National 5 Mathematics

2016 Paper 2

Time allowed = 1 hr 30 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/2016/mi_N5_Mathematics_all_2016.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 $V=\frac{1}{3}Ah$

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 — 50

Attempt ALL questions

1. A drinks manufacturer is reducing the sugar content of one of their fizzy drinks by 8% per year over the next 3 years.

   The sugar content of a standard can is currently 35 grams.

   Calculate the sugar content of a standard can after 3 years. 3

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

https://youtu.be/u8aCdIYkOAY

Video Lesson: APP 1·3a Bronze Outcome 3

2. A pollen sample weighs 12 grams

   and contains $1{\cdot}5 \times 10^9$ pollen grains.

   Calculate the weight of **one** pollen grain in grams.

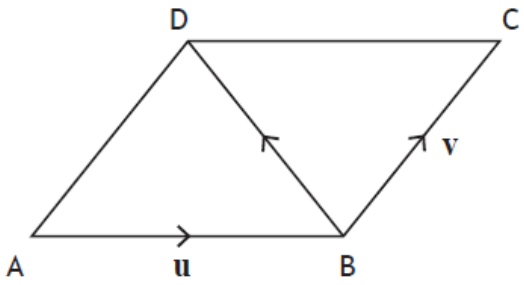
   Give your answer in scientific notation. 2

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

https://youtu.be/5ieHq7Eov6s

Video Lesson: E+F 1·1b Gold Outcome 3

3. The diagram below shows parallelogram ABCD.



$\overrightarrow{AB}$ represents vector $\mathbf{u}$ and $\overrightarrow{BC}$ represents vector $\mathbf{v}$.

Express $\overrightarrow{BD}$ in terms of $\mathbf{u}$ and $\mathbf{v}$. 1

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

https://youtu.be/nQBRHeRv3ww

Video Lesson: APP 1·2 Gold Outcome 2

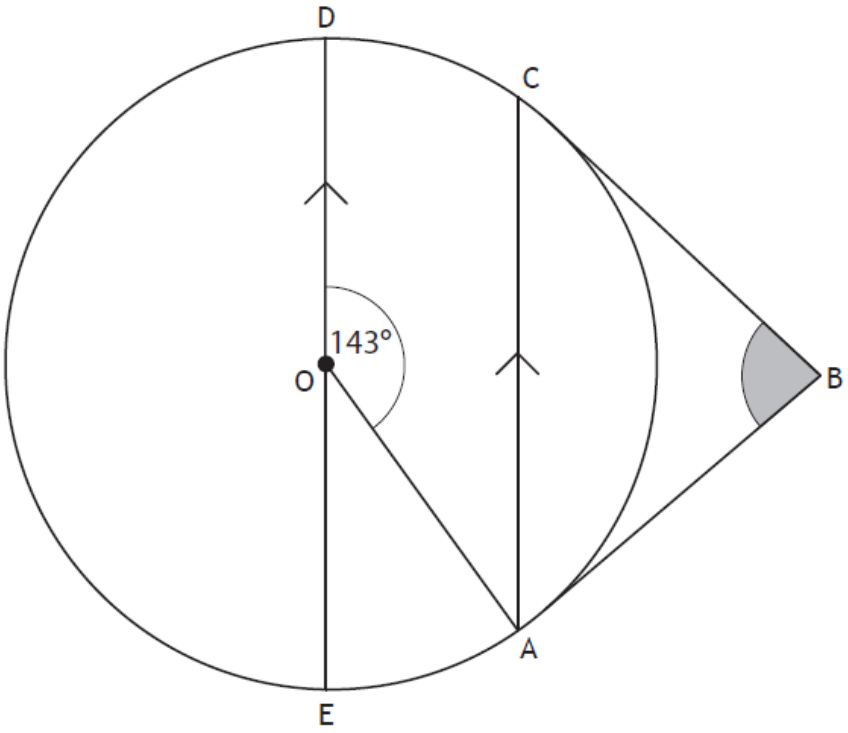
4. Factorise fully $3x^2 - 48$. 2

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

https://youtu.be/83iY3IJ7MyM

Video Lesson: E+F 1·2b Gold Outcome 2

5. The diagram below shows a circle, centre O.



- AB and CB are tangents to the circle.
- AC and ED are parallel.
- Angle AOD is 143°.

Calculate the size of angle ABC. 3

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

https://youtu.be/snMcQpQnR1I

Video Lesson: REL 1·4b Gold Outcome 1

6. Jack called his internet provider on six occasions to report connection problems.

On each occasion he noted the length of time he had to wait before speaking to an adviser.

The times (in minutes) were as follows:

13 16 10 22 5 12

(a) Calculate the mean and standard deviation of these times. 4

(b) Sophie also called the same internet provider, on several occasions, to report connection problems.

Her mean waiting time was 15 minutes and the standard deviation was 4·3 minutes.

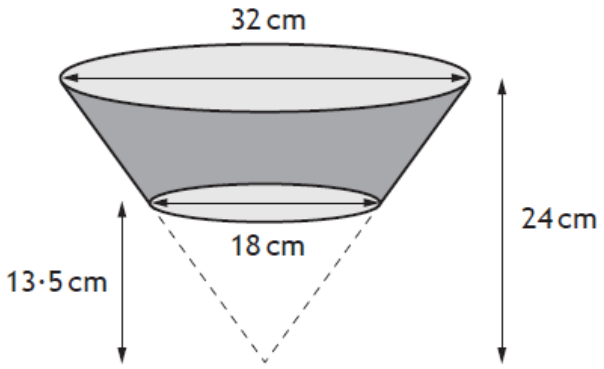
Make two valid comments comparing Sophie's waiting times with Jack's waiting times. 2

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

https://youtu.be/5e3W-lpw7mE

Video Lesson: APP 1·4 Silver Outcome 2

7. A carton is in the shape of a large cone with a small cone removed.
The large cone has diameter of 32 cm and height 24 cm.
The small cone has diameter of 18 cm and height 13·5 cm.



Calculate the volume of the carton.
Give your answer correct to 2 significant figures. 5

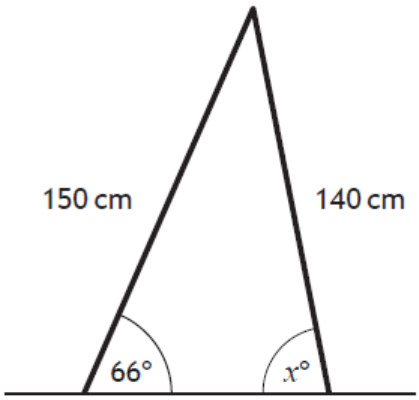
Scan the QR code or click on it to view the worked solutions;

https://youtu.be/5w62Hlx_9j8

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

8. A set of stepladders has legs 150 centimetres and 140 centimetres long.

When the stepladder is fully open, the angle between the longer leg and the ground is 66°.



Calculate $x°$, the size of the angle between the shorter leg and the ground. 3

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

https://youtu.be/chqc76sIb1E

Video Lesson: APP 1·1 Gold Outcome 2

9. Express $x^2 + 8x - 7$ in the form $(x+a)^2 + b$. 2

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

https://youtu.be/HYerksbcbX8

Video Lesson: E+F 1·2c Bronze Outcome 1

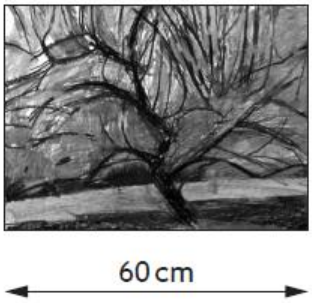
10. Simplify $(n^2)^3 \times n^{-10}$.
Give your answer with a **positive** power. 3

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

https://youtu.be/5efQhT7K83Y

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

11. Two pictures are mathematically similar in shape.



The cost of each picture is proportional to its area.
The large picture costs £13·75.
Find the cost of the small picture. 3

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

https://youtu.be/lA4cyyqn5y0

Video Lesson: REL 1·4c Silver Outcome 2

12. Change the subject of the formula $L = \sqrt{4kt - p}$ to k. 3

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

https://youtu.be/CQPUko8reEA

Video Lessons: E+F 1·1b Silver Outcome 2 and Gold Outcome 2

13. Express

$$\frac{3}{x-2}+\frac{5}{x+1}, \qquad x \neq 2, x \neq -1$$

as a single fraction in its simplest form. 3

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

https://youtu.be/Sph3iXIKMCo

Video Lesson: E+F 1·3 Gold Outcome 2

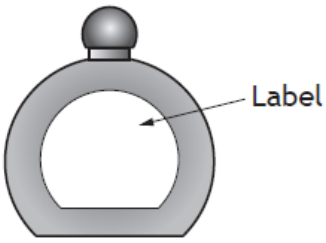
14. Solve the equation $2\tan x° + 5 = -4$, for $0 \leq x \leq 360$. 3

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

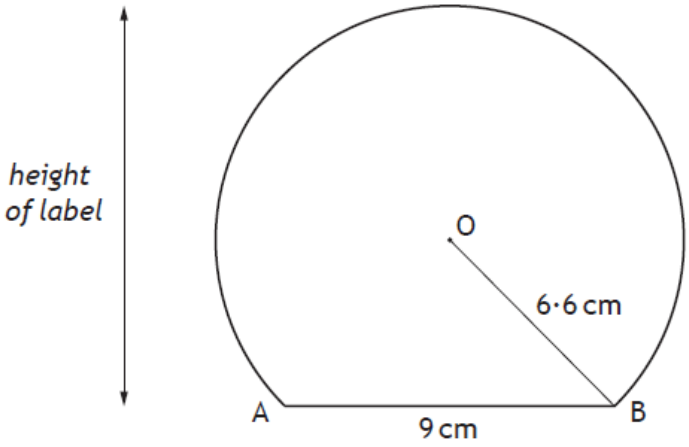
https://youtu.be/7idsuJ4CGAM

Video Lesson: REL 1·5b Silver Outcome 1

15. This perfume bottle has a label in the shape of part of a circle.



A diagram of the label is shown below.



- The centre of the circle is O.
- The chord AB is 9 centimetres.
- The radius OB is 6·6 centimetres.

Find the height of the label. 4

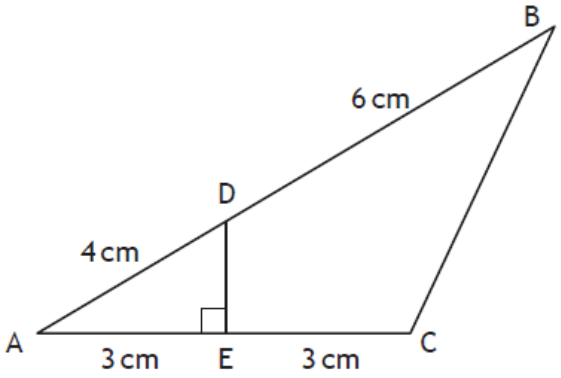
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/_hprZ4Gq0_I

Video Lesson: REL 1·4a Gold Outcome 1

16. In the diagram below:

- DE is perpendicular to AC.
- AD = 4 centimetres.
- DB = 6 centimetres.
- AE = EC = 3 centimetres.



Calculate the length of BC.
Give your answer correct to one decimal place. 4

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

https://youtu.be/_FCdt7yzoE4

Video Lesson: APP 1·1 Silver Outcome 2

[END OF QUESTION PAPER]