National 5 Mathematics

2019 Paper 2

Time allowed = 1 hr 50 mins Marks available = 60

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 ÷ 60 × 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 — 60

Attempt ALL questions

1. A charity distributed 80 000 emergency packages during 2018.

   This number is expected to increase by 15% each year.

   Calculate how many emergency packages the charity expects to distribute in 2021. 3

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

https://youtu.be/VYTuN3UR_Fk

Video Lesson: APP 1·3a Bronze Outcome 2

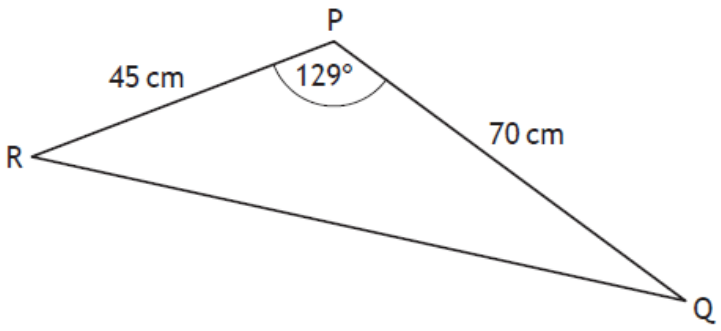
2. Find $|\mathbf{p}|$, the magnitude of vector $\mathbf{p} = \begin{pmatrix} 6 \\ 27 \\ -18 \end{pmatrix}$. 2

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

https://youtu.be/qD1D2MyDcuk

Video Lesson: APP 1·4 Silver Outcome 4

3. The diagram shows triangle PQR.



- PR = 45 centimetres
- PQ = 70 centimetres
- Angle QPR = 129°

Calculate the area of triangle PQR. 2

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

https://youtu.be/Uc2asvhLtFI

Video Lesson: APP 1·1 Bronze Outcome 1

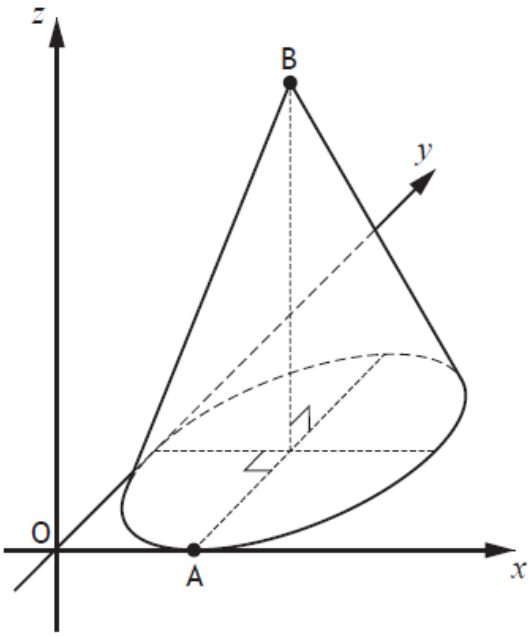
4. A sesame seed weighs $3{\cdot}6\times10^{-6}$ kilograms.
The weight of a poppy seed is 8% of the weight of a sesame seed.
Calculate the weight of a poppy seed in kilograms.
Give your answer in scientific notation. 2

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

https://youtu.be/YpsMGEEyG7A

Video Lesson: REL 1·1b Gold Outcome 3

5. The diagram shows a cone with diameter 6 units and height 8 units.



- The x-axis and the y-axis are tangents to the base
- A is the point of contact between the base and the x-axis
- B is directly above the centre of the base

Write down the coordinates of A and B. 2

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

https://youtu.be/AjPSzjiT1uY

Video Lesson: APP 1·4 Silver Outcome 2

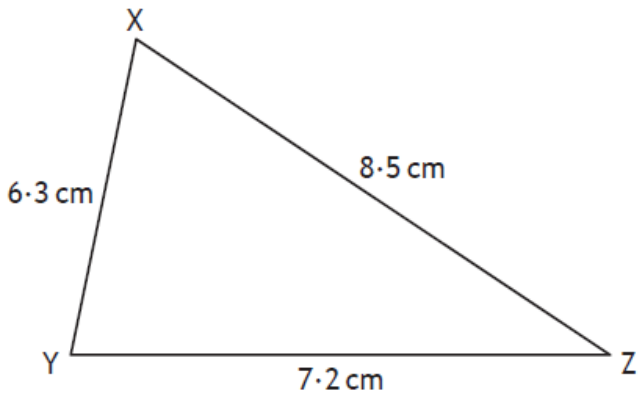
6. Solve the equation $3x^2 + 9x - 2 = 0$.
   Give your answers correct to 1 decimal place. 3

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

https://youtu.be/AXfHA-W0-R0

Video Lesson: REL 1·3a Gold Outcome 3

7. Triangle XYZ is shown below.



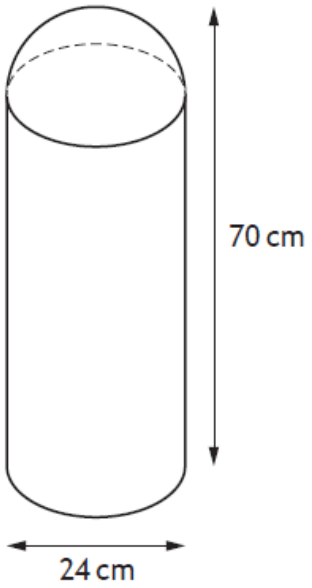
Calculate the size of the smallest angle in triangle XYZ. 3

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

https://youtu.be/toXU4311-gE

Video Lesson: APP 1·1 Gold Outcome 3

8. A traffic bollard is in the shape of a cylinder with a hemisphere on top.
The bollard has
- diameter 24 centimetres
- height 70 centimetres.



Calculate the volume of the bollard.
Give your answer correct to 3 significant figures. 5

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

https://youtu.be/yOwBclnl0Sk

Video Lesson: E+F 1·4c Silver Outcomes 1 and 3

9. Georgie had her roof repaired.
She was charged an extra 2·5% for late payment.
She had to pay a total of £977·85.
Calculate how much she would have **saved** if she had paid on time. 3

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

https://youtu.be/xZG9FaUc31w

Video Lesson: APP 1·3a Gold Outcome 1

10. Express $x^2+10x-15$ in the form $(x+p)^2+q$. 2

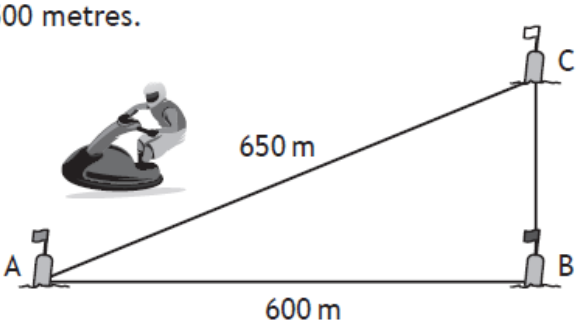
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/p79m9--aHFo

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

11. The diagram shows the course for a jet-ski race.
The course is indicated by markers A, B and C.
The total length of the course is 1500 metres.

- B is 600 metres from A
- C is 650 metres from A
- C is due north of B



Determine whether B is due east of A.
Justify your answer. 4

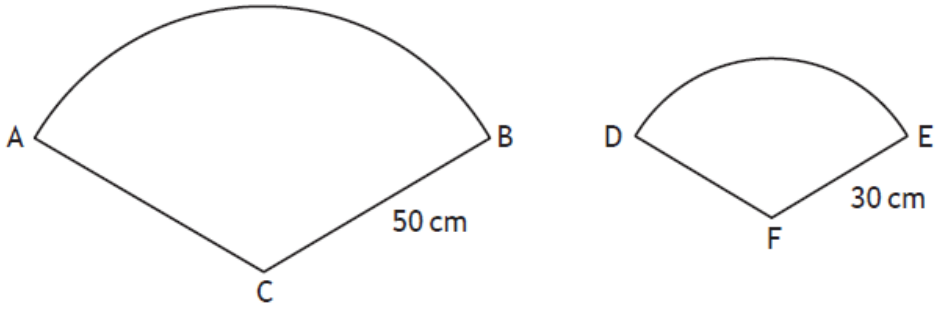
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/0pQlmZB6K7M

Video Lesson: REL 1·4a Bronze Outcome 1

12. In the diagram

- ABC is a sector of a circle, centre C
- DEF is a sector of a circle, centre F.



The sectors are mathematically similar.

The area of the larger sector, ABC, is 2750 square centimetres.

(a) Calculate the area of the smaller sector, DEF. 3

(b) Calculate the size of angle ACB. 3

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

https://youtu.be/GaHmzJNl7HI

Video Lessons: REL 1·4c Silver Outcome 2, E+F 1·4b Gold Outcome 2

13. Find an expression for the gradient of the line joining point A(6,9) to point B$(4p, 4p^2)$.
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/Z9v3l86gyH0

Video Lessons: E+F 1·4a Gold Outcome 1, E+F 1·3 Gold Outcome 1

14. Solve the equation $5\cos x° + 2 = 1, \quad 0 \leq x < 360.$ 3

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

https://youtu.be/9Xy12HffPvU

Video Lesson: REL 1·5b Silver Outcome 1

15. Express

$$\frac{4}{x-2}-\frac{3}{x+5}, \quad x \neq 2, x \neq -5$$

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/NkGFK3njfnw

Video Lesson: E+F 1·3 Gold Outcome 2

16. Simplify $\frac{a^4 \times 3a}{\sqrt{a}}$. 3

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

https://youtu.be/_CZS1PfdD1A

Video Lessons: REL 1·1b Silver Outcome 1, Gold Outcome 2

17. Expand and simplify

$$(\sin x° + \cos x°)^2.$$

Show your working. 2

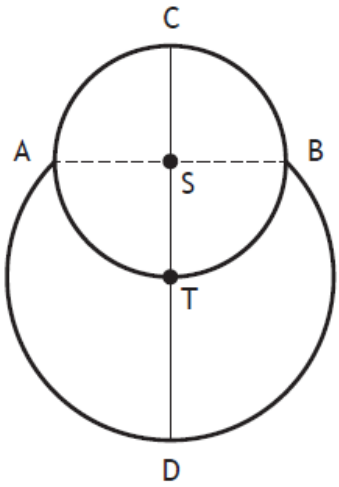
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/ZWLYPqNRWZc

Video Lesson: REL 1·5b Gold Outcome 2

18. The picture shows a cartoon snowman.

The diagram below represents the snowman.



- The head is a small circle, centre S, with diameter 15 centimetres
- The body is part of a larger circle, centre T
- The point T lies on the circumference of the small circle
- The points A and B lie on the circumferences of both circles

Calculate CD, the height of the snowman. 4

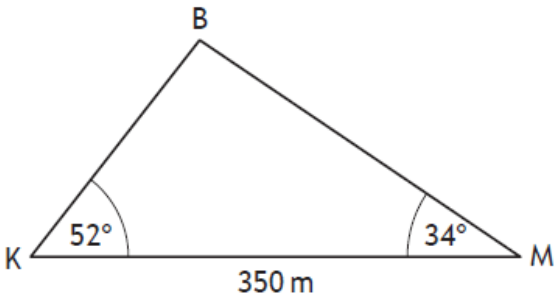
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/S-BzLEknFBA

Video Lesson: REL 1·4 Gold Outcome 1

19. Katy and Mona are looking up at a hot-air balloon.

In the diagram below, K, M and B represent the positions of Katy, Mona and the balloon respectively.



- The angle of elevation of the balloon from Katy is 52°
- The angle of elevation of the balloon from Mona is 34°
- Katy and Mona are 350 metres apart on level ground

Calculate the height of the hot-air balloon above the ground. **5**

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

https://youtu.be/jNh1npq7Q0I

Video Lesson: APP 1·1 Silver Outcome 2

[END OF QUESTION PAPER]