

Increase or decrease by a percentage

Starter

You may use your calculator for all the questions in the starter.

1. **(Review of last lesson)** The mass of the Earth is 5.97×10^{24} kg and the mass of the Sun is 1.988×10^{30} kg. How many times heavier is the Sun?

Working: $1.988 \times 10^{30} \div 5.97 \times 10^{24} = 3.33 \times 10^5$

2. **(Review of last lesson)** Given that $L = 2\sqrt{\frac{a}{k}}$, find the value of L in standard form when $a = 4.5 \times 10^{12}$ and $k = 5 \times 10^7$.

Working: $L = 2\sqrt{\frac{4.5 \times 10^{12}}{5 \times 10^7}} = 600 = 6 \times 10^2$

3. **(Review of previous material)**
 (a) Find 4% of 63 km. (b) Increase £85 by 17%.

Working: (a) $4\% = \frac{4}{100} = 0.04$
 So 4% of 63 = $0.04 \times 63 = 2.52$ m.

(b) Increase by 17% so $100\% + 17\% = 117\% = \frac{117}{100} = 1.17$
 Increase £85 by 17% = $1.17 \times 85 = \text{£}99.45$

4. Copy and complete the following by writing the correct decimal in place of the box:
 (a) 53% of 650 = $\square \times 650$ (b) Decrease 8 by 23% = $8 \times \square$
 (c) Increase 75 by 24% = $75 \times \square$ (d) 4% of 250 = $\square \times 250$

Working: (a) 53% of 650 = $\square \times 650$ **0.53**
 (b) $100\% - 23\% = 77\% \equiv \frac{77}{100} = 0.77$
 Decrease 8 by 23% = $8 \times \square$ **0.77**
 (c) $100\% + 24\% = 124\% \equiv \frac{124}{100} = 1.24$
 Increase 75 by 24% = $75 \times \square$ **1.24**
 (d) 4% of 250 = $\square \times 250$ **0.04**

E.g. 1 Using a calculator:

- (a) increase 490 by 8 % (b) decrease 627 by 21 %
(c) decrease 728 by 6 % (d) increase 329 by 78 %
(e) increase 839 by 4.7 % (f) decrease 194 by 13.6 %

Do not round your answers.

- Working:**
- (a) **Increase** by 8 % : $100\% + 8\% = 108\% = \frac{108}{100} = 1.08$
Increase 490 by 8 % = $490 \times 1.08 = 529.2$
- (b) **Decrease** by 21 % : $100\% - 21\% = 79\% = \frac{79}{100} = 0.79$
Decrease 627 by 21 % = $627 \times 0.79 = 495.33$
- (c) **Decrease** by 6 % : $100\% - 6\% = 94\% = \frac{94}{100} = 0.94$
Decrease 728 by 6 % = $728 \times 0.94 = 684.32$
- (d) **Increase** by 78 % : $100\% + 78\% = 178\% = \frac{178}{100} = 1.78$
Increase 329 by 78 % = $329 \times 1.78 = 585.62$
- (e) **Increase** by 4.7 % : $100\% + 4.7\% = 104.7\% = \frac{104.7}{100} = 1.047$
Increase 839 by 4.7 % = $839 \times 1.047 = 878.433$
- (f) **Decrease** by 13.6 % : $100\% - 13.6\% = 86.4\% = \frac{86.4}{100} = 0.864$
Decrease 194 by 13.6 % = $194 \times 0.864 = 167.616$

E.g. 2 Copy and complete the following by writing the correct decimal in place of the box:

- (a) Increase 92 by 7.3 % = $92 \times \square$ (b) Decrease 11 by 2.9 % = $11 \times \square$

- Working:**
- (a) **Increase** by 7.3 % : $100\% + 7.3\% = 107.3\% = \frac{107.3}{100} = 1.073$
The box should be replaced by 1.073.
- (b) **Decrease** by 2.9 % : $100\% - 2.9\% = 97.1\% = \frac{97.1}{100} = 0.971$
The box should be replaced by 0.971

E.g. 3 Two years ago Martha earned £25,000 per annum. Last year she got a pay rise of 3 % . This year she got a pay rise of 2 % . How much does she earn now?

- Working:**
- Last year +3 % : $100\% + 3\% = 103\% = \frac{103}{100} = 1.03$
- This year +2 % : $100\% + 2\% = 102\% = \frac{102}{100} = 1.02$
- New salary = $25000 \times 1.03 \times 1.02 = £26265$

E.g. 4 Last year a club had 2500 members who each paid £95 annual subscription. This year, the number of members went up by 9% so the annual subscription was reduced by 6%. How much more money does the club have this year compared to last year?

Working:

$$\begin{aligned} \text{Money last year} &= 2500 \times 95 = \text{£}237500 \\ \text{Members this year} &= 2500 \times 1.09 = 2725 \\ \text{Annual subscription this year} &= 95 \times 0.94 = \text{£}89.30 \\ \text{Money this year} &= 2725 \times 89.30 = \text{£}243342.50 \\ \text{Additional money} &= 243342.50 - 237500 = \text{£}5842.50 \end{aligned}$$

E.g. 5 Copy the complete:

“Doubling means to increase a quantity by ___% and trebling means to increase by ___%.”

Working: Doubling means to increase a quantity by 100% and trebling means to increase by 200%.

Video: [Increasing or decreasing by a percentage](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook:	p26 M2.1 Qu 1-13
A*-G class textbook:	p24 M2.1 Qu 2-18
9-1 homework book:	p7 M2.1 Qu 1-9
A*-G homework book:	p5 M2.1 Qu 1-10