Foundation Mathematics Units 3 & 4

Chapter 10 — Consumer products, taxation and economic indicators

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Theory

Every day we choose between competing products and services — phone plans, insurance, subscriptions, appliances. The cheapest *headline* price is often not the best value once you account for how much you use, the length of a contract, and hidden fees. This section develops a simple, reliable habit: **work out the total cost of each option over the same period, then compare**.

Unit cost — comparing different sizes.

When the same product comes in different sizes, compare the **unit cost** (the cost per gram, per litre, per 100 g, etc.):

$$\text{unit cost} = \frac{\text{price}}{\text{number of units}}.$$

The option with the **lowest** unit cost is the best value for that product. For example, 500 g of coffee for $\$12.50$ costs $\frac{12.50}{5} = \$2.50$ per 100 g, while 750 g for $\$17.25$ costs $\frac{17.25}{7.5} = \$2.30$ per 100 g — so the larger pack is better value. Always compare using the **same** unit.

Total cost over a contract period.

For plans and subscriptions, multiply the regular cost by the number of periods and add any one-off fees:

$$\text{total cost} = \text{set-up/joining fee} + (\text{cost per period} \times \text{number of periods}).$$

Compare two plans over the **same** length of time (e.g. a 24-month contract). A plan with a lower monthly cost can still be dearer overall once a set-up fee or an add-on is included.

Usage matters — included amounts and excess charges.

Many plans include an allowance (e.g. 10 GB of data) and charge an **excess** rate for anything over it. The right plan depends on **how much you actually use**:

$$\text{monthly cost} = \text{base cost} + \text{excess rate} \times \text{units over the allowance}.$$

A cheap-looking plan with a small allowance can become expensive for a heavy user.

Insurance — premium and excess.

With insurance you pay a yearly **premium** for cover, and if you make a claim you also pay an **excess** (a fixed amount you contribute). A policy with a lower premium but a higher excess can cost **more** in a year when you claim, and **less** in a year when you don't. So compare both the *no-claim* cost (just the premium) and the *one-claim* cost (premium + excess).

Buying outright vs paying over time.

Paying by **hire purchase** or **rent-to-own** spreads the cost but almost always costs more than paying cash: the extra is the price of borrowing.

$$\text{hire-purchase total} = \text{deposit} + (\text{repayment} \times \text{number of repayments}),$$

and the **extra cost** is this total minus the cash price. Comparing the extra with the cash price (as a percentage) shows how expensive the convenience is.

The habit. Put every option on the **same footing** — same period, same usage, all fees included — then the cheapest total is the best value. State any assumptions (e.g. "for a user who needs 13 GB a month").

Worked examples

Example 1 — scaffolded

Two phone plans are offered on a 24-month contract. Plan A costs $\$49$ per month. Plan B costs $\$35$ per month, but the data you need requires a $\$12$-per-month add-on. Which plan is cheaper over the contract, and by how much?

Working	Comment
Plan A total $= 49 \times 24 = \$1176$.	Monthly cost × number of months.
Plan B monthly cost $= 35 + 12 = \$47$.	Include the add-on you actually need.
Plan B total $= 47 \times 24 = \$1128$.	Monthly cost × number of months.
$1176 - 1128 = \$48$.	Compare the two totals over the same period.
Plan B is cheaper by $\$48$ over the 24 months.	State the conclusion in context.

Example 2 — scaffolded

A shop sells rice as a 2 kg bag for $\$15.00$ and a 5 kg bag for $\$34.00$. Which is better value?

Working	Comment
2 kg bag: unit cost $= \dfrac{15.00}{2} = \$7.50$ per kg.	Price ÷ number of kilograms.
5 kg bag: unit cost $= \dfrac{34.00}{5} = \$6.80$ per kg.	Compare using the **same** unit.
$\$6.80 < \$7.50$.	The lower unit cost is better value.
The 5 kg bag is better value at $\$6.80$ per kg.	State which and why.

Example 3 — unscaffolded

Insurer P charges a premium of $\$840$ per year with a $\$500$ excess. Insurer Q charges a premium of $\$720$ per year with a $\$900$ excess. Compare the cost of each for a year with **no** claim and for a year with **one** claim.

With no claim you pay only the premium: Insurer P costs $\$840$ and Insurer Q costs $\$720$, so **Q is cheaper by** $\$120$. With one claim you pay the premium plus the excess:

$$P = 840 + 500 = \$1340, Q = 720 + 900 = \$1620,$$

so **P is cheaper by** $\$280$.

$\therefore$ Insurer Q is better in a claim-free year, but Insurer P is better if you make a claim — the choice depends on how likely you are to claim.

Example 4 — unscaffolded

A fridge costs $\$1200$ cash, or can be bought on hire purchase for a $\$150$ deposit plus $\$95$ per month for 12 months. Find the hire-purchase total and how much extra it costs compared with paying cash.

The hire-purchase total is

$$150 + 95 \times 12 = 150 + 1140 = \$1290.$$

The extra cost compared with the cash price is $1290 - 1200 = \$90$.

$\therefore$ hire purchase costs $\$1290$ — that is $\$90$ more than paying cash, the price of spreading the payments.

Practice questions

Scaffolded

Q1. Two streaming-and-phone plans run for 12 months. Plan A is $39 per month. Plan B is $25 per month plus a $9-per-month add-on. (a) Find the total cost of Plan A over the year. (b) Find the total cost of Plan B over the year. (c) State which is cheaper and by how much.

Q2. Laundry powder comes as a 3 kg box for $19.50 and a 5 kg box for $30.00. (a) Find the unit cost per kg of each. (b) State which box is better value.

Q3. A music service costs $16.99 per month, or $169 if paid annually in advance. (a) Find the cost of paying monthly for a year. (b) Find how much the annual payment saves.

Q4. Insurer P charges a $900 premium with a $400 excess. Insurer Q charges a $750 premium with a $700 excess. (a) Find each cost in a year with no claim. (b) Find each cost in a year with one claim. (c) State which insurer is cheaper if you make one claim.

Q5. A gym charges either $12.50 per visit, or $89 per month for unlimited visits. (a) Find the pay-per-visit cost for 8 visits in a month. (b) State whether the monthly membership is cheaper for someone who visits 8 times a month.

Q6. A television costs $1150 cash, or a $100 deposit plus $80 per month for 15 months on hire purchase. (a) Find the hire-purchase total. (b) Find how much extra the hire purchase costs compared with cash.

Unscaffolded

Q7. Orange juice is sold as 1.5 L for $4.20, 1 L for $3.10, and 2.25 L for $6.30. Find the cost per litre of each and state which size (or sizes) give the best value.

Q8. A mobile plan costs $30 per month, including 10 GB of data, with excess data charged at $8 per GB. Find the monthly cost for a customer who uses 13 GB.

Q9. Two internet plans run on a 24-month contract. Plan A is $65 per month with no set-up fee. Plan B is $55 per month plus a one-off $95 set-up fee. Find the total cost of each and state which is cheaper.

Q10. Insurer R charges a $680 premium with a $600 excess; Insurer S charges a $590 premium with an $850 excess. Compare the cost of each in a year with one claim, and state which is cheaper.

Q11. A lounge suite costs $1400 cash, or $35 per week for one year on a rent-to-own plan. Find the rent-to-own total and how much extra it costs than paying cash.

Q12. A subscription is $12 per month or $120 per year paid up front. Find how much a customer saves in a year by paying annually.

Q13. A phone plan has a base cost of $45 per month including 15 GB, with excess data at $10 per GB. Find the monthly cost for a customer who uses 18 GB.

Q14. Rice is sold as 5 kg for $12.00, 10 kg for $21.00, and 2 kg for $5.20. Find the unit cost per kg of each and state which is the best value.

Q15. A laptop costs $1500 cash, or a $200 deposit plus $65 per month for 24 months. Find the hire-purchase total, the extra cost compared with cash, and express the extra as a percentage of the cash price (to two decimal places).

Q16. Gym A charges a $50 joining fee plus $8 per visit. Gym B charges $15 per visit with no joining fee. Find the number of visits at which the two gyms cost the same, and state which gym is cheaper for someone who visits 12 times.

Q17. A phone can be bought outright for $960 and then used on a $40-per-month plan for 24 months, or taken on a plan that includes the phone for $75 per month for 24 months. Find the total cost of each option over 24 months and state which is cheaper.

Q18. Three 12-month plans are compared. Plan A is $\$30$ per month. Plan B is $\$25$ per month plus a $\$40$ set-up fee. Plan C is $\$27$ per month. Find the total cost of each over the year and state which is the best value.

Answers

Q1. (a) $468. (b) $408. (c) Plan B, by $60. **Q2.** (a) $6.50/kg and $6.00/kg. (b) the 5 kg box. **Q3.** (a) $203.88. (b) $34.88. **Q4.** (a) P $900, Q $750. (b) P $1300, Q $1450. (c) Insurer P. **Q5.** (a) $100. (b) yes — $89 < $100. **Q6.** (a) $1300. (b) $150. **Q7.** 1.5 L $2.80/L, 1 L $3.10/L, 2.25 L $2.80/L; the 1.5 L and 2.25 L sizes are equal best value. **Q8.** $54. **Q9.** A $1560, B $1415; Plan B is cheaper (by $145). **Q10.** R $1280, S $1440; Insurer R is cheaper. **Q11.** $1820; $420 extra. **Q12.** $24. **Q13.** $75. **Q14.** $2.40/kg, $2.10/kg, $2.60/kg; the 10 kg bag is the best value. **Q15.** total $1760; extra $260; 17.33%. **Q16.** $7\frac{1}{7}$ visits, so they cost the same near 7 visits (equal at exactly $50 = 7\frac{1}{7} \times 7$); for 12 visits Gym A is cheaper. **Q17.** outright-plus-plan $1920, plan-included $1800; the plan that includes the phone is cheaper. **Q18.** A $360, B $340, C $324; Plan C is the best value.

Fully-worked solutions

Q1. (a) Plan A $= 39 \times 12 = \$468$. (b) Plan B monthly $= 25 + 9 = \$34$, so $34 \times 12 = \$408$. (c) $468 - 408 = \$60$, so Plan B is cheaper by $60.

Q2. (a) 3 kg box: $\frac{19.50}{3} = \$6.50$ per kg; 5 kg box: $\frac{30.00}{5} = \$6.00$ per kg. (b) The 5 kg box has the lower unit cost, so it is better value.

Q3. (a) $16.99 \times 12 = \$203.88$. (b) $203.88 - 169 = \$34.88$ saved by paying annually.

Q4. (a) No claim = premium only: P $900, Q $750. (b) One claim = premium + excess: P $= 900 + 400 = \$1300$; Q $= 750 + 700 = \$1450$. (c) $1300 < $1450, so Insurer P is cheaper if you claim.

Q5. (a) $8 \times 12.50 = \$100$. (b) The monthly membership is $89, and $89 < $100, so yes, the membership is cheaper for 8 visits.

Q6. (a) $100 + 80 \times 15 = 100 + 1200 = \$1300$. (b) $1300 - 1150 = \$150$ extra.

Q7. Cost per litre: $\frac{4.20}{1.5} = \$2.80$; $\frac{3.10}{1} = \$3.10$; $\frac{6.30}{2.25} = \$2.80$. The 1.5 L and 2.25 L sizes are equal cheapest at $2.80 per litre, so both are the best value; the 1 L size is dearest.

Q8. Base $30 plus 3 GB over the allowance at $8 per GB: $30 + 8 \times 3 = 30 + 24 = \$54$.

Q9. Plan A $= 65 \times 24 = \$1560$. Plan B $= 55 \times 24 + 95 = 1320 + 95 = \$1415$. Since $1415 < $1560, Plan B is cheaper by $145.

Q10. One claim: R $= 680 + 600 = \$1280$; S $= 590 + 850 = \$1440$. Since $1280 < $1440, Insurer R is cheaper when you claim.

Q11. $35 \times 52 = \$1820$ over the year. Extra over cash $= 1820 - 1400 = \$420$.

Q12. Monthly for a year $= 12 \times 12 = \$144$; annual $= \$120$; saving $= 144 - 120 = \$24$.

Q13. Base $45 plus 3 GB over the allowance at $10 per GB: $45 + 10 \times 3 = \$75$.

Q14. $\frac{12.00}{5} = \$2.40$/kg; $\frac{21.00}{10} = \$2.10$/kg; $\frac{5.20}{2} = \$2.60$/kg. The 10 kg bag has the lowest unit cost, so it is the best value.

Q15. Total $= 200 + 65 \times 24 = 200 + 1560 = \$1760$. Extra $= 1760 - 1500 = \$260$. As a percentage of the cash price: $\frac{260}{1500} \times 100\% = 17.33\%$ (to 2 d.p.).

Q16. Gym A costs $50 + 8v$ for v visits; Gym B costs $15v$. Setting them equal, $50 + 8v = 15v$, so $50 = 7v$ and $v = \frac{50}{7} = 7\,1/7$ visits — the costs are equal at about 7 visits. For 12 visits: Gym A $= 50 + 8 \times 12 = \$146$; Gym B $= 15 \times 12 = \$180$; so Gym A is cheaper.

Q17. Outright then plan: $960 + 40 \times 24 = 960 + 960 = \$1920$. Plan that includes the phone: $75 \times 24 = \$1800$. Since $\$1800 < \$1920$, the plan that includes the phone is cheaper by $\$120$.

Q18. Plan A $= 30 \times 12 = \$360$. Plan B $= 25 \times 12 + 40 = 300 + 40 = \$340$. Plan C $= 27 \times 12 = \$324$. The lowest total is Plan C at $\$324$, so it is the best value.

Theory

Governments raise money through **taxation** to pay for services such as health, education and roads. This section looks at how **income tax**, the **Medicare levy** and **superannuation** are calculated, and how **GST** works for a business. The rates and brackets below are the Australian resident rates for the **2025–26** financial year and are used throughout this section — but note that **tax brackets and rates change from year to year**, so in a real calculation you must always use the current figures (or the ones a question gives you).

Income tax and marginal tax brackets.

Australia uses a **progressive** tax system: higher parts of your income are taxed at higher rates. Income tax is worked out from a **tax table** like the one below. You do not pay one rate on your whole income — instead you pay a **base amount** plus a **marginal rate** on the part of your income above a threshold.

Taxable income	Tax on this income
\$0 – \$18 200	Nil
\$18 201 – \$45 000	16c for each \$1 over \$18 200
\$45 001 – \$135 000	\$4288 plus 30c for each \$1 over \$45 000
\$135 001 – \$190 000	\$31 288 plus 37c for each \$1 over \$135 000
\$190 001 and over	\$51 638 plus 45c for each \$1 over \$190 000

For example, a taxable income of \$60 000 falls in the third row, so the tax is

$$4288 + 0.30 \times (60\,000 - 45\,000) = 4288 + 4500 = \$8788.$$

The first \$18 200 (the **tax-free threshold**) is always untaxed. Use the tax table above for every question in this section unless a question provides its own.

The Medicare levy.

Most taxpayers also pay the **Medicare levy** to help fund public health. It is **2%** of taxable income (this rate is on the Foundation Mathematics formula sheet):

$$\text{Medicare levy} = 0.02 \times \text{taxable income}.$$

Net (take-home) pay.

Your employer withholds tax from your pay during the year (this is called **PAYG**, pay-as-you-go). Ignoring other deductions, your **net** or **take-home** pay is

$$\text{net pay} = \text{gross income} - \text{income tax} - \text{Medicare levy}.$$

Marginal rate versus average rate.

Your **marginal rate** is the rate on your *next* dollar (the rate for the bracket your income sits in). Your **average rate** is your total tax divided by your total income. For any income above the tax-free threshold the average rate is lower than the marginal rate, because the earlier parts of your income are taxed at lower rates (and the first \$18 200 is not taxed at all). Below the threshold both rates are 0%.

Superannuation.

Superannuation ("super") is money set aside for retirement. Under the **superannuation guarantee**, an employer must pay a set percentage of an employee's ordinary earnings into a super fund, **on top of** their wage. The rate is set by law: it rose in yearly steps to **12%** on 1 July 2025. The rate to use will be given in each question:

$$\text{super contribution} = \text{super rate} \times \text{ordinary earnings}.$$

GST for a business.

The **Goods and Services Tax (GST)** is **10%**, added to the price of most goods and services. A business **collects** GST on its sales and **pays** GST on its purchases, then sends the difference to the Australian Taxation Office (ATO). (If it paid more GST than it collected, it receives the difference back instead.)

- To find the GST to **add**: multiply the pre-GST price by 0.10; to get the GST-inclusive price, multiply the pre-GST price by 1.10.
- To find the GST **included** in a GST-inclusive total, divide the total by 11 (because the total is 110% of the pre-GST price, and $10/110 = 1/11$).

Taxes at the local and state level.

Not all taxes are national. **Local councils** charge **rates** on property to pay for local services such as roads, rubbish collection and parks. Rates are usually a **rate in the dollar** applied to a property's **capital-improved value (CIV)**, plus a fixed service charge:

$$\text{rates} = \text{CIV} \times \text{rate in the dollar} + \text{service charge}.$$

For example, a property with a CIV of \$650 000, a rate of \$0.0042 per \$1 of value and a \$180 service charge pays $650\,000 \times 0.0042 + 180 = 2730 + 180 = \$2910$ in rates.

State governments charge taxes such as **stamp duty** (paid when you buy a property or a car) and **land tax**. At Foundation level these are found as a percentage of a value, with the rate given. For example, stamp duty of 5% on a \$500 000 house is $0.05 \times 500\,000 = \$25\,000$. Real stamp-duty and land-tax scales vary by state and change over time, so a question will always give you the rate to use.

Worked examples

Example 1 — scaffolded

Priya has a taxable income of \$60 000. Using the tax table, find her income tax, her Medicare levy, and her net (take-home) pay for the year.

Working	Comment
\$60 000 is in the \$45 001–\$135 000 bracket.	Locate the income in the tax table.
Income tax $= 4288 + 0.30 \times (60\,000 - 45\,000)$	Base amount for the bracket, plus 30c per \$1 over \$45 000.
$= 4288 + 0.30 \times 15\,000 = 4288 + 4500 = \$8788.$	
Medicare levy $= 0.02 \times 60\,000 = \$1200.$	2% of taxable income.
Net pay $= 60\,000 - 8788 - 1200 = \$50\,012.$	Gross − income tax − Medicare levy.

Example 2 — scaffolded

Liam earns ordinary wages of \$70 000. His employer pays superannuation at the guarantee rate of 12%. Find the super contribution his employer must make.

Working	Comment
Super $= 12\% \times 70\,000.$	The guarantee is a percentage of ordinary earnings.
$= 0.12 \times 70\,000 = \$8400.$	This is paid into super **on top of** the \$70 000 wage.

Example 3 — unscaffolded

Maria has a taxable income of \$150 000. Find her income tax and Medicare levy, and hence her average rate of tax-plus-levy, correct to two decimal places.

\$150 000 is in the \$135 001–\$190 000 bracket, so the income tax is

$$31\,288 + 0.37 \times (150\,000 - 135\,000) = 31\,288 + 5550 = \$36\,838.$$

The Medicare levy is $0.02 \times 150\,000 = \$3000$, so the total is $36\,838 + 3000 = \$39\,838$. As a fraction of her income,

$$\frac{39\,838}{150\,000} \times 100\,\% = 26.56\,\% \text{ (to 2 d.p.)}.$$

∴ Maria pays \$36 838 income tax and \$3000 Medicare levy, an average of $26.56\,\%$ of her income.

Example 4 — unscaffolded

A landscaping business sends an invoice for \$4400, which includes GST. Find the GST included in the invoice and the price before GST.

The total is $110\,\%$ of the pre-GST price, so the GST is

$$\frac{4400}{11} = \$400.$$

The price before GST is $4400 - 400 = \$4000$ (equivalently $4400 \times 10/11$).

∴ the invoice includes \$400 of GST on a pre-GST price of \$4000.

Practice questions

Use the tax table in the Theory for all income-tax questions. Take the Medicare levy as 2% and GST as 10%.

Scaffolded

Q1. Ben has a taxable income of \$38 000. (a) Find his income tax. (b) Find his Medicare levy. (c) Find his net pay for the year.

Q2. Aisha has a taxable income of \$85 000. (a) Find her income tax. (b) Find her Medicare levy. (c) Find her net pay for the year.

Q3. Noah earns ordinary wages of \$52 000, with superannuation paid at the guarantee rate of $12\,\%$. (a) Find his employer's super contribution. (b) Find the contribution that would have been made at the 2024–25 rate of $11.5\,\%$. (c) Find the difference between the two contributions.

Q4. A shop sells a chair for \$250 before GST. (a) Find the GST to be added. (b) Find the price including GST. (c) A different invoice totals \$946 including GST. Find the GST included in it.

Q5. Chloe has a taxable income of \$48 000. (a) Find her income tax. (b) Find her Medicare levy. (c) Find her net pay for the year.

Q6. Sam has a taxable income of \$100 000. (a) Find his income tax. (b) Find his average tax rate (income tax ÷ income), correct to two decimal places. (c) State his marginal tax rate.

Unscaffolded

Q7. Find the income tax, Medicare levy and net pay for a taxable income of \$25 000.

Q8. Find the income tax, Medicare levy and net pay for a taxable income of \$135 000.

Q9. Find the income tax, Medicare levy and net pay for a taxable income of \$200 000.

Q10. An employee earns \$95 000 in ordinary wages, with super paid at $12\,\%$. Find the super contribution, and hence the total cost to the employer (wage plus super).

Q11. In a quarter, a cafe collects \$33 000 (including GST) in sales and pays \$11 000 (including GST) for supplies. Find the GST collected, the GST paid, and the net GST the cafe must send to the ATO.

Q12. Find the net pay for a taxable income of $72 000, and hence the monthly take-home pay (to the nearest cent).

Q13. Find the average tax rate (income tax ÷ income, to two decimal places) for a taxable income of $50 000 and for one of $150 000, and comment on the comparison.

Q14. An employer pays super at 12 % on ordinary earnings of $60 000. Find the annual super contribution.

Q15. Dev's taxable income rises from $44 000 to $46 000. (a) Find the income tax at each income. (b) Find the extra income tax and extra Medicare levy on the $2000 rise. (c) Hence find the increase in his take-home pay.

Q16. An invoice totals $1650 including GST. Find the GST included and the price before GST.

Q17. Ivy earns a salary of $88 000, with super paid at 12 %. Find her income tax, her Medicare levy, her net pay, and (separately) the super her employer pays on top.

Q18. Tom's taxable income rises from $130 000 to $140 000. Using the marginal rates in the table, find the extra income tax on the $10 000 rise, showing how it is split across the two brackets involved.

Q19. A house has a capital-improved value of $480 000. The council charges rates of $0.0045 per $1 of value, plus a fixed waste-service charge of $220. Find the annual rates.

Q20. A buyer purchases a house for $540 000 and must pay state stamp duty at a rate of 5 % of the purchase price. Find the stamp duty payable.

Answers

Q1. (a) \$3168. (b) \$760. (c) \$34 072. **Q2.** (a) \$16 288. (b) \$1700. (c) \$67 012. **Q3.** (a) \$6240. (b) \$5980. (c) \$260. **Q4.** (a) \$25. (b) \$275. (c) \$86. **Q5.** (a) \$5188. (b) \$960. (c) \$41 852. **Q6.** (a) \$20 788. (b) 20.79%. (c) 30%. **Q7.** tax \$1088; levy \$500; net \$23 412. **Q8.** tax \$31 288; levy \$2700; net \$101 012. **Q9.** tax \$56 138; levy \$4000; net \$139 862. **Q10.** super \$11 400; total cost \$106 400. **Q11.** collected \$3000; paid \$1000; net GST \$2000. **Q12.** net \$58 172; monthly \$4847.67. **Q13.** \$50 000: 11.58%; \$150 000: 24.56%. The higher earner pays a higher *average* rate — the system is progressive. **Q14.** \$7200. **Q15.** (a) \$4128 and \$4588. (b) extra tax \$460, extra levy \$40. (c) take-home rises by \$1500. **Q16.** GST \$150; price before GST \$1500. **Q17.** tax \$17 188; levy \$1760; net \$69 052; super \$10 560. **Q18.** extra tax \$3350 (\$1500 at 30% on the \$5000 up to \$135 000, plus \$1850 at 37% on the \$5000 above). **Q19.** \$2380. **Q20.** \$27 000.

Fully-worked solutions

Q1. \$38 000 is in the \$18 201–\$45 000 bracket. (a) Income tax $= 0.16 \times (38\,000 - 18\,200) = 0.16 \times 19\,800 = \$3168$. (b) Medicare levy $= 0.02 \times 38\,000 = \$760$. (c) Net pay $= 38\,000 - 3168 - 760 = \$34\,072$.

Q2. \$85 000 is in the \$45 001–\$135 000 bracket. (a) Income tax $= 4288 + 0.30 \times (85\,000 - 45\,000) = 4288 + 12\,000 = \$16\,288$. (b) Medicare levy $= 0.02 \times 85\,000 = \$1700$. (c) Net pay $= 85\,000 - 16\,288 - 1700 = \$67\,012$.

Q3. (a) Super $= 0.12 \times 52\,000 = \$6240$. (b) At 11.5%, super $= 0.115 \times 52\,000 = \$5980$. (c) Difference $= 6240 - 5980 = \$260$.

Q4. (a) GST $= 0.10 \times 250 = \$25$. (b) Price including GST $= 250 + 25 = \$275$. (c) GST included in \$946 $= \dfrac{946}{11} = \$86$.

Q5. \$48 000 is in the \$45 001–\$135 000 bracket. (a) Income tax $= 4288 + 0.30 \times (48\,000 - 45\,000) = 4288 + 900 = \$5188$. (b) Medicare levy $= 0.02 \times 48\,000 = \$960$. (c) Net pay $= 48\,000 - 5188 - 960 = \$41\,852$.

Q6. \$100 000 is in the \$45 001–\$135 000 bracket. (a) Income tax $= 4288 + 0.30 \times (100\,000 - 45\,000) = 4288 + 16\,500 = \$20\,788$. (b) Average rate $= \dfrac{20\,788}{100\,000} \times 100\% = 20.79\%$ (to 2 d.p.). (c) The marginal rate for this bracket is 30%.

Q7. \$25 000 is in the \$18 201–\$45 000 bracket. Income tax $= 0.16 \times (25\,000 - 18\,200) = 0.16 \times 6800 = \$1088$; Medicare levy $= 0.02 \times 25\,000 = \$500$; net pay $= 25\,000 - 1088 - 500 = \$23\,412$.

Q8. \$135 000 is the top of the third bracket. Income tax $= 4288 + 0.30 \times (135\,000 - 45\,000) = 4288 + 27\,000 = \$31\,288$; Medicare levy $= 0.02 \times 135\,000 = \$2700$; net pay $= 135\,000 - 31\,288 - 2700 = \$101\,012$.

Q9. \$200 000 is in the top bracket. Income tax $= 51\,638 + 0.45 \times (200\,000 - 190\,000) = 51\,638 + 4500 = \$56\,138$; Medicare levy $= 0.02 \times 200\,000 = \$4000$; net pay $= 200\,000 - 56\,138 - 4000 = \$139\,862$.

Q10. Super $= 0.12 \times 95\,000 = \$11\,400$. Total cost to the employer $= 95\,000 + 11\,400 = \$106\,400$.

Q11. GST collected $= \dfrac{33\,000}{11} = \$3000$; GST paid $= \dfrac{11\,000}{11} = \$1000$; net GST to the ATO $= 3000 - 1000 = \$2000$.

Q12. \$72 000 is in the third bracket. Income tax $= 4288 + 0.30 \times (72\,000 - 45\,000) = 4288 + 8100 = \$12\,388$; Medicare levy $= 0.02 \times 72\,000 = \$1440$; net pay $= 72\,000 - 12\,388 - 1440 = \$58\,172$. Monthly take-home $= \dfrac{58\,172}{12} = \$4847.67$ (to the nearest cent).

Q13. At \$50 000: income tax $= 4288 + 0.30 \times 5000 = \$5788$, so average rate $= \dfrac{5788}{50\,000} \times 100\,\% = 11.58\,\%$. At \$150 000: income tax $= \$36\,838$ (from Example 3), so average rate $= \dfrac{36\,838}{150\,000} \times 100\,\% = 24.56\,\%$. The higher earner pays a much higher **average** rate — this is what "progressive" means.

Q14. Super $= 0.12 \times 60\,000 = \$7200$.

Q15. (a) At \$44 000 (second bracket): $0.16 \times (44\,000 - 18\,200) = 0.16 \times 25\,800 = \$4128$. At \$46 000 (third bracket): $4288 + 0.30 \times (46\,000 - 45\,000) = 4288 + 300 = \$4588$. (b) Extra income tax $= 4588 - 4128 = \$460$; extra Medicare levy $= 0.02 \times 2000 = \$40$. (c) Increase in take-home $= 2000 - 460 - 40 = \$1500$.

Q16. GST $= \dfrac{1650}{11} = \$150$; price before GST $= 1650 - 150 = \$1500$.

Q17. \$88 000 is in the third bracket. Income tax $= 4288 + 0.30 \times (88\,000 - 45\,000) = 4288 + 12\,900 = \$17\,188$; Medicare levy $= 0.02 \times 88\,000 = \$1760$; net pay $= 88\,000 - 17\,188 - 1760 = \$69\,052$. The super paid on top is $0.12 \times 88\,000 = \$10\,560$.

Q18. The rise from \$130 000 to \$140 000 crosses the \$135 000 threshold. The \$5000 from \$130 000 to \$135 000 is taxed at $30\,\%$: $0.30 \times 5000 = \$1500$. The \$5000 from \$135 000 to \$140 000 is taxed at $37\,\%$: $0.37 \times 5000 = \$1850$. Extra income tax $= 1500 + 1850 = \$3350$.

Q19. Rates $= \text{CIV} \times \text{rate} + \text{service charge} = 480\,000 \times 0.0045 + 220 = 2160 + 220 = \$2380$.

Q20. Stamp duty $= 5\,\% \times 540\,000 = 0.05 \times 540\,000 = \$27\,000$.

Theory

Money does not stop at the border. What your dollar is worth overseas, and the health of the wider economy, both affect everyday decisions — a holiday, an online purchase, or the price of imported groceries. This section looks at **exchange rates** and at the **economic indicators** reported in the news.

Exchange rates.

An **exchange rate** tells you how much of a foreign currency you get for one Australian dollar. If the rate is $\text{AUD}\,1 = \text{USD}\,0.65$, then each Australian dollar buys 65 US cents. Two rules cover every conversion:

- to change **AUD into a foreign currency**, **multiply** by the rate;
- to change a **foreign currency back into AUD**, **divide** by the rate.

For example, at $\text{AUD}\,1 = \text{USD}\,0.65$, converting $\$\,800$ Australian gives $800 \times 0.65 = \text{USD}\,520$. Converting $\text{USD}\,260$ back gives $260 \div 0.65 = \text{AUD}\,400$.

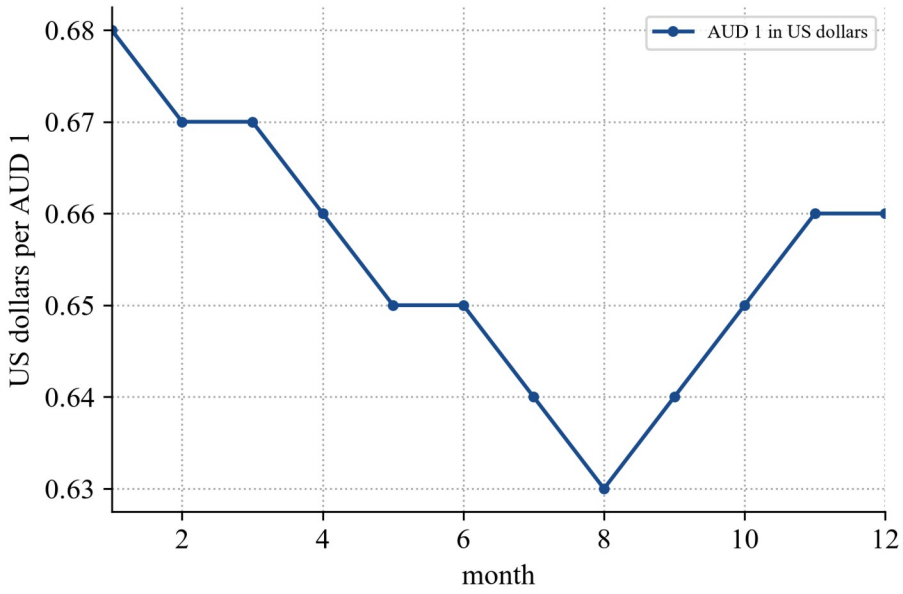
A rising or falling dollar.

When the Australian dollar **rises** (buys more foreign currency), overseas travel and imported goods become **cheaper** for us. When it **falls**, they become **dearer**. Consider a $\text{USD}\,1000$ item bought online:

$$\text{at AUD}\,1 = \text{USD}\,0.65 : \text{cost} = \frac{1000}{0.65} = \text{AUD}\,1538.46,$$

$$\text{at AUD}\,1 = \text{USD}\,0.60 : \text{cost} = \frac{1000}{0.60} = \text{AUD}\,1666.67.$$

The lower dollar makes the same item cost about $\$\,128$ more.



Economic indicators.

Governments and news reports track **indicators** that describe the whole economy. You are not expected to calculate them, but you should be able to read and interpret them.

- **Inflation rate (CPI)** — the percentage rise in the general price level over a year (a $3.5\,\%$ inflation rate means prices are, on average, $3.5\,\%$ higher than a year ago).

- **Cash (interest) rate** — the base interest rate set by the Reserve Bank; a higher rate makes loans and mortgages dearer and savings more rewarding.
- **Unemployment rate** — the percentage of people in the labour force who are looking for work but cannot find it.
- **Gross Domestic Product (GDP)** — the total value of goods and services produced; a measure of the "size" of the economy, and whether it is growing or shrinking.

Reading these together gives a picture of the economy: for example, falling inflation with steady employment is usually seen as healthy.

Worked examples

Example 1 — scaffolded

The exchange rate is $\text{AUD}\,1 = \text{USD}\,0.65$. (a) Convert $\$800$ Australian to US dollars. (b) Convert $\text{USD}\,260$ to Australian dollars.

Working	Comment
(a) $800 \times 0.65 = 520$.	AUD → foreign: **multiply** by the rate.
So $\$800$ Australian $= \text{USD}\,520$.	State the answer with the currency.
(b) $260 \div 0.65 = 400$.	Foreign → AUD: **divide** by the rate.
So $\text{USD}\,260 = \$400$ Australian.	

Example 2 — scaffolded

A laptop is advertised online for $\text{USD}\,1000$. Find its cost in Australian dollars when $\text{AUD}\,1 = \text{USD}\,0.65$, and again when the dollar falls to $\text{AUD}\,1 = \text{USD}\,0.60$. Comment.

Working	Comment
At 0.65: cost $= \dfrac{1000}{0.65} = \$1538.46$.	USD → AUD: divide by the rate.
At 0.60: cost $= \dfrac{1000}{0.60} = \$1666.67$.	A lower rate means each AUD buys less.
The item costs about $\$128$ **more** when the dollar is lower.	A falling dollar makes imports dearer.

Example 3 — unscaffolded

A jacket costs $\$120$ in an Australian shop, or $\text{USD}\,70$ from an overseas website. The exchange rate is $\text{AUD}\,1 = \text{USD}\,0.65$. Which is cheaper, and by how much?

Converting the online price to Australian dollars,

$$70 \div 0.65 = \text{AUD}\,107.69.$$

This is less than the local price of $\$120$, so the website is cheaper by $120 - 107.69 = \$12.31$ (before any postage).

$\therefore$ the overseas website is cheaper, by about $\$12.31$.

Example 4 — unscaffolded

A traveller changes $\$2000$ Australian into Japanese yen at $\text{AUD}\,1 = \text{JPY}\,95$, spends $\text{JPY}\,150\,000$, and changes the rest back at the same rate. How much, in Australian dollars, does she get back?

Converting to yen: $2000 \times 95 = \text{JPY}\,190\,000$. After spending $\text{JPY}\,150\,000$, the remainder is $190\,000 - 150\,000 = \text{JPY}\,40\,000$. Converting back,

$$40\,000 \div 95 = \text{AUD}\,421.05.$$

$\therefore$ she gets back about $\$421.05$ Australian.

Practice questions

Scaffolded

Q1. The exchange rate is $\text{AUD}\,1 = \text{USD}\,0.65$. Convert to US dollars: (a) $\$400$; (b) $\$1500$; (c) $\$85$.

Q2. Convert each amount to Australian dollars: (a) $\text{USD}\,130$ at $\text{AUD}\,1 = \text{USD}\,0.65$; (b) $\text{EUR}\,300$ at $\text{AUD}\,1 = \text{EUR}\,0.60$; (c) $\text{GBP}\,260$ at $\text{AUD}\,1 = \text{GBP}\,0.52$.

Q3. A gadget costs $\text{USD}\,500$. (a) Find its cost in AUD at $\text{AUD}\,1 = \text{USD}\,0.65$. (b) Find its cost in AUD if the dollar falls to $\text{AUD}\,1 = \text{USD}\,0.62$. (c) By how much did the cost change?

Q4. Running shoes cost $\$150$ in Australia or $\text{USD}\,92$ online, at $\text{AUD}\,1 = \text{USD}\,0.65$. (a) Convert the online price to AUD. (b) State which is cheaper and by how much (ignore postage).

Q5. A news report states that the inflation rate is 3.2%, the cash rate is 4.35% and the unemployment rate is 4.1%. (a) What does the 3.2% inflation rate tell you about prices over the past year? (b) If the cash rate rises, what happens to the cost of a home loan?

Q6. Explain, in a sentence each, what the following indicators measure: (a) GDP; (b) the unemployment rate.

Unscaffolded

Q7. Convert $\$1200$ Australian to euros at $\text{AUD}\,1 = \text{EUR}\,0.60$.

Q8. Convert $\text{THB}\,8800$ (Thai baht) to Australian dollars at $\text{AUD}\,1 = \text{THB}\,22$.

Q9. Convert $\$650$ Australian to New Zealand dollars at $\text{AUD}\,1 = \text{NZD}\,1.08$.

Q10. Convert $\text{GBP}\,180$ to Australian dollars at $\text{AUD}\,1 = \text{GBP}\,0.52$.

Q11. A laptop costs $\text{USD}\,1500$. Find its cost in AUD when $\text{AUD}\,1 = \text{USD}\,0.66$ and again when the dollar falls to $\text{AUD}\,1 = \text{USD}\,0.60$, and state how much more it costs at the lower rate.

Q12. A traveller changes $\$3000$ Australian to yen at $\text{AUD}\,1 = \text{JPY}\,95$, spends $\text{JPY}\,250\,000$, and changes the rest back at the same rate. How much (AUD) does he get back?

Q13. A camera costs $\$980$ in Australia or $\text{USD}\,590$ overseas, at $\text{AUD}\,1 = \text{USD}\,0.65$. Which is cheaper, and by how much?

Q14. The Australian dollar rises from $\text{USD}\,0.62$ to $\text{USD}\,0.68$. Explain what this means for the cost of a holiday in the United States.

Q15. Over a year the inflation rate is 4% and a worker's pay rises by 2.5%. Explain whether the worker is better or worse off in real terms.

Q16. A hotel bill in Europe is $\text{EUR}\,450$. Convert it to Australian dollars at $\text{AUD}\,1 = \text{EUR}\,0.60$.

Q17. A tourist has $\$500$ Australian to spend in the United States at $\text{AUD}\,1 = \text{USD}\,0.65$. How many US dollars will she have?

Q18. The unemployment rate falls from 5.2% to 4.0% while GDP grows. State what this suggests about the economy, and one reason a business owner might view it positively.

Answers

Q1. (a) USD 260; (b) USD 975; (c) USD 55.25. **Q2.** (a) $200; (b) $500; (c) $500. **Q3.** (a) $769.23; (b) $806.45; (c) about $37.22 dearer. **Q4.** (a) $141.54; (b) online is cheaper by about $8.46. **Q5.** (a) prices are on average 3.2% higher than a year ago; (b) it rises (loans become dearer). **Q6.** (a) GDP measures the total value of goods and services produced — the size of the economy; (b) the unemployment rate is the percentage of the labour force who want work but cannot find it. **Q7.** EUR 720. **Q8.** $400. **Q9.** NZD 702. **Q10.** $346.15. **Q11.** $2272.73 at 0.66; $2500 at 0.60; about $227.27 more. **Q12.** $368.42. **Q13.** the overseas price is cheaper: $907.69 vs $980, saving about $72.31. **Q14.** a higher dollar buys more US dollars, so the holiday becomes cheaper for Australians. **Q15.** worse off — the pay rise (2.5%) is less than inflation (4%), so buying power falls by about 1.5%. **Q16.** $750. **Q17.** USD 325. **Q18.** the economy is growing and more people are employed (a strengthening economy); a business owner might expect more customers with income to spend.

Fully-worked solutions

Q1. AUD → USD means multiply by 0.65: (a) $400 \times 0.65 = \text{USD } 260$; (b) $1500 \times 0.65 = \text{USD } 975$; (c) $85 \times 0.65 = \text{USD } 55.25$.

Q2. Foreign → AUD means divide by the rate: (a) $130 \div 0.65 = \$200$; (b) $300 \div 0.60 = \$500$; (c) $260 \div 0.52 = \$500$.

Q3. (a) $500 \div 0.65 = \$769.23$. (b) $500 \div 0.62 = \$806.45$. (c) $806.45 - 769.23 = \$37.22$ dearer, because the lower dollar buys fewer US dollars.

Q4. (a) $92 \div 0.65 = \$141.54$. (b) $\$141.54 < \$150$, so the online price is cheaper by $150 - 141.54 = \$8.46$.

Q5. (a) An inflation rate of 3.2% means that, on average, prices are 3.2% higher than they were a year ago. (b) A rise in the cash rate feeds through to lending rates, so a home loan costs more (higher repayments).

Q6. (a) GDP (Gross Domestic Product) is the total value of all goods and services a country produces — a measure of the size of its economy. (b) The unemployment rate is the percentage of people in the labour force who are actively seeking work but do not have a job.

Q7. $1200 \times 0.60 = \text{EUR } 720$.

Q8. $8800 \div 22 = \$400$.

Q9. $650 \times 1.08 = \text{NZD } 702$.

Q10. $180 \div 0.52 = \$346.15$.

Q11. At 0.66: $1500 \div 0.66 = \$2272.73$. At 0.60: $1500 \div 0.60 = \$2500$. The difference is $2500 - 2272.73 = \$227.27$, so the laptop costs about $227.27 more when the dollar is lower.

Q12. Converting to yen: $3000 \times 95 = \text{JPY } 285\,000$. After spending JPY 250 000, the remainder is $285\,000 - 250\,000 = \text{JPY } 35\,000$. Converting back: $35\,000 \div 95 = \$368.42$.

Q13. Converting the overseas price: $590 \div 0.65 = \$907.69$. Since $\$907.69 < \$980$, the overseas camera is cheaper by $980 - 907.69 = \$72.31$.

Q14. When the dollar rises from USD 0.62 to USD 0.68, each Australian dollar buys more US dollars. So the same US-priced holiday converts to fewer Australian dollars — the trip becomes cheaper for an Australian traveller.

Q15. Prices rose by 4% but the wage rose by only 2.5%. Because the pay rise did not keep up with inflation, the worker can afford about $4\% - 2.5\% = 1.5\%$ less than before — they are worse off in real terms.

Q16. $450 \div 0.60 = \$750$.

Q17. $500 \times 0.65 = \text{USD } 325$.

Q18. A falling unemployment rate (5.2% to 4.0%) together with growing GDP suggests the economy is expanding and more people have jobs. A business owner might view this positively because more employed people with income to spend can mean more customers and higher sales.

Theory

Every decision about money involves a trade-off between **reward** (the return you hope to gain) and **risk** (the chance that things turn out worse than expected). Understanding this trade-off helps you choose where to put your money sensibly.

Return and the rate of return.

The **return** on an investment is the profit it earns. As a percentage of the amount invested,

$$\text{percentage return} = \frac{\text{profit}}{\text{amount invested}} \times 100\%,$$

where the **profit** is the final value minus the amount invested, plus any income received along the way (interest, share **dividends**, or rent). A negative return is a **loss**.

For example, if \$5000 grows to \$5400 in a year, the profit is \$400 and the return is $\frac{400}{5000} \times 100\% = 8\%$.

The risk–return trade-off.

As a general rule, the **higher the potential return, the higher the risk**. Options can be ranked roughly from lower to higher risk:

- **Savings accounts and term deposits** — low risk, low return; the return is known in advance and your money is safe.
- **Bonds** — loans to a government or a company, repaid with interest at a set date; low-to-moderate risk.
- **Shares** — higher potential return but the value rises and falls, so higher risk.
- **Property** — potentially high return over the long term, but large amounts of money, high costs, and prices that can fall.

There is no "best" option for everyone: a safe choice protects your money but grows it slowly, while a risky choice might grow it faster — or lose some of it.

Expected loss — comparing risks informally.

When a large loss is possible but uncertain, we can measure the risk informally with the **expected loss** — the probability of the loss, multiplied by its size:

$$\text{expected loss} = \text{probability of loss} \times \text{size of loss}.$$

For example, a 5% chance of a \$2000 loss gives an expected loss of $0.05 \times 2000 = \$100$. This is a long-run *average*, not what happens in any one year — the loss itself is either \$0 or \$2000 — but it lets us compare risks, and judge whether an insurance premium is reasonable.

Diversification.

Diversification means spreading your money across several different investments instead of putting it all in one place ("don't put all your eggs in one basket"). If one investment does badly, the others may still do well, so the overall risk is reduced. A mix of savings, shares and property is more stable than any one of them alone.

Insurance — paying to transfer risk.

Insurance lets you swap the small, certain cost of a **premium** for protection against a large, uncertain **loss**. You pay the premium every year; if an insured event happens, the insurer pays the cost (often minus an **excess** you pay

yourself). Even when the premium is close to the *expected* loss, insurance is worthwhile because it protects you from a rare but **catastrophic** loss you could not afford — that is the point of transferring the risk.

Time frame and the risk of debt.

Risk also depends on your **time frame**. Volatile investments such as shares suit a **long-term** goal (time to recover from falls), while money needed **soon** belongs somewhere safe. Borrowing to invest adds risk: the debt and its interest must be repaid even if the investment falls in value.

Worked examples

Example 1 — scaffolded

Priya invests \$5000 in a managed fund (money pooled from many investors and spread across a range of investments). After one year the investment is worth \$5400, which includes \$150 of income already paid to her. Find her profit and her percentage return.

Working	Comment
Profit $= 5400 - 5000 = \$400$.	Final value minus the amount invested (the \$150 income is already included in the \$5400).
Percentage return $= \dfrac{400}{5000} \times 100\% = 8\%$.	Profit as a percentage of the amount invested.
A return of 8% is higher than a typical savings account, which reflects the fund's higher risk.	Higher return usually means higher risk.

Example 2 — scaffolded

Sam has \$10 000 to invest for one year. A savings account pays a guaranteed 4%, while a share fund is *expected* to return 8% but could lose money. Compare the two options.

Working	Comment
Savings: $10\,000 \times 0.04 = \$400$, guaranteed.	A known, low-risk return.
Shares: $10\,000 \times 0.08 = \$800$ *expected*, but not guaranteed.	Double the expected return — but the value could also fall.
Sam must weigh the extra \$400 of expected return against the risk of a loss.	The risk–return trade-off: more reward, more risk.

Example 3 — unscaffolded

Zoe invests \$20 000 in a share fund for one year. In a good year the fund rises 12%; in a bad year it falls 7%. Find the value of the investment at the end of the year in each case, and state what this shows about the risk.

In a good year the investment rises by $0.12 \times 20\,000 = \$2400$, so it is worth

$$20\,000 + 2400 = \$22\,400.$$

In a bad year it falls by $0.07 \times 20\,000 = \$1400$, so it is worth

$$20\,000 - 1400 = \$18\,600.$$

$\therefore$ in a good year the investment is worth \$22 400, but in a bad year only \$18 600 — less than Zoe started with. This chance of finishing *below* the starting value is the risk of shares: their return is not guaranteed.

Example 4 — unscaffolded

The contents of Maria's home are worth \$40 000. Insurance costs a premium of \$600 per year. In any year there is about a 2% chance of a major loss of \$30 000 (from fire or theft). Explain, using an expected-loss calculation, why Maria still insures.

Without insurance, the expected loss in a year is

$$0.02 \times 30\,000 = \$600,$$

which is the same as the premium. So on *average* insurance costs about what she would lose anyway. However, the \$30 000 loss, though unlikely, would be **catastrophic** — Maria could not easily replace \$30 000 of belongings. Paying the certain \$600 premium removes that small chance of a disastrous loss.

∴ Maria insures to **transfer the risk** of a rare but unaffordable loss, which is worthwhile even though the premium roughly equals the expected loss.

Practice questions

Scaffolded

Q1. Leo invests \$8000 for a year and it grows to \$8600. (a) Find his profit. (b) Find his percentage return. (c) State whether this return suggests a low-risk or a higher-risk investment.

Q2. Ava has \$6000 to invest for a year. Account A pays 3.5% and term deposit B pays 4.2%. (a) Find the return from account A. (b) Find the return from term deposit B. (c) How much more does B return than A?

Q3. Noah buys \$12 000 of shares. After a year he sells them for \$12 900 and has also received \$360 in dividends. (a) Find his total profit (price gain plus dividends). (b) Find his percentage return. (c) Explain why shares are considered higher-risk than a savings account.

Q4. Luca invests \$20 000 for a year: \$10 000 in a savings account at 4%, \$5000 in a bond fund at 5%, and \$5000 in a share fund expected to return 9%. (a) Find the return from the savings account. (b) Find the return from the bond fund and the return from the share fund. (c) Find the total return and the overall percentage return on the \$20 000.

Q5. Mia has \$30 000 to invest. (a) Explain what it means to *diversify* this money. (b) Suggest how she could split it across three different types of investment. (c) State how diversifying changes her risk.

Q6. Home insurance costs a premium of \$450 per year. In any year there is a 3% chance of an \$18 000 loss. (a) Find the expected loss without insurance. (b) Compare the premium with the expected loss. (c) Give one reason to insure even if the premium were higher than the expected loss.

Unscaffolded

Q7. An investment of \$15 000 grows to \$16 200 in a year. Find the percentage return.

Q8. Jordan has \$20 000. A low-risk option returns 5% and a high-risk option is expected to return 9%. Find the expected return in dollars from each, and state the trade-off Jordan faces.

Q9. An investor buys a property for \$500 000 and sells it for \$560 000, but pays \$15 000 in buying and selling costs. Find the percentage return on the \$500 000.

Q10. Jack borrows \$10 000 at 6% interest per year and invests it all in shares. Over the year the shares fall 8%. Find the loss on the shares and the interest owed, and hence his total loss for the year. Explain why borrowing made the outcome worse than if he had invested \$10 000 of his own money.

Q11. Explain, in terms of risk, why a financial adviser would recommend that a young saver spread \$40 000 across a savings account, a share fund and a bond fund rather than putting it all in one share.

Q12. A car worth \$25 000 can be insured for a premium of \$900 per year with a \$700 excess. In any year there is about a 4% chance the car is written off. (a) Find the expected loss without insurance. (b) Compare it with the premium and advise whether to insure.

Q13. An investment of \$10 000 falls in value to \$9200 over a year. Find the percentage return, and state what the sign of your answer means.

Q14. Two people each have \$50 000 to invest: one is 25 years old saving for retirement, the other is 64 and retiring next year. Explain, in terms of risk and time frame, why they should choose differently, and suggest a suitable option for each.

Q15. A financial adviser predicts that a \$5000 investment will be worth \$5350 after one year. Find the predicted percentage return.

Q16. Explain why financial advisers suggest keeping an "emergency fund" of several months' expenses in a safe, easy-to-access account rather than investing it in shares.

Q17. A share priced at \$50 pays an annual dividend of \$2.50. Find the **dividend yield** (the dividend as a percentage of the share price).

Q18. Portfolio P invests \$10 000: \$6000 in a savings account at a guaranteed 4% and \$4000 in a share fund expected to return 9%. Portfolio Q invests \$10 000 at a guaranteed 5%. (a) Find the expected return in dollars of each portfolio. (b) State which portfolio has the higher expected return, and which one is riskier.

Answers

Q1. (a) \$600. (b) 7.5%. (c) a higher-risk investment, since 7.5% is above a typical savings-account return. **Q2.** (a) \$210. (b) \$252. (c) \$42 more. **Q3.** (a) \$1260. (b) 10.5%. (c) the share price can fall, so the return is not guaranteed. **Q4.** (a) \$400. (b) \$250 from the bond fund, \$450 from the share fund. (c) \$1100 in total; 5.5%. **Q5.** (a) spreading the money across several different investments. (b) e.g. \$10 000 savings, \$10 000 shares, \$10 000 property/bonds. (c) it reduces the overall risk. **Q6.** (a) \$540. (b) the \$450 premium is less than the \$540 expected loss. (c) it protects against a rare but unaffordable large loss. **Q7.** 8%. **Q8.** low-risk \$1000, high-risk \$800 more expected (\$1800) but with a chance of loss; more expected reward means more risk. **Q9.** 9%. **Q10.** share loss \$800 + interest \$600 = \$1400 in total; the debt and its interest must be repaid even though the shares fell, so borrowing magnifies the loss. **Q11.** spreading the money means a fall in one investment is cushioned by the others, lowering overall risk; a single share is far more volatile. **Q12.** (a) \$1000. (b) the \$900 premium is less than the \$1000 expected loss, and insurance also removes the risk of a \$25 000 loss — insure. **Q13.** -8%; the negative sign means a loss. **Q14.** the 25-year-old has decades to recover from falls, so can take more risk (e.g. shares); the 64-year-old needs the money soon, so should choose a safe option (e.g. savings/term deposit). **Q15.** 7% predicted return. **Q16.** an emergency fund may be needed at any time, so it must be safe and accessible; shares could be down in value just when the money is needed. **Q17.** 5%. **Q18.** (a) P \$600, Q \$500. (b) P has the higher expected return; P is riskier (its share portion is not guaranteed), while all of Q's return is guaranteed.

Fully-worked solutions

Q1. (a) Profit $= 8600 - 8000 = \$600$. (b) Percentage return $= \dfrac{600}{8000} \times 100\% = 7.5\%$. (c) A return of 7.5% is higher than a typical savings account, so it suggests a higher-risk investment (as in Example 1).

Q2. (a) Account A: $6000 \times 0.035 = \$210$. (b) Term deposit B: $6000 \times 0.042 = \$252$. (c) $252 - 210 = \$42$ more from B.

Q3. (a) Price gain $= 12\,900 - 12\,000 = \$900$; adding dividends, total profit $= 900 + 360 = \$1260$. (b) Percentage return $= \dfrac{1260}{12\,000} \times 100\% = 10.5\%$. (c) Unlike a savings account, the share price can fall, so the \$12 900 (and hence the return) is not guaranteed — this uncertainty is the risk.

Q4. (a) Savings account: $10\,000 \times 0.04 = \$400$. (b) Bond fund: $5000 \times 0.05 = \$250$; share fund: $5000 \times 0.09 = \$450$. (c) Total return $= 400 + 250 + 450 = \$1100$, so the overall percentage return is $\dfrac{1100}{20\,000} \times 100\% = 5.5\%$.

Q5. (a) To diversify is to spread the \$30 000 across several different investments rather than putting it all into one. (b) For example \$10 000 in a savings account, \$10 000 in a share fund and \$10 000 in a bond or property fund. (c) If one investment falls, the others may hold or rise, so diversifying reduces the overall risk.

Q6. (a) Expected loss $= 0.03 \times 18\,000 = \$540$. (b) The premium (\$450) is **less** than the expected loss (\$540), so insurance is good value on average. (c) Even if the premium were higher, insurance protects against a rare \$18 000 loss that would be very hard to afford — it transfers that risk.

Q7. Profit $= 16\,200 - 15\,000 = \$1200$, so the return is $\dfrac{1200}{15\,000} \times 100\% = 8\%$.

Q8. Low-risk: $20\,000 \times 0.05 = \$1000$. High-risk: $20\,000 \times 0.09 = \$1800$ expected, i.e. \$800 more. The trade-off is that the extra \$800 of *expected* return comes with the risk that the high-risk option may return less, or lose money.

Q9. Profit $= (560\,000 - 500\,000) - 15\,000 = 60\,000 - 15\,000 = \$45\,000$. Return $= \dfrac{45\,000}{500\,000} \times 100\% = 9\%$.

Q10. Loss on the shares $= 0.08 \times 10\,000 = \$800$. Interest owed $= 0.06 \times 10\,000 = \$600$. Total loss $= 800 + 600 = \$1400$. Had Jack invested his own \$10 000, his loss would have been \$800 only — the debt and its interest must be repaid even when the investment falls, so borrowing to invest makes losses larger.

Q11. Putting all \$40 000 into one share means the saver's whole outcome depends on that single company; if it falls, everything falls. Spreading it across a savings account, a share fund and a bond fund means a poor result in one is cushioned by the others, so the overall risk is much lower for a similar expected return.

Q12. (a) Expected loss $= 0.04 \times 25\,000 = \$1000$. (b) The \$900 premium is less than the \$1000 expected loss, and insuring also removes the risk of a sudden \$25 000 loss the owner may not be able to cover — so insure.

Q13. Profit $= 9200 - 10\,000 = -\$800$, so the return is $\frac{-800}{10\,000} \times 100\,\% = -8\,\%$. The negative sign means the investment made a **loss** of $8\,\%$.

Q14. The 25-year-old has about 40 years before needing the money, so short-term falls have time to recover — they can accept more risk for higher expected return (e.g. a share fund). The 64-year-old needs the money within a year, so a fall could not be recovered in time — they should choose a safe, stable option (e.g. a savings account or term deposit).

Q15. Predicted profit $= 5350 - 5000 = \$350$, so the predicted percentage return is $\frac{350}{5000} \times 100\,\% = 7\,\%$.

Q16. An emergency fund might be needed at any moment (job loss, car repair, medical bill), so it must be safe and quickly accessible. Shares can be down in value exactly when the money is needed, forcing a sale at a loss — so an emergency fund is kept in a safe account, not invested for growth.

Q17. Dividend yield $= \frac{2.50}{50} \times 100\,\% = 5\,\%$.

Q18. (a) Portfolio P: $6000 \times 0.04 = \$240$ and $4000 \times 0.09 = \$360$, so the expected return is $240 + 360 = \$600$. Portfolio Q: $10\,000 \times 0.05 = \$500$. (b) Portfolio P has the higher expected return (\$600 vs \$500). Portfolio P is riskier: the return on its share portion is not guaranteed and could fall, while all of portfolio Q's return is guaranteed.

Theory

News reports, government websites and company reports are full of data about the economy, our health and the environment. Being able to **read, interpret and question** this data — rather than just accept a headline — is one of the most useful skills in this course. This section is about pulling meaning out of published tables and graphs, and knowing what a figure does (and does not) tell you.

Reading values and trends.

From a table or a line graph you can read a single **value** (the figure at one point) or describe a **trend** over time — is it rising, falling, steady, or fluctuating (going up and down)? Always check the **units** and the **time period** on the axes before drawing any conclusion.

Percentage change versus percentage-point change.

This distinction trips people up, especially with rates like unemployment or interest. Suppose an unemployment rate rises from $5\,\%$ to $6.5\,\%$.

- The **percentage-point** change is simply $6.5 - 5 = 1.5$ **percentage points**.
- The **percentage** change (the relative change) is

$$\frac{\text{new} - \text{old}}{\text{old}} \times 100\,\% = \frac{6.5 - 5}{5} \times 100\,\% = 30\,\%.$$

So the rate went up "1.5 percentage points", which is a "$30\,\%$ increase" in relative terms. Reporting one as the other is a common way to mislead. The percentage-change formula above works for any two data values (populations, prices, emissions, wages).

Comparing groups, years or countries.

To compare two figures, find the **difference** (how much more), or a **ratio** (how many times as large). For a rate, state whether you mean a percentage-point difference or a relative one.

Some common indicators.

Indicator	What it measures
Inflation rate / CPI	how fast prices are rising
Unemployment rate	percentage of the labour force without work
Gender pay gap	difference between men's and women's pay, as a percentage of men's: $\frac{\text{men} - \text{women}}{\text{men}} \times 100\,\%$
Life expectancy	average years a person is expected to live
Immunisation / vaccination rate	percentage of a group vaccinated
Emissions / temperature anomaly	greenhouse gas released; how far temperature is above a baseline

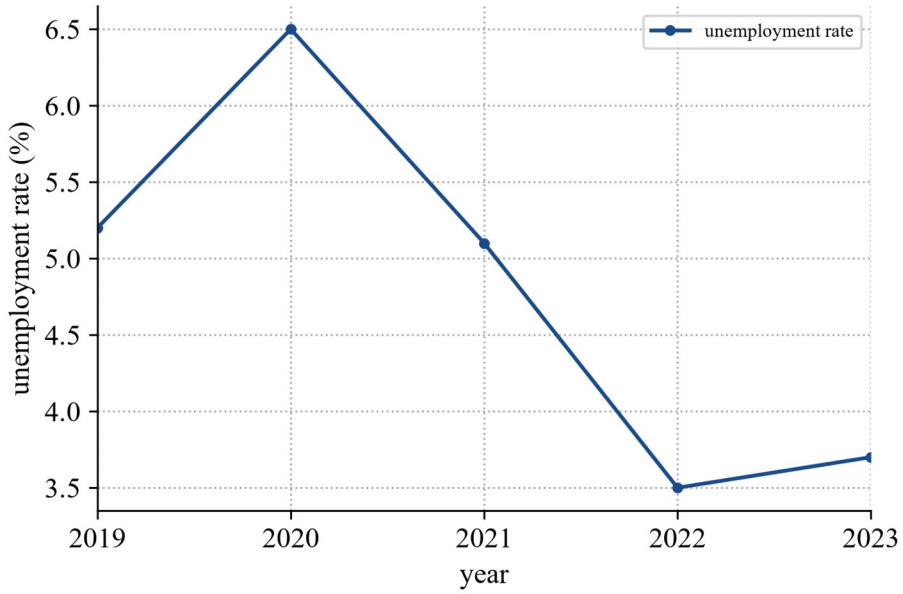
Drawing conclusions — and stating limitations.

A good conclusion is **supported by the data** and no stronger than the data allows. Just as important is naming a **limitation**: data may not show the *cause* of a trend (two things rising together does not prove one caused the other), may cover only a short period or one region, or may report a **total** when a **per-person** figure would be fairer (a big country has higher total emissions but perhaps lower emissions *per person*).

Worked examples

Example 1 — scaffolded

The line graph shows a country's unemployment rate (%) from 2019 to 2023.



The recorded rates were 5.2, 6.5, 5.1, 3.5 and 3.7 (per cent, in year order). Find (a) the year with the highest rate, (b) the change from 2019 to 2020 in percentage points, and (c) the change from 2020 to 2023 in percentage points.

Working	Comment
(a) The highest point on the graph is in **2020**, at $6.5\,\%$.	Read the peak off the graph or the largest value in the list.
(b) $6.5 - 5.2 = 1.3$ percentage points (a rise).	Subtract the two rates; the result is in percentage POINTS.
(c) $3.7 - 6.5 = -2.8$ percentage points (a fall).	A negative change means the rate fell overall.

Example 2 — scaffolded

A region's greenhouse-gas emissions fell from 550 Mt (megatonnes) of CO_2 in 2010 to 495 Mt in 2022. Find the percentage change in emissions.

Working	Comment
Change $= 495 - 550 = -55$ Mt.	New minus old; negative because emissions fell.
Percentage change $= \dfrac{-55}{550} \times 100\,\%$.	Divide the change by the ORIGINAL (2010) value.
$= -10\,\%$.	Emissions fell by $10\,\%$ over the period.

Example 3 — unscaffolded

In an industry, men earn a median of $\$1900$ per week and women earn a median of $\$1600$ per week. Find the gender pay gap as a percentage, and state what percentage of men's pay women earn.

The gender pay gap is the difference as a percentage of men's pay:

$$\frac{1900 - 1600}{1900} \times 100\,\% = \frac{300}{1900} \times 100\,\% = 15.79\,\% \text{ (to 2 d.p.)}.$$

Women's pay as a percentage of men's is $\dfrac{1600}{1900} \times 100\,\% = 84.2\,\%$.

$\therefore$ the gender pay gap is $15.79\,\%$; women earn about $84.2\,\%$ of what men earn.

Example 4 — unscaffolded

A health report gives the life expectancy in Country A as 83.2 years and in Country B as 76.5 years. State the difference, and give one limitation of concluding that "people in Country A are healthier".

The difference is $83.2 - 76.5 = 6.7$ years, so life expectancy in Country A is 6.7 years higher than in Country B. However, life expectancy alone does not measure how *healthy* people are while alive, and the gap could be due to income, health care, diet or safety rather than health itself — the data does not show the cause.

$\therefore$ Country A's life expectancy is 6.7 years higher, but this single figure does not prove its people are "healthier" — the cause of the gap is not shown.

Practice questions

Scaffolded

Q1. A country's childhood immunisation coverage (%) over five years was $82, 88, 91, 94, 95$. (a) Describe the trend. (b) Find the change from the first year to the last, in percentage points. (c) Find the percentage change from the first year to the last, correct to two decimal places.

Q2. The Consumer Price Index (CPI) rose from 104.5 to 111.2 over a year. (a) Find the change in the index. (b) Find the percentage change, correct to two decimal places. (c) State what this tells you about prices.

Q3. In a workplace, men earn a median of $\$1850$ per week and women earn $\$1550$. (a) Find the gender pay gap in dollars. (b) Find the gender pay gap as a percentage of men's pay, correct to two decimal places. (c) Find what percentage of men's pay women earn.

Q4. A climate report lists the global average temperature anomaly as 0.6 °C in 2000 and 1.1 °C in 2020. (a) Find the increase in the anomaly. (b) State the trend. (c) Explain what a "temperature anomaly" of 1.1 °C means.

Q5. The unemployment rate in region A is 4.2% and in region B is 6.8%. (a) Which region has the higher unemployment? (b) Find the difference in percentage points. (c) State one thing this comparison does **not** tell you.

Q6. A country's electricity was generated from coal (47%), renewables (32%) and gas (21%). (a) Check that the percentages account for all the electricity. (b) State the largest source. (c) If total generation was $200\,000$ GWh, find the amount from renewables.

Unscaffolded

Q7. A city's emissions fell from 620 Mt to 558 Mt of CO_2 over a decade. Find the percentage change, correct to one decimal place.

Q8. Life expectancy is 82.3 years for women and 74.8 years for men in a country. Find the difference, and state one reason such a gap should not be read as "women are healthier than men".

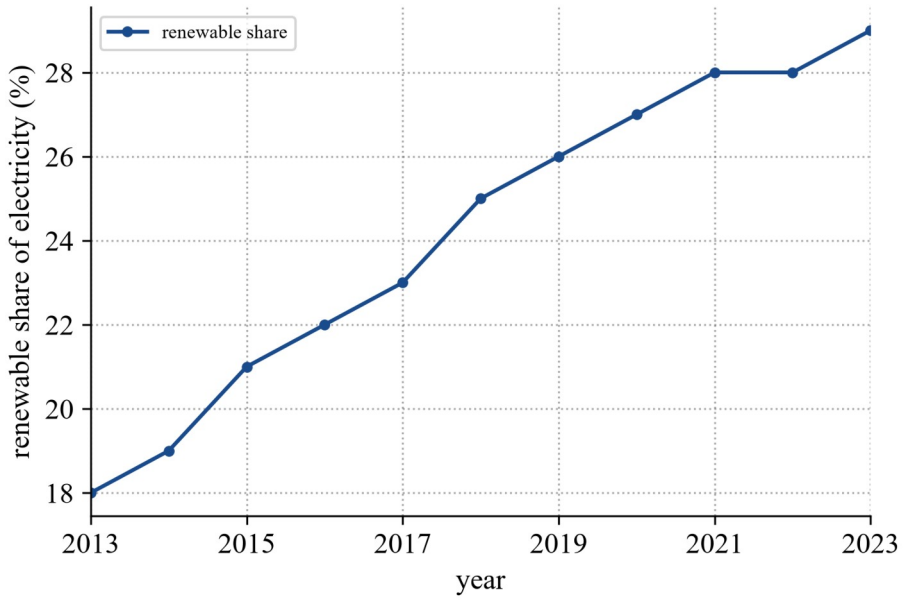
Q9. The CPI rose from 118.0 to 122.5 in a year. Find the percentage change (the inflation rate), correct to two decimal places.

Q10. In an industry, men's median pay is $\$2100$ per week and women's is $\$1743$. Find the gender pay gap as a percentage of men's pay, correct to one decimal place.

Q11. The youth unemployment rate is 9.6% while the national rate is 4.1%. (a) Find the difference in percentage points. (b) Find how many times the national rate the youth rate is, correct to two decimal places.

Q12. Immunisation coverage is 76% in area A and 92% in area B. State which is higher and by how many percentage points, and explain why the lower area may be a health concern.

Q13. The graph shows a country's renewable share of electricity from 2013 to 2023.



The share rose from 18 % to 29 %. (a) Find the change in percentage points. (b) Find the percentage change, correct to one decimal place.

Q14. The median full-time wage rose from $\$\,65\,000$ to $\$\,72\,800$ over five years. Find the percentage change, correct to one decimal place.

Q15. A temperature anomaly rose from 0.7 °C to 1.15 °C. Find the increase, correct to two decimal places.

Q16. The number of reported cases of a disease fell from 2400 to 1560 in a year after a vaccination program. Find the percentage change, correct to one decimal place, and state one limitation of concluding the program caused the fall.

Q17. A table lists three countries' life expectancy and health spending per person: Country A 82.1 years, $\$\,5200$; Country B 79.4 years, $\$\,4100$; Country C 83.6 years, $\$\,6000$. (a) Describe the general relationship between spending and life expectancy in this table. (b) State one limitation of concluding "more spending always means longer life".

Q18. A report states that a region's unemployment rate fell from $5.5\,\%$ to $4.0\,\%$ and concludes "more people are now in work". Explain why the fall in the *rate* alone does not prove this, naming one other figure you would want to check.

Answers

Q1. (a) rising each year. (b) 13 percentage points. (c) 15.85%. **Q2.** (a) 6.7. (b) 6.41%. (c) prices rose by about 6.4% over the year. **Q3.** (a) $\$300$. (b) 16.22%. (c) 83.78%. **Q4.** (a) 0.5 °C. (b) rising. (c) the average temperature was 1.1 °C above the long-term baseline. **Q5.** (a) region B. (b) 2.6 percentage points. (c) it does not tell you the number of people unemployed, or the population sizes. **Q6.** (a) $47+32+21=100\%$. (b) coal. (c) $32\% \times 200\,000 = 64\,000$ GWh. **Q7.** -10.0%. **Q8.** 7.5 years; a life-expectancy gap can be due to occupation, risk-taking or health-care use, not overall "healthiness". **Q9.** 3.81%. **Q10.** 17.0%. **Q11.** (a) 5.5 percentage points. (b) 2.34 times. **Q12.** area B is higher by 16 percentage points; area A's lower coverage risks outbreaks of preventable disease. **Q13.** (a) 11 percentage points. (b) 61.1%. **Q14.** 12.0%. **Q15.** 0.45 °C. **Q16.** -35.0%; the fall could be due to other factors (better hygiene, fewer tests, a natural drop), so the program is not proven to be the cause. **Q17.** (a) higher spending generally goes with higher life expectancy (B lowest on both; C highest on both). (b) the relationship is not exact and other factors (diet, lifestyle, health system) matter; correlation is not causation. **Q18.** the rate can fall if people give up looking for work (and leave the labour force); you would want the number employed or the participation rate.

Fully-worked solutions

Q1. (a) The coverage rises every year, from 82% to 95% — an upward trend. (b) $95-82=13$ percentage points. (c) Percentage change $=\dfrac{95-82}{82}\times 100\% = \dfrac{13}{82}\times 100\% = 15.85\%$ (to 2 d.p.).

Q2. (a) Change $=111.2-104.5=6.7$. (b) Percentage change $=\dfrac{6.7}{104.5}\times 100\% = 6.41\%$ (to 2 d.p.). (c) Prices, on average, rose by about 6.4% over the year (this is the inflation rate).

Q3. (a) Gap $=1850-1550=\$300$ per week. (b) As a percentage of men's pay, $\dfrac{300}{1850}\times 100\% = 16.22\%$ (to 2 d.p.).

(c) Women earn $\dfrac{1550}{1850}\times 100\% = 83.78\%$ of men's pay.

Q4. (a) Increase $=1.1-0.6=0.5$ °C. (b) The anomaly is rising, so the world is warming. (c) A temperature anomaly of 1.1 °C means the average temperature was 1.1 °C **above** the long-term baseline (not that the temperature was 1.1 °C).

Q5. (a) Region B (6.8%) has the higher unemployment. (b) $6.8-4.2=2.6$ percentage points. (c) It does not tell you how many people are unemployed in each region, because the populations (labour-force sizes) may be very different.

Q6. (a) $47+32+21=100\%$, so the three sources account for all the electricity. (b) Coal (47%) is the largest source. (c) Renewables: $32\% \times 200\,000 = 0.32 \times 200\,000 = 64\,000$ GWh.

Q7. Percentage change $=\dfrac{558-620}{620}\times 100\% = \dfrac{-62}{620}\times 100\% = -10.0\%$: emissions fell by 10%.

Q8. Difference $=82.3-74.8=7.5$ years. A gap in life expectancy can come from differences in occupation, risk-taking, or how often each group uses health care, so it is not evidence that women are "healthier" — only that they live longer on average.

Q9. Percentage change $=\dfrac{122.5-118.0}{118.0}\times 100\% = \dfrac{4.5}{118.0}\times 100\% = 3.81\%$ (to 2 d.p.), so the inflation rate was about 3.81%.

Q10. Gap $=\dfrac{2100-1743}{2100}\times 100\% = \dfrac{357}{2100}\times 100\% = 17.0\%$.

Q11. (a) $9.6 - 4.1 = 5.5$ percentage points. (b) $\frac{9.6}{4.1} = 2.34$ (to 2 d.p.), so the youth rate is about 2.34 times the national rate.

Q12. Area B ($92\,\%$) is higher than area A ($76\,\%$) by $92 - 76 = 16$ percentage points. Area A's lower coverage means more unvaccinated people, so it is at greater risk of an outbreak of a preventable disease.

Q13. (a) $29 - 18 = 11$ percentage points. (b) Percentage change $= \frac{29 - 18}{18} \times 100\,\% = \frac{11}{18} \times 100\,\% = 61.1\,\%$ (to 1 d.p.).

Q14. Percentage change $= \frac{72\,800 - 65\,000}{65\,000} \times 100\,\% = \frac{7\,800}{65\,000} \times 100\,\% = 12.0\,\%$.

Q15. Increase $= 1.15 - 0.7 = 0.45$ °C.

Q16. Percentage change $= \frac{1560 - 2400}{2400} \times 100\,\% = \frac{-840}{2400} \times 100\,\% = -35.0\,\%$: cases fell by $35\,\%$. The fall cannot be credited to the program alone — hygiene, reduced testing or a natural decline could also have contributed (correlation is not causation).

Q17. (a) Ordering by spending: B ($\$4100$, 79.4 yr), A ($\$5200$, 82.1 yr), C ($\$6000$, 83.6 yr) — as spending rises, life expectancy also rises, so there is a positive relationship in this table. (b) The pattern is not exact and other factors (diet, lifestyle, how efficiently the money is spent) affect life expectancy, so more spending does not *always* mean longer life — a positive relationship is not proof of cause.

Q18. The unemployment **rate** is the percentage of the *labour force* that is looking for work. The rate can fall simply because discouraged people stop looking and leave the labour force, even if no extra jobs were created. To show that "more people are in work" you would check the **number employed** (or the **participation rate**), not just the rate.