

UNITS 10 – 12

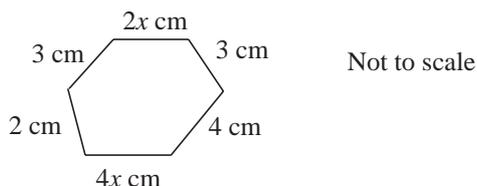
Miscellaneous Exercises



Note

Starred* questions are for *Academic Route* only.

1.



- (a) Write an expression in terms of x for the perimeter of this hexagon.
Simplify your answer.
- (b) The perimeter of the hexagon is 36 cm.
What is the value of x ?

(SEG)

2. Solve the equations

- (a) $3x + 2 = 16$,
(b) $5(2x - 1) = 35$,
(c) $4x + 3 = 18 - 2x$.

(NEAB)

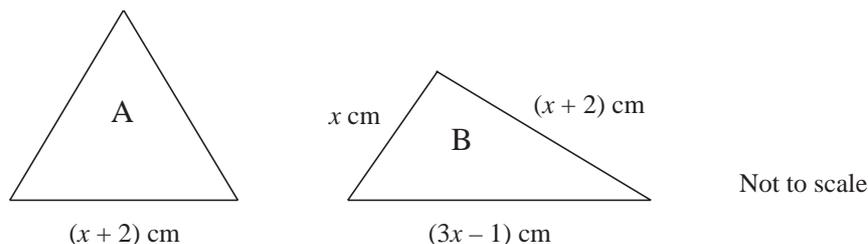
3. (a) The perimeter of a rectangle is $8x$ cm.



The length of the shorter side is x cm.

Write an expression, in terms of x , for the length of the longer side.

(b) The perimeters of these triangles are equal.



- (i) Triangle A is equilateral. Its perimeter is $3(x + 2)$ cm.
Multiply out $3(x + 2)$.

- (ii) Solve the equation

$$3(x + 2) = x + (x + 2) + (3x - 1)$$

- (iii) Calculate the perimeter of triangle B.

(SEG)

4. The equation
- $x^2 + 3x = 20$
- has a solution between 3 and 4.

Use a trial and improvement method to find the solution correct to one decimal place.

(SEG)

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5. Solve the simultaneous equations

$$2x + 3y = 14$$

$$8x - 5y = 5$$

(SEG)

6. One day at St. George's Comprehensive,

$\frac{1}{2}$ of the pupils walked to school,

$\frac{2}{5}$ of the pupils came to school by bus,

the remaining 68 pupils came by car.

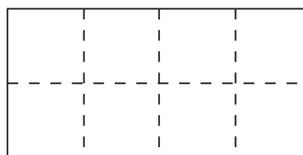
- (a) Work out $\frac{1}{2} + \frac{2}{5}$.
- (b) What fraction of the pupils came by car?
- (c) How many pupils are there in the school?

(NEAB)

7. (a) Shade
- $\frac{1}{6}$
- of this shape.



- (b) Shade 25% of this shape.



- (c) How much of this shape is shaded?
-
- Give your answer as a decimal.



(SEG)

8. Rowlinson School has 540 pupils.
 $\frac{2}{3}$ of the pupils stay at school for lunch.

Calculate how many pupils stay at school for lunch.

(NEAB)

9.

**Buy a BETTERPLUG.
 It will cut fridge freezer
 electricity costs by 15%.**

- (a) The average cost of the electricity needed to run a fridge freezer for one year is £65.

Calculate 15% of £65.

- (b) The price of a BETTERPLUG is £23.95.

How long will it take before the money spent on buying a BETTERPLUG is recovered by the saving in electricity?

Give your answer to a sensible degree of accuracy.

(NEAB)

10. Dipak's income is £25 546 per year. He does not pay tax on a pension contribution of $17\frac{1}{2}\%$ of his income.

Dipak also has an allowance of £3155 on which he does not pay tax.

He then pays tax at 25% on the rest of his income.

Calculate the amount of tax which Dipak pays.

(SEG)

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11. Scientists count the number of seals around the coast of Scotland.

They think that sea pollution is reducing the number of seals by 20% every year.

In May 1996 there were 13 000 seals.

- (a) How many seals do the scientists think there will be in

(i) May 1997,

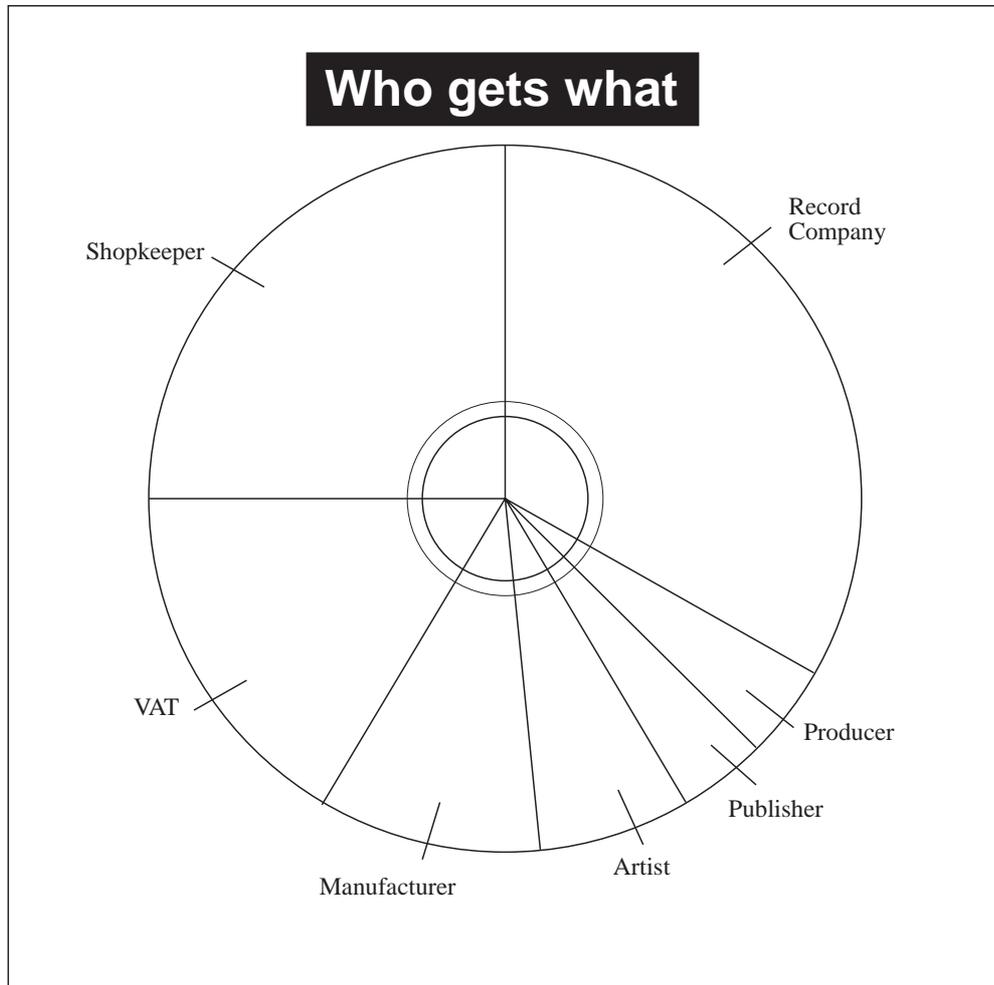
(ii) May 1999?

- (b) If this reduction continues, in what year would the seal population first fall below 3000?

(NEAB)

12. The selling price of a CD is £12.99.

The diagram below shows how the £12.99 is divided between the people who have been involved in the sale of a CD.



- (a) What fraction of the selling price goes to the Record Company?
- (b) How much money does the shopkeeper get from the sale of this CD?
- (c) The artist receives 88p for each CD sold.
What percentage of the £12.99 is this?

(NEAB)

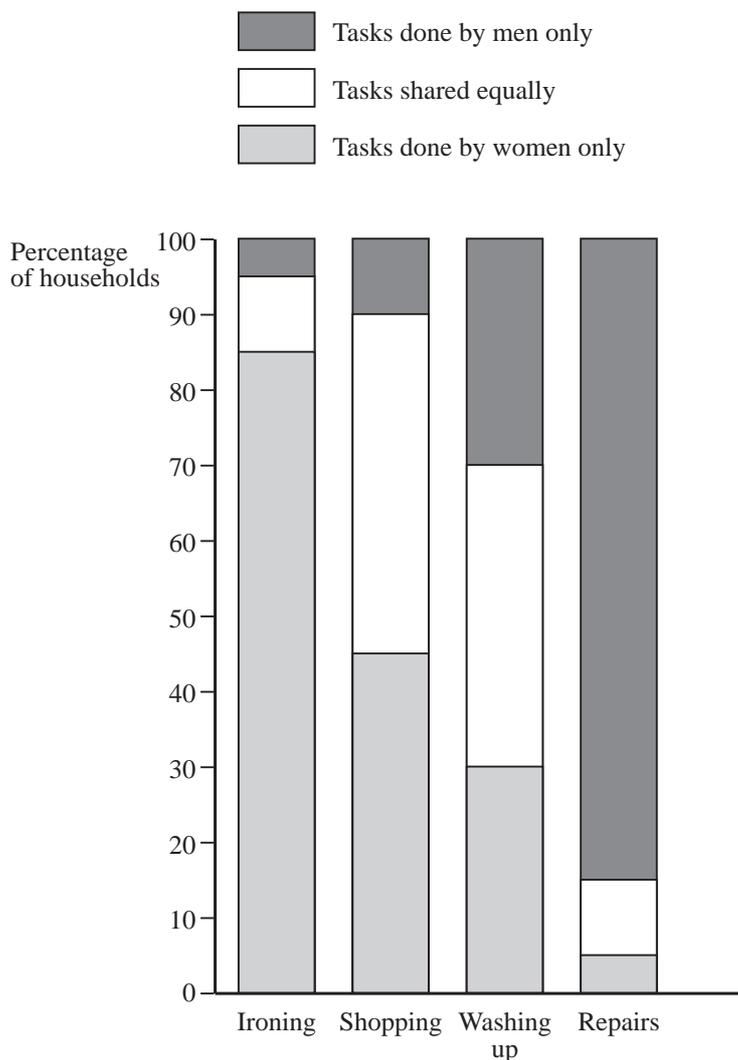
13. In 1993 a "CHOCO EASTER EGG" cost £1.60.

- (a) In 1994 a "CHOCO EASTER EGG" cost 10% more.
How much more did one of these eggs cost in 1994?
- (b) In 1995 a "CHOCO EASTER EGG" cost £1.90.

Calculate the percentage increase in the price of one of these eggs from 1993 to 1995.

(SEG)

14. The diagram shows some of the results of a survey to find out which household tasks are done by women only, which are done by men only, and which are shared.



- (a) Which of the four tasks is most likely to be done by
- (i) women only,
 - (ii) men only?
- (b) Shopping is done by women only in about 45% of households.
In what percentage of households is the shopping done by men only?
- (c) Another question asked in the survey was:

Who cooks the evening meal?

The results were: Women only: 70%
 Shared equally: 10%
 Men only: 20%

Show these results on a diagram similar to the one above.

(NEAB)

- * 15. £ 1000 is invested in a bank account at a rate of $r\%$ per annum. After n years the amount of money, £ A in the account is given by the formula

$$A = 1000 \left(1 + \frac{r}{100} \right)^n$$

- (a) Calculate A when $r = 4$ and $n = 3$.
- (b) £1000 is invested in a bank account at a rate of $r\%$ per annum. After three years the amount of money in the account is £1179.23.
- (i) Show that the value of r is between 5 and 6.
- (ii) By trial and improvement or otherwise, find the value of r correct to 2 decimal places.

(NEAB)

16. (a) Write down
- (i) all the prime numbers between 20 and 30,
- (ii) the first five square numbers,
- (iii) the cube of each of the first three positive whole numbers.
- (b) The first three lines of a number pattern are

$$1 \times 8 + 1 = 9$$

$$12 \times 8 + 2 = 98$$

$$123 \times 8 + 3 = 987$$

Write down the next two lines of this number pattern.

(NEAB)

17. Here are the first five multiples of 3:

3 6 9 12 15

- (a) Write down the first five multiples of 5.
- (b) The number 15 is a multiple of both 3 and 5.
Write down two more numbers that are multiples of both 3 and 5.
- (c) Find a number that is a multiple of both 3 and 5 and is also bigger than 100.

(NEAB)

- * 18. (a) Calculate the next term in the following sequences:

(i) 3, 10, 21, 36, ...

(ii) 5, 14, 27, 44, ...

- (b) The two sequences in (a) have been used to form the following number pattern:

$$3^2 + 4^2 = 5^2 \qquad \qquad \qquad 3 \text{ terms}$$

$$10^2 + 11^2 + 12^2 = 13^2 + 14^2 \qquad \qquad \qquad 5 \text{ terms}$$

$$21^2 + 22^2 + 23^2 + 24^2 = 25^2 + 26^2 + 27^2 \qquad \qquad \qquad 7 \text{ terms}$$

$$36^2 + 37^2 + 38^2 + 39^2 + 40^2 = 41^2 + 42^2 + 43^2 + 44^2 \qquad \qquad \qquad 9 \text{ terms}$$

Using your answers to (a), or otherwise, write down the next line of this number pattern.

- (c) The number of terms in each line of the number pattern form the sequence

$$3, \quad 5, \quad 7, \quad 9, \quad \dots$$

- (i) What is the 10th term of this sequence?
 (ii) Write down an expression for the n th term of this sequence.

(NEAB)

19. A sequence of numbers is

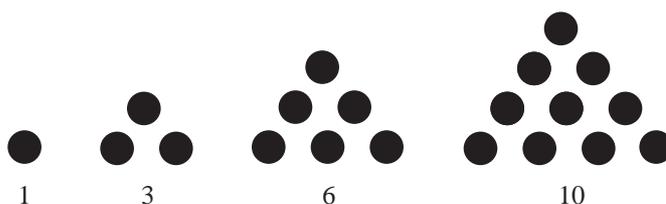
$$\dots, a, 9, 3, 1, \frac{1}{3}, b, \dots$$

In the sequence two numbers are shown as a and b .

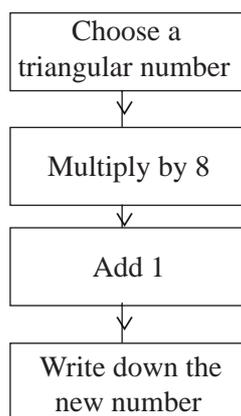
- (a) Describe how to find the number a .
 (b) Describe how to find the number b .

(SEG)

20. Here are the first four triangular numbers.



- (a) Write down the next two triangular numbers.
 (b) Here is a rule for working out a new set of numbers.



- (i) Use this rule to complete the table below.
 The first two have been done for you.

Triangular number	1	3	6	10
New number	9	25		

- (ii) 9 and 25 are both odd numbers.

What is the other special name given to these numbers?

- (iii) Write down an equation connecting the new numbers and the triangular numbers. Use N to stand for the new number and T to stand for the triangular number.

(NEAB)

21. The positive integers are arranged as shown.

1					
2	3				
4	5	6			
7	8	9	10		
11	12	13	14	15	
16	17	18	19	20	21

The numbers, 1, 3, 6, 10, 15, 21, . . . , formed by the last entry in each row are called triangular numbers.

- (a) Write down the next two triangular numbers in this sequence.
- (b) The last number in each row can be found by using the formula $kn(n + 1)$, where k is a constant and n is the number of the row.
- (i) Use row 4 to show that $k = \frac{1}{2}$.
- (ii) What is the last entry in row 100?
- (iii) Find, by trial and improvement, the row in which the number 1996 appears.

(NEAB)