National 5 Mathematics

2017 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/2017/mi_N5_Mathematics_all_2017.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. Find $|\mathbf{v}|$, the magnitude of vector $\mathbf{v} = \begin{pmatrix} 18 \\ -14 \\ 3 \end{pmatrix}$. 2

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

https://youtu.be/Kkvt34JoaLY

Video Lesson: APP 1·2 Silver Outcome 4

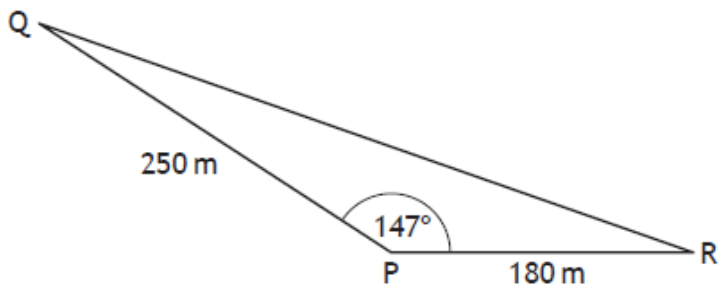
2. A necklace is valued at £1200.
Its value is expected to increase by 4·5% per year over the next 3 years.
Calculate the expected value of the necklace after this time.
Give your answer to the nearest pound. 3

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

https://youtu.be/ezGAZuQy8YI

Video Lesson: APP 1·3a Silver Outcome 2

3. A piece of land is in the shape of a triangle as shown.



- PQ = 250 metres
- PR = 180 metres
- angle QPR = 147°

The owner wishes to build a fence along the side QR.
Calculate the length of the fence. 3

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

https://youtu.be/eJEDSDSn1dA

Video Lesson: APP 1·1 Bronze Outcome 3

4. Solve the equation $2x^2 + 5x - 4 = 0$.
Give your answers correct to one decimal place. 3

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

https://youtu.be/wpPwypgnOW4

Video Lesson: REL 1·3a Gold Outcome 3

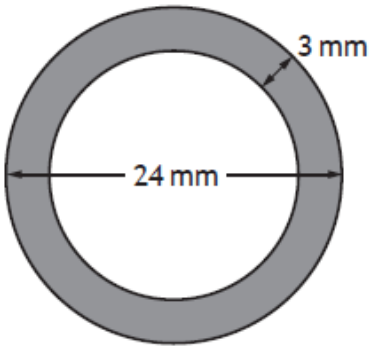
5. A theatre group sold 4830 tickets for their show.
This was 15% more than they sold last year.
How many tickets did they sell last year? 3

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

https://youtu.be/ZPaLqaBqZZk

Video Lesson: APP 1·3a Bronze Outcome 1

6. A spherical sweet is made by coating a caramel sphere evenly with chocolate.
A cross-section of the sweet is shown below.



The diameter of the sweet is 24 millimetres and the thickness of the chocolate coating is 3 millimetres.
Calculate the volume of the chocolate coating. 5
Give your answer correct to 3 significant figures.

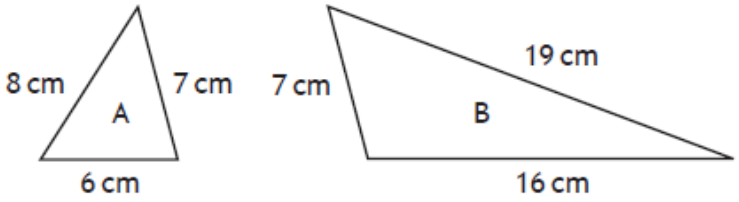
Scan the QR code or click on the link to view the worked solutions;

https://youtu.be/3tk7gl1lz_E

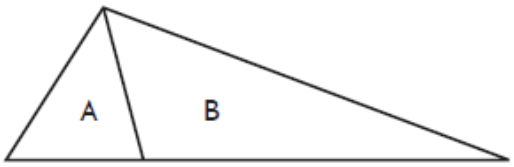
Video Lesson: E+F 1·4c Silver Outcome 3

SQA Pastpapers

7. Triangles A and B are shown below.



The triangles are placed together to form the larger triangle shown below.



Is this larger triangle right-angled? 3

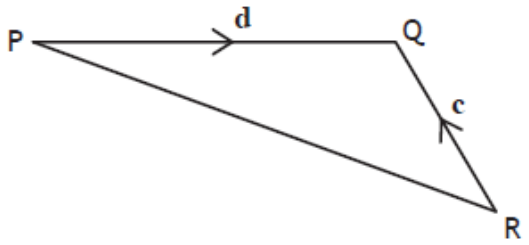
Justify your answer.

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

https://youtu.be/Qxzagmme-3E

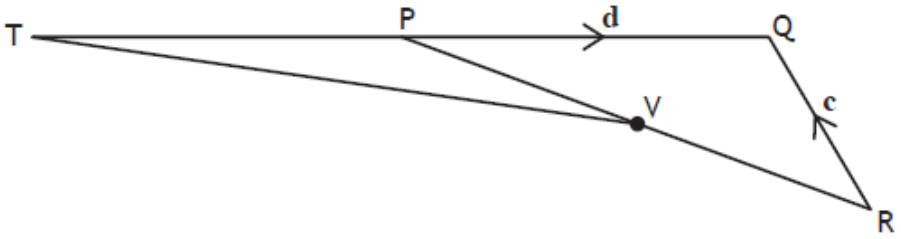
Video Lesson: REL 1·4a Bronze Outcome 1

8. In the diagram below, $\overrightarrow{RQ}$ and $\overrightarrow{PQ}$ represent the vectors $\mathbf{c}$ and $\mathbf{d}$ respectively.



(a) Express $\overrightarrow{PR}$ in terms of $\mathbf{c}$ and $\mathbf{d}$. 1

The line QP is extended to T.



- TP = PQ
- V is the midpoint of PR

(b) Express $\overrightarrow{TV}$ in terms of $\mathbf{c}$ and $\mathbf{d}$.
Give your answer in simplest form. 2

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

https://youtu.be/kL32QeevqO4

Video Lesson: APP 1·2 Gold Outcome 2

9. (a) Factorise $4x^2 - 25$. 1

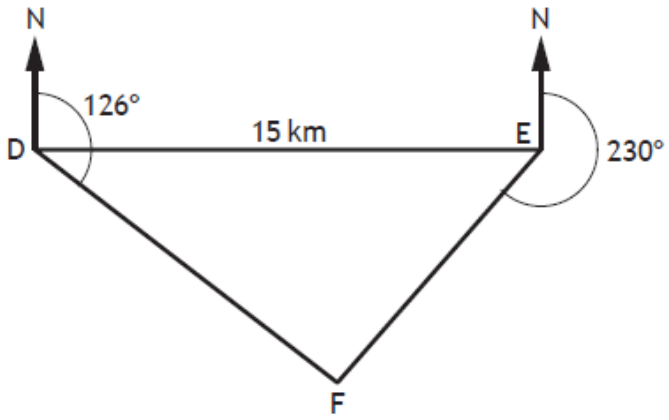
(b) Hence simplify $\dfrac{4x^2 - 25}{2x^2 - x - 10}$. 3

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

https://youtu.be/622dAAGFI_8

Video Lessons: E+F 1·2b Silver Outcome 2 and E+F 1·3 Gold Outcome 1

10. In the diagram below D, E and F represent the positions of Dunbridge, Earlsford and Fairtown respectively.



Dunbridge is 15 kilometres west of Earlsford.
From Dunbridge, the bearing of Fairtown is 126°.
From Earlsford the bearing of Fairtown is 230°.

Calculate the distance between Dunbridge and Fairtown. 4
Do not use a scale drawing.

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

https://youtu.be/VVUXwXrT7U4

Video Lesson: APP 1·1 Silver Outcome 2

11. A straight line has equation $3x-5y-10=0$.
Find the gradient of this line. 2

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

https://youtu.be/myF_ckIguug

Video Lesson: REL 1·1a Gold Outcome 1

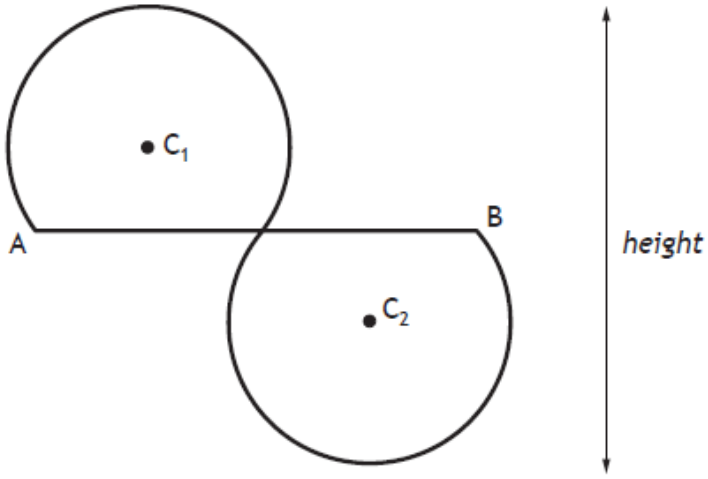
12. Express $\frac{1}{\sqrt[3]{x}}$ in the form x^n. 2

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

https://youtu.be/T7yGKSDhq1E

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

13. Two identical shapes are used to form a logo.
Each shape is part of a circle.



- The circles have centres C_1 and C_2.
- The radius of each circle is 14 centimetres.
- The logo has half-turn symmetry about the mid-point of AB.
- AB is 48 centimetres long.

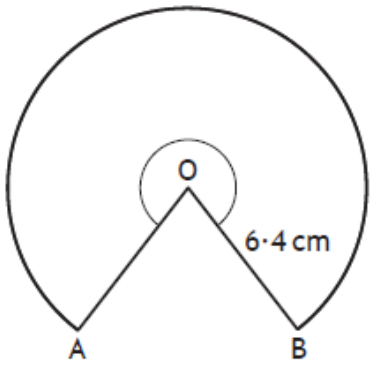
Calculate the height of the logo. 4

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

https://youtu.be/v0WbMvuM7vs

Video Lesson: REL 1·4a Gold Outcome 1

14. The diagram below shows part of a circle, centre O.



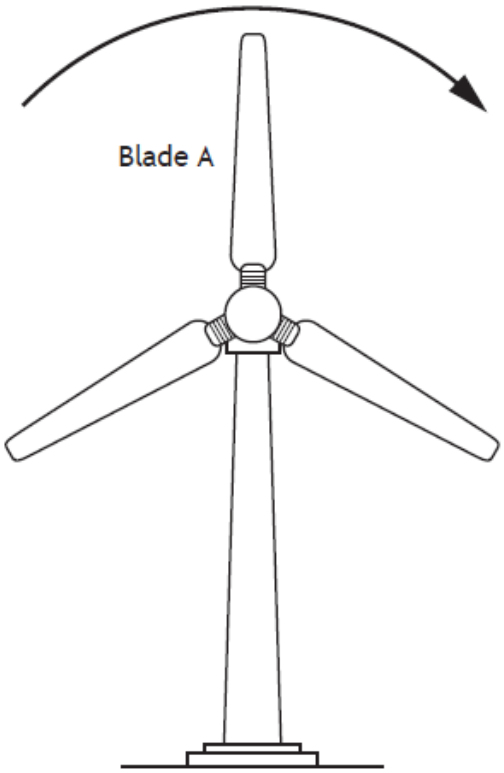
The radius of the circle is 6·4 centimetres.
Major arc AB has length 31·5 centimetres.
Calculate the size of the reflex angle AOB. 3

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

https://youtu.be/EHBgC9VElus

Video Lesson: E+F 1·4b Gold Outcome 1

15. A wind turbine has three blades as shown below.



The height, h metres, of the tip of blade A above the ground in each rotation is given by

$$h = 40 + 23\cos x°, \qquad 0 \leq x < 360$$

where x is the angle blade A has turned clockwise from its vertical position.

(a) Calculate the height of the tip of blade A after it has turned through an angle of 60°. 1

(b) Find the minimum height of the tip of blade A above the ground. 1

(c) Calculate the values of x for which the tip of blade A is 61 metres above the ground. 4

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

https://youtu.be/2wnBrgAHSmU

Video Lesson: REL 1·5b Gold Outcome 1

[END OF QUESTION PAPER]