National 5 Mathematics

2016 Paper 1

Time allowed = 1 hr Marks available = 40

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/2016/mi_N5_Mathematics_all_2016.pdf

Remember to record your percentage for this paper in your analysis grid (your score ÷ 40 × 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 $V=\frac{1}{3}Ah$

Standard deviation $s=\sqrt{\dfrac{\Sigma(x-\bar{x})^2}{n-1}}$

or $s=\sqrt{\dfrac{\Sigma x^2-\dfrac{(\Sigma x)^2}{n}}{n-1}}$, where n is the sample size.

Total marks — 40

Attempt ALL questions

1. Given $\mathbf{p} = \begin{pmatrix} 4 \\ -6 \end{pmatrix}$ and $\mathbf{q} = \begin{pmatrix} -5 \\ -1 \end{pmatrix}$.

   Find the resultant vector $\frac{1}{2}\mathbf{p} + \mathbf{q}$.

   Express your answer in component form. 2

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

https://youtu.be/GcR3tiu-xhQ

Video Lesson: APP 1·2 Bronze Outcome 3

2. Evaluate $\frac{3}{4}\left(\frac{1}{3} + \frac{2}{7}\right)$.

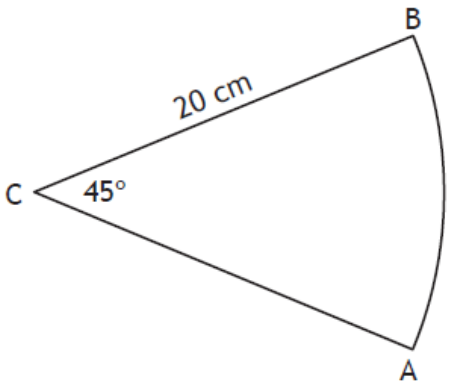
   Give your answer in its simplest form. 2

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

https://youtu.be/vn7DrcdrA9s

Video Lessons: APP 1·3b Silver Outcomes 1 and 2

3. The diagram shows a sector of a circle, centre C.



The radius of the circle is 20 centimetres and angle ACB is 45°.

Calculate the area of the sector.

Take $\pi = 3{\cdot}14$. 3

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

https://youtu.be/eL1RVpZMwck

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

4. Charlie is making costumes for a school show.
One day he made 2 cloaks and 3 dresses.
The total amount of material he used was 9·6 square metres.

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

(b) The following day Charlie made 3 cloaks and 4 dresses.
The total amount of material he used was 13·3 square metres.
Write down an equation to illustrate this information. 1

(c) Calculate the amount of material required to make one cloak and the amount of material required to make one dress. 4

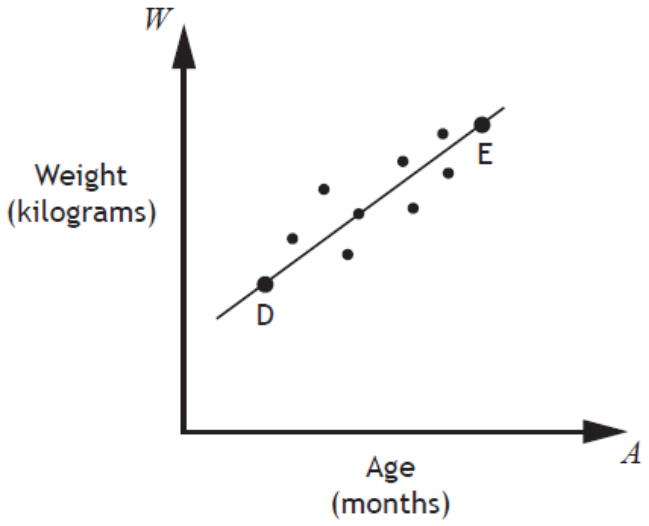
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/LwnrNfGU4jk

Video Lesson: REL 1·1d Gold Outcome 1

5. A cattle farmer records the weight of some of his calves.

The scattergraph shows the relationship between the age, A months, and the weight, W kilograms, of the calves.



A line of best fit is drawn.

Point D represents a 3 month old calf which weighs 100 kilograms.

Point E represents a 15 month old calf which weighs 340 kilograms.

(a) Find the equation of the line of best fit in terms of A and W.
Give the equation in its simplest form. 3

(b) Use your equation from part (a) to estimate the weight of a one year old calf.
Show your working. 1

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

https://youtu.be/JkDo-vS0uFc

Video Lesson: APP 1·4 Bronze Outcome 3

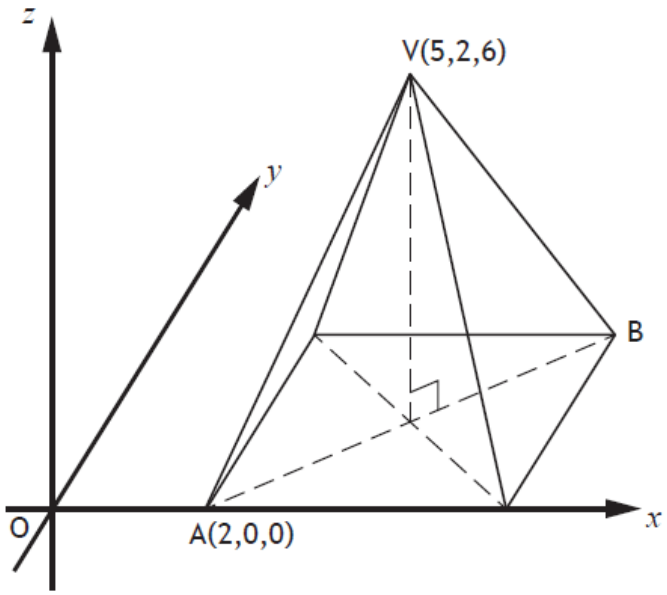
6. Determine the nature of the roots of the function $f(x) = 7x^2 + 5x - 1$. 2

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

https://youtu.be/iqJLV_WI-UY

Video Lesson: REL 1·3b Bronze Outcome 1

7. The diagram shows a rectangular based pyramid, relative to the coordinate axes.



- A is the point (2,0,0).
- V is the point (5,2,6).

(a) Write down the coordinates of B. 1

(b) Calculate the length of edge AV of the pyramid. 3

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

https://youtu.be/OcYvEDXAyFU

Video Lessons: APP 1·2 Silver Outcomes 2 and 4

SQA Pastpapers

8. Solve the equation

$$\frac{2x}{3} - \frac{5}{6} = 2x.$$

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/ldSZrFIH5Wo

Video Lesson: REL 1·1c Gold Outcome 1

9. The function $f(x)$ is defined by $f(x) = \frac{2}{\sqrt{x}}, \quad x > 0.$

Express $f(5)$ as a fraction with a rational denominator. 2

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

https://youtu.be/N7fjGYQGTf0

Video Lessons: REL 1·1b Bronze Outcome 1 and E+F 1·1a Bronze Outcome 2

10. Sketch the graph of $y = (x-3)^2 + 1$.

On your sketch, show clearly the coordinates of the turning point and the point of intersection with the y–axis. 3

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

https://youtu.be/bJDoHaFzkV0

Video Lesson: REL 1·2 Bronze Outcome 2

11. Simplify

$$\tan^2 x° \cos^2 x° .$$

Show your working. 2

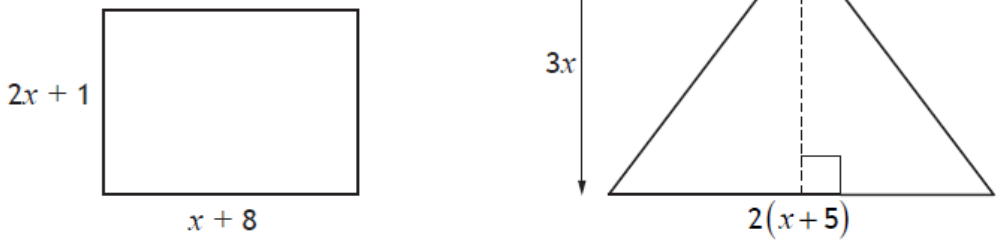
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/geMHgAUsncI

Video Lesson: REL 1·5b Silver Outcome 2

12. The diagrams below show a rectangle and a triangle.

All measurements are in centimetres.



(a) Find an expression for the area of the **rectangle**. 1

(b) Given that the area of the rectangle is equal to the area of the triangle, show that $x^2 - 2x - 8 = 0$. 3

(c) Hence find, **algebraically**, the length and breadth of the rectangle. 3

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

https://youtu.be/5b94vohtZDI

Video Lesson: REL 1·3a Silver Outcome 2

[END OF QUESTION PAPER]