GCSE
MATHEMATICS

H

Higher Tier   Paper 1 Non-Calculator
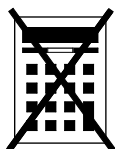
Tuesday 21 May 2019   Morning   Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
• mathematical instruments

You must **not** use a calculator.

Instructions

• Use black ink or black ball-point pen. Draw diagrams in pencil.
• Fill in the boxes at the top of this page.
• Answer **all** questions.
• You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
• Do all rough work in this book. Cross through any work you do not want to be marked.

Information

• The marks for questions are shown in brackets.
• The maximum mark for this paper is 80.
• You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

Advice

In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
TOTAL	

Answer **all** questions in the spaces provided

1 Here are two right-angled triangles.

Not drawn accurately

6 cm

10 cm

x

y cm

15 cm

x
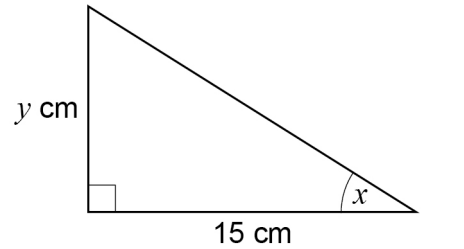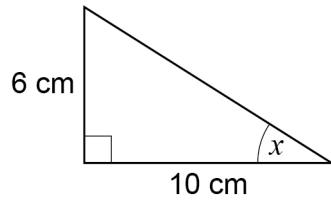
Circle the value of y.

[1 mark]

11   7.5   9   4

2 Work out the value of $\left(1\dfrac{2}{3}\right)^2$

Circle your answer.

[1 mark]

$1\dfrac{4}{9}$ $3\dfrac{1}{3}$ $2\dfrac{4}{9}$ $2\dfrac{7}{9}$

3 Work out the arc length, in metres, of a semicircle of radius 6 metres.

Circle your answer.

[1 mark]

3π   6π   12π   18π

4 Circle the fraction that is equivalent to 4.625

[1 mark]

$$\frac{39}{8} \qquad \frac{37}{8} \qquad \frac{185}{4} \qquad \frac{17}{4}$$

5 (a) Write 0.000 97 in standard form.

[1 mark]

Answer _____

5 (b) Work out $\dfrac{3 \times 10^5}{4 \times 10^3}$

Give your answer as an ordinary number.

[2 marks]

Answer _____

7

Turn over ▶

6 Anna plays a game with an ordinary, fair dice.

If she rolls 1 she wins.

If she rolls 2 or 3 she loses.

If she rolls 4, 5 or 6 she rolls again.

When she has to roll again,

if she rolls an odd number she wins

if she rolls an even number she loses.

6 (a) Complete the tree diagram with the four missing probabilities.

[2 marks]

First roll   **Second roll**

1

2 or 3

$\dfrac{1}{2}$

4, 5 or 6

Odd

Even

6 (b) Is Anna more likely to win or to lose?

You **must** work out the probability that she wins.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

Turn over for the next question

6

Turn over ▶

7 Three friends arrive at a party.

Their arrival increases the number of people at the party by 20%

In total, how many people are now at the party?

[2 marks]

Answer _____

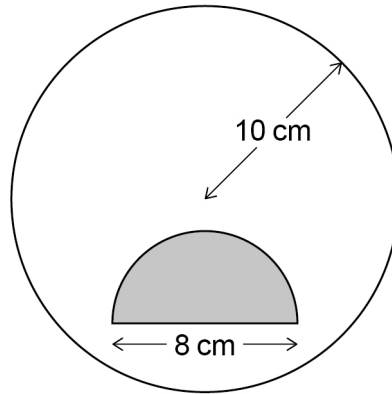**8** Work out the value of $(3^{12} \div 3^5) \div (3^2 \times 3)$

[3 marks]

Answer _____

9 A shaded semicircle is inside a circle as shown.

Not drawn accurately

The **radius** of the circle is 10 cm

The **diameter** of the semicircle is 8 cm

How many times bigger is the unshaded area than the shaded area?

[4 marks]

Answer _____

Turn over for the next question

Turn over ▶

07

10 The number of items, n, made in 1 hour by a machine is given by $n = \dfrac{60}{t}$

t is the time in minutes the machine takes to make one item.

The value of t changes for different types of item.

10 (a) On the grid below, draw the graph of $n = \dfrac{60}{t}$ for values of t from 1 to 4

[2 marks]

Number of items, n, made in 1 hour

Time, t, (minutes) to make one item
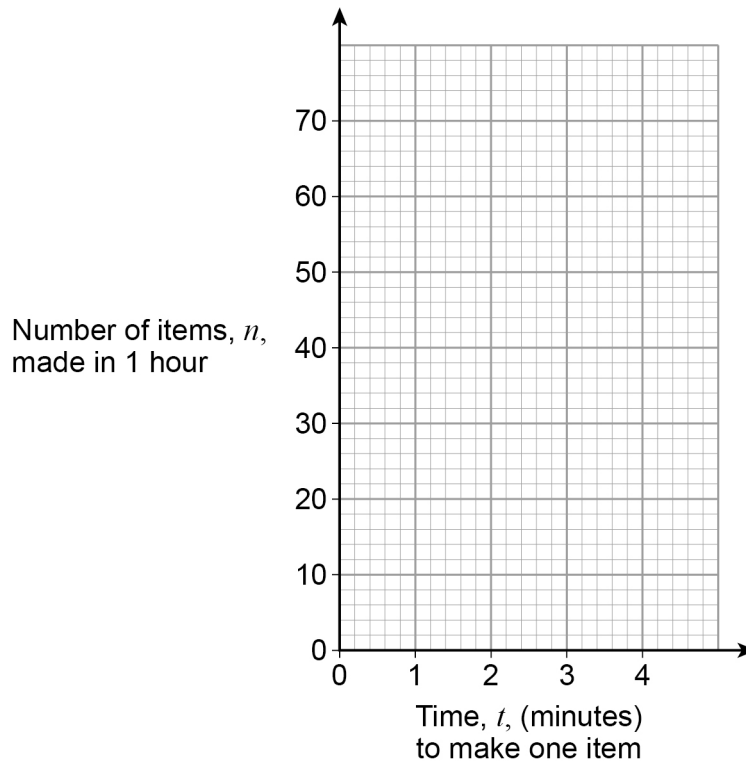
10 (b) The machine takes 3 minutes 30 seconds to make one item.

Use your graph to estimate the value of n.

[2 marks]

Answer _____

11 Ed and Fay shared £330 in the ratio   7 : 4

Ed gives Fay some of his money.

Fay now has the same amount as Ed.

How much does Ed give Fay?

[3 marks]

Answer £_____

12 The next term of a sequence is made by adding the previous two terms.

Which of these sequences follows this rule?

Circle your answer.

[1 mark]

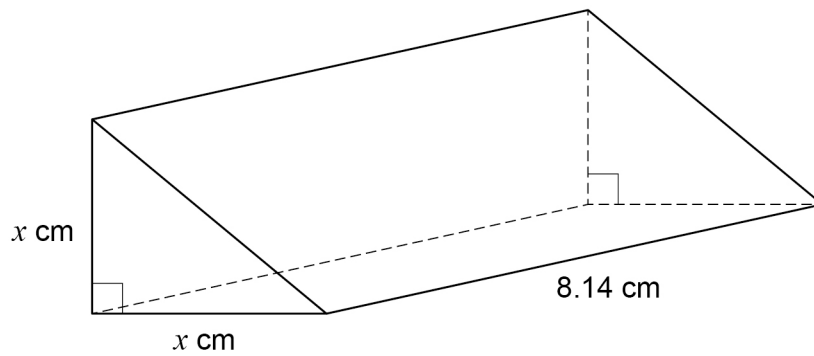–9   2   –7   –5   –12   –3   5   –2   3   1

0   –3   –3   0   –3   –1   –1   –2   –3   1

8

Turn over ▶

13 The triangular cross section of a prism is an isosceles right-angled triangle.

x cm

x cm

8.14 cm

The volume of the prism is 102 cm^3

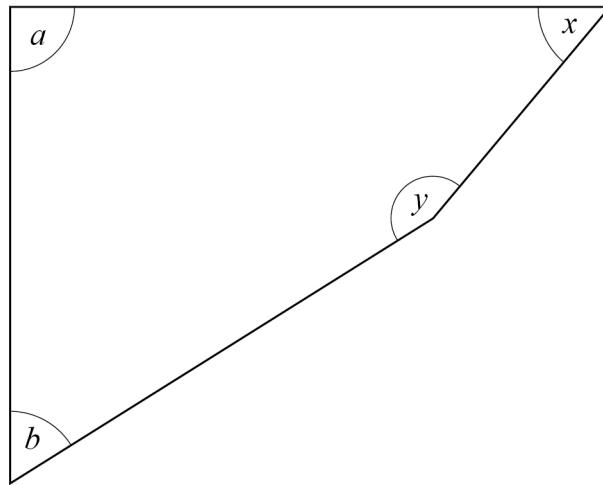Use approximations to estimate the value of x.

You **must** show your working.

[3 marks]

Answer _____

14 Here is a quadrilateral.

Not drawn accurately

$a = 90°$ and $a : b = 5 : 3$

$x : y = 1 : 3$

Show that $b = x$

[3 marks]

_____

_____

_____

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_____

6

Turn over ▶

15 Here is some information about the test marks of 120 students.

Mark, m	$0 < m \leqslant 10$	$10 < m \leqslant 20$	$20 < m \leqslant 30$	$30 < m \leqslant 40$	$40 < m \leqslant 50$
Frequency	20	28	40	20	12

15 (a) Complete the cumulative frequency table.

[1 mark]

Mark, m	$m \leqslant 10$	$m \leqslant 20$	$m \leqslant 30$	$m \leqslant 40$	$m \leqslant 50$
Cumulative frequency	20	48			

15 (b) Draw a cumulative frequency graph.

[2 marks]
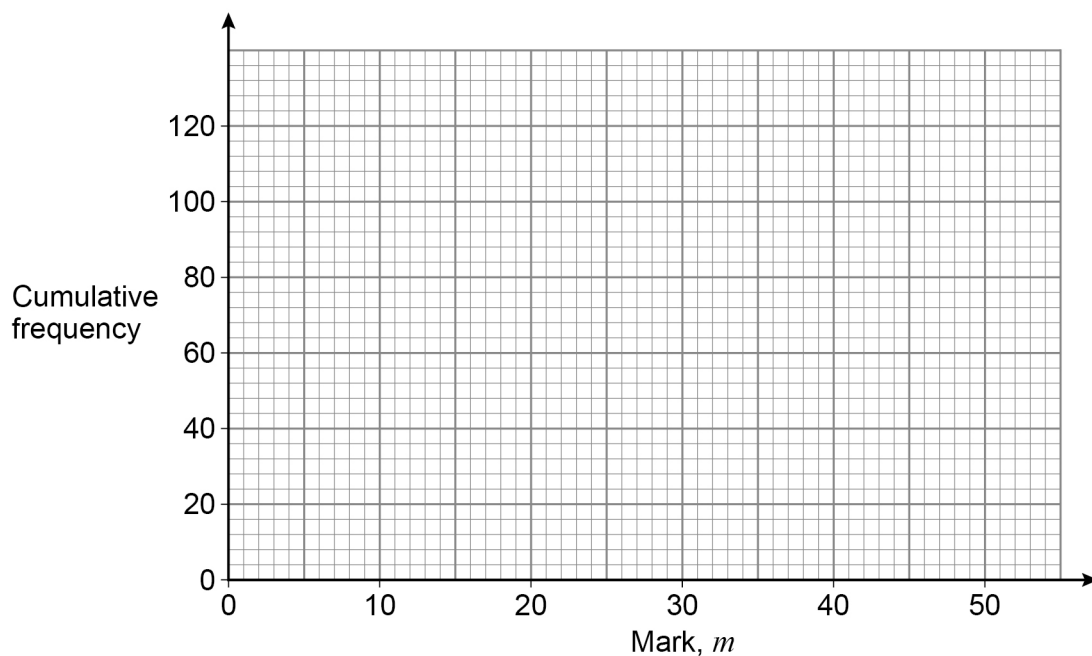
15 (c) Students who scored 15 marks or fewer take another test.

Use your graph to estimate how many students take another test.

[2 marks]

Answer _____

16 Simplify fully $\dfrac{4x - 8x^2}{12x - 6}$

[3 marks]

Answer _____

Turn over for the next question

8

Turn over ▶

17 Toby is forming and solving equations.

17 (a)

> The product of half of a number and three more than the number
> is the same as
> the square of the number

Toby uses y to represent the number.

Write an equation that Toby could form.

[2 marks]

_____

_____

Answer _____

17 (b) Toby forms another equation.

$$x = \frac{9}{8x}$$

He wants to work out the values of x.

Here is his working.

$$x = \frac{9}{8x}$$

$$8x^2 = 9$$

$$8x = 3 \ \text{ or } \ 8x = -3$$

$$x = \frac{3}{8} \ \text{ or } \ x = -\frac{3}{8}$$

What error has he made in his working?

[1 mark]

_____

_____

_____

18 Here is an identity.

$$x^2 - y^2 \equiv (x + y)(x - y)$$

18 (a) Use the identity to work out the value of $193^2 - 7^2$

You **must** show your working.

[2 marks]

Answer _____

18 (b) Factorise $100a^2 - 81b^2$

[1 mark]

Answer _____

19 Circle the fraction that is equivalent to $0.\dot{1}$

[1 mark]

$\dfrac{1}{9}$ $\qquad$ $\dfrac{1}{99}$ $\qquad$ $\dfrac{1}{10}$ $\qquad$ $\dfrac{11}{100}$

7

Turn over ▶

20   *A*, *B* and *C* are points on a circle.

CD is a tangent.

Not drawn accurately
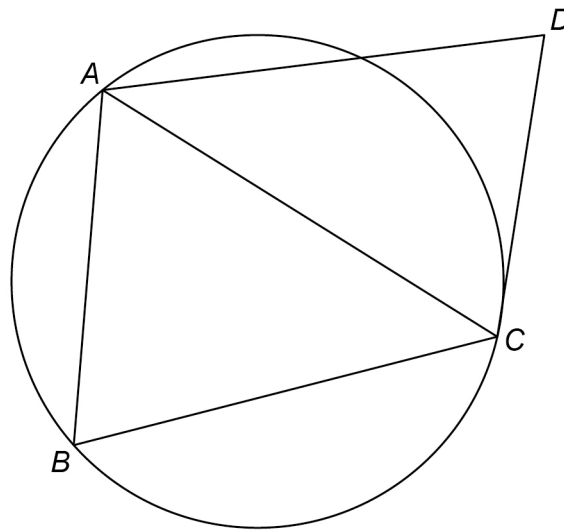
20 (a)   Assume that triangle *ABC* is isosceles with   *AC = BC*

Prove that *AB* is parallel to *DC*.

[4 marks]

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_____

_____

_____

20 (b) In fact, triangle *ABC* is equilateral.

Tick the **two** boxes for the statements that **must** be correct.

[1 mark]

☐   *AB* is parallel to *DC*

☐   *AC* bisects angle *BCD*

☐   *AC* bisects angle *BAD*

21   Solve the simultaneous equations
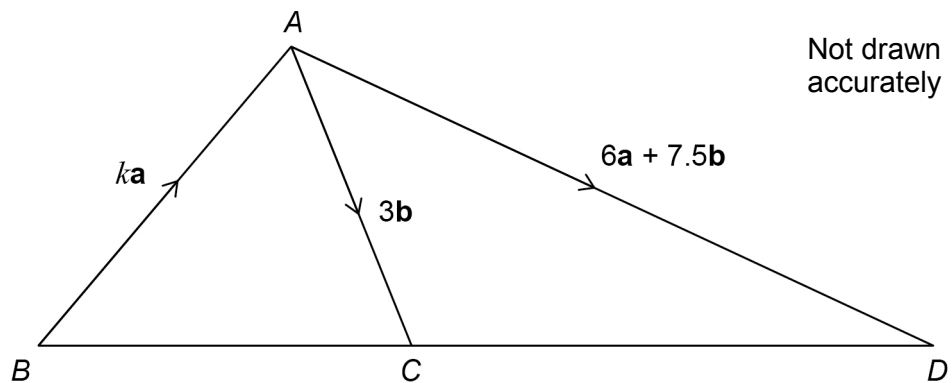
$$2x + 3y = 5p$$

$$y = 2x + p$$

where p is a constant.

Give your answers in terms of p in their simplest form.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

$x =$ _____ $y =$ _____

9

Turn over ▶

22 *ABC* and *ACD* are triangles.

k is a constant.

A

Not drawn accurately

k**a**

3**b**

6**a** + 7.5**b**

B   C   D

22 (a) Show that $\overrightarrow{CD}$ = 6**a** + 4.5**b**

[1 mark]

22 (b) *BCD* is a straight line.

Work out the value of k.

You **must** show your working.

[3 marks]

Answer _____

23 Simplify $8^4 \div 32^{\frac{2}{5}}$

Give your answer in the form 2^m where m is an integer.

[3 marks]

Answer _____

24 $f(x) = \sin(x - 90°)$

Circle the value of $f(0°)$

[1 mark]

$1 \qquad\qquad 0 \qquad\qquad -\dfrac{1}{2} \qquad\qquad -1$

Turn over for the next question

8

Turn over ▶

25 P (4, 8) is a point on a circle, centre O.

The tangent at P intersects the axes at points A and B.

Not drawn accurately
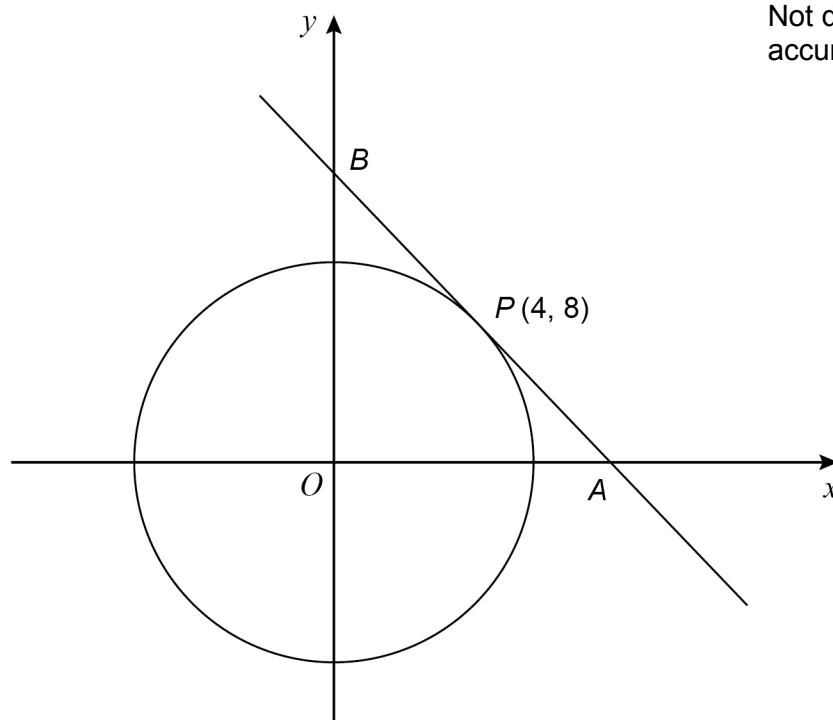
25 (a)   Show that the gradient of the tangent is $-\dfrac{1}{2}$

[2 marks]

_____

_____

_____

_____

_____

25 (b) Work out the length *AB*.

Give your answer in the form $a\sqrt{5}$ where a is an integer.

You **must** show your working.

[4 marks]

Answer _____ units

Turn over for the next question

Turn over ▶

26 The turning point of the graph $y = (x + a)^2 + b$ has x-coordinate -2

(3, 1) is another point on the graph.

Work out the y-coordinate of the turning point.

[3 marks]

Answer _____

27 Angle x is acute.

$\cos x = \sin 60° \times \tan 30°$

Work out the size of angle x.

You **must** show your working.

[3 marks]

Answer _____ degrees

END OF QUESTIONS

6

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED