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N5

National
Qualifications
2021 ASSESSMENT RESOURCE

Mark

X847/75/01

Mathematics
Paper 1 (Non-calculator)

Duration — 1 hour 15 minutes

X8477501

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.

You must 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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SQA ©

X8477501

X8477501 01

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

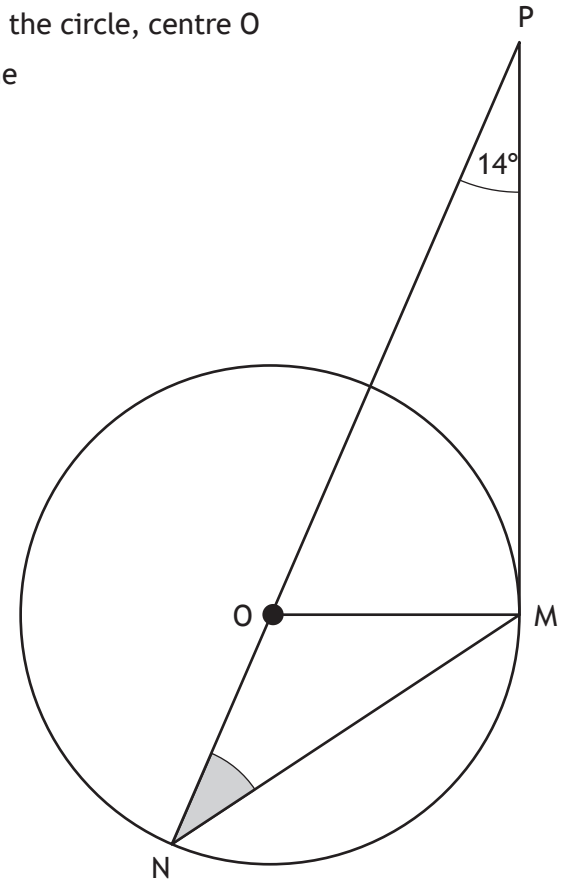
1. Calculate $|\mathbf{d}|$, the magnitude of vector $\mathbf{d} = \begin{pmatrix} 1 \\ -4 \\ 8 \end{pmatrix}$. **2**

2. Evaluate $5\frac{1}{2} - 1\frac{2}{7}$. **2**

3. Expand and simplify $(6x-5)(x+3)+2x(4-x)$. **3**

4. In the diagram shown below

- PM is a tangent to the circle, centre O
- PN is a straight line
- angle OPM is 14°.



Calculate the size of shaded angle ONM. **2**

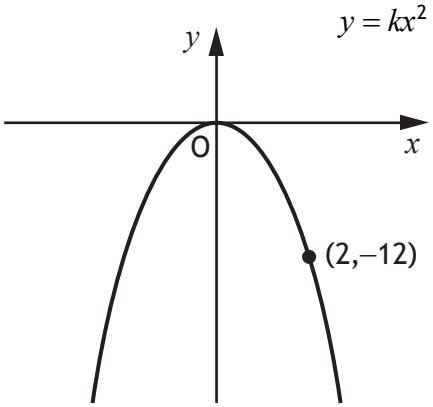
5. The number of absentees at Applegrove High School was recorded each day over a four-week period.

The results are shown below.

7	8	8	11	12	14	14	15	17	17
18	20	20	21	23	24	25	26	27	29

Find the semi-interquartile range of this data. **2**

6. The diagram below shows part of the graph of $y = kx^2$.



Find the value of k. **2**

7. Solve, algebraically, the system of equations

$$5c + 2d = 4$$
$$4c - 3d = 17$$

3

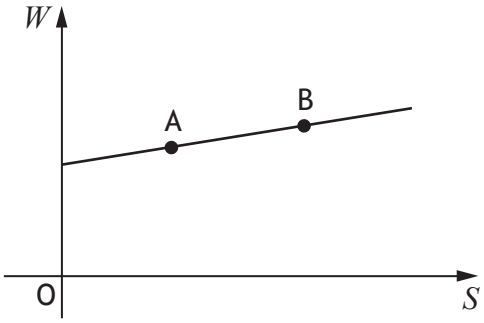
8. Determine the nature of the roots of the function $f(x) = x^2 + 4x - 7$. **2**

9. Express $\sqrt{50} + \sqrt{45} - \sqrt{2}$ in its simplest form. **3**

10. David works in a shop, and is paid weekly.

His wage is made up of a basic wage plus commission on his sales.

The graph shows his wage, W pounds, against his sales, S pounds.



Point A represents sales of £6000 and a wage of £450.

Point B represents sales of £7200 and a wage of £510.

(a) Find the equation of the line in terms of W and S.
Give the equation in its simplest form. **3**

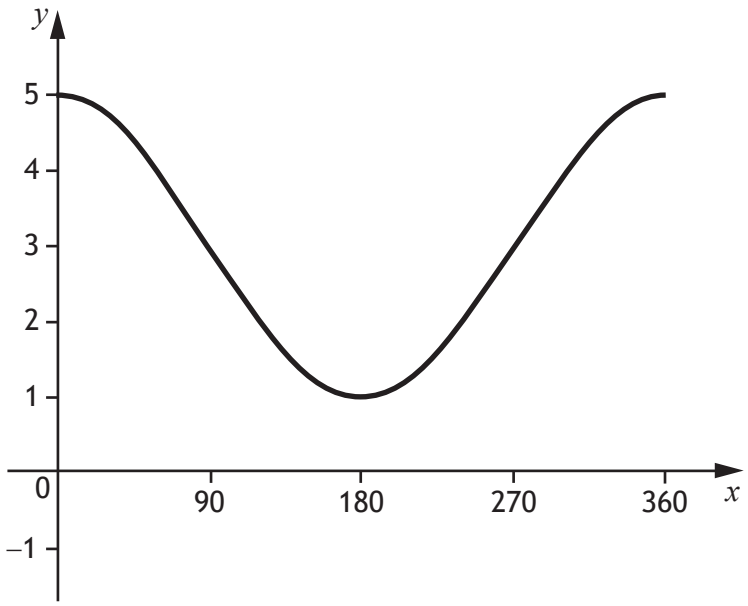
10. (continued)

(b) Calculate David's wage in a week when his sales are £1000. **1**

11. Solve, algebraically, the inequation $1-(x+4)>2x$. **3**

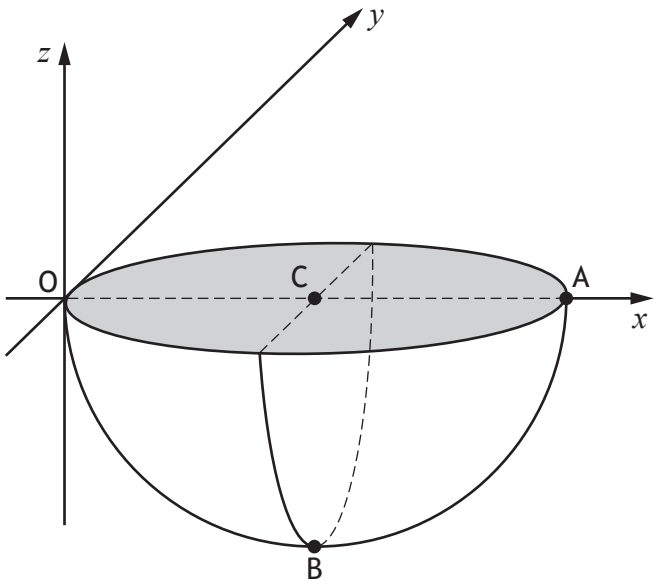
12. A band sold 2400 tickets for their gig in Edinburgh.
This was 75% of the number of tickets sold for their gig in Glasgow.
Calculate the number of tickets sold for their gig in Glasgow. **3**

13. The graph of $y = a\cos x^\circ + b$, $0 \leq x \leq 360$, is shown.



State the values of a and b. **2**

14. The diagram shows a hemisphere relative to the coordinate axes.



- A is the point (6, 0, 0)
- C is the midpoint of diameter OA
- B is vertically below C

(a) State the coordinates of B. **1**

(b) Calculate the volume of the hemisphere.

Give your answer in its simplest form in terms of π. **2**

MARKS | DO NOT WRITE IN THIS MARGIN

15. Evaluate $16^{\frac{3}{2}}$. **2**

16. The function $f(x)$ is defined by $f(x) = 4\sin 3x°$.

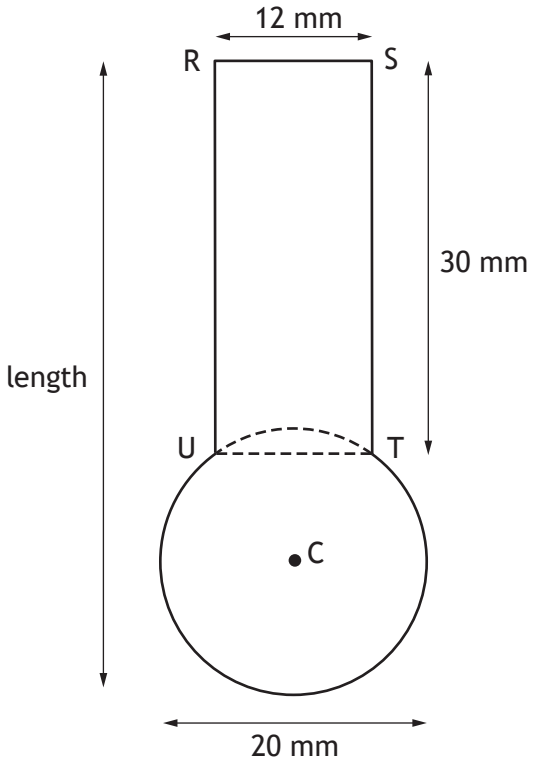
Evaluate $f(90)$. **2**

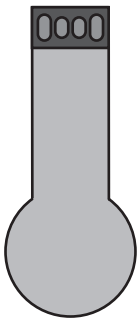
17. Sketch the graph of $y = 2(x-1)^2 + 4$.

On your sketch, show clearly the coordinates of the turning point and the point of intersection with the y-axis. **3**

18. The diagram below shows a design for a memory stick.

The design consists of a rectangle, RSTU and part of a circle, centre C.





memory stick

- RS = UT = 12 millimetres
- RU = ST = 30 millimetres
- The diameter of the circle is 20 millimetres
- UT is a chord of the circle

Calculate the length of the memory stick. **4**

19. Solve the equation **by factorising**

$$6x^2 + 13x - 5 = 0$$ **3**

[END OF QUESTION PAPER]

FOR OFFICIAL USE

National Qualifications
2021 ASSESSMENT RESOURCE

Mark

X847/75/02

Mathematics
Paper 2

Duration — 1 hour 50 minutes

X8477502

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 — 60

Attempt ALL questions.

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Total marks — 60

Attempt ALL questions

1. A housing development is being built.

The price of a house built in 2020 is £250 000.

This price is expected to increase by 4% each year.

Calculate the expected price of a house built in 2022. **3**

2. Light travels at 3×10^8 metres per second.

A star is $4{\cdot}2 \times 10^{17}$ metres away from Earth.

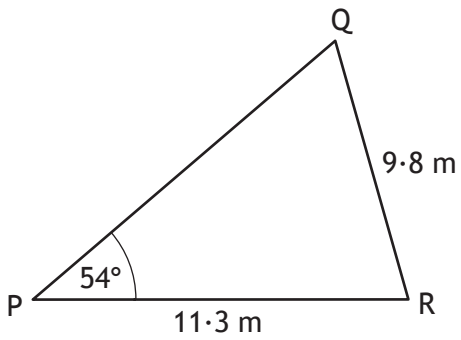
Calculate the number of seconds it takes for light from this star to reach Earth.

Give your answer in scientific notation. **2**

3. Factorise fully $3a^2 - 75$. **2**

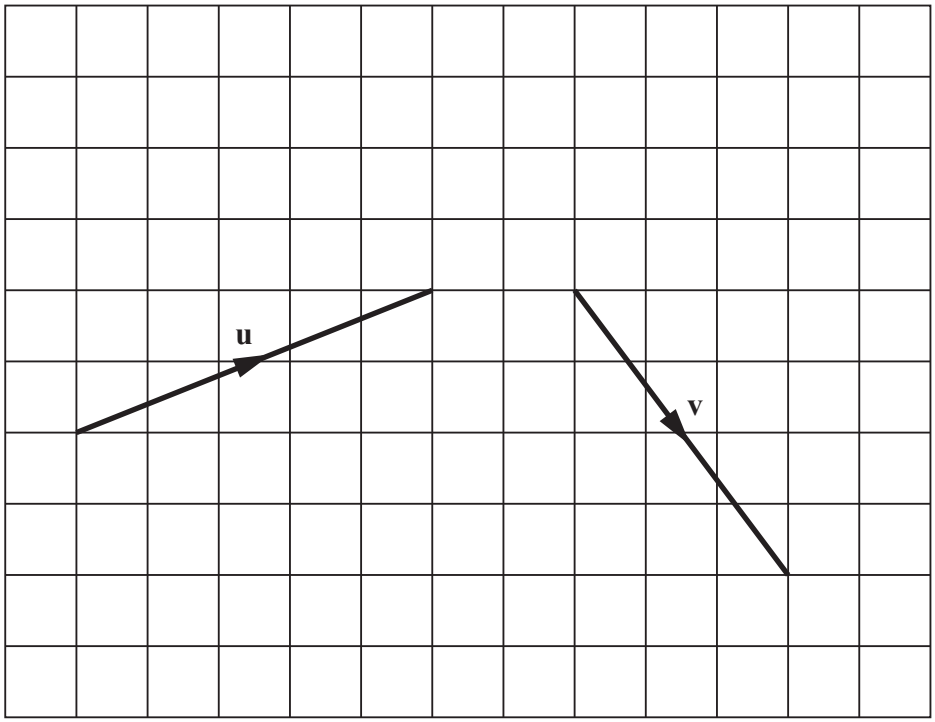
4. In triangle PQR

- PR = 11·3 metres
- QR = 9·8 metres
- angle QPR = 54°.



Calculate the size of acute angle PQR. **3**

5. The vectors **u** and **v** are shown in the diagram below.



Find the resultant vector $\mathbf{u} - \mathbf{v}$.

Express your answer in component form. **2**

6. A company operates a bus route from the city centre to the airport.

The number of passengers on six of its buses on a Monday was

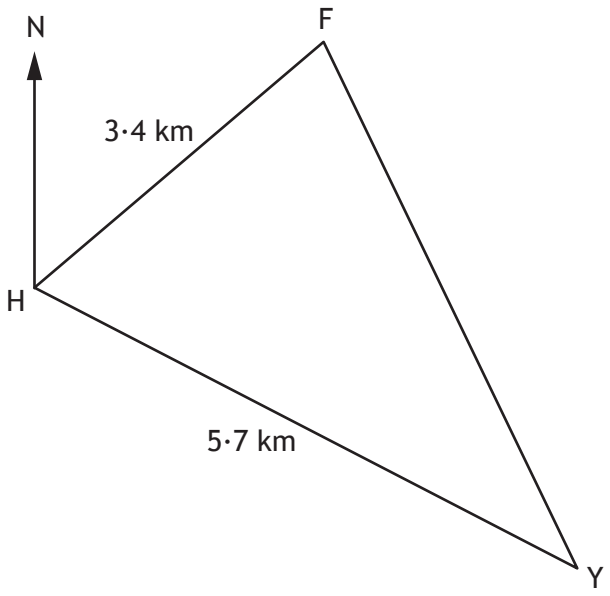
32 27 34 29 31 33.

(a) Calculate the mean and standard deviation of the number of passengers. **4**

(b) The mean number of passengers the following Saturday was 28 and the standard deviation was 3·2.

Make two valid comments comparing the number of passengers on each bus on Monday and Saturday. **2**

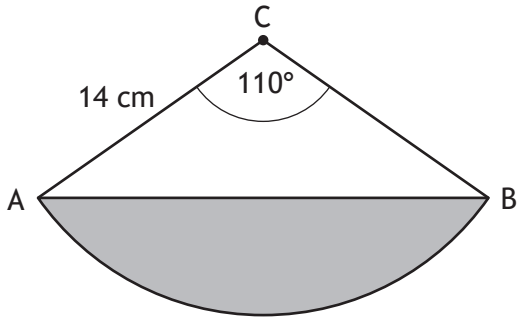
7. A fishing boat and a yacht left a harbour at the point H.
The fishing boat travelled 3·4 kilometres on a bearing of 047° to the point F.
The yacht travelled 5·7 kilometres on a bearing of 115° to the point Y.



Calculate the distance between the fishing boat at F and the yacht at Y. **4**

8. The diagram shows a sector of a circle, with centre C and radius 14 centimetres.

Angle ACB is 110°.



AB splits the sector into the shaded segment and triangle ABC.

Find the area of the shaded segment. **5**

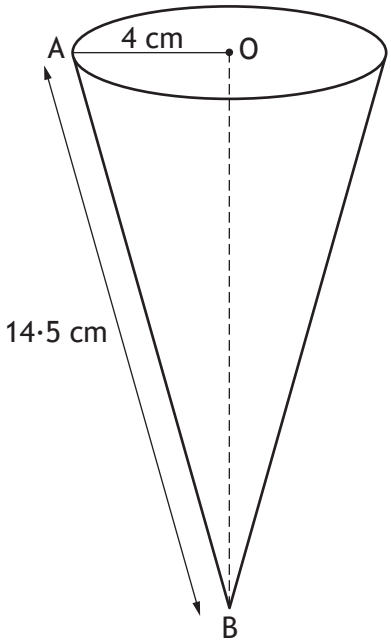
9. A straight line has equation $3x + 4y - 8 = 0$.

(a) Find the gradient of the line. **2**

(b) State the coordinates of the point where the line crosses the y-axis. **1**

10. Change the subject of the formula $d = \sqrt{\frac{3h}{2}}$ to h. **3**

11. The base of an ice cream cone has centre O and radius 4 centimetres.
The length of AB is 14·5 centimetres.



Calculate the volume of the cone.
Give your answer correct to 2 significant figures. **5**

12. Express

$$\frac{6x}{y} \div \frac{2x^2}{y+5}, \quad x \neq 0,\ y \neq 0,\ y \neq -5$$

as a single fraction in its simplest form. **3**

13. The two photographs shown are mathematically similar.

12 cm

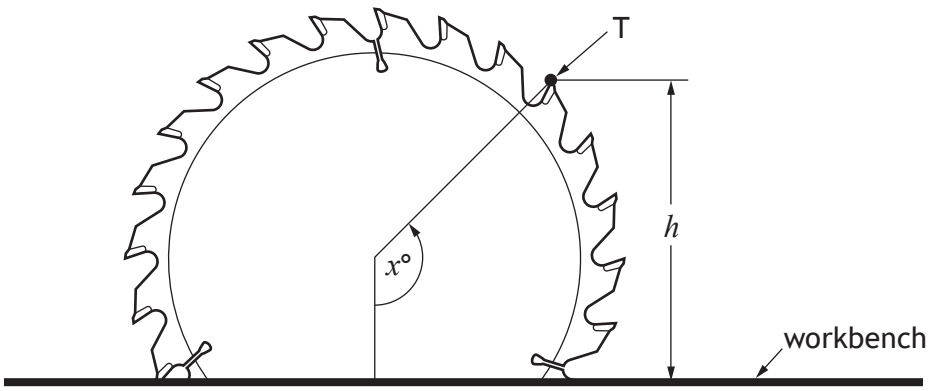
width

The small photograph has an area of 80 square centimetres, and is 12 centimetres wide.

The large photograph has an area of 500 square centimetres.

Calculate the width of the large photograph. **3**

14. The diagram shows the part of the blade of a circular saw above a workbench.



As the blade rotates, the height, h millimetres, of point T above the workbench is given by

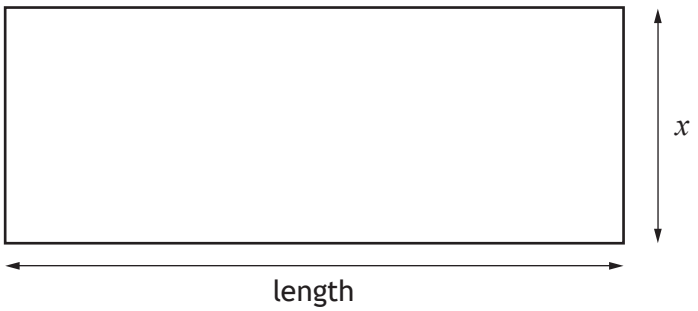
$$h = 57 - 85\cos x^\circ$$

where x is the angle the blade has turned anti-clockwise from a starting position.

(a) Calculate the value of x when point T is first at a height of 115 millimetres above the workbench. **3**

(b) Calculate the value of x when point T is next at this height. **1**

15. The diagram shows a rectangle with breadth x centimetres.



The length of the rectangle is 5 centimetres more than its breadth.

(a) Write down an expression for its length in terms of x. **1**

The rectangle has an area of 20 square centimetres.

(b) Show that $x^2 + 5x - 20 = 0$. **2**

15. (continued)

(c) Calculate x, the breadth of the rectangle.
Give your answer correct to one decimal place. **4**

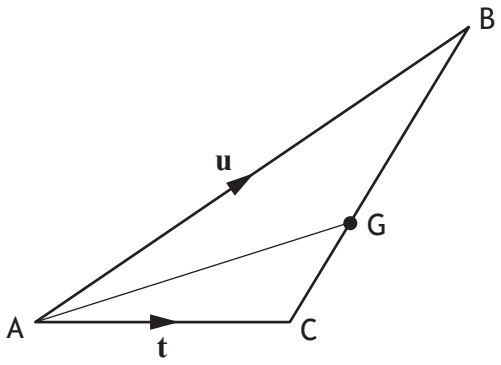
16. Expand and simplify

$$\cos x^\circ \left(\tan x^\circ + 1\right).$$

2

Show your working.

17. The triangle ABC is shown below



$\overrightarrow{AB} = \mathbf{u}$ and $\overrightarrow{AC} = \mathbf{t}$.

G is the point such that $CG = \frac{1}{3}CB$.

Express $\overrightarrow{AG}$ in terms of $\mathbf{u}$ and $\mathbf{t}$.

Give your answer in simplest form. **3**

[END OF QUESTION PAPER]