Substitution, Solving & Rearranging Equations

A collection of 9-1 Maths GCSE Sample and Specimen questions from AQA, OCR, Pearson-Edexcel and WJEC Eduqas.

Name:	
Total Marks:	

1. Solve.

   $3x^2 = 75$

   x = ... [2]

2. Solve.

   $3x + 7 = 19$

   x = ... [2]

3. Here is a formula.

   $T = 5r + 3u$

   Work out the value of T when r = 8 and u = 9.

   ..... [2]

4. Six equations are shown below, each labelled with a letter.

A	B	C
$y = -6x$	$x = \frac{1}{6}y$	$y = \frac{-3}{x}$
D	**E**	**F**
$x = \frac{6}{y}$	$y = 6x$	$y = \frac{2}{x} + 2$

Choose the correct letters to make this statement true.

Equation B and equation ..... are equivalent. [1]

5. Solve.

$5x = 2x + 18$

x = ... [2]

6. (a) Solve.

(i) $2x = 18$

(a)(i) x = ... [1]

(ii) $x + 2 = 5$

(ii) x = ... [1]

(iii) $\frac{x}{3} = 15$

(iii) x = ... [1]

(b) (i) Find the value of t when g = 4 and h = 7.

$t = 12g - 5h$

(b)(i) t = ... [2]

(ii) Rearrange to make r the subject.

$4r - p = q$

(ii) ..... [2]

7. Show that $3r = 2(5k^2 - 2r)$ can be rearranged to $k = \sqrt{\frac{7r}{10}}$

[4]

8. Find the value of a − b when a = 3 and b = -2.

..... [1]

9. Solve.

3a + 10 = a + 40

a = ... [3]

10. Here are three expressions.

$\frac{b}{a}$ $b - a$ ab

When a = 2 and b = - 6 which expression has the smallest value?

You must show your working.

[2]

11. Kelly is trying to work out the two values of w for which $3w - w^3 = 2$

Her values are 1 and -1

Are her values correct?

You must show your working.

[2]

12. Solve 4x + 5 = x + 26

x = ...

[2]

13. Solve 3x – 5 = 9

x = ...

[2]

14. f = 5x + 2y

x = 3 and y = −2

Find the value of f.

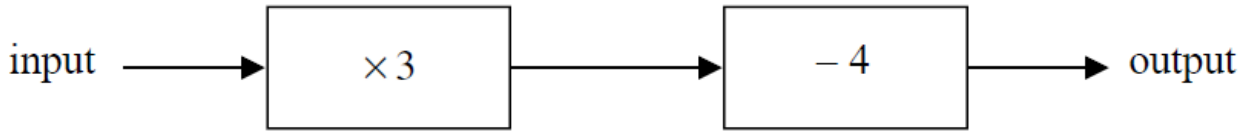
..... [2]

15. $q = \frac{p}{r} + s$

Make p the subject of this formula.

..... [2]

16. Here is a number machine.



(a) Work out the output when the input is 4

..... [1]

(b) Work out the input when the output is 11

..... [2]

(c) Show that there is a value of the input for which the input and the output have the same value.

[2]

17. Solve 3x + 7 = 1

x = ... [2]

18. f = 6, g = 5

Work out the value of 3f – 2g

..... [2]

19. Solve 5p = 3p + 8

..... [2]

20. Make t the subject of the formula $y = \frac{t}{3} - 2a$

..... [2]

21. (a) Alan is looking at number machine problems.

He says,

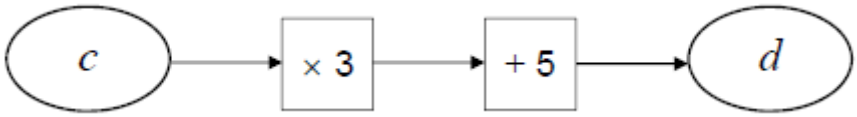
"If I know y I can work out x. I subtract 3 then I add 5."

Does this method work?

Give a reason for your answer.

[1]

(b)



He says,

"If I know d I can work out c. I divide by 3, then subtract 5."

Does this method work?

Give a reason for your answer.

[1]

22. Solve 5w - 11 = 24

[2]

23. A company has bikes for hire.

The cost, £C, to hire a bike for n days is given by the formula

$$C = 12 + \frac{27}{4}(n - 1)$$

(a) Write down the cost to hire a bike for 1 day.

[1]

(b)

Special offer

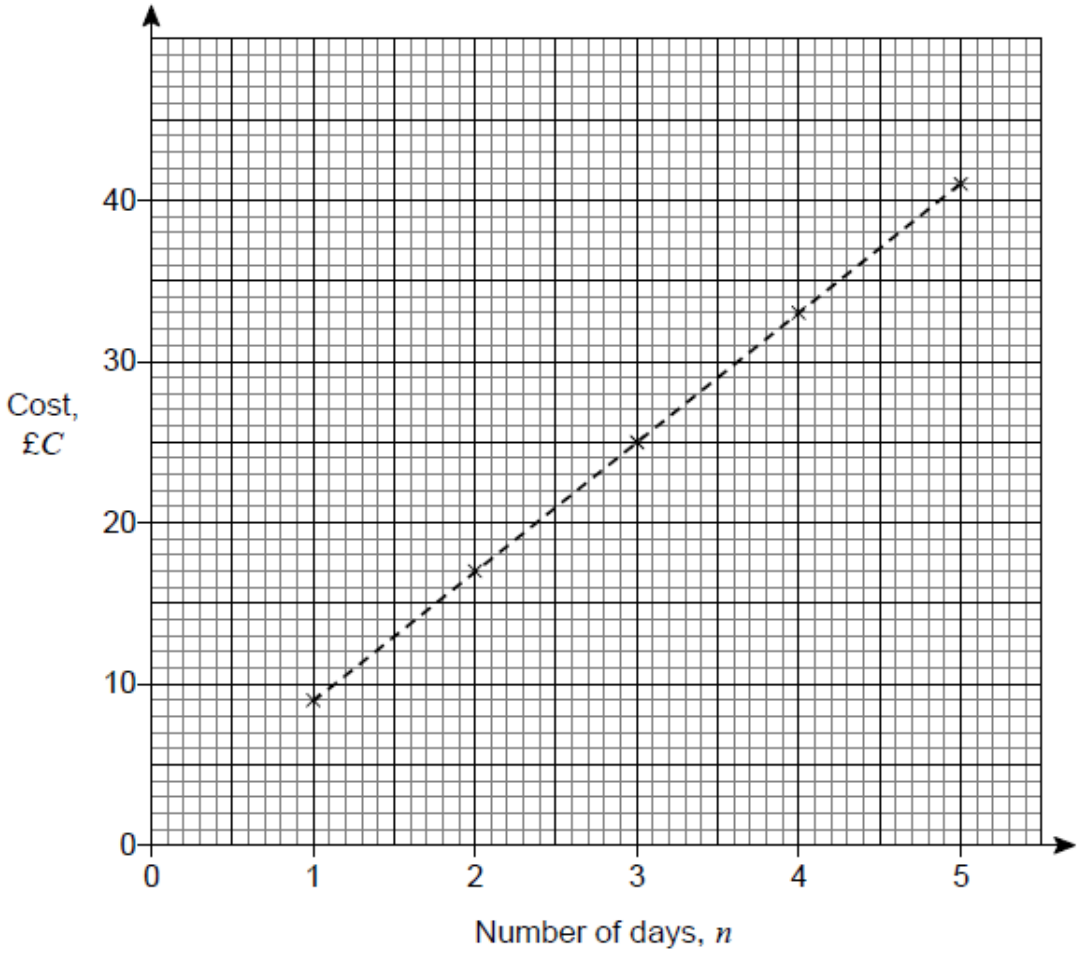
Hire a bike for £9 per day

Is it cheaper to hire a bike for 7 days using the special offer?

You must show your working.

[2]

(c) The graph shows the cost to hire a bike for one to five days at a different company.



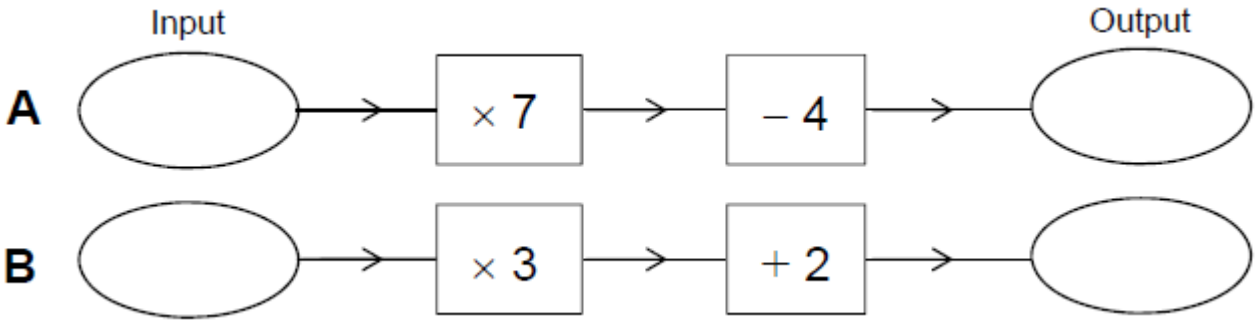
The cost, £C, to hire a bike for n days using this company is given by the formula

$$C = a + b(n - 1)$$

Work out the values of a and b.

a = _____ b = _____ [3]

24. Here are two number machines, A and B.



Both machines have the same input.

Work out the input that makes the output of A three times the output of B.

[4]

25. Solve 4(x + 5) = 15

[3]

26. Work out the value of 5x + 9y when x = 7 and y = –2

[2]

27. Solve 4x - 5 = 17

[2]

28. Here is a formula.

$$V = \frac{1}{2} x^2 h$$

Work out the value of V when $x = 11$ and $h = 6$

[2]

29. Solve 12x = 3

Circle your answer.

[1]

x = -9 $\quad$ x = $\frac{1}{4}$ $\quad$ x = 4 $\quad$ x = 36

30. You are given that a = 3 and b = 5

Tick whether each statement is true or false.

Give a reason for each answer.

Statement	True	False	Reason
$ab = 35$			
$2b^2 = 100$			

[2]

31. (a) Solve $4x = 16$

[1]

(b) Solve $\frac{y}{5} = 4$

[1]

(c) Solve $5a - 8 = 17$

[2]

32. Using the formula below, find the value of k when $p = 50$ and $q = 10$.

You must show all your working.

$$2q = p - 10k$$

[3]

33. (a) Solve $4c + 5 = 11$

c = ... [2]

(b) Solve $5(e + 7) = 20$

e = ... [2]

34. Make t the subject of the formula $w = 3t + 11$

[2]

35. (a) Solve $f + 2f + f = 20$

f =..... [1]

(b) Solve $18 - m = 6$

m =..... [1]

36. Complete this table of values.

n	$3n + 2$
12	.....
.....	47

[3]

CREDITS AND NOTES

Q	Awarding Body	Q	Awarding Body	Q	Awarding Body
1	OCR	13	Pearson Edexcel	25	AQA
2	OCR	14	Pearson Edexcel	26	AQA
3	OCR	15	Pearson Edexcel	27	AQA
4	OCR	16	Pearson Edexcel	28	AQA
5	OCR	17	Pearson Edexcel	29	AQA
6	OCR	18	Pearson Edexcel	30	AQA
7	OCR	19	Pearson Edexcel	31	WJEC Eduqas
8	OCR	20	Pearson Edexcel	32	WJEC Eduqas
9	OCR	21	AQA	33	Pearson Edexcel
10	AQA	22	AQA	34	Pearson Edexcel
11	AQA	23	AQA	35	Pearson Edexcel
12	Pearson Edexcel	24	AQA	36	Pearson Edexcel

Notes:

These questions have been retyped from the original sample/specimen assessment materials and whilst every effort has been made to ensure there are no errors, any that do appear are mine and not the exam board s (similarly any errors I have corrected from the originals are also my corrections and not theirs!).

Please also note that the layout in terms of fonts, answer lines and space given to each question does not reflect the actual papers to save space.

These questions have been collated by me as the basis for a GCSE working party set up by the GLOW maths hub - if you want to get involved please get in touch. The objective is to provide support to fellow teachers and to give you a flavour of how different topics "could" be examined. They should not be used to form a decision as to which board to use. There is no guarantee that a topic will or won't appear in the "live" papers from a specific exam board or that examination of a topic will be as shown in these questions.

Links:

AQA http://www.aqa.org.uk/subjects/mathematics/gcse/mathematics-8300

OCR http://ocr.org.uk/gcsemaths

Pearson Edexcel http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics-2015.html

WJEC Eduqas http://www.eduqas.co.uk/qualifications/mathematics/gcse/

Contents:

This version contains questions from:

AQA – Sample Assessment Material and Practice set 1

OCR – Sample Assessment Material and Practice set 1

Pearson Edexcel – Sample Assessment Material, Specimen set 1 and Specimen set 2.

WJEC Eduqas – Sample Assessment Material