PAPER 3H

GCSE MATHEMATICS

CM

Practice Set A   Calculator   Time allowed: 1 hour 30 minutes

Instructions to candidates:

• In the boxes above, write your centre number, candidate number, your surname, other names and signature.

• Answer ALL of the questions.

• You must write your answer for each question in the spaces provided.

• You may use a calculator.

Information to candidates:

• Full marks may only be obtained for answers to ALL of the questions.

• The marks for individual questions and parts of the questions are shown in round brackets.

• There are 18 questions in this question paper. The total mark for this paper is 80.

Advice to candidates:

• You should ensure your answers to parts of the question are clearly labelled.

• You should show sufficient working to make your workings clear to the Examiner.

• Answers without working may not gain full credit.

1 The plan, front elevation and side elevation of a solid prism is shown on the centimetre grid below.

plan

side elevation

front elevation
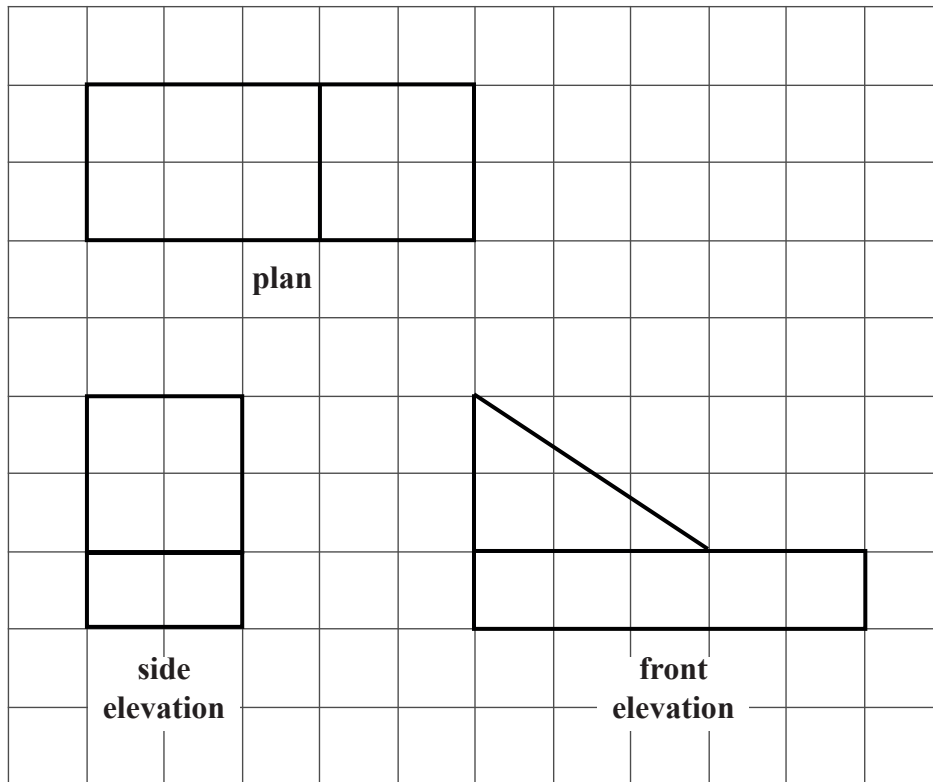
In the space below, draw a sketch of the solid prism.

Write the dimensions of the prism on your sketch.

(Total for Question 1 is 2 marks)

2 (a) Using your calculator, find the value of the reciprocal of

$$\sqrt{2+\sqrt{2+\sqrt{2+\sqrt{2}}}}$$

Write down all the figures on your calculator display.

....

(1)

(b) Round your answer in part (a) to

(i) five decimal places

....

(1)

(ii) one significant figure

....

(1)

(Total for Question 2 is 3 marks)

3 Given that $y = -9$, solve the equation $x + 2y = 10x$.

$x = $ ....

(Total for Question 3 is 3 marks)

4 Jessie has 30 euros and 10 dollars in her purse.

She wants to buy a dress that costs £35.

Jessie converts her money into pounds using a local bank. The exchange rates at the bank are

  1 euro is 89 pence

  1 dollar is 0.83 euros

Does Jessie have enough money to buy the dress?
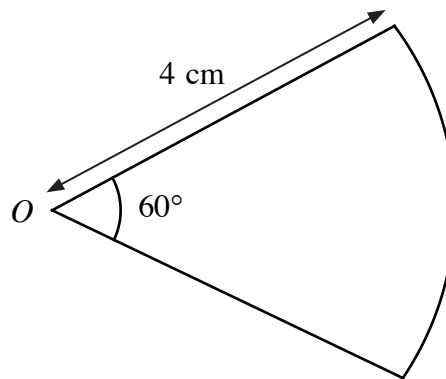
You must show all of your working.

(Total for Question 4 is 3 marks)

5 The diagram below shows a sector of a circle with centre *O* and radius 4 cm.

**NOT
TO SCALE**

(a) What proportion of the circle is the sector?

....

(1)

The sector is the cross-section of a prism with length 10 cm.

(b) Calculate the volume of this prism.

.............................cm^3

(3)

(Total for Question 5 is 4 marks)

6
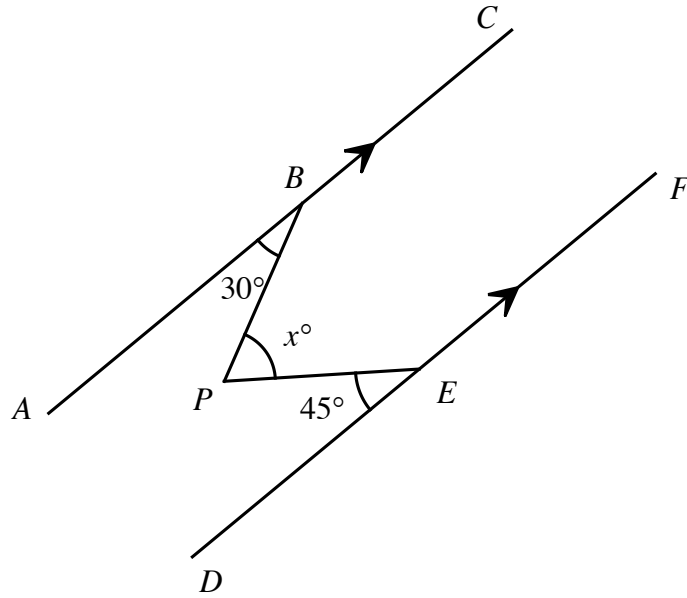
The lines *ABC* and *DEF* are parallel lines.

The angle *PBA* is 30°, the angle *PED* is 45° and the angle *BPE* is *x*°.

Find the value of *x*.

You must show all of your working, stating clearly the angle properties that you use.

x = ...

(Total for Question 6 is 4 marks)

7 Josh, Shivani, Abdul and Lauren are due to split some commission in the ratio $3:k:4:7$, where k is a constant.

Abdul receives £200 more commission than Shivani.

Lauren receives £700 in commission.

Find the total amount of commission given to Josh, Shivani, Abdul and Lauren.
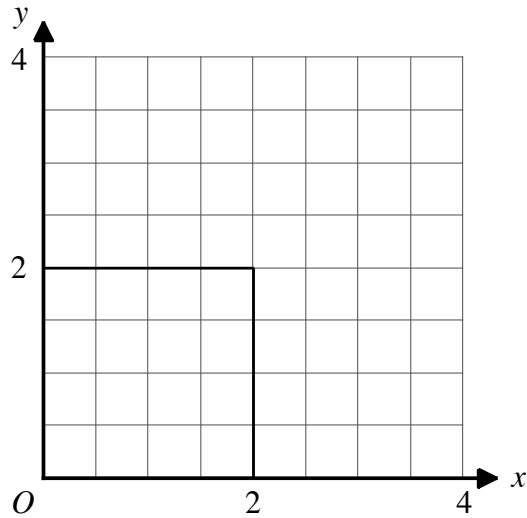
You must show all of your working.

£....................................

(Total for Question 7 is 4 marks)

8 The square $OABC$ is shown on the coordinate axes below, where O is the origin.

The point A has coordinates $(2, 0)$, B has coordinates $(2, 2)$ and C has coordinates $(0, 2)$.

(a) The square $OABC$ is enlarged by a scale factor 2, centre O.

Which of the following points are invariant under this enlargement?

Place a tick in the correct box(es). **(1)**

O	A	B	C

(b) The square $OABC$ is reflected in the line $y = x$.

Which of the following points are invariant under this reflection?

Place a tick in the correct box(es). **(1)**

O	A	B	C

(Total for Question 8 is 2 marks)

9 Here is a partially completed table that summarises the data collected about the variable x.

x	frequency f	xf	x^2f
2	4	8	16
7	12		
11	6		
14	8		

(a) Complete the table. **(2)**

(b) Find the mean value of the variable x.

....
(3)

(c) Find the mean value of the variable x^2.

....
(3)

The variance of these data is given by

the mean value of x^2 – (the mean value of x)^2

(d) (i) Calculate the variance of these data.

....
(1)

(ii) Given that x is measured in centimetres, give a suitable unit for the variance of these data.

....
(1)

(Total for Question 9 is 10 marks)

10 *m* and *n* are integers such that

$$-5 < m \le 4 \text{ and } 4 \le n \le 8$$

Work out

(a) the largest possible value of *m* + *n*

....

(1)

(b) the largest possible value of *m* − *n*

....

(1)

(c) the largest possible value of $m^2 + n^2$

....

(1)

(d) the largest possible value of $\dfrac{\left(m^2 + n^2\right)\left(m^2 - n^2\right)}{(m+n)(m-n)}$

....

(1)

(Total for Question 10 is 4 marks)

11 The square of A is inversely proportional to the cube root of B.

When $A = 2$, $B = 27$.

Find the value of B when $A = 4$.

$B =$ ....

(Total for Question 11 is 4 marks)

12 Edgar bought a car for £5400.

The price of the car, £P, depreciates each year by a constant rate r.

The price of the Edgar's car n years after he bought it is given by

$$P = 5400r^n$$

(a) What type of progression does the price of Edgar's car follow?

....

(1)

(b) Which of the following inequalities must be true?

Place a tick in the correct box.

$r \geq 0$	$0 < r \leq 1$	$0 < r < 1$	$r > 1$	$r \geq 1$

(1)

The price of Edgar's car after 4 years is £2000.

After 5 years of having the car, Edgar sells the car in order to purchase another car worth £1500.

(c) Has Edgar made any profit from selling his old car?

You must show all of your working.

(5)

(Total for Question 12 is 7 marks)

13

$$f(x) = \frac{x}{2x+1}$$

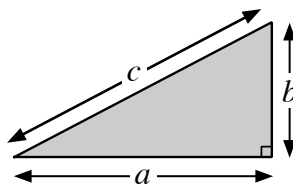Find an expression for $f(x+1) - f(x)$, giving your answer as a single fraction in its simplest form.

....

(Total for Question 13 is 4 marks)

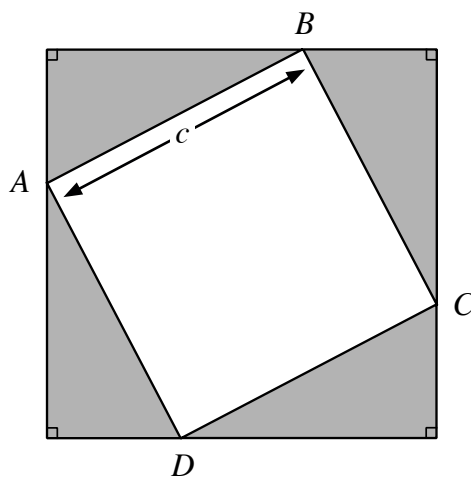**14** Here is a right-angled triangle T.

Four of these triangles are joined to form the square $ABCD$, as shown in the diagram below.

(a) Which of the following is an expression for the area of the square $ABCD$?

Circle your answer.

$$a^2 \qquad\qquad b^2 \qquad\qquad c^2$$

(1)

By considering the area of the shaded region,

(b) show that the area of $ABCD$ can also be given by $a^2 + b^2$.

(4)

(c) Explain what has been proved about the triangle T in parts (a) and (b).

....

....

(1)

(Total for Question 14 is 6 marks)

15 There are n counters in a bag, where n satisifies $n^2 - n - 210 = 0$.

10 of the counters in the bag are red. The rest of the counters are blue.

Adam takes one counter from the bag at random. He does not replace it.

Adam then takes another counter from the bag at random.

The probability that Adam takes two counters from the bag is p.

Find the value of p.

....

(Total for Question 15 is 3 marks)

16 (a) The curve with equation $y = f(x)$ has one maximum point at (3, 10).

Write down the coordinates of the maximum point on the curves with equation

(i) $y = 3f(x)$

....
(1)

(ii) $y = f(x - 4)$

....
(1)

(iii) $y = f(6x)$

....
(1)

(b) The table below has some statements about trigonometric functions.

Read the statements and determine whether they are true or false.

Place a tick in the correct box. The first one has been done for you.

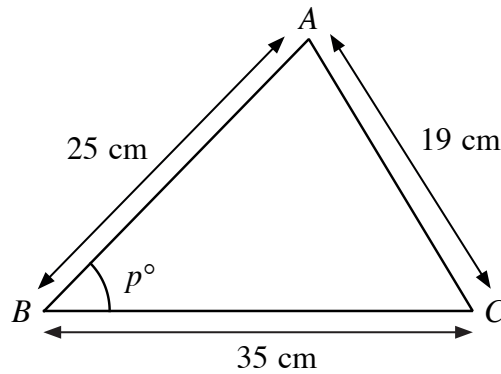| statement	true	false
the value of $\sin(30°)$ is 0.5	✓	
the graph $y = \tan x$ is a straight line		
the minimum value of $2\sin^2 x$ is -2		
the graph $y = \cos(x - 90°)$ is the same as the graph $y = \sin x$		

(3)

(Total for Question 16 is 6 marks)

17 *ABC* is a triangle such that *AB* = 25 cm, *AC* = 19 cm and *BC* = 35 cm.

A

25 cm

19 cm

p°

B

C

35 cm

NOT TO SCALE

The angle *ABC* = *p*°.

(a) Find the value of *p*.

p =.............................

(4)

(b) Find the area of the triangle *ABC*.

....

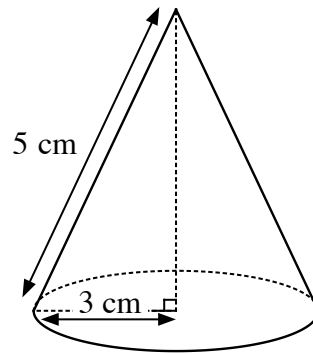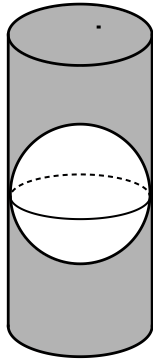**(2)**

(Total for Question 17 is 6 marks)

18 A sphere is placed completely inside of a 2 cm cylinder, as shown in the diagram below.

NOT TO SCALE

5 cm

3 cm

The region of the cylinder that does not contain the sphere is shown shaded.

The diagram above also shows a circular cone.

The ratio between the volume of the cone and the total volume of the cylinder is 2:3.

Find the volume of the shaded region.

Give your answer as an exact value.

[You will find relevant formulae for this question on Page 19]

.................................cm^3

(Total for Question 18 is 5 marks)

TOTAL FOR PAPER = 80 MARKS

Relevant formulae for Question 18 are:

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

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