

Linear equations, and algebra with number

About 75 minutes No calculator 69 marks



Hints online, answers free with an account:
mathswariz.uk/worksheets/further-maths-linear-equations-and-algebra-with-number/

Date _____

A Do Now

The first questions are what today's lesson needs. The others bring back the last lesson.

- A1** Needed today [2 marks] **A2** Needed today [2 marks]
- Solve $7x - 4 = 3x + 18$. Write $\frac{a}{6} + \frac{b}{8}$ as a single fraction.

Answer

Answer

- A3** Last lesson [2 marks] **A4** Last lesson [2 marks]
- $x : y = 2 : 5$ and $y : z = 3 : 4$. A price rises by 8% to £54. Work out the price before the rise.
- Work out $x : z$ in its simplest form.

Answer

Answer

B Example, then your turn

Level 2

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

Solve $5(3x - 4) = 2(4x + 1) - 3x$.

Hint Multiply out both sides first. Then collect the x terms on the side with more of them.

- B1** Solve [3 marks]

$3(2y + 5) - 4(y - 3) = 7(y + 1)$.

Answer $y = \dots\dots$

EXAMPLE 2

Solve $\frac{x + 4}{3} - \frac{2x - 1}{5} = 1$.

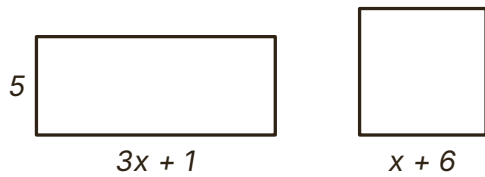
Hint Multiply EVERY term by 15, the LCM of 3 and 5. Put each top in a bracket first.

- B2** Solve $\frac{3t - 2}{4} - \frac{t + 5}{6} = 1$. [3 marks]

Answer $t = \dots\dots$

EXAMPLE 3

A rectangle is $(3x + 1)$ cm long and 5 cm wide. A square has sides of $(x + 6)$ cm. They have the same perimeter. Work out the area of the square.



Not drawn accurately

Hint Write each perimeter in terms of x and set them equal.

- B3** The sum of four consecutive odd numbers is 136. The smallest of them is n . Write an equation in n and solve it. Write down the largest of the four numbers. [3 marks]

Answer largest =

EXAMPLE 4

35% of a is equal to 14% of b . Work out a as a percentage of b .

Hint Write the percentages as decimals, then make a the subject.

- B4** p increased by 20% is equal to q decreased by 10%. Work out p as a percentage of q . [3 marks]

Answer%

EXAMPLE 5

a is 60% of b , and $b : c = 5 : 4$. Show that $4a = 3c$.

Hint Write a in terms of b and b in terms of c . Then put one into the other.

- B5** x is 125% of y , and $y : z = 4 : 7$. [3 marks]
Show that $7x = 5z$.

C1 Write an expression for each of these in its simplest form.

(a) $c\%$ of d [1 mark]

Answer

(b) k decreased by 35% [1 mark]

Answer

(c) m increased by 2.5% [1 mark]

Answer

Total for C1: 3 marks

C2 Maya is five times as old as her niece Ella. In 18 years' time Maya will be twice as old as Ella. Ella is e years old now.

(a) Write an expression for Maya's age in 18 years' time. [1 mark]

Answer

(b) Write an equation in e and solve it. How old is Maya now? [2 marks]

Answer Maya is

Total for C2: 3 marks

C3 A test has 30 questions. A correct answer scores 3 marks and 1 mark is taken off for each wrong answer. A question not tried scores nothing. Jo tries a questions and gets c of them correct.

(a) Write an expression for Jo's total mark. Simplify it. [2 marks]

Answer

(b) Jo tries 24 questions and scores 52. Work out how many she gets correct. [2 marks]

Answer

Total for C3: 4 marks

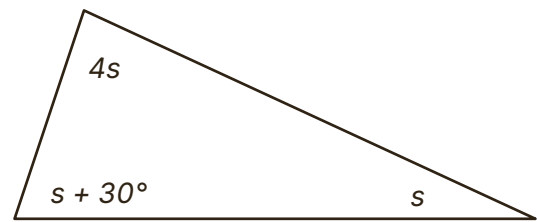
C4 $m : n = 5 : 8$ and r is 40% of n . [2 marks]
Work out $m : r$ in its simplest form.

Answer $m : r = \dots : \dots$

- C5** y is 30% greater than x . w is 30% less than y . Work out $w : x$ in its simplest form. [2 marks]

Answer $w : x = \dots : \dots$

- C6** In a triangle, the largest angle is four times the smallest angle, s . The third angle is 30° more than the smallest. Write an equation in s and work out the three angles. [3 marks]



Not drawn accurately

Answer $\dots^\circ, \dots^\circ, \dots^\circ$

D Exam-style questions

AQA exam style

- D1** Tom solves $\frac{x+5}{2} - \frac{x-1}{3} = 4$. He writes $3(x+5) - 2(x-1) = 4$, so $x+17=4$ and $x=-13$. [3 marks]

Explain Tom's mistake. Solve the equation correctly.

Answer $x = \dots\dots$

- D2** The ratio of boys to girls in a club is 5 : 4. Then 10 boys leave and 8 girls join. The ratio of boys to girls is now 3 : 4. Work out the number of boys and the number of girls in the club now. Do not use trial and improvement. You must show your working. [4 marks]

Answer boys $\dots\dots$ girls $\dots\dots$

- D3** p is 20% greater than q . p is also 20% less than r .

(a) Show that $r = 1.5q$ [2 marks]

(b) Work out $q : p : r$ in its simplest form.

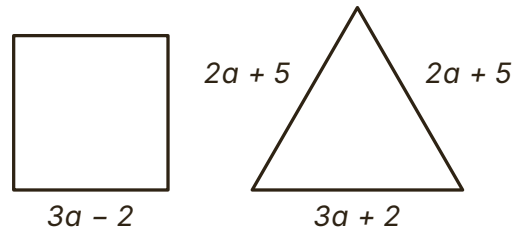
[2 marks]

Answer

Total for D3: 4 marks

D4 The diagram shows a square and an isosceles triangle. All lengths are in centimetres. The square and the triangle have the same perimeter.

(a) Work out the value of a . [3 marks]



Answer $a = \dots\dots$

Not drawn accurately

(b) Work out the area of the square. [2 marks]

Answer cm^2

Total for D4: 5 marks

D5 Here is an equation. $4(3x - 2) - 2(x + 1) = 5(2x - 3)$

(a) Show that the equation has no solution. [2 marks]

(b) The 3 on the right side is changed to k . Then $4(3x - 2) - 2(x + 1) \equiv 5(2x - k)$ is true for every value of x . Work out the value of k . [2 marks]

Answer $k = \dots\dots$

Total for D5: 4 marks

D6 Ali, Bev and Cal share some money. Bev gets £10 more than twice what Ali gets. Cal gets $\frac{3}{4}$ of what Bev gets. Altogether they get £152.50. Work out how much Cal gets. You must show your working. [4 marks]

Answer £

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 p is $m\%$ greater than q . p is also $m\%$ less than r . Write $r : q$ in terms of m . Then [5 marks]
work out the value of m for which $r : q = 3 : 2$.

Answer $r : q = \dots\dots$ $m = \dots\dots$

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** Write p in two ways, once using q and once using r .
Hint 2 $p = q \left(1 + \frac{m}{100}\right)$ and $p = r \left(1 - \frac{m}{100}\right)$.
Hint 3 So $\frac{r}{q} = \frac{100 + m}{100 - m}$. Set this equal to $\frac{3}{2}$:
 $200 + 2m = 300 - 3m$, so $m = 20$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

- I can solve linear equations with brackets and with fractions. ☐ ☐ ☐
- I can form an equation from a problem and solve it. ☐ ☐ ☐
- I can write percentage changes in algebra and use them with ratios. ☐ ☐ ☐
- I can tell when an equation has no solution or is true for every value. ☐ ☐ ☐