



FOUNDED 1900

THE ENGLISH SCHOOL
A SECOND CENTURY OF EXCELLENCE

YEAR 3 MID-PROGRAMME ENTRY EXAMINATIONS 2016

MATHEMATICS

SATURDAY 4th JUNE 2016

Time allowed: 2 hours

Instructions to candidates

Answer all the questions in the spaces provided.
Without sufficient working, correct answers may be awarded no marks.

Information to candidates

This paper has 29 questions.
There are 15 pages in this question paper.
Full marks may be obtained for answers to all questions.
The total marks for this paper is 120.
The marks for each question is shown in round brackets, e.g. (2)

Calculator may be used.

Advice for candidates

Write your answers neatly and in good English.
Work steadily through the paper.
Do not spend too long on one question.
Show all stages in any calculations.

Materials required for the paper

Calculator, ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

1. A map has a scale of 1:100000. What distance on the map would represent 20km in real life?

.....
(2)
(Total 2 marks)

2. (a) Find the missing number in the subtraction $13\frac{1}{4} - \square = 2\frac{5}{12}$
giving your answer as a mixed number.
You must show all steps of your working.

.....
(3)

(b) Write $\frac{x+1}{4} - \frac{3}{5}$ as a single fraction.

.....
(3)

(c) Work out $\frac{4x}{9} \div \frac{8x}{3}$.

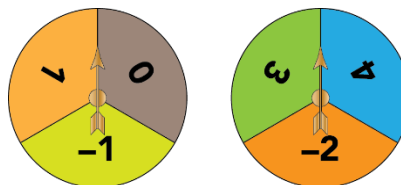
.....
(3)

(Total 9 marks)

3. The world's heaviest man had a mass of 445 kg, to the nearest kilogram.
What is the upper bound of his mass?

..... kg
(1)
(Total 1 mark)

4. James spins both spinners shown.
He then calculates the *difference* of the two numbers.



- (a) Complete the sample space of the scores.

	-1	0	1
-2	1		
3			
4			

(1)

- (b) What is the probability to get a difference of 2?

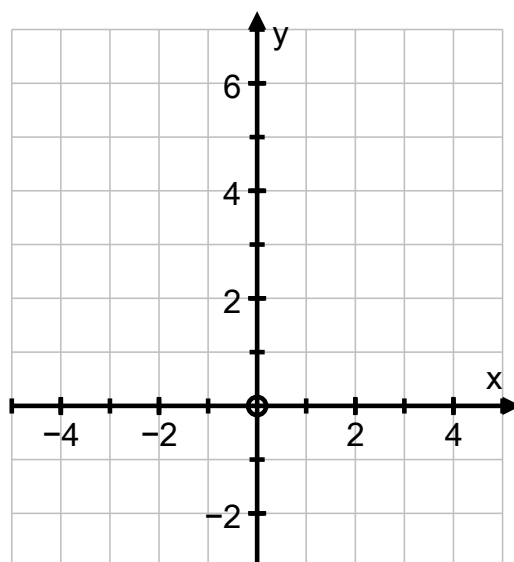
.....
(1)
(Total 2 marks)

5. A straight line passes through the points $(0, 4)$ and $(-2, 0)$.

- (a) What are the coordinates of the point where this line cuts the y -axis?

.....
(1)

- (b) By plotting both points on the grid, calculate the gradient of the line.

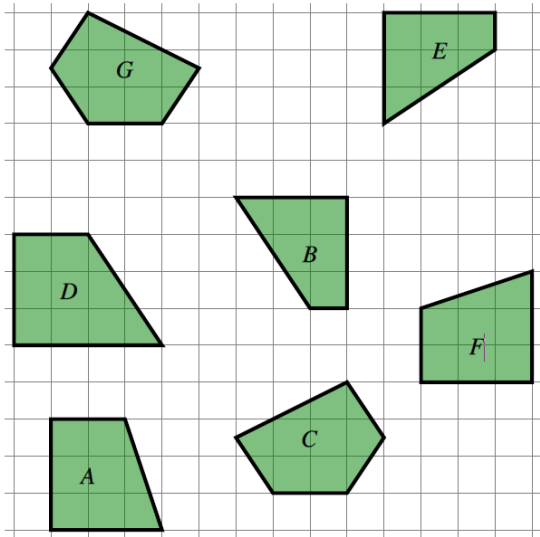


.....
(3)

- (c) What is the equation of the line?

.....
(2)
(Total 6 marks)

6. Identify the only shape which is not congruent to any other shape in the grid below.



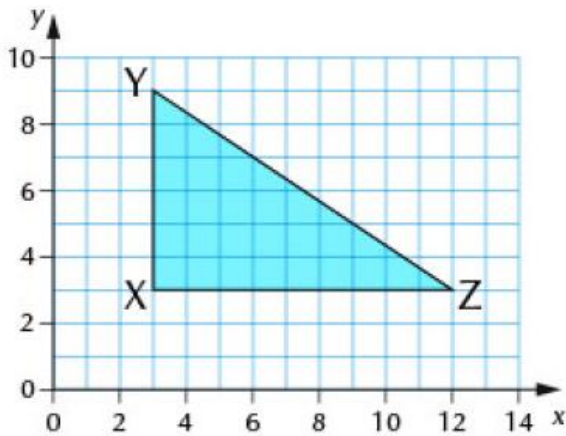
.....
(1)
(Total 1 mark)

7. A six sided dice is rolled. Which of these pairs of outcomes are mutually exclusive?

- A. The number is even and a multiple of 3
- B. The number is odd and a multiple of 2
- C. The number is odd and square

.....
(1)
(Total 1 marks)

8. Enlarge triangle XYZ by a scale factor of $\frac{1}{3}$ about the point (0,0)



(2)
(Total 2 marks)

9. The table gives the surface areas, in square kilometres, of five seas.

Sea	Surface area in square kilometres
Mediterranean Sea	2.97×10^6
East China Sea	1.25×10^6
Baltic Sea	4.22×10^5
Red Sea	4.38×10^5
Okhotsk Sea	1.59×10^6

(a) Write 1.59×10^6 as an ordinary number.

.....
(1)

The surface area of the East China Sea is k times the surface area of the Baltic Sea.

(b) Work out the value of k . Give your answer to the nearest whole number.

$k =$
(2)

(Total 3 marks)

10. Jacob throws an ordinary die 300 times. The table below shows his results.

Score	1	2	3	4	5	6
Frequency	100	52	48	30	20	50

(a) What is his experimental probability of throwing a 3?

.....
(1)

(b) Do you think the die is biased? Give a reason for your answer.

.....
.....
(2)

(Total 3 marks)

11. ABC is an equilateral triangle. D lies on BC . AD is perpendicular to BC .

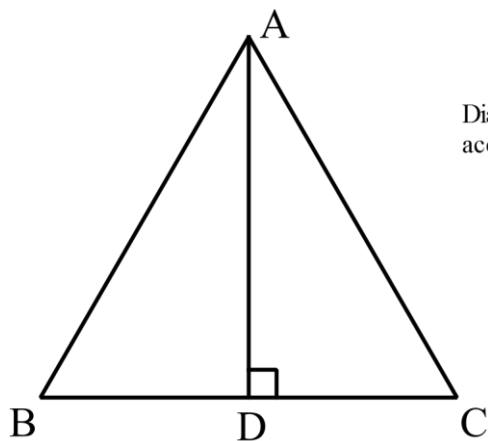


Diagram **NOT**
accurately drawn

- (a) Prove that triangle ADC is congruent to triangle ADB .

- (b) Hence, prove that $BD = \frac{1}{2}AB$.

(4)

(2)

(Total 6 marks)

-
12. A plane flew from Bogotá to Quito. The distance the plane flew was 725 km. The time of flight was 1 hour and 24 minutes.

Work out the average speed of the plane, giving your answer in m/s, correct to 3 significant figures.

..... m/s
(4)

(Total 4 marks)

13. (a) In the following table B is directly proportional to A.

A	3	5	
B	10.5		28

- (i) Find the equation connecting B and A.

.....
(2)

- (ii) Hence complete the table.

(2)

- (b) In the following table A is inversely proportional to B.

A	5	8	
B	10		4

- (i) Find the equation connecting B and A.

.....
(2)

- (ii) Hence complete the table.

(2)

(Total 8 marks)

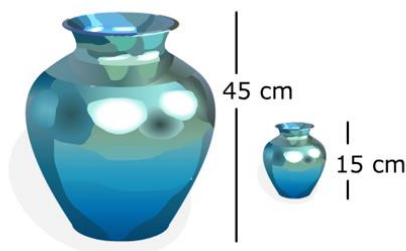
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14. A formula for the area, A , of a circle with diameter d is $A = \frac{1}{4}\pi d^2$.

Make d the subject of this formula.

.....
(3)

(Total 3 marks)

15. The two vases shown below are similar. The bigger vase is 45cm high and the smaller vase is 15cm high.



- (a) Give the ratio of the volume of the small vase to the volume of the big vase in the form $1 : n$.

.....
(2)

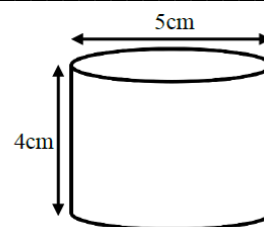
- (b) The small vase has a volume of 0.7 litres. What is the volume of the bigger vase?

..... l
(2)
(Total 4 marks)

16. We are going to buy ice cream in a cylindrical ice cream tub. The tub measures 5cm across and 4cm high.

In this exercise use the π key on your calculator.

- (a) Calculate how much ice cream the tub can hold, giving your answer correct to 1d.p.

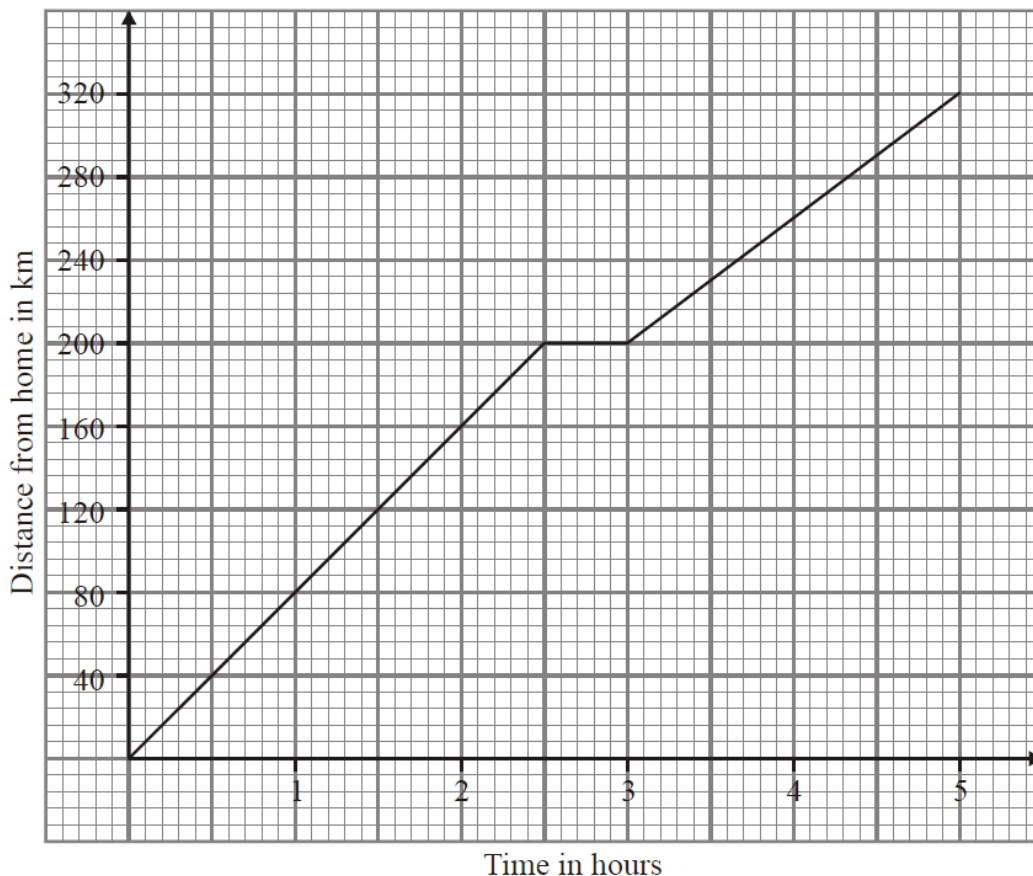


..... cm^3
(2)

- (b) Find the area of the label that wraps around the side of the tub, if the label overlaps by 1cm. Give your answer correct to 1d.p.

..... cm^2
(3)

17. Jane drove 320 km from her home to the airport. The travel graph shows Jane's journey.



During the journey, Jane stopped for lunch.

(a) (i) For how long did Jane stop for lunch?

.....
(1)

(ii) How far had Jane travelled in the first 90 minutes?

..... km
(1)

(b) Work out the constant speed that Jane travelled at, after lunch.

..... km/h
(2)

Jane's car uses 1 gallon of petrol for each 40 miles. A gallon of petrol costs £3.20 .

(c) Work out the cost of petrol, to the nearest cent, for Jane's 320 km journey.

(1 mile = 1.61 km)

£
(4)

(Total 8 marks)

18. (a) Solve $9y - 3 = 5y + 2$

$y = \dots\dots\dots$
(2)

(b) Solve $\frac{2x+12}{5x-3} = -2$

Show clear algebraic working.

$x = \dots\dots\dots$
(3)

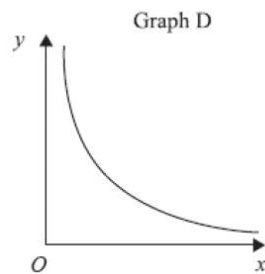
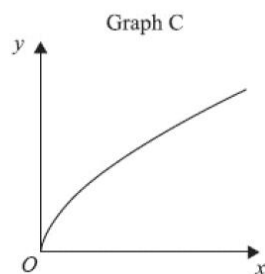
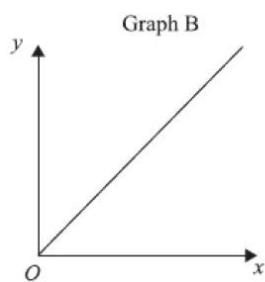
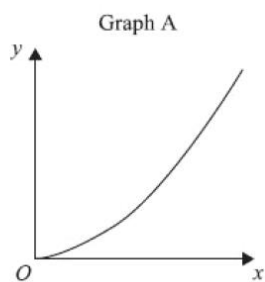
(Total 5 marks)

19. Pamela bought an electric drill at 85% of the regular price. She paid \$32.89 for the drill. What was the regular price? (Round to the nearest cent)

\$ $\dots\dots\dots$
(2)

(Total 2 marks)

20. The graphs of y against x represent four different types of proportionality.



Write down the letter of the graph which represents the type of proportionality:

y is directly proportional to x

.....
(1)

y is inversely proportional to x

.....
(1)

(Total 2 marks)

21. To buy a car, Jessica borrowed \$15,000 for 3 years at an annual **simple interest** rate of 9%.

(a) How much interest will she pay if she pays off the entire loan at the end of the third year?

\$
(2)

(b) What is the total amount that she will repay?

\$
(1)

(Total 3 marks)

22. (a) Expand and simplify $4(2d + 3) - 2(3d - 5)$

.....
(3)

(b) Factorise fully

(i) $18c - 27$

.....
(1)

(ii) $12x^2 - 36x^3$

.....
(2)

(Total 6 marks)

23. $ABCDE$ is a regular pentagon.

Work out the value of x .

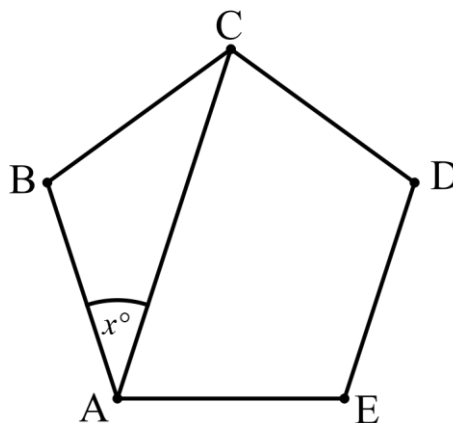


Diagram **NOT**
accurately drawn

.....
(3)

(Total 3 marks)

24. The cost of an mp3 player was reduced by 30% and then by a further 40%.
What was the overall percentage reduction?

.....
(3)

(Total 3 marks)

25. Two joggers run 8 miles north and then 5 miles west.
What is the shortest distance, to the *nearest tenth* of a mile, they must travel to return to their starting point?

..... miles

(3)

(Total 3 marks)

26. (a) Expand and simplify $(m+2)(m-4)(m-2)$.

.....

(3)

- (d) Factorise each of the following completely:

(i) $x^2 - 2x - 63$

.....

(2)

(iii) $x^2 - 196$

.....

(2)

(Total 7 marks)

27. Lead has a density of 11.5g/cm^3 . A rectangular block of lead measures $7\text{cm} \times 5\text{cm} \times 2\text{cm}$.
Find the mass of the block of lead.

..... g

(3)

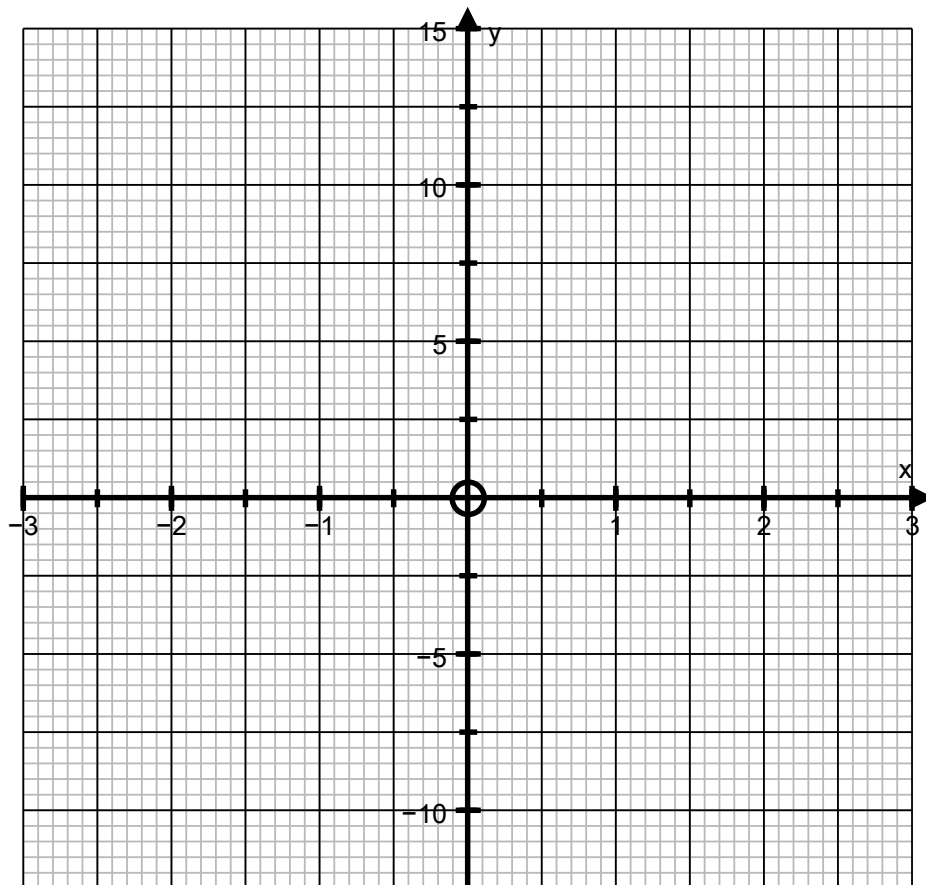
(Total 3 marks)

28. (a) Complete the table of values for $y = x^3 - 5x + 2$

x	-3	-2	-1	0	1	2	3
y		4			-2		14

(4)

(b) On the grid, draw the graph of $y = x^3 - 5x + 2$ for $-3 \leq x \leq 3$



(2)

(b) Use your graph to solve the equation $x^3 - 5x + 2 = 2.5$

.....
(3)

(Total 9 marks)

29. (a) Here is a right angle triangle.

Calculate the size of the angle marked x .
Give your answer correct to 1 decimal place.

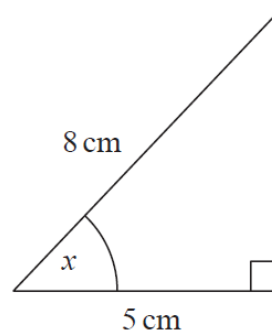


Diagram **NOT** accurately drawn

..... °
(3)

(b) Here is another right angle triangle.

Calculate the value of y .
Give your answer correct to 1 decimal place.

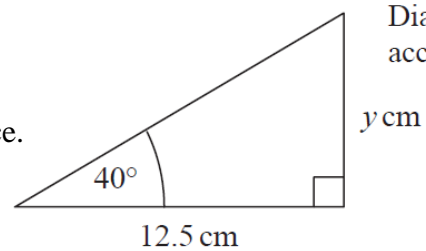


Diagram **NOT** accurately drawn

..... cm
(3)
(Total 6 marks)

End of paper