**Rearranging equations**

**A LEVEL LINKS**

**Scheme of work:** 6a. Definition, differentiating polynomials, second derivatives

**Textbook:**Pure Year 1, 12.1 Gradients of curves

Key points

* To change the subject of a formula, get the terms containing the subject on one side and everything else on the other side.
* You may need to factorise the terms containing the new subject.

Examples

**Example 1** Make *t* the subject of the formula *v* = *u* + *at*.

|  |  |
| --- | --- |
| *v* = *u* + *at*  *v* − *u* = *at* | **1** Get the terms containing *t* on one side and everything else on the other side.  **2** Divide throughout by *a*. |

**Example 2** Make *t* the subject of the formula *r* = 2*t* − *πt*.

|  |  |
| --- | --- |
| *r* = 2*t* − *πt*  *r* = *t*(2 − *π*) | **1** All the terms containing *t* are already on one side and everything else is on the other side.  **2** Factorise as *t* is a common factor.  **3** Divide throughout by 2 − *π*. |

**Example 3** Make *t* the subject of the formula .

|  |  |
| --- | --- |
| 2*t* + 2*r* = 15*t*  2*r* = 13*t* | **1** Remove the fractions first by multiplying throughout by 10.  **2** Get the terms containing *t* on one side and everything else on the other side and simplify.  **3** Divide throughout by 13. |

**Example 4** Make *t* the subject of the formula .

|  |  |
| --- | --- |
| *r*(*t* − 1) = 3*t* + 5  *rt* − *r* = 3*t* + 5  *rt* − 3*t* = 5 + *r*  *t*(*r* − 3) = 5 + *r* | **1** Remove the fraction first by multiplying throughout by *t* − 1.  **2** Expand the brackets.  **3** Get the terms containing *t* on one side and everything else on the other side.  **4** Factorise the LHS as *t* is a common factor.  **5** Divide throughout by *r* − 3. |

Practice

Change the subject of each formula to the letter given in the brackets.

**1** *C* = *πd*  [*d*]**2** *P* = 2*l* + 2*w* [*w*] **3** *D = * [*T*]

**4** ** [*t*] **5** *u* = *at* – *t* [*t*] **6** *V* = *ax* + 4*x* [*x*]

**7** ** [*y*] **8**  [*a*] **9**  [*d*]

**10**  [*g*] **11** *e*(9 + *x*) = 2*e* + 1 [*e*] **12**  [*x*]

**13** Make *r* the subject of the following formulae.

**a** *A* = *πr*2 **b**  **c** *P* = *πr* + 2*r* **d** 

**14** Make *x* the subject of the following formulae.

**a  b **

**15** Make sin *B* the subject of the formula 

**16** Make cos *B* the subject of the formula *b*2 = *a*2 + *c*2 – 2*ac* cos *B*.

Extend

**17** Make *x* the subject of the following equations.

**a**  **b** 

Answers

**1** *d* =  **2**  **3** 

**4**  **5**  **6** 

**7** *y* = 2 + 3*x* **8**  **9** 

**10**  **11**  **12** 

**13 a**  **b** 

**c**  **d** 

**14 a**  **b** 

**15** 

**16** 

**17 a**  **b** 