OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

MATHEMATICS A
Unit B (Higher Tier)

A502/02

Candidates answer on the question paper.

OCR supplied materials:
None

Other materials required:
• Geometrical instruments
• Tracing paper (optional)

Tuesday 9 November 2010
Morning

Duration: 1 hour

A50202

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

• Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
• Use black ink. Pencil may be used for graphs and diagrams only.
• Read each question carefully. Make sure you know what you have to do before starting your answer.
• Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
• Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
• Answer **all** the questions.
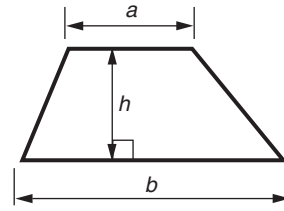• Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

• The number of marks is given in brackets **[ ]** at the end of each question or part question.
• Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
• The total number of marks for this paper is **60**.
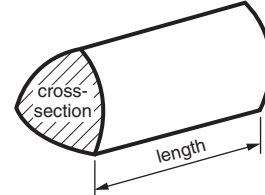• This document consists of **16** pages. Any blank pages are indicated.

WARNING

No calculator can be used for this paper

This paper has been pre modified for carrier language

OCR is an exempt Charity

Turn over

Formulae Sheet: Higher Tier

Area of trapezium $= \frac{1}{2}(a+b)h$

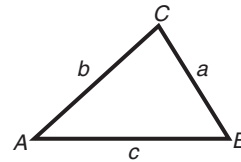**Volume of prism** = (area of cross-section) × length

In any triangle *ABC*

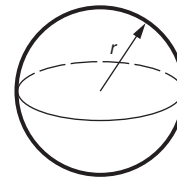**Sine rule** $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

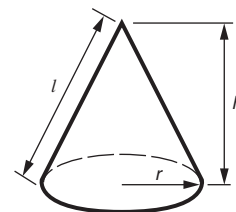**Area of triangle** $= \frac{1}{2}ab\sin C$

Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$

Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

PLEASE DO NOT WRITE ON THIS PAGE

1 **(a)** Work out.

(i) the cube of 5

(a)(i) _____ **[1]**

(ii) $\sqrt{169}$

(ii) _____ **[1]**

(b) **(i)** Write as a single power of 5.

$5^6 \times 5^4$

(b)(i) _____ **[1]**

(ii) Write as a single power of r.

$$\frac{r^{12}}{r^3}$$
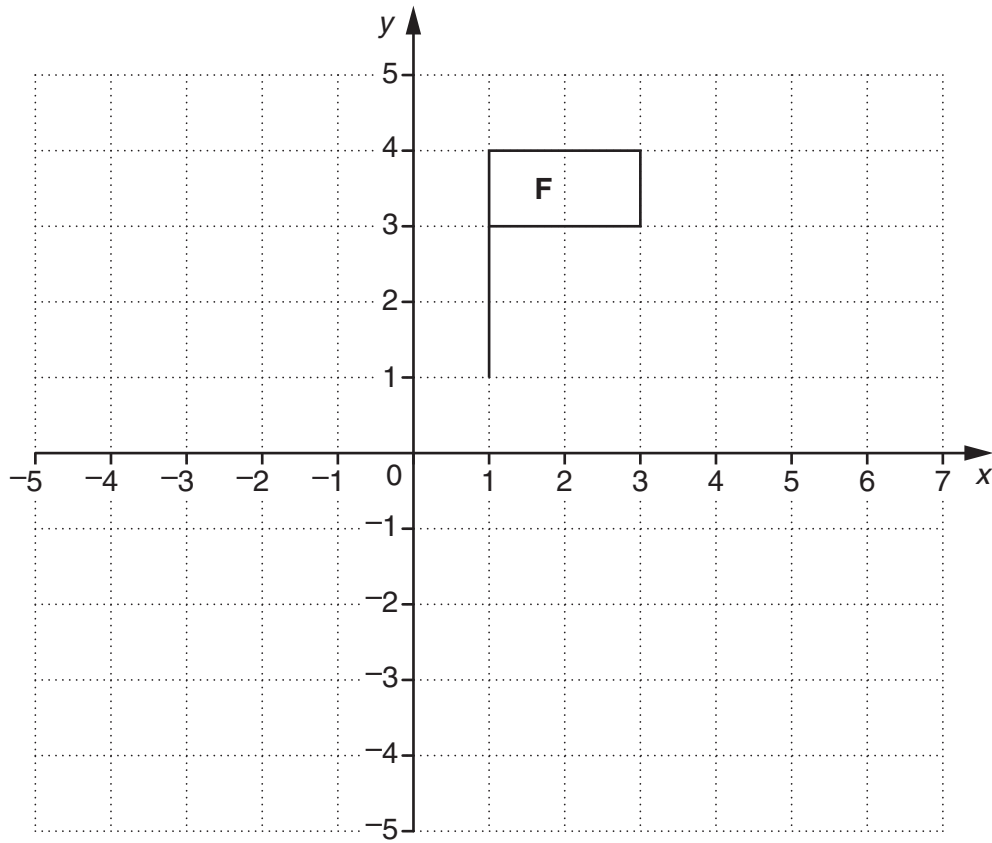
(ii) _____ **[1]**

(c) Find the value of the following.

(i) 16^0

(c)(i) _____ **[1]**

(ii) $27^{\frac{2}{3}}$

(ii) _____ **[2]**

Turn over

2

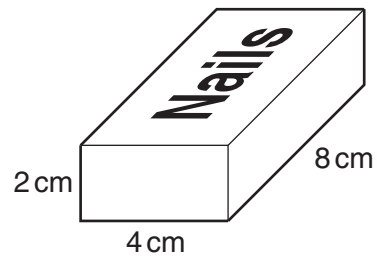**(a)** Rotate shape **F** 90° anticlockwise about the point (1, 1).
Label the image **G**.   **[3]**

(b) Translate shape **F** using the vector $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$.
Label the image **H**.   **[2]**

3 A DIY store sells nails in boxes, which are cuboids.

Each full box of nails weighs 250 g.
The boxes are delivered in crates which are cubes of side 0.4 m.
An empty crate weighs 20 kg.

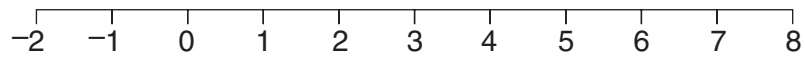How much, in kg, would a crate full of these boxes of nails weigh?

_____ kg **[4]**

Turn over

4 **(a)** Solve this inequality.

$$3x - 2 \leqslant 10$$

(a) _____ **[2]**

(b) Represent your solution to part **(a)** on this number line.

```
├────┬────┬────┬────┬────┬────┬────┬────┬────┬────┤
−2   −1   0    1    2    3    4    5    6    7    8
```

[1]

5 Petra is designing a small mat to put a glass on.
She decides to make the mat a **regular** hexagon.
All the corners should lie on the circle, centre O.
One of the corners should be at point A.
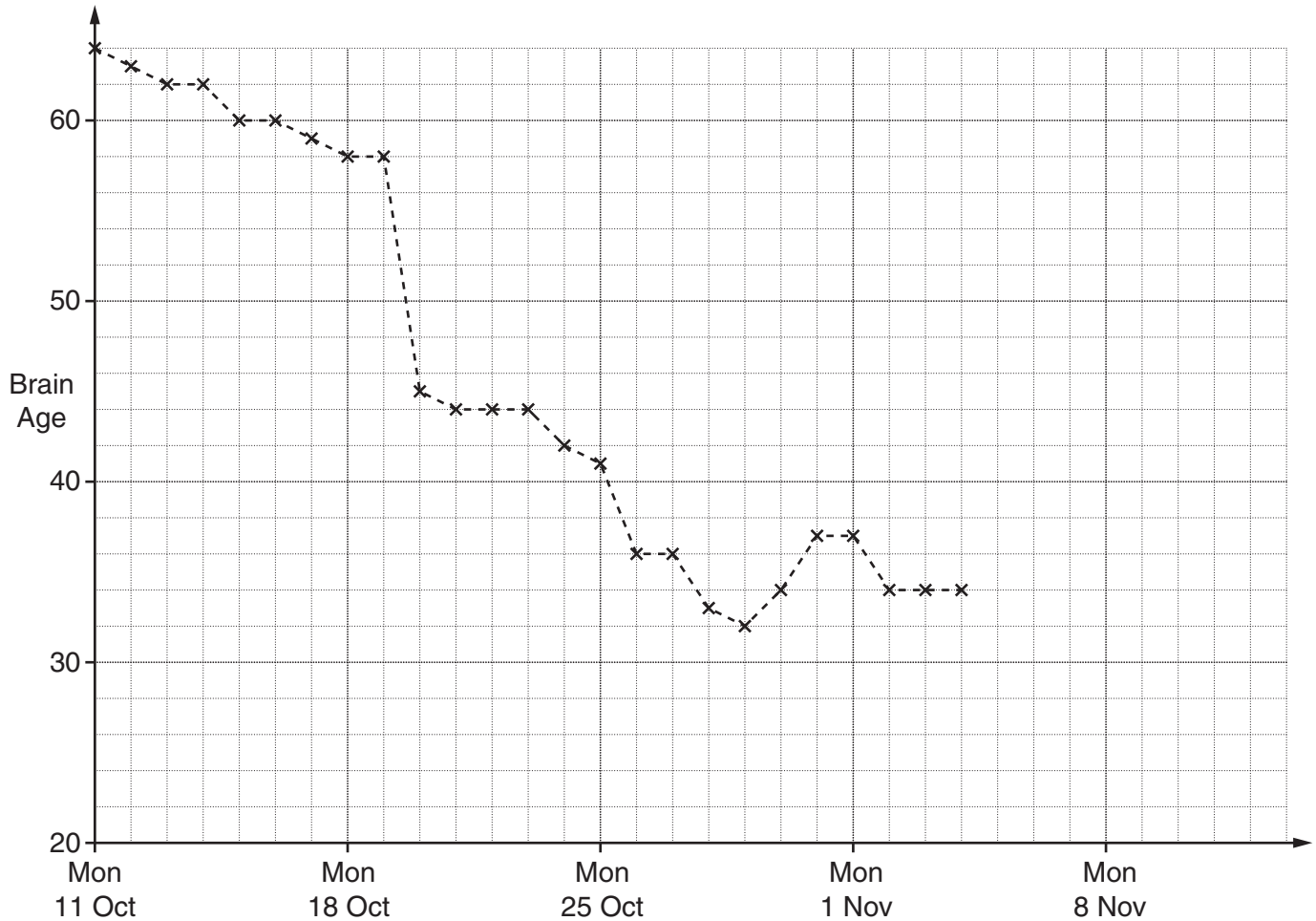
Construct the hexagon.

A

O

[3]

Turn over

6 Sam bought an electronic game on Monday 11th October.
The game gives him word and number puzzles to test how well his brain works.
He can practise the puzzles to try to improve.
The game gives him a 'Brain Age' to show how well he is doing.

The Brain Age can range from 65, which is very poor, to 20, which is best.

The game uses a time series graph to show Sam's Brain Age.

(a) Complete the time series graph with this information.

Date	Sam's Brain Age
Fri 5 Nov	34
Sat 6 Nov	34
Sun 7 Nov	33
Mon 8 Nov	31
Tues 9 Nov	30
Wed 10 Nov	30
Thur 11 Nov	28

[2]

(b) One day Sam discovers a method to get much better scores.

On what date did Sam discover this method?

(b) _____ **[1]**

(c) Sam realises he does not do as well when he is ill.
Sam was ill for two days in October.

On which dates was he ill?

(c) _____ **[1]**

(d) Sam's father, John, also likes to play the game occasionally.

Date	John's Brain Age
Tues 12 Oct	38
Wed 20 Oct	30
Sat 23 Oct	35
Mon 1 Nov	28
Thur 11 Nov	29

(i) On the grid, draw the time series graph for John's Brain Age. **[1]**

(ii) Sam thinks he will soon be able to get a better Brain Age than his father all the time.

Is Sam correct?
Explain your answer.

_____

_____

_____

_____ **[2]**

7 **(a)** The sketches of three different straight line graphs are shown below.

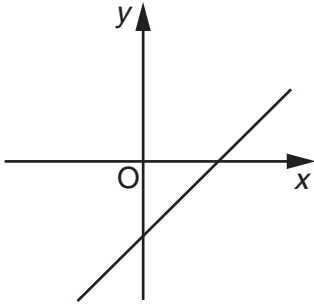Write the correct equation under each sketch. Choose from this list.
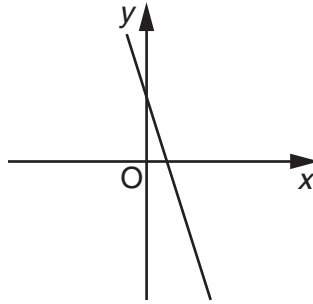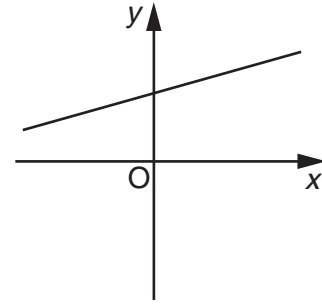
$y = \frac{1}{2}x + 5$ $y = -3x + 5$ $y = x^2 + 5$ $y = x - 5$ $y = -3x - 5$
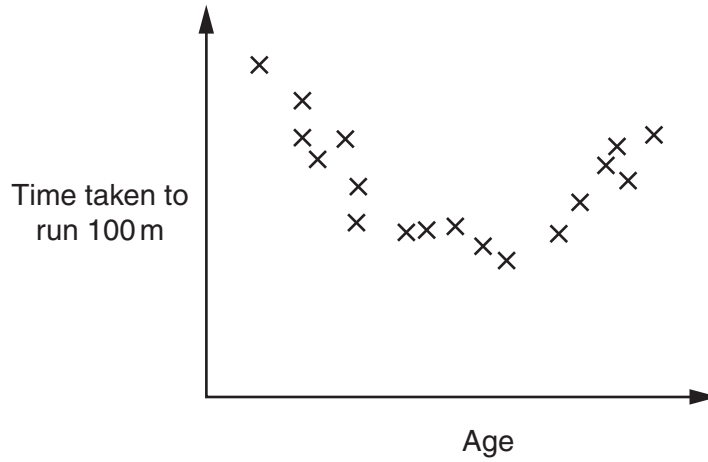
_____   _____   _____   **[3]**

(b) A line, *L*, is **perpendicular** to the line $y = 2x + 6$.
L goes through the point (0, 3).

Find the equation of the line *L*.

(b) _____ **[2]**

8* This scatter graph shows the time taken to run 100 metres plotted against age for a group of 18 people.

Lizzie says that, for these people, there is **no correlation** between age and time taken to run 100m.

Parand says that, for these people, there **is a relationship** between age and time taken to run 100 m.

Is Lizzie correct? Is Parand correct?
Explain your conclusions clearly.

_____

_____

_____

_____

_____

_____ **[4]**

9 The *Park and Ride* is a bus service to take people into the city centre.
Adults pay £1.60 for a ticket and children pay 20 pence.
On one journey there are 55 passengers and the driver collects £67.

Let *a* be the number of adults on the bus and let *c* be the number of children on the bus.

(a) Show that $8a + c = 335$.

_____

_____

_____ **[2]**

(b) The fact that there are 55 passengers means that $a + c = 55$.

Solve this equation simultaneously with the one from part **(a)** to find how many children are on the bus.

(b) _____ **[3]**

10 The three-toed sloth is a very slow-moving animal.

In $2\frac{3}{4}$ hours it can only travel $\frac{33}{80}$ of a mile.

Use the formula

$$\text{speed} = \text{distance} \div \text{time}$$

to calculate its average speed in miles per hour.
Give your answer as a fraction in its simplest form.

_____ mph **[3]**

Turn over

11 A, B, C and D are points on a circle.

Not to scale

(a) Work out angle *p*. Give a reason for your answer.

p = _____° because _____

_____ **[2]**

(b)* Is the diameter of the circle less than 8 cm, more than 8 cm or equal to 8 cm?
Justify your answer.

_____

_____

_____ **[3]**

12 Write the following in the form $a\sqrt{3}$, where a is an integer.

(a) $\dfrac{6}{\sqrt{3}}$

(a) —————————————————— **[2]**

(b) $\sqrt{24} \times \sqrt{2}$

(b) —————————————————— **[2]**

TURN OVER FOR QUESTION 13

13 (a) On the grid, draw the line $3x + 4y = 12$.

[2]

(b) On the grid, indicate clearly the region R which satisfies all the following inequalities.

$$3x + 4y < 12$$
$$x > 1$$
$$y > 0$$

[2]

(c) Write down the integer values of x and y that satisfy all three inequalities.

(c) $x =$ _____ $y =$ _____ [1]