Candidate Surname		Other names

	Centre Number	Candidate Number

Tuesday 7 June 2022

Morning (Time: 1 hours 30 minutes)

Mathematics

Paper 2 (Calculator)

Higher Tier

You must have: Ruler graduated in centimetres and millimetres, protractor, pairs of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Student Self Reflection

Topics I need to *revise*

Topics I need to *learn*

Silly Mistakes?

Target mark for next time

Answer ALL questions

Write your answers in the spaces provided

You must write down all the stages in your working.

1 (a) Simplify $(m^3)^4$

....

(1)

(b) Simplify $20a^9b^{10} \div 4a^3b^2$

....

(2)

(c) Expand and simplify $(x + 6)(x - 2)$

....

(2)

(d) Factorise $12y - 2y^2$

....

(2)

(Total for Question 1 is 7 marks)

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2 Rashid buys a car for £20000.

Each year the car loses 15% of its value.

Show that after 3 years the value of the car is still greater than £12000.

(Total for Question 2 is 2 marks)

3 Bryn is going on holiday to Europe.

He changes £440 into euros for spending money.

Whilst on holiday he spends €470.

When he returns, he changes his remaining euros back into pounds.

Use the exchange £1 = €1.25 to work out how many pounds Bryn has after his holiday.

£ ....

(Total for Question 3 is 3 marks)

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4   A number, *n*, is rounded to 2 decimal places.
The result is 3.17

Complete the error interval for *n*.

.... $\leq n <$ ....

(Total for Question 4 is 2 marks)

5   Here is a rectangle and a square.

6 cm
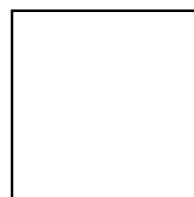
The height of the rectangle is 6 cm.

The ratio of the height of the rectangle to its width is 3 : 10

The ratio of the height of the rectangle to the height of the square is 1 : 2

Find the ratio of the area of the rectangle to the area of the square.
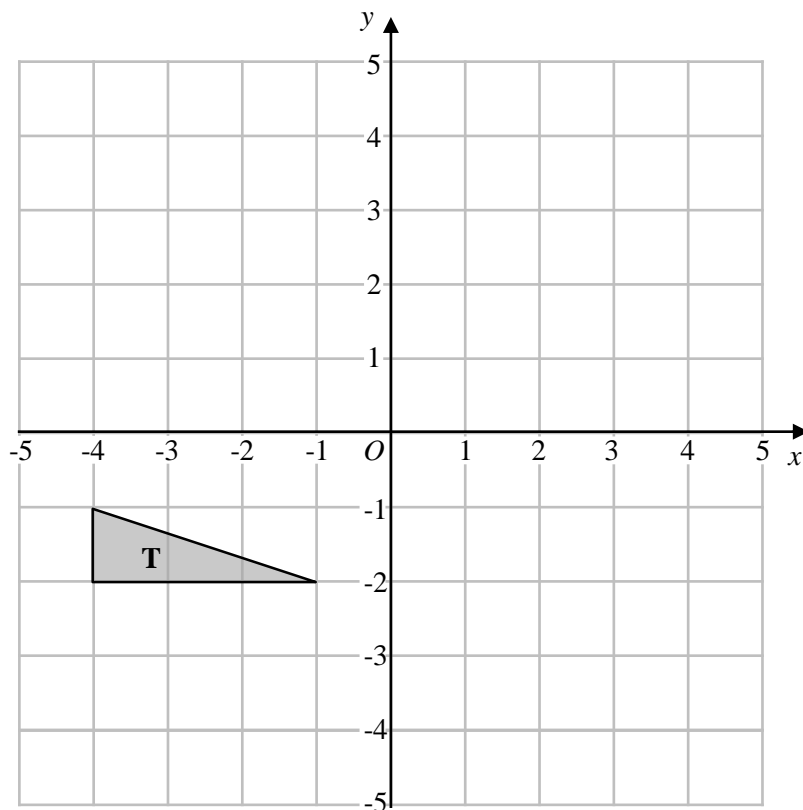
Give your answer as a ratio in its simplest form.

....

(Total for Question 5 is 3 marks)

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6

(a) Rotate triangle **T** 90° clockwise about the origin.
Label the new triangle **A**.

(b) Translate triangle **T** by the vector $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$
Label the new triangle **B**.

(Total for Question 6 is 2 marks)

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7 It takes a gardener 30 minutes to mow a lawn that is 8 m by 10 m.

Assuming the gardener works at the same rate, work out how long the gardener would take to mow a lawn that is 32 m by 17 m.

Give your answer in hours and minutes.

.... hours .... minutes

(Total for Question 7 is 4 marks)

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8 (a) Use your calculator to work out $\dfrac{2.6^4 \times \sin(88)}{\sqrt{888} - 12}$

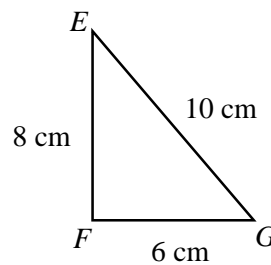Write down all the figures on your calculator display.

....

(2)

(b) Write your answer to part (a) correct to 4 significant figures.

....

(1)

(Total for Question 8 is 3 marks)

9 *ABCD* is a rectangle and *EFG* is a triangle.

A ——— 4x ——— D

x − 2

B ——————— C

E

8 cm

10 cm

F —— 6 cm —— G
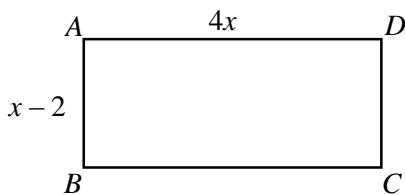
Perimeter of *ABCD* = 2 × Perimeter *EFG*

Work out the value of *x*.

....

(Total for Question 9 is 3 marks)

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10 Objects *A* and *B* are placed on the floor.

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

The area of the base of object *A* that is in contact with the ground is 40 cm^2
The area of the base of object *B* that is in contact with the ground is 0.025 m^2

The force exerted by object *A* on the floor is 50 newtons.

The pressure on the floor due to object *A* is equal to the pressure on the floor due to object *B*.

Work out the force exerted by object *B* on the floor.

.... newtons

(Total for Question 10 is 4 marks)

11 8 workers paint a wall in 6 hours.

(a) How many hours will it take 3 workers to paints another wall the same size.

.... hours

(2)

(b) State one assumption you made in working out your answer to part (a).

....

....

....
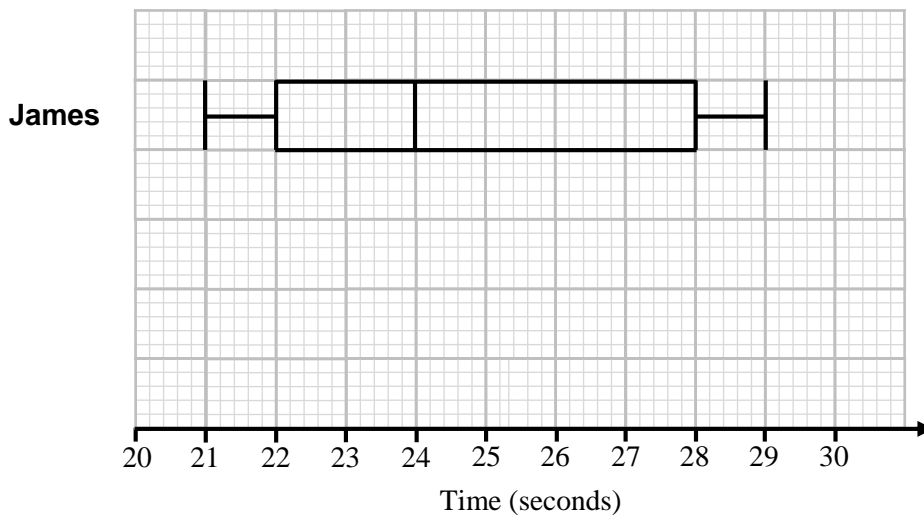
(1)

(Total for Question 11 is 3 marks)

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12 The box plot below shows the distribution of James' race times during an athletics season.

James

20   21   22   23   24   25   26   27   28   29   30

Time (seconds)

The table below shows information about the distribution of Aggie's race during the same season.

	Fastest	Lower Quartile	Median	Upper Quartile	Slowest
Time (seconds)	22	24	26	29	30

(a) On the grid above, draw a box plot for the information in the table.

(2)

(b) Compare the distribution of Aggie's race times with the distribution of James' race times.

....

....

....

....

....

(2)

(Total for Question 12 is 4 marks)

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13 (a) Sketch the graph of $y = \cos x°$ for $0 \leq x \leq 360$
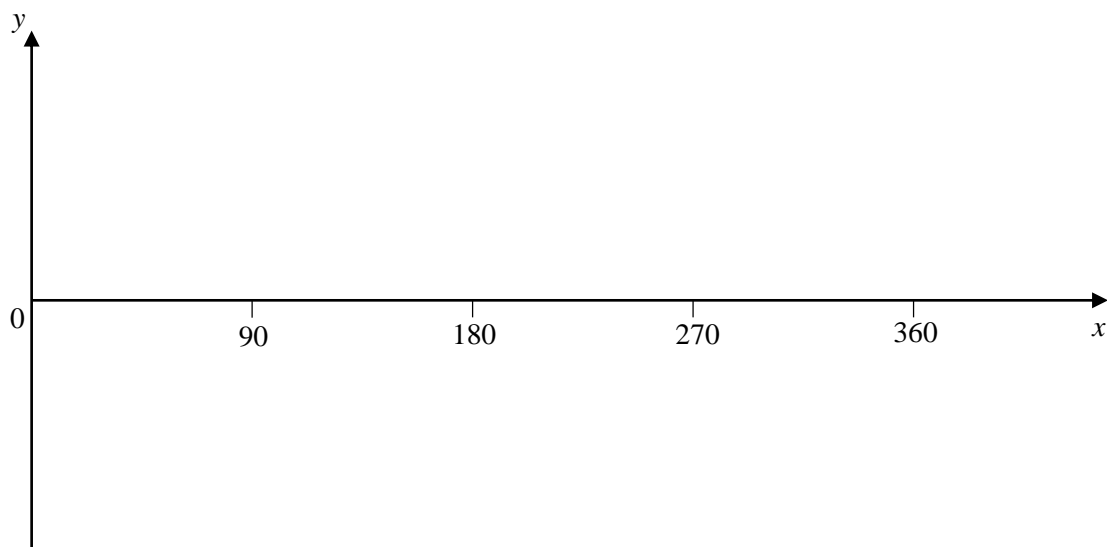
(2)

The graph of $y = \cos x°$ is translated by the vector $\begin{pmatrix} 90 \\ -2 \end{pmatrix}$

(b) Write down the equation of the translated graph.

....

(2)

(Total for Question 13 is 4 marks)

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14 The straight line $\mathbf{L_1}$ has the equation $6y = 3x - 2$
The point A has coordinates $(10, 2)$
The point B has coordinates $(p, 0)$

The straight line $\mathbf{L_2}$ is parallel to line $\mathbf{L_1}$ and passes through points A and B.

Work out the value of p.

....

(Total for Question 14 is 3 marks)

15 Oksana wants to find out an estimate for the number of fish in a lake.

One day she catches 20 fish from the lake.
She puts a mark on each fish and returns them to the lake.

The next day she catches 48 fish from the lake.
She finds that 15 of these fish have been marked.

(a) Work out an estimate for the total number of fish in the lake.

....

(3)

Oksana assumes that none of the marks had rubbed off between the first and second capture.

(b) If Oksana's assumption is wrong, explain what effect this would have on your answer to part (a).

....

....

....

(1)

(Total for Question 15 is 4 marks)

11

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16 The functions f and g are such that

$$f(x) = 5x + 1 \quad \text{and} \quad g(x) = \frac{x-1}{2}$$

(a) Find $f^{-1}(x)$

$f^{-1}(x) = $ ....

(2)

(b) Find gf(7)

....

(2)

(c) Solve $f(x) = g(x)$

....

(2)

(Total for Question 16 is 6 marks)

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17
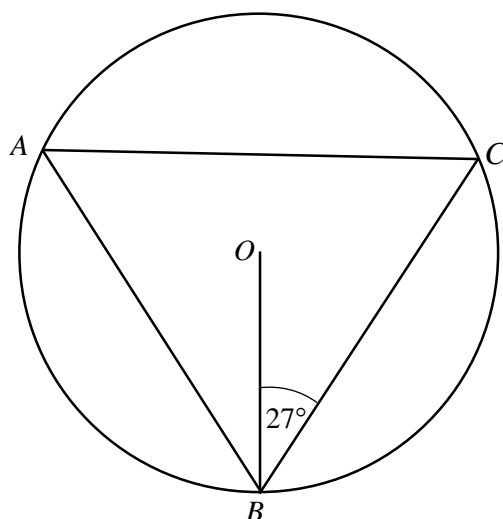
A, *B* and *C* are points on the circumference of a circle with centre *O*.

Angle *CBO* = 27°

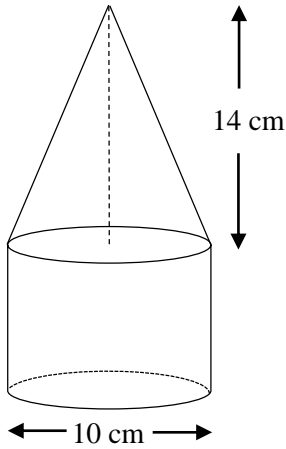Work out the size of angle *BAC*.
You must show all your working.

.... °

(Total for Question 17 is 3 marks)

18 The diagram shows a solid shape.
The shape is a cone on top of a cylinder.

14 cm

10 cm

Volume of a cone $= \frac{1}{3}\pi r^2 h$
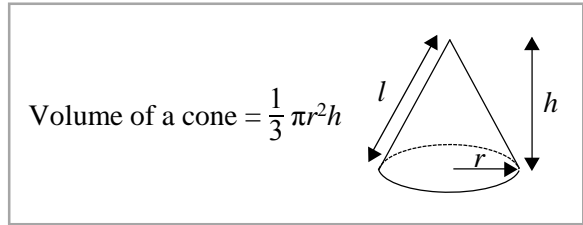
The diameter of the cylinder is 10 cm.
The height of the cone is 14 cm.

The ratio of the height of the cylinder to the height of the cone is 4 : 7
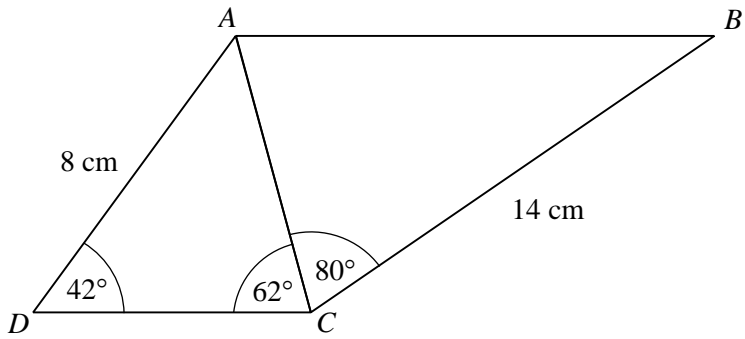
Work out the volume of the solid shape.

.... cm^3

(Total for Question 18 is 4 marks)

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19

Work out the length of AB.
Give your answer to 3 significant figures.

.... cm

(Total for Question 19 is 5 marks)

20 40 A level students were asked if they study biology, chemistry or physics.

20 students study physics.
9 students do not study any of the subjects.
6 students study all three subjects.
10 students study biology and physics.
7 students study biology and chemistry.
All of the students who study physics and chemistry also study biology.
The number of students who study biology is the same as the number that study chemistry.

Two of the 40 students are chosen at random.

Work out the probability that they both study Chemistry.

....

(Total for Question 20 is 5 marks)

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21 Darren, Kerry, Thomas and Shellie each have a bar of chocolate.

The mass of Darren's bar is m kg.
The mass of Kerry's bar is 2.5 kg more than Darren's.
The mass of Shellie's bar is 4 kg more than Darren's.
The mass of Thomas' bar is the product of the masses of Darren and Kerry's bars.

The total mass of all of their bars of chocolate is less than 17 kg.

(a) Show that $2m^2 + 11m - 21 < 0$

(3)

(b) Find a range of possible values for the mass of Darren's bar, m.

....

(3)

(Total for Question 21 is 6 marks)

TOTAL FOR PAPER IS 80 MARKS

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