

SURNAME FIRST NAME

JUNIOR SCHOOL SENIOR SCHOOL



Independent Schools
Examinations Board

COMMON ENTRANCE EXAMINATION AT 13+

MATHEMATICS

LEVEL 3: 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: (1)

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

(a) 3 decimal places

Answer: (1)

(b) to 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: × (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 r when $V = 36$

Answer: $r =$ (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 (1)

- (b) A greyhound wins a race in 27 seconds at an average speed of 72 kilometres per hour.
Calculate the length of this race in metres.

Answer: m (3)

- (c) Minnie drove 40 miles from her home to the station at an average speed of 30 mph.
She waited 10 minutes and then drove 30 miles to Mickey's house at an average speed of 60 mph.
What was Minnie's average speed for her whole trip from home to Mickey's house?

Answer: mph (3)

3. (a) 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) 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 £3330

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 £1050 more than the expenses.

- (iii) Next year, how much will *The Bike Club* spend altogether on hiring the track and on expenses?

Answer: £ (2)

- (b) Alberto and Mark share £480 in the ratio 3 : 5

Alberto gives half of his share to Carol.

Mark gives one tenth of his share to Carol.

Write down, in its simplest form, the ratio of the amounts which Alberto, Mark and Carol end up with.

Answer: Alberto : Mark : Carol is : : (3)

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) How old is Joe?

Answer: years (2)

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		
total	16			

(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: (1)

6. Simplify

(i) $5a - 8a^3 - 6a + 10a^3$

Answer: (1)

(ii) $6cd^3 \times 9d$

Answer: (2)

(iii) $4e^3 \times (-3e)^2$

Answer: (2)

(iv) $\frac{16f^2 + 8f}{8f}$

Answer: (2)

7. (a) Simplify

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

Answer: (3)

(b) (i) Factorise completely

$$24y^2 + 36y$$

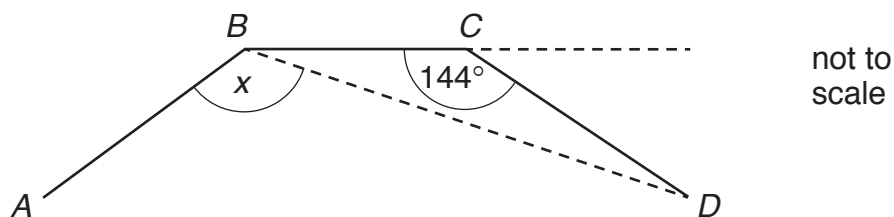
Answer: (2)

(ii) Amir has $(24y^2 + 36y)$ 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) How many sides does this regular polygon have?

Answer: (2)

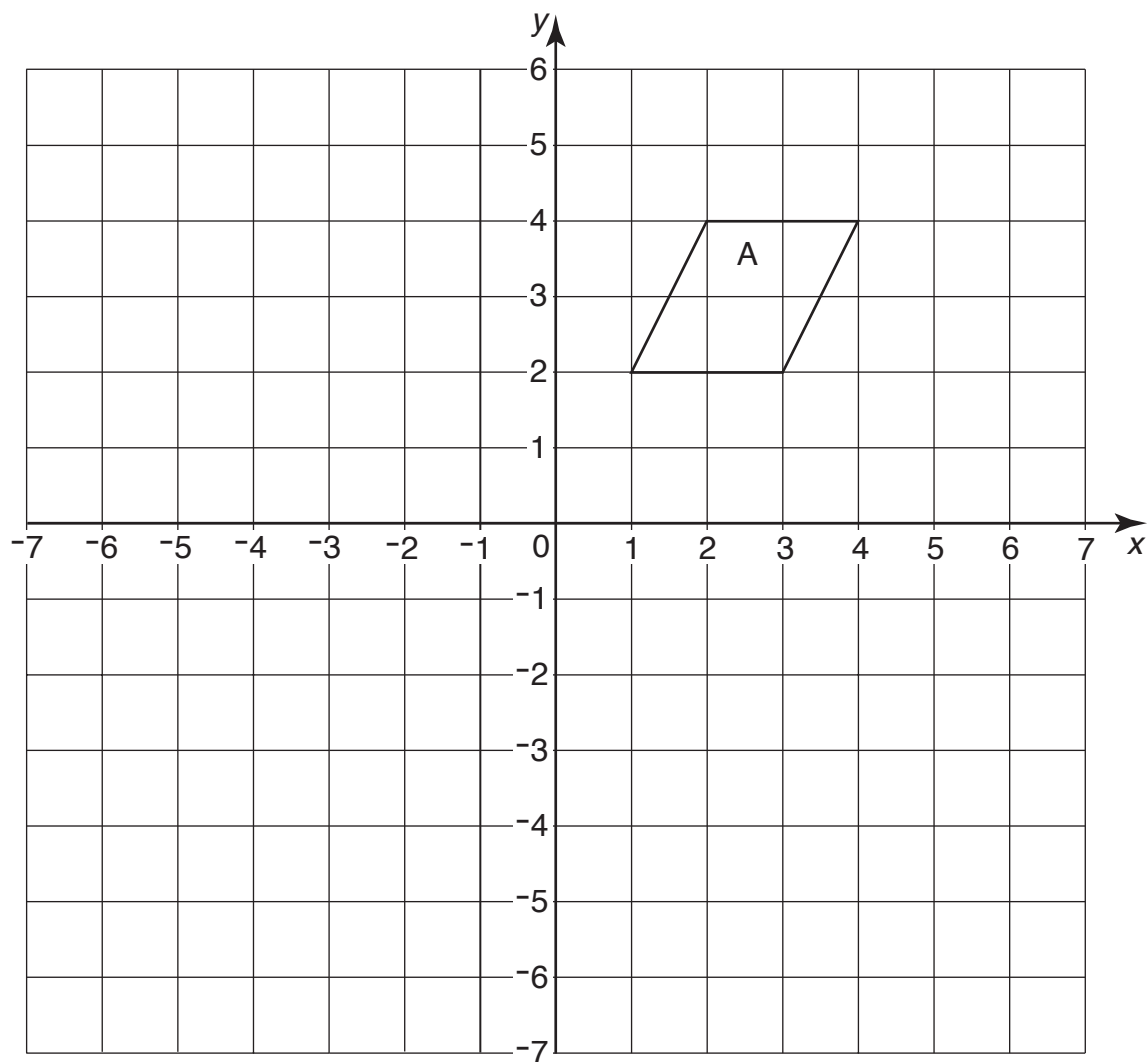
- (ii) What is the sum of all the interior angles of this polygon?

Answer: (1)

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

Answer: $x =$ (2)

9. Look at the grid below.



(i) Reflect shape A in the line $x = 0$
Label the new shape B. (1)

(ii) Rotate shape A through 180° about the point $(0, -1)$.
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. (a) (i) (a) Work out the circumference of a circle with diameter 100 centimetres.

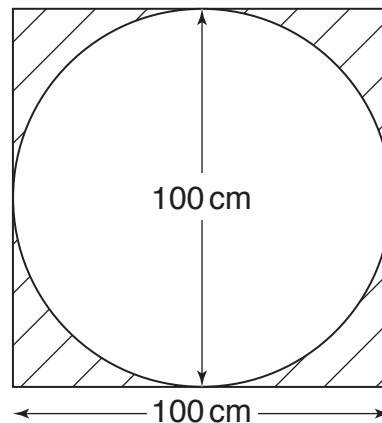
Answer: cm (1)

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

Answer: cm^2 (1)

- (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.

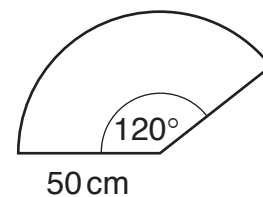


not to
size

Answer: cm^2 (2)

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

Work out the perimeter of this sector.



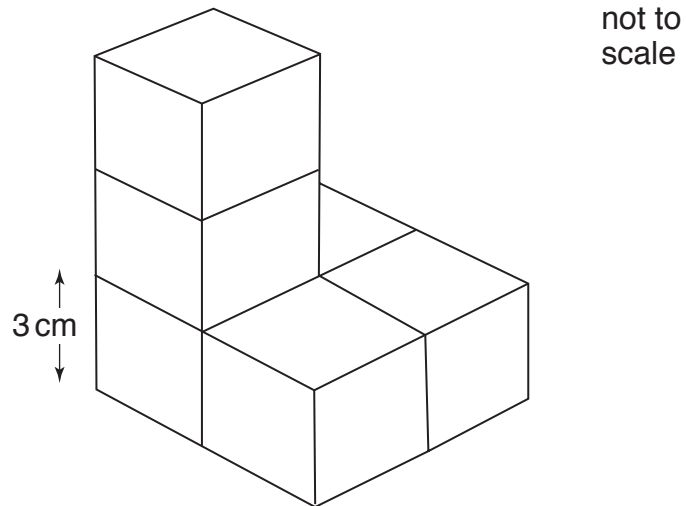
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Answer: cm (2)

- (b) Work out the radius, r , of a circle with area 804 cm^2 .

Answer: $r =$ cm (2)

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



- (i) What is the total volume of all of these cubes?
Include units of measure in your answer.

Answer: (2)

- (ii) What is the total surface area of this arrangement of the cubes?
Include units of measure in your answer.

Answer: (3)

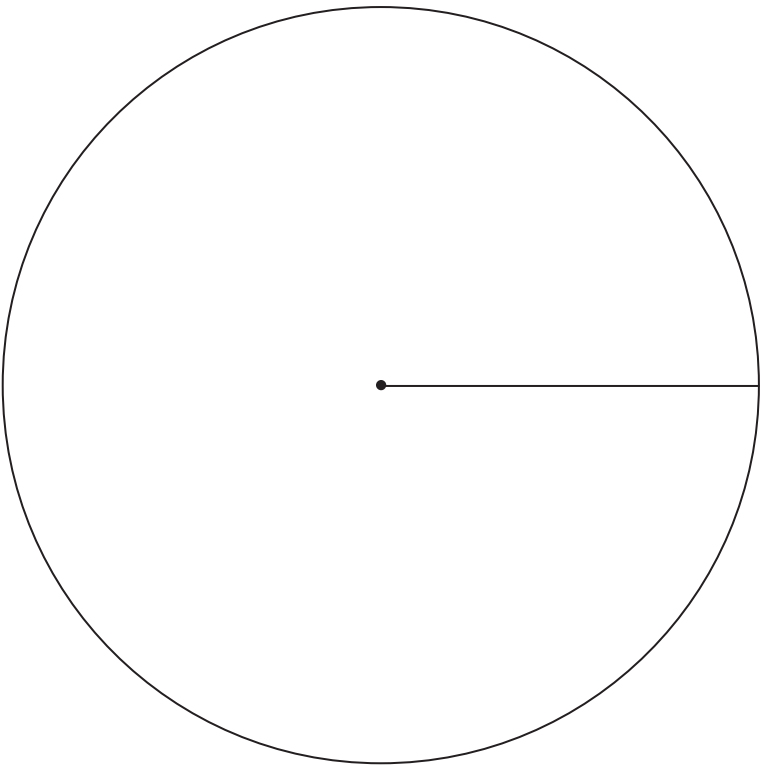
12. Jamie carries out a survey of 90 Year 8 pupils.
 He asks each of them to state their favourite snack and draws a pie chart of the results.

(i) 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: (1)

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*, a *modo* and a *maxi* hold 3328 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: (1)

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

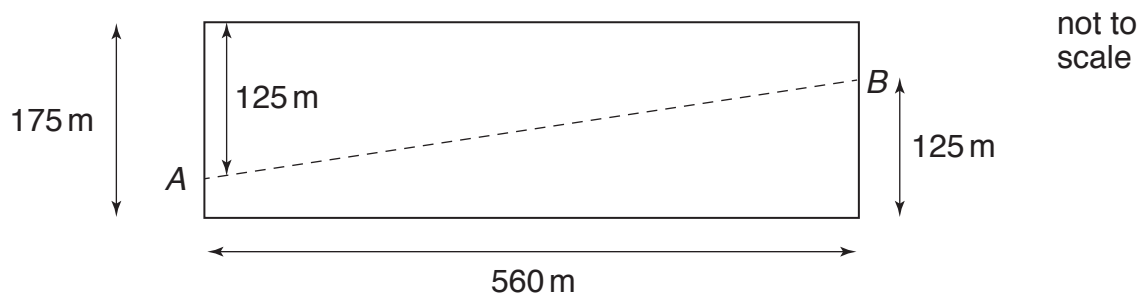
- (a) If the first number is 20, what is the third number in the sequence?

Answer: (2)

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

Answer: (2)

16. Farmer Fred's rectangular field is shown in the diagram below.
Gates A and B are joined by a straight path shown as a dashed line.



- (i) Given that 1 hectare = $10\,000\text{m}^2$, work out the area of Farmer Fred's field.

Answer: hectares (2)

- (ii) How long is the path between the gates A and B ?

Answer: $AB =$ m (3)

- (iii) Sandra walks from one gate to the other along the marked path.

Each step she takes is approximately 80 cm.

Estimate the number of steps Sandra takes to get from one gate to the other.

Answer: steps (1)

(Total marks: 100)

