National 5 Mathematics

2019 Paper 1

Time allowed = 1 hr 15 mins   Marks available = 50

For each question, you can scan the QR codes if using a paper copy or click on the links viewing this document electronically. This will allow you to view the worked solutions for each question. You can also either scan this QR Code or click on the link below to view this paper's marking scheme;

https://www.sqa.org.uk/pastpapers/papers/instructions/2019/mi_N5_Mathematics_all_2019.pdf

Remember to record your percentage for this paper in your analysis grid (your score ÷ 50 × 100).

FORMULAE LIST

The roots of	$ax^2 + bx + c = 0$ are $x = \dfrac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$
Sine rule	$\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$
Cosine rule	$a^2 = b^2 + c^2 - 2bc \cos A$ or $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$
Area of a triangle	$A = \frac{1}{2} ab \sin C$
Volume of a sphere	$V = \frac{4}{3} \pi r^3$
Volume of a cone	$V = \frac{1}{3} \pi r^2 h$
Volume of a pyramid	$V = \frac{1}{3} A h$
Standard deviation	$s = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n-1}}$
	or $\quad s = \sqrt{\dfrac{\Sigma x^2 - \dfrac{(\Sigma x)^2}{n}}{n-1}}$, where n is the sample size.

Total marks — 50
Attempt ALL questions

1. Given that $f(x) = 5x^3$, evaluate $f(-2)$.   2

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/1xAs1uYZSLA

Video Lesson: REL 1·1b Silver Outcome 1

2. Evaluate $\dfrac{3}{8} \times 1\dfrac{5}{7}$.

Give your answer in its simplest form.   2

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/TVjM8fY0hQM

Video Lesson: APP 1·3b Gold Outcome 2

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

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/RFVjLHcmKXg

Video Lesson: E+F 1·2a Gold Outcome 3

4. The diagram below shows a sector of a circle, centre C.
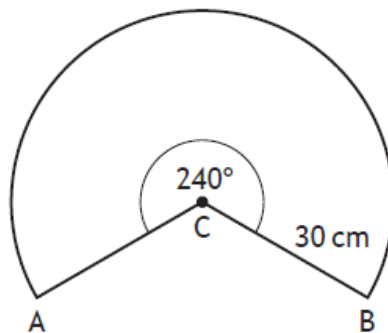
The radius of the circle is 30 centimetres.

Calculate the length of the major arc AB.

Take $\pi = 3·14$.   3

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/bLWv5tfaMnY

Video Lesson: E+F 1·4b Bronze Outcome 2

5. The midday temperatures in Grantford were recorded over a nine day period.

The temperatures, in °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 °C, and the semi-interquartile range was 1·5 °C.

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

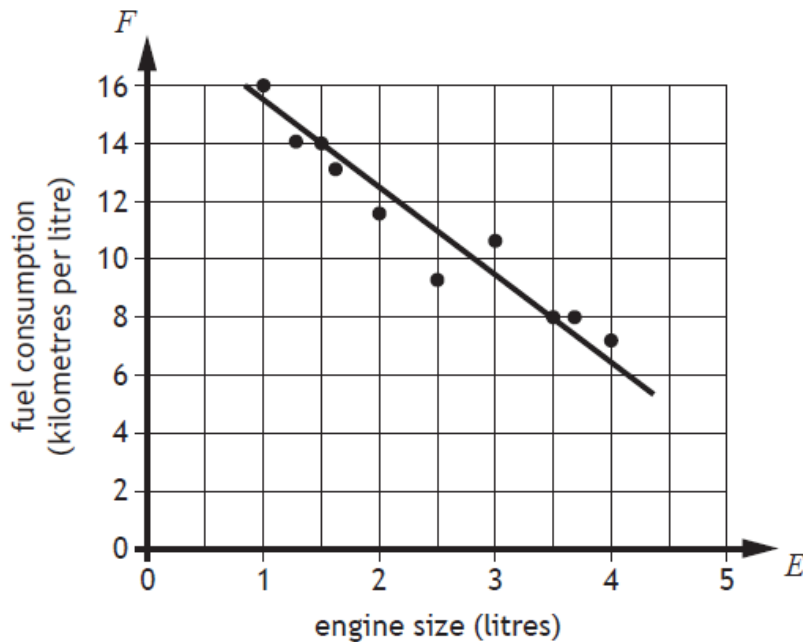Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/4F0NlM8arHk

Video Lesson: APP 1·4 Silver Outcome 1

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.

         Give the equation in its simplest form.   **3**

    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**

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/vBGE3_9di5A

Video Lesson: APP 1·4 Silver Outcome 3

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

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

Make x the subject of the formula.   3

Scan the QR code or click on it to view the worked solutions;

https://youtu.be/cnnfPeatLX8

Video Lesson: REL 1·1e Silver Outcome 2

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

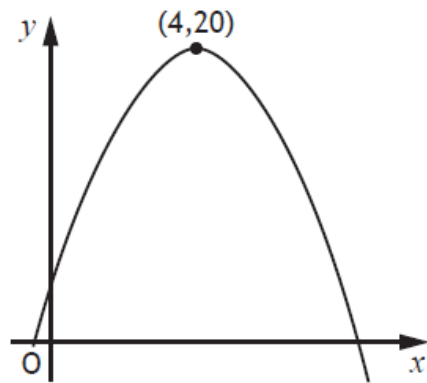   (c) Calculate the weight of one bag of cement and the weight of one bag of
         gravel.   4

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/rThay3CWZ28

Video Lesson: REL 1·1d Gold Outcome 1

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
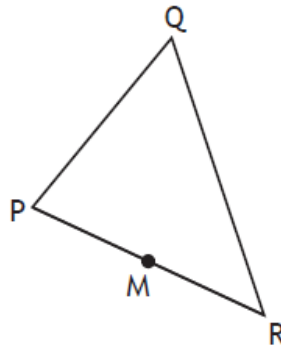
(i) a **1**

(ii) b.   **1**

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/DYXjbh5V-jc

Video Lesson: REL 1·2 Silver Outcomes 1 and 3

SQA Pastpapers

10. In triangle PQR, $\overrightarrow{PR} = \begin{pmatrix} 6 \\ -4 \end{pmatrix}$ 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

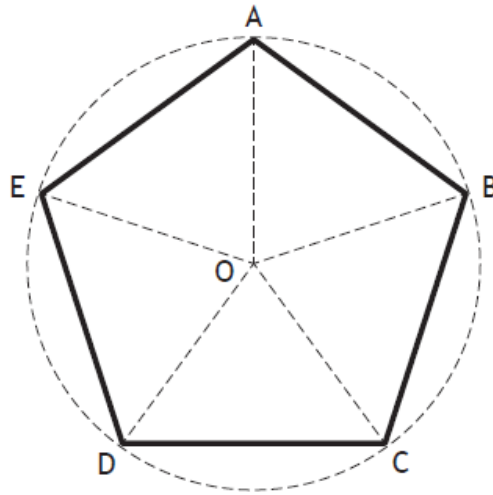Scan the QR code or click on the link to view the worked solutions;

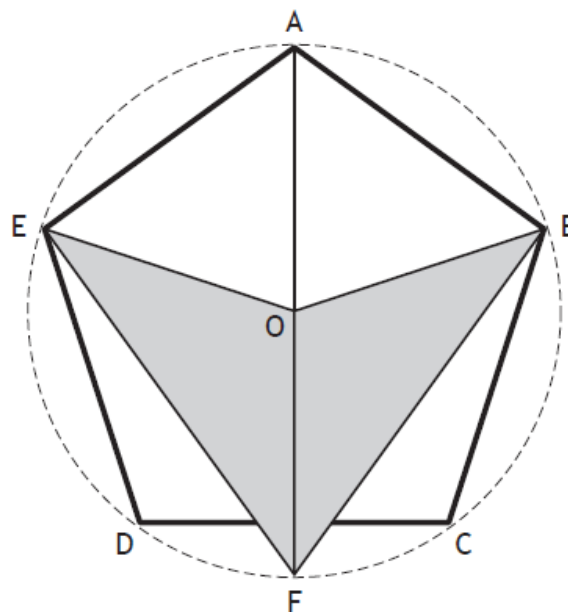https://youtu.be/hUj5oRDQikw

Video Lesson: APP 1·2 Bronze Outcome 3

11. Pam is designing a company logo.

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.   3

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/ODAHJRJ2oGQ

Video Lesson: REL 1·4b Gold Outcome 1

12. Express $\dfrac{\sqrt{2}}{\sqrt{40}}$ as a fraction with a rational denominator.
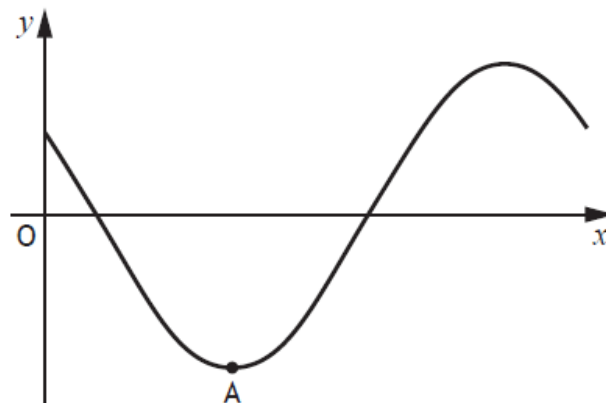
   Give your answer in its simplest form. 3

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/JnL9b-gfHkQ

Video Lesson: E+F 1·1a Silver Outcome 2

13. Part of the graph of $y = 3\cos(x+45)°$ is shown in the diagram.

   The graph has a minimum turning point at A.

   State the coordinates of A. 2

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/xwkPOdYAGmw

Video Lesson: REL 1·5a Gold Outcome 1

14. Solve the equation $\dfrac{x}{2} - 1 = \dfrac{3-x}{5}$.   3

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/x1Gi5mh2YYc

Video Lesson: REL 1·1c Gold Outcome 1
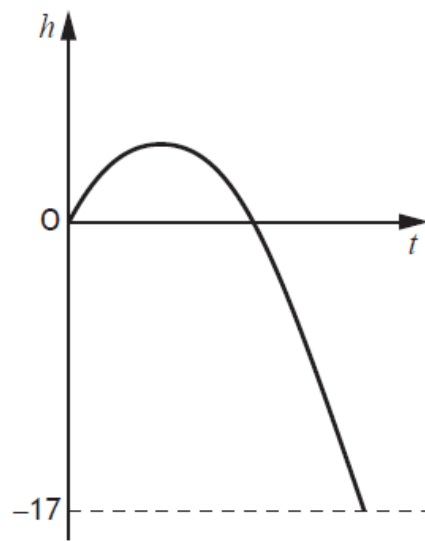

15. A ball is kicked from a clifftop.
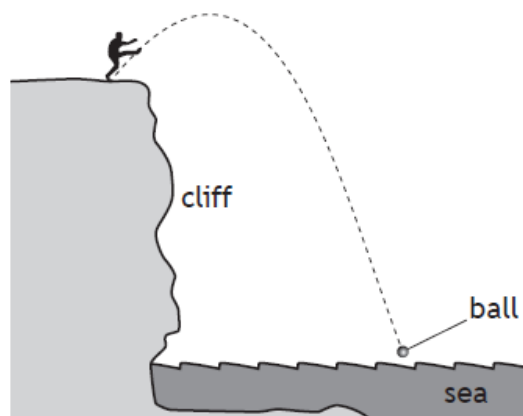
The height, h metres, of the ball relative to the clifftop after t seconds is given by $h = 12t - 5t^2$.

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

The rest of question 15 is on the next page...

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

Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/YJvpaOWFTM8

Video Lesson: REL 1·3a Gold Outcome 2

[END OF QUESTION PAPER]