

**Dr Oliver Mathematics**  
**Mathematics: National Qualifications N5**  
**2019 Paper 1: Non-Calculator**  
**1 hour 15 minutes**

The total number of marks available is 50.

You must write down all the stages in your working.

1. Given that (2)

$$f(x) = 5x^3,$$

evaluate  $f(-2)$ .

2. Evaluate (2)

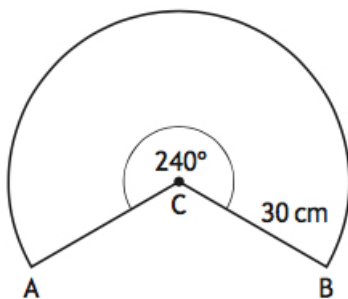
$$\frac{3}{8} \times 1\frac{5}{7}.$$

Give your answer in its simplest form.

3. Expand and simplify (3)

$$(x + 5)(2x^2 - 7x - 3).$$

4. The diagram below shows a sector of a circle, centre  $C$ . (3)



The radius of the circle is 30 centimetres.

Calculate the length of the major arc  $AB$ .

Take  $\pi = 3.14$ .

5. The midday temperatures in Grantford were recorded over a nine-day period.  
The temperatures, in  $^{\circ}\text{C}$ , were

4 7 4 3 6 10 9 5 3.

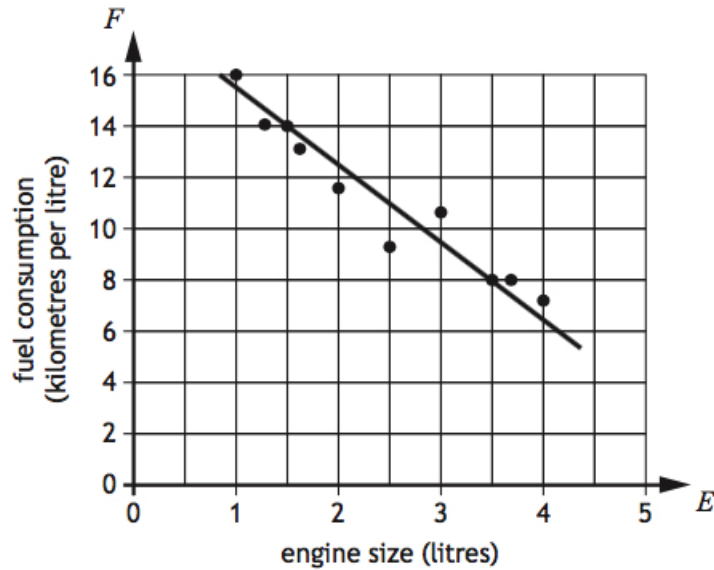
- (a) Calculate the median and semi-interquartile range for these temperatures. (3)

Over the same nine day period the midday temperatures in Endoch were also recorded.  
The median temperature was  $8^{\circ}\text{C}$ , and the semi-interquartile range was  $1.5^{\circ}\text{C}$ .

- (b) Make two valid comments comparing the midday temperatures of Grantford and Endoch during this period. (2)

6. The fuel consumption of a group of cars is recorded.

The scattergraph shows the relationship between the fuel consumption,  $F$  kilometres per litre, and the engine size,  $E$  litres, of the cars.



A line of best fit has been drawn.

- (a) Find the equation of the line of best fit in terms of  $F$  and  $E$ . (3)  
Give the equation in its simplest form.

Amaar's car has an engine size of 1.1 litres.

- (b) Use your equation from part (a) to estimate how many kilometres per litre he should expect to get. (1)

7. The area of a trapezium is given by the formula (3)

$$A = \frac{1}{2}h(x + y).$$

Make  $x$  the subject of the formula.

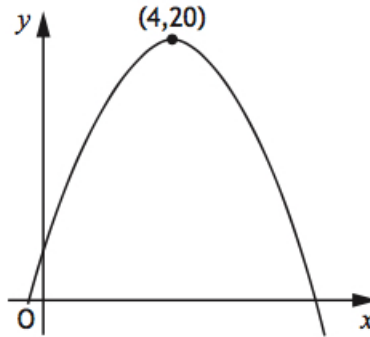
8. John bought 7 bags of cement and 3 bags of gravel.  
The total weight of these bags was 215 kilograms.

- (a) Write down an equation to illustrate this information. (1)

Shona bought 5 bags of cement and 4 bags of gravel.  
The total weight of her bags was 200 kilograms.

- (b) Write down an equation to illustrate this information. (1)
- (c) Calculate the weight of one bag of cement and the weight of one bag of gravel. (4)

9. The graph shows a parabola.



The maximum turning point has coordinates (4, 20) as shown in the diagram.

- (a) Write down the equation of the axis of symmetry of the graph. (1)

The equation of the parabola is of the form

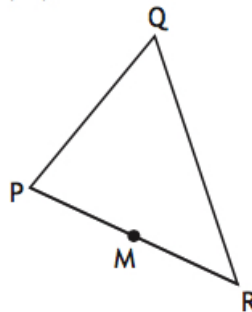
$$y = b - (x + a)^2.$$

(b) State the values of

- (i)  $a$ , (1)
- (ii)  $b$ . (1)

10. In triangle  $PQR$ ,

$$\overrightarrow{PR} = \begin{pmatrix} 6 \\ -4 \end{pmatrix} \text{ and } \overrightarrow{RQ} = \begin{pmatrix} -1 \\ 8 \end{pmatrix}.$$



- (a) Express  $\overrightarrow{PQ}$  in component form. (1)

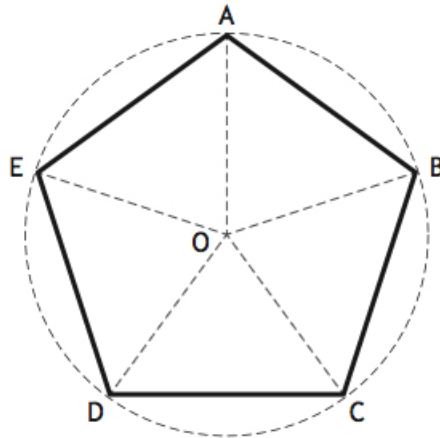
$M$  is the midpoint of  $PR$ .

(b) Express  $\overrightarrow{MQ}$  in component form. (2)

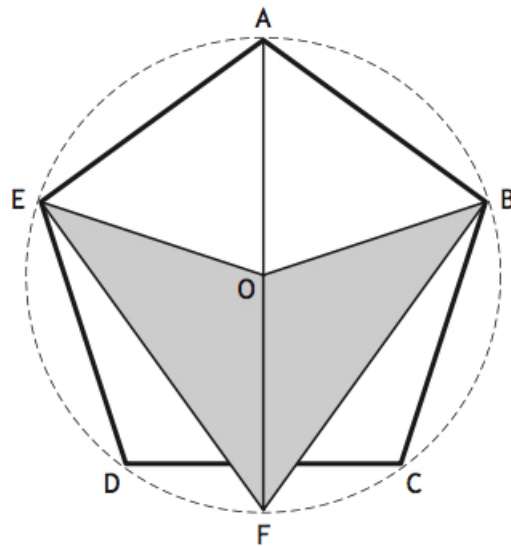
11. Pam is designing a company logo. (3)

She starts by drawing a regular pentagon  $ABCDE$ .

The vertices of the pentagon lie on the circumference of a circle with centre  $O$ .



She then adds to the design as shown in the diagram below.



$AF$  is a diameter of the circle.

Calculate the size of angle  $OFB$ .

12. Express (3)

$$\frac{\sqrt{2}}{\sqrt{40}}$$

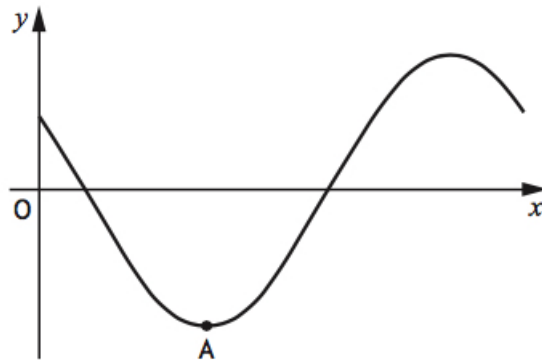
as a fraction with a rational denominator.  
Give your answer in its simplest form.

13. Part of the graph of

$$y = 3 \cos(x + 45)^\circ$$

(2)

is shown in the diagram.



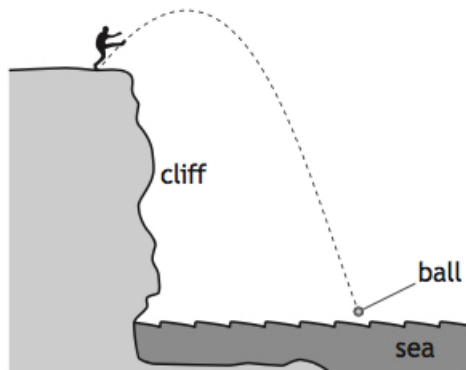
The graph has a minimum turning point at A.  
State the coordinates of A.

14. Solve the equation

$$\frac{1}{2}x - 1 = \frac{3 - x}{5}.$$

(3)

15. A ball is kicked from a clifftop.

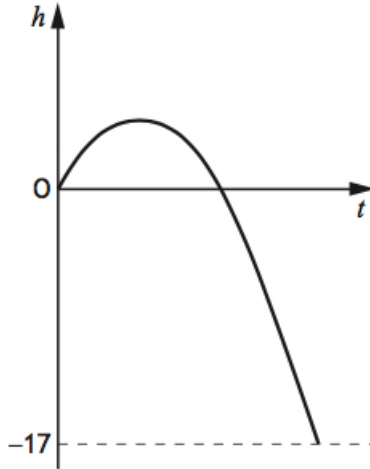


The height,  $h$  metres, of the ball relative to the clifftop after  $t$  seconds is given by

$$h = 12t - 5t^2.$$

(a) Calculate the height of the ball above the clifftop after 2 seconds. (1)

The graph below represents the height,  $h$  metres, of the ball relative to the clifftop after  $t$  seconds.



The sea is 17 metres below the clifftop.

(b) After how many seconds will the ball hit the sea? (4)