

Formulae and rearranging

Pearson Edexcel GCSE Mathematics 1MA1 • L021
Foundation and Higher • 60 minutes • Lesson resources

REACH FOR THE STAR | GCSE MATHEMATICS

Substitute into formulae and change the subject by inverse operations. State necessary restrictions and check with values.

Work without a calculator except where a check is invited. Write on the lines or replace them with typed answers. Attempt before reading intentional practice feedback.

Connect & Check

Formula: equation connecting quantities. Subject: isolated variable. Rearrange: express the same relationship with a different subject. Restriction: excluded value such as a zero divisor.

R1

Solve $3x+4=19$.

R2

Evaluate $2a+3$ for $a=4$.

R3

Expand $2(x+5)$.

Share | In pairs, predict the first step for this problem: Changing the subject uses the same balanced operations as solving, but retains letters. From $y=3x+4$, subtract 4 to obtain $y-4=3x$, then divide by 3: $x=(y-4)/3$. Brackets show that the whole difference is divided. Compare your reasons before using the worked model.

Present through worked examples

Changing the subject uses the same balanced operations as solving, but retains letters. From $y=3x+4$, subtract 4 to obtain $y-4=3x$, then divide by 3: $x=(y-4)/3$. Brackets show that the whole difference is divided.

D1

Model: $y=x+5$ becomes $x=y-5$. Now make a the subject of $b=a-7$.

D2

Model: $y=3x+4$ becomes $x=(y-4)/3$. Now make n the subject of $C=5n+2$.

D3

Model: $P=2l+2w$ becomes $l=(P-2w)/2$. Now make w the subject.

D4

Model: $v=d/t$ becomes $d=vt$ by multiplying by t . Now make t the subject, for $v \neq 0$.

Apply with less support

Identify the required subject and undo operations in reverse order on both sides. Keep grouped numerators in brackets. Check by substitution into both versions; do not divide by zero.

A1

Make x the subject: $y=2x+3$; $y=2(x+3)$; $y=x/2+3$. Explain the different order of inverses.

A2

Make h the subject of $A=bh/2$ for $b \neq 0$. Use $A=30, b=5$ to find h .

A3

A taxi costs C pounds for d km, with $C=4+3d$. Rearrange for d , then find d when $C=25$.

Optional support: Start with the outermost operation.

Optional check: choose $x=2$ in $y=3x+4$ to give $y=10$. Enter $(10-4) \div 3$ to recover 2. Parentheses must reflect the written numerator.

Apply and extend reasoning

C1

Are $(P-2w)/2$ and $P/2-w$ equivalent? Justify without relying on one example.

C2

A learner rearranges $y=3x+4$ as $x=y/3-4$. Find a counterexample and repair it.

Intentional practice feedback — read after attempting

A1: $(y-3)/2$; $y/2-3$; $2(y-3)$.

A2: $h=2A/b$; $h=12$.

A3: $d=(C-4)/3$; 7 km.

C1: Yes: divide both terms of $P-2w$ by 2.

C2: At $y=10$ it gives $-2/3$, but $x=2$ is correct. Use $x=(y-4)/3$.

Correct one response and explain your change. Stretch is available to either tier; temporary support needs do not determine entry tier.

Recall & Review through retrieval

Work without notes. Six retrieval points; this attempt does not establish mastery. Equivalent exact numeric forms are accepted. Where accuracy is requested, also state the requested form in your written work.

Q1 x when $y=3x+4$ and $y=19$

Q2 h when $A=bh/2$, $A=30$, $b=5$

Q3 w when $P=2l+2w$, $P=30$, $l=9$

Q4 t when $d=120$, $v=40$ in $d=vt$

Q5 d when $C=4+3d$ and $C=25$

Q6 Solve $2x+5=13$

Intentional retrieval feedback

Q1 5; Q2 12; Q3 6; Q4 3; Q5 7; Q6 4. Correct and retry tomorrow, then in one week.

Prove independently and improve

P1–P2: five minutes without notes; 4 marks. Your teacher reviews explanations and method marks.
P3 has no mark.

P1

Make x the subject of $y=4x-3$. Show a balanced step. [2]

P2

Make h the subject of $A=bh/2$ for $b \neq 0$. [2]

P3

Explain one corrected error. Set a fresh question and a date to check it without support.

Teacher feedback: _____

Fresh question and retry date: _____

Delayed independent evidence: _____

Prepare for the next lesson

L022: Inequalities and number lines

F1

Tomorrow rearrange $y=5x+6$ for x .

F2

Before L022, explain the difference between $x=3$ and $x>3$.

Read and prepare

An inequality describes a set of values. An open circle excludes an endpoint; a filled circle includes it. A number line shows which side of the endpoint is allowed.

Digital workbook: save locally where available; export a JSON backup before closing or moving the file. Restore only this lesson/version. Printing records answers, not mastery. Live browser checks remain pending; use Word/PDF if required.

Optional extension activities

Allow 10–15 minutes for learners who have secured the main practice. Show a method, explain a check and justify your conclusion.

Stretch

Rearrange $A = \pi r^2$ for positive r , then find r when $A = 49\pi \text{ cm}^2$.

Deep challenge

Rearrange $v = u + at$ for t and identify when the rearrangement is invalid.

Recall & Review: feedback and extension integration

Lesson L021: Formulae and rearranging

Objective: Substitute into formulae and change the subject by inverse operations. State necessary restrictions and check with values.

Timing for a 60-minute lesson

0-7 Connect & Check; 7-14 Share; 14-25 Present/model; 25-44 Apply route choice/practice; 44-52 independent exam-style check; 52-60 Recall & Review, WWW/EBI and next step.

Recall & Review evidence

At the end of the lesson, solve a fresh question without prompts, explain one check, correct one error and record the next practice step.

What Went Well (WWW)

I represented the algebraic structure accurately, kept each transformation valid and checked the result by substitution, graph or equivalent reasoning.

Even Better If (EBI)

I will show the missing inverse operation or algebraic step, keep signs and brackets accurate and test the result in the original relationship.

Integrated stretch and deep challenge

Stretch: Rearrange $A = \pi r^2$ for positive r , then find r when $A = 49\pi \text{ cm}^2$.

Deep challenge: Rearrange $v = u + at$ for t and identify when the rearrangement is invalid.

My next-step response
