National 5 Mathematics

2023 Paper 2

Time allowed = 1 hr 30 mins   Marks available = 50

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/2023/mi_N5_Mathematics_Paper-2_2023.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 caravan was bought for £20,000.

   It depreciated by 11% in the first year.

   It then depreciated by a further 6% each year over the next two years.

   Calculate the value of the caravan three years after it was bought.   3

Click here to view the worked solutions.

Video Lesson: APP 1·3b Gold Outcome 3

2. The mass of a helium atom is 6.64×10^{-24} grams.

   A flask contains 300 grams of helium.

   Calculate the number of helium atoms in this flask.

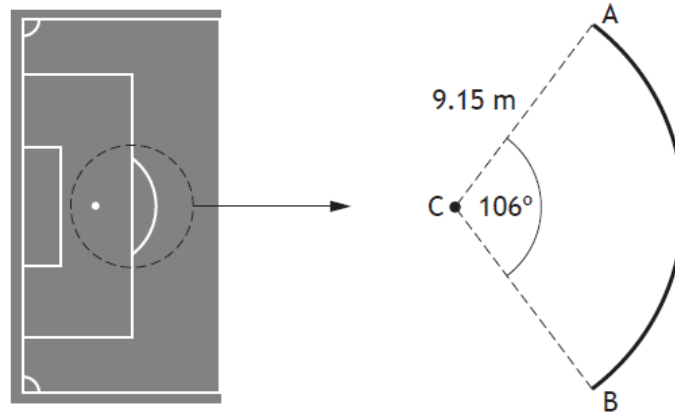   Give your answer in scientific notation, correct to 3 significant figures.   3

Click here to view the worked solutions.

Video Lesson: E+F 1·1b Gold Outcome 3

3. The diagram shows part of a football pitch.

9.15 m

C • 106°

A

B

The penalty spot is marked at point C.

AB is an arc of a circle, centre C, radius 9.15 metres.

Calculate the length of the arc AB.   3
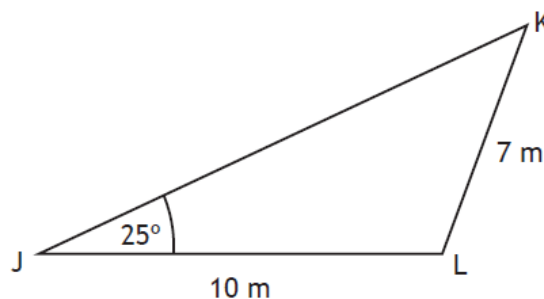
Click here to view the worked solutions.

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

4. The diagram shows triangle JKL.

*   Angle KJL = 25°
*   JL = 10 metres
*   KL = 7 metres

K

7 m

25°

J

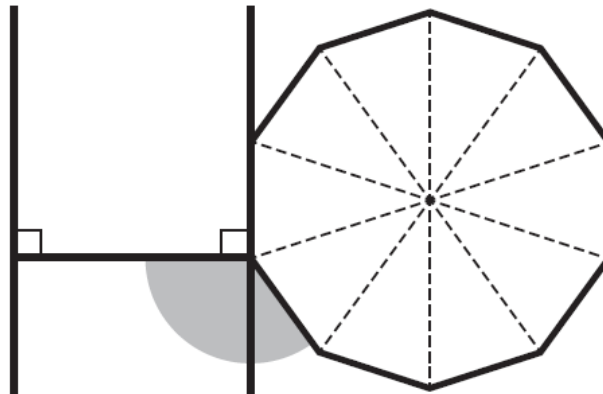10 m

L

Calculate the size of angle JKL.   3

Click here to view the worked solutions.

Video Lesson: APP 1·1 Gold Outcome 2

5.   A logo consists of an H shape and a regular decagon.

     The diagram represents the logo.

     Calculate the size of the shaded angle.   2

Click here to view the worked solutions.

Video Lesson: REL 1·4b Bronze Outcome 1

6.   Nadim bought a flat last year.

     The value of the flat has increased by 8% and it is now worth £94,500.

     Calculate how much Nadim paid for the flat.   3

Click here to view the worked solutions.
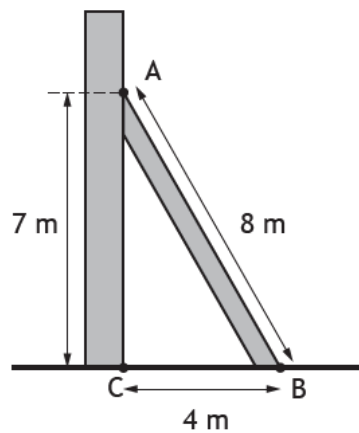
Video Lesson: APP 1·3b Bronze Outcome 1

7. Change the subject of the formula $P = \dfrac{1}{3}mn - r$ to m.   3

Click here to view the worked solutions.

Video Lesson: REL 1·1e Silver Outcome 2

8. A wooden beam is used to support a wall built on horizontal ground as shown in the diagram.

The edge of the beam, AB, is 8 metres long.

C is at the foot of the wall.

A is 7 metres from C.

B is 4 metres from C.

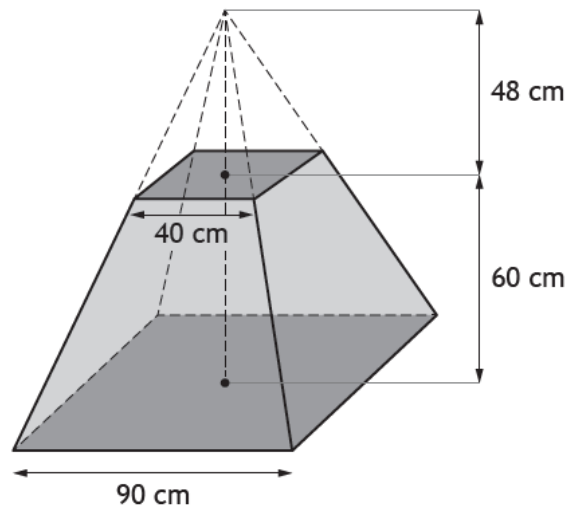Determine whether the wall is perpendicular to the ground.

Justify your answer.   4

Click here to view the worked solutions.

Video Lesson: REL 1·4a Bronze Outcome 1

9. A concrete block is in the shape of a large pyramid with a small pyramid removed.

48 cm

40 cm

60 cm

90 cm

The large pyramid has a square base of length 90 centimetres.

The small pyramid has a square base of length 40 centimetres and a height of 48 centimetres.

The block has height 60 centimetres.

Calculate the volume of the block.   4

Click here to view the worked solutions.

10. Express
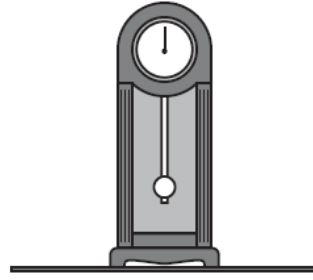
$$\frac{7}{x-3} - \frac{2}{x}, \quad x \neq 3, x \neq 0$$

as a single fraction in its simplest form.   3

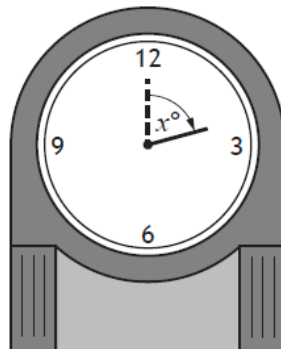Click here to view the worked solutions.

Video Lesson: E+F 1·3 Gold Outcome 2

11. Anna has a grandfather clock in her house.

The height of the tip of the hour hand above the floor, in centimetres, is given by

$$h = 20\cos x° + 147$$

where $x°$ is the angle the **hour hand** has rotated through since 12 o'clock.

Calculate the first two values of x for which the tip of the hour hand is
150 centimetres above the floor.   4

Click here to view the worked solutions.

Video Lesson: REL 1·5b Bronze Outcome 1

12. Simplify $\dfrac{x^2 - 16}{x^2 + x - 20}$.   3

Click here to view the worked solutions.

Video Lesson: E+F 1·3 Gold Outcome 1

13.   Simplify $2\sin^2 x° + 2\cos^2 x°$.

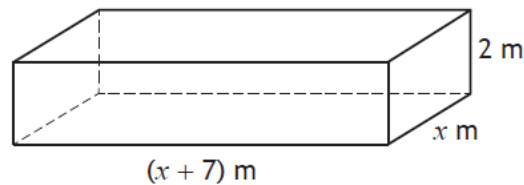   **Show your working.**   2

Click here to view the worked solutions.

Video Lesson: REL 1·5b Gold Outcome 2

14.   A storage unit, built in the shape of a cuboid, is shown.

      2 m

      x m

      $(x + 7)$ m

      It has length $(x + 7)$ metres, breadth x metres and height 2 metres.

      The volume of this unit is 45 cubic metres.

      (a) Show that $2x^2 + 14x - 45 = 0$.   2

      (b) Calculate x, the breadth of the storage unit.
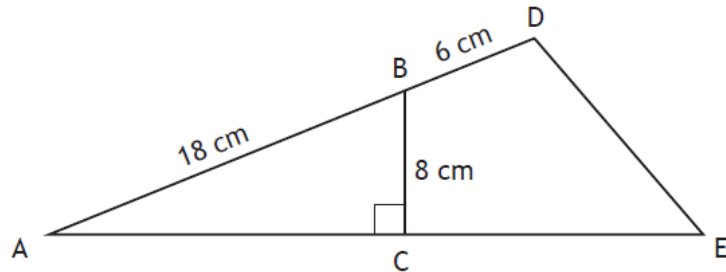
           Give your answer correct to 1 decimal place.   4

Click here to view the worked solutions.

Video Lesson: REL 1·3a Gold Outcome 3

15. In the diagram:

- AC is perpendicular to BC
- AB = 18 centimetres
- BD = 6 centimetres
- BC = 8 centimetres.

The **area** of triangle ADE is 160 square centimetres.

Calculate the length of AE.   **4**

Click here to view the worked solutions.

Video Lesson: APP 1·1 Gold Outcome 1

[END OF QUESTION PAPER]