UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

9523289317

MATHEMATICS **0580/21**

Paper 2 (Extended) **May/June 2011**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Mathematical tables (optional)
Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 70.

This document consists of **12** printed pages.

1 A concert hall has 1540 seats.

Calculate the number of people in the hall when 55% of the seats are occupied.

Answer ..... [1]

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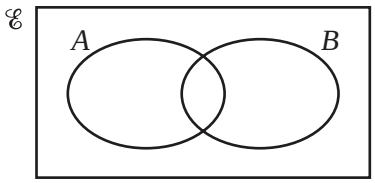
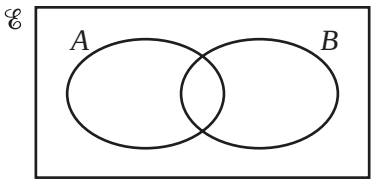
2 Shade the required region on each Venn diagram.



$A \cup B'$



$(A \cap B)'$

[2]

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3 Calculate $81^{0.25} \div 4^{-2}$.

Answer ..... [2]

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4 **(a)** Find m when $4^m \times 4^2 = 4^{12}$.

Answer(a) $m =$ ..... [1]

(b) Find p when $6^p \div 6^5 = \sqrt{6}$.

Answer(b) $p =$ ..... [1]

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5 A hummingbird beats its wings 24 times per second.

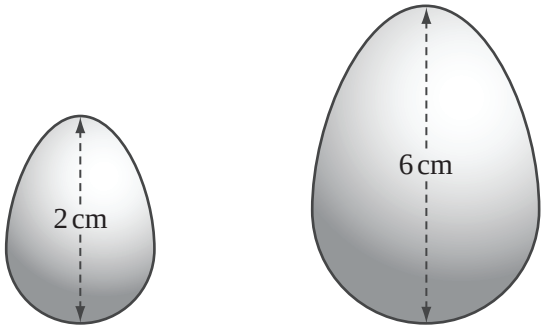
(a) Calculate the number of times the hummingbird beats its wings in one hour.

Answer(a) ..... [1]

(b) Write your answer to **part (a)** in standard form.

Answer(b) ..... [1]

6



NOT TO SCALE

A company makes solid chocolate eggs and their shapes are mathematically similar.
The diagram shows eggs of height 2 cm and 6 cm.
The mass of the small egg is 4 g.

Calculate the mass of the large egg.

Answer ..... g [2]

---

7 Find the length of the straight line from Q (−8, 1) to R (4 , 6).

Answer QR = ... [3]

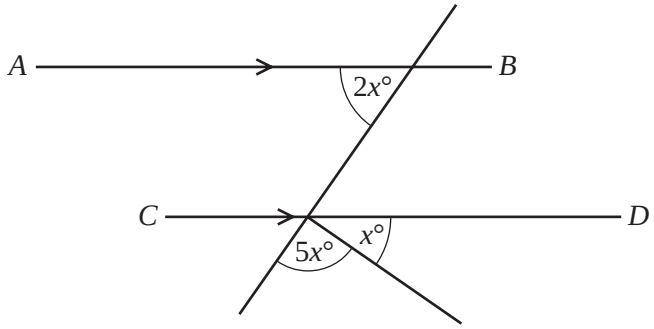
---

8 Calculate the radius of a sphere with volume $1260\,\text{cm}^3$.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Answer ..... cm [3]

9



NOT TO SCALE

AB is parallel to *CD*.
Calculate the value of x.

Answer $x =$ ..... [3]

---

10 Solve the simultaneous equations.

$$3x + y = 30$$
$$2x - 3y = 53$$

Answer $x =$ .....

$y =$ ..... [3]

---

11 A rectangular photograph measures 23.3 cm by 19.7 cm, each correct to 1 decimal place. Calculate the lower bound for

(a) the perimeter,

Answer(a) ..... cm [2]

(b) the area.

Answer(b) ..... cm^2 [1]

---

12 A train leaves Barcelona at 21 28 and takes 10 hours and 33 minutes to reach Paris.

(a) Calculate the time the next day when the train arrives in Paris.

Answer(a) ..... [1]

(b) The distance from Barcelona to Paris is 827 km.

Calculate the average speed of the train in kilometres per hour.

Answer(b) ..... km/h [3]

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13 The scale on a map is 1: 20 000.

(a) Calculate the actual distance between two points which are 2.7 cm apart on the map.
Give your answer in kilometres.

Answer(a) ..... km [2]

(b) A field has an area of 64 400 m^2.
Calculate the area of the field on the map in cm^2.

Answer(b) ..... cm^2 [2]

---

14 Solve the equation $2x^2 + 3x - 6 = 0$.
Show all your working and give your answers correct to 2 decimal places.

Answer x = ... or x = ... [4]

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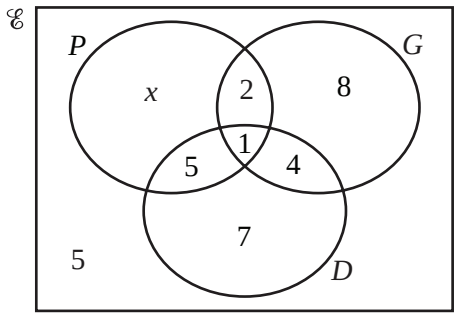
15 A teacher asks 36 students which musical instruments they play.

P = {students who play the piano}
G = {students who play the guitar}
D = {students who play the drums}

The Venn diagram shows the results.



(a) Find the value of x.

Answer(a) x = ... [1]

(b) A student is chosen at random.

Find the probability that this student

(i) plays the drums but **not** the guitar,

Answer(b)(i) ..... [1]

(ii) plays only 2 different instruments.

Answer(b)(ii) ..... [1]

(c) A student is chosen at random from those who play the guitar.

Find the probability that this student plays no other instrument.

Answer(c) ..... [1]

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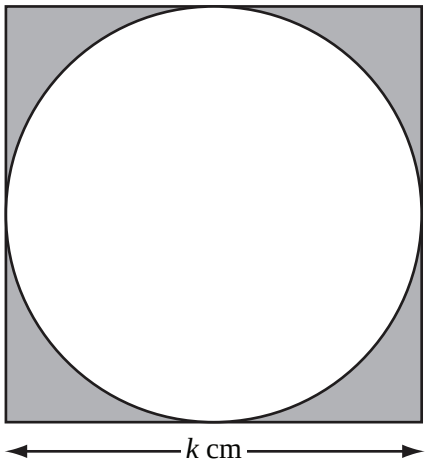

The diagram shows a square of side k cm.

The circle inside the square touches all four sides of the square.

(a) The shaded area is A cm^2.

Show that $4A = 4k^2 - \pi k^2$.

Answer (a)

[2]

(b) Make k the subject of the formula $4A = 4k^2 - \pi k^2$.

Answer(b) $k =$ ..... [3]

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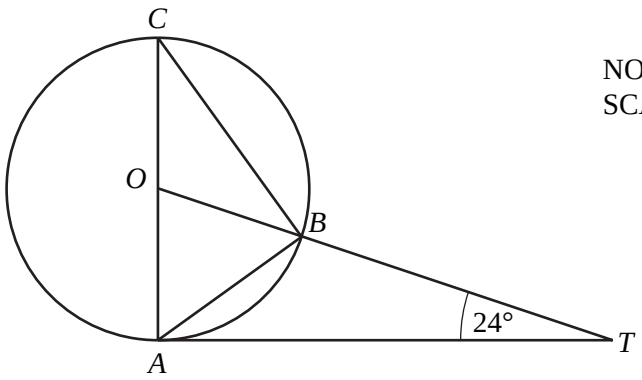

NOT TO SCALE

A, *B* and *C* are points on a circle, centre *O*.
TA is a tangent to the circle at *A* and *OBT* is a straight line.
AC is a diameter and angle *OTA* = 24°.

Calculate

(a) angle *AOT*,

Answer(a) Angle *AOT* = ... [2]

(b) angle *ACB*,

Answer(b) Angle *ACB* = ... [1]

(c) angle *ABT*.

Answer(c) Angle *ABT* = ... [2]

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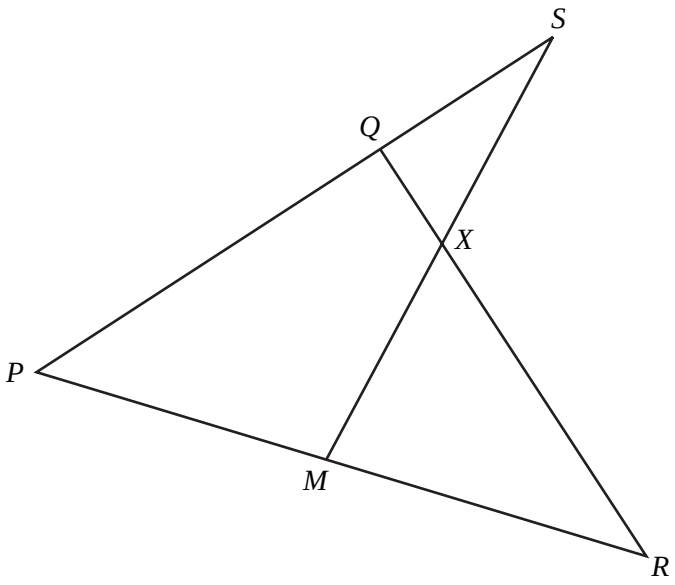


NOT TO SCALE

In the diagram, PQS, PMR, MXS and QXR are straight lines.

$PQ = 2\,QS$.
M is the midpoint of PR.
$QX : XR = 1 : 3$.

$\overrightarrow{PQ} = \mathbf{q}$ and $\overrightarrow{PR} = \mathbf{r}$.

(a) Find, in terms of **q** and **r**,

(i) $\overrightarrow{RQ}$,

Answer(a)(i) $\overrightarrow{RQ}$ = ... [1]

(ii) $\overrightarrow{MS}$.

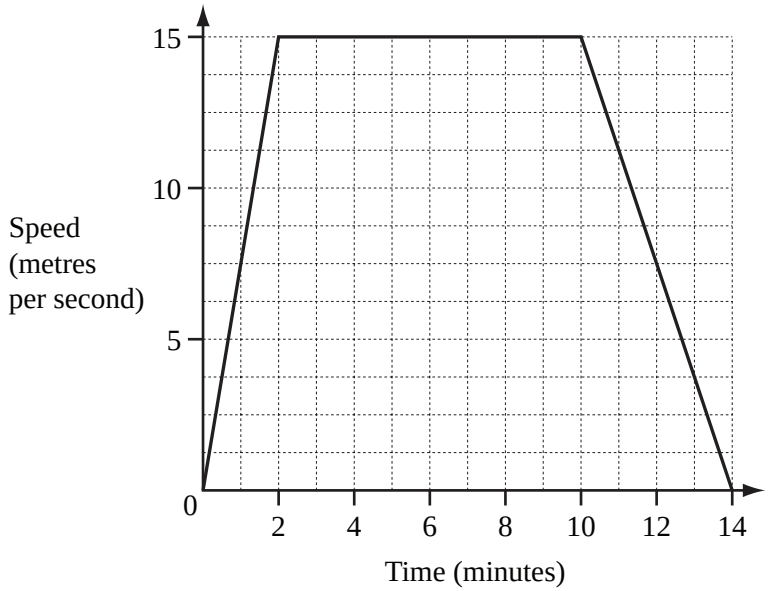
Answer(a)(ii) $\overrightarrow{MS}$ = ... [1]

(b) By finding $\overrightarrow{MX}$, show that X is the midpoint of MS.

Answer (b)

[3]

19



The diagram shows the speed-time graph of a train journey between two stations.
The train accelerates for two minutes, travels at a constant maximum speed, then slows to a stop.

(a) Write down the number of **seconds** that the train travels at its constant maximum speed.

Answer(a) ..... s [1]

(b) Calculate the distance between the two stations **in metres**.

Answer(b) ..... m [3]

(c) Find the acceleration of the train in the **first two minutes**.
Give your answer in m/s^2.

Answer(c) ..... m/s^2 [2]

Question 20 is printed on the next page.

20 $f(x) = x^3$ $g(x) = 2x - 3$

(a) Find

(i) g(6),

Answer(a)(i) ..... [1]

(ii) f(2x).

Answer(a)(ii) ..... [1]

(b) Solve fg(x) = 125.

Answer(b) x = ... [3]

(c) Find the inverse function $g^{-1}(x)$.

Answer(c) $g^{-1}(x)$ = ... [2]