BLOCK 9 TEST

TIME: 45 minutes
The total mark for this paper is 50

NAME	TOTAL MARKS	PERCENTAGE

Calculators may be used.

TUTORS & FUTURES

1. (a) Prove that the sum of the squares of two consecutive odd numbers is always 2 more than a multiple of 8.

.....

(Total 2 marks)

(b) Prove that $(3n + 1)^2$ - $(3n - 1)^2$ is always a multiple of 12, for all possible values of n.

.....

(Total 2 marks)

2. By completing the square solve $x^2 + 5x + 4.25 = 0$

Give your answers in surd form.

.....

(Total 5 marks)

3. P is the point (1, 2) on the circle $x^2 + y^2 = 5$
Work out the equation of the tangent to the circle at P.

.....

(Total 4 marks)

4.

a) Show that the equation $x^3 + 4x = 1$ has a solution between x = 0 and x = 1

.....

(Total 2 marks)

b) Show that the equation $x^3 + 4x = 1$ can be rearranged to give:

$$x = \frac{1}{4} - \frac{x^3}{4}$$

.....

(Total 1 mark)

c) Starting with $x_0 = 0$, use the iteration formula $x_{n+1} = \frac{1}{4} - \frac{x_n^3}{4}$ twice to find an estimate for the solution to $x^3 + 4x = 1$

.....

(Total 3 marks)

5. (a) There are 4 red counters and x blue counters in a bag.
2 counters are removed from the bag at random.

The probability that both the counters taken are blue is $\frac{1}{3}$
Work out the value of x

x =.....

(Total 6 marks)

(b) There are 5 red counters and x blue counters in a bag.
2 counters are removed from the bag at random.

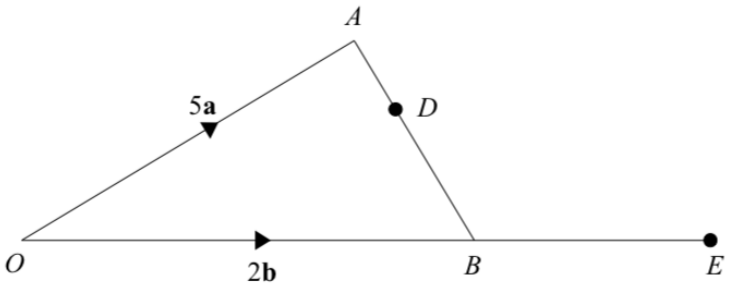
The probability that both the counters taken are red is $\frac{5}{33}$

Work out the value of x

x =.....

(Total 7 marks)

5.



$\overrightarrow{OA} = 5a$

$\overrightarrow{OB} = 2b$

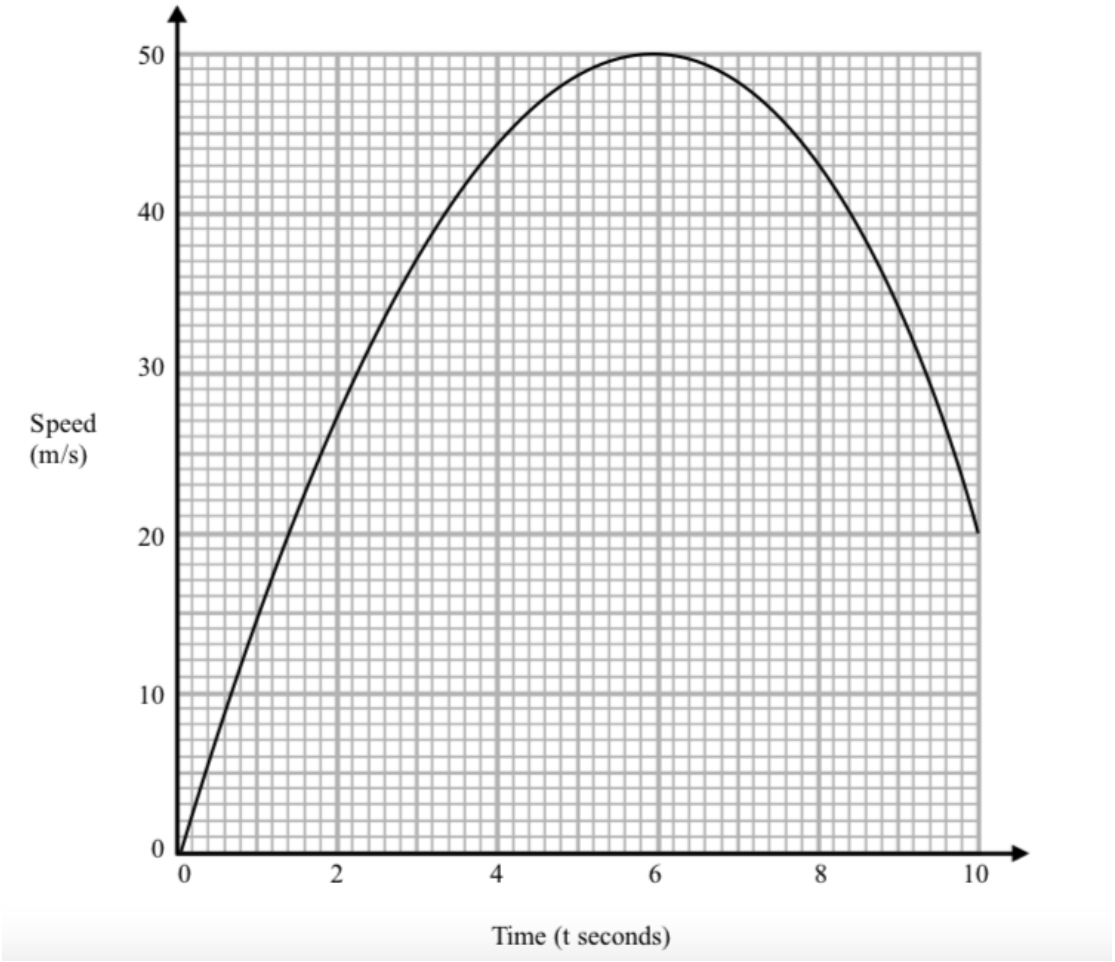
C is the point on A such that OC:CA = 4:1
D is the point such that AD:DB = 1:2
The line OB is extended to point E

Given that C, D, and E are on the same straight line, find $\overrightarrow{BE}$

.....

(Total 5 marks)

6. Here is a speed-time graph



(a) Work out an estimate for the acceleration when t = 2

.....

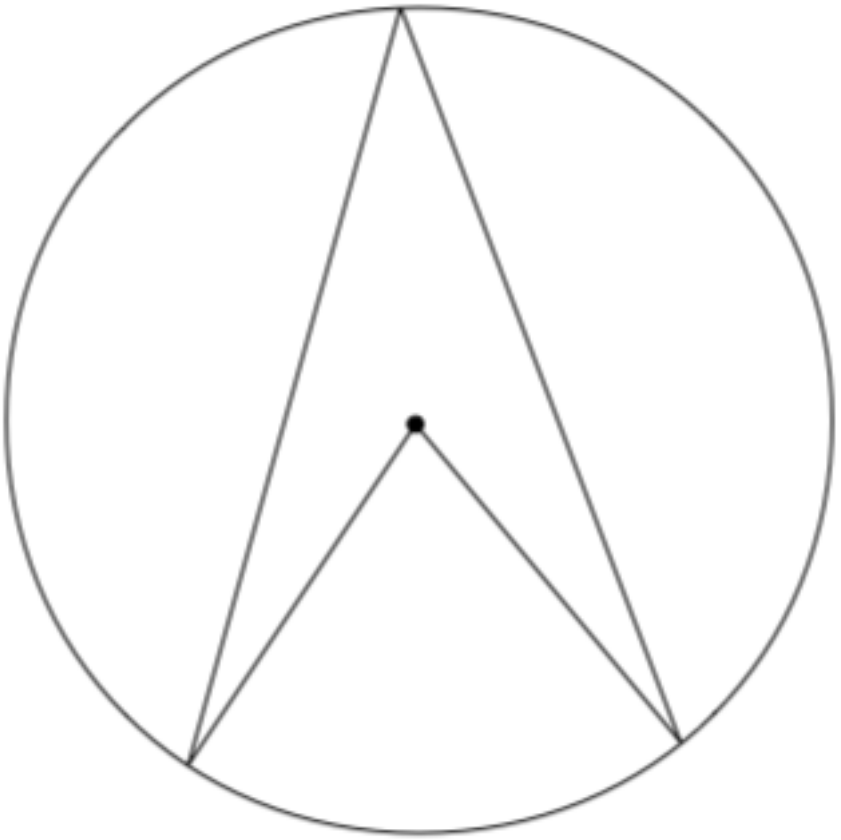
(Total 2 marks)

(b) Use 5 strips of equal width to find an estimate for the distance travelled in 10 seconds.

.....

(Total 3 marks)

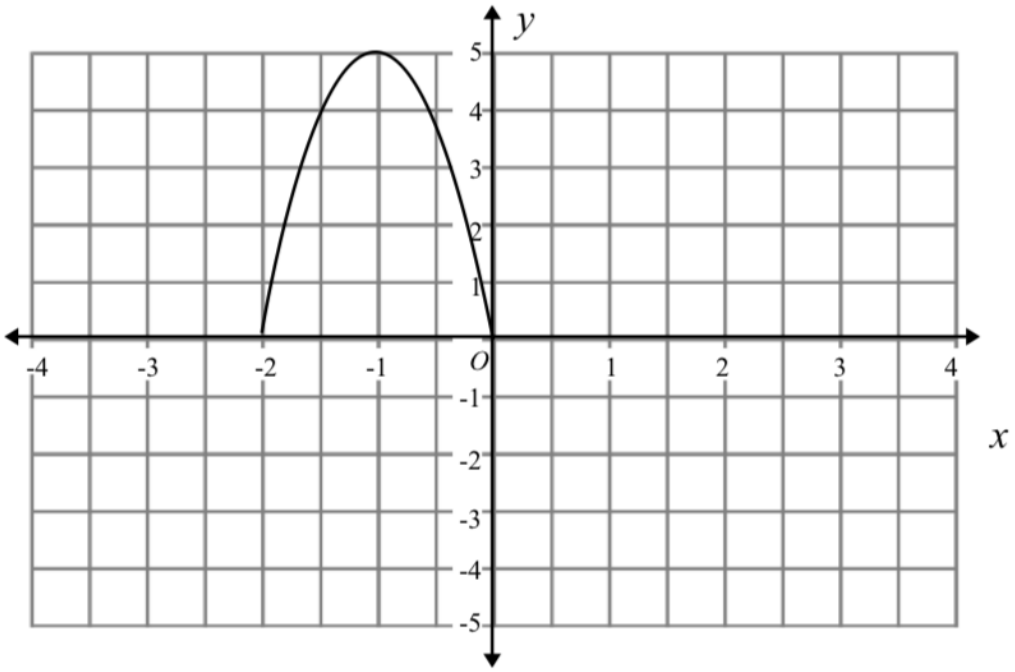
7. Prove that the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference.



(Total 4 marks)

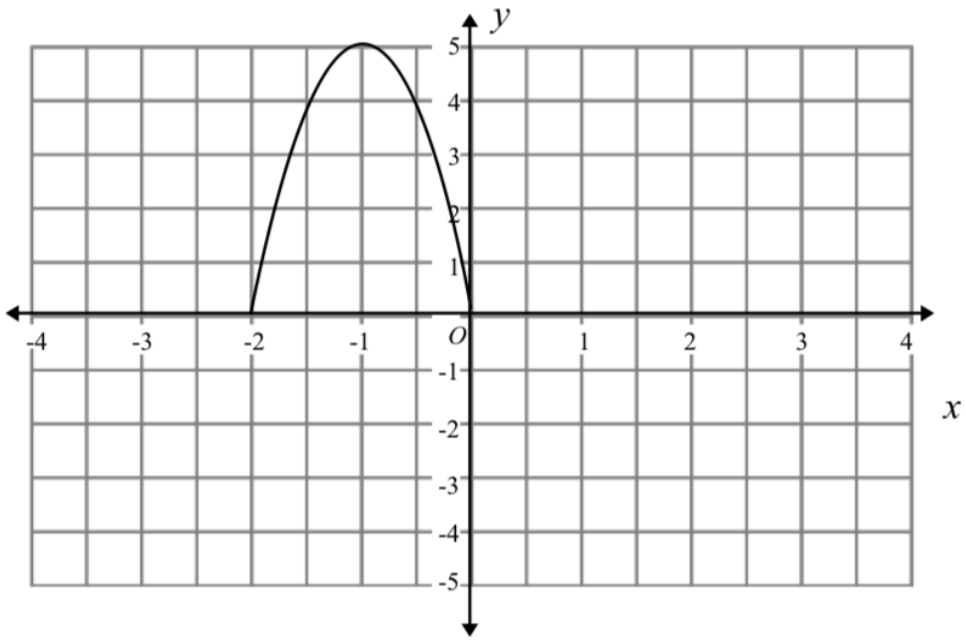
8.

The graph of $y = f(x)$ is shown on both grids below.



(a) On the grid above, sketch the graph of $y = -f(x)$.

(Total 2 marks)



(b) On the grid above, sketch the graph of $y = f(x - 1)$

(Total 2 marks)