

Friday 14 June 2013 – Morning

GCSE MATHEMATICS B

J567/04 Paper 4 (Higher Tier)

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

- Geometrical instruments
- Tracing paper (optional)
- Scientific or graphical calculator

Duration: 1 hour 45 minutes



Candidate forename		Candidate surname	
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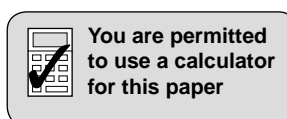
Centre number							Candidate number				
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INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

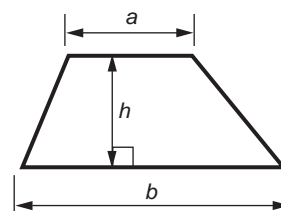
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- The total number of marks for this paper is **100**.
- This document consists of **20** pages. Any blank pages are indicated.

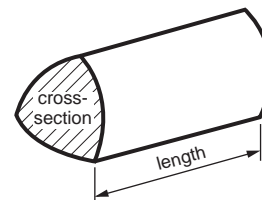


Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a + b)h$



Volume of prism = (area of cross-section) \times length

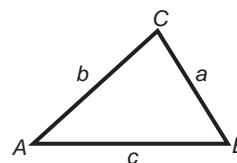


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

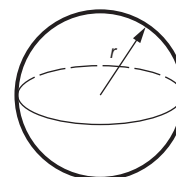
Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$



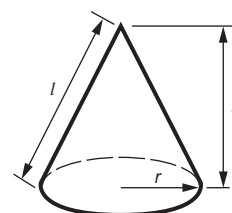
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



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

Curved surface area of cone = $\pi r l$



The Quadratic Equation

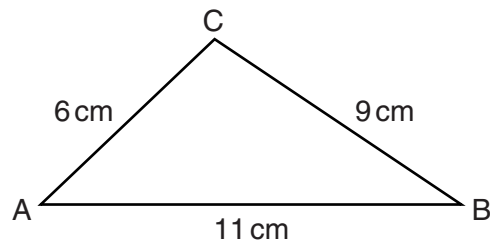
The solutions of $ax^2 + bx + c = 0$,
where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

PLEASE DO NOT WRITE ON THIS PAGE

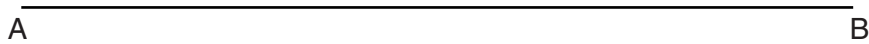
3

- 1 (a) ABC is a triangle.



Not to scale

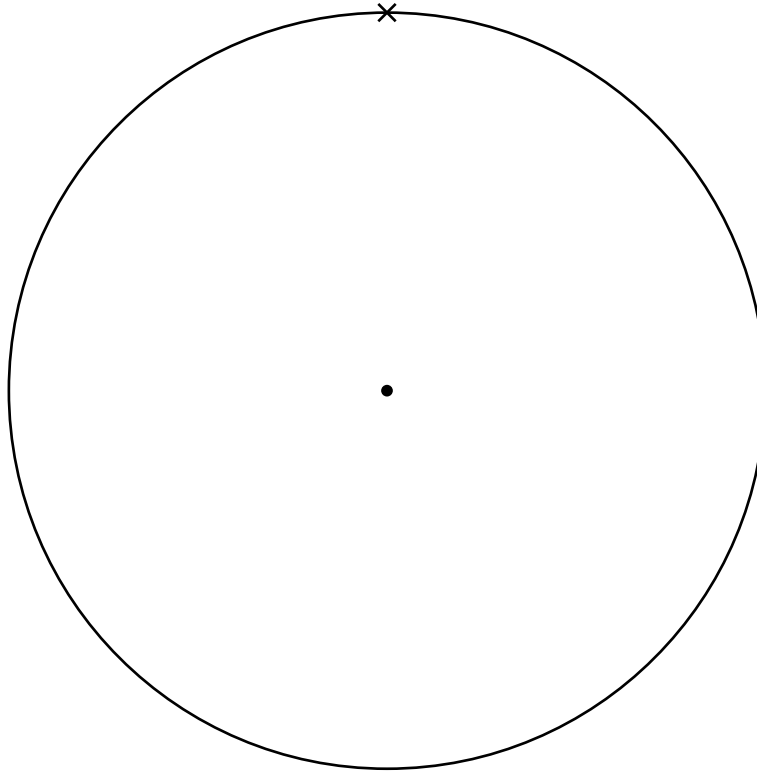
Make a full-size drawing of triangle ABC in the space below.
The line AB has been drawn for you.
Leave in all your construction lines.



[2]

4

- (b) Construct a regular pentagon inside this circle.
Make sure the vertices of the pentagon lie on the circumference of the circle.
One vertex has been marked for you.



[2]

- 2 The price of a car increases from £10 400 to £11 284.

Calculate the percentage increase.

% [3]

5

3 (a) Solve.

$$7x + 6 = 3x - 4$$

(a) $x =$ _____ [3]

(b) Rearrange this formula to make W the subject.

$$T = 5W - 8$$

(b) _____ [2]

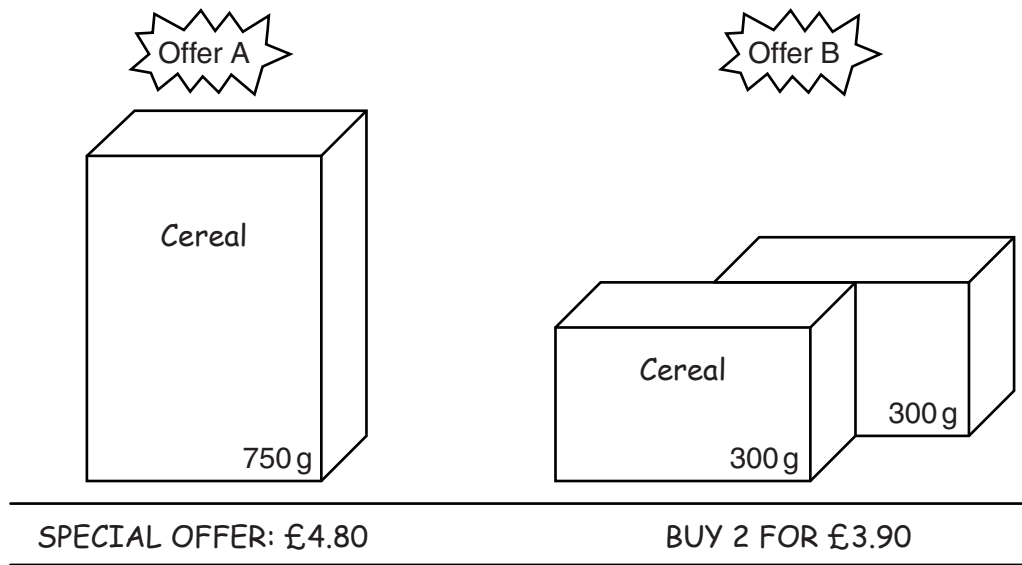
4 A train completes a journey of 288 miles in 4 hours 30 minutes.

Calculate the average speed of the train.

_____ mph [3]

6

5 A shop sells boxes of a cereal in two sizes.

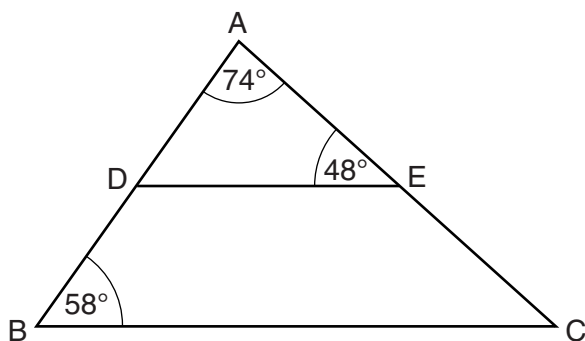


Which offer gives the better value?
Show how you decide.

[3]

7

- 6 ABC is a triangle with point D on AB and point E on AC.



Not to scale

Explain why DE is parallel to BC.
Use angle properties to explain your reasons.

[3]

- 7 Henry's class is given a test.
The mean mark for all 20 pupils is 3.3.

Henry's test paper is lost.
Here is a summary of the marks for the rest of his class.

Test mark	1	2	3	4	5
Number of pupils	4	2	4	3	6

Work out Henry's mark.
You must show all your working.

[4]

8

- 8 Alice surveys the families in her village about their last holiday. The table shows the probability that one of the families, chosen at random, went to a destination.

Destination	UK	Rest of Europe	USA	Rest of the World	No holiday
Probability	0.42	0.25	p	0.08	0.03

- (a) Work out the value of p in the table.

(a) _____ [2]

- (b) Calculate the probability that a family, chosen at random, went to the UK or the Rest of Europe for their last holiday.

(b) _____ [1]

- (c) Calculate the probability that a family, chosen at random, did **not** go to the UK for their last holiday.

(c) _____ [2]

- (d) There are 842 families in the village.

Use the results from Alice's survey to estimate the number of these families who will go to the UK for their next holiday.

(d) _____ [2]

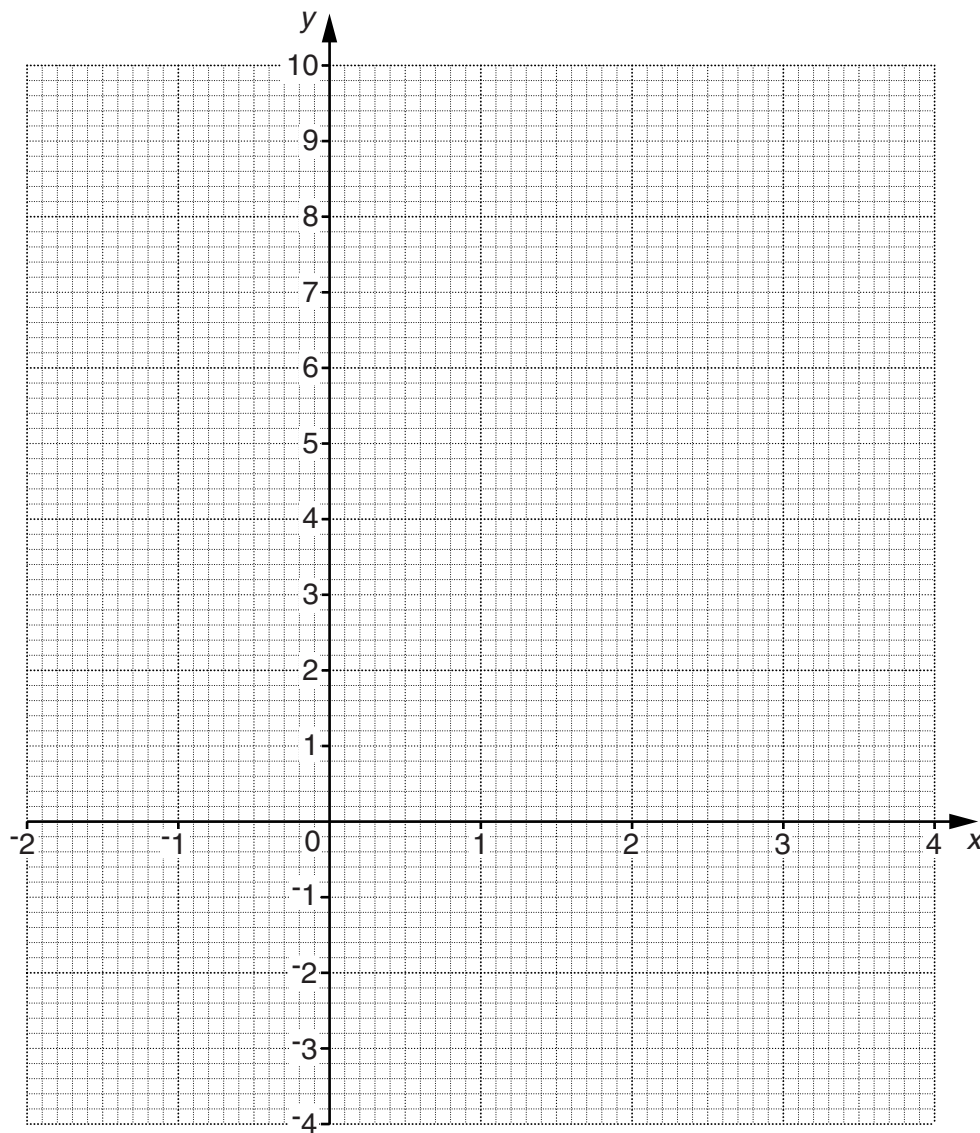
9

9 (a) Complete this table for $y = x^2 - 3x$.

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

[2]

(b) On the grid draw the graph of $y = x^2 - 3x$.



[2]

(c) Use your graph to solve the equation $x^2 - 3x = 2$.

(c) $x =$ _____ or $x =$ _____ [2]

10

- 10 (a)* Webtravel advertise holidays on their website.
Some of these holidays, and their prices, are shown in this table.

Destination	7 nights	14 nights
Majorca	£380 pp	£600 pp
Cyprus	£620 pp	£980 pp
Madeira	£478 pp	£768 pp
Rhodes	£840 pp	£1400 pp
Portugal	£890 pp	£1380 pp

Note:

- prices are per person (pp)
- holidays include flights from London Heathrow airport
- flights from other airports have an extra charge of £50 pp per holiday.

Webtravel offer an online discount of 8% off the total cost of each booking.

Mr Dawe has £1850 for a holiday for himself and his wife.
They want to book online and fly from Birmingham airport.

Can they afford to go to Cyprus for 14 nights?
Show all your working clearly.

[5]

11

- (b) Alistair paid £1643 for a holiday in 2012.
This was an increase of 6% on the cost of the same holiday in 2011.

Calculate the cost of the holiday in 2011.

(b) £ _____ [3]

- 11 Solve algebraically these simultaneous equations.

$$5x + 3y = 24$$

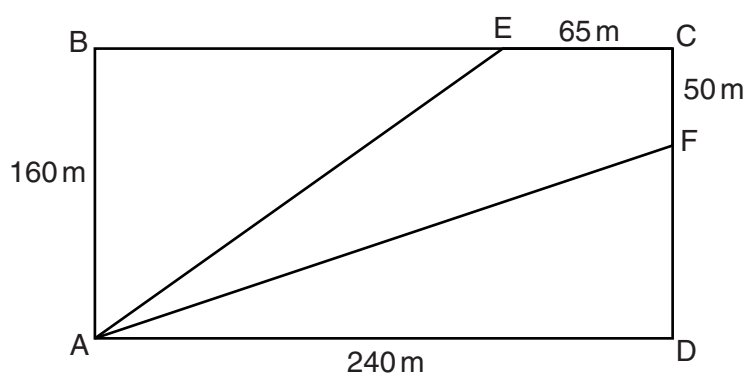
$$3x - 4y = 26$$

$x =$ _____

$y =$ _____ [4]

12

12 Here is a diagram of a park, ABCD.



Not to scale

E is a point on BC and F is a point on CD.
 $EC = 65\text{ m}$ and $CF = 50\text{ m}$.

The perimeter of the park is a rectangle measuring 160 m by 240 m.
 There are straight paths around the perimeter of the park and from A to E and A to F.

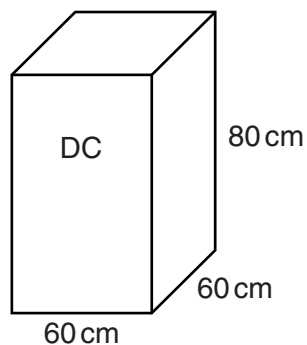
Mary has to use the paths.

Calculate the shortest distance she has to walk to get from A to C.

_____ m [5]

13

- 13 (a) Darnby Council uses this litter bin in parks.
It is a cuboid.



Calculate the volume of the bin.
Write your answer in litres.

(a) _____ litres [3]

- (b) Hemby Council's bins have a volume of 120 litres.
They change to a bin with all dimensions **double** those of their original bin.

Calculate the volume of the larger bin.

(b) _____ litres [2]

- (c) Fairmead Council uses a bin with width 45 cm, depth 55 cm and height 60 cm.
They want a new bin which is mathematically similar and has **three** times the volume.

Calculate the height of the new bin.

(c) _____ cm [3]

14

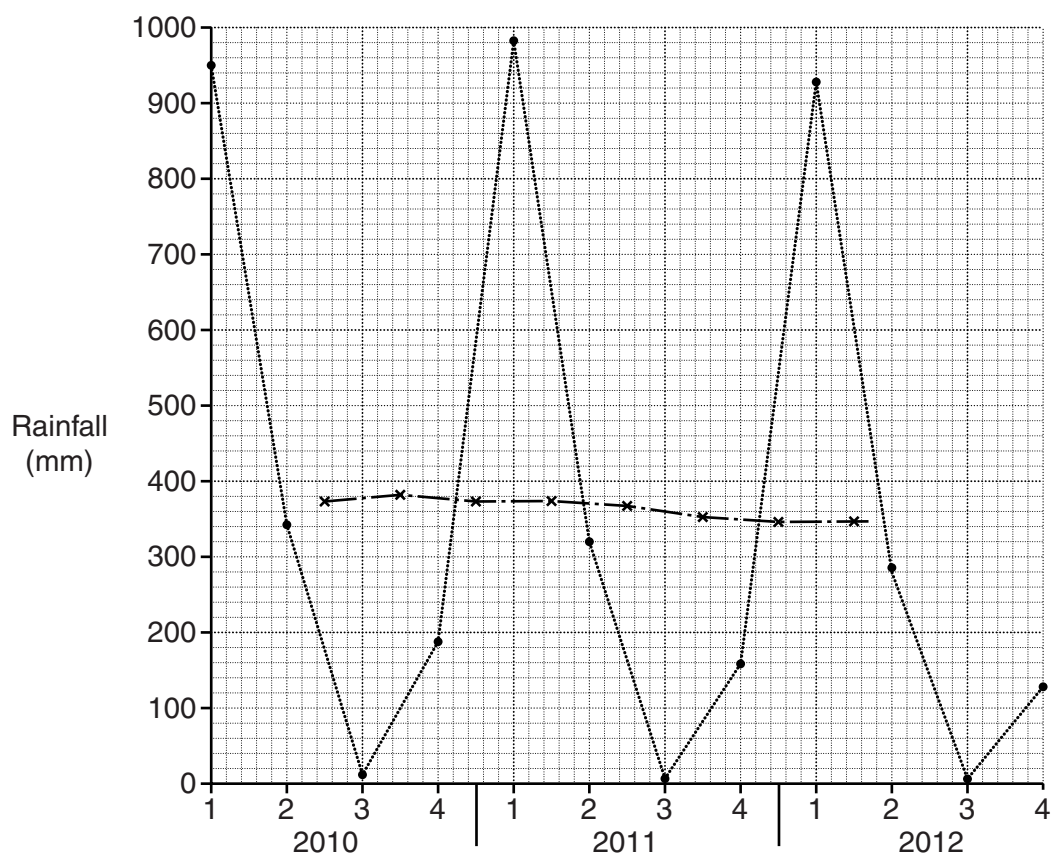
- 14 The amount of rainfall, in mm, for Moortown is recorded each quarter for 3 years. The table summarises the rainfall for each quarter, together with the 4-point moving average.

Year	2010							
Quarter	1		2		3		4	
Rainfall (mm)	950		342		12		188	
4-point moving average				373			381	375.5

Year	2011							
Quarter	1		2		3		4	
Rainfall (mm)	982		320		6		158	
4-point moving average		374		366.5		353		344.5

Year	2012							
Quarter	1		2		3		4	
Rainfall (mm)	928		286		4		128	
4-point moving average		344		a		330		

These points and some of the 4-point moving averages have been plotted in the graph below.



15

- (a) (i) Calculate the missing 4-point moving average in 2012, labelled *a* in the table.

(a)(i) _____ mm [2]

- (ii) Plot this 4-point moving average on the graph. [1]

- (b) (i) Describe the seasonal variation in the rainfall.

[2]

- (ii) Describe the general trend in the rainfall.

[1]

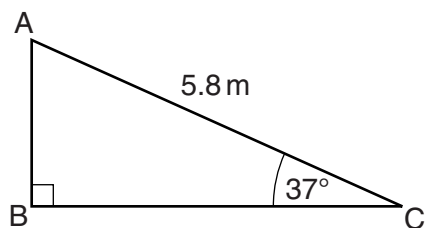
- (c) The final 4-point moving average in the table has been estimated as 330.

Use this figure to estimate the rainfall for the first quarter of 2013.

(c) _____ mm [2]

16

15 ABC is a right-angled triangle.

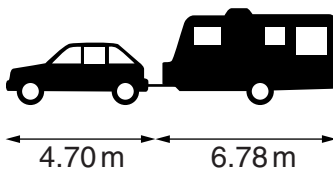


Not to scale

Calculate AB.

_____ m [3]

16



A car's length is 4.70 m and a caravan's length is 6.78 m, both correct to 2 decimal places.

(a) Write down the upper bound of the length of the car.

(a) _____ m [1]

(b) Calculate the upper bound of the total length of the car and the caravan.

(b) _____ m [2]

(c) Calculate the lower bound of the difference in the lengths of the caravan and the car.

(c) _____ m [2]

17

- 17 A population of birds decreases at a rate of 5% each year.
On 1st January 2010 the population was 16 800.

The formula for working out N , the size of the population, t years after 1st January 2010 is

$$N = 16\,800 \times A^t.$$

- (a) Explain why the value of A is 0.95.

[1]

- (b) Calculate the population on 1st January 2016.

(b) _____ [1]

- (c) Find the year in which the population will fall below 8000.

(c) _____ [3]

18

18 Solve this equation, writing your answers correct to 2 decimal places.

$$3x^2 + 5x - 1 = 0$$

_____ [3]

19 (a) The graph of $y = x^2$ is translated using the vector $\begin{pmatrix} 0 \\ -1 \end{pmatrix}$.

Write down the equation of the translated graph.

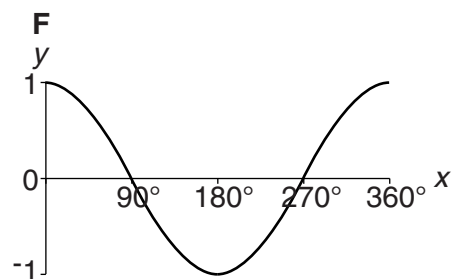
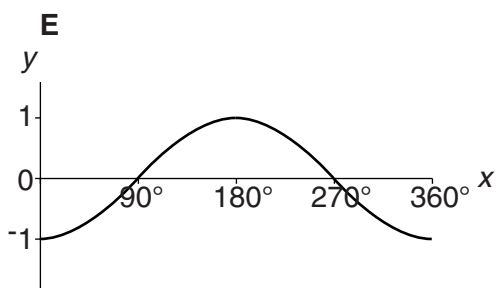
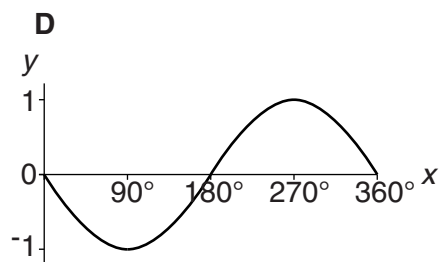
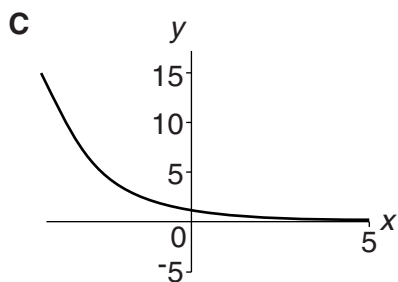
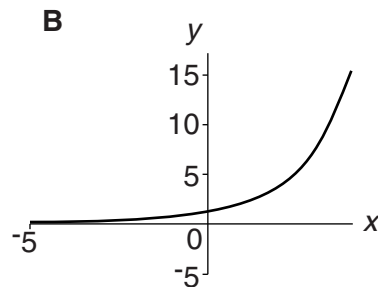
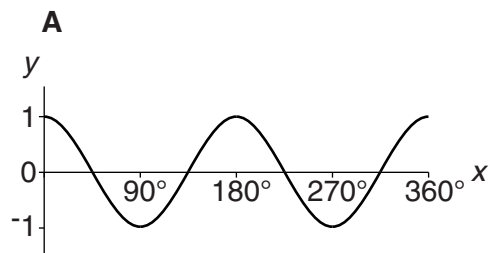
(a) _____ [1]

(b) The graph of $y = x^2$ is translated using the vector $\begin{pmatrix} 4 \\ 0 \end{pmatrix}$.

Write down the equation of the translated graph.

(b) _____ [1]

20 (a) Here are six graphs.



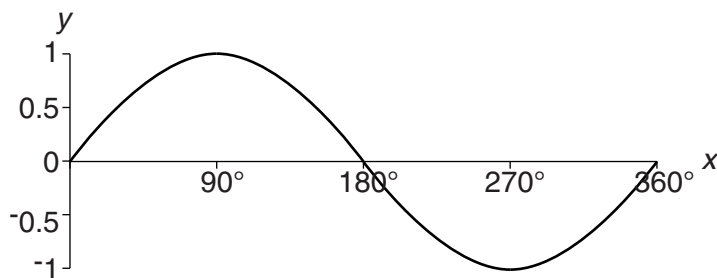
Choose the correct letter to complete these sentences.

The graph of $y = 2^x$ is graph _____ .

The graph of $y = \cos x$ is graph _____ .

[2]

(b) Solve, to the nearest degree, $\sin x = 0.53$ where $0^\circ \leq x \leq 360^\circ$.
Use your calculator and the graph below to help you.



(b) _____ [2]

TURN OVER FOR QUESTION 21

20

21 Solve, algebraically, $\frac{5}{x+2} + \frac{3}{4x-1} = 5$.

$x =$ _____ or $x =$ _____ [7]

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