Expressions and Formulae

Simplifying an expression, multiplying brackets and factorising

1. Simplify:

(a) $2x - 3x + 5x$ **(b)** $8y - 5y - 3y$ **(c)** $2s + 3t - s + 5t$

(d) $x + x + x + x + x$ **(e)** $k + 3k + 4k$ **(f)** $12m + 9m - 2m$

(g) $4p + 2q + 3q$ **(h)** $5x - 5x$ **(i)** $3a + 5b - b - 2a$

2. Multiply out the brackets:

(a) $3(x + 5)$ **(b)** $4(a - 9)$ **(c)** $x(x + 2)$ **(d)** $y(b - 5)$

3. Multiply out the brackets:

(a) $5(3x + 4)$ **(b)** $6(2b + c)$ **(c)** $10(4 - 5d)$ **(d)** $8(7y - 6)$

4. Multiply out the brackets and simplify:

(a) $3(x + 7) + 2x$ **(b)** $5(2y + 3) - 6y$ **(c)** $7(s - 4) + 13$

5. Multiply out the brackets and simplify

(a) $-2(b + 4)$ **(b)** $2(a + 2d) - 3(d - 2a)$

6. Factorise: **(a)** $3x + 9$ **(b)** $8x - 12$

7. Factorise:

(a) $12b + 8$ **(b)** $x^2 + 5x$ **(c)** $ab + ac$

(d) $6b - 9c$ **(e)** $2y^2 - 4y$ **(f)** $4ab^2 - 6abc$

Evaluating an expression or formulae which has more than one variable

1. If $x = 5$ and $y = 3$, find the value of

(a) $x + y$ **(b)** $2x - 4$ **(c)** $x^2 + 6y$

2. **(a)** $s = u + at.$ Find s when $u = 3$, $a = 5$ and $t = 6$

(b) $E = mc^2$ Find E when $m = 7$ and $c = 5$

(c) $b = \sqrt{\frac{c}{d}}$ Find b when $c = 100$ and $d = 4$

3. The cost of using a photocopier is £2 plus 5 pence for each copy printed.

The cost £C of printing n copies is given by the formula

$$C = 2 + 0{\cdot}05n$$

(a) Find the cost of printing a class set of 30 worksheets.

(b) Peter was charged £4.75 for a number of copies.

How many copies did he have made?

4. $W = \sqrt{\frac{V}{h}}$. Calculate W when $V = 81$ and $h = 9$.

5. Using the formula $F = \frac{\sqrt{E}}{g\,h^2}$, calculate F when $E = 3600$, $g = 3$ and $h = 2$.

6. The formula to calculate acceleration is given as

$$a = \frac{2d}{t^2}$$

Where a is the acceleration, d is the total distance and t is the time.
Calculate the acceleration when the distance is 100 metres and the time is 8 seconds.
Give your answer correct to 1 decimal place.

Extending a pattern and determining its formula

1. For their barbeque Mr and Mrs Goldie allowed 2 burgers for each person attending and an extra 8 to be on the safe side.

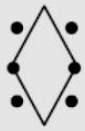
(a) Complete this table for the numbers of burgers they would need:

Number of people attending (n)	1	2	3	4	5	6	10	15	20
Number of burgers required (b)									

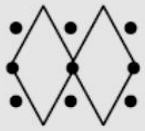
(b) Find a formula for the number of burgers for 'n' people attending the barbeque.

(c) How many burgers would be needed for a barbeque with 23 people attending?

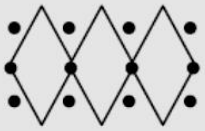
2. A pattern is built up as shown in this diagram:



Pattern 1
1 Diamond
6 Beads



Pattern 2
2 Diamonds
9 Beads



Pattern 3
3 Diamonds
12 Beads

(a) Complete the table for the number of diamonds and number of beads in other patterns.

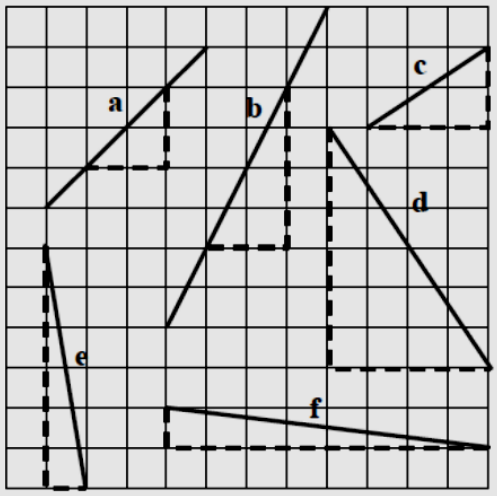
Number of Diamonds	1	2	3	4	5		12
Number of Beads	6	9	12				

(b) Write down a rule, in symbols, for finding the number of beads needed for any number of diamonds.

(c) Jasper has 57 beads, how many diamonds would he need to use up all of the beads?

Calculating the gradient of a straight line from horizontal and vertical distances

1. Find the **gradients** of the lines shown in the diagram below



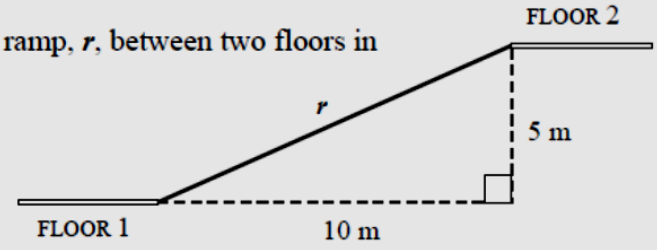
2. **(a)** Draw a coordinate diagram and plot the following pairs of points.

(i) A(3, 8) and B(7, 10) **(ii)** C(–8, 2) and D(3, –4)

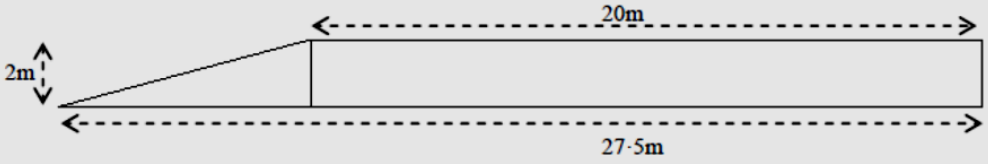
(b) Calculate the gradient of the lines AB and CD.

3. The diagram shows a moving ramp, ***r***, between two floors in a shopping centre.

Find the gradient of the ramp.



4. A special stage is being built for an outdoor concert. It has to be 20 metres wide, 2 metres high and have a ramp on one side.



To be safe the gradient of the ramp should be between 0·25 and 0·3.

Is this ramp safe? Show all your working and give a reason for your answer.