

GCSE Grade 8/9

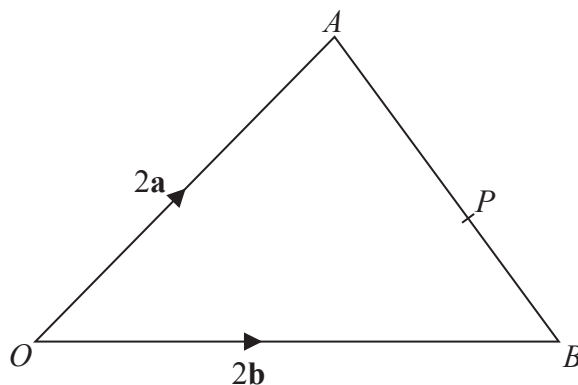
Maths
Booklet 4

Paper 3H
Calculator

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- 1 Prove algebraically that the recurring decimal $0.3\dot{1}\dot{8}$ can be written as $\frac{7}{22}$

(Total for Question 1 is 2 marks)



OAB is a triangle.

P is the point on AB such that $AP:PB = 5:3$

$$\vec{OA} = 2\mathbf{a}$$

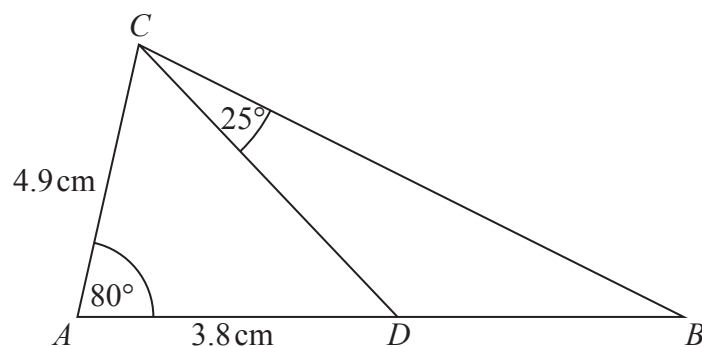
$$\vec{OB} = 2\mathbf{b}$$

$$\vec{OP} = k(3\mathbf{a} + 5\mathbf{b}) \text{ where } k \text{ is a scalar quantity.}$$

Find the value of k .

(Total for Question 2 is 4 marks)

3



ABC is a triangle.

D is a point on AB .

Work out the area of triangle BCD .

Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 3 is 5 marks)

- 4 There are y black socks and 5 white socks in a drawer.

Joshua takes at random two socks from the drawer.

The probability that Joshua takes one white sock and one black sock is $\frac{6}{11}$

- (a) Show that $3y^2 - 28y + 60 = 0$

(4)

- (b) Find the probability that Joshua takes two black socks.

(3)

(Total for Question 4 is 7 marks)

- 5 (a) Write $2x^2 + 16x + 35$ in the form $a(x + b)^2 + c$ where a , b , and c are integers.

.....
(3)

- (b) Hence, or otherwise, write down the coordinates of the turning point of the graph of $y = 2x^2 + 16x + 35$

.....
(1)

(Total for Question 5 is 4 marks)

- 6 x is directly proportional to the square of y .
 y is directly proportional to the cube of z .

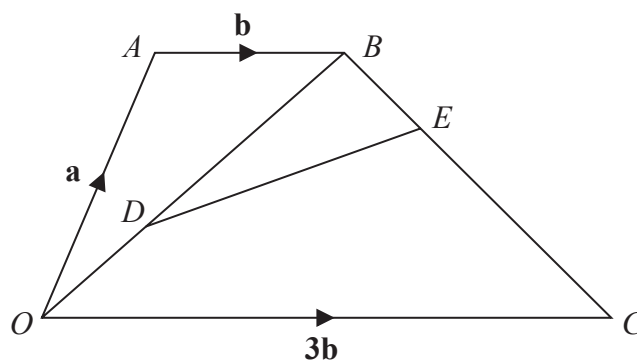
$$z = 2 \text{ when } x = 32$$

Find a formula for x in terms of z .

(Total for Question 6 is 4 marks)



7 $OABC$ is a trapezium.



$$\begin{aligned}\vec{OA} &= \mathbf{a} \\ \vec{AB} &= \mathbf{b} \\ \vec{OC} &= 3\mathbf{b}\end{aligned}$$

D is the point on OB such that $OD:DB = 2:3$
 E is the point on BC such that $BE:EC = 1:4$

Work out the vector \vec{DE} in terms of \mathbf{a} and \mathbf{b} .
 Give your answer in its simplest form.

(Total for Question 7 is 4 marks)

- 8 At the start of year n , the number of animals in a population is P_n

At the start of the following year, the number of animals in the population is P_{n+1} where

$$P_{n+1} = kP_n$$

At the start of 2017 the number of animals in the population was 4000

At the start of 2019 the number of animals in the population was 3610

Find the value of the constant k .

(Total for Question 8 is 3 marks)

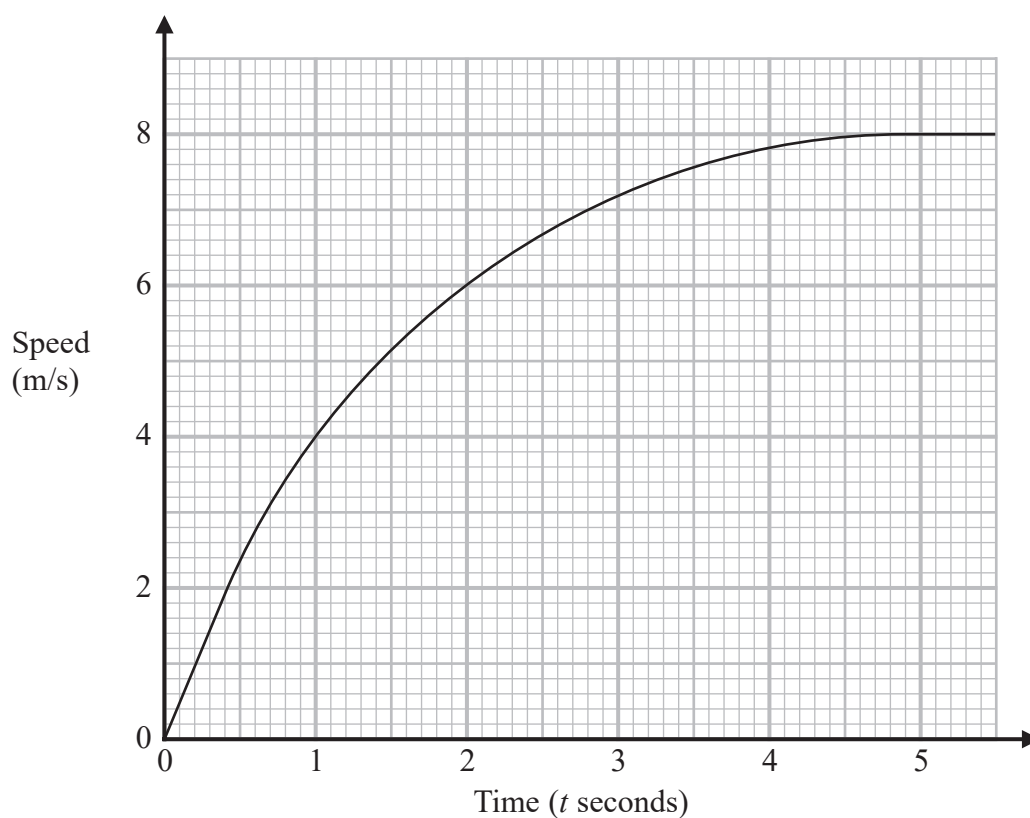
- 9 Pat throws a fair coin n times.

Find an expression, in terms of n , for the probability that Pat gets at least 1 head and at least 1 tail.

(Total for Question 9 is 2 marks)



- 10 Here is a speed-time graph showing the speed, in metres per second, of an object t seconds after it started to move from rest.



- (a) Using 3 trapeziums of equal width, work out an estimate for the area under the graph between $t = 1$ and $t = 4$

.....
(3)

- (b) What does this area represent?

.....
(1)

(Total for Question 10 is 4 marks)

- 11 Show that $\frac{6x^3}{(9x^2 - 144)} \div \frac{2x^4}{3(x - 4)}$ can be written in the form $\frac{1}{x(x + r)}$ where r is an integer.

(Total for Question 11 is 3 marks)

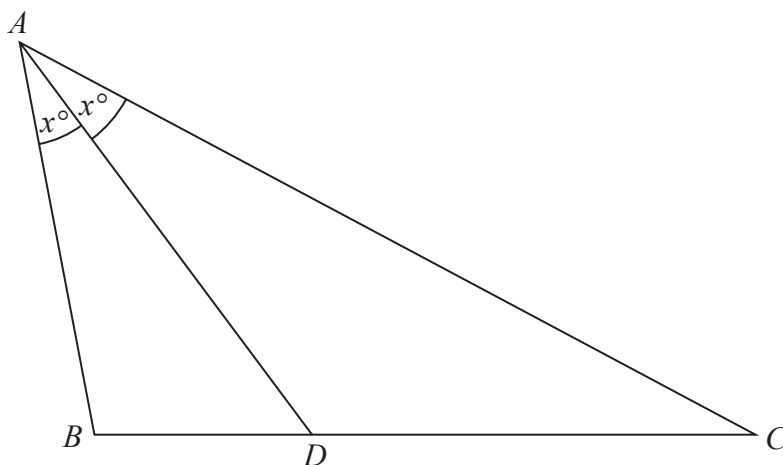
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12 ABC is a triangle.



D is the point on BC such that angle $BAD = \text{angle } DAC = x^\circ$

Prove that $\frac{AB}{BD} = \frac{AC}{DC}$

(Total for Question 12 is 4 marks)