National 5 Mathematics

2023 Paper 1

Time allowed = 1 hr Marks available = 40

For each question, you can click on the link to view the worked solutions for each question.

You can also click on the link below to view this paper's marking scheme;

www.sqa.org.uk/pastpapers/papers/instructions/2022/mi_N5_Mathematics_Paper-1-Non-calculator_2022.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. Evaluate $2\frac{1}{6} \div \frac{8}{9}$.

   Give your answer in its simplest form. 2

Click here to view the worked solutions.

Video Lesson: APP 1·3a Gold Outcome 3

2. Expand and simplify $(x+7)^2 + 6(x^2 - 10)$. 3

Click here to view the worked solutions.

Video Lesson: E+F 1·2a Gold Outcome 2

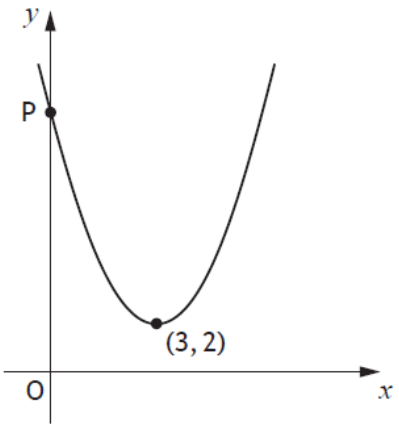
3. Solve, algebraically, the system of equations

$$2x + 3y = 8$$
$$5x + 2y = -2.$$ 3

Click here to view the worked solutions.

Video Lesson: REL 1·1d Gold Outcome 1

4. The graph below shows part of a parabola of the form $y=(x+a)^2+b$.



(a) (i) State the value of a. 1

(ii) State the value of b. 1

(b) P is the point $(0, c)$.
Find the value of c. 1

Click here to view the worked solutions.

Video Lesson: REL 1·2 Bronze Outcome 1

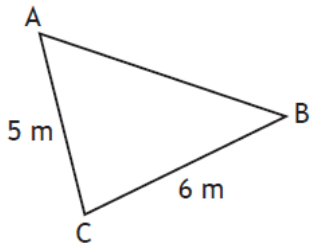
5. Determine the nature of the roots of the function $f(x)=4x^2+6x-1$. 2

Click here to view the worked solutions.

Video Lesson: REL 1·3b Bronze Outcome 1

6. In triangle ABC:

- AC = 5 metres
- BC = 6 metres
- $\cos C = \frac{1}{5}$.



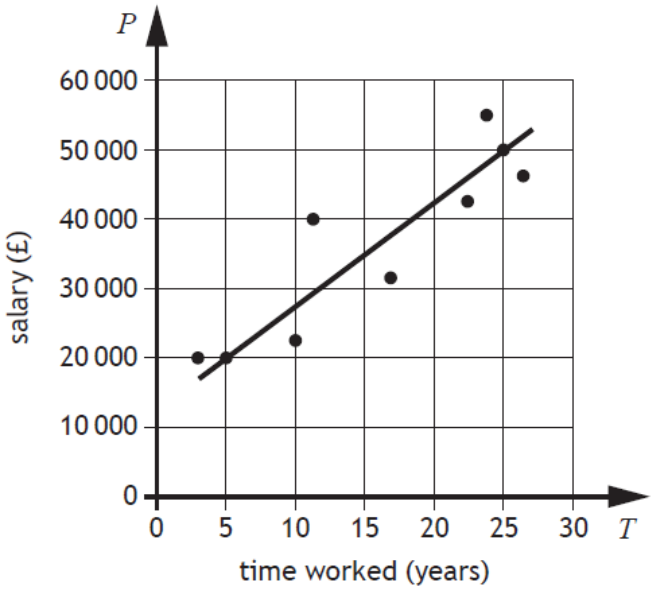
Calculate the length of AB. 3

Click here to view the worked solutions.

Video Lesson: APP 1·1 Bronze Outcome 3

7. A business recorded the salaries of a sample of its employees and the length of time they have worked for the business.

The scattergraph shows the relationship between their salary, P pounds, and the length of time, T years, they have worked.



A line of the best fit has been drawn.

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

(b) Use your equation from part (a) to estimate the salary of an employee who has worked for the business for 8 years. 1

Click here to view the worked solutions.

Video Lesson: APP 1·4 Silver Outcome 3 and Gold Outcome 3

8. Express $\frac{12}{\sqrt{15}}$ with a rational denominator.

Give your answer in its simplest form. 2

Click here to view the worked solutions.

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

9. A magazine company conducted a survey of the ages of its readers.

A sample of ten readers' ages, in years, are shown below.

33 55 38 47 36 41 42 41 35 31

(a) Calculate the median and interquartile range of the ages of readers for this sample. 3

A newspaper company also conducted a survey of the ages of its readers.

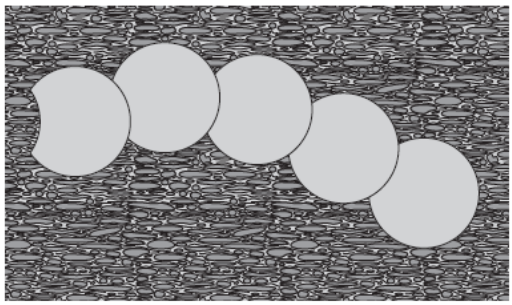
The median age of a sample of its readers was 41 years and the interquartile range was 9 years.

(b) Make two valid comments comparing the ages of the readers of the magazine and the ages of the readers of the newspaper. 2

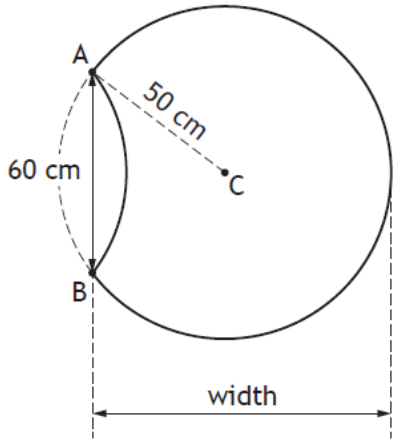
Click here to view the worked solutions.

Video Lesson: APP 1·4 Silver Outcome 1

10. Alan buys some identical paving slabs to make a path.
Each slab is part of a circle.



The diagram below shows a single slab.



The circle, centre C, has a radius of 50 centimetres.
Length AB is 60 centimetres.
Calculate the width of the paving slab. **4**

Click here to view the worked solutions.

Video Lesson: REL 1·4a Gold Outcome 1

11. Given that $\sin 30° = 0.5$, state the value of $\sin 330°$. **1**

Click here to view the worked solutions.

Video Lesson: REL 1·5a Gold Outcomes 2

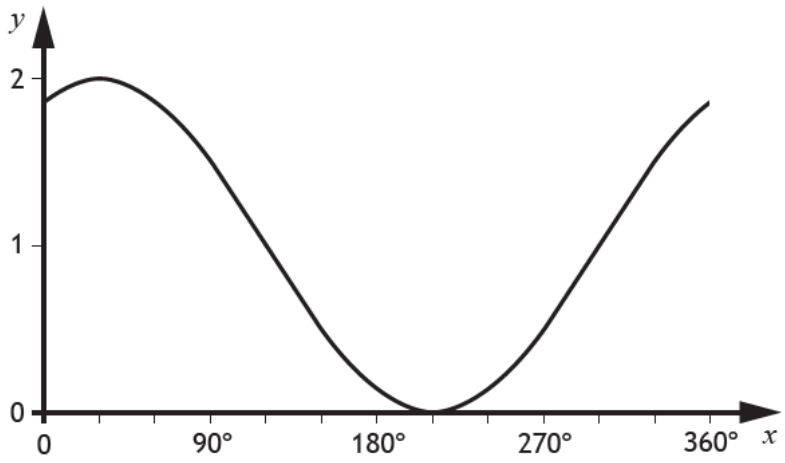
12. Simplify $\frac{5c^{-2}}{c^3 \times c^4}$.

Give your answer with a **positive** power. 3

Click here to view the worked solutions.

Video Lesson: E+F 1·1b Silver Outcomes 1 and 2

13. Part of the graph of $y = \cos(x + a)° + b$ is shown.



(a) State the value of a. 1

(b) State the value of b. 1

Click here to view the worked solutions.

Video Lesson: REL 1·5a Gold Outcome 1

14. Solve, algebraically, the inequation $\frac{x+1}{3}-2>\frac{3x}{5}$. 3

Click here to view the worked solutions.

Video Lesson: REL 1·1c Gold Outcome 2

[END OF QUESTION PAPER]