Exercise walk-through

1.4
Ratio, rate, proportion and exponentials

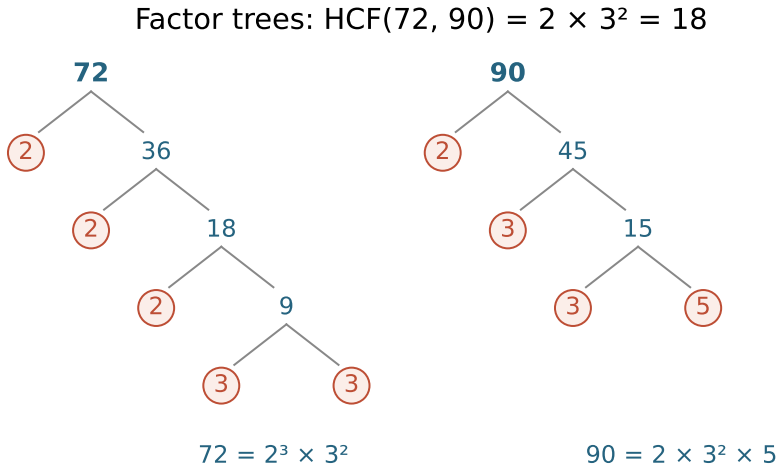
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Ordering and the four operations

- An **integer** is a whole number: positive, negative or zero.
- Order integers, decimals and fractions on a **number line** using the symbols $=$, $\neq$, $<$ and $>$.
- To compare different forms, change them to the same form first: $\frac{3}{5} = 0.6$, so $\frac{3}{5} < 0.62$.
- To add or subtract fractions, use a common **denominator**.

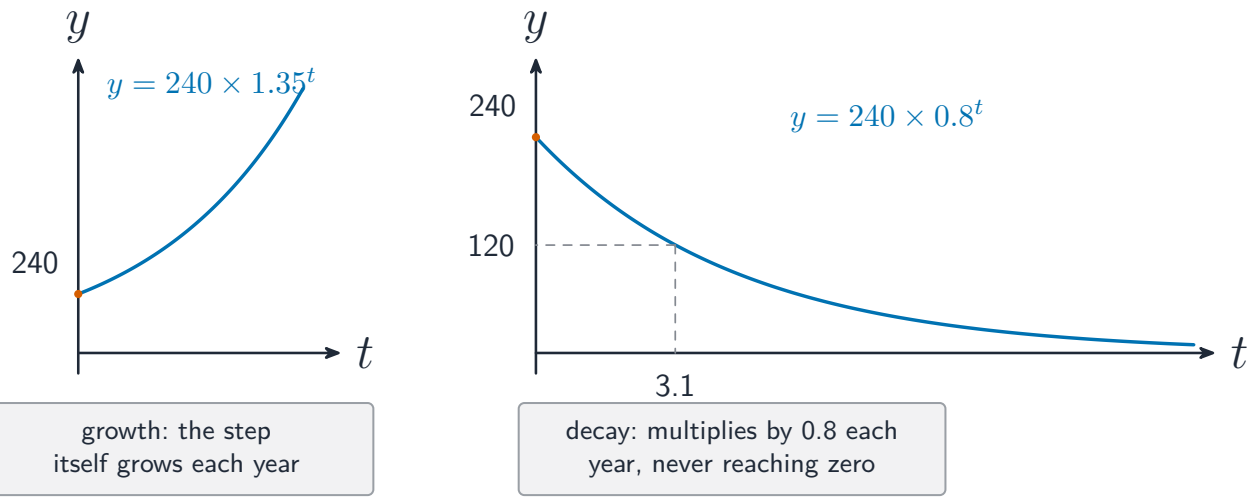
$$2\tfrac{1}{3} + 1\tfrac{1}{4} = \tfrac{7}{3} + \tfrac{5}{4} = \tfrac{28}{12} + \tfrac{15}{12} = \tfrac{43}{12} = 3\tfrac{7}{12}$$

Figure: Ordering and the four operations



- $72 = 2^3 \times 3^2$ and $90 = 2 \times 3^2 \times 5$
- $\text{HCF} = 2 \times 3^2 = 18$

Figure: Exponential growth and decay



- Growth: $y = 240 \times 1.35^t$ rises ever faster
- Decay: $y = 240 \times 0.8^t$ falls towards zero

Exercises 2.1·2.2

2.1 Simplify the ratio $45 : 60 : 75$. Write $8 : 20$ in the form $1 : n$. [2]

$45 : 60 : 75$ $8 : 20$

2.2 Use the pay slip. Overtime is paid at 1.5 times the normal rate. Find the total pay for the week. [2]

	hours	rate
normal	38	¥28 per hour
overtime	6	$1.5\times$ normal

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2.1

- **3 : 4 : 5**
- **1 : 2.5**

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	hours	rate
normal	38	¥28 per hour
overtime	6	1.5× normal

2.2

- $38 \times 28 + 6 \times 42$
- **¥1316**

Exercises 2.3·3.1

2.3 5 printers take 12 hours to print a book order. How long do 8 printers take, working at the same rate? [2]

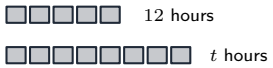


3.1 y is directly proportional to x^2. Use the table to find y when $x = 7$, and x when $y = 200$ $(x > 0)$. [3]

x	5	7	
y	50		200

Exercises 2.3·3.1

2.3 5 printers take 12 hours to print a book order. How long do 8 printers take, working at the same rate? [2]



2.3

- $5 \times 12 = 60$ printer-hours
- $60 \div 8 = \mathbf{7.5}$ hours

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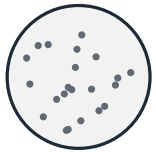
3.1

- $y = kx^2$, $50 = 25k$, $k = 2$
- $y = 2 \times 49 = \mathbf{98}$
- $x^2 = 100$, $x = \mathbf{10}$

Exercise 3.2 (a)

3.2 A colony of bacteria has 400 cells at the start. The number grows by 15% every hour.

(a) Write down a formula for the number of cells N after t hours. [2]



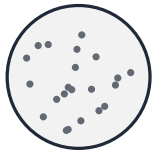
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400 cells at the start
+15% every hour

(a) $N = 400 \times 1.15^t$

Exercise 3.2 (b)

3.2 A colony of bacteria has 400 cells at the start. The number grows by 15% every hour.

(b) Find the number of cells after 6 hours. [3]

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(b) Find the number of cells after 6 hours. [3]

(b) $400 \times 1.15^6 = 925.2$; **925** cells

Exercise 3.2 (c)

3.2 A colony of bacteria has 400 cells at the start. The number grows by 15% every hour.

(c) After 6 hours, a medicine makes the number fall by 30% every hour. Find the number of cells after 3 hours of medicine, and write it as a percentage of the starting number. [4]

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(c) $925.2 \times 0.7^3 = \mathbf{317}$ cells; $317.3 \div 400 \times 100 = \mathbf{79.3}\%$

Exercise 3.2 (d)

3.2 A colony of bacteria has 400 cells at the start. The number grows by 15% every hour.

(d) A second colony starts at the same time. The ratio of the starting sizes, first : second, is 2 : 3. The second colony grows by 10% every hour. With no medicine, after how many whole hours is the first colony bigger than the second? [5]

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(d) second colony starts at 600; $t = 9$: $400 \times 1.15^9 = 1407$ and $600 \times 1.1^9 = 1415$; the second is still bigger; $t = 10$: 1618 and 1556; **10** hours