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National
Qualifications
2022 MODIFIED

Mark

X847/75/01

Mathematics Paper 1 (Non-calculator)

WEDNESDAY, 4 MAY

9:00 AM – 10:00 AM



* X 8 4 7 7 5 0 1 *

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day

Month

Year

Scottish candidate number

Total marks — 40

Attempt ALL questions.

You may NOT use a calculator.

To earn full marks you must show your working in your answers.

State the units for your answer where appropriate.

Write your answers clearly in the spaces provided in this booklet. Additional space for answers is provided at the end of this booklet. If you use this space you must clearly identify the question number you are attempting.

Use **blue** or **black** ink.

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* X 8 4 7 7 5 0 1 0 1 *

FORMULAE LIST

The roots of $ax^2 + bx + c = 0$ are $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$ or $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$

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 $s = \sqrt{\frac{\Sigma(x - \bar{x})^2}{n - 1}}$

or $s = \sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n - 1}}$, where n is the sample size.



* X 8 4 7 7 5 0 1 0 2 *

Total marks — 40
 Attempt ALL questions

1. Evaluate

$$\frac{2}{3} \left(\frac{1}{5} + \frac{3}{4} \right).$$

Give your answer in its simplest form.

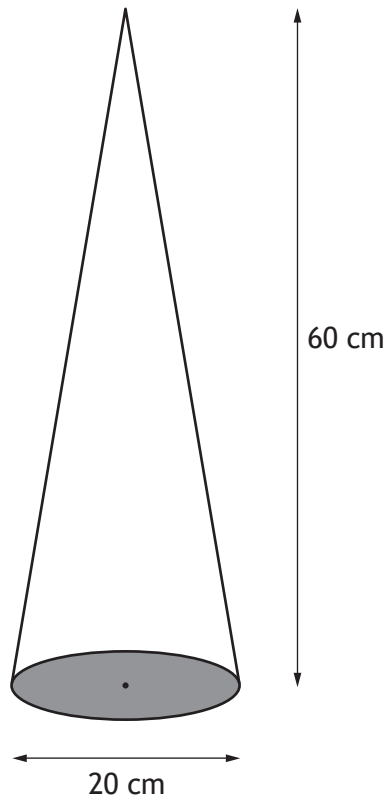
2

2. Given that $f(x) = x^3 - 2$, evaluate $f(-3)$.

2



3. The diagram below shows a cone with diameter 20 centimetres and height 60 centimetres.



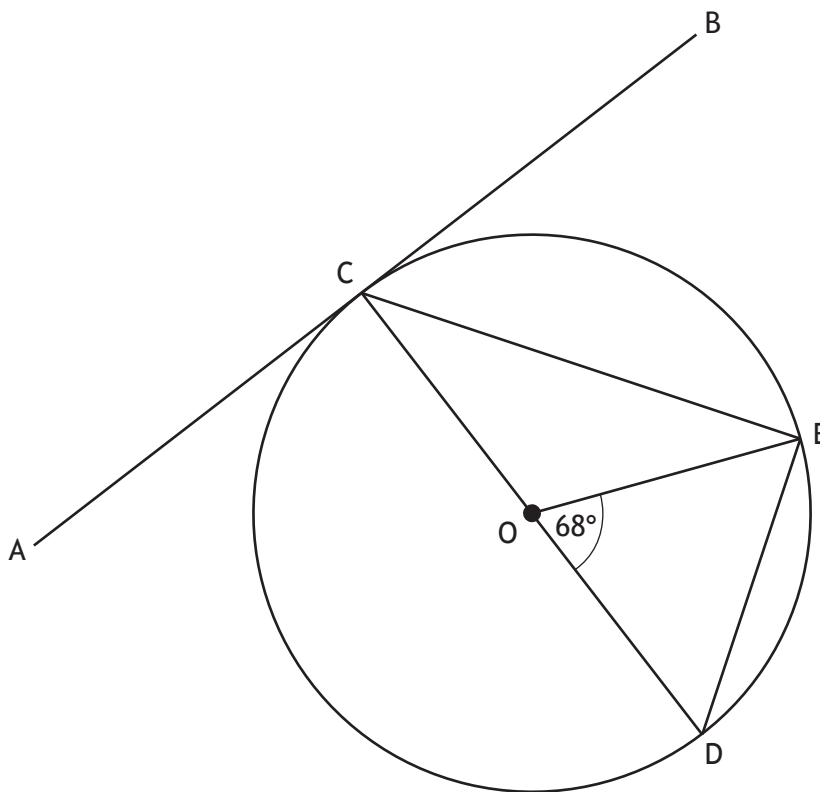
Calculate the volume of the cone.

Take $\pi = 3.14$.

2



4. The diagram below shows a circle with centre O.



AB is a tangent to the circle at the point C.

CD is a diameter of the circle.

Angle EOD is 68° .

Calculate the size of angle ACE.

3

Angle ACE =



5. (a) Express $x^2 + 8x + 15$ in the form $(x + a)^2 + b$.

2

(b) Hence, or otherwise, state the coordinates of the turning point of the graph of $f(x) = x^2 + 8x + 15$.

1

6. Find the equation of the line passing through the points $(-3, -1)$ and $(-5, 7)$.
Give the equation in its simplest form.

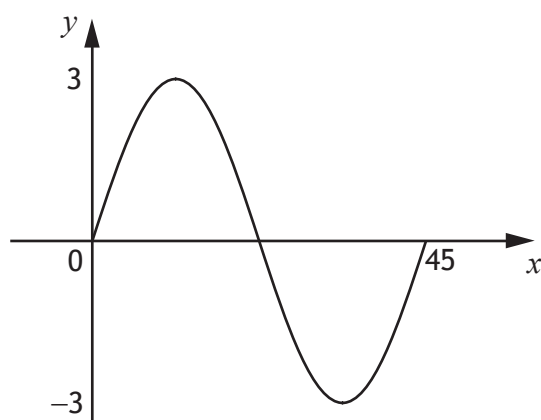
3



7. Change the subject of the formula $D = \frac{B+4}{C^2}$ to B .

2

8. Part of the graph of $y = a \sin bx^\circ$ is shown in the diagram.



(a) State the value of a .

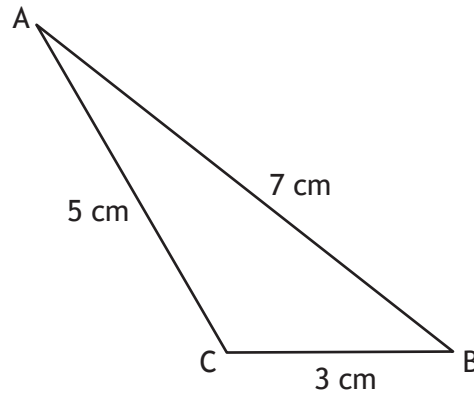
1

(b) State the value of b .

1



9. The diagram shows triangle ABC.



- $AB = 7$ centimetres
- $BC = 3$ centimetres
- $AC = 5$ centimetres

Calculate the value of $\cos B$.

Give your answer in its simplest form.

2



10. Tommy buys flower seeds from a website.
Tommy is given a 30% discount. He pays £16.10 for the seeds.
Calculate the cost of the flower seeds without the discount.

3

11. Simplify $(m^{-2})^4 \times m^{-5}$.
Give your answer with a **positive** power.

3



* X 8 4 7 7 5 0 1 0 9 *

12. Express $\frac{4}{x+2} \div \frac{5}{(x+2)^2}$, $x \neq -2$ as a single fraction in its simplest form.

2

13. Expand and simplify $\sqrt{10}(\sqrt{10} - \sqrt{2}) + 8\sqrt{5}$.

3



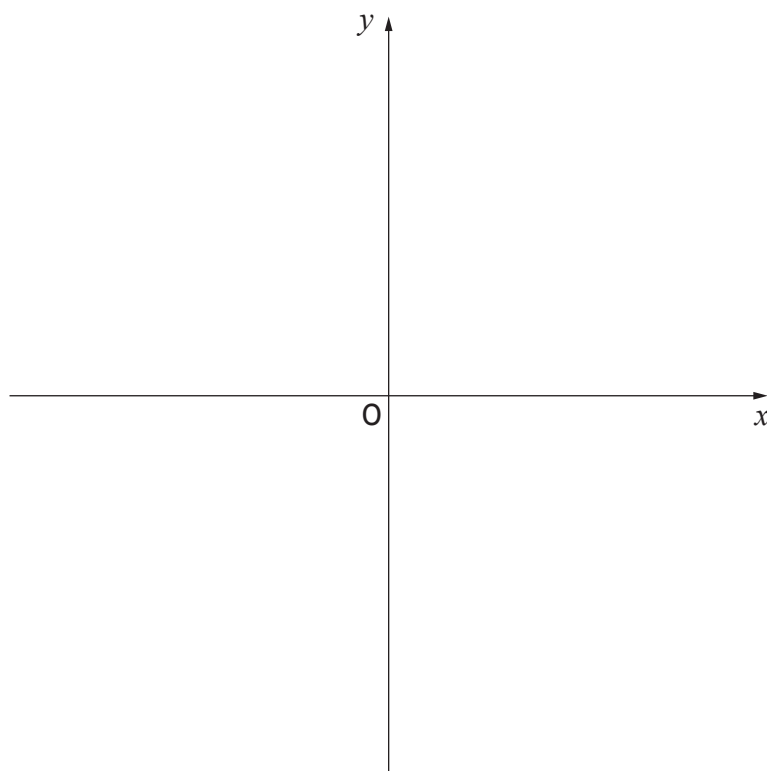
* X 8 4 7 7 5 0 1 1 0 *

14. Sketch the graph of $y = (x + 1)(x - 3)$ using the axes provided below.

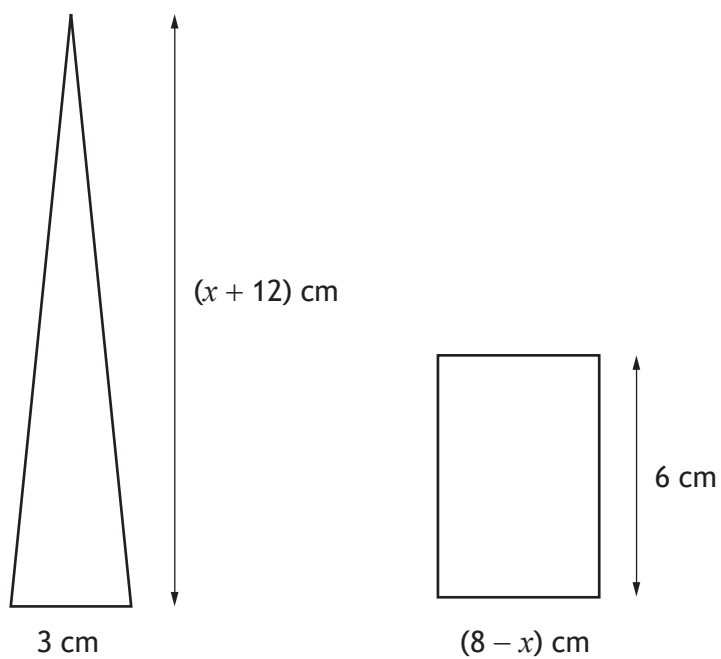
On your sketch, show clearly the points of intersection with the x -axis and the y -axis, and the coordinates of the turning point.

(Additional axes, if required, can be found on *page 14*.)

3



15. A triangle and rectangle are shown in the diagram.



(a) Find an expression for the area of the triangle.

1

15. (continued)

- (b) Given that the area of the triangle is equal to the area of the rectangle, find algebraically the value of x .

4

[END OF QUESTION PAPER]



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**Mathematics
Paper 2**

WEDNESDAY, 4 MAY

10:30 AM – 12:00 NOON



* X 8 4 7 7 5 0 2 *

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Number of seat

Date of birth

Day

Month

Year

Scottish candidate number

Total marks — 50

Attempt ALL questions.

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* X 8 4 7 7 5 0 2 0 1 *

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* X 8 4 7 7 5 0 2 0 2 *

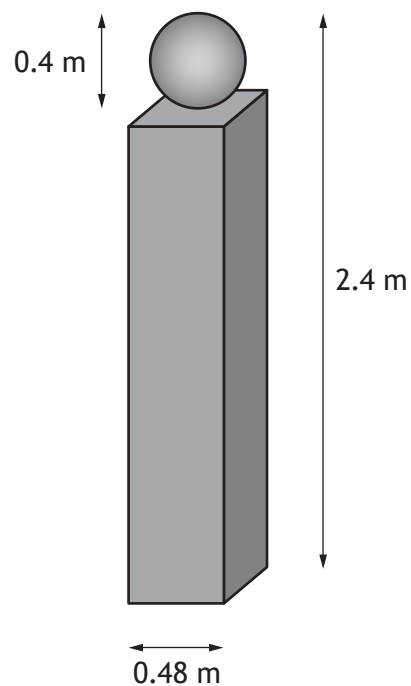
Total marks — 50
Attempt ALL questions

1. Expand and simplify $(3x - 2)(2x^2 + 5x - 1)$. 3

2. A company's annual profit at the end of 2021 was £215,000.
The profit is expected to increase by 3% each year.
Calculate the company's expected annual profit by the end of 2025.
Give your answer correct to the nearest thousand pounds. 3



3. A concrete gatepost is made in the shape of a cuboid with a sphere on top.



The sphere has diameter 0.4 metres.

The cuboid has a square base of length 0.48 metres.

The total height of the gatepost is 2.4 metres.

Calculate the volume of concrete needed to make a gatepost.

3



4. Moira buys 4 mangoes and 3 apples at a fruit shop.
The total cost is £4.25.

(a) Write down an equation to illustrate this information.

1

Sami buys 5 mangoes and 2 apples in the same fruit shop.
The total cost is £4.70.

(b) Write down an equation to illustrate this information.

1

(c) Calculate, algebraically, the cost of a mango and the cost of an apple.

4



5. A school netball team recorded the number of sit-ups each player completed in a minute.

The numbers for the seven players were:

29 27 24 31 22 19 30

- (a) Calculate the mean and standard deviation of the numbers of sit-ups.

4



* X 8 4 7 7 5 0 2 0 6 *

5. (continued)

Some players in the school's hockey team also recorded the number of sit-ups they completed in a minute.

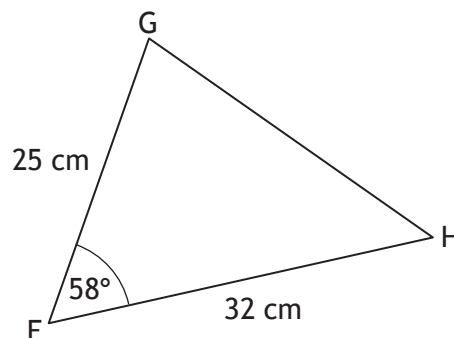
Their numbers gave a mean of 29 and a standard deviation of 3.2.

- (b) Make two valid comments comparing the numbers of sit-ups of the players in the netball team and the hockey team.

2

6. The diagram shows triangle FGH.

- $FG = 25$ centimetres
- $FH = 32$ centimetres
- Angle $GFH = 58^\circ$



Calculate the area of triangle FGH.

2



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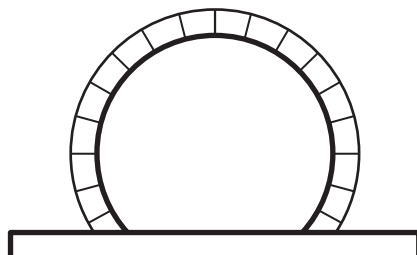
7. Solve the equation $4x^2 + 2x - 7 = 0$.
Give your answers correct to 2 significant figures.

4

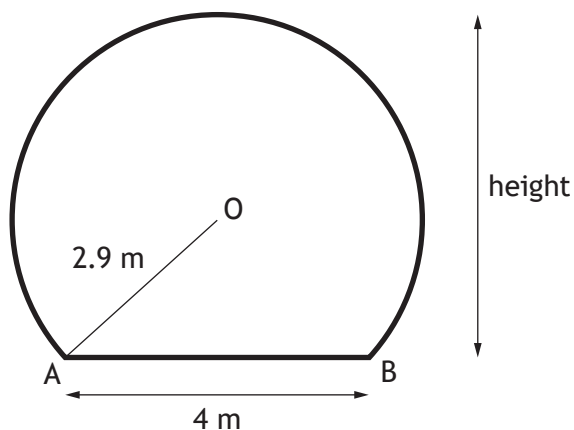


* X 8 4 7 7 5 0 2 0 8 *

8. A train tunnel has a circular cross-section with a horizontal floor.



A diagram of the cross-section is shown below.



- The centre of the circle is O.
- Chord AB is 4 metres.
- The radius OA is 2.9 metres.

Calculate the height of the tunnel.

4



MARKS

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3

9. Solve the equation $3\sin x^\circ + 4 = 6$, for $0 \leq x \leq 360$.

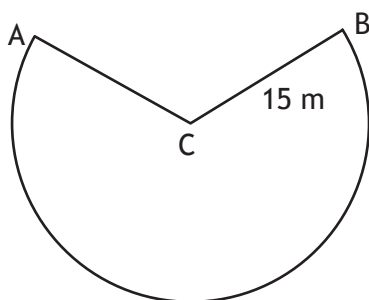


* X 8 4 7 7 5 0 2 1 0 *

10. An attraction at a theme park has a carriage attached to an arm.



The arm swings from A to B along the arc of a circle, centre C, as shown in the diagram below.



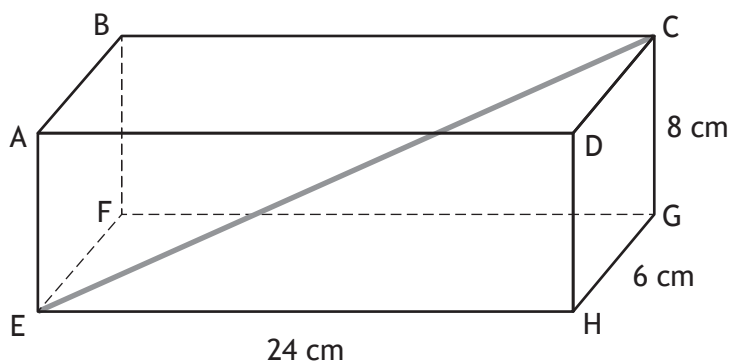
- The length of the arm, CB, is 15 metres.
- The length of the major arc, AB, is 69.4 metres.

Calculate the size of the reflex angle ACB.

3



11. The diagram shows a cuboid, ABCDEFGH.



- The length of the cuboid, EH, is 24 centimetres.
- The breadth of the cuboid, HG, is 6 centimetres.
- The height of the cuboid, CG, is 8 centimetres.

Calculate the length of EC, the space diagonal of the cuboid.

3

MARKS

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MARGIN

12. Simplify $\frac{2ab + 6a}{b^2 - 9}$.

3

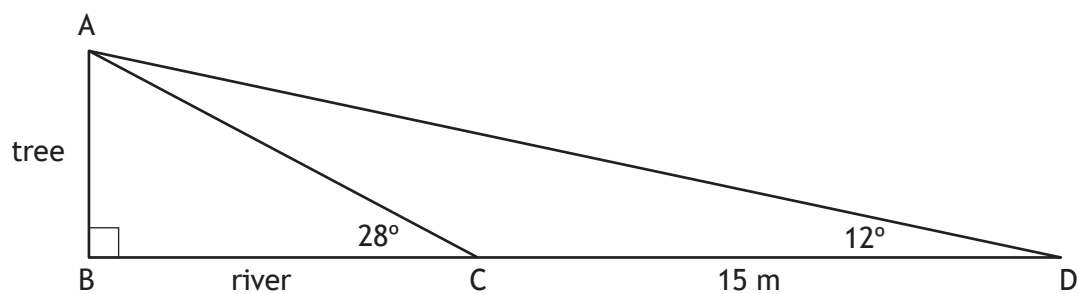
13. Simplify $\frac{\sin x^\circ + 2 \cos x^\circ}{\cos x^\circ}$.

2



* X 8 4 7 7 5 0 2 1 3 *

14. The width of a river is represented by BC in the diagram below. AB represents a tree on the river bank.



- From C , the angle of elevation to A is 28° .
- From D , the angle of elevation to A is 12° .
- The distance from C to D is 15 metres.
- BCD is a straight line.

Calculate BC , the width of the river.

5

[END OF QUESTION PAPER]

