FOR OFFICIAL USE

N5

National Qualifications 2017

Mark

X747/75/01

Mathematics Paper 1 (Non-Calculator)

FRIDAY, 5 MAY

1:00 PM – 2:00 PM

X7477501

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.

Full credit will be given only to solutions which contain appropriate working.

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.

Before leaving the examination room you must give this book to the Invigilator; if you do not, you may lose all the marks for this paper.

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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. Given that $f(x) = x^2 + 3x$, evaluate $f(-5)$. **2**

2. The number of calls received by the police was recorded over 10 days.
The results are shown below.

198 216 218 230 232 247 248 250 265 267

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

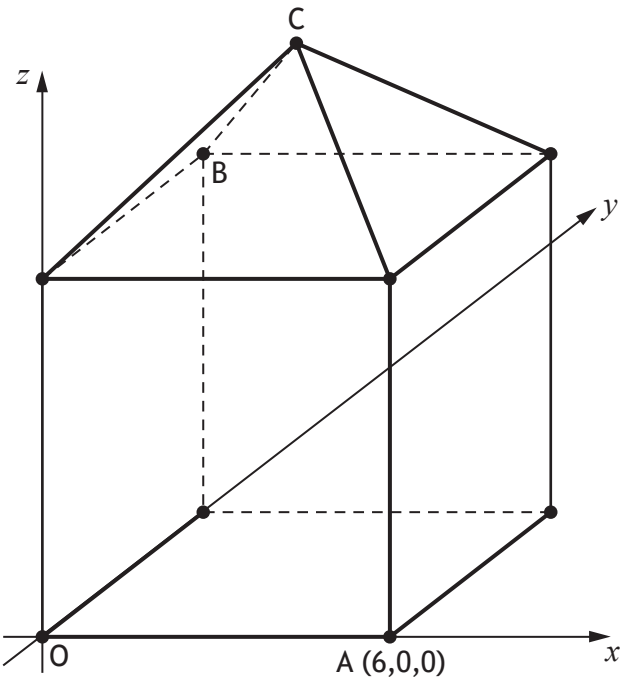
[Turn over

3. Evaluate $1\frac{5}{6} \div \frac{3}{4}$.

Give your answer in its simplest form. **2**

4. Expand and simplify $(2x+3)(x^2-4x+1)$. **3**

5. The diagram shows a square-based pyramid placed on top of a cube, relative to the coordinate axes.



The height of the pyramid is half of the height of the cube.

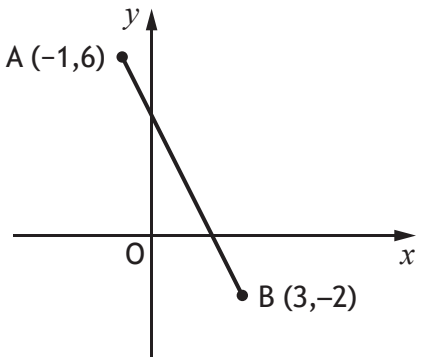
A is the point (6,0,0).

The point C is directly above the centre of the base.

Write down the coordinates of B and C. **2**

[Turn over

6. The diagram below shows the straight line joining points A and B.

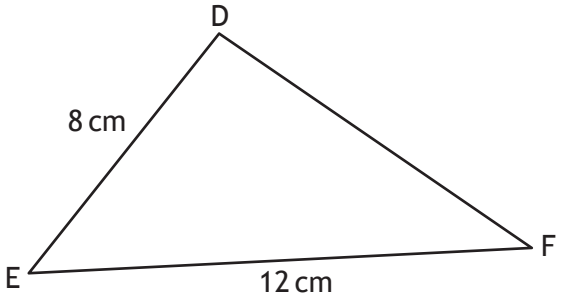


Find the equation of the line AB.

Give the equation in its simplest form. **3**

7. In triangle DEF:

- DE = 8 centimetres
- EF = 12 centimetres
- $\sin E = \frac{2}{3}$



Calculate the area of triangle DEF. **2**

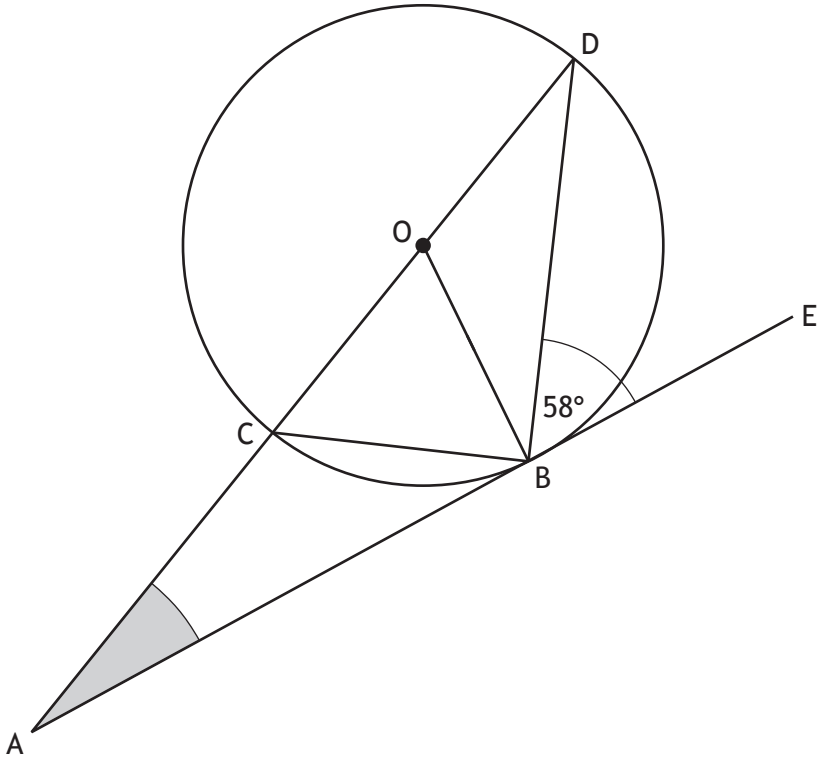
[Turn over

8. Solve, algebraically, the inequality

$$19 + x > 15 + 3(x - 2).$$ **3**

9. In the diagram shown below:

- ABE is a tangent to the circle centre O
- Angle DBE is 58°



Calculate the size of angle CAB. **3**

[Turn over

10. Change the subject of the formula $F = \dfrac{t^2 + 4b}{c}$ to b. **3**

11. Express $\dfrac{3}{a^2} - \dfrac{2}{a}$, $a \neq 0$, as a single fraction in its simplest form. **2**

12. Gym members are asked to fill out a questionnaire to rate the quality of service provided.

They are asked to give a rating on a scale of 1 to 6.

The ratings given by five members were as follows:

1 4 6 3 6

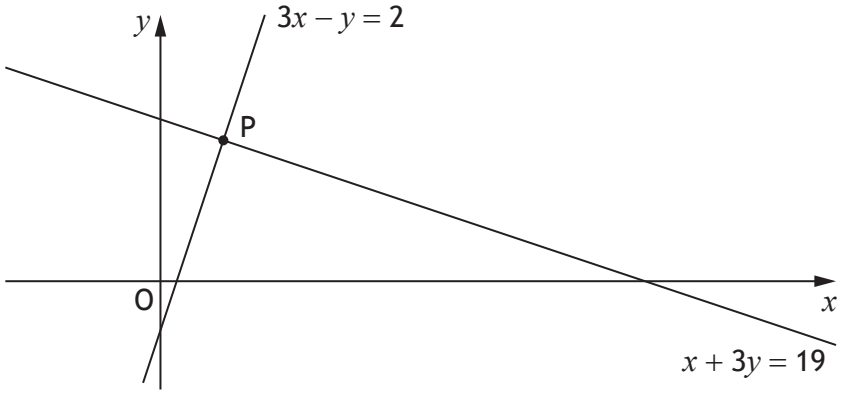
In its simplest form, the standard deviation of these ratings can be written as $\frac{a\sqrt{b}}{2}$.

Find the values of a and b. **4**

[Turn over

13. The graph below shows two straight lines with the equations:

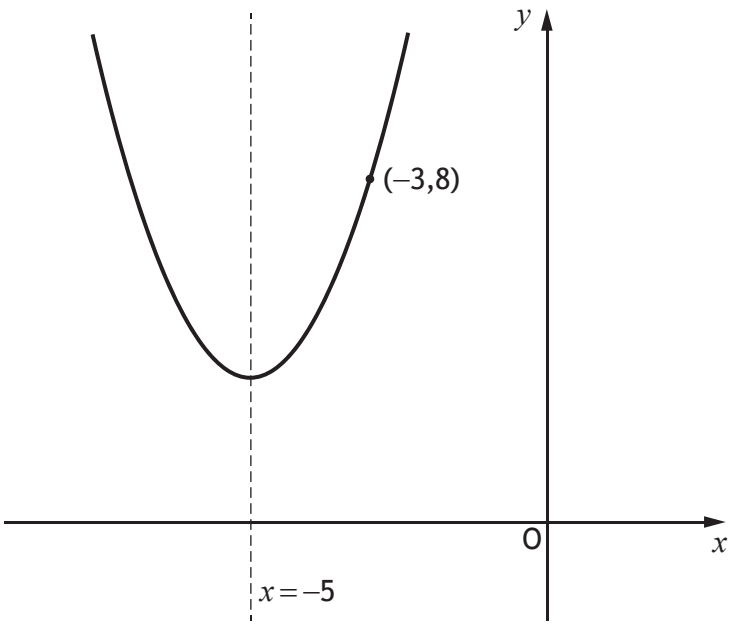
- $3x - y = 2$
- $x + 3y = 19$



The lines intersect at the point P.

Find, **algebraically**, the coordinates of P. **3**

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



The equation of the axis of symmetry of the parabola is $x = -5$.

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

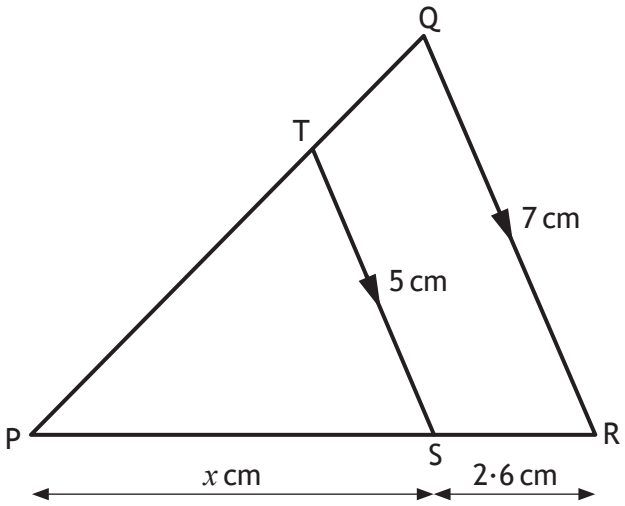
The point (–3,8) lies on the parabola.

(b) Calculate the value of b. **2**

[Turn over for next question

15. In the diagram below:

- TS is parallel to QR
- TS = 5 centimetres
- QR = 7 centimetres
- SR = 2·6 centimetres



The length of PS is x centimetres.

Calculate the value of x. **3**

[END OF QUESTION PAPER]

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ADDITIONAL SPACE FOR ANSWERS

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Mathematics Paper 2

FRIDAY, 5 MAY

2:20 PM – 3:50 PM

X7477502

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

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SQA ©

X747750201

FORMULAE LIST

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Total marks — 50

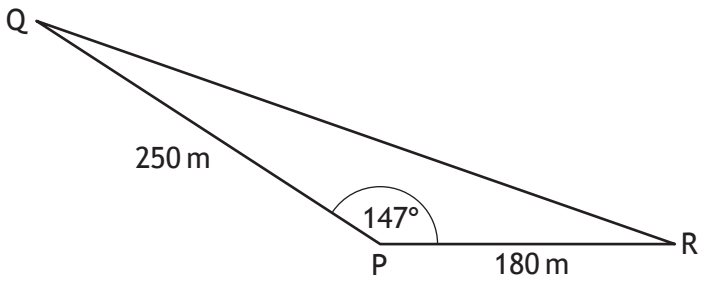
Attempt ALL questions

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

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**

[Turn over

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**

4. Solve the equation $2x^2 + 5x - 4 = 0$.

Give your answers correct to one decimal place. **3**

5. A theatre group sold 4830 tickets for their show.

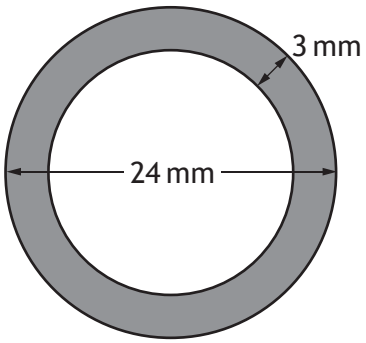
This was 15% more than they sold last year.

How many tickets did they sell last year? **3**

[Turn over

6. A spherical sweet is made by coating a caramel sphere evenly with chocolate.

A cross-section of the sweet is shown below.

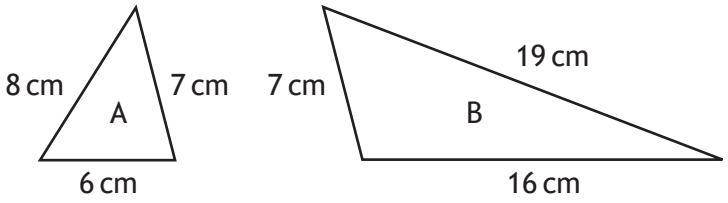


The diameter of the sweet is 24 millimetres and the thickness of the chocolate coating is 3 millimetres.

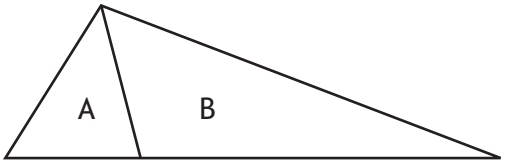
Calculate the volume of the chocolate coating. **5**

Give your answer correct to 3 significant figures.

7. Triangles A and B are shown below.



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

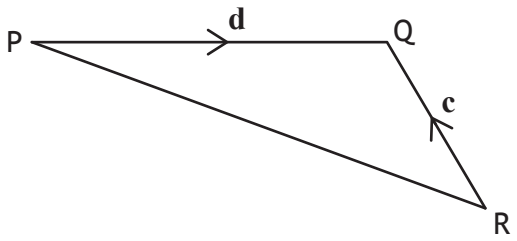


Is this larger triangle right-angled? **3**

Justify your answer.

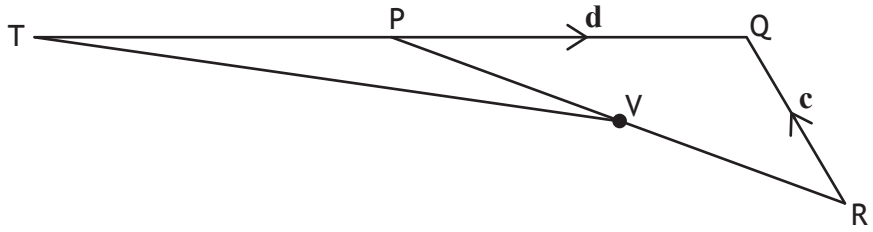
[Turn over

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**

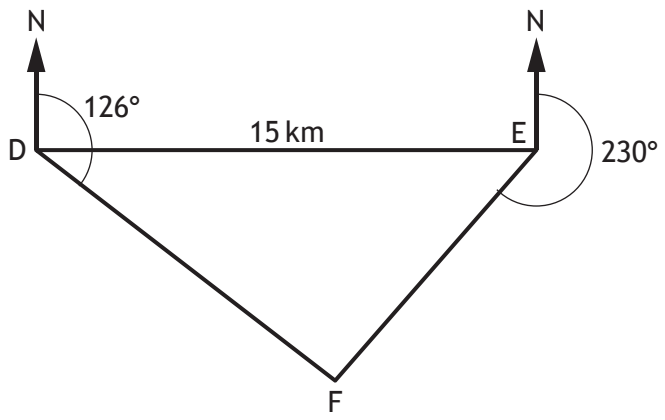
MARKS | DO NOT WRITE IN THIS MARGIN

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

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

[Turn over

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.

11. A straight line has equation $3x-5y-10=0$.

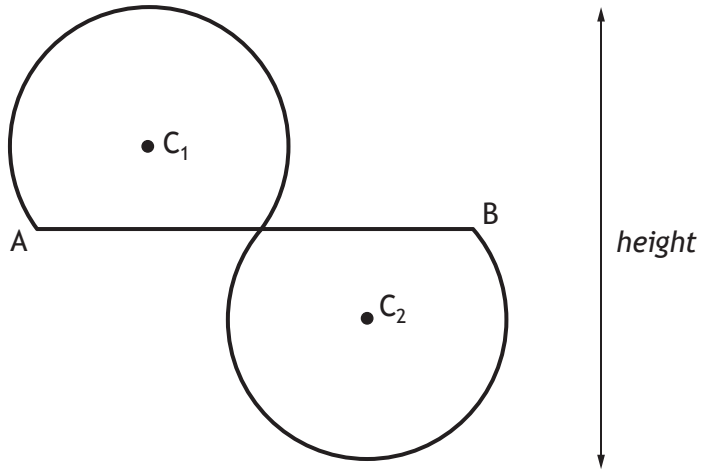
Find the gradient of this line. **2**

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

[Turn over

13. Two identical shapes are used to form a logo.

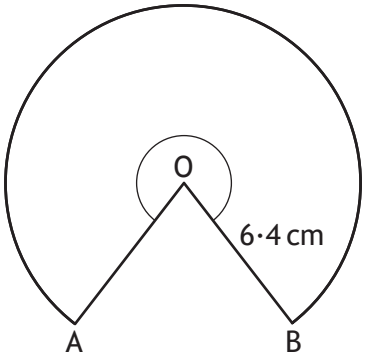
Each shape is part of a circle.



- 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**

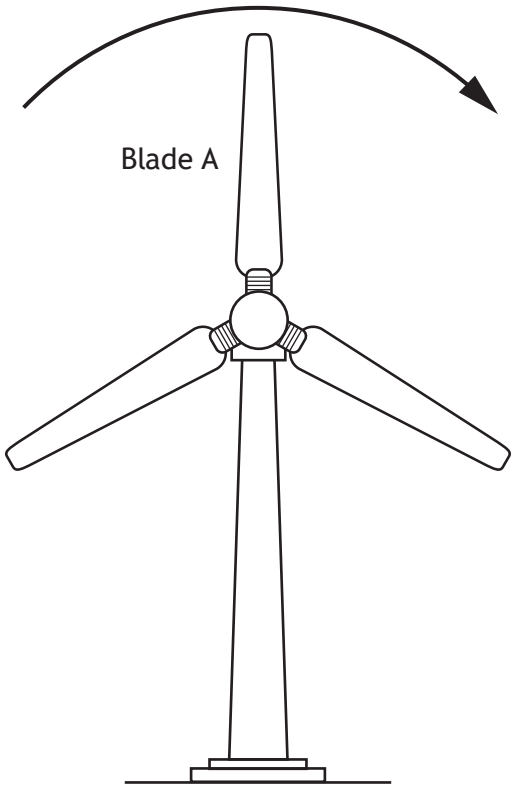
14. The diagram below shows part of a circle, centre O.



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**

[Turn over

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**

15. (continued)

(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**

[END OF QUESTION PAPER]

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