

SURNAME FIRST NAME

JUNIOR SCHOOL SENIOR SCHOOL



Independent Schools
Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

LEVEL 2: CALCULATOR PAPER

Tuesday 23 January 2018

Please read this information before the examination starts.

- This examination is 60 minutes long.
- **All** questions should be attempted.
- Write your answers on the dotted lines.
- Where answers are not exact, they should be given to three significant figures, unless specified otherwise.
- The π button on your calculator should be used for calculations involving π .



1. (a) (i) Writing down the first 7 figures shown on your calculator, work out the decimal value of

$$\frac{(4.2 + 7)^2}{2.21}$$

Answer: (2)

- (ii) Write your answer to part (a) (i) correct to

(a) 3 decimal places

Answer: (1)

(b) 2 significant figures

Answer: (1)

- (b) (i) Write each of the numbers in the following expression correct to 1 significant figure.

$$\frac{525 \times 2.76}{11.39}$$

Answer: $\frac{\text{.....} \times \text{.....}}{\text{.....}}$ (2)

- (ii) Work out the value of your answer to part (b) (i).

Answer: (1)

- (c) Given that $V = \frac{4}{3}r^3$ find the value of V when $r = 3$

Answer: $V = \text{.....}$ (2)

2. (a) A plane takes off on Sunday at 9:25 p.m.
The plane lands at its destination the following morning at 11:13 a.m.
How long is the plane's journey in hours and minutes?

Answer: h min (2)

- (b) A hiker walks the 10 miles from Abton to Zabton in 2 hours and 36 minutes.

- (i) Write this time in hours as a decimal.

Answer: h (1)

- (ii) Calculate the average speed of the hiker in miles per hour.

Answer: mph (2)

- (c) A greyhound wins a race in 27 seconds at an average speed of 72 kilometres per hour.

- (i) Change 72 kilometres per hour into metres per second.

Answer: m/s (2)

- (ii) Calculate the length of this race in metres.

Answer: m (1)

3. Last year, *The Bike Club*'s income came from a bank loan and from members' fees.

bank loan	£1500
members' fees	362 at £5 each

- (i) (a) Work out the income of the club last year.

Answer: £ (2)

- (b) Work out the bank loan as a percentage of the club's income last year.

Answer:% (2)

This year, *The Bike Club*'s income is £3000

The income is spent on the hire of a track and on expenses in the ratio 11 : 4

- (ii) How much does the club spend on the hire of a track this year?

Answer: £ (2)

Next year, the cost of hiring the track and the expenses will be in the ratio 5 : 2

The cost of hiring the track will be £1260 more than the expenses.

- (iii) Next year, how much will *The Bike Club* spend on the hire of the track?

Answer: £ (2)

4. There are 7 passengers on a bus.

The ages, in years, of the passengers are

35 74 52 16 44 66 28

- (i) What is the range of their ages?

Answer: years (1)

- (ii) What is the median age of the 7 passengers on the bus?

Answer: years (2)

- (iii) What is the mean age of the 7 passengers on the bus?

Answer: years (2)

At the next stop, Joe gets on the bus and no one gets off the bus.

The mean age of the passengers is now 41 years.

- (iv) (a) What is the total of the ages of all 8 passengers on the bus?

Answer: years (1)

- (b) How old is Joe?

Answer: years (1)

5. The table below shows how all the 25 pupils at *Smallplace College* travel to school.

(i) Complete the table using the information given.

	car	bus	walk	total
boys	7		3	11
girls		3	2	
total	16			25

(2)

(ii) What fraction of the pupils at *Smallplace College*

(a) are girls?

Answer: (1)

(b) walk to school?

Answer: (1)

(iii) What fraction of the girls travel to school by car or bus?

Answer: (2)

6. Simplify

(i) $5a - 8b - 6a + 10b$

Answer: (1)

(ii) $6c \times 9d$

Answer: (2)

(iii) $4e^3 \times -3e^3$

Answer: (2)

(iv) $\frac{16f + 8}{8}$

Answer: (2)

7. (a) Simplify

$$4 + 3(6a - 5)$$

Answer: (3)

(b) (i) Factorise completely

$$24y + 36$$

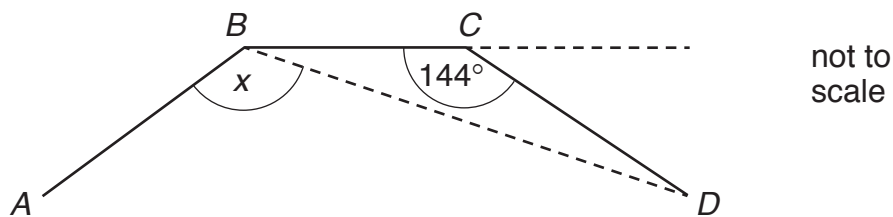
Answer: (2)

(ii) Amir has $(24y + 36)$ sweets which he shares equally between himself and each of his three sisters.

How many sweets does each sister receive?

Answer: (1)

8. The diagram below shows $ABCD$ which is part of a regular polygon.



- (i) (a) Work out the size of the exterior angle of the polygon.

Answer: (1)

- (b) How many sides does this regular polygon have?

Answer: (1)

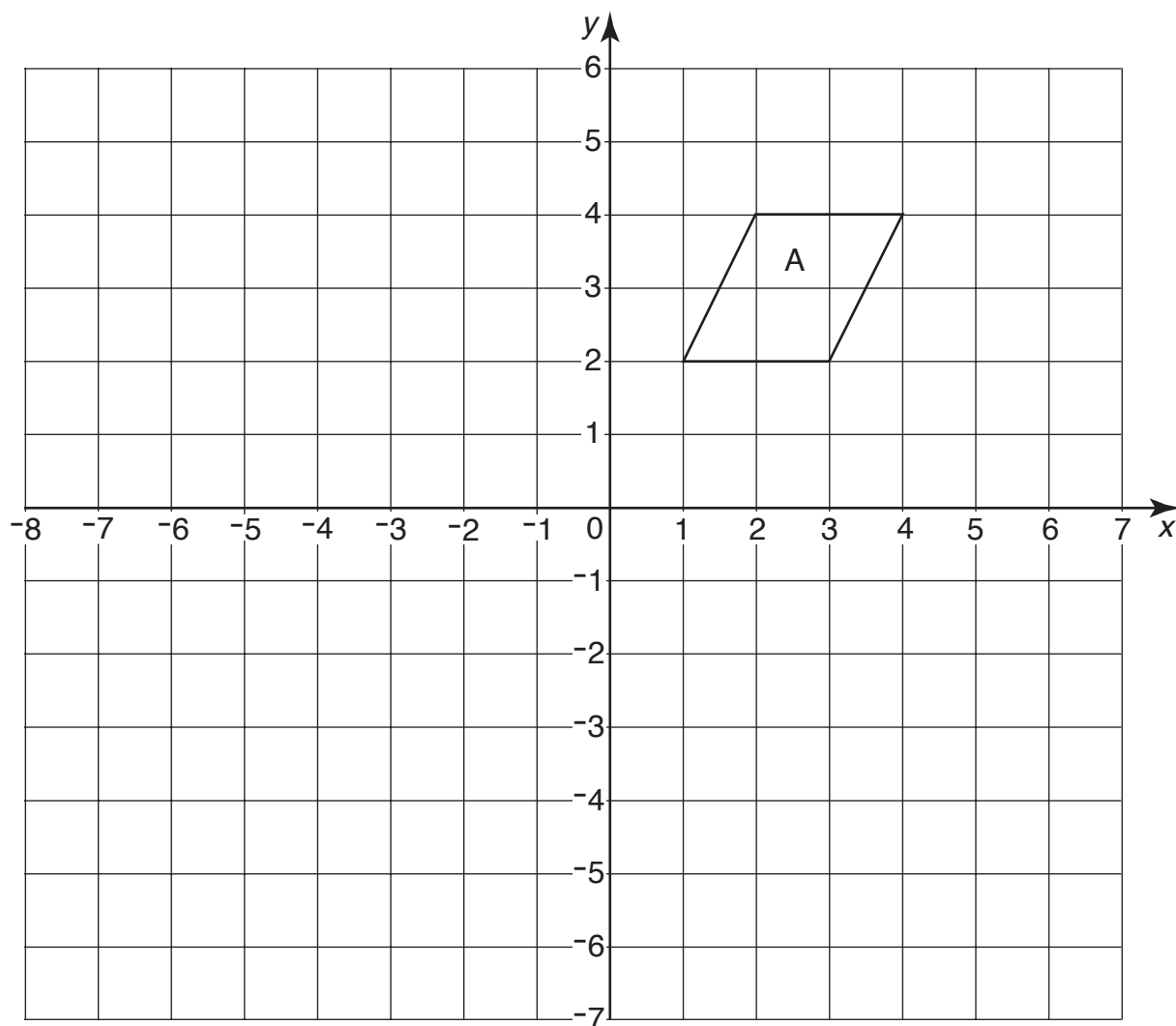
- (ii) What is the sum of all the interior angles of this polygon?

Answer: (1)

- (iii) What is the size of the angle marked x ?

Answer: $x =$ (2)

9. Look at the grid below.



(i) (a) Draw and label the line $x = -1$ on the grid above. (1)

(b) Reflect shape A in the line $x = -1$
Label the new shape B. (1)

(ii) Rotate shape A through 180° about the point $(-1, 0)$
Label the new shape C. (2)

(iii) Translate shape A by *2 units left* and *5 units down*.
Label the new shape D. (2)

(iv) Describe fully the single transformation which maps shape B onto shape C.

Answer:

..... (1)

10. (i) (a) Work out the circumference of a circle with diameter 100 centimetres.

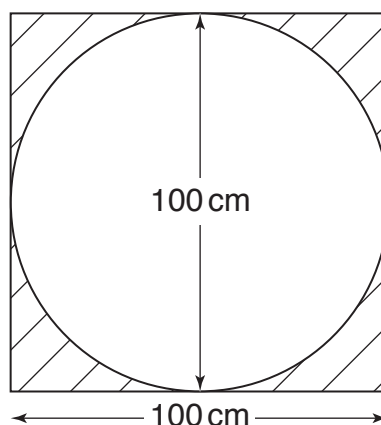
Answer: cm (2)

- (b) Work out the area of a circle with diameter 100 centimetres.

Answer: cm^2 (2)

- (ii) The diagram shows a circle with diameter 100 cm inside a square with sides of 100 cm.

Work out the area of the shaded part of the diagram.

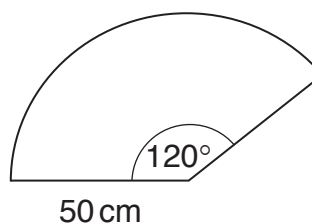


not to
size

Answer: cm^2 (2)

- (iii) A sector of a circle has radius 50 cm.

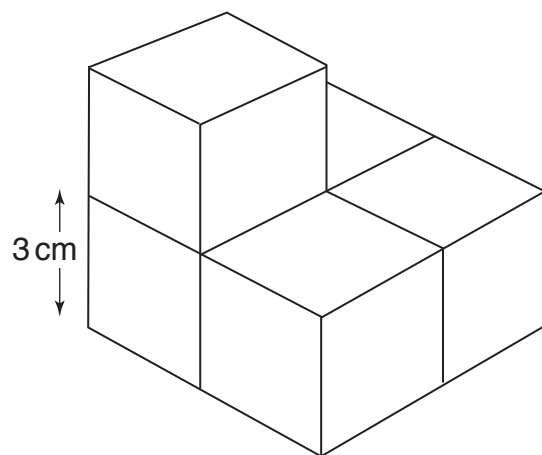
Work out the perimeter of this sector.



not to
size

Answer: cm (2)

11. The diagram below shows five cubes placed together.
Each cube has edges of length 3 centimetres.



not to
scale

- (i) What is the total volume of all of these cubes?

Answer:cm³ (2)

- (ii) What is the total surface area of this arrangement of the cubes?

Answer:cm² (3)

12. Jamie carries out a survey of 90 Year 8 pupils.

He asks each of them to state their favourite snack and draws a pie chart of the results.

(i) (a) What angle is needed to show each pupil on the pie chart?

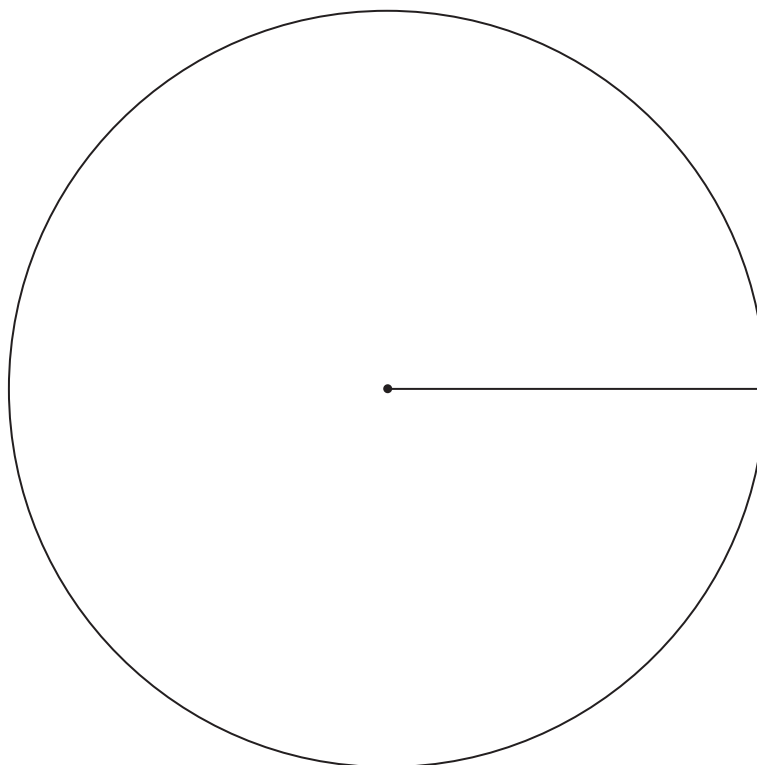
Answer: (1)

(b) Complete the table below.

favourite snack	number of pupils	angle
chips	10	40°
burger		°
kebab		60°
pizza	45	°
total	90	°

(2)

(ii) Draw a fully-labelled pie chart to show the favourite snacks of these Year 8 pupils.



(3)

Jamie also asks each of 30 Year 9 pupils to state their favourite snack.

Half of them say 'Chips' and half say 'Pizza'.

- (iii) What fraction of all the pupils that Jamie asks in Years 8 and 9 say that pizza is their favourite snack?

Answer: (2)

13. There are 9250 gallons of oil in an oil tanker.

The oil is pumped from the tanker at a rate of 1800 litres per minute.

1 gallon = 4.5 litres.

How many minutes will it take to empty the tanker completely?

Give your answer correct to the nearest minute.

Answer: min (3)

14. *Macsoft* make memory sticks for computers in three sizes, *mini*, *modo* and *maxi*.

The *mini* holds n units of data.

The *modo* holds 4 times as many units of data as the *mini*.

(i) Write an expression, in terms of n , for the number of units of data the *modo* holds.

Answer: units (1)

The *maxi* holds 1024 more units of data than the *modo*.

(ii) Write an expression, in terms of n , for the number of units of data the *maxi* holds.

Answer: units (1)

A *mini* and a *maxi* hold 2304 units of data altogether.

(iii) Write down an equation and solve it to find the value of n

Answer: $n =$ (2)

15. (i) A sequence begins with the following numbers:

1 9 25 49

(a) Show that the fifth number is 81 and write down the sixth number.

Answer: sixth number is (2)

(b) What is the difference between the first and second numbers in the sequence, and between the second and third numbers in the sequence?

Answer: and (1)

(c) What is the difference between the tenth and eleventh numbers in the sequence?

Answer: (2)

(ii) Different sequences follow the rule '*divide by 2 then add 6*'

(a) If the first number is 20, what is the third number in the sequence?

Answer: (2)

(b) If the third number is 26, what is the first number in the sequence?

Answer: (2)

(Total marks: 100)

