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MATHEMATICS

0580/42

Paper 4 (Extended)

October/November 2020

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π , use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Blank pages are indicated.

1 Karel travelled from London to Johannesburg and then from Johannesburg to Windhoek.

- (a) The flight from London to Johannesburg took 11 hours 10 minutes.
The average speed was 813 km/h.

Calculate the distance travelled from London to Johannesburg.
Give your answer correct to the nearest 10 km.

..... km [3]

- (b) The total time for Karel’s journey from London to Windhoek was 15 hours 42 minutes.
The total distance travelled from London to Windhoek was 10 260 km.

- (i) Calculate the average speed for this journey.

..... km/h [2]

(ii) The cost of Karel's journey from London to Windhoek was \$470.

(a) Calculate the distance travelled per dollar.

..... km per dollar [1]

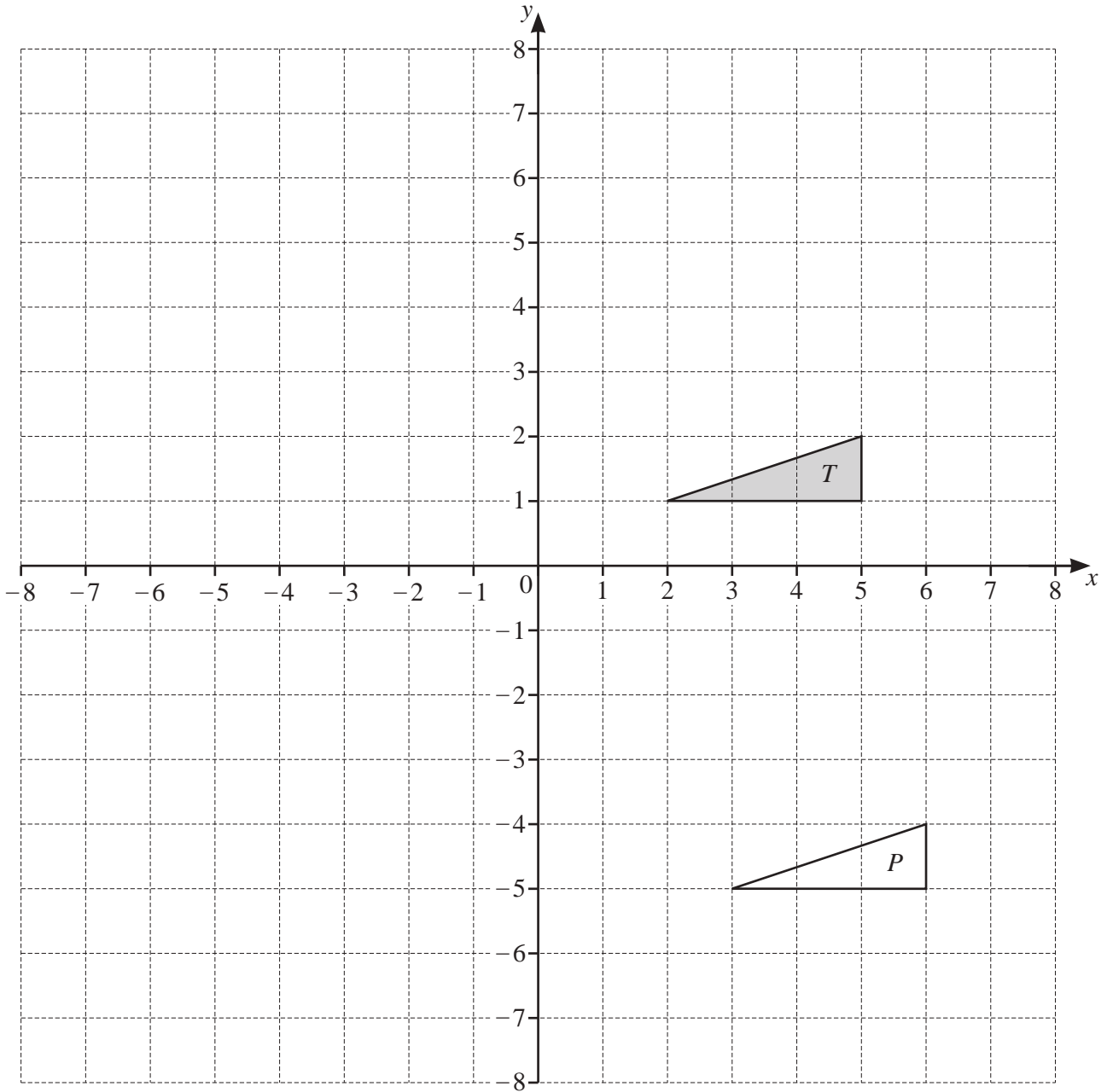
(b) Calculate the cost per 100 km of this journey.
Give your answer correct to the nearest cent.

\$ per 100 km [2]

(c) Karel changed \$300 into 3891 Namibian dollars.

Complete the statement.

\$1 = Namibian dollars [1]



(a) Describe fully the **single** transformation that maps triangle *T* onto triangle *P*.

.....

[2]

(b) (i) Reflect triangle *T* in the line $x = 1$.

[2]

(ii) Rotate triangle *T* through 90° anticlockwise about $(6, 0)$.

[2]

(iii) Enlarge triangle *T* by a scale factor of -2 , centre $(1, 0)$.

[2]

3 (a) Beth invests \$2000 at a rate of 2% per year compound interest.

(i) Calculate the value of this investment at the end of 5 years.

\$ [2]

(ii) Calculate the overall percentage increase in the value of Beth's investment at the end of 5 years.

..... % [2]

(iii) Calculate the minimum number of complete years it takes for the value of Beth's investment to increase from \$2000 to more than \$2500.

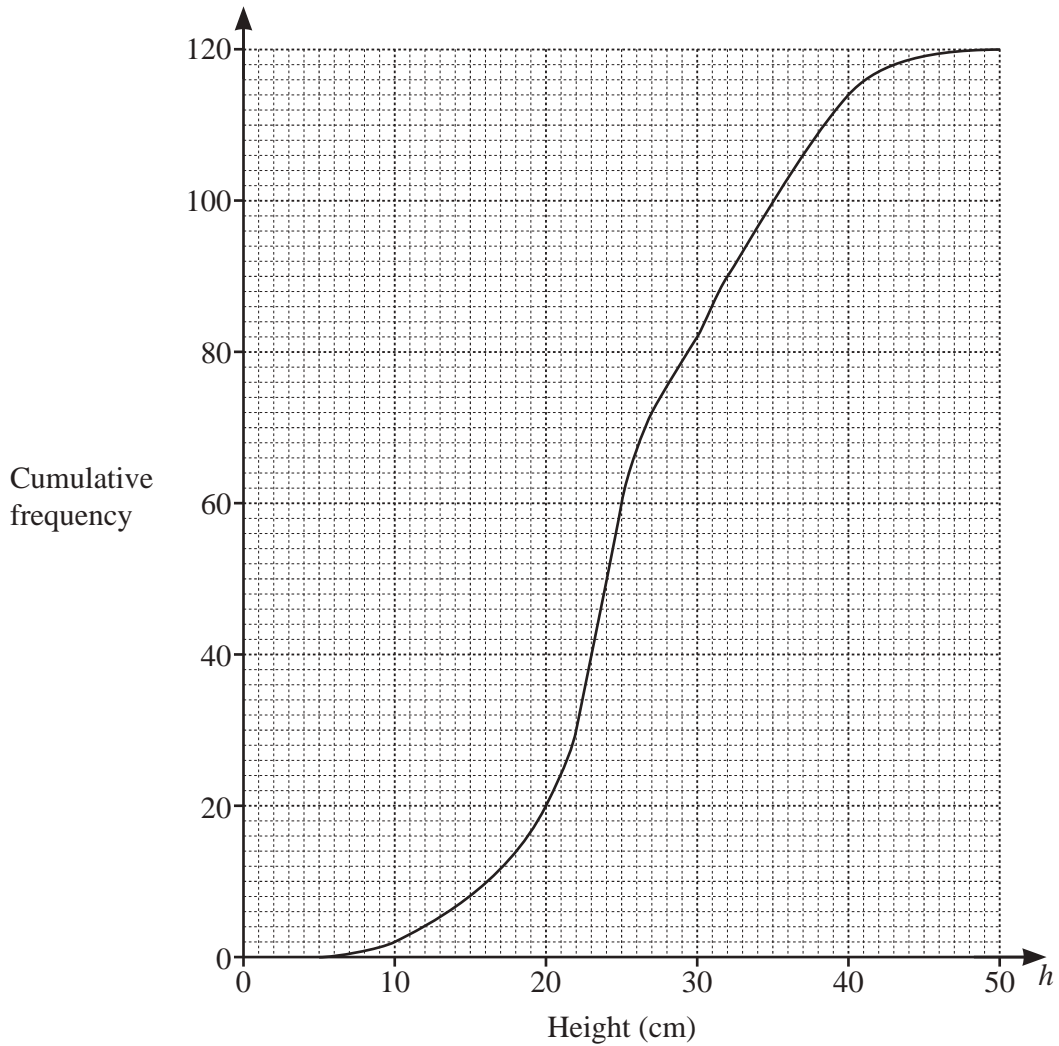
..... [3]

(b) The population of a village decreases exponentially at a rate of 4% each year.
The population is now 255.

Calculate the population 16 years ago.

..... [3]

- 4 The height, h cm, of each of 120 plants is measured.
The cumulative frequency diagram shows this information.



(a) Use the cumulative frequency diagram to find an estimate of

(i) the median,

..... cm [1]

(ii) the interquartile range,

..... cm [2]

(iii) the 60th percentile,

..... cm [1]

(iv) the number of plants with a height greater than 40 cm.

..... [2]

(b) The information in the cumulative frequency diagram is shown in this frequency table.

Height, h cm	$0 < h \leq 10$	$10 < h \leq 20$	$20 < h \leq 30$	$30 < h \leq 50$
Frequency	2	18	62	38

(i) Calculate an estimate of the mean height.

..... cm [4]

(ii) A histogram is drawn to show the information in the frequency table.
The height of the bar representing the interval $10 < h \leq 20$ is 7.2 cm.

Calculate the height of the bar representing the interval $30 < h \leq 50$.

..... cm [2]

- 5** Ahmed sells different types of cake in his shop.
The cost of each cake depends on its type and its size.

Every small cake costs $\$x$ and every large cake costs $\$(2x + 1)$.

- (a) The total cost of 3 small lemon cakes and 2 large lemon cakes is $\$12.36$.

Find the cost of a small lemon cake.

$\$ \dots\dots\dots$ [3]

- (b) The cost of 18 small chocolate cakes is the same as the cost of 7 large chocolate cakes.

Find the cost of a small chocolate cake.

$\$ \dots\dots\dots$ [3]

- (c) The number of small cherry cakes that can be bought for $\$4$ is the same as the number of large cherry cakes that can be bought for $\$13$.

Find the cost of a small cherry cake.

$\$ \dots\dots\dots$ [3]

- (d) Petra spends \$20 on small coffee cakes and \$10 on large coffee cakes.
The total number of cakes is 45.

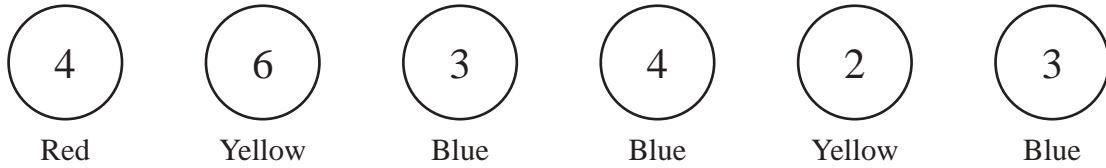
Write an equation in terms of x .

Solve this equation to find the cost of a small coffee cake.

Show all your working.

\$ [7]

6



The diagram shows six discs.
Each disc has a colour and a number.

(a) One disc is picked at random.

Write down the probability that

(i) the disc has the number 4,

..... [1]

(ii) the disc is red and has the number 3,

..... [1]

(iii) the disc is blue and has the number 4.

..... [1]

(b) Two of the six discs are picked at random **without** replacement.

Find the probability that

(i) both discs have the number 3,

..... [2]

(ii) both discs have the same colour.

..... [3]

(c) Two of the six discs are picked at random **with** replacement.

Find the probability that both discs have the same colour.

..... [3]

7 $y = x^2 + \frac{1}{x}, x \neq 0$

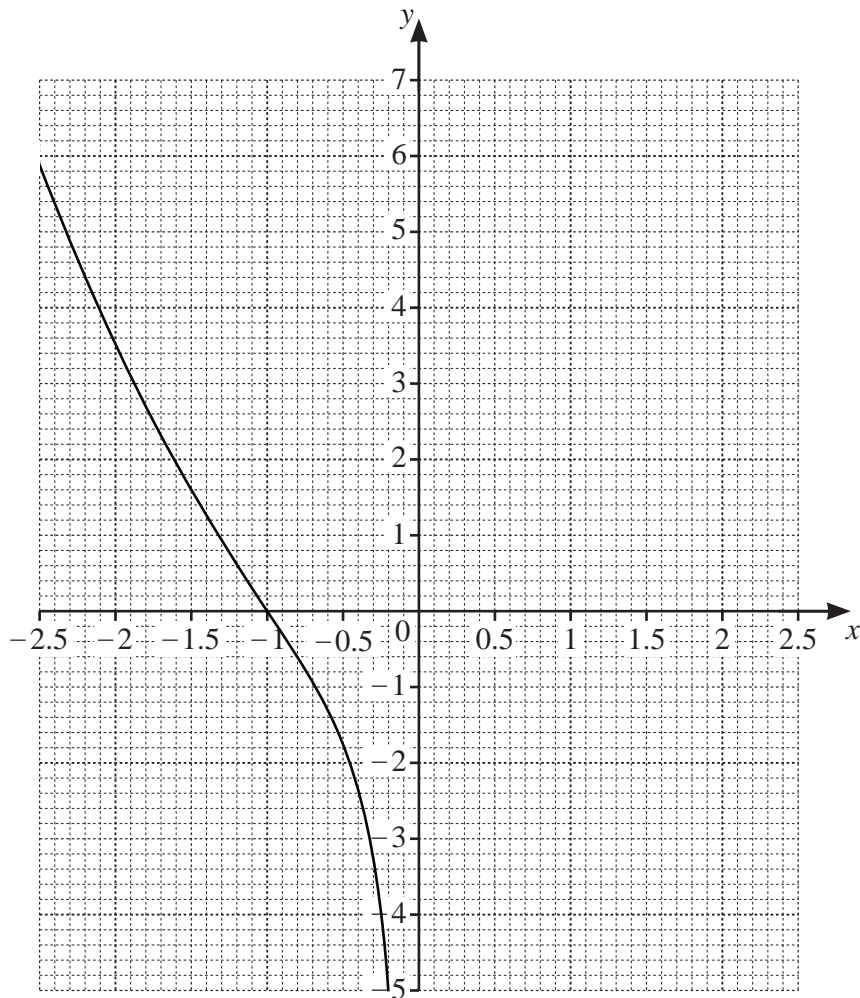
(a) Complete the table.

x	0.2	0.3	0.5	1	1.5	2	2.5
y	5.0	3.4	2.3		2.9		6.7

[2]

(b) On the grid, draw the graph of $y = x^2 + \frac{1}{x}$ for $0.2 \leq x \leq 2.5$.

The graph of $y = x^2 + \frac{1}{x}$ for $-2.5 \leq x \leq -0.2$ has been drawn for you.



[4]

(c) By drawing suitable straight lines on the grid, solve the following equations.

(i) $x^2 + \frac{1}{x} = -2$

$x = \dots\dots\dots$ [1]

(ii) $x^2 + \frac{1}{x} + x - 1 = 0$

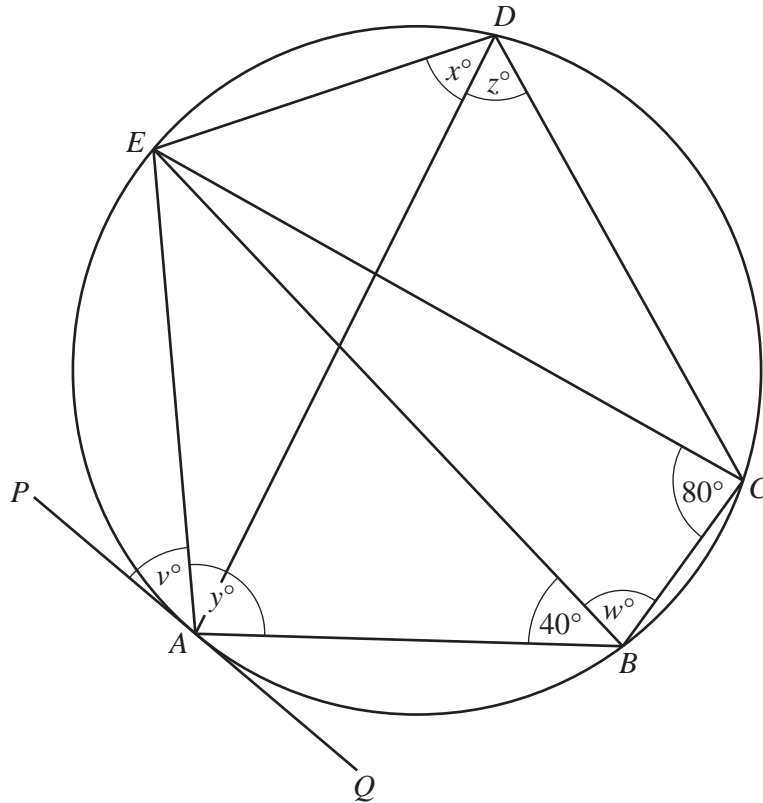
$x = \dots\dots\dots$ [2]

(d) k is an integer and the equation $x^2 + \frac{1}{x} = k$ has three solutions.

Write down a possible value of k .

$k = \dots\dots\dots$ [1]

8 (a)



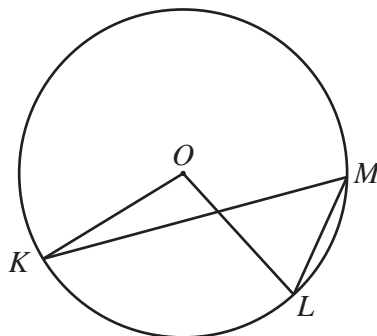
NOT TO SCALE

The points A, B, C, D and E lie on the circle.
 PAQ is a tangent to the circle at A and $EC = EB$.
 Angle $ECB = 80^\circ$ and angle $ABE = 40^\circ$.

Find the values of v, w, x, y and z .

$v = \dots\dots\dots$ $w = \dots\dots\dots$ $x = \dots\dots\dots$ $y = \dots\dots\dots$ $z = \dots\dots\dots$ [5]

(b)



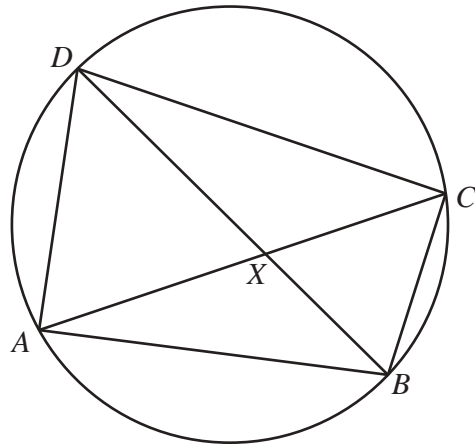
NOT TO SCALE

In the diagram, K, L and M lie on the circle, centre O .
 Angle $KML = 2x^\circ$ and reflex angle $KOL = 11x^\circ$.

Find the value of x .

$x = \dots\dots\dots$ [3]

(c)



NOT TO
SCALE

The diagonals of the cyclic quadrilateral $ABCD$ intersect at X .

- (i) Explain why triangle ADX is similar to triangle BCX .
Give a reason for each statement you make.

.....

.....

.....

..... [3]

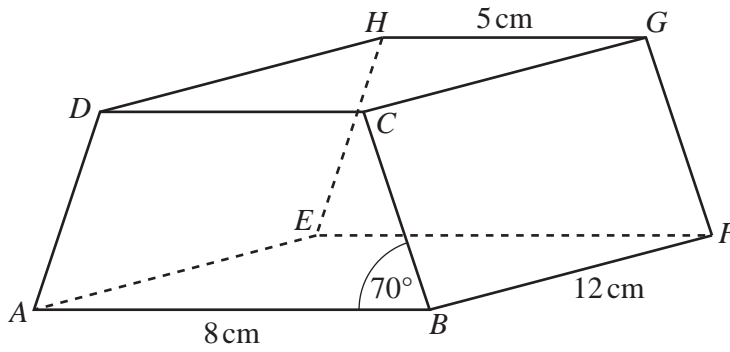
- (ii) $AD = 10\text{ cm}$, $BC = 8\text{ cm}$, $BX = 5\text{ cm}$ and $CX = 7\text{ cm}$.

- (a) Calculate DX .

$DX = \dots\dots\dots\text{ cm}$ [2]

- (b) Calculate angle BXC .

Angle $BXC = \dots\dots\dots$ [4]



NOT TO SCALE

The diagram shows a prism with a rectangular base, $ABFE$.
 The cross-section, $ABCD$, is a trapezium with $AD = BC$.
 $AB = 8$ cm, $GH = 5$ cm, $BF = 12$ cm and angle $ABC = 70^\circ$.

(a) Calculate the total surface area of the prism.

..... cm² [6]

(b) The perpendicular from G onto EF meets EF at X .

(i) Show that $EX = 6.5$ cm.

[1]

(ii) Calculate AX .

$AX = \dots\dots\dots$ cm [2]

(iii) Calculate the angle between the diagonal AG and the base $ABFE$.

$\dots\dots\dots$ [2]

10 $f(x) = x^2 + 1$ $g(x) = 1 - 2x$ $h(x) = \frac{1}{x}, x \neq 0$ $j(x) = 5^x$

(a) Find the value of

(i) $f(3)$,

..... [1]

(ii) $gf(3)$.

..... [1]

(b) Find $g^{-1}(x)$.

$g^{-1}(x) =$ [2]

(c) Find x when $h(x) = 2$.

$x =$ [1]

(d) Find $g(x)g(x) - gg(x)$, giving your answer in the form $ax^2 + bx + c$.

..... [4]

(e) Find $hh(x)$, giving your answer in its simplest form.

..... [1]

(f) Find $j(5)$.

..... [1]

(g) Find x when $j^{-1}(x) = 2$.

$x =$ [1]

(h) $j(x) = hg(-12)$

Find the value of x .

$x =$ [2]

Question 11 is printed on the next page.

11

Sequence	1st term	2nd term	3rd term	4th term	5th term		n th term
A	13	9	5	1			
B	0	7	26	63			
C	$\frac{7}{8}$	$\frac{8}{16}$	$\frac{9}{32}$	$\frac{10}{64}$			

(a) Complete the table for the three sequences.

[10]

(b) One term in Sequence C is $\frac{p}{q}$.

Write down the next term in Sequence C in terms of p and q .

..... [2]

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