

CANDIDATE  
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**MATHEMATICS (SYLLABUS D)**

**4024/11**

Paper 1

**May/June 2014**

**2 hours**

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

**DO NOT WRITE IN ANY BARCODES.**

Answer **all** questions.

If working is needed for any question it must be shown in the space below that question.

Omission of essential working will result in loss of marks.

**ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.**

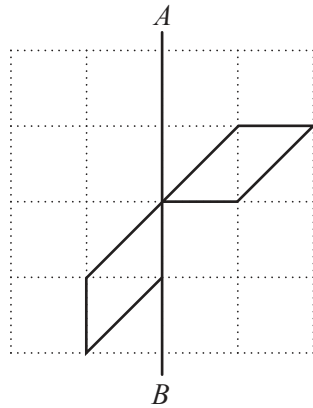
The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks for this paper is 80.

This document consists of **20** printed pages.

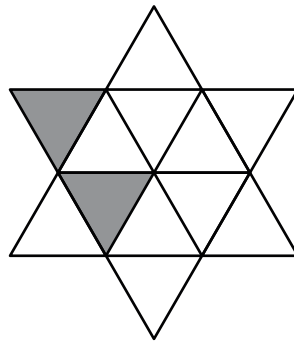
## ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

- 1 (a) Complete the pattern so that  $AB$  is the only line of symmetry.



[1]

- (b) Shade four more small triangles in the shape below to make a pattern with rotational symmetry of order 3.



[1]

- 2 (a) Evaluate  $5 + 1 \times 0.3$ .

Answer .....

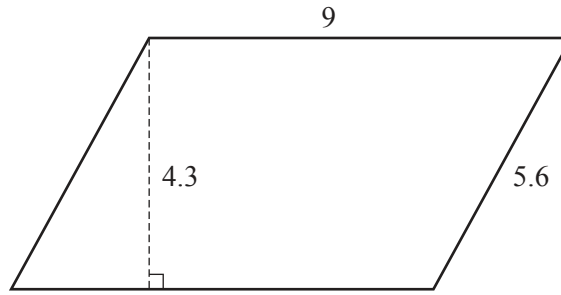
[1]

- (b) Evaluate  $18 \div 0.2$ .

Answer .....

[1]

3



The diagram shows a parallelogram with lengths as marked.  
All the lengths are in centimetres.

(a) Calculate the perimeter of the parallelogram.

*Answer* .....cm [1]

(b) Calculate the area of the parallelogram.

*Answer* .....cm<sup>2</sup> [1]

4 In the triangle  $PQR$ ,  $PQ = 5$  cm,  $QR = 7$  cm and  $PR = 9$  cm.

Decide whether the triangle is acute angled or obtuse angled.  
Show calculations to support your decision.

*Answer* Triangle  $PQR$  is ..... [2]

5 (a) Solve  $4 \leq 3y - 11$ .

*Answer*  $y$  ..... [1]

(b) Write down all the integers that satisfy the inequality  $-4 \leq 2x < 4$ .

*Answer* ..... [1]

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6 (a) The angles of a triangle are in the ratio 3 : 4 : 5.

Calculate the smallest angle in the triangle.

*Answer* ..... [1]

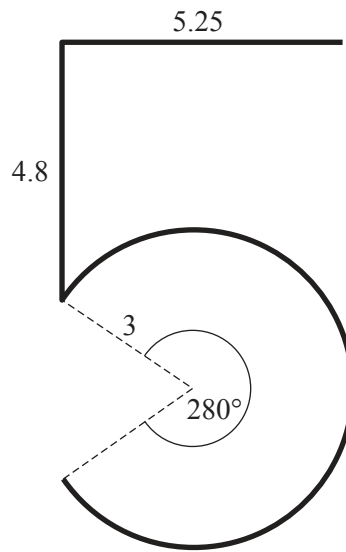
(b) The ratio of boys to girls in a class is 4 : 5.  
There are 3 more girls than boys.

Calculate the total number of students in the class.

*Answer* ..... [1]

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- 7 A thin piece of wire is shaped into a figure five as shown.



The shape has two straight sections of length 5.25 cm and 4.8 cm.  
 The curved part is the arc of the major sector of a circle, radius 3 cm.  
 The angle of the major sector is  $280^\circ$ .

The total length of wire needed to make the figure is  $(a + b\pi)$  cm.

Find the values of  $a$  and  $b$ .

*Answer*  $a = \dots\dots\dots$

$b = \dots\dots\dots [2]$

- 8 (a) By writing each number correct to one significant figure, estimate the value of

$$\frac{28.6 + 47.7}{0.47 \times 21.4} .$$

*Answer* ..... [2]

- (b) Write  $\frac{8}{25}$  as a decimal.

*Answer* ..... [1]

---

- 9 Make  $a$  the subject of the formula  $y = \frac{a - 4}{3 - a}$  .

*Answer*  $a =$  ..... [3]

---

- 10 (a) One morning the temperature was  $5^{\circ}\text{C}$ .  
By the evening the temperature had dropped  $9^{\circ}\text{C}$ .

Write down the temperature in the evening.

*Answer* .....  $^{\circ}\text{C}$  [1]

- (b) The times of some buses from Aytown to Deetown are shown.

|         |       |       |       |       |       |       |
|---------|-------|-------|-------|-------|-------|-------|
| Aytown  | 07 04 | 08 04 | 08 56 | 09 00 | 09 32 | 10 56 |
| Beetown | -     | -     | 09 05 | -     | 09 41 | 11 05 |
| Ceetown | 07 18 | 08 18 | 09 14 | -     | -     | 11 14 |
| Deetown | 07 35 | 08 35 | 09 31 | 09 28 | 10 05 | 11 31 |

- (i) Maryam lives in Ceetown and has to be in Deetown by 09 30.

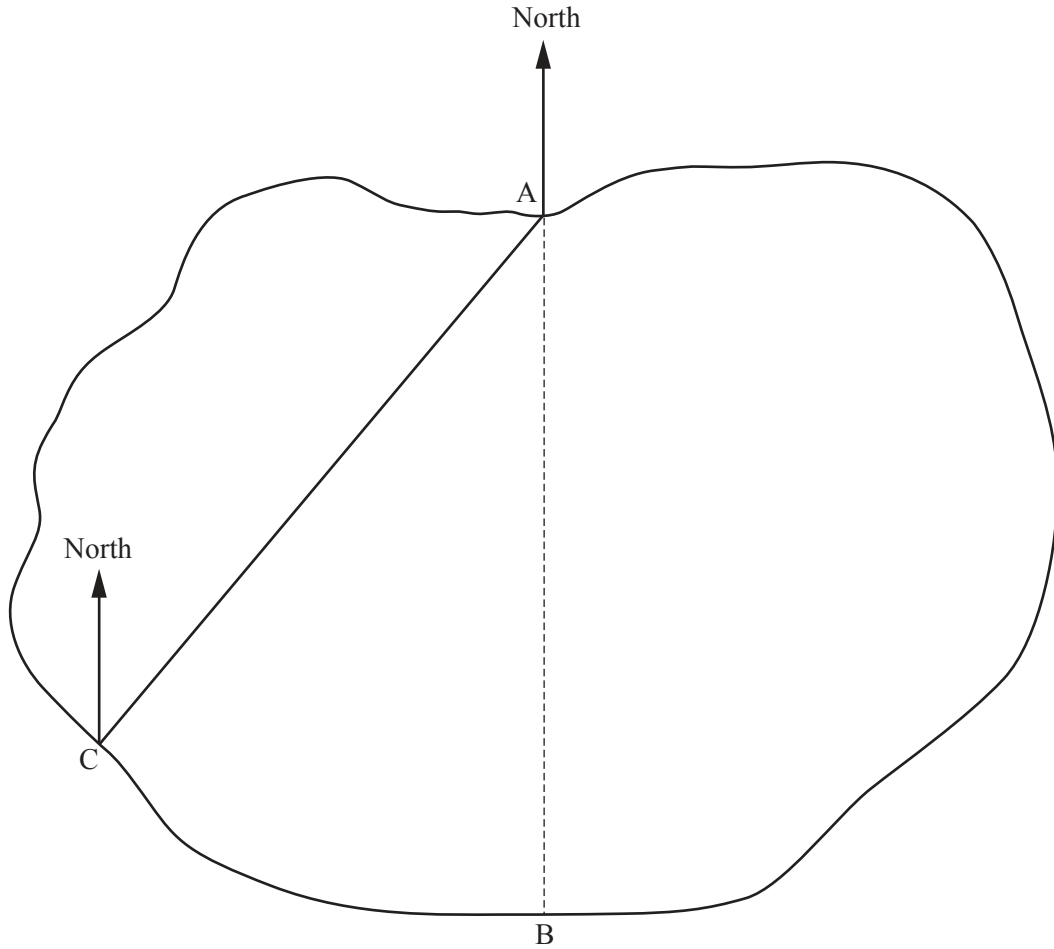
What time is the latest bus from Ceetown that she can catch?

*Answer* ..... [1]

- (ii) Aadil catches the 09 32 from Aytown to Deetown.

How long does his journey take?

*Answer* ..... minutes [1]



The diagram shows a map of a lake.  
Three points  $A$ ,  $B$  and  $C$  are on the edge of the lake.

- (a) A ship sails due south from  $A$  to  $B$ .

Write down the bearing of  $B$  from  $A$ .

*Answer* ..... [1]

- (b) A yacht sails from  $A$  to  $C$ .

Measure and write down the bearing of  $C$  from  $A$ .

*Answer* ..... [1]

- (c) A cruiser sails from  $C$  to  $D$  on a bearing of  $105^\circ$ .

Work out the bearing of  $C$  from  $D$ .

*Answer* ..... [1]



- 12 (a) Here are the first four terms of a sequence.

7    11    15    19

Write down an expression, in terms of  $n$ , for the  $n$ th term of this sequence.

*Answer* ..... [1]

- (b)  $u_n$  is the  $n$ th term of another sequence.  
Here is the formula connecting the  $n$ th and  $(n + 1)$ th terms of this sequence.

$$3u_n - 4 = u_{n+1}$$

The value of  $u_3$  is 11.

Find  $u_2$  and  $u_4$ .

*Answer*  $u_2 =$  .....

$u_4 =$  ..... [2]

- 13 (a) Solve  $2(5^p) = 250$ .

*Answer*  $p =$  ..... [1]

- (b) Simplify

(i)  $1 \div x^{-5}$ ,

*Answer* ..... [1]

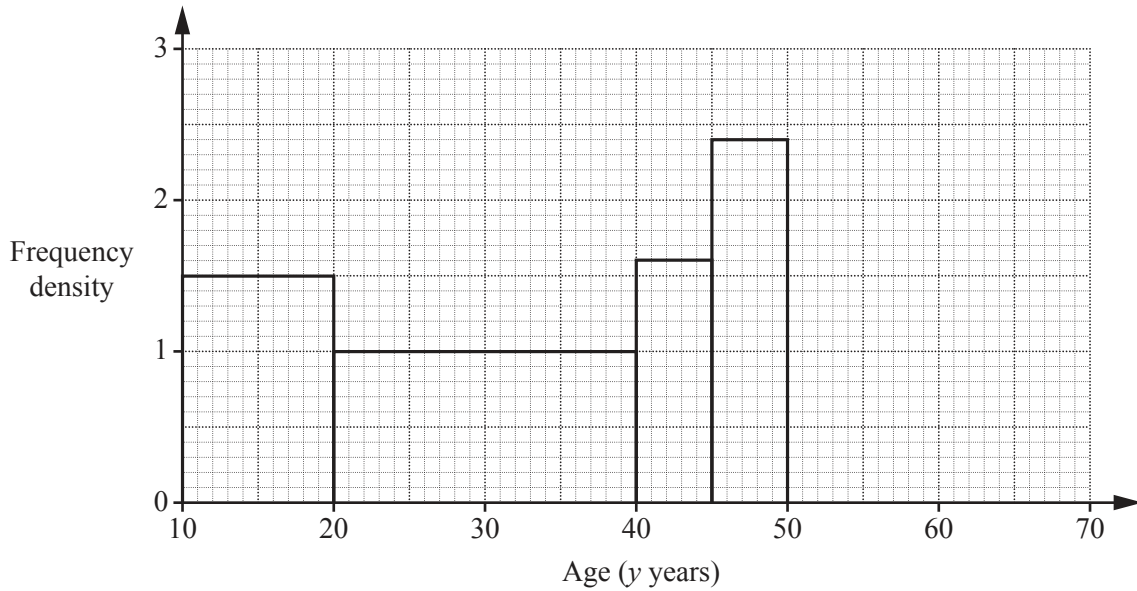
(ii)  $\frac{3a}{4} \div \frac{9a^2}{8}$ .

*Answer* ..... [1]

14 The table shows the ages of guests at a party.

|                  |                  |                  |                  |                  |                  |
|------------------|------------------|------------------|------------------|------------------|------------------|
| Age ( $y$ years) | $10 \leq y < 20$ | $20 \leq y < 40$ | $40 \leq y < 45$ | $45 \leq y < 50$ | $50 \leq y < 65$ |
| Frequency        | $p$              | 20               | 8                | $q$              | 18               |

The histogram represents some of this information.



(a) Use the histogram to find the value of

(i)  $p$ ,

Answer  $p = \dots\dots\dots$  [1]

(ii)  $q$ .

Answer  $q = \dots\dots\dots$  [1]

(b) Complete the histogram. [1]

15 (a) Find an integer  $r$  such that  $r > 5$  and  $5r - 1$  is a square number.

*Answer*  $r =$  ..... [1]

(b) Find the value of  $s$  which makes  $8s + 2$  a prime number.

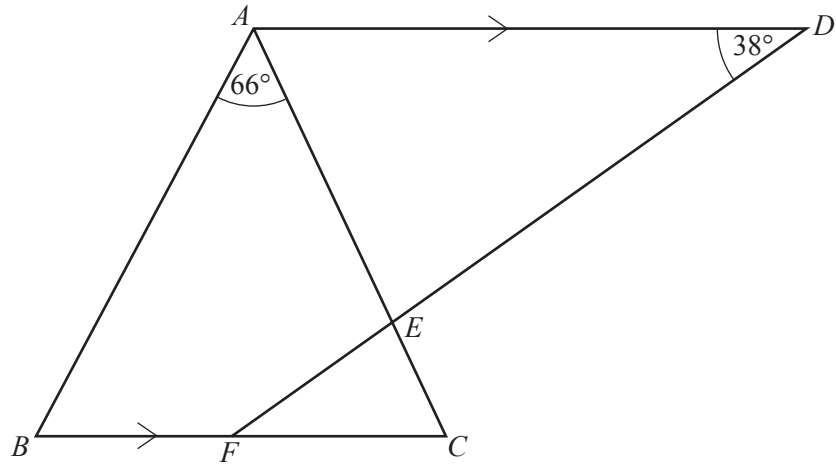
*Answer*  $s =$  ..... [1]

(c) Write down an irrational number between 7 and 8.

*Answer* ..... [1]

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16



In the diagram  $AB = AC$  and  $AD$  is parallel to  $BC$ .  
 A line from  $D$  intersects  $AC$  at  $E$  and  $BC$  at  $F$ .  
 $\hat{ADE} = 38^\circ$  and  $\hat{BAC} = 66^\circ$ .

Find

(a)  $\hat{DFC}$ ,

Answer  $\hat{DFC} = \dots\dots\dots [1]$

(b)  $\hat{ABC}$ ,

Answer  $\hat{ABC} = \dots\dots\dots [1]$

(c)  $\hat{AED}$ .

Answer  $\hat{AED} = \dots\dots\dots [1]$

17 (a) Expand and simplify

(i)  $4(2t + 3) + 5$ ,

*Answer* ..... [1]

(ii)  $6p + 3q - 2(2p - 5q)$ .

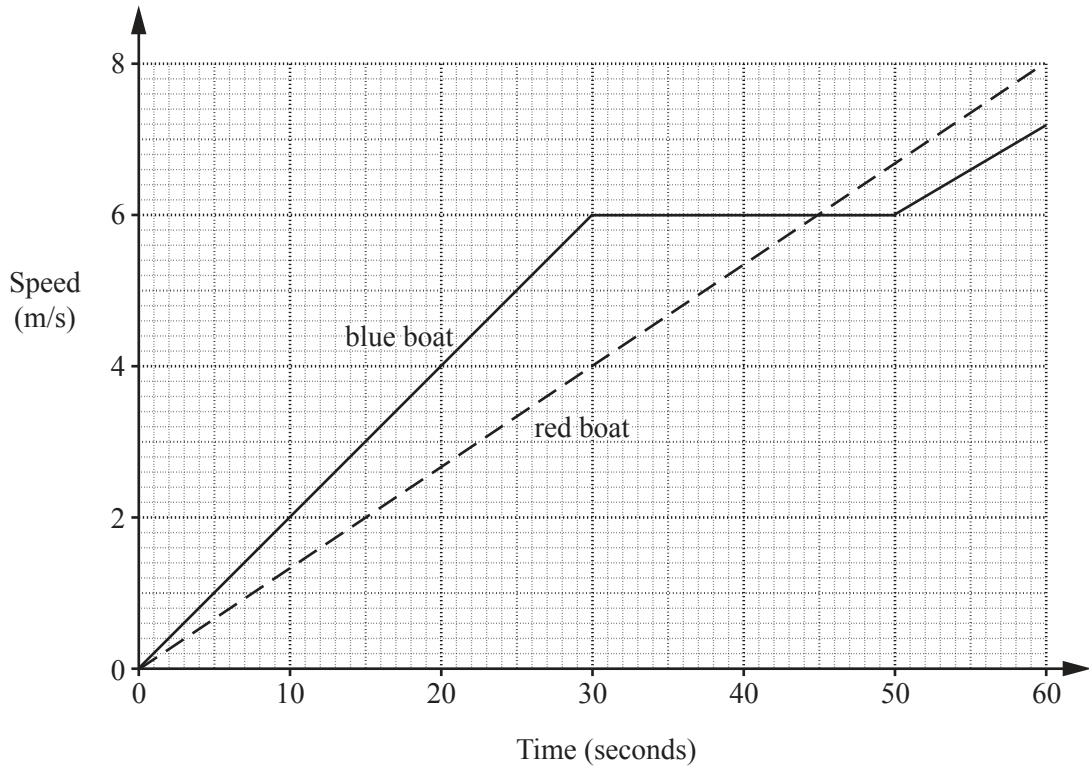
*Answer* ..... [1]

(b) Factorise completely

$25x^3y^2 - 15x^2y$ .

*Answer* ..... [1]

---



Two boats, one red and one blue, leave a harbour at the same time. They travel in the same direction. The speed-time graphs for the boats are shown, for the first minute of their journey.

(a) Find the acceleration of the blue boat in the last 10 seconds.

Answer ..... m/s<sup>2</sup> [1]

(b) Find which boat is ahead after one minute and by what distance.

Answer ..... is ahead by ..... m [3]

- 19 (a) Light travels at a speed of  $3 \times 10^8$  m/s.

Calculate the time it takes for light to travel 6 km.  
Give your answer in standard form.

*Answer* .....s [2]

- (b) One molecule of water is made up of two atoms of hydrogen and one atom of oxygen.  
The mass of one atom of hydrogen is  $1.67 \times 10^{-24}$  g.  
The mass of one atom of oxygen is  $2.66 \times 10^{-23}$  g.

Calculate the mass of one molecule of water.  
Give your answer in standard form.

*Answer* .....g [2]

- 20 (a) Given that  $x^2 - 14x + 40 = (x - a)^2 + b$ , find the values of  $a$  and  $b$ .

*Answer*  $a =$  .....

$b =$  ..... [2]

- (b) Solve the equation  $3x^2 + 7x - 6 = 0$  by factorisation.

*Answer*  $x =$  ..... or ..... [2]

21 (a) The line  $2y = 6 - 3x$  meets the  $y$ -axis at  $A$  and the  $x$ -axis at  $B$ .

Write down

(i) the coordinates of  $A$  and  $B$ ,

*Answer*  $A = (\dots\dots\dots, \dots\dots\dots)$

$B = (\dots\dots\dots, \dots\dots\dots)$  [2]

(ii) the gradient of the line.

*Answer* ..... [1]

(b) Another straight line cuts the  $x$ -axis at  $P(-4, 0)$  and passes through  $Q(2, 18)$ .

Find the coordinates of the midpoint of  $PQ$ .

*Answer*  $(\dots\dots\dots, \dots\dots\dots)$  [1]

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- 22 (a) Construct, using ruler and compasses only, an equilateral triangle  $ABC$ .  
The side  $AB$  has been drawn for you.



- [1]
- (b) Construct the locus of points, inside triangle  $ABC$ , which are
- (i) equidistant from  $A$  and  $C$ , [1]
- (ii) 4 cm from  $A$ . [1]
- (c) A point  $X$  lies within triangle  $ABC$ , is nearer to  $A$  than to  $C$  and is less than 4 cm from  $A$ .  
On your diagram shade the region in which  $X$  must lie. [1]
-

- 23 (a) A spherical tennis ball and a spherical beach ball have diameters in the ratio 1 : 3.  
The surface area of the beach ball is  $153 \text{ cm}^2$ .

Calculate the surface area of the tennis ball.

*Answer* .....  $\text{cm}^2$  [2]

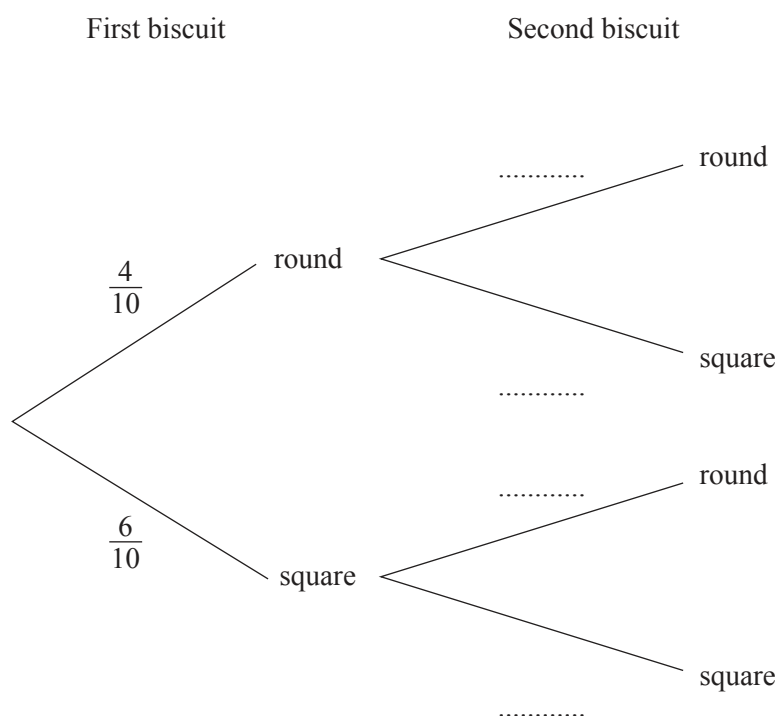
- (b)  $y$  is inversely proportional to the cube of  $x$ .  
When  $x = 2$ ,  $y = 9$ .

Find  $y$  when  $x = 5$ .

*Answer*  $y =$  ..... [3]

---

- 24 On a plate there are ten biscuits.  
 Four of the biscuits are round and six of the biscuits are square.  
 Sabah chooses a biscuit at random from the plate and eats it.  
 She then chooses another biscuit at random from the plate.  
 The tree diagram shows the possible outcomes and some of their probabilities.



(a) Complete the tree diagram. [2]

(b) Calculate the probability that Sabah chooses

(i) two round biscuits,

*Answer* ..... [1]

(ii) one round biscuit and one square biscuit.

*Answer* ..... [2]

$$25 \quad \mathbf{A} = \begin{pmatrix} 3 & -1 \\ -2 & 4 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} 5 & 3 \\ 0 & -2 \end{pmatrix}$$

(a) Find  $3\mathbf{A} - \mathbf{B}$ .

*Answer*  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

(b) Find  $\mathbf{A}^2$ .

*Answer*  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

(c) Find the  $2 \times 2$  matrix  $\mathbf{X}$ , where  $\mathbf{AX} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ .

*Answer*  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

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