:

a) **144**

b) **76**

3) a) Factorise:

$$6ab + 8bc$$

b) Factorise:

$$9x^2y + 12xy^2 - 3xy$$

4) Given that $x = -5$ and $y = 2$, evaluate:

a) $2y^2 - 3x$

b) $\frac{25 - x}{y}$

5) The frequency table below shows how many school dinners a group of students had over a week. What is the mean number of school dinners eaten rounded to 1 d.p?

Number of school dinners	Frequency	
0	7	
1	6	
2	5	
3	5	
4	3	
5	2	

Week 3: Day 5 Answers

1) Evaluate

a) $\sqrt[3]{(125)} = 5$

b) $\sqrt{(225)} = 15, -15$

2) Write as a product of prime factors using index notation:

a) $144 = 2^4 \times 3^2$

b) $76 = 2^2 \times 19$

3) Factorise:

a) $6ab + 8bc$
 $= 2b(3a + 4c)$

b) $9x^2y + 12xy^2 - 3xy$
 $= 3xy(3x + 4y - 1)$

4) Given that $x = -5$ and $y = 2$, evaluate:

a) $2y^2 - 3x = 23$

b) $\frac{25 - x}{y} = 15$

5) The frequency table below shows how many school dinners a group of students had over a week. What is the mean number of school dinners eaten rounded to 1 d.p? **1.9**

Number of school dinners	Frequency	
0	7	
1	6	
2	5	
3	5	
4	3	
5	2	

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