HEADS-UP

REACH FOR THE STARS

TOPICAL PRACTICE QUESTIONS

IGCSE MATHEMATICS

PAPER 4

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1   Anna, Bobby and Carl receive a sum of money.   May June 2012 Code 41
They share it in the ratio $12:7:8$.
Anna receives \$504.

   (a) Calculate the **total** amount.

Answer(a) \$ [3]

   (b)   **(i)** Anna uses 7% of her \$504 to pay a bill.
Calculate how much she has left.

Answer(b)(i) \$ [3]

      (ii) She buys a coat in a sale for \$64.68.
This was 23% less than the original price.
Calculate the original price of the coat.

Answer(b)(ii) \$ [3]

   (c) Bobby uses \$250 of his share to open a bank account.
This account pays compound interest at a rate of 1.6% per year.
Calculate the amount in the bank account after 3 years.
Give your answer correct to 2 decimal places.

Answer(c) \$ [3]

   (d) Carl buys a computer for \$288 and sells it for \$324.
Calculate his percentage profit.

Answer(d)   % [3]

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2 (a) In a sale, Jen buys a laptop for $351.55.
    This price is 21% less than the price before the sale.   May June 2012 Code 42

    Calculate the price before the sale.

                 Answer(a) $ [3]

  (b) Alex invests $4000 at a rate of 8% per year simple interest for 2 years.
    Bob invests $4000 at a rate of 7.5% per year compound interest for 2 years.

    Who receives more interest and by how much?

      Answer(b)   receives $ more interest. [6]

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3   **(a)** In Portugal, Miguel buys a book about planets.
The book costs €34.95.
In England the same book costs £27.50.
The exchange rate is £1 = €1.17.

May June 2012 Code 42

Calculate the difference in pounds (£) between the cost of the book in Portugal and England.

Answer(a) £   [2]

(b) In the book, the distance between two planets is given as 4.07×10^{12} kilometres.
The speed of light is 1.1×10^{9} kilometres per hour.

Calculate the time taken for light to travel from one of these planets to the other.
Give your answer in days and hours.

Answer(b)   days   hours [3]

(c) In one of the pictures in the book, a rectangle is drawn.
The rectangle has length 9.3 cm and width 5.6 cm, both correct to one decimal place.

(i) What is the lower bound for the length?

Answer(c)(i)   cm [1]

(ii) Work out the lower and upper bounds for the area of the rectangle.

Answer(c)(ii) Lower bound =   cm²

Upper bound =   cm² [2]

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4   A train travels from Paris to Milan.   May June 2012 Code 43

    (a)   The train departs from Paris at 20 28 and the journey takes 9 hours 10 minutes.

       (i)   Find the time the train arrives in Milan.

                                             Answer(a)(i)   [1]

       (ii)   The distance between Paris and Milan is 850 km.

          Calculate the average speed of the train.

                                             Answer(a)(ii)   km/h   [2]

    (b)   The total number of passengers on the train is 640.

       (i)   160 passengers have tickets which cost $255 each.
          330 passengers have tickets which cost $190 each.
          150 passengers have tickets which cost $180 each.

          Calculate the mean cost of a ticket.

                                             Answer(b)(i) $ [3]

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(ii) There are men, women and children on the train in the ratio

men : women : children   =   4 : 3 : 1 .

Show that the number of women on the train is 240.

Answer(b)(ii)

[2]

(iii) 240 is an increase of 60% on the number of women on the train the previous day.

Calculate the number of women on the train the previous day.

Answer(b)(iii)   [3]

(c) The length of the train is 210 m.
It passes through a station of length 340 m, at a speed of 180 km/h.

Calculate the number of seconds the train takes to pass completely through the station.

Answer(c)   s [3]

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5   Distances from the Sun can be measured in astronomical units, AU.
Earth is a distance of 1 AU from the Sun.
One AU is approximately 1.496×10^8 km.

Oct Nov 2012 Code 41

The table shows distances from the Sun.

Name	Distance from the Sun in AU	Distance from the Sun in kilometres
Earth	1	1.496×10^8
Mercury	0.387	
Jupiter		7.79×10^8
Pluto		5.91×10^9

(a) Complete the table.   [3]

(b) Light travels at approximately 300 000 kilometres per second.

     (i) How long does it take light to travel from the Sun to Earth?
         Give your answer in seconds.

Answer(b)(i)   s   [2]

     (ii) How long does it take light to travel from the Sun to Pluto?
         Give your answer in minutes.

Answer(b)(ii)   min   [2]

(c) One light year is the distance that light travels in one year (365 days).

How far is one light year in kilometres?
Give your answer in standard form.

Answer(c)   , km   [3]

(d) How many astronomical units (AU) are equal to one light year?

Answer(d)   , AU   [2]

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6   A factory produces bird food made with sunflower seed, millet and maize.

    (a) The amounts of sunflower seed, millet and maize are in the ratio

         sunflower seed : millet : maize = 5 : 3 : 1 .   Oct Nov 2012 Code 42

        (i) How much millet is there in 15 kg of bird food?

                                            Answer(a)(i)   kg [2]

        (ii) In a small bag of bird food there is 60 g of sunflower seed.

           What is the mass of bird food in a small bag?

                                            Answer(a)(ii)   g [2]

    (b) Sunflower seeds cost $204.50 for 30 kg from Jon's farm or €96.40 for 20 kg from Ann's farm. The exchange rate is $1 = €0.718.

        Which farm has the cheapest price per kilogram?
You must show clearly all your working.

                                          Answer(b)   [4]

(c) Bags are filled with bird food at a rate of 420 grams per second.

How many 20 kg bags can be **completely** filled in 4 hours?

Answer(c)   [3]

(d) Brian buys bags of bird food from the factory and sells them in his shop for $15.30 each.
He makes 12.5% profit on each bag.

How much does Brian pay for each bag of bird food?

Answer(d) $ [3]

(e) Brian orders 600 bags of bird food.

The probability that a bag is damaged is $\dfrac{1}{50}$.

How many bags would Brian expect to be damaged?

Answer(e)   [1]

7   **(a)**   The Martinez family travels by car to Seatown.   Oct Nov 2012 Code 43
              The distance is 92 km and the journey takes 1 hour 25 minutes.

        (i)   The family leaves home at 0750.
            Write down the time they arrive at Seatown.

                                       Answer(a)(i)   [1]

        (ii)   Calculate the average speed for the journey.

                                           Answer(a)(ii)   km/h [2]

      (iii)   During the journey, the family stops for 10 minutes.

            Calculate 10 minutes as a percentage of 1 hour 25 minutes.

                                         Answer(a)(iii)   . % [1]

      (iv)   92 km is 15% more than the distance from Seatown to Deecity.

            Calculate the distance from Seatown to Deecity.

                                         Answer(a)(iv)   km [3]

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(b) The Martinez family spends $150 in the ratio

    fuel : meals : gifts = 11 : 16 : 3.

  (i) Show that $15 is spent on gifts.

    Answer (b)(i)

                                                                          [2]

  (ii) The family buys two gifts.
      The first gift costs $8.25.

    Find the ratio

      cost of first gift : cost of second gift.

    Give your answer in its simplest form.

                                        Answer(b)(ii)   :   [2]

8   **(a)**   One day, Maria took 27 minutes to walk 1.8 km to school.   May June 2013 Code 41
She left home at 07 48.

      (i)   Write down the time Maria arrived at school.

Answer(a)(i) .... [1]

      (ii)   Show that Maria's average walking speed was 4 km/h.

Answer(a)(ii)

[2]

   (b)   Another day, Maria cycled the 1.8 km to school at an average speed of 15 km/h.

      (i)   Calculate the percentage **increase** that 15 km/h is on Maria's walking speed of 4 km/h.

Answer(b)(i) .... % [3]

      (ii)   Calculate the percentage **decrease** that Maria's cycling time is on her walking time of
27 minutes.

Answer(b)(ii) .... % [3]

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(iii) After school, Maria cycled to her friend's home.
This took 9 minutes, which was 36% of the time Maria takes to walk to her friend's home.

Calculate the time Maria takes to walk to her friend's home.

Answer(b)(iii) .... min [2]

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9   A tennis club has 560 members.   May June 2013 Code 42

   (a)   The ratio   men : women : children   =   5 : 6 : 3.

      (i)   Show that the club has 240 women members.

      Answer(a)(i)

                                                                                  [2]

      (ii)   How many members are children?

                                  Answer(a)(ii) .... [1]

   (b) $\frac{5}{8}$ of the 240 women members play in a tournament.

      How many women members do **not** play in the tournament?

                                  Answer(b) .... [2]

   (c)   The annual membership fee in 2013 is $198 for each adult and $75 for each child.

      (i)   Calculate the total amount the 560 members pay in 2013.

                                  Answer(c)(i) $ .... [2]

      (ii)   The adult fee of $198 in 2013 is 5.6% more than the fee in 2012.

          Calculate the adult fee in 2012.

                                  Answer(c)(ii) $ .... [3]

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(d) The club buys 36 tennis balls for $9.50 and sells them to members for $0.75 each.

Calculate the percentage profit the club makes.

Answer(d) .... % [3]

(e) A tennis court is a rectangle with length 23.7 m and width 10.9 m, each correct to 1 decimal place.

Calculate the upper and lower bounds of the perimeter of the court.

Answer(e) Upper bound .... m

Lower bound .... m [3]

10   **(a)**   Ali and Ben receive a sum of money.   May June 2013 Code 43
They share it in the ratio $5:1$.
Ali receives $2345.

Calculate the total amount.

Answer(a) $ .... [2]

(b)   Ali uses 11% of his $2345 to buy a television.

Calculate the cost of the television.

Answer(b) $ .... [2]

(c)   A different television costs $330.

     (i)   Ben buys one in a sale when this cost is reduced by 15%.

        How much does Ben pay?

Answer(c)(i) $ .... [2]

     (ii) $330 is 12% less than the cost last year.

        Calculate the cost last year.

Answer(c)(ii) $ .... [3]

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(d) Ali invests $1500 of his share in a bank account.
The account pays compound interest at a rate of 2.3% per year.

Calculate the total amount in the account at the end of 3 years.

Answer(d) $ .... [3]

(e) Ali also buys a computer for $325.
He later sells this computer for $250.

Calculate Ali's percentage loss.

Answer(e) .... % [3]

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11   David sells fruit at the market.   Oct Nov 2013 Code 41

(a)   In one week, David sells 120 kg of tomatoes and 80 kg of grapes.

     (i)   Write 80 kg as a fraction of the total mass of tomatoes and grapes.
         Give your answer in its lowest terms.

                                  Answer(a)(i) .... [1]

     (ii)   Write down the ratio   mass of tomatoes : mass of grapes.
         Give your answer in its simplest form.

                           Answer(a)(ii) .... : .... [1]

(b)   (i)   One day he sells 28 kg of oranges at \$1.56 per kilogram.
         He also sells 35 kg of apples.
         The total he receives from selling the oranges and the apples is \$86.38 .

         Calculate the price of 1 kilogram of apples.

                             Answer(b)(i) \$ .... [2]

     (ii)   The price of 1 kilogram of oranges is \$1.56 .
         This is 20% more than the price two weeks ago.

         Calculate the price two weeks ago.

                             Answer(b)(ii) \$ .... [3]

(c)   On another day, David received a total of \$667 from all the fruit he sold.
     The cost of the fruit was \$314.20 .
     David worked for $10\frac{1}{2}$ hours on this day.

     Calculate David's rate of pro t in dollars per hour.

                             Answer(c) .... dollars/h [2]

12   Last year Mukthar earned $18 900 .   Oct Nov 2013 Code 42
        He did not pay tax on $5500 of his earnings.
        He paid 24% tax on his remaining earnings.

    (a) **(i)** Calculate how much tax Mukthar paid last year.

Answer(a)(i) $ .... [2]

        (ii) Calculate how much Mukthar earned each month after tax had been paid.

Answer(a)(ii) $ .... [2]

    (b) This year Mukthar now earns $19 750.50 .

        Calculate the percentage increase from $18 900.

Answer(b) .... % [2]

    (c) Mukthar has $1500 to invest in one of the following ways.

        •   **Account A** paying **simple** interest at a rate of 4.1% per year

        •   **Account B** paying **compound** interest at a rate of 3.3% per year

    Which account will be worth more after **3 years** and by how much?

Answer(c) Account .... by $ .... [5]

13   **(a)**   **(i)**   In a camera magazine, 63 pages are used for adverts.
                The ratio   number of pages of adverts : number of pages of reviews $= 7:5$.

                Calculate the number of pages used for reviews.

Oct Nov 2013 Code 43

Answer(a)(i) .... [2]

      (ii)   In another copy of the magazine, 56 pages are used for reviews and for photographs.
                The ratio   number of pages of reviews : number of pages of photographs $= 9:5$.

                Calculate the number of pages used for photographs.

Answer(a)(ii) .... [2]

     (iii)   One copy of the magazine costs $4.90 .
                An annual subscription costs $48.80 for 13 copies.

                Calculate the percentage discount by having an annual subscription.

Answer(a)(iii) .... % [3]

14   **(a)**   The running costs for a papermill are \$75 246.
This amount is divided in the ratio   labour costs : materials = 5 : 1.

May June 2014 Code 41

Calculate the labour costs.

Answer(a) \$ .... [2]

(b)   In 2012 the company made a pro t of \$135 890.
In 2013 the pro t was \$150 675.

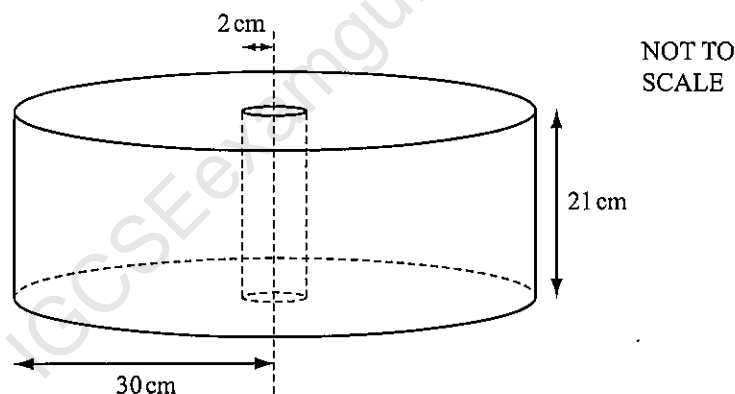Calculate the percentage increase in the pro t from 2012 to 2013.

Answer(b) .... % [3]

(c)   The pro t of \$135 890 in 2012 was an increase of 7% on the pro t in 2011.

Calculate the pro t in 2011.

Answer(c) \$ .... [3]

(d)

2 cm

NOT TO
SCALE

21 cm

30 cm

Paper is sold in cylindrical rolls.
There is a wooden cylinder of radius 2 cm and height 21 cm in the centre of each roll.
The outer radius of a roll of paper is 30 cm.

(i)   Calculate the volume of paper in a roll.

Answer(d)(i) .... cm³ [3]

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(ii) The paper is cut into sheets which measure 21 cm by 29.7 cm.
The thickness of each sheet is 0.125 mm.

    (a) Change 0.125 millimetres into centimetres.

Answer(d)(ii)(a) .... cm [1]

    (b) Work out how many whole sheets of paper can be cut from a roll.

Answer(d)(ii)(b) .... [4]

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15   Jane and Kate share $240 in the ratio 5 : 7 .   May June 2014 Code 42

     (a)   Show that Kate receives $140.

         Answer(a)

                                                                   [2]

     (b)   Jane and Kate each spend $20.

         Find the new ratio   Jane's remaining money : Kate's remaining money.
         Give your answer in its simplest form.

                                  Answer(b) .... : .... [2]

     (c)   Kate invests $120 for 5 years at 4% per year simple interest.

         Calculate the total amount Kate has after 5 years.

                                  Answer(c) $ .... [3]

     (d)   Jane invests $80 for 3 years at 4% per year compound interest.

         Calculate the total amount Jane has after 3 years.
         Give your answer correct to the nearest cent.

                                  Answer(d) $ .... [3]

     (e)   An investment of $200 for 2 years at 4% per year compound interest is the same as an investment of $200 for 2 years at r% per year simple interest.

         Find the value of r.

                                    Answer(e) r = ... [3]

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16   In July, a supermarket sold 45 981 bottles of fruit juice.

May June 2014 Code 43

(a)   The cost of a bottle of fruit juice was $1.35 .

Calculate the amount received from the sale of the 45 981 bottles.
Give your answer correct to the nearest hundred dollars.

Answer(a) \$ .... [2]

(b)   The number of bottles sold in July was 17% more than the number sold in January.

Calculate the number of bottles sold in January.

Answer(b) .... [3]

(c)   There were 3 different avours of fruit juice.
The number of bottles sold in each avour was in the ratio   apple : orange : cherry = 3 : 4 : 2.
The total number of bottles sold was 45 981.

Calculate the number of bottles of orange juice sold.

Answer(c) .... [2]

(d)   One bottle contains 1.5 litres of fruit juice.

Calculate the number of 330 ml glasses that can be lled completely from one bottle.

Answer(d) .... [3]

(e) $\frac{5}{9}$ of the 45 981 bottles are recycled.

Calculate the number of bottles that are recycled.

Answer(e) .... [2]

17   **(a)**   A company makes compost by mixing loam, sand and coir in the following ratio.

$$loam : sand : coir = 7 : 2 : 3$$

Oct Nov 2014 Code 41

     (i)   How much loam is there in a 72 litre bag of the compost?

Answer(a)(i) .... litres [2]

     (ii)   In a small bag of the compost there are 13.5 litres of coir.
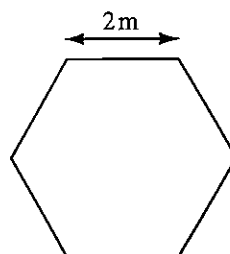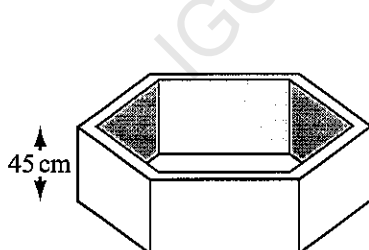
How much compost is in a small bag?

Answer(a)(ii) .... litres [2]

     (iii)   The price of a large bag of compost is $8.40 .
This is an increase of 12% on the price last year.

Calculate the price last year.

Answer(a)(iii) $ .... [3]

(b)   Teresa builds a raised garden bed in the shape of a hexagonal prism.

2 m

NOT TO SCALE

45 cm

The garden bed has a height of 45 cm.
The cross section of the inside of the garden bed is a regular hexagon of side 2 m.

(i) Show that the area of the cross section of the inside of the garden bed is 10.4 m², correct to 3 signi cant gures.

Answer(b)(i)

[3]

(ii) Calculate the volume of soil needed to ll the garden bed.

Answer(b)(ii) .... m³ [2]

(iii) Teresa wants to ll the garden bed with organic top soil.
She sees this advertisement in the local garden centre.

ORGANIC TOP SOIL	Number of tonnes purchased		
	1 to 5	**6 to 10**	**Over 10**
Cost per tonne	$47.00	$45.50	$44.00

Organic top soil is sold in one tonne bags.
1 m³ of organic top soil has a mass of 1250 kg.

Calculate the cost of the organic top soil needed to ll the garden bed completely.
[1 tonne = 1000 kg]

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18 **(a)** Alfonso has $75 to spend on the internet.   Oct Nov 2014 Code 42
He spends some of the money on music, lms and books.

    (i) The money he spends on music, lms and books is in the ratio

$$music : lms : books = 5 : 3 : 7.$$

He spends $16.50 on music.

Calculate the **total** amount he spends on music, lms and books.

Answer(a)(i) $ .... [3]

    (ii) Find this total amount as a percentage of the $75.

Answer(a)(ii) .... % [1]

(b) The download times for the music, lms and books are in the ratio

$$music : lms : books = 2 : 9 : 1.$$

The **total** download time is 3 hours and 33 minutes.

Calculate the download time for the lms.
Give your answer in hours, minutes and seconds.

Answer(b) .... hours .... minutes .... seconds [3]

(c) The cost of $16.50 for the music was a reduction of 12% on the original cost.

Calculate the original cost of the music.

Answer(c) $.. [3]

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19 There are three different areas, A, B and C, for seating in a theatre.   Oct Nov 2014 Code 43
The numbers of seats in each area are in the ratio $A:B:C = 11:8:7$.
There are 920 seats in area B.

(a) (i) Show that there are 805 seats in area C.

Answer(a)(i)

[1]

(ii) Write the number of seats in area B as a percentage of the total number of seats.

Answer(a)(ii) .... % [2]

(b) The cost of a ticket for a seat in each area of the theatre is shown in the table.

Area A	$11.50
Area B	$15
Area C	$22.50

For a concert 80% of area B tickets were sold and $\frac{3}{5}$ of area C tickets were sold.
The total amount of money taken from ticket sales was $35 834.

Calculate the number of area A tickets that were sold.

Answer(b) .... [5]

(c) The total ticket sales of $35 834 was 5% less than the ticket sales at the previous concert.

Calculate the ticket sales at the previous concert.

Answer(c) $... [3]

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20   12 000 vehicles drive through a road toll on one day.   May June 2015 Code 41
The ratio   cars : trucks : motorcycles $= 13 : 8 : 3$.

   (a)   **(i)**   Show that 6500 cars drive through the road toll on that day.

         Answer(a)(i)

                                                                                       [1]

     (ii)   Calculate the number of trucks that drive through the road toll on that day.

                                   Answer(a)(ii) .... [1]

   (b)   The toll charges in 2014 are shown in the table.

Vehicle	Charge
Cars	$2
Trucks	$5
Motorcycles	$1

   Show that the total amount paid in tolls on that day is $34 500.

   Answer(b)

                                                                                            [2]

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(c) This total amount is a decrease of 8% on the total amount paid on the same day in 2013.

Calculate the total amount paid on that day in 2013.

Answer(c) $... [3]

(d) 2750 of the 6500 car drivers pay their toll using a credit card.

Write down, in its simplest terms, the fraction of car drivers who pay using a credit card.

Answer(d) .... [2]

(e) To the nearest thousand, 90 000 cars drive through the road toll in one week.

Write down the lower bound for this number of cars.

Answer(e) .... [1]

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21   **(a)**   Last year a golf club charged $1650 for a family membership.   May June 2015 Code 42
This year the cost increased by 12%.

Calculate the cost of a family membership this year.

Answer(a) $ .... [2]

(b) The golf club runs a competition.
The total prize money is shared in the ratio   1st prize : 2nd prize = 9 : 5.
The 1st prize is $500 more than the 2nd prize.

   (i)   Calculate the total prize money for the competition.

Answer(b)(i) $ .... [2]

   (ii)   What percentage of the total prize money is given as the 1st prize?

Answer(b)(ii) .... % [1]

(c) For the members of the golf club the ratio   men : children = 11 : 2.
The ratio   women : children = 10 : 3.

   (i)   Find the ratio   men : women.

Answer(c)(i) .... : .... [2]

(ii) The golf club has 24 members who are children.

Find the total number of members.

Answer(c)(ii) .... [3]

(d) The club shop sold a box of golf balls for $20.40 .
The shop made a profit of 20% on the cost price.

Calculate the cost price of the golf balls.

Answer(d) $ .... [3]

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22 **(a)** **(i)** Eduardo invests $640 at a rate of 2% per year compound interest.

Show that, at the end of 6 years, Eduardo has $721, correct to the nearest dollar.

Answer(a)(i)

May June 2015 Code 42

[2]

(ii) Manuela also invests $640.
At the end of 4 years, Manuela has $721.

Find the yearly compound interest rate.

Answer(a)(ii) .... % [4]

(b) Carlos buys a motor scooter for $1200.
Each year the value of the scooter decreases by 10% of its value at the beginning of that year.

Find the value of the scooter after 3 years.

Answer(b) $ .... [2]

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23   **(a)** $72 = 2 \times 2 \times 2 \times 3 \times 3$ written as a product of prime factors.

Oct Nov 2011 Code 41

   (i)   Write the number 126 as a product of prime factors.

Answer(a)(i) 126 = ... [2]

   (ii)   Find the value of the highest common factor of 72 and 126.

Answer(a)(ii) .... [1]

   (iii)   Find the value of the lowest common multiple of 72 and 126.

Answer(a)(iii) .... [2]

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(b) John wants to estimate the value of π.
He measures the circumference of a circular pizza as 105 cm and its diameter as 34 cm, both correct to the nearest centimetre.

Calculate the lower bound of his estimate of the value of π.
Give your answer correct to 3 decimal places.

Answer(b) .... [4]

(c) The volume of a cylindrical can is 550 cm³, correct to the nearest 10 cm³.
The height of the can is 12 cm correct to the nearest centimetre.

Calculate the upper bound of the radius of the can.
Give your answer correct to 3 decimal places.

Answer(c) .... cm [5]

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24 Noma ies from Johannesburg to Hong Kong.
Her plane leaves Johannesburg at 1845 and arrives in Hong Kong 13 hours and 25 minutes later.
The local time in Hong Kong is 6 hours ahead of the time in Johannesburg.

(a) At what time does Noma arrive in Hong Kong?

Oct Nov 2013 Code 42

Answer(a) .... [2]

(b) Noma sleeps for part of the journey.
The time that she spends sleeping is given by the ratio

sleeping : awake $= 3 : 4$.

Calculate how long Noma sleeps during the journey.
Give your answer in hours and minutes.

Answer(b) .... h .... min [2]

(c) (i) The distance from Hong Kong to Johannesburg is 10 712 km.
The time taken for the journey is 13 hours and 25 minutes.

Calculate the average speed of the plane for this journey.

Answer(c)(i) .... km/h [2]

(ii) The plane uses fuel at the rate of 1 litre for every 59 metres travelled.

Calculate the number of litres of fuel used for the journey from Johannesburg to Hong Kong.
Give your answer in standard form.

Answer(c)(ii) .... litres [4]

(d) The cost of Noma's journey is 10 148 South African Rand (R).
This is an increase of 18% on the cost of the journey one year ago.

Calculate the cost of the same journey one year ago.

Answer(d) R .... [3]

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25   **(a)**   Rearrange $s = ut + \frac{1}{2}at^2$ to make a the subject.   Oct Nov 2013 Code 43

Answer(a) a = ... [3]

(b)   The formula $v = u + at$ can be used to calculate the speed, v, of a car.

$u = 15$, $a = 2$ and $t = 8$, each correct to the nearest integer.

Calculate the upper bound of the speed v.

Answer(b) .... [3]

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26 12 000 vehicles drive through a road toll on one day.
The ratio   cars : trucks : motorcycles = 13 : 8 : 3.

    (a) **(i)** Show that 6500 cars drive through the road toll on that day.

        Answer(a)(i)

[1]

        (ii) Calculate the number of trucks that drive through the road toll on that day.

                                               Answer(a)(ii) .... [1]

    (b) The toll charges in 2014 are shown in the table.

Vehicle	Charge
Cars	$2
Trucks	$5
Motorcycles	$1

    Show that the total amount paid in tolls on that day is $34 500.

    Answer(b)

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(c) This total amount is a decrease of 8% on the total amount paid on the same day in 2013.

Calculate the total amount paid on that day in 2013.

Answer(c) $.. [3]

(d) 2750 of the 6500 car drivers pay their toll using a credit card.

Write down, in its simplest terms, the fraction of car drivers who pay using a credit card.

Answer(d) .... [2]

(e) To the nearest thousand, 90 000 cars drive through the road toll in one week.

Write down the lower bound for this number of cars.

Answer(e) .... [1]

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0580/42/M/J/15

27 **(a)** Last year a golf club charged $1650 for a family membership.
This year the cost increased by 12%.

Calculate the cost of a family membership this year.

Answer(a) $ .... [2]

(b) The golf club runs a competition.
The total prize money is shared in the ratio 1st prize : 2nd prize = 9 : 5.
The 1st prize is $500 more than the 2nd prize.

(i) Calculate the total prize money for the competition.

Answer(b)(i) $ .... [2]

(ii) What percentage of the total prize money is given as the 1st prize?

Answer(b)(ii) ....% [1]

(c) For the members of the golf club the ratio men : children = 11 : 2.
The ratio women : children = 10 : 3.

(i) Find the ratio men : women.

Answer(c)(i) .... : .... [2]

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(ii) The golf club has 24 members who are children.

Find the total number of members.

Answer(c)(ii) .... [3]

(d) The club shop sold a box of golf balls for $20.40 .
The shop made a profit of 20% on the cost price.

Calculate the cost price of the golf balls.

Answer(d) $ .... [3]

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0580/43/M/J/15

28 **(a)** **(i)** Eduardo invests \$640 at a rate of 2% per year compound interest.

Show that, at the end of 6 years, Eduardo has \$721, correct to the nearest dollar.

Answer(a)(i)

[2]

(ii) Manuela also invests \$640.
At the end of 4 years, Manuela has \$721.

Find the yearly compound interest rate.

Answer(a)(ii) .... % [4]

(b) Carlos buys a motor scooter for \$1200.
Each year the value of the scooter decreases by 10% of its value at the beginning of that year.

Find the value of the scooter after 3 years.

Answer(b) \$ .... [2]

1   **(a)**   A parallelogram has base $(2x - 1)$ metres and height $(4x - 7)$ metres.
The area of the parallelogram is $1\,\text{m}^2$.

       (i)   Show that $4x^2 - 9x + 3 = 0$.   May June 2012 Code 41

         Answer (a)(i)

                                                                         [3]

       (ii)   Solve the equation $4x^2 - 9x + 3 = 0$.

           Show all your working and give your answers correct to 2 decimal places.

                       Answer(a)(ii) $x = $ .... or $x =$ .... [4]

       (iii)   Calculate the height of the parallelogram.

                           Answer(a)(iii) .... m [1]

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(b) (i) Factorise $x^2 - 16$.

Answer(b)(i) .... [1]

(ii) Solve the equation $\dfrac{2x+3}{x-4} + \dfrac{x+40}{x^2-16} = 2$.

Answer(b)(ii) $x =$ .... [4]

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2 **(a)**
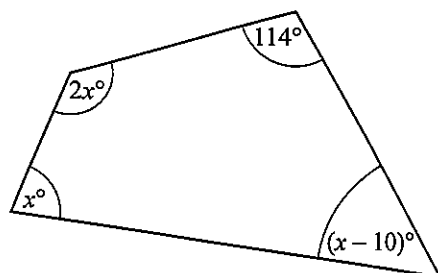
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Find the value of x.

Answer(a) $x =$ .... [3]

(b) **(i)** Write the four missing terms in the table for sequences A, B, C and D.

Term	1	2	3	4	5		n
Sequence A	−4		2	5	8		$3n - 7$
Sequence B	1	4	9	16	25		
Sequence C	5	10	15	20	25		
Sequence D	6	14	24	36	50		

[4]

(ii) Which term in sequence D is equal to 500?

Answer(b)(ii) .... [2]

(c) Simplify $\dfrac{x^2 - 16}{2x^2 + 7x - 4}$.

Answer(c) .... [4]

3   **(a)**   Simplify

<div align="right">May June 2012 Code 42</div>

       (i) $(2x^2y^3)^3$,

<div align="right">*Answer(a)*(i) .... [2]</div>

       (ii) $\left(\dfrac{27}{x^6}\right)^{-\frac{1}{3}}$.

<div align="right">*Answer(a)*(ii) .... [3]</div>

   (b)   Multiply out and simplify.

$$(3x - 2y)(2x + 5y)$$

<div align="right">*Answer(b)* .... [3]</div>

   (c)   Make h the subject of

       (i) $V = \pi r^3 + 2\pi r^2 h$,

<div align="right">*Answer(c)*(i) $h = $ .... [2]</div>

       (ii) $V = \sqrt{3h}$.

<div align="right">*Answer(c)*(ii) $h = $ .... [2]</div>

   (d)   Write as a single fraction in its simplest form.

$$\frac{x}{2} + \frac{5x}{3} - \frac{7x}{4}$$

<div align="right">*Answer(d)* .... [2]</div>

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4   **(a)**   The cost of 1 kg of tomatoes is $\$x$ and the cost of 1 kg of onions is $\$y$.   May June 2012 Code 42

           Ian pays a total of $\$10.70$ for 10 kg of tomatoes and 4 kg of onions.

           Jao pays a total of $\$10.10$ for 8 kg of tomatoes and 6 kg of onions.

           Write down simultaneous equations and solve them to find x and y.

Answer(a) $x =$ ....

$y =$ ....   [6]

    (b)   Solve $2x^2 - 5x - 8 = 0$.

           Give your answers correct to 2 decimal places.
           Show all your working.

Answer(b) $x =$ .... or $x =$ ....   [4]

5   **(a)**   Rice costs $\$x$ per kilogram.   May June 2012 Code 43
             Potatoes cost $\$(x + 1)$ per kilogram.
             The total cost of 12 kg of rice and 7 kg of potatoes is $31.70.

             Find the cost of 1 kg of rice.

                                              Answer(a) $ .... [3]

     (b)   The cost of a small bottle of juice is $\$y$.
             The cost of a large bottle of juice is $\$(y + 1)$.
             When Catriona spends $36 on small bottles only, she receives 25 more bottles than when she spends $36 on large bottles only.

         (i)   Show that $25y^2 + 25y - 36 = 0$.

            Answer(b)(i)

                                                           [3]

         (ii)   Factorise $25y^2 + 25y - 36$.

                            Answer(b)(ii) .... [2]

         (iii)   Solve the equation $25y^2 + 25y - 36 = 0$.

                  Answer(b)(iii) $y =$ .... or $y =$ .... [1]

         (iv)   Find the total cost of 1 small bottle of juice and 1 large bottle of juice.

                           Answer(b)(iv) $ .... [1]

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6   **(a)**   Solve the equations.   Oct Nov 2012 Code 41

         (i) $4x - 7 = 8 - 2x$

Answer(a)(i) $x =$ .... [2]

         (ii) $\dfrac{x - 7}{3} = 2$

Answer(a)(ii) $x =$ .... [2]

   (b)   Simplify the expressions.

         (i) $(3xy^4)^3$

Answer(b)(i) .... [2]

         (ii) $(16a^6b^2)^{\frac{1}{2}}$

Answer(b)(ii) .... [2]

         (iii) $\dfrac{x^2 - 7x - 8}{x^2 - 64}$

Answer(b)(iii) .... [4]

7   A rectangular piece of card has a square of side 2 cm removed from each corner.
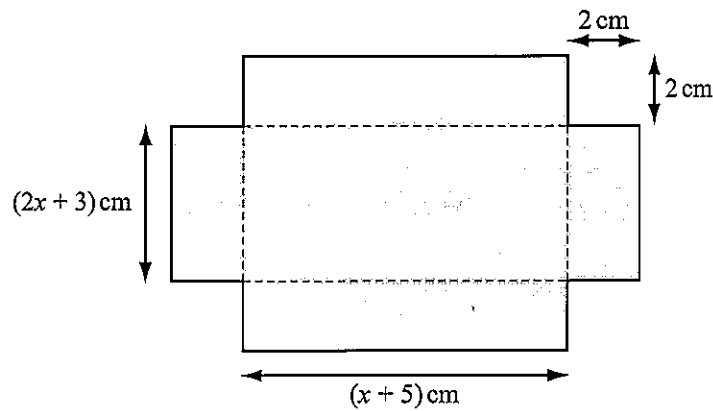
Oct Nov 2012 Code 41

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(a) Write expressions, in terms of x, for the dimensions of the rectangular card before the squares are removed from the corners.

Answer(a) .... cm by .... cm [2]

(b) The diagram shows a net for an open box.
Show that the volume, V cm^3, of the open box is given by the formula $V = 4x^2 + 26x + 30$.

Answer(b)

52

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(c)   **(i)**   Calculate the values of x when $V = 75$.
           Show all your working and give your answers correct to two decimal places.

Answer(c)(i) $x =$ ...., or $x =$ ....   [5]

    (ii)   Write down the length of the longest edge of the box.

Answer(c)(ii) .... cm   [1]

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8   (a) (i)   Factorise completely the expression $4x^2 - 18x - 10$.   Oct Nov 2012 Code 42

Answer(a)(i) .... [3]

(ii)   Solve $4x^2 - 18x - 10 = 0$.

Answer(a)(ii) $x =$ .... or $x =$ .... [1]

(b)   Solve the equation $2x^2 - 7x - 10 = 0$.

Show all your working and give your answers correct to two decimal places.

Answer(b) $x =$ .... or $x =$ .... [4]

(c)   Write $\dfrac{6}{3x-1} - \dfrac{2}{x-2}$ as a single fraction in its simplest form.

Answer(c) .... [3]

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9   **(a)**   Marcos buys 2 bottles of water and 3 bottles of lemonade.   Oct Nov 2012 Code 43
        The total cost is $3.60.
        The cost of one bottle of lemonade is $0.25 more than the cost of one bottle of water.
        Find the cost of one bottle of water.

                                                            Answer(a) $ .... [4]

(b)
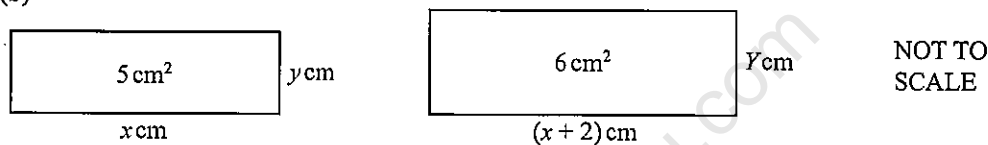
The diagram shows two rectangles.
The first rectangle measures x cm by y cm and has an area of 5 cm².
The second rectangle measures $(x + 2)$ cm by Y cm and has an area of 6 cm².

(i)   When $y + Y = 1$, show that $x^2 - 9x - 10 = 0$.

Answer (b)(i)

                                                                                   [4]

(ii)   Factorise $x^2 - 9x - 10$.

                                                            Answer(b)(ii) .... [2]

(iii)   Calculate the perimeter of the first rectangle.

                                                            Answer(b)(iii) .... cm [2]

(c)

$(2x + 3)\,$cm   5 cm   NOT TO SCALE
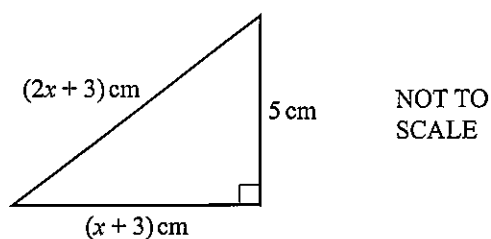
$(x + 3)\,$cm

The diagram shows a right-angled triangle with sides of length 5 cm, $(x + 3)\,$cm and $(2x + 3)\,$cm.

(i) Show that $3x^2 + 6x - 25 = 0$.

Answer (c)(i)

[4]

(ii) Solve the equation $3x^2 + 6x - 25 = 0$.
Show all your working and give your answers correct to 2 decimal places.

Answer(c)(ii) $x =$ .... or $x =$ .... [4]

(iii) Calculate the area of the triangle.

Answer(c)(iii) .... cm^2 [2]

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10   **(a)**   May June 2013 Code 41

NOT TO SCALE
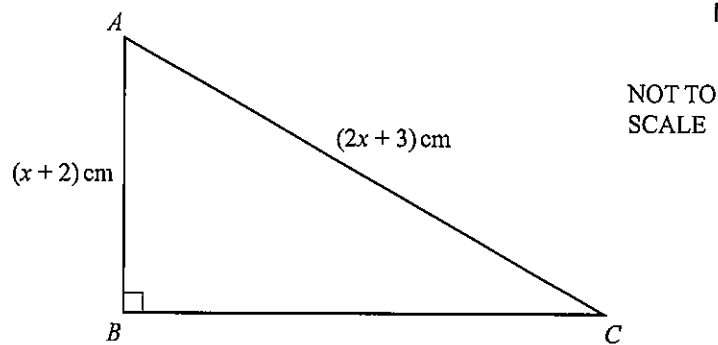
In triangle ABC, $AB = (x + 2)$ cm and $AC = (2x + 3)$ cm.

$\sin ACB = \dfrac{9}{16}$

Find the length of BC.

Answer(a) BC = ... cm [6]

(b)   A bag contains 7 white beads and 5 red beads.

     (i)   The mass of a red bead is 2.5 grams more than the mass of a white bead.
            The total mass of all the 12 beads is 114.5 grams.

            Find the mass of a white bead and the mass of a red bead.

Answer(b)(i) White .... g

Red .... g [5]

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(ii) Two beads are taken out of the bag at random, without replacement.

Find the probability that

(a) they are both white,

Answer(b)(ii)(a) .... [2]

(b) one is white and one is red.

Answer(b)(ii)(b) .... [3]

11   Paul buys a number of large sacks of fertiliser costing $x each.   May June 2013 Code 42

He spends $27.

(a)   Write down, in terms of x, an expression for the number of large sacks which Paul buys.

Answer(a) .... [1]

(b)   Rula buys a number of small sacks of fertiliser.
Each small sack costs $2 less than a large sack.
Rula spends $25.

Write down, in terms of x, an expression for the number of small sacks which Rula buys.

Answer(b) .... [1]

(c)   Rula buys 4 more sacks than Paul.
Write down an equation in x and show that it simpli es to $2x^2 - 3x - 27 = 0$.

Answer(c)

[4]

(d)   Solve $2x^2 - 3x - 27 = 0$.

Answer(d) $x =$ .... or $x =$ .... [3]

(e)   Calculate the number of sacks which Paul buys.

Answer(e) .... [1]

12   **(a)**   Write as a single fraction   May June 2013 Code 42

       (i) $\dfrac{5}{4} - \dfrac{2x}{5}$,

Answer(a)(i) .... [2]

       (ii) $\dfrac{4}{x+3} + \dfrac{2x-1}{3}$.

Answer(a)(ii) .... [3]

   (b)   Solve the simultaneous equations.

$$9x - 2y = 12$$
$$3x + 4y = -10$$

Answer(b) $x =$ ....

$y =$ .... [3]

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(c) Simplify $\dfrac{7x + 21}{2x^2 + 9x + 9}$.

Answer(c) .... [4]

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13   **(a)**   **(i)**   Solve $2(3x - 7) = 13$.   May June 2013 Code 43

Answer(a)(i) $x =$ .... [3]

   (ii)   Solve by factorising $x^2 - 7x + 6 = 0$.

Answer(a)(ii) $x =$ .... or $x =$ .... [3]

   (iii)   Solve $\dfrac{3x - 2}{5} + \dfrac{x + 2}{10} = 4$.

Answer(a)(iii) $x =$ .... [4]

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(b) 1^2 $= 1$

      $1^2 + 2^2$ $= 5$

      $1^2 + 2^2 + 3^2$ $= 14$

      $1^2 + 2^2 + 3^2 + 4^2$ $= 30$

$$1^2 + 2^2 + 3^2 + 4^2 + \ldots\ldots\ldots\ldots + n^2 = an^3 + bn^2 + \frac{n}{6}$$

Work out the values of a and b.

Answer(b) $a = $ ....

             $b = $ .... [6]

14   **(a)**   Solve the equation $8x^2 - 11x - 11 = 0$.
           Show all your working and give your answers correct to 2 decimal places.

<div align="right">Oct Nov 2013 Code 41</div>

<div align="right">*Answer(a)* $x =$ .... or $x =$ .... [4]</div>

   (b) y varies directly as the square root of x.
        $y = 18$ when $x = 9$.

        Find y when $x = 484$.

<div align="right">*Answer(b)* $y =$ .... [3]</div>

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(c) Sara spends x on pens which cost \$2.50 each.
She also spends $(x - 14.50)$ on pencils which cost \$0.50 each.
The **total** of the number of pens and the number of pencils is 19.

Write down and solve an equation in x.

Answer(c) $x =$ .... [6]

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15 **(a)** Write as a single fraction in its simplest form.   Oct Nov 2013 Code 42

$$\frac{2x-1}{2} - \frac{3x+1}{5}$$

Answer(a) .... [3]

(b) Expand and simplify.
$$(2x-3)^2 - 3x(x-4)$$

Answer(b) .... [4]

(c) **(i)** Factorise.
$$2x^2 + 5x - 3$$

Answer(c)(i) .... [2]

(ii) Simplify.
$$\frac{2x^2 + 5x - 3}{2x^2 - 18}$$

Answer(c)(ii) .... [3]

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16   **(a)**   Simplify.   Oct Nov 2013 Code 43

$$\frac{x^2 - 3x}{x^2 - 9}$$

Answer(a) .... [3]

   (b)   Solve.

$$\frac{15}{x} - \frac{20}{x+1} = 2$$

Answer(b) $x =$ .... or $x =$ .... [7]

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17   The distance a train travels on a journey is 600 km.   May June 2014 Code 42

   (a)   Write down an expression, in terms of x, for the average speed of the train when

     (i)   the journey takes x hours,

Answer(a)(i) .... km/h [1]

     (ii)   the journey takes $(x + 1)$ hours.

Answer(a)(ii) .... km/h [1]

   (b)   The difference between the average speeds in **part(a)(i)** and **part(a)(ii)** is 20 km/h.

     (i)   Show that $x^2 + x - 30 = 0$.

Answer(b)(i)

[3]

     (ii)   Find the average speed of the train for the journey in **part(a)(ii)**.
            Show all your working.

Answer(b)(ii) .... km/h [4]

18   **(a)**   **(i)**   Show that the equation $\dfrac{7}{x+4} + \dfrac{2x-3}{2} = 1$ can be simplified to $2x^2 + 3x - 6 = 0$.

Answer(a)(i)

May June 2014 Code 43

[3]

  (ii)   Solve the equation $2x^2 + 3x - 6 = 0$.

    Show all your working and give your answers correct to 2 decimal places.

Answer(a)(ii) $x =$ .... or $x =$ .... [4]

(b)   The **total** surface area of a cone with radius x and slant height $3x$ is equal to the area of a circle with radius r.

Show that $r = 2x$.
[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

Answer(b)

[4]

19   **(a)** Rearrange the formula $v^2 = u^2 - 2as$ to make u the subject.   Oct Nov 2014 Code 41

Answer(a) u = ... [2]

   (b) Chuck cycles along Skyline Drive.
He cycles 60 km at an average speed of x km/h.
He then cycles a further 45 km at an average speed of $(x + 4)$ km/h.
His total journey time is 6 hours.

     (i) Write down an equation in x and show that it simplifies to $2x^2 - 27x - 80 = 0$.

     Answer(b)(i)

[4]

     (ii) Solve $2x^2 - 27x - 80 = 0$ to find the value of x.

Answer(b)(ii) x = ... [3]

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20   **(a)** Expand and simplify.   Oct Nov 2014 Code 41

       (i) $\quad 4(2x - 1) - 3(3x - 5)$

$Answer(a)$(i) .... [2]

       (ii) $\quad (2x - 3y)(3x + 4y)$

$Answer(a)$(ii) .... [3]

   (b) Factorise.
$$x^3 - 5x$$

$Answer(b)$ .... [1]

   (c) Solve the inequality.
$$\frac{2x + 1}{3} \leqslant \frac{5x - 8}{4}$$

$Answer(c)$ .... [3]

(d) (i) $\qquad\qquad x^2 - 9x + 12 = (x - p)^2 - q$

Find the value of p and the value of q.

Answer(d)(i) $p =$ ....

$q =$ .... [3]

(ii) Write down the minimum value of $x^2 - 9x + 12$.

Answer(d)(ii) .... [1]

(iii) Write down the equation of the line of symmetry of the graph of $y = x^2 - 9x + 12$.

Answer(d)(iii) .... [1]

21   **(a)**   Solve the inequality.   Oct Nov 2014 Code 42

$$7x - 5 > 3(2 - 5x)$$

Answer(a) .... [3]

   (b)   **(i)**   Factorise completely.

$$pq - 2q - 8 + 4p$$

Answer(b)(i) .... [2]

       (ii)   Factorise.

$$9p^2 - 25$$

Answer(b)(ii) .... [1]

   (c)   Solve this equation by factorising.

$$5x^2 + x - 18 = 0$$

Answer(c) x = ... or *x* = ... [3]

22 (a) Simplify.   Oct Nov 2014 Code 43

     (i) $x^3 \div \dfrac{3}{x^5}$

Answer(a)(i) .... [1]

     (ii) $5xy^8 \times 3x^6 y^{-5}$

Answer(a)(ii) .... [2]

     (iii) $(64x^{12})^{\frac{2}{3}}$

Answer(a)(iii) .... [2]

(b) Solve $3x^2 - 7x - 12 = 0$.
Show your working and give your answers correct to 2 decimal places.

Answer(b) $x =$ .... or $x =$ .... [4]

(c) Simplify $\dfrac{x^2 - 25}{x^3 - 5x^2}$.

Answer(c) .... [3]

23 **(a)** Simplify.   Oct Nov 2014 Code 43

       (i) $x^3 \div \dfrac{3}{x^5}$

Answer(a)(i) .... [1]

       (ii) $5xy^8 \times 3x^6 y^{-5}$

Answer(a)(ii) .... [2]

       (iii) $(64x^{12})^{\frac{2}{3}}$

Answer(a)(iii) .... [2]

(b) Solve $3x^2 - 7x - 12 = 0$.
Show your working and give your answers correct to 2 decimal places.

Answer(b) x = ... or *x =* .... [4]

(c) Simplify $\dfrac{x^2 - 25}{x^3 - 5x^2}$.

Answer(c) .... [3]

24   **(a)**   A straight line joins the points $(-1, -4)$ and $(3, 8)$.   Oct Nov 2014 Code 43

     (i)   Find the midpoint of this line.

Answer(a)(i) (...................... , ...) [2]

     (ii)   Find the equation of this line.
         Give your answer in the form $y = mx + c$.

Answer(a)(ii) $y = $ .... [3]

(b)   **(i)**   Factorise $x^2 + 3x - 10$.

Answer(b)(i) .... [2]

     (ii)   The graph of $y = x^2 + 3x - 10$ is sketched below.
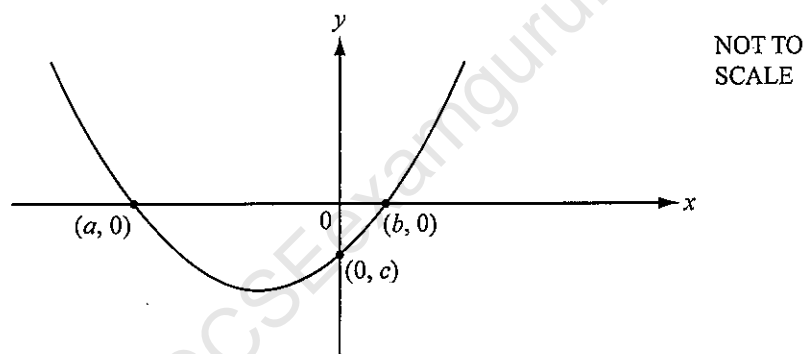
Write down the values of a, b and c.

Answer(b)(ii) $a = $ ....

$b = $ ....

$c = $ .... [3]

     (iii)   Write down the equation of the line of symmetry of the graph of $y = x^2 + 3x - 10$.

Answer(b)(iii) .... [1]

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(c) Sketch the graph of $y = 18 + 7x - x^2$ on the axes below.
Indicate clearly the values where the graph crosses the x and y axes.
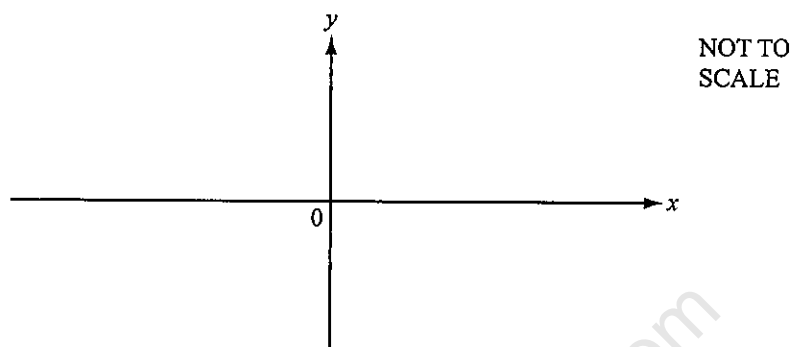
NOT TO SCALE

[4]

(d) (i) $\qquad x^2 + 12x - 7 = (x + p)^2 - q$

Find the value of p and the value of q.

Answer(d)(i) $p =$ ....

$q =$ .... [3]

(ii) Write down the minimum value of y for the graph of $y = x^2 + 12x - 7$.

Answer(d)(ii) .... [1]

25   **(a)**

$(3x - 5)$ cm

$(2x - 3)$ cm

$(15 - 2x)$ cm

$(2x + 7)$ cm
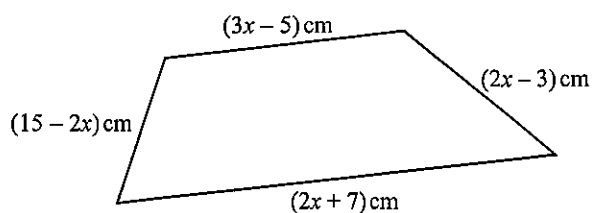
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(i)   Write an expression, in terms of x, for the perimeter of the quadrilateral.
Give your answer in its simplest form.

Answer(a)(i) .... cm [2]

(ii)   The perimeter of the quadrilateral is 32 cm.

Find the length of the longest side of the quadrilateral.

Answer(a)(ii) .... cm [3]

(b)

14 m

$(7a - 6b)\,\text{m}$

$(3b + a)\,\text{m}$

$(5a - 2b)\,\text{m}$ $(6b - a)\,\text{m}$

$a\,\text{m}$

13.5 m
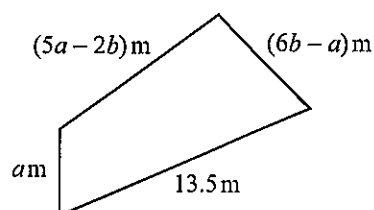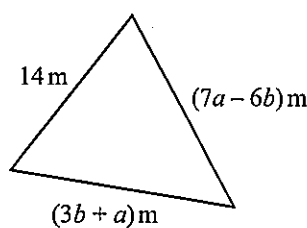
NOT TO SCALE

The triangle has a perimeter of 32.5 m.
The quadrilateral has a perimeter of 39.75 m.

Write two equations in terms of a and b and simplify them.
Use an algebraic method to find the values of a and b.
Show all your working.

Answer(b) a = ...

b = ... [6]

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26   **(a)**   Jamil, Kiera and Luther collect badges.   May June 2015 Code 41
              Jamil has x badges.
              Kiera has 12 badges more than Jamil.
              Luther has 3 times as many badges as Kiera.
              Altogether they have 123 badges.

              Form an equation and solve it to find the value of x.

Answer(a) x = ... [3]

   (b)   Find the integer values of t which satisfy the inequalities.

$$4t + 7 < 39 \leqslant 7t + 2$$

Answer(b) .... [3]

   (c)   Solve the following equations.

       (i) $\dfrac{21 - x}{x + 3} = 4$

Answer(c)(i) *x* = ... [3]

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(ii) $3x^2 + 7x - 5 = 0$

Show all your working and give your answers correct to 2 decimal places.

Answer(c)(ii) $x =$ .... or $x =$ .... [4]

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27   **(a)**   Make x the subject of the formula.   May June 2015 Code 41

$$A - x = \frac{xr}{t}$$

Answer(a) $x =$ .... [4]

(b)   Find the value of a and the value of b when $x^2 - 16x + a = (x + b)^2$.

Answer(b) $a =$ ....

$b =$ .... [3]

(c)   Write as a single fraction in its simplest form.

$$\frac{6}{x-4} - \frac{5}{3x-2}$$

Answer(c) .... [3]

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28 On the first part of a journey, Alan drove a distance of x km and his car used 6 litres of fuel.

The rate of fuel used by his car was $\dfrac{600}{x}$ litres per 100 km.

(a) Alan then drove another $(x + 20)$ km and his car used another 6 litres of fuel.

    (i) Write down an expression, in terms of x, for the rate of fuel used by his car on this part
of the journey.
Give your answer in litres per 100 km.

Answer(a)(i) .... litres per 100 km [1]

    (ii) On this part of the journey the rate of fuel used by the car **decreased** by 1.5 litres per 100 km.

Show that $x^2 + 20x - 8000 = 0$.

Answer(a)(ii)

May June 2015 Code 42

[4]

(b) Solve the equation $x^2 + 20x - 8000 = 0$.

Answer(b) x = ... or x = ... [3]

(c) Find the rate of fuel used by Alan's car for the complete journey.
Give your answer in litres per 100 km.

Answer(c) .... litres per 100 km [2]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

29   **(a)**   Expand and simplify.

$$3x(x-2) - 2x(3x-5)$$

May June 2015 Code 42

Answer(a) .... [3]

   (b)   Factorise the following completely.

       (i) $6w + 3wy - 4x - 2xy$

Answer(b)(i) .... [2]

       (ii) $4x^2 - 25y^2$

Answer(b)(ii) .... [2]

   (c)   Simplify.

$$\left(\frac{16}{9x^4}\right)^{-\frac{3}{2}}$$

Answer(c) .... [2]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

(d) n is an integer.

    (i) Explain why $2n - 1$ is an odd number.

    Answer(d)(i) ....

    .... [1]

    (ii) Write down, in terms of n, the next odd number after $2n - 1$.

    Answer(d)(ii) .... [1]

    (iii) Show that the difference between the squares of two consecutive odd numbers is a multiple of 8.

    Answer(d)(iii)

[3]

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30   **(a)**   The total surface area of a cone is given by the formula $A = \pi r l + \pi r^2$.   May June 2015 Code 43

     (i)   Find A when $r = 6.2\,$cm and $l = 10.8\,$cm.

Answer(a)(i) .... cm^2 [2]

     (ii)   Rearrange the formula to make l the subject.

Answer(a)(ii) $l = $ .... [2]

  (b)   **(i)**   Irina walks 10 km at 4 km/h and then a further 8 km at 5 km/h.

Calculate Irina's average speed for the whole journey.

Answer(b)(i) .... km/h [3]

     (ii)   Dariella walks x km at 5 km/h and then runs $(x + 4)$ km at 10 km/h.
The average speed of this journey is 7 km/h.

Find the value of x.
Show all your working.

Answer(b)(ii) $x = $ .... [5]

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(c)   **(i)**   Priyantha sells her model car for $19.80 at a profit of 20%.

Calculate the original price of the model car.

Answer(c)(i) $... [3]

(ii)   Dev sells his model car for $$x$ at a profit of y%.

Find an expression, in terms of x and y, for the original price of this model car.
Write your answer as a single fraction.

Answer(c)(ii) $... [3]

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0580/41/M/J/15

31 (a) Jamil, Kiera and Luther collect badges.
Jamil has x badges.
Kiera has 12 badges more than Jamil.
Luther has 3 times as many badges as Kiera.
Altogether they have 123 badges.

Form an equation and solve it to find the value of x.

Answer(a) $x =$ .... [3]

(b) Find the integer values of t which satisfy the inequalities.

$$4t + 7 < 39 \leqslant 7t + 2$$

Answer(b) .... [3]

(c) Solve the following equations.

(i) $\dfrac{21 - x}{x + 3} = 4$

Answer(c)(i) $x =$ .... [3]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

(ii) $3x^2 + 7x - 5 = 0$

Show all your working and give your answers correct to 2 decimal places.

Answer(c)(ii) $x = $ .... or $x = $ .... [4]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

32 **(a)** Make x the subject of the formula.

$$A - x = \frac{xr}{t}$$

Answer(a) $x =$ .... [4]

(b) Find the value of a and the value of b when $x^2 - 16x + a = (x + b)^2$.

Answer(b) $a =$ ....

$b =$ .... [3]

(c) Write as a single fraction in its simplest form.

$$\frac{6}{x - 4} - \frac{5}{3x - 2}$$

Answer(c) .... [3]

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0580/42/M/J/15

33 On the first part of a journey, Alan drove a distance of x km and his car used 6 litres of fuel.

The rate of fuel used by his car was $\dfrac{600}{x}$ litres per 100 km.

(a) Alan then drove another $(x + 20)$ km and his car used another 6 litres of fuel.

     (i) Write down an expression, in terms of x, for the rate of fuel used by his car on this part of the journey.
Give your answer in litres per 100 km.

                                    Answer(a)(i) .... litres per 100 km [1]

     (ii) On this part of the journey the rate of fuel used by the car **decreased** by 1.5 litres per 100 km.

Show that $x^2 + 20x - 8000 = 0$.

Answer(a)(ii)

                                                                         [4]

(b) Solve the equation $x^2 + 20x - 8000 = 0$.

                       Answer(b) $x =$ .... or $x =$ .... [3]

(c) Find the rate of fuel used by Alan's car for the complete journey.
Give your answer in litres per 100 km.

                                    Answer(c) .... litres per 100 km [2]

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0580/42/M/J/15

34 **(a)** Expand and simplify.

$$3x(x-2) - 2x(3x-5)$$

Answer(a) .... [3]

(b) Factorise the following completely.

    (i) $6w + 3wy - 4x - 2xy$

Answer(b)(i) .... [2]

    (ii) $4x^2 - 25y^2$

Answer(b)(ii) .... [2]

(c) Simplify.

$$\left(\frac{16}{9x^4}\right)^{-\frac{3}{2}}$$

Answer(c) .... [2]

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(d) n is an integer.

   (i) Explain why $2n - 1$ is an odd number.

   Answer(d)(i) ....

   .... [1]

  (ii) Write down, in terms of n, the next odd number after $2n - 1$.

                                     Answer(d)(ii) .... [1]

 (iii) Show that the difference between the squares of two consecutive odd numbers is a multiple of 8.

   Answer(d)(iii)

                                                                                [3]

35 **(a)** The total surface area of a cone is given by the formula $A = \pi r l + \pi r^2$.

       (i) Find A when $r = 6.2$ cm and $l = 10.8$ cm.

                          Answer(a)(i) .... cm^2 [2]

       (ii) Rearrange the formula to make l the subject.

                          Answer(a)(ii) $l =$ .... [2]

     (b) **(i)** Irina walks 10 km at 4 km/h and then a further 8 km at 5 km/h.

         Calculate Irina's average speed for the whole journey.

                          Answer(b)(i) .... km/h [3]

       (ii) Dariella walks x km at 5 km/h and then runs $(x + 4)$ km at 10 km/h.
           The average speed of this journey is 7 km/h.

           Find the value of x.
           Show all your working.

                          Answer(b)(ii) $x =$ .... [5]

(c) **(i)** Priyantha sells her model car for \$19.80 at a profit of 20%.

Calculate the original price of the model car.

Answer(c)(i) \$.. [3]

(ii) Dev sells his model car for \$$x$ at a profit of y%.

Find an expression, in terms of x and y, for the original price of this model car.
Write your answer as a single fraction.

Answer(c)(ii) \$.. [3]

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1

May June 2012 Code 41

24 cm

9 cm

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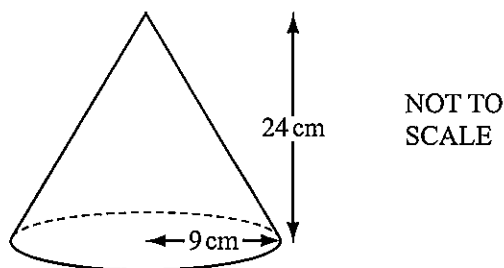
A solid metal cone has base radius 9 cm and vertical height 24 cm.

(a) Calculate the volume of the cone.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(a) .... cm^3 [2]

(b)

16 cm

9 cm

NOT TO SCALE
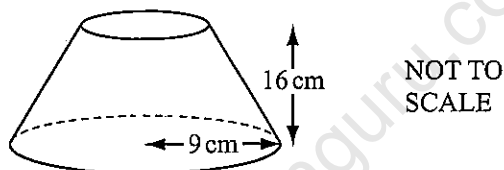
A cone of height 8 cm is removed by cutting parallel to the base, leaving the solid shown above.
Show that the volume of this solid rounds to 1960 cm^3, correct to 3 significant figures.

Answer (b)

[4]

(c) The 1960 cm^3 of metal in the solid in **part (b)** is melted and made into 5 identical cylinders, each of length 15 cm.
Show that the radius of each cylinder rounds to 2.9 cm, correct to 1 decimal place.

Answer (c)

[4]

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2

NOT TO SCALE
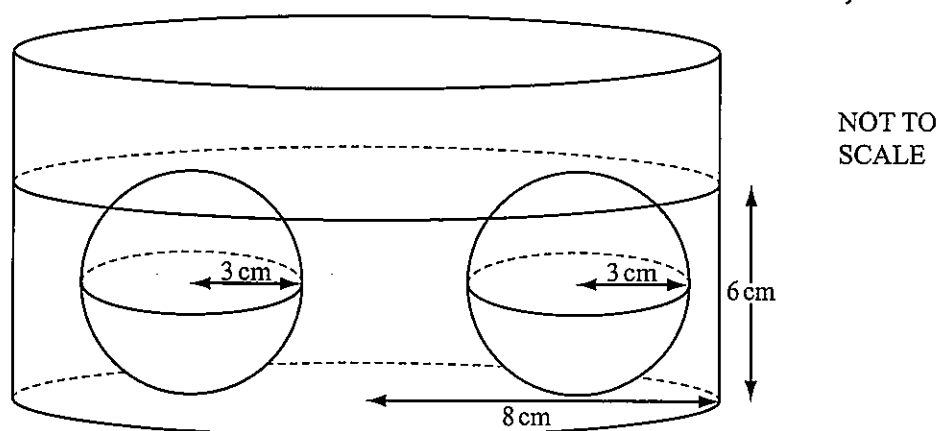
The diagram shows two solid spheres of radius 3 cm lying on the base of a cylinder of radius 8 cm.

Liquid is poured into the cylinder until the spheres are just covered.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

(a) Calculate the volume of liquid in the cylinder in

(i) cm³,

Answer(a)(i) .... cm³ [4]

(ii) litres.

Answer(a)(ii) .... litres [1]

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(b) One cubic centimetre of the liquid has a mass of 1.22 grams.

Calculate the mass of the liquid in the cylinder.

Give your answer in kilograms.

Answer(b) .... kg [2]

(c) The spheres are removed from the cylinder.

Calculate the new height of the liquid in the cylinder.

Answer(c) .... cm [2]

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3   (a)
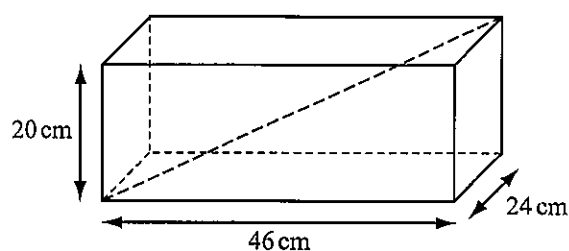
Oct Nov 2012 Code 41
NOT TO
SCALE

Jose has a fish tank in the shape of a cuboid measuring 46 cm by 24 cm by 20 cm.

Calculate the length of the diagonal shown in the diagram.

Answer(a) .... cm   [3]

(b) Maria has a fish tank with a volume of 20 000 cm³.

Write the volume of Maria's fish tank as a percentage of the volume of Jose's fish tank.

Answer(b) .... %   [3]

(c) Lorenzo's fish tank is mathematically similar to Jose's and double the volume.

Calculate the dimensions of Lorenzo's fish tank.

Answer(c) .... cm by .... cm by .... cm   [3]

(d) A sphere has a volume of 20 000 cm³. Calculate its radius.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

Answer(d) .... cm   [3]

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4   A metal cuboid has a volume of $1080\,cm^3$ and a mass of 8 kg.   Oct Nov 2012 Code 43

     (a) Calculate the mass of one cubic centimetre of the metal.
           Give your answer in grams.

Answer(a) .... g [1]

     (b) The base of the cuboid measures 12 cm by 10 cm.

           Calculate the height of the cuboid.

Answer(b) .... cm [2]

     (c) The cuboid is melted down and made into a sphere with radius r cm.

           (i) Calculate the value of r.

              [The volume, V, of a sphere with radius r is $V = \dfrac{4}{3}\pi r^3$.]

Answer(c)(i) $r =$ .... [3]

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(ii) Calculate the surface area of the sphere.

[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

Answer(c)(ii) .... cm^2 [2]

(d) A larger sphere has a radius R cm.
The surface area of this sphere is double the surface area of the sphere with radius r cm in
part (c).

Find the value of $\dfrac{R}{r}$.

Answer(d) .... [2]

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5   **(a)**
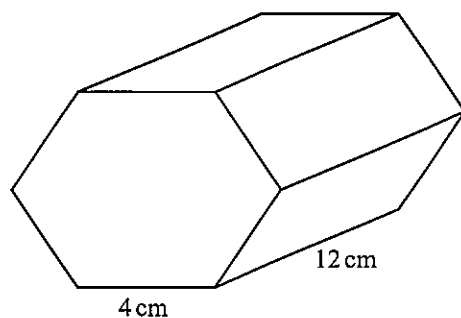
May June 2013 Code 42

NOT TO
SCALE

12 cm

4 cm

The diagram shows a prism of length 12 cm.
The cross section is a regular hexagon of side 4 cm.

Calculate the total surface area of the prism.

Answer(a) .... cm² [4]

(b) Water ows through a cylindrical pipe of radius 0.74 cm.
It lls a 12 litre bucket in 4 minutes.

   (i) Calculate the speed of the water through the pipe in centimetres per minute.

Answer(b)(i) .... cm/min [4]

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(ii) When the 12 litre bucket is emptied into a circular pool, the water level rises by 5 **millimetres**.

Calculate the radius of the pool correct to the nearest centimetre.

Answer(b)(ii) .... cm   [5]

6

Oct Nov 2013 Code 41

NOT TO
SCALE

13 cm

h

5 cm
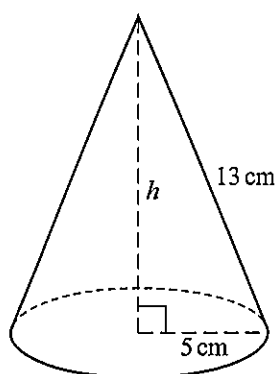
(a) The diagram shows a cone of radius 5 cm and slant height 13 cm.

    (i) Calculate the curved surface area of the cone.
    [The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

                                                      Answer(a)(i) .... cm² [2]

    (ii) Calculate the perpendicular height, h, of the cone.

                                              Answer(a)(ii) $h =$ .... cm [3]

    (iii) Calculate the volume of the cone.
    [The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

                                              Answer(a)(iii) .... cm³ [2]

    (iv) Write your answer to **part (a)(iii)** in cubic metres.
    Give your answer in standard form.

                                              Answer(a)(iv) .... m³ [2]

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(b)
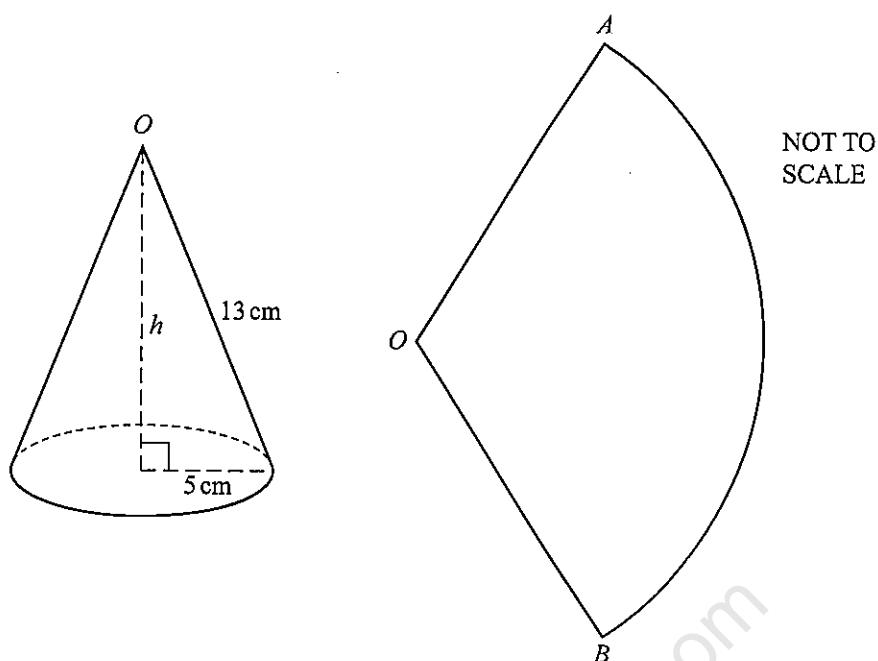
NOT TO
SCALE

The cone is now cut along a slant height and it opens out to make the sector *AOB* of a circle.

Calculate angle *AOB*.

Answer(b) Angle *AOB* = ... [4]

7
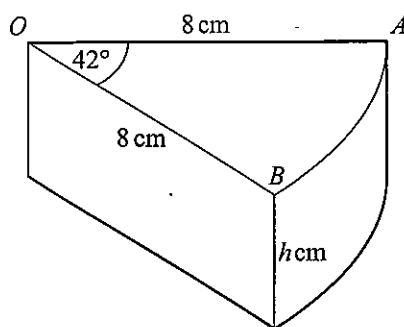
NOT TO SCALE

Oct Nov 2013 Code 42

A wedge of cheese in the shape of a prism is cut from a cylinder of cheese of height h cm.
The radius of the cylinder, OA, is 8 cm and the angle $AOB = 42°$.

(a) (i) The volume of the wedge of cheese is 90 cm^3.

Show that the value of h is 3.84 cm correct to 2 decimal places.

Answer(a)(i)

[4]

(ii) Calculate the **total** surface area of the wedge of cheese.

Answer(a)(ii) .... cm^2 [5]

(b) A mathematically similar wedge of cheese has a volume of 22.5 cm^3.

Calculate the height of this wedge.

Answer(b) .... cm [3]

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8   Sandra has designed this open container.   Oct Nov 2013 Code 43
         The height of the container is 35 cm.

NOT TO
SCALE

35 cm
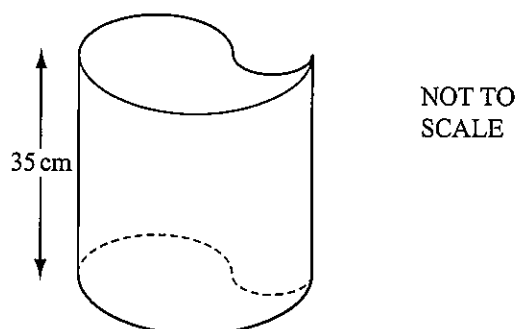
The cross section of the container is designed from three semi-circles with diameters 17.5 cm, 6.5 cm and 24 cm.

17.5 cm   6.5 cm   NOT TO
                                          SCALE
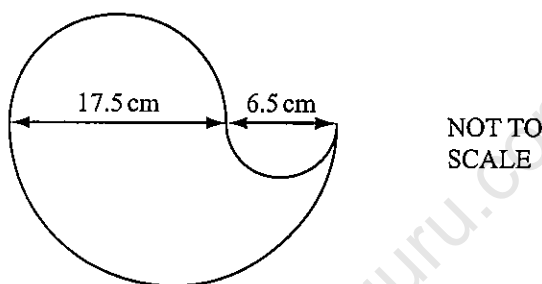
(a) Calculate the area of the cross section of the container.

Answer(a) .... cm² [3]

(b) Calculate the external surface area of the container, including the base.

Answer(b) .... cm² [4]

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(c) The container has a height of 35 cm.

Calculate the capacity of the container.
Give your answer in litres.

Answer(c) .... litres [3]

(d) Sandra's container is completely lled with water.
All the water is then poured into another container in the shape of a cone.
The cone has radius 20 cm and height 40 cm.
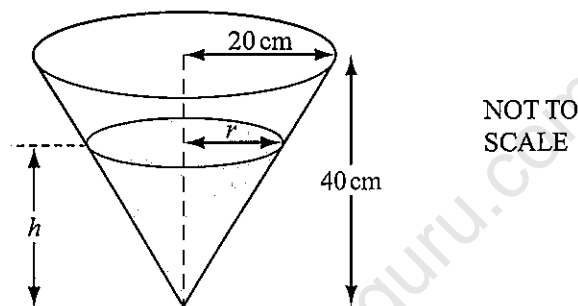
(i) The diagram shows the water in the cone.

Show that $r = \dfrac{h}{2}$.

Answer(d)(i)

[1]

(ii) Find the height, h, of the water in the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(d)(ii) $h =$ .... cm [3]

9

May June 2014 Code 42

NOT TO
SCALE
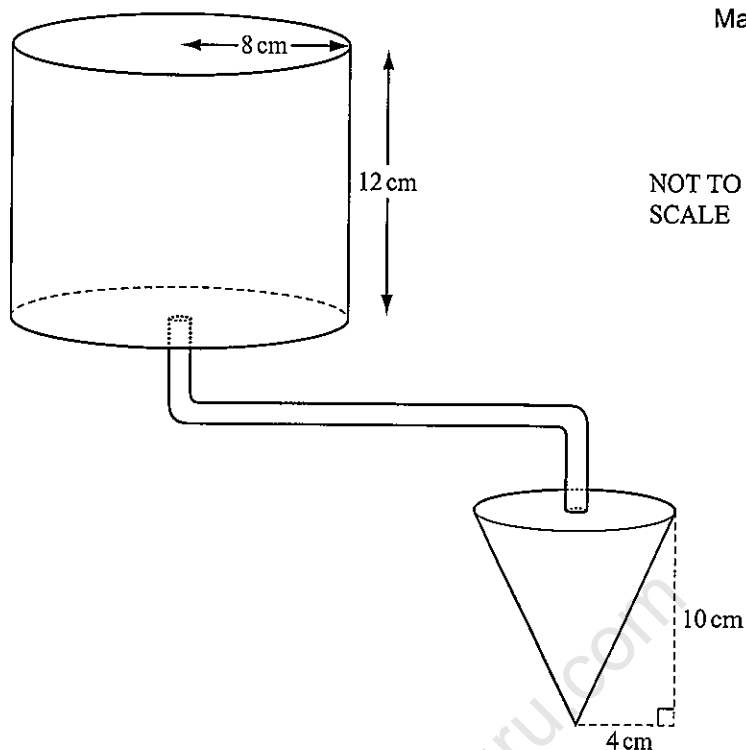
The diagram shows a cylinder with radius 8 cm and height 12 cm which is full of water.
A pipe connects the cylinder to a cone.
The cone has radius 4 cm and height 10 cm.

(a) (i) Calculate the volume of water in the cylinder.
Show that it rounds to 2410 cm^3 correct to 3 signi cant gures.

Answer(a)(i)

[2]

(ii) Change 2410 cm^3 into litres.

Answer(a)(ii) .... litres [1]

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(b) Water ows from the cylinder along the pipe into the cone at a rate of $2\,\text{cm}^3$ per second.

Calculate the time taken to ll the empty cone.
Give your answer in minutes and seconds correct to the nearest second.

[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

Answer(b) .... min .... s [4]

(c) Find the number of empty cones which can be lled completely from the full cylinder.

Answer(c) .... [3]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

10 **(a)**

8 cm

r cm
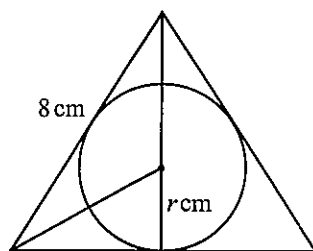
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The three sides of an equilateral triangle are tangents to a circle of radius *r* cm.
The sides of the triangle are 8 cm long.

Calculate the value of *r*.
Show that it rounds to 2.3, correct to 1 decimal place.

Answer(a)

[3]

(b)

8 cm
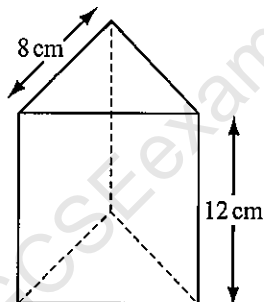
NOT TO
SCALE

12 cm

The diagram shows a box in the shape of a triangular prism of height 12 cm.
The cross section is an equilateral triangle of side 8 cm.

Calculate the volume of the box.

Answer(b) .... cm³ [4]

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(c) The box contains biscuits.
Each biscuit is a cylinder of radius 2.3 centimetres and height 4 millimetres.

Calculate

   (i)   the largest number of biscuits that can be placed in the box,

Answer(c)(i) .... [3]

   (ii)   the volume of one biscuit in cubic centimetres,

Answer(c)(ii) .... cm^3 [2]

   (iii)   the percentage of the volume of the box **not** lled with biscuits.

Answer(c)(iii) .... % [3]

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11
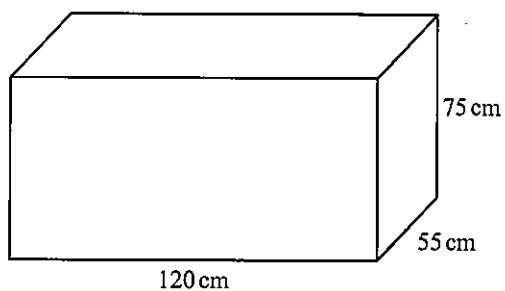
NOT TO
SCALE

75 cm

55 cm

120 cm

Oct Nov 2014 Code 42

The diagram shows a water tank in the shape of a cuboid measuring 120 cm by 55 cm by 75 cm.
The tank is lled completely with water.

(a) Show that the capacity of the water tank is 495 litres.

Answer(a)

[2]

(b) (i) The water from the tank ows into an empty cylinder at a uniform rate of 750 millilitres per second.

Calculate the length of time, in minutes, for the water to be completely emptied from the tank.

Answer(b)(i) .... min [2]

(ii) When the tank is completely empty, the height of the water in the cylinder is 112 cm.

NOT TO
SCALE

112 cm
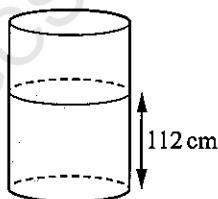
Calculate the radius of the cylinder.

Answer(b)(ii) .... cm [3]

(c)
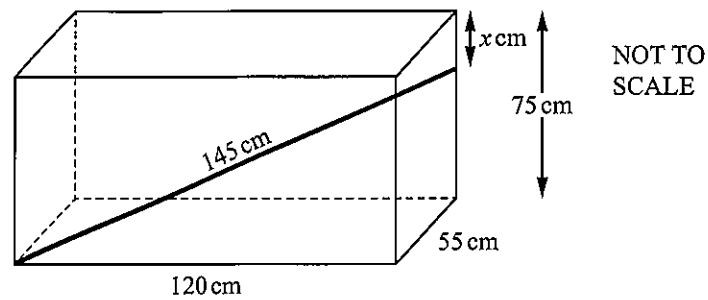
A rod of length 145 cm is placed inside the water tank.
One end of the rod is in the bottom corner of the tank as shown.
The other end of the rod is x cm below the top corner of the tank as shown.

Calculate the value of x.

Answer(c) x = ... [4]

(d) Calculate the angle that the rod makes with the base of the tank.

Answer(d) .... [3]

12 **(a)** A sector of a circle has radius 12 cm and an angle of 135°.   May June 2015 Code 42

     (i) Calculate the length of the arc of this sector.
        Give your answer as a multiple of π.
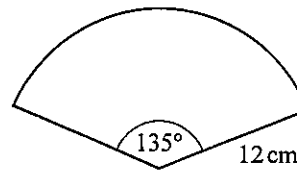
        NOT TO SCALE

        135°   12 cm

Answer(a)(i) .... cm [2]

     (ii) The sector is used to make a cone.

        (a) Calculate the base radius, *r*.

        NOT TO SCALE

        h   12 cm   *r*
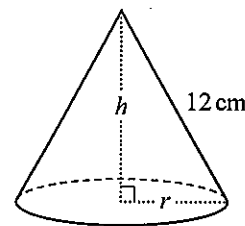
Answer(a)(ii)(a) *r* = ... cm [2]

        (b) Calculate the height of the cone, *h*.

Answer(a)(ii)(b) *h* = ... cm [3]

(b) The diagram shows a plant pot.
    It is made by removing a small cone from a larger cone and adding a circular base.

        NOT TO SCALE

13   This is the cross section of the plant pot.

        (i) Find *l*.

NOT TO
SCALE

Answer(b)(i) *l* = ... cm [3]

        (ii) Calculate the total surface area of the outside of the plant pot.
             [The curved surface area, *A*, of a cone with radius *r* and slant height *l* is $A = \pi r l$.]

Answer(b)(ii) .... cm² [3]

    (c) Some cones are mathematically similar.
         For these cones, the mass, *M* grams, is proportional to the cube of the base radius, *r* cm.
         One of the cones has mass 1458 grams and base radius 4.5 cm.

        (i) Find an expression for *M* in terms of *r*.

Answer(c)(i) *M* = ... [2]

        (ii) Two of the cones have radii in the ratio 2 : 3.

            Write down the ratio of their masses.

Answer(c)(ii) .... : .... [1]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

14   **(a)**   A cylindrical tank contains $180\,000\,cm^3$ of water.
The radius of the tank is 45 cm.

Calculate the height of water in the tank.

45 cm

NOT TO
SCALE

May June 2015 Code 43

Answer(a) .... cm [2]

(b)

D   C   NOT TO
70 cm   SCALE
40 cm
                150 cm
A   50 cm   B

The diagram shows an empty tank in the shape of a horizontal prism of length 150 cm.
The cross section of the prism is an isosceles trapezium *ABCD*.
AB = 50 cm, *CD* = 70 cm and the vertical height of the trapezium is 40 cm.

   (i)   Calculate the volume of the tank.

Answer(b)(i) .... cm^3 [3]

   (ii)   Write your answer to **part (b)(i)** in litres.

Answer(b)(ii) .... litres [1]

   (c)   The $180\,000\,cm^3$ of water flows from the tank in **part (a)** into the tank in **part (b)** at a rate of $15\,cm^3/s$.

Calculate the time this takes.
Give your answer in hours and minutes.

Answer(c) .... h .... min [3]

(d)

The $180\,000\,\text{cm}^3$ of water reaches the level EF as shown above.
$EF = x\,\text{cm}$ and the height of the water is $h\,\text{cm}$.

(i) Using the properties of similar triangles, show that $h = 2(x - 50)$.

Answer(d)(i)

[2]

(ii) Using $h = 2(x - 50)$, show that the shaded area, in cm^2, is $x^2 - 2500$.

Answer(d)(ii)

[1]

(iii) Find the value of x.

Answer(d)(iii) $x =$ .... [2]

(iv) Find the value of h.

Answer(d)(iv) $h =$ .... [1]

1   **(a)**   May June 2012 Code 42

NOT TO SCALE
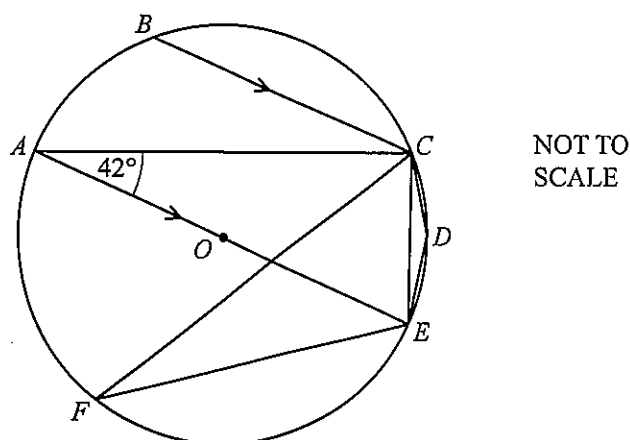
A, B, C, D, E and F are points on the circumference of a circle centre O.
AE is a diameter of the circle.
BC is parallel to AE and angle $CAE = 42°$.

Giving a reason for each answer, find

(i)   angle BCA,

     Answer(a)(i) Angle $BCA =$ ....

     Reason .... [2]

(ii)   angle ACE,

     Answer(a)(ii) Angle $ACE =$ ....

     Reason .... [2]

(iii)   angle CFE,

     Answer(a)(iii) Angle $CFE =$ ....

     Reason .... [2]

(iv)   angle CDE.

     Answer(a)(iv) Angle $CDE =$ ....

     Reason .... [2]

(b)
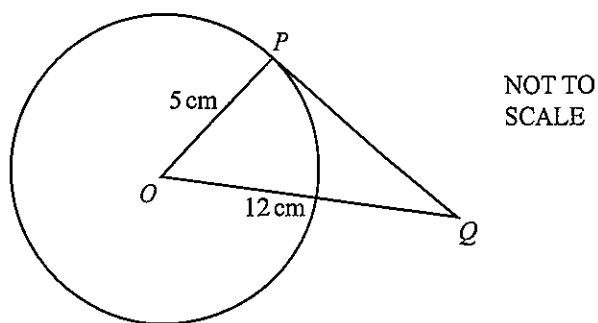
In the diagram, O is the centre of the circle and PQ is a tangent to the circle at P.
$OP = 5$ cm and $OQ = 12$ cm.

Calculate PQ.

Answer(b) PQ = ... cm [3]

(c)

NOT TO
SCALE
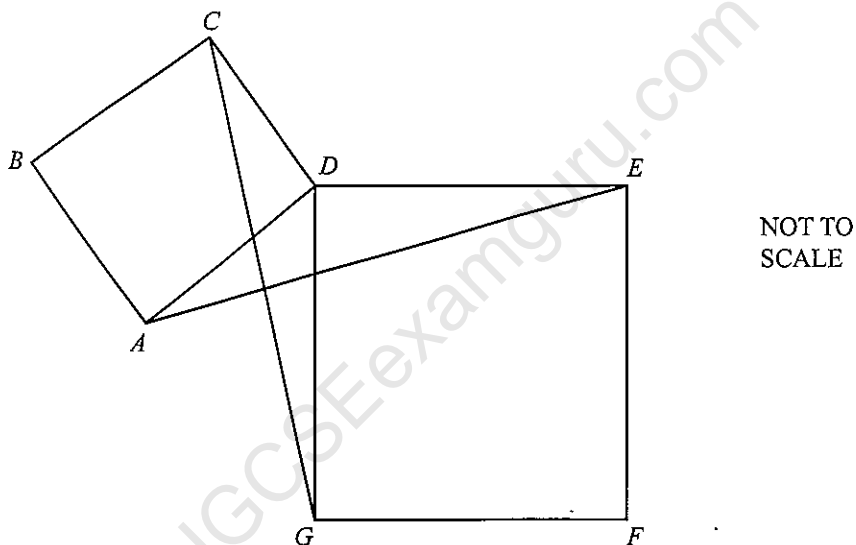
In the diagram, $ABCD$ and $DEFG$ are squares.

(i) In the triangles CDG and ADE, explain with a reason which sides and/or angles are equal.

Answer (c)(i)

[3]

(ii) Complete the following statement.

Triangle CDG is .... to triangle ADE.   [1]

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2

May June 2012 Code 42
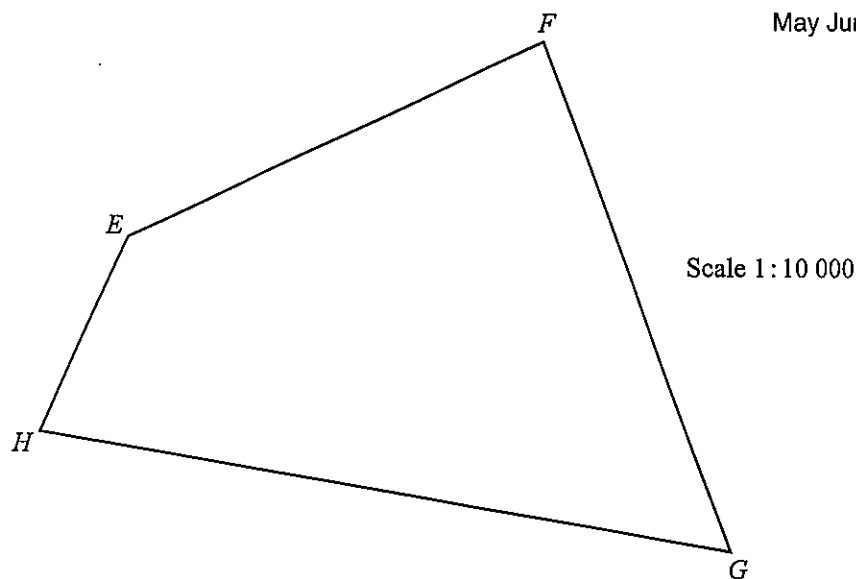
Scale 1 : 10 000

The diagram is a scale drawing of a park *EFGH*. The scale is 1 : 10 000.

A statue is to be placed in the park so that it is

- nearer to *G* than to *H*

- nearer to *HG* than to *FG*

- more than 550 metres from *F*.

Construct accurately the boundaries of the region *R* in which the statue can be placed.

Leave in all your construction arcs and shade the region *R*.   [7]

3   **(a)**   Calculate the area of a circle with radius 12 cm.   May June 2012 Code 42

Answer(a) .... cm² [2]

(b)

22°

7 cm
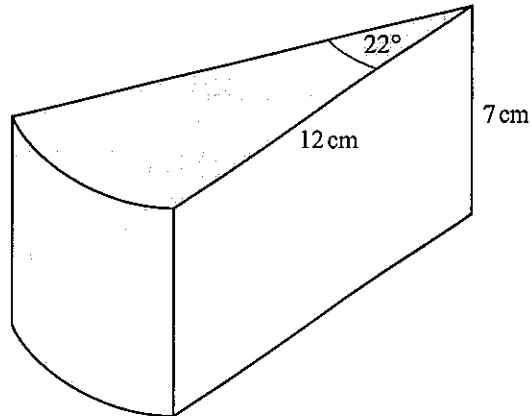
12 cm

NOT TO
SCALE

A circular cake has radius 12 cm and height 7 cm.
The uniform cross-section of a slice of the cake is a sector with angle 22°.
The top and the curved surface of the slice, shaded in the diagram, are covered with chocolate.

Calculate the area of the slice which is covered with chocolate.

Answer(b) .... cm² [5]

4   **(a)**   May June 2012 Code 43

NOT TO SCALE
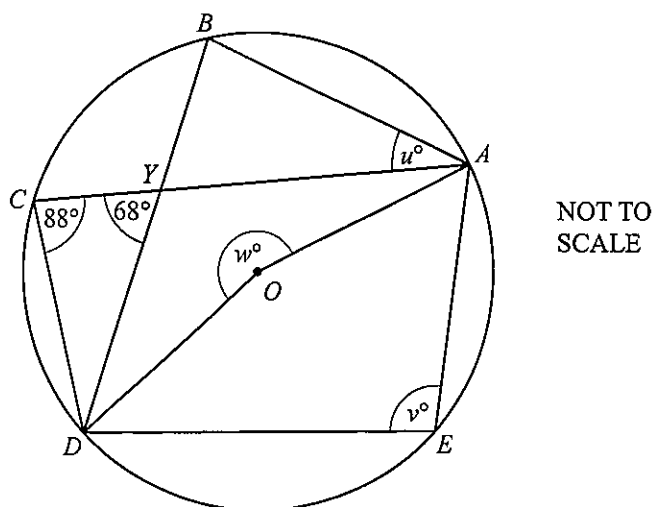
A, B, C, D and E lie on the circle, centre O.
CA and BD intersect at Y.
Angle $DCA = 88°$ and angle $CYD = 68°$.
Angle $BAC = u°$, angle $AED = v°$ and reflex angle $AOD = w°$.

Calculate the values of u, v and w.

Answer(a) u = ...

v = ...

w = ...   [4]

(b)
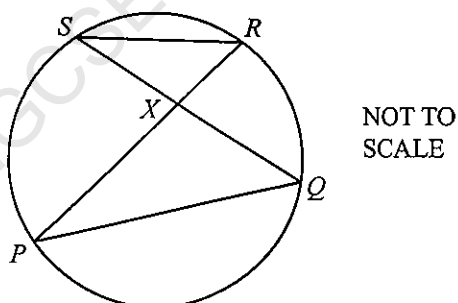
NOT TO SCALE

P, Q, R and S lie on the circle. PR and QS intersect at X.
The area of triangle $RSX = 1.2\,cm^2$ and $PX = 3\,SX$.

Calculate the area of triangle PQX.

Answer(b) .... cm^2 [2]

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(c)
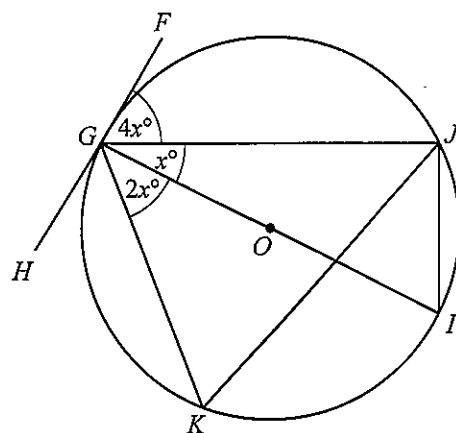
NOT TO SCALE

GI is a diameter of the circle.
FGH is a tangent to the circle at *G*.
J and *K* also lie on the circle.
Angle $JGI = x°$, angle $FGJ = 4x°$ and angle $KGI = 2x°$.

Find

(i) the value of x,

Answer(c)(i) $x =$ .... [2]

(ii) the size of angle *JKG*,

Answer(c)(ii) Angle *JKG* = ... [2]

(iii) the size of angle *GJK*.

Answer(c)(iii) Angle *GJK* = ... [1]

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5

Oct Nov 2012 Code 41
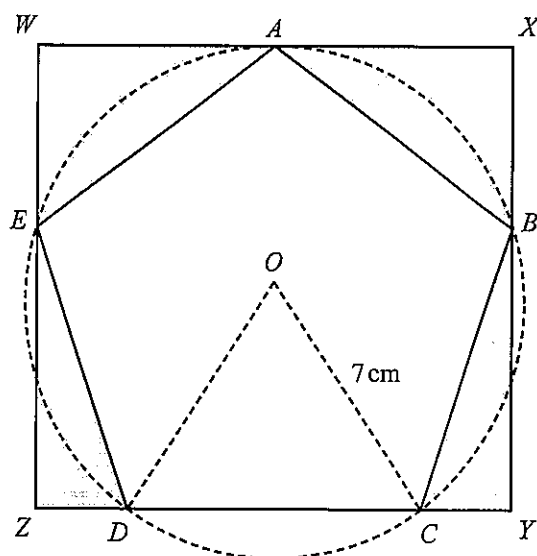
NOT TO
SCALE

The vertices A, B, C, D and E of a regular pentagon lie on the circumference of a circle, centre O, radius 7 cm.
They also lie on the sides of a rectangle $WXYZ$.

(a) Show that

    (i) angle $DOC = 72°$,

    Answer(a)(i)

    (ii) angle $DCB = 108°$,

    Answer(a)(ii)

    (iii) angle $CBY = 18°$.

    Answer(a)(iii)

(b) Show that the length CD of one side of the pentagon is 8.23 cm correct to three significant figures.

Answer(b)

[3]

(c) Calculate

    (i) the area of the triangle DOC,

                                                              Answer(c)(i) .... cm^2 [2]

    (ii) the area of the pentagon $ABCDE$,

                                                              Answer(c)(ii) .... cm^2 [1]

    (iii) the area of the sector ODC,

                                                             Answer(c)(iii) .... cm^2 [2]

    (iv) the length XY.

                                                              Answer(c)(iv) .... cm [2]

(d) Calculate the ratio

        area of the pentagon $ABCDE$: area of the rectangle $WXYZ$.

Give your answer in the form $1 : n$.

                                                      Answer(d) 1 : .... [5]

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6   **(a)**   Oct Nov 2012 Code 42
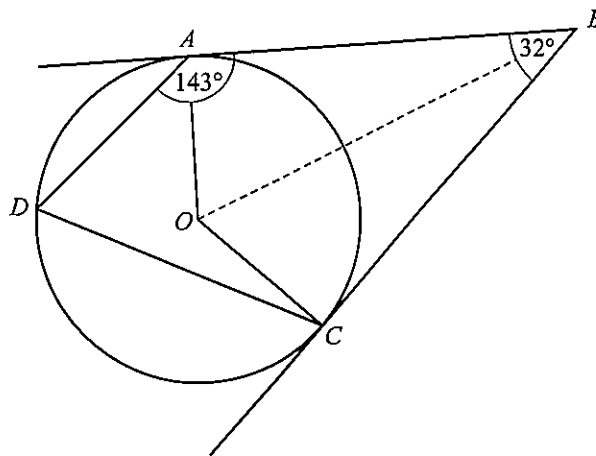
NOT TO SCALE

Points A, C and D lie on a circle centre O.
BA and BC are tangents to the circle.
Angle $ABC = 32°$ and angle $DAB = 143°$.

  (i)   Calculate angle AOC in quadrilateral $AOCB$.

Answer(a)(i) Angle $AOC =$ .... [2]

  (ii)   Calculate angle ADC.

Answer(a)(ii) Angle $ADC =$ .... [1]

  (iii)   Calculate angle OCD.

Answer(a)(iii) Angle $OCD =$ .... [2]

  (iv) $OA = 6\,$cm.

       Calculate the length of AB.

Answer(a)(iv) $AB =$ .... cm [3]

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(b)
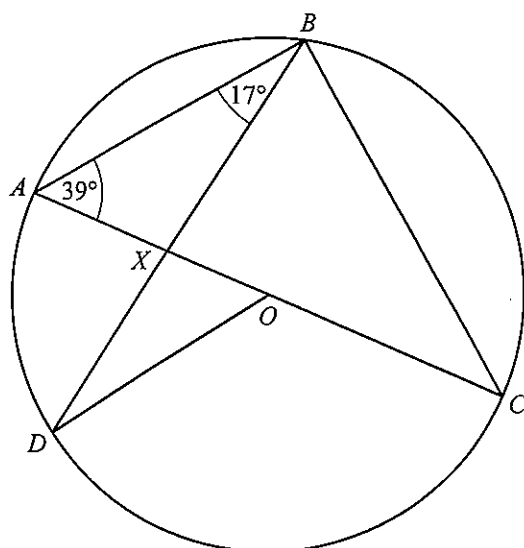
NOT TO SCALE

A, B, C and D are on the circumference of the circle centre O.
AC is a diameter.
Angle $CAB = 39°$ and angle $ABD = 17°$.

(i) Calculate angle ACB.

Answer(b)(i) Angle $ACB =$ .... [2]

(ii) Calculate angle BXC.

Answer(b)(ii) Angle $BXC =$ .... [2]

(iii) Give the reason why angle DOA is 34°.

Answer(b)(iii) .... [1]

(iv) Calculate angle BDO.

Answer(b)(iv) Angle $BDO =$ .... [1]

(v) The radius of the circle is 12 cm. Calculate the length of major arc $ABCD$.

Answer(b)(v) Arc $ABCD =$ .... cm [3]

7   **(a)**

Oct Nov 2012 Code 43
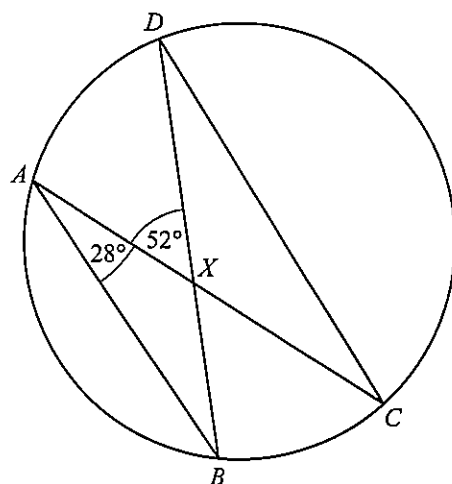
NOT TO
SCALE

A, B, C and D lie on a circle.
The chords AC and BD intersect at X.
Angle $BAC = 28°$ and angle $AXD = 52°$.
Calculate angle XCD.

*Answer(a)*Angle $XCD =$ .... [3]

(b)
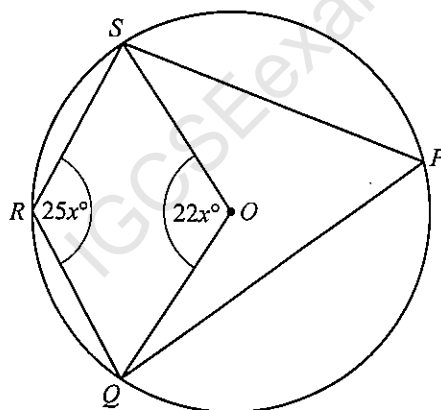
NOT TO
SCALE

$PQRS$ is a cyclic quadrilateral in the circle, centre O.
Angle $QOS = 22x°$ and angle $QRS = 25x°$.
Find the value of x.

Answer(b) $x =$ .... [3]

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(c)
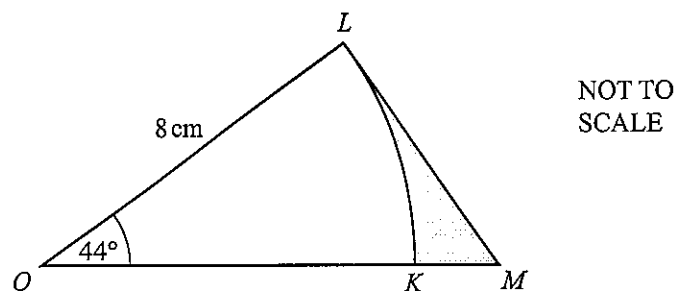
In the diagram OKL is a sector of a circle, centre O and radius 8 cm.
OKM is a straight line and ML is a tangent to the circle at L.
Angle $LOK = 44°$.

Calculate the area shaded in the diagram.

Answer(c) .... cm^2 [5]

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8 **(a)**
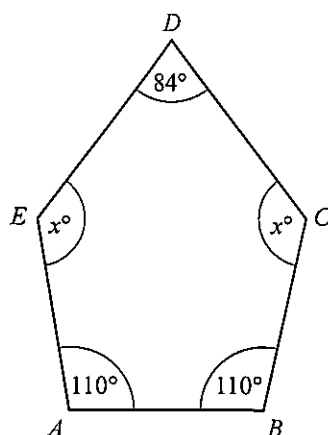
NOT TO
SCALE

In the pentagon $ABCDE$, angle EAB = angle ABC = 110° and angle CDE = 84°.
Angle BCD = angle $DEA = x°$.

(i) Calculate the value of x.

Answer(a)(i) $x =$ .... [2]

(ii) $BC = CD$.
Calculate angle CBD.

Answer(a)(ii) Angle $CBD =$ .... [1]

(iii) This pentagon also has one line of symmetry.
Calculate angle ADB.

Answer(a)(iii) Angle $ADB =$ .... [1]

(b) A, B and C lie on a circle centre O.
Angle $AOC = 3y°$ and angle $ABC = (4y + 4)°$.

Find the value of y.

NOT TO
SCALE

Answer(b) $y =$ .... [4]

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(c)
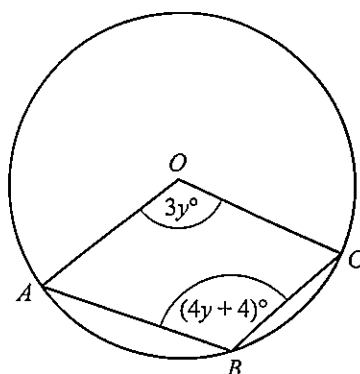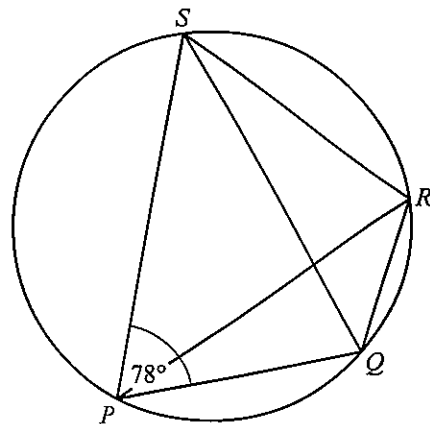
NOT TO
SCALE

In the cyclic quadrilateral *PQRS*, angle *SPQ* = 78°.

(i) Write down the geometrical reason why angle *QRS* = 102°.

Answer(c)(i) .... [1]

(ii) Angle *PRQ* : Angle *PRS* = 1 : 2.

Calculate angle *PQS*.

Answer(c)(ii) Angle *PQS* = ... [3]

(d)
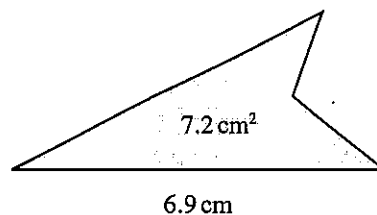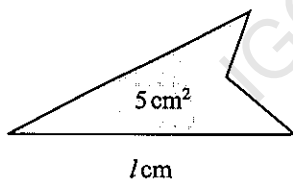
NOT TO
SCALE

The diagram shows two similar ﬁgures.
The areas of the ﬁgures are 5 cm² and 7.2 cm².
The lengths of the bases are *l* cm and 6.9 cm.

Calculate the value of *l*.

Answer(d) *l* = ... [3]

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9
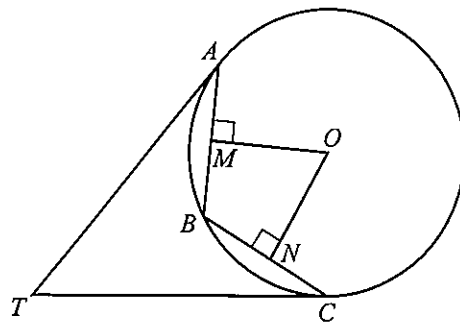
NOT TO
SCALE

A, B and *C* lie on the circle centre *O*, radius 8.5 cm.
AB = BC = 10.7 cm.
OM is perpendicular to *AB* and *ON* is perpendicular to *BC*.

(a) Calculate the area of the circle.

Answer(a) .... cm² [2]

(b) Write down the length of *MB*.

Answer(b) .... cm [1]

(c) Calculate angle *MOB* and show that it rounds to 39° correct to the nearest degree.

Answer(c)

[2]

(d) Using angle *MOB* = 39°, calculate the length of the **major** arc *AC*.

Answer(d) .... cm [3]

(e) The tangents to the circle at *A* and at *C* meet at *T*.

Explain clearly why triangle *ATB* is congruent to triangle *CTB*.

Answer(e)

[3]

10   Sidney draws the triangle OP_1P_2.
$OP_1 = 3$ cm and $P_1P_2 = 1$ cm.
Angle $OP_1P_2 = 90°$.

NOT TO SCALE

O

3 cm

P_1 1 cm P_2
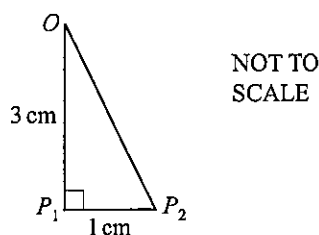
May June 2013 Code 42

(a)   Show that $OP_2 = \sqrt{10}$ cm.

Answer(a)

[1]

(b)   Sidney now draws the lines P_2P_3 and OP_3.
Triangle OP_2P_3 is mathematically similar
to triangle OP_1P_2.

NOT TO SCALE

O

3 cm

P_1 1 cm P_2 P_3
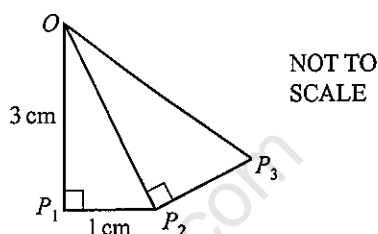
(i)   Write down the length of P_2P_3 in the form $\dfrac{\sqrt{a}}{b}$ where a and b are integers.

Answer(b)(i) $P_2P_3 =$ .... cm [1]

(ii)   Calculate the length of OP_3 giving your answer in the form $\dfrac{c}{d}$ where c and d are integers.

Answer(b)(ii) $OP_3 =$ .... cm [2]

(c)   Sidney continues to add
mathematically similar triangles
to his drawing.

Find the length of OP_5.

NOT TO SCALE

P_5

O

3 cm

P_4

P_3

P_1 1 cm P_2

Answer(c) $OP_5 =$ .... cm [2]

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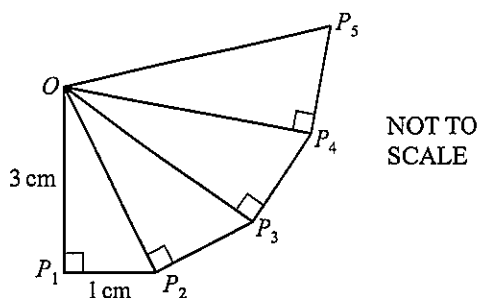
(d) (i) Show that angle $P_1OP_2 = 18.4°$, correct to 1 decimal place.

Answer(d)(i)

[2]

(ii) Write down the size of angle P_2OP_3.

Answer(d)(ii) Angle P_2OP_3 = ... [1]

(iii) The last triangle Sidney can draw without covering his first triangle is triangle $OP_{(n-1)}P_n$.
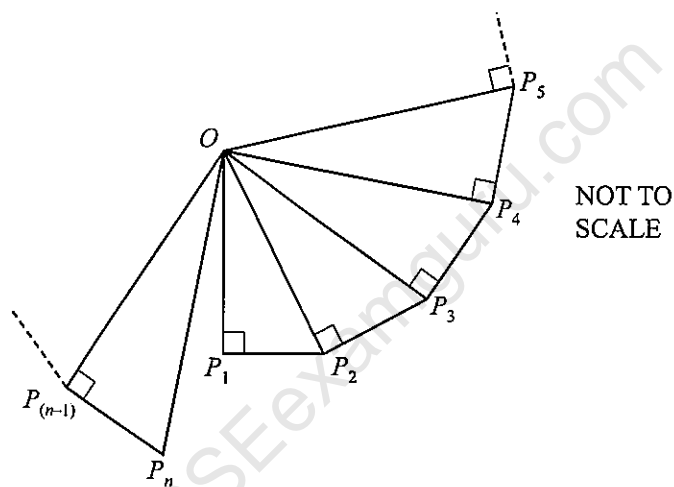
Calculate the value of n.

Answer(d)(iii) n = ... [3]

11   **(a)**   **In this question show all your construction arcs and use only a ruler and compasses to draw the boundaries of your region.**

This scale drawing shows the positions of four towns, *P*, *Q*, *R* and *S*, on a map where 1 cm represents 10 km.

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Scale: 1 cm to 10 km
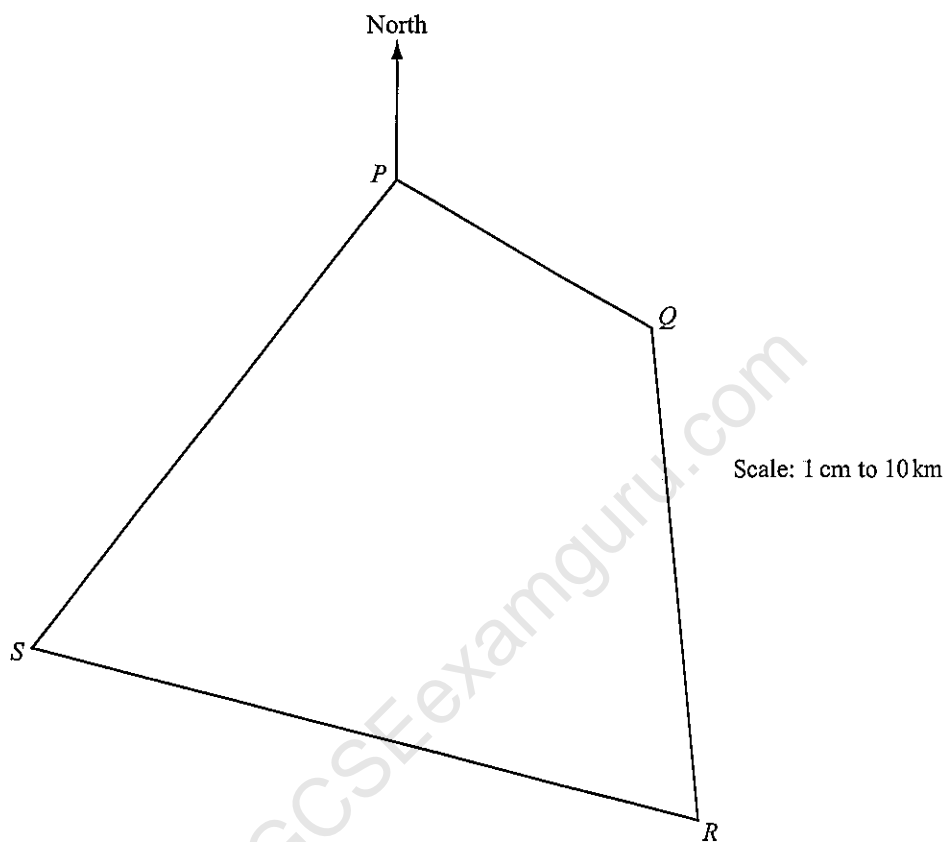
A nature reserve lies in the quadrilateral *PQRS*.
The boundaries of the nature reserve are:

- equidistant from *Q* and from *R*
- equidistant from *PS* and from *PQ*
- 60 km from *R*
- along *QR*.

(i)   Shade the region which represents the nature reserve.   [7]

(ii)   Measure the bearing of *S* from *P*.

Answer(a)(ii) .... [1]

(b) A circular lake in the nature reserve has a radius of 45 m.

    (i) Calculate the area of the lake.

Answer(b)(i) .... m² [2]

(ii)
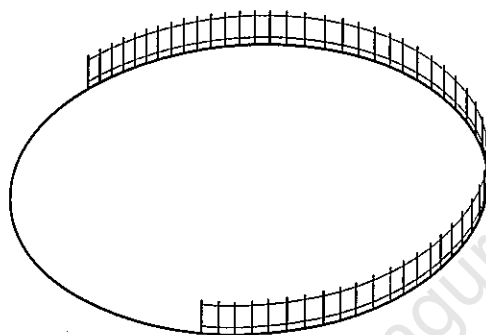
NOT TO
SCALE

A fence is placed along part of the circumference of the lake.
This arc subtends an angle of 210° at the centre of the circle.

Calculate the length of the fence.

Answer(b)(ii) .... m [2]

12 **(a)**

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NOT TO SCALE
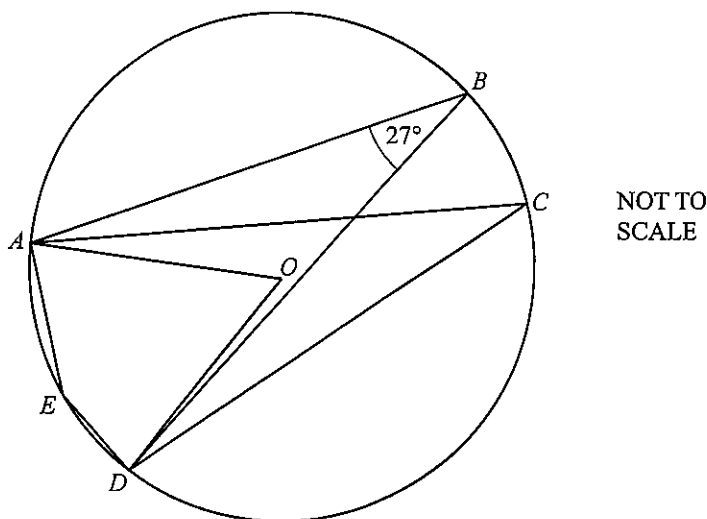
A, *B*, *C*, *D* and *E* are points on the circle centre *O*.
Angle *ABD* = 27°.

Find

(i)   angle *ACD*,

Answer(a)(i) Angle *ACD* = ... [1]

(ii)   angle *AOD*,

Answer(a)(ii) Angle *AOD* = ... [1]

(iii)   angle *AED*.

Answer(a)(iii) Angle *AED* = ... [1]

(b)

NOT TO SCALE
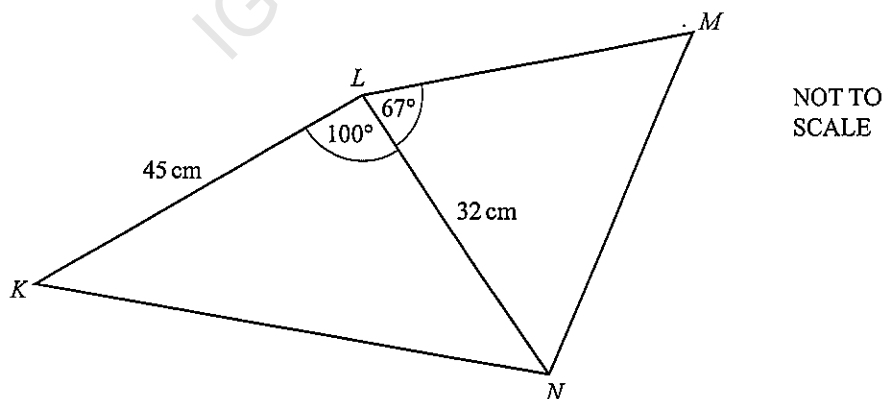
The diagram shows quadrilateral *KLMN*.
KL = 45 cm, *LN* = 32 cm, angle *KLN* = 100° and angle *NLM* = 67°.

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(i) Calculate the length *KN*.

Answer(b)(i) *KN* = ... cm [4]

(ii) The area of triangle *LMN* is 324 cm².

Calculate the length *LM*.

Answer(b)(ii) *LM* = ... cm [3]

(iii) Another triangle *XYZ* is mathematically similar to triangle *LMN*.
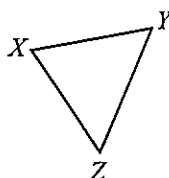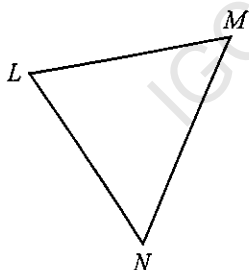
XZ = 16 cm and the area of triangle *LMN* is 324 cm².

Calculate the area of triangle *XYZ*.

Answer(b)(iii) .... cm² [2]

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13
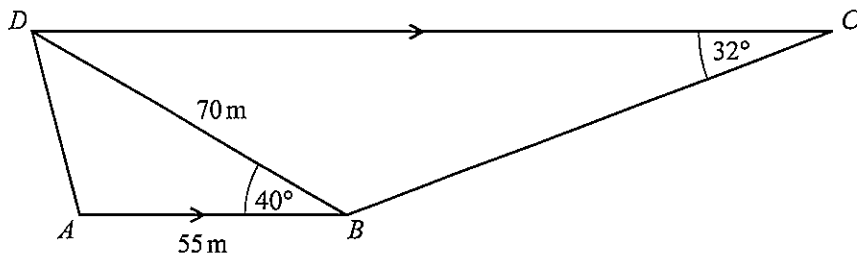
NOT TO
SCALE

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The diagram shows a school playground $ABCD$.
$ABCD$ is a trapezium.
$AB = 55\,\text{m}$, $BD = 70\,\text{m}$, angle $ABD = 40°$ and angle $BCD = 32°$.

(a) Calculate AD.

Answer(a) AD = ... m [4]

(b) Calculate BC.

Answer(b) BC = ... m [4]

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(c) (i)   Calculate the area of the playground *ABCD*.

Answer(c)(i) .... m² [3]

(ii)   An accurate plan of the school playground is to be drawn to a scale of 1:200 .

Calculate the area of the school playground on the plan.
Give your answer in cm².

Answer(c)(ii) .... cm² [2]

(d)   A fence, *BD*, divides the playground into two areas.

Calculate the shortest distance from *A* to *BD*.

Answer(d) .... m [2]

14   **(a)** One angle of an isosceles triangle is 48°.   Oct Nov 2013 Code 43

Write down the possible pairs of values for the remaining two angles.

Answer(a) .... and ....

.... and .... [2]

(b) Calculate the sum of the interior angles of a pentagon.

Answer(b) .... [2]

(c) Calculate the sum of the angles *a*, *b*, *c*, *d*, *e*, *f* and *g* shown in this diagram.

NOT TO
SCALE

Answer(c) .... [2]

More Notes and Topical Past Papers at https://IGCSEexamguru.com
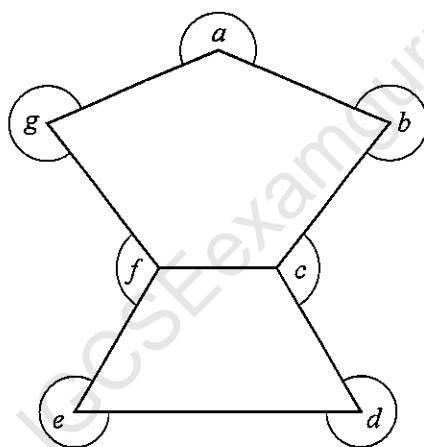
(d) The trapezium, *ABCD*, has four angles as shown.
All the angles are in degrees.
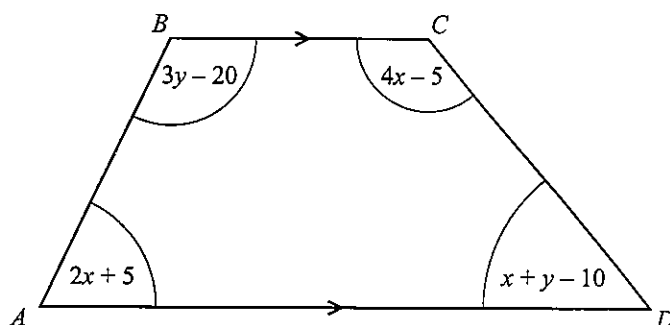
NOT TO
SCALE

(i) Show that $7x + 4y = 390$.

Answer(d)(i)

[1]

(ii) Show that $2x + 3y = 195$.

Answer(d)(ii)

[1]

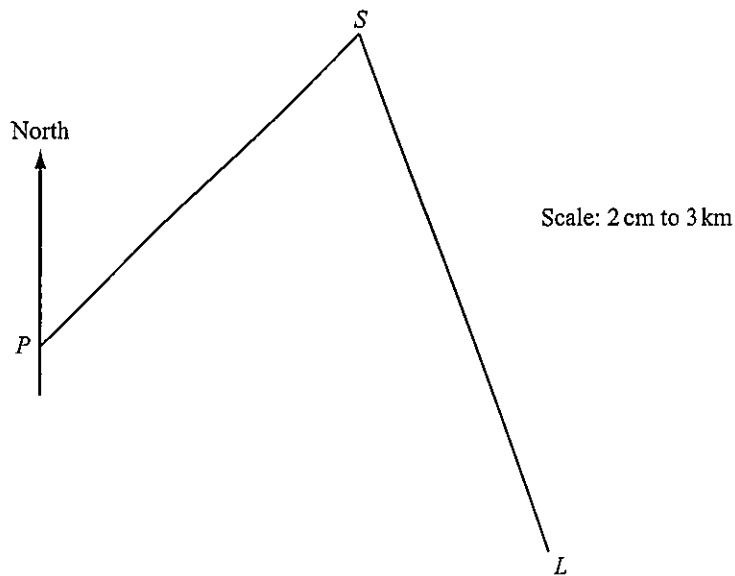**(iii)** Solve these simultaneous equations.

Answer(d)(iii) $x = $ ....

$y = $ .... [4]

(iv) Use your answer to **part (d)(iii)** to find the sizes of all four angles of the trapezium.

Answer(d)(iv) .... , ... , ... , ... [1]

15   May June 2014 Code 41

Scale: 2 cm to 3 km

In the scale drawing, P is a port, L is a lighthouse and S is a ship.
The scale is 2 centimetres represents 3 kilometres.

(a) Measure the bearing of S from P.

Answer(a) .... [1]

(b) Find the actual distance of S from L.

Answer(b) .... km [2]

(c) The bearing of L from S is 160°.

Calculate the bearing of S from L.

Answer(c) .... [1]

(d) Work out the scale of the map in the form $1:n$.

Answer(d) 1 : .... [2]

(e) A boat B is

- equidistant from S and L

and

- equidistant from the lines PS and SL.

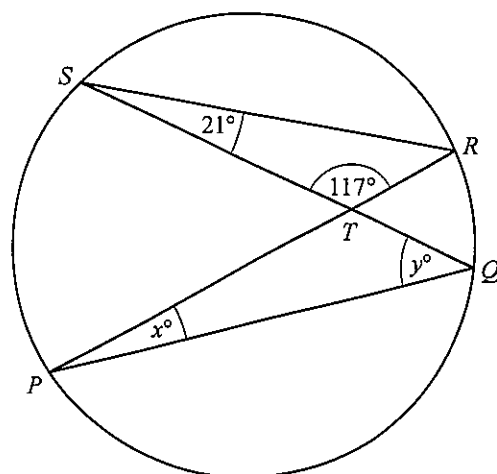On the diagram, **using a straight edge and compasses only**, construct the position of B.   [5]

(f) The lighthouse stands on an island of area $1.5\,\text{cm}^2$ on the scale drawing.

Work out the actual area of the island.

Answer(f) .... km^2 [2]

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16

NOT TO SCALE

May June 2014 Code 42

(a) The chords PR and SQ of the circle intersect at T.
Angle $RST = 21°$ and angle $STR = 117°$.

   (i) Find the values of x and y.

Answer(a)(i) $x =$ ....
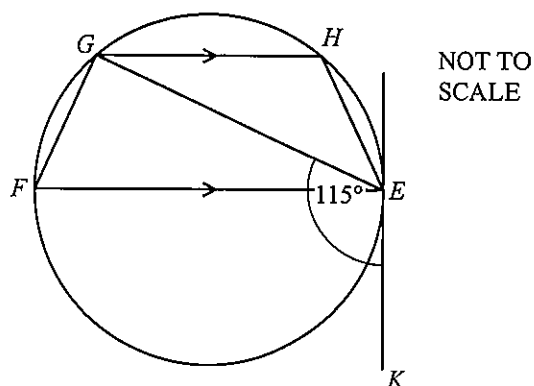
$y =$ .... [2]

   (ii) $SR = 8.23$ cm, $RT = 3.31$ cm and $PQ = 9.43$ cm.

Calculate the length of TQ.

Answer(a)(ii) $TQ =$ .... cm [2]

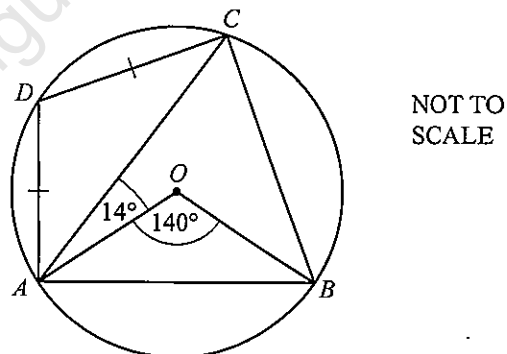More Notes and Topical Past Papers at https://IGCSEexamguru.com

(b) *EFGH* is a cyclic quadrilateral.
EF is a diameter of the circle.
KE is the tangent to the circle at *E*.
GH is parallel to *FE* and angle *KEG* = 115°.

Calculate angle *GEH*.

NOT TO SCALE

Answer(b) Angle *GEH* = ... [4]

(c) *A*, *B*, *C* and *D* are points on the circle centre *O*.
Angle *AOB* = 140° and angle *OAC* = 14°.
AD = *DC*.

Calculate angle *ACD*.

NOT TO SCALE

Answer(c) Angle *ACD* = ... [5]

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17   The total area of each of the following shapes is X.
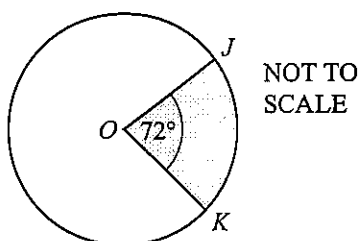The area of the shaded part of each shape is kX.

May June 2014 Code 42

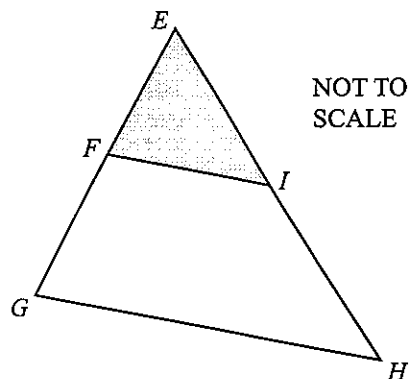For each shape, find the value of k and write your answer below each diagram.

NOT TO SCALE
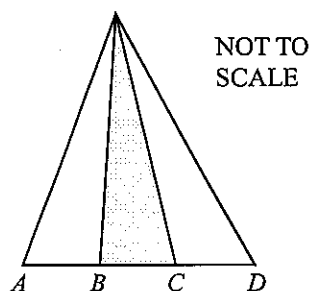
NOT TO SCALE

NOT TO SCALE

$AB = BC = CD$ Angle $JOK = 72°$ $EF = FG$ and $EI = IH$

$k =$ .... $k =$ .... $k =$ ....
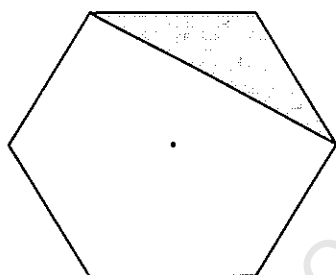
NOT TO SCALE

NOT TO SCALE

The shape is a regular hexagon.   The diagram shows a sector of a circle centre O.
Angle $AOB = 90°$
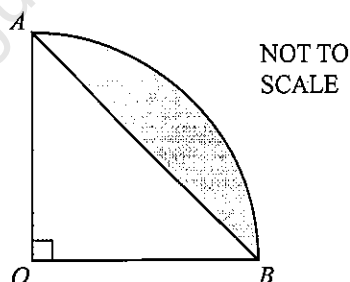
$k =$ .... $k =$ ....

[10]

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18 (a)

May June 2014 Code 43
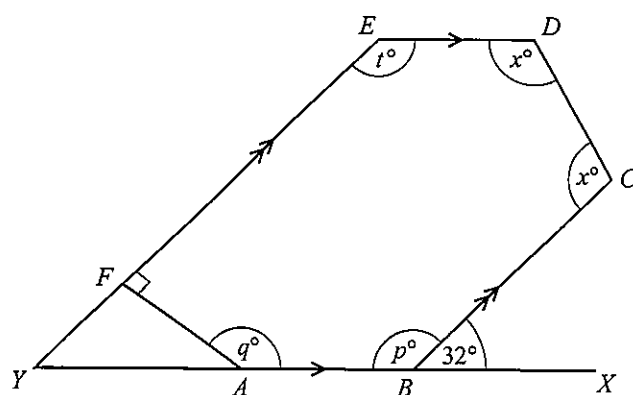
NOT TO
SCALE

ABCDEF is a hexagon.
AB is parallel to *ED* and *BC* is parallel to *FE*.
YFE and *YABX* are straight lines.
Angle *CBX* = 32° and angle *EFA* = 90°.

Calculate the value of

(i) *p*,

Answer(a)(i) *p* = ... [1]

(ii) *q*,

Answer(a)(ii) *q* = ... [2]

(iii) *t*,

Answer(a)(iii) *t* = ... [1]

(iv) *x*.

Answer(a)(iv) *x* = ... [3]

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(b)

NOT TO SCALE
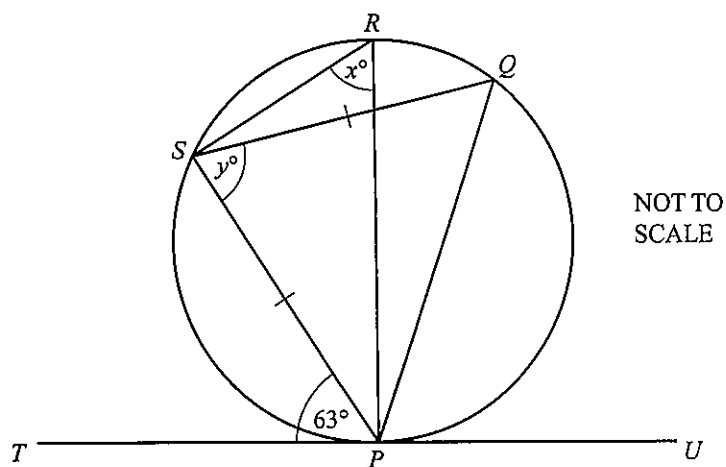
P, Q, R and S are points on a circle and $PS = SQ$.
PR is a diameter and TPU is the tangent to the circle at P.
Angle $SPT = 63°$.

Find the value of

(i) x,

Answer(b)(i) $x =$ .... [2]

(ii) y.

Answer(b)(ii) $y =$ .... [2]

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19 **(a)** The diagram shows a circle with two chords, *AB* and *CD*, intersecting at *X*.   Oct Nov 2014 Code 41
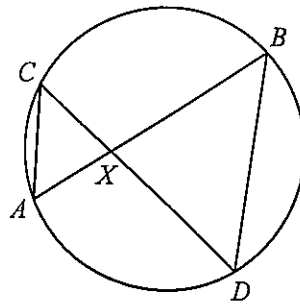
NOT TO SCALE

(i) Show that triangles *ACX* and *DBX* are similar.

Answer(a)(i)

[2]

(ii) *AX* = 3.2 cm, *BX* = 12.5 cm, *CX* = 4 cm and angle *AXC* = 110°.

    (a) Find *DX*.

Answer(a)(ii)(a) *DX* = ... cm [2]

    (b) Use the cosine rule to nd *AC*.

Answer(a)(ii)(b) *AC* = ... cm [4]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

(c) Find the area of triangle *BXD*.

Answer(a)(ii)(c) .... cm² [2]

(b)
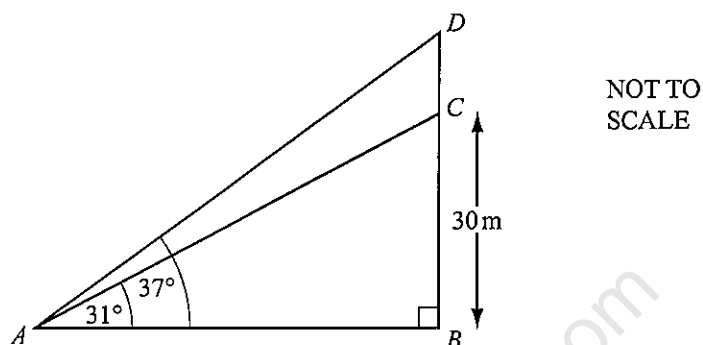
In the diagram, *BC* represents a building 30 m tall.
A agpole, *DC*, stands on top of the building.
From a point, *A*, the angle of elevation of the top of the building is 31°.
The angle of elevation of the top of the agpole is 37°.

Calculate the height, *DC*, of the agpole.

Answer(b) .... m [5]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

20   **(a)**   *ABCD* is a trapezium.

Oct Nov 2014 Code 43
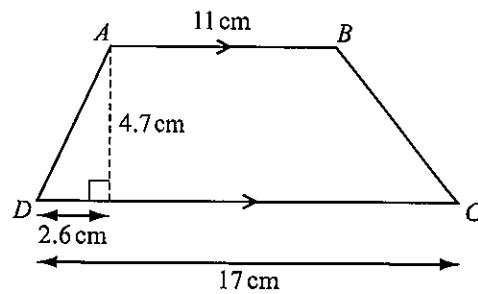
NOT TO
SCALE

     (i)   Calculate the length of *AD*.

Answer(a)(i) *AD* = ... cm [2]

     (ii)   Calculate the size of angle *BCD*.

Answer(a)(ii) Angle *BCD* = ... [3]

     (iii)   Calculate the area of the trapezium *ABCD*.

Answer(a)(iii) .... cm^2 [2]

(b)   A **similar** trapezium has perpendicular height 9.4 cm.

Calculate the area of this trapezium.

Answer(b) .... cm^2 [3]

21   Oct Nov 2014 Code 43

NOT TO SCALE
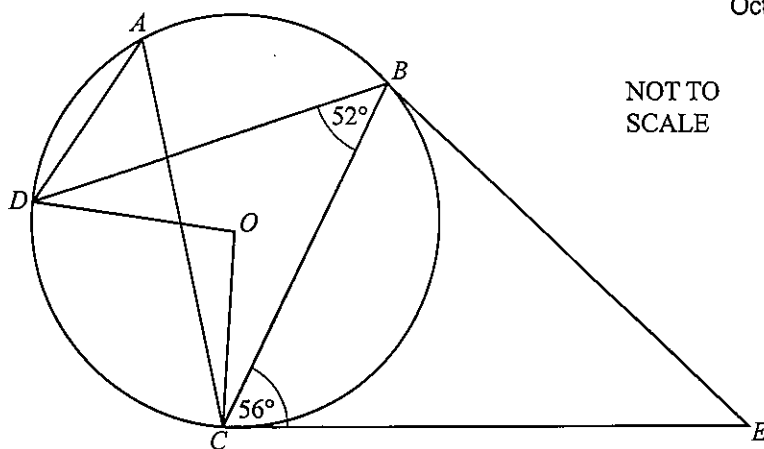
A, B, C and D are points on a circle, centre O.
CE is a tangent to the circle at C.

(a) Find the sizes of the following angles and give a reason for each answer.

    (i) Angle DAC = ... because ....

          .... [2]

    (ii) Angle DOC = ... because ....

          .... [2]

    (iii) Angle BCO =..................... because ....

          .... [2]

(b) $CE = 8.9$ cm and $CB = 7$ cm.

   (i) Calculate the length of BE.

Answer(b)(i) $BE =$ .... cm [4]

   (ii) Calculate angle BEC.

Answer(b)(ii) Angle $BEC =$ .... [3]

22
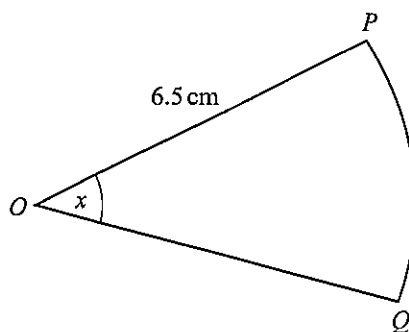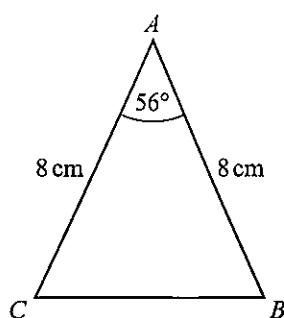
NOT TO SCALE

The diagram shows a triangle and a sector of a circle.   Oct Nov 2014 Code 43

In triangle ABC, $AB = AC = 8$ cm and angle $BAC = 56°$.

Sector OPQ has centre O, sector angle x and radius 6.5 cm.

(a) Show that the area of triangle ABC is 26.5 cm^2 correct to 1 decimal place.

Answer(a)

[2]

(b) The area of sector OPQ is equal to the area of triangle ABC.

    (i) Calculate the sector angle x.

Answer(b)(i) .... [3]

    (ii) Calculate the perimeter of the sector OPQ.

Answer(b)(ii) .... cm [3]

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(c) The diagram shows a sector of a circle, radius r cm.

NOT TO SCALE

r cm

$30°$
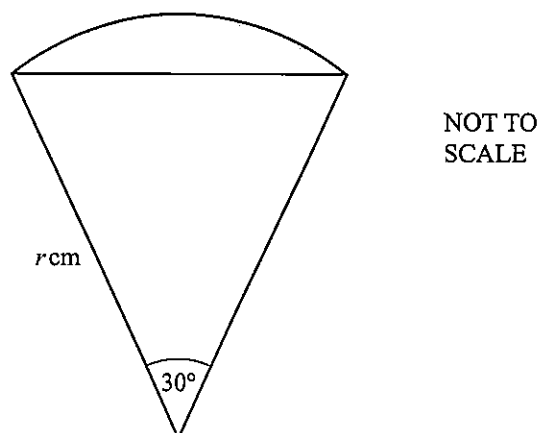
(i) Show that the area of the shaded segment is $\frac{1}{4}r^2\left(\frac{1}{3}\pi - 1\right)$ cm^2.

Answer(c)(i)

[4]

(ii) The area of the segment is 5 cm^2.

Find the value of r.

Answer(c)(ii) $r =$ .... [3]

23   **(a)**   The points A, B, C and D lie on a circle.
AC is a diameter of the circle.
ST is the tangent to the circle at A.

May June 2015 Code 41

NOT TO
SCALE

Find the value of

(i) x,
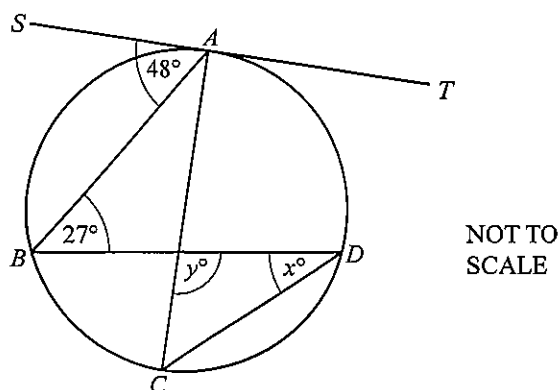
Answer(a)(i) $x =$ .... [2]

(ii) y.

Answer(a)(ii) $y =$ .... [2]

(b) The diagram shows a shaded shape formed by three semi-circular arcs.
The radius of each semi-circle is shown in the diagram.

NOT TO
SCALE

6 cm

4 cm

2 cm

(i) Calculate the perimeter of the shaded shape.

Answer(b)(i) .... cm [2]

(ii) The shaded shape is made from metal 1.6 mm thick.

Calculate the volume of metal used to make this shape.
Give your answer in cubic millimetres.

Answer(b)(ii) .... mm^3 [5]

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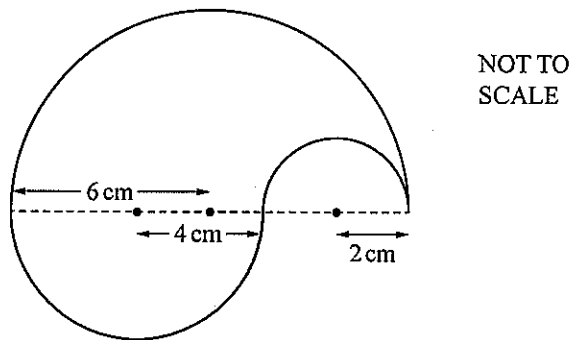
24   The diagram is a scale drawing of three straight roads, *AB*, *BC* and *CD*.
The scale is 1 : 5000.   May June 2015 Code 41

Scale 1 : 5000

(a)   Find the actual length of the road *BC*.
Give your answer in metres.

Answer(a) .... m [2]

(b)   Another straight road starts at *M*, the midpoint of *AB*.
This road is perpendicular to *AB* and it meets the road *CD* at *X*.

      Using a straight edge and compasses only, construct *MX*.   [2]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

(c) There is a park in the area enclosed by the four roads.

The park is

     •   less than 290 m from B

and

     •   nearer to CD than to CB.

Using a ruler and compasses only, construct the boundaries of the park.

Leave in all your construction arcs and label the park P.   [5]

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25

NOT TO
SCALE

In the diagram, B, C, D and E lie on the circle, centre O.
AB and AD are tangents to the circle.
Angle $BAD = 48°$.

(a) Find

     (i) angle ABD,

Answer(a)(i) Angle ABD = ... [1]

     (ii) angle OBD,

Answer(a)(ii) Angle OBD = ... [1]

     (iii) angle BCD,

Answer(a)(iii) Angle BCD = ... [2]

     (iv) angle BED.

Answer(a)(iv) Angle BED = ... [1]

(b) The radius of the circle is 15 cm.

Calculate the area of triangle BOD.

Answer(b) .... cm² [2]

(c) Give a reason why $ABOD$ is a cyclic quadrilateral.

Answer(c) ....

.... [1]

26   (a)   May June 2015 Code 43

In the hexagon ABCDEF, AB is parallel to ED and AF is parallel to CD.
Angle ABC = 90°, angle CDE = 140° and angle DEF = 120°.

Calculate angle EFA.

Answer(a) Angle EFA = ... [4]

(b)

In the cyclic quadrilateral ABCD, angle ABC = 100° and angle BDC = 30°.
The diagonals intersect at X.

  (i)   Calculate angle ACB.

Answer(b)(i) Angle ACB = ... [2]

  (ii)   Angle BXC = 89°.

         Calculate angle CAD.

Answer(b)(ii) Angle CAD = ... [2]

  (iii)   Complete the statement.

         Triangles AXD and BXC are ....   [1]

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(c)

NOT TO SCALE

P, Q, R and S lie on a circle.
PR and QS intersect at Y.
$PS = 11$ cm, $QR = 10$ cm and the area of triangle $QRY = 23$ cm^2.

Calculate the area of triangle PYS.

Answer(c) .... cm^2 [2]

(d) A regular polygon has n sides.
Each exterior angle is equal to $\frac{n}{10}$ degrees.

    (i) Find the value of n.

Answer(d)(i) $n =$ .... [3]

    (ii) Find the size of an interior angle of this polygon.

Answer(d)(ii) .... [2]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

0580/41/M/J/15

27 (a) The points A, B, C and D lie on a circle.
AC is a diameter of the circle.
ST is the tangent to the circle at A.

NOT TO
SCALE

Find the value of

(i) x,

Answer(a)(i) $x =$ .... [2]

(ii) y.

Answer(a)(ii) $y =$ .... [2]

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(b) The diagram shows a shaded shape formed by three semi-circular arcs.
The radius of each semi-circle is shown in the diagram.

NOT TO
SCALE

(i) Calculate the perimeter of the shaded shape.

Answer(b)(i) .... cm [2]

(ii) The shaded shape is made from metal 1.6 mm thick.

Calculate the volume of metal used to make this shape.
Give your answer in cubic millimetres.

Answer(b)(ii) .... mm^3 [5]

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0580/41/M/J/15

28 The diagram is a scale drawing of three straight roads, *AB*, *BC* and *CD*.
The scale is 1 : 5000.

Scale 1 : 5000

(a) Find the actual length of the road *BC*.
Give your answer in metres.

Answer(a) .... m [2]

(b) Another straight road starts at *M*, the midpoint of *AB*.
This road is perpendicular to *AB* and it meets the road *CD* at *X*.

Using a straight edge and compasses only, construct *MX*.   [2]

(c) There is a park in the area enclosed by the four roads.

The park is

- less than 290 m from B

and

- nearer to CD than to CB.

Using a ruler and compasses only, construct the boundaries of the park.

Leave in all your construction arcs and label the park P. [5]

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0580/42/M/J/15

29

NOT TO SCALE

In the diagram, B, C, D and E lie on the circle, centre O.
AB and AD are tangents to the circle.
Angle $BAD = 48°$.

(a) Find

    (i) angle ABD,

                  Answer(a)(i) Angle ABD = ... [1]

    (ii) angle OBD,

                  Answer(a)(ii) Angle OBD = ... [1]

    (iii) angle BCD,

                  Answer(a)(iii) Angle BCD = ... [2]

    (iv) angle BED.

                  Answer(a)(iv) Angle BED = ... [1]

(b) The radius of the circle is 15 cm.

    Calculate the area of triangle BOD.

                  Answer(b) .... cm² [2]

(c) Give a reason why $ABOD$ is a cyclic quadrilateral.

    Answer(c) ....

    .... [1]

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0580/42/M/J/15

30 **(a)** A sector of a circle has radius 12 cm and an angle of 135°.

(i) Calculate the length of the arc of this sector.
Give your answer as a multiple of π.
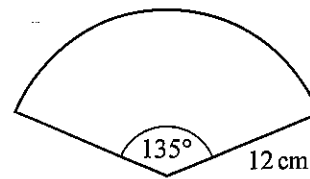
NOT TO SCALE

135°   12 cm

Answer(a)(i) .... cm [2]

(ii) The sector is used to make a cone.

(a) Calculate the base radius, *r*.

NOT TO SCALE

h   12 cm

r

Answer(a)(ii)(a) *r* = ... cm [2]

(b) Calculate the height of the cone, *h*.

Answer(a)(ii)(b) *h* = ... cm [3]

(b) The diagram shows a plant pot.
It is made by removing a small cone from a larger cone and adding a circular base.

NOT TO SCALE

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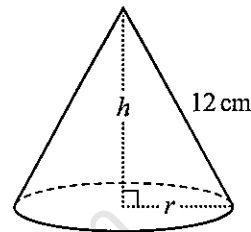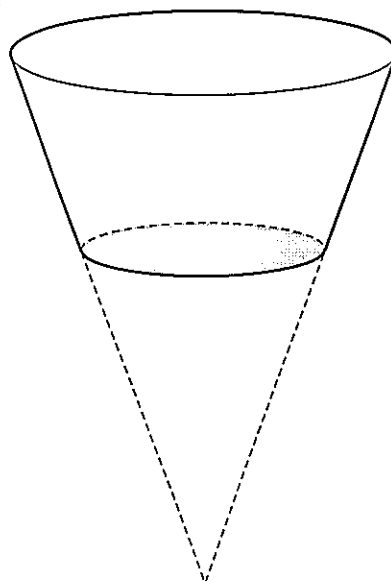
This is the cross section of the plant pot.

(i) Find l.

Answer(b)(i) $l =$ .... cm [3]

(ii) Calculate the total surface area of the outside of the plant pot.

[The curved surface area, A, of a cone with radius r and slant height l is $A = \pi r l$.]

Answer(b)(ii) .... cm² [3]

(c) Some cones are mathematically similar.

For these cones, the mass, M grams, is proportional to the cube of the base radius, r cm.

One of the cones has mass 1458 grams and base radius 4.5 cm.

(i) Find an expression for M in terms of r.

Answer(c)(i) $M =$ .... [2]

(ii) Two of the cones have radii in the ratio $2:3$.

Write down the ratio of their masses.

Answer(c)(ii) .... : .... [1]

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31 **(a)**

In the hexagon *ABCDEF*, *AB* is parallel to *ED* and *AF* is parallel to *CD*.
Angle *ABC* = 90°, angle *CDE* = 140° and angle *DEF* = 120°.

Calculate angle *EFA*.

Answer(a) Angle *EFA* = ... [4]

(b)

In the cyclic quadrilateral *ABCD*, angle *ABC* = 100° and angle *BDC* = 30°.
The diagonals intersect at *X*.

(i) Calculate angle *ACB*.

Answer(b)(i) Angle *ACB* = ... [2]

(ii) Angle *BXC* = 89°.

Calculate angle *CAD*.

Answer(b)(ii) Angle *CAD* = ... [2]

(iii) Complete the statement.

Triangles *AXD* and *BXC* are .... [1]

(c)

NOT TO SCALE

P, Q, R and S lie on a circle.
PR and QS intersect at Y.
$PS = 11$ cm, $QR = 10$ cm and the area of triangle $QRY = 23$ cm^2.

Calculate the area of triangle PYS.

Answer(c) .... cm^2 [2]

(d) A regular polygon has n sides.
Each exterior angle is equal to $\dfrac{n}{10}$ degrees.

(i) Find the value of n.

Answer(d)(i) $n =$ .... [3]

(ii) Find the size of an interior angle of this polygon.

Answer(d)(ii) .... [2]

0580/43/M/J/15

32 (a) A cylindrical tank contains $180\,000\,\text{cm}^3$ of water.
The radius of the tank is 45 cm.

Calculate the height of water in the tank.

45 cm

NOT TO SCALE

Answer(a) .... cm [2]

(b)

D   C

70 cm

40 cm

150 cm

A   50 cm   B

NOT TO SCALE

The diagram shows an empty tank in the shape of a horizontal prism of length 150 cm.
The cross section of the prism is an isosceles trapezium *ABCD*.
AB = 50 cm, *CD* = 70 cm and the vertical height of the trapezium is 40 cm.

  (i) Calculate the volume of the tank.

Answer(b)(i) .... cm^3 [3]

  (ii) Write your answer to **part (b)(i)** in litres.

Answer(b)(ii) .... litres [1]

(c) The $180\,000\,\text{cm}^3$ of water flows from the tank in **part (a)** into the tank in **part (b)** at a rate of $15\,\text{cm}^3/\text{s}$.

Calculate the time this takes.
Give your answer in hours and minutes.

Answer(c) .... h .... min [3]

(d)

The $180\,000\,\text{cm}^3$ of water reaches the level EF as shown above.
$EF = x\,\text{cm}$ and the height of the water is $h\,\text{cm}$.

(i) Using the properties of similar triangles, show that $h = 2(x - 50)$.

Answer(d)(i)

[2]

(ii) Using $h = 2(x - 50)$, show that the shaded area, in cm^2, is $x^2 - 2500$.

Answer(d)(ii)

[1]

(iii) Find the value of x.

Answer(d)(iii) $x = $ .... [2]

(iv) Find the value of h.

Answer(d)(iv) $h = $ .... [1]

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1   May June 2012 Code 41

Three buoys *K*, *L* and *M* show the course of a boat race.
MK = 4 km, *KL* = 9 km and angle *MKL* = 108°.

(a) Calculate the distance *ML*.

Answer(a) ML = ... km [4]

(b) The bearing of *L* from *K* is 125°.

    (i) Calculate how far *L* is south of *K*.

Answer(b)(i) .... km [3]

    (ii) Find the three figure bearing of *K* from *M*.

Answer(b)(ii) .... [2]

2

NOT TO SCALE
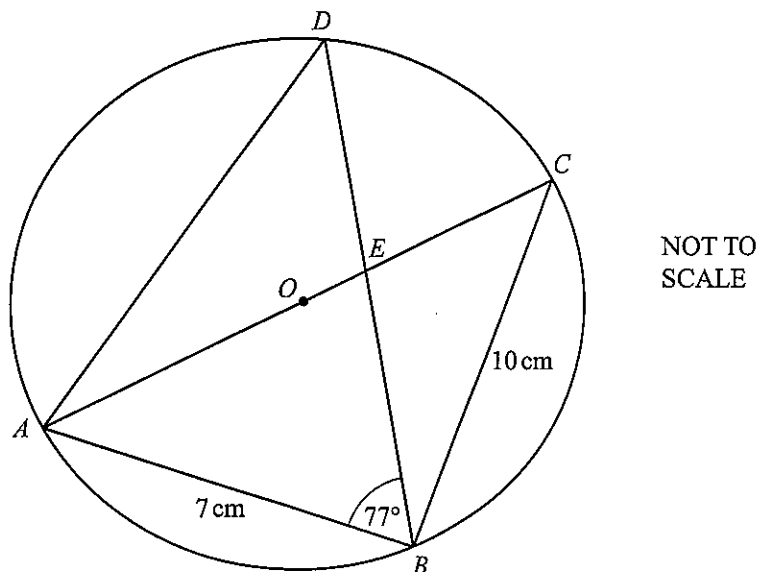
A, B, C and D lie on a circle, centre O.
$AB = 7$ cm, $BC = 10$ cm and angle $ABD = 77°$.
AOC is a diameter of the circle.

(a) Find angle ABC.

Answer(a) Angle $ABC =$ .... [1]

(b) Calculate angle ACB and show that it rounds to 35° correct to the nearest degree.

Answer(b)

[2]

(c) Explain why angle $ADB =$ angle ACB.

Answer(c) .... [1]

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(d) **(i)** Calculate the length of *AD*.

Answer(d)(i) *AD* = ... cm [3]

(ii) Calculate the area of triangle *ABD*.

Answer(d)(ii) .... cm² [2]

(e) The area of triangle *AED* = 12.3 cm², correct to 3 significant figures.

Use similar triangles to calculate the area of triangle *BEC*.

Answer(e) .... cm² [3]

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3
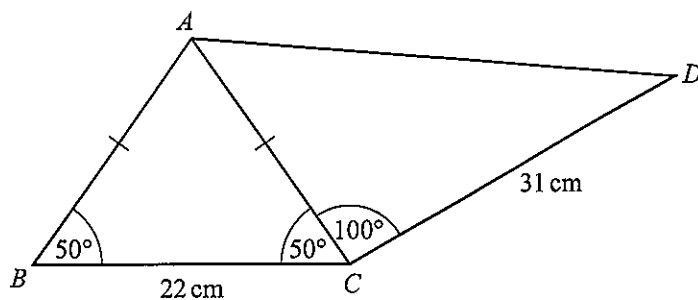
NOT TO
SCALE

The frame of a child's bicycle is made from metal rods.
ABC is an isosceles triangle with base 22 cm and base angles 50°.
Angle $ACD = 100°$ and $CD = 31$ cm.

Calculate the length AD.

Answer(c) AD = ... cm [6]

4   May June 2012 Code 43
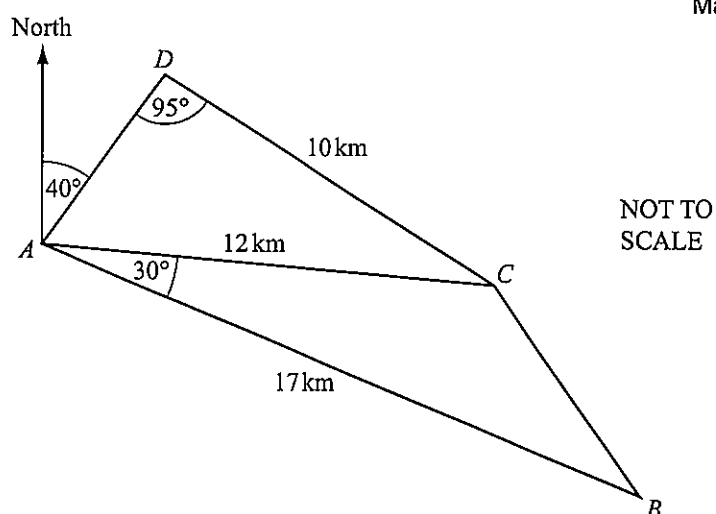
The diagram shows straight roads connecting the towns A, B, C and D.

$AB = 17\,km$, $AC = 12\,km$ and $CD = 10\,km$.

Angle $BAC = 30°$ and angle $ADC = 95°$.

(a) Calculate angle CAD.

Answer(a) Angle $CAD =$ .... [3]

(b) Calculate the distance BC.

Answer(b) $BC =$ .... km [4]

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(c) The bearing of D from A is 040°.

Find the bearing of

(i) B from A,

Answer(c)(i) .... [1]

(ii) A from B.

Answer(c)(ii) .... [1]

(d) Angle ACB is obtuse.

Calculate angle BCD.

Answer(d) Angle $BCD =$ .... [4]

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5   Oct Nov 2012 Code 42

NOT TO SCALE
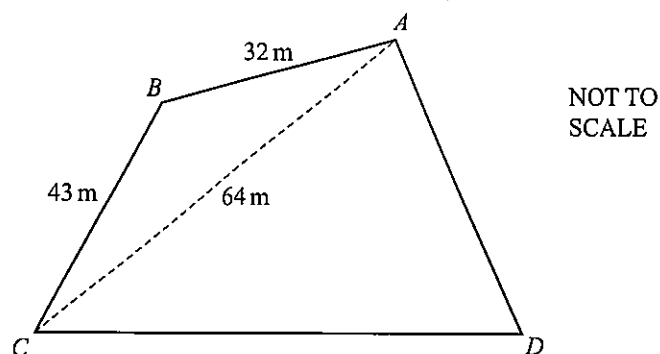
The diagram represents a field in the shape of a quadrilateral *ABCD*.
$AB = 32\,$m, $BC = 43\,$m and $AC = 64\,$m.

(a) (i) Show clearly that angle $CAB = 37.0°$ correct to one decimal place.

Answer(a)(i)

[4]

(ii) Calculate the area of the triangle *ABC*.

Answer(a)(ii) .... m^2 [2]

(b) $CD = 70\,$m and angle $DAC = 55°$.

Calculate the perimeter of the whole field *ABCD*.

Answer(b) .... m [6]

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6
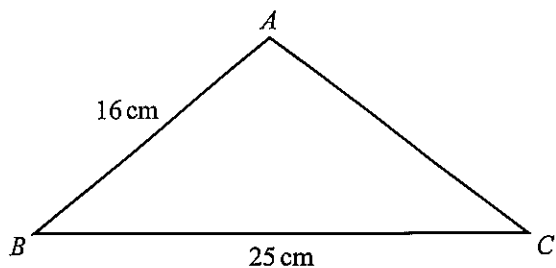
The area of triangle ABC is $130\,\text{cm}^2$.
$AB = 16\,\text{cm}$ and $BC = 25\,\text{cm}$.

(a) Show clearly that angle $ABC = 40.5°$, correct to one decimal place.

Answer (a)

[3]

(b) Calculate the length of AC.

Answer(b) AC = ... cm [4]

(c) Calculate the shortest distance from A to BC.

Answer(c) .... cm [2]

7

May June 2013 Code 41
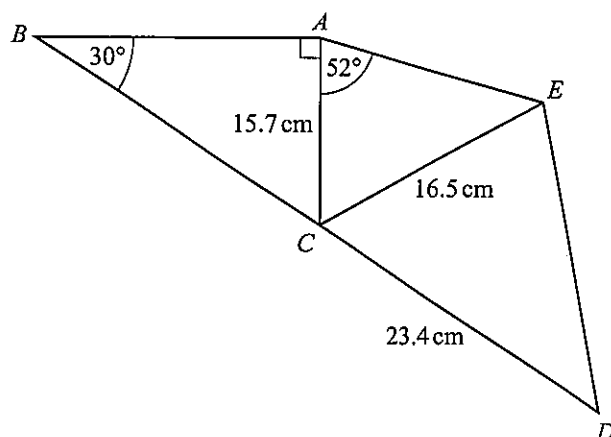
NOT TO
SCALE

In the diagram, *BCD* is a straight line and *ABDE* is a quadrilateral.
Angle $BAC = 90°$, angle $ABC = 30°$ and angle $CAE = 52°$.
$AC = 15.7$ cm, $CE = 16.5$ cm and $CD = 23.4$ cm.

(a) Calculate *BC*.

Answer(a) BC = ... cm [3]

(b) Use the sine rule to calculate angle *AEC*.
Show that it rounds to 48.57°, correct to 2 decimal places.

Answer(b)

[3]

(c)   **(i)**   Show that angle $ECD = 40.6°$, correct to 1 decimal place.

Answer(c)(i)

[2]

    (ii)   Calculate *DE*.

Answer(c)(ii) *DE =* .... cm [4]

(d)   Calculate the area of the quadrilateral *ABDE*.

Answer(d) .... cm^2 [4]

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8
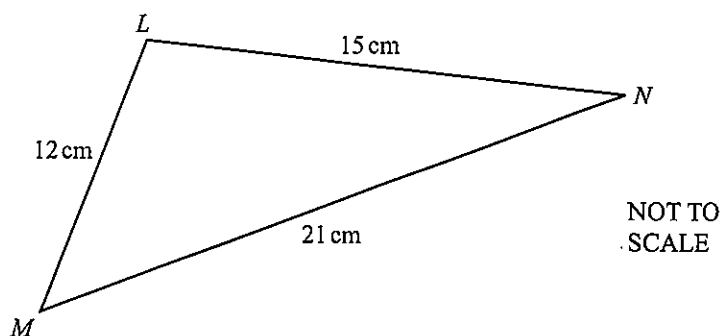
The diagram shows triangle *LMN* with *LM* = 12 cm, *LN* = 15 cm and *MN* = 21 cm.

(i) Calculate angle *LMN*.
   Show that this rounds to 44.4°, correct to 1 decimal place.

Answer(a)(i)

[4]

(ii) Calculate the area of triangle *LMN*.

Answer(a)(ii) .... cm² [2]

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(b)
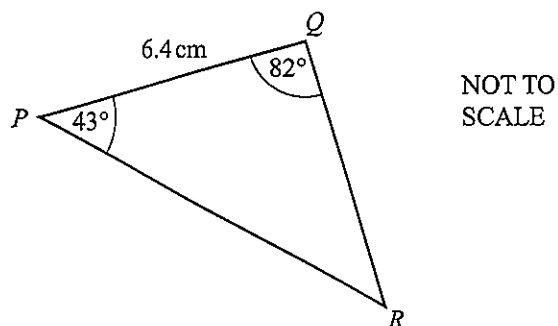
The diagram shows triangle PQR with $PQ = 6.4$ cm, angle $PQR = 82°$ and angle $QPR = 43°$.

Calculate the length of PR.

Answer(b) PR = ... cm   [4]

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9   May June 2013 Code 43

NOT TO SCALE
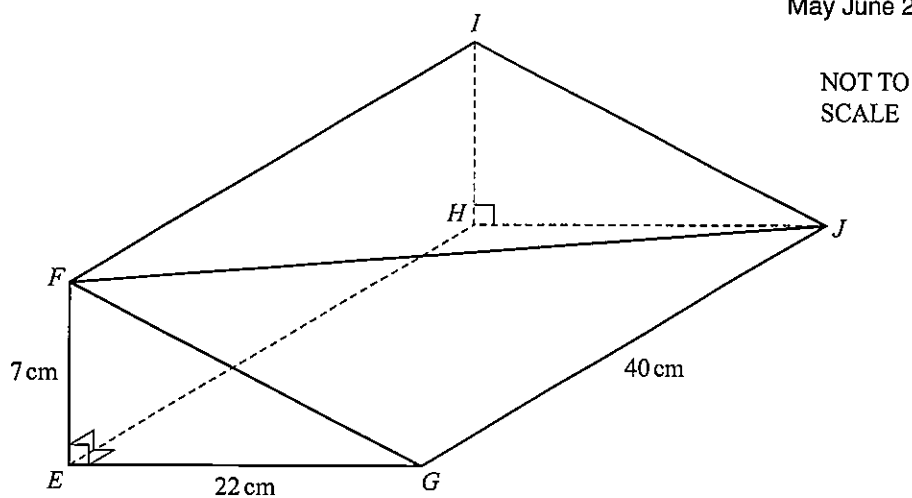
EFGHIJ is a solid metal prism of length 40 cm.
The cross section *EFG* is a right-angled triangle.
EF = 7 cm and *EG* = 22 cm.

(a) Calculate the volume of the prism.

Answer(a) .... cm³ [2]

(b) Calculate the length *FJ*.

Answer(b) FJ = ... cm [4]

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(c) Calculate the angle between *FJ* and the base *EGJH* of the prism.

Answer(c) .... [3]

(d) The prism is melted and made into spheres.
Each sphere has a radius 1.5 cm.

Work out the greatest number of spheres that can be made.

[The volume, *V*, of a sphere with radius *r* is $V = \frac{4}{3}\pi r^3$.]

Answer(d) .... [3]

(e) **(i)** A right-angled triangle is the cross section of another prism.
This triangle has height 4.5 cm and base 11.0 cm.
Both measurements are correct to 1 decimal place.

Calculate the upper bound for the area of this triangle.

Answer(e)(i) .... cm² [2]

(ii) Write your answer to **part (e)(i)** correct to 4 signi cant gures.

Answer(e)(ii) .... cm² [1]

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10
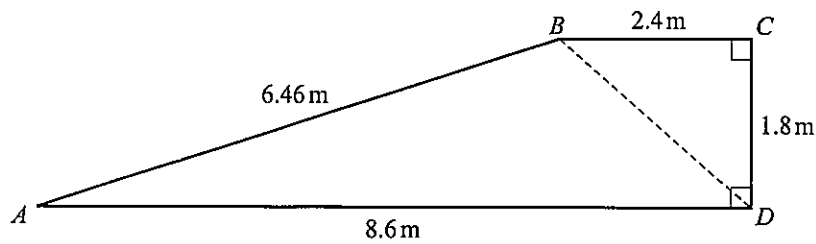
The diagram shows the cross section, *ABCD*, of a ramp.

Oct Nov 2013 Code 42

(a) Calculate angle *DBC*.

Answer(a) Angle *DBC* = ... [2]

(b) (i) Show that *BD* is exactly 3 m.

Answer(b)(i)

[2]

(ii) Use the cosine rule to calculate angle *ABD*.

Answer(b)(ii) Angle *ABD* = ... [4]

(c) The ramp is a prism of width 4 m.

Calculate the volume of this prism.

Answer(c) .... m³ [3]

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11   A field, *ABCD*, is in the shape of a quadrilateral.   Oct Nov 2013 Code 43
       A footpath crosses the field from *A* to *C*.

NOT TO
SCALE
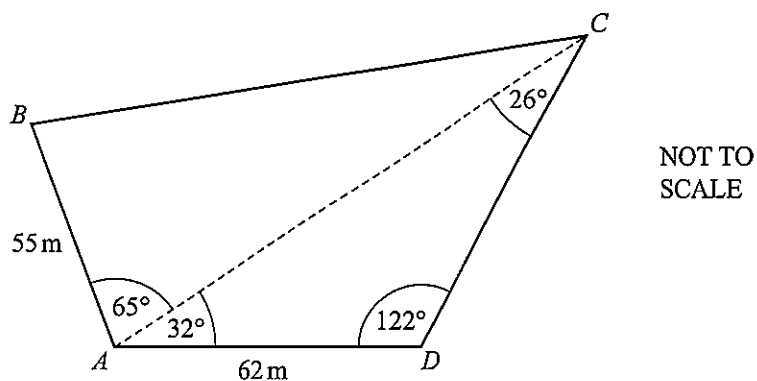
(a) Use the sine rule to calculate the distance *AC* and show that it rounds to 119.9 m, correct to 1 decimal place.

Answer(a)

[3]

(b) Calculate the length of *BC*.

Answer(b) BC = ... m [4]

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(c) Calculate the area of triangle *ACD*.

Answer(c) .... m² [2]

(d) The field is for sale at \$4.50 per square metre.

Calculate the cost of the field.

Answer(d) \$ .... [3]

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12

NOT TO SCALE
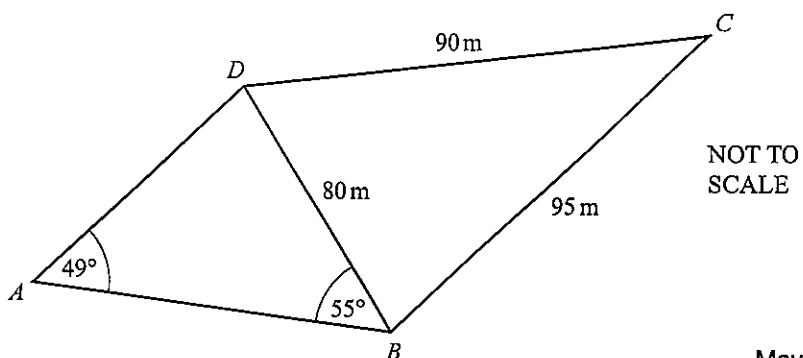
May June 2014 Code 42

The diagram shows a quadrilateral $ABCD$.
Angle $BAD = 49°$ and angle $ABD = 55°$.
$BD = 80$ m, $BC = 95$ m and $CD = 90$ m.

(a) Use the sine rule to calculate the length of AD.

Answer(a) AD = ... m [3]

(b) Use the cosine rule to calculate angle BCD.

Answer(b) Angle $BCD =$ .... [4]

(c) Calculate the area of the quadrilateral *ABCD*.

Answer(c) .... m² [3]

(d) The quadrilateral represents a eld.
Corn seeds are sown across the whole eld at a cost of $3250 per hectare.

Calculate the cost of the corn seeds used.
1 hectare = 10 000 m²

Answer(d) $ .... [3]

13   **(a)** May June 2014 Code 43
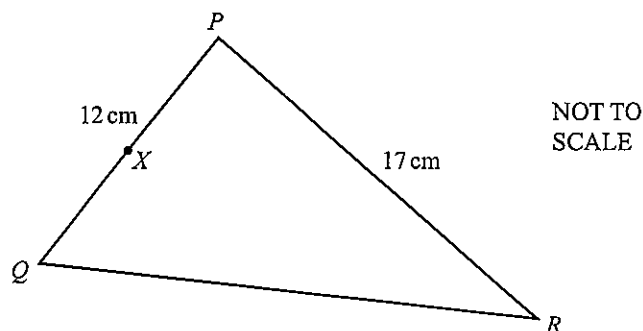
The diagram shows triangle PQR with $PQ = 12$ cm and $PR = 17$ cm.
The area of triangle PQR is $97\,cm^2$ and angle QPR is acute.

   (i)   Calculate angle QPR.

Answer(a)(i) Angle QPR = ... [3]

   (ii)   The midpoint of PQ is X.

         Use the cosine rule to calculate the length of XR.

Answer(a)(ii) XR = ... cm [4]

(b)
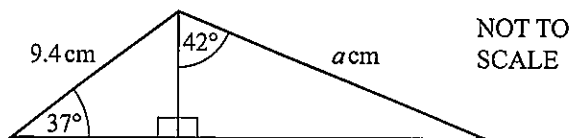
Calculate the value of a.

Answer(b) a = ... [4]

(c) $\sin x = \cos 40°, \quad 0° \leqslant x \leqslant 180°$

Find the two values of x.

Answer(c) x = ... or $x =$ .... [2]

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14

Oct Nov 2014 Code 42

North

NOT TO SCALE

P

58 km

L

North

74 km

Q
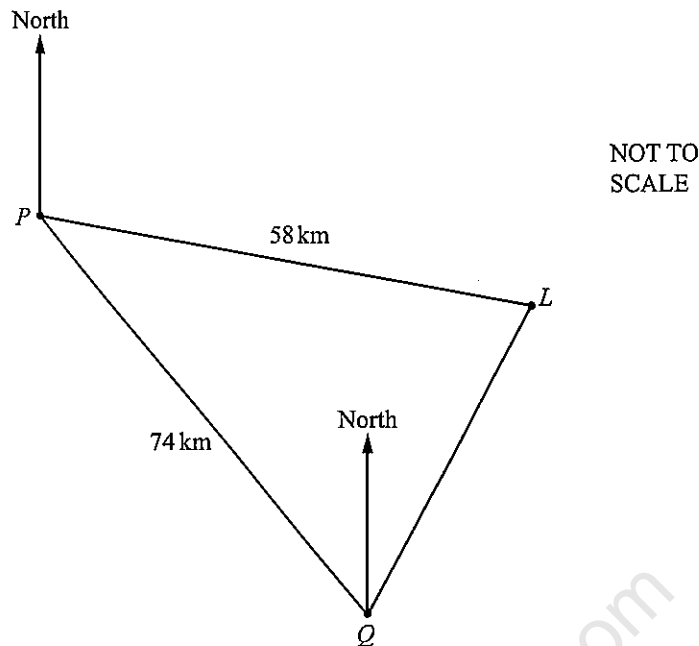
A ship sails from port P to port Q.
Q is 74 km from P on a bearing of 142°.
A lighthouse, L, is 58 km from P on a bearing of 110°.

(a) Show that the distance LQ is 39.5 km correct to 1 decimal place.

Answer(a)

[5]

(b) Use the sine rule to calculate angle PQL.

Answer(b) Angle PQL = ... [3]

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(c) Find the bearing of

(i) *P* from *Q*,

Answer(c)(i) .... [2]

(ii) *L* from *Q*.

Answer(c)(ii) .... [1]

(d) The ship takes 2 hours and 15 minutes to sail the 74 km from *P* to *Q*.

Calculate the average speed in knots.
[1 knot = 1.85 km/h]

Answer(d) .... knots [3]

(e) Calculate the shortest distance from the lighthouse to the path of the ship.

Answer(e) .... km [3]

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15 **(a)** Andrei stands on level horizontal ground, 294 m from the foot of a vertical tower which is 55 m high.

(i) Calculate the angle of elevation of the top of the tower.

May June 2015 Code 41

Answer(a)(i) .... [2]

(ii) Andrei walks a distance x metres directly towards the tower. The angle of elevation of the top of the tower is now 24.8°.

Calculate the value of x.

Answer(a)(ii) $x =$ .... [4]

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(b) The diagram shows a pyramid with a horizontal rectangular base.

NOT TO SCALE

The rectangular base has length 4.8 m and width 3 m and the height of the pyramid is 4 m.

Calculate

(i) y, the length of a sloping edge of the pyramid,

Answer(b)(i) y = ... m [4]

(ii) the angle between a sloping edge and the rectangular base of the pyramid.

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16   **(a)**
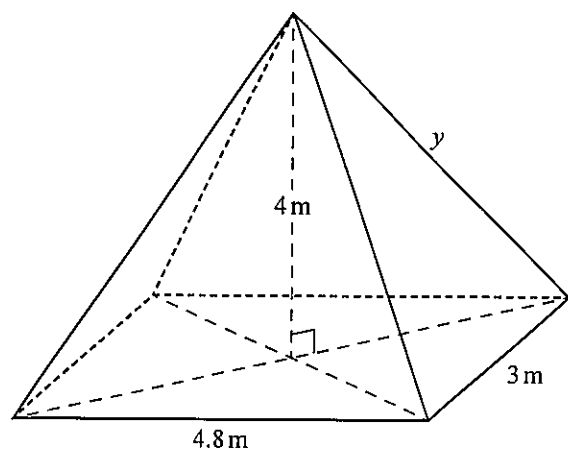
NOT TO
SCALE
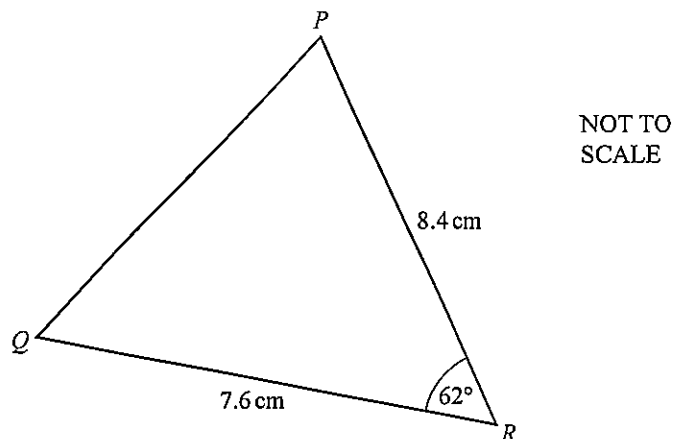
In the triangle PQR, $QR = 7.6$ cm and $PR = 8.4$ cm.
Angle $QRP = 62°$.

Calculate

(i) PQ,

Answer(a)(i) PQ = ... cm [4]

(ii)   the area of triangle PQR.

Answer(a)(ii) .... cm^2 [2]

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(b)

North

H

North

NOT TO
SCALE

63 km

G

J

The diagram shows the positions of three small islands *G*, *H* and *J*.
The bearing of *H* from *G* is 045°.
The bearing of *J* from *G* is 126°.
The bearing of *J* from *H* is 164°.
The distance *HJ* is 63 km.

Calculate the distance *GJ*.

Answer(b) GJ = ... km [5]

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17   The diagram shows the positions of two ships, *A* and *B*, and a coastguard station, *C*.

North

May June 2015 Code 42

A

95.5 km

101°

C

83.1 km

B

NOT TO SCALE

(a)   Calculate the distance, *AB*, between the two ships.
      Show that it rounds to 138 km, correct to the nearest kilometre.

Answer(a)

[4]

(b)   The bearing of the coastguard station *C* from ship *A* is 146°.

      Calculate the bearing of ship *B* from ship *A*.

Answer(b) .... [4]

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(c)

At noon, a lighthouse, L, is 46.2 km from ship B on the bearing 021°.
Ship B sails north west.

Calculate the distance ship B must sail from its position at noon to be at its closest distance to the lighthouse.

Answer(c) .... km [2]

0580/41/M/J/15

18   **(a)**   Andrei stands on level horizontal ground, 294 m from the foot of a vertical tower which is 55 m high.

       (i)   Calculate the angle of elevation of the top of the tower.

Answer(a)(i) .... [2]

       (ii)   Andrei walks a distance x metres directly towards the tower.
The angle of elevation of the top of the tower is now 24.8°.

Calculate the value of x.

Answer(a)(ii) $x =$ .... [4]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

(b) The diagram shows a pyramid with a horizontal rectangular base.

NOT TO SCALE

The rectangular base has length 4.8 m and width 3 m and the height of the pyramid is 4 m.

Calculate

(i) y, the length of a sloping edge of the pyramid,

Answer(b)(i) $y =$ .... m [4]

(ii) the angle between a sloping edge and the rectangular base of the pyramid.

Answer(b)(ii) .... [2]

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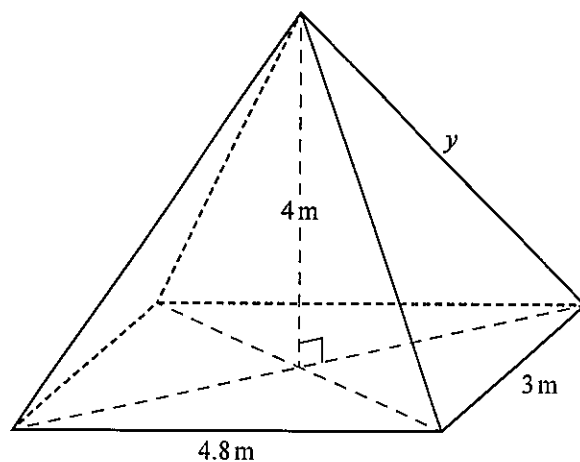
0580/41/M/J/15

19 (a)
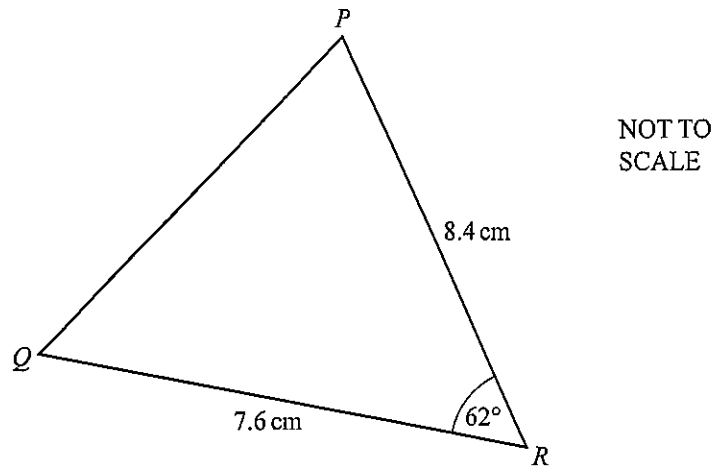
In the triangle PQR, $QR = 7.6$ cm and $PR = 8.4$ cm.
Angle $QRP = 62°$.

Calculate

(i) PQ,

(a) (i)	8.27 or 8.269... nfww	
(ii)	28.2 or 28.18..	
(b)	55.8 or 55.78 to 55.79 nfww	

Answer(a)(i) *PQ* = ... cm [4]

(ii) the area of triangle PQR.
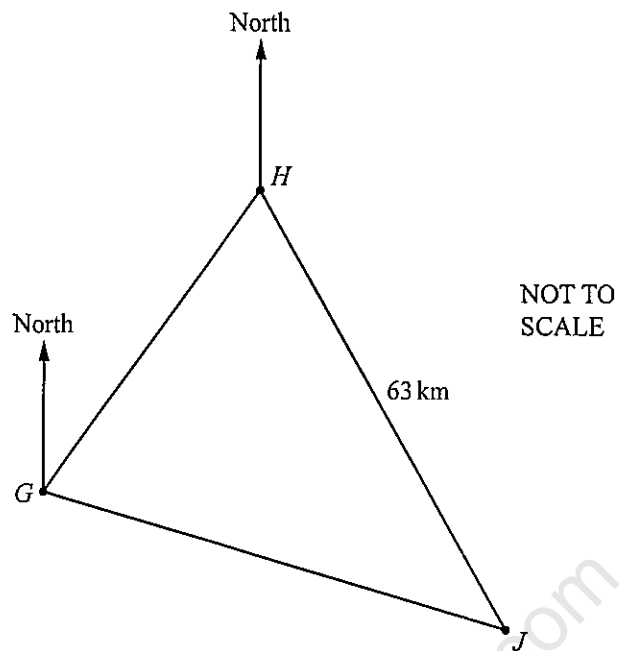
Answer(a)(ii) .... cm^2 [2]

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(b)

North

H

North

NOT TO
SCALE

63 km

G

J

The diagram shows the positions of three small islands G, H and J.
The bearing of H from G is 045°.
The bearing of J from G is 126°.
The bearing of J from H is 164°.
The distance HJ is 63 km.

Calculate the distance GJ.

Answer(b) GJ = ... km [5]

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0580/42/M/J/15

20 The diagram shows the positions of two ships, *A* and *B*, and a coastguard station, *C*.
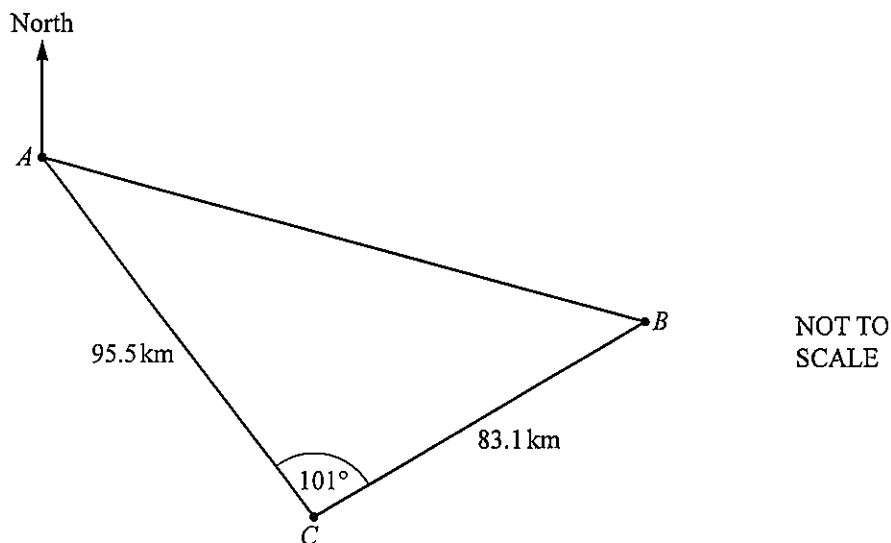
North

NOT TO
SCALE

(a) Calculate the distance, *AB*, between the two ships.
Show that it rounds to 138 km, correct to the nearest kilometre.

Answer(a)

[4]

(b) The bearing of the coastguard station *C* from ship *A* is 146°.

Calculate the bearing of ship *B* from ship *A*.

Answer(b) .... [4]

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(c)

At noon, a lighthouse, *L*, is 46.2 km from ship *B* on the bearing 021°.
Ship *B* sails north west.

Calculate the distance ship *B* must sail from its position at noon to be at its closest distance to the lighthouse.

Answer(c) .... km [2]

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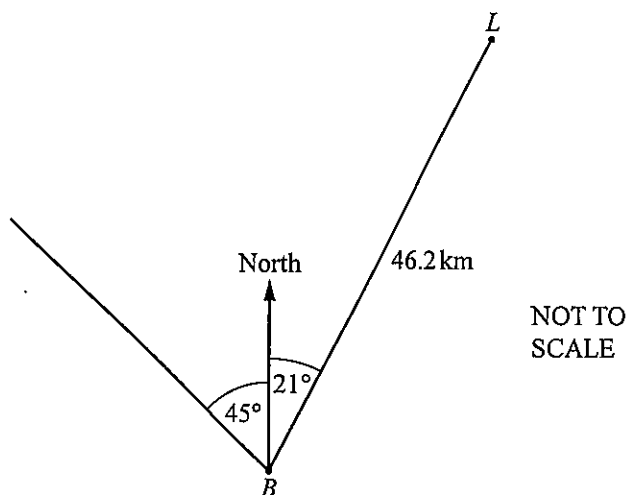
1   The table shows some values for the equation $y = x^3 - 2x$ for $-2 \leqslant x \leqslant 2$.

x	−2	−1.5	−1	−0.6	−0.3	0	0.3	0.6	1	1.5	2
y	−4	−0.38			0.57		−0.57			0.38	4

(a) Complete the table of values.   [3]

(b) On the grid below, draw the graph of $y = x^3 - 2x$ for $-2 \leqslant x \leqslant 2$.
      The first two points have been plotted for you.

                                                                          [4]

More Notes and Topical Past Papers at https://IGCSEexamguru.com
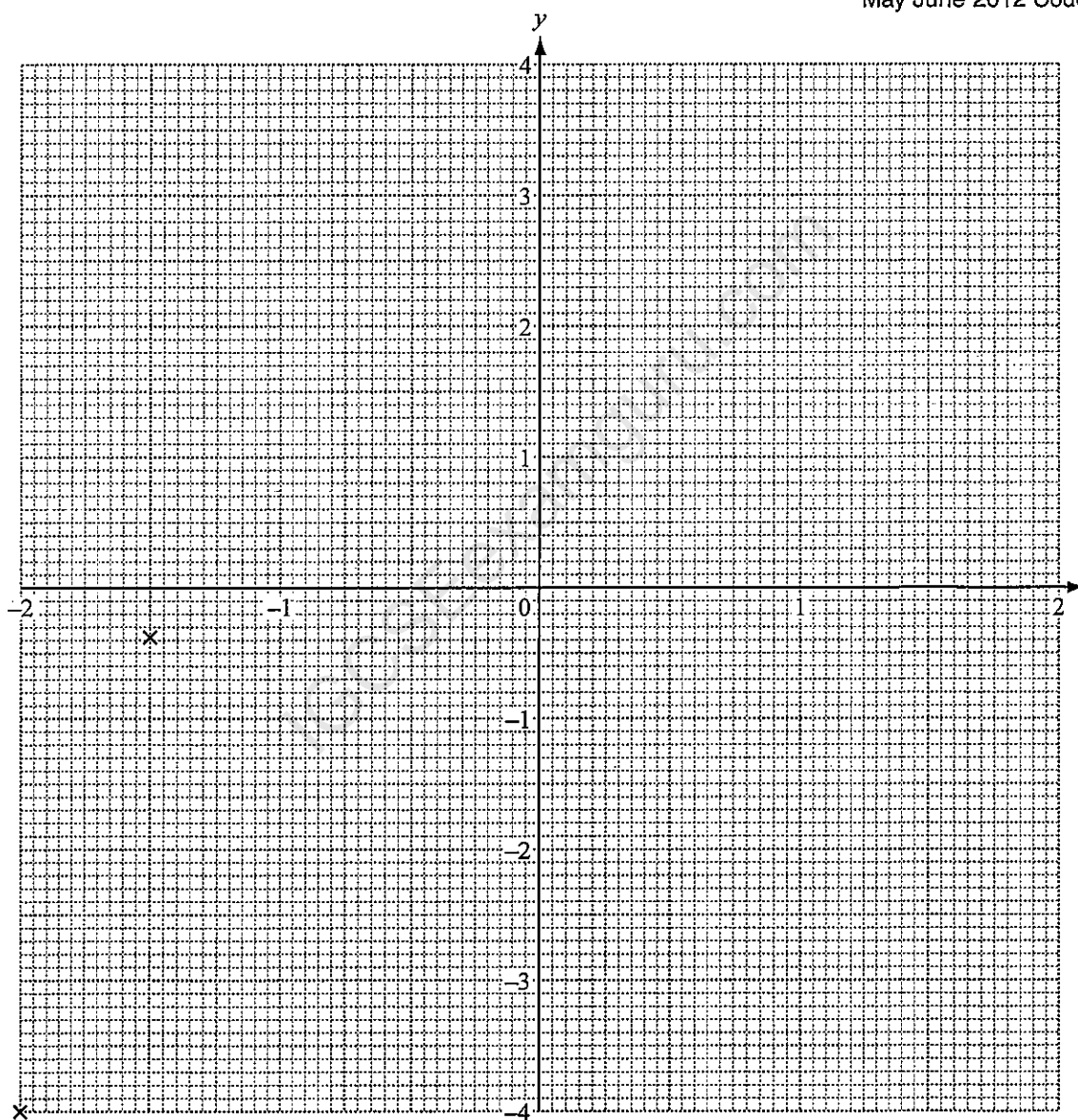
(c)   **(i)**   On the grid, draw the line $y = 0.8$ for $-2 \leqslant x \leqslant 2$.   [1]

        (ii)   Use your graph to solve the equation $x^3 - 2x = 0.8$.

                 Answer(c)(ii) $x =$ .... or $x =$ .... or $x =$ ....   [3]

(d)   By drawing a suitable tangent, work out an estimate for the gradient of the graph of $y = x^3 - 2x$ where $x = -1.5$.

     You must show your working.

                                     Answer(d) ....   [3]

2 $f(x) = 2^x$ May June 2012 Code 43

(a) Complete the table.

x	0	0.5	1	1.5	2	2.5	3	3.5	4
$f(x)$		1.4	2	2.8	4	5.7	8		

[3]

(b) Draw the graph of $y = f(x)$ for $0 \leqslant x \leqslant 4$.

[4]

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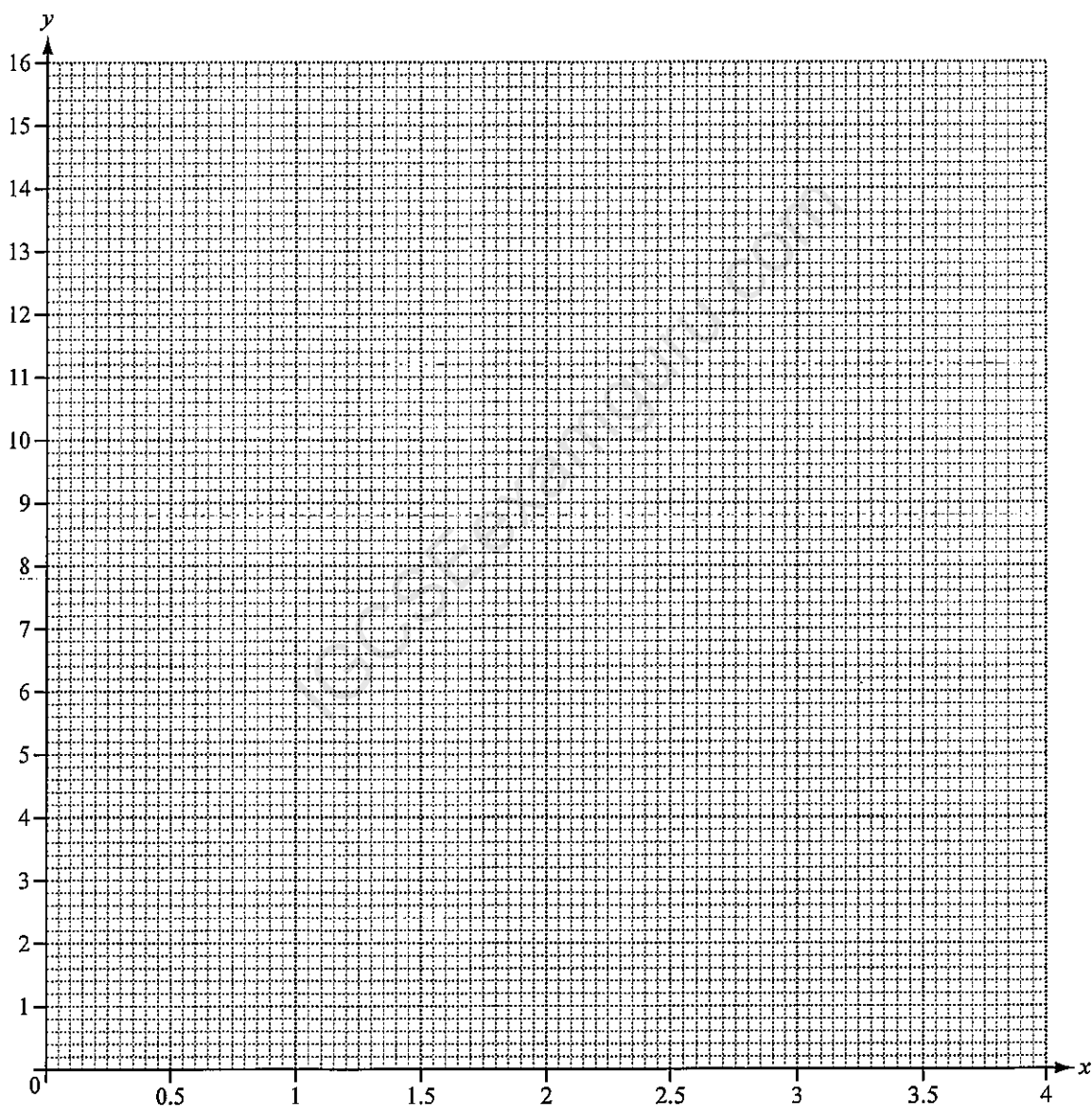
(c) Use your graph to solve the equation $2^x = 5$.

Answer(c) $x =$ .... [1]

(d) Draw a suitable straight line and use it to solve the equation $2^x = 3x$.

Answer(d) $x =$ .... or $x =$ .... [3]

(e) Draw a suitable tangent and use it to find the co-ordinates of the point on the graph of $y = f(x)$ where the gradient of the graph is 3.

Answer(e) (............ , ...) [3]

3   **(a)**   **(i)**   Complete the table of values for $y = \dfrac{1}{2}x^3 + x^2 - 7x$.   Oct Nov 2012 Code 41

x	−5	−4	−3	−2	−1	0	1	2	3	4
y	−2.5	12	16.5		7.5	0		−6	1.5	

[3]

     (ii)   On the grid, draw the graph of $y = \dfrac{1}{2}x^3 + x^2 - 7x$ for $-5 \leqslant x \leqslant 4$.
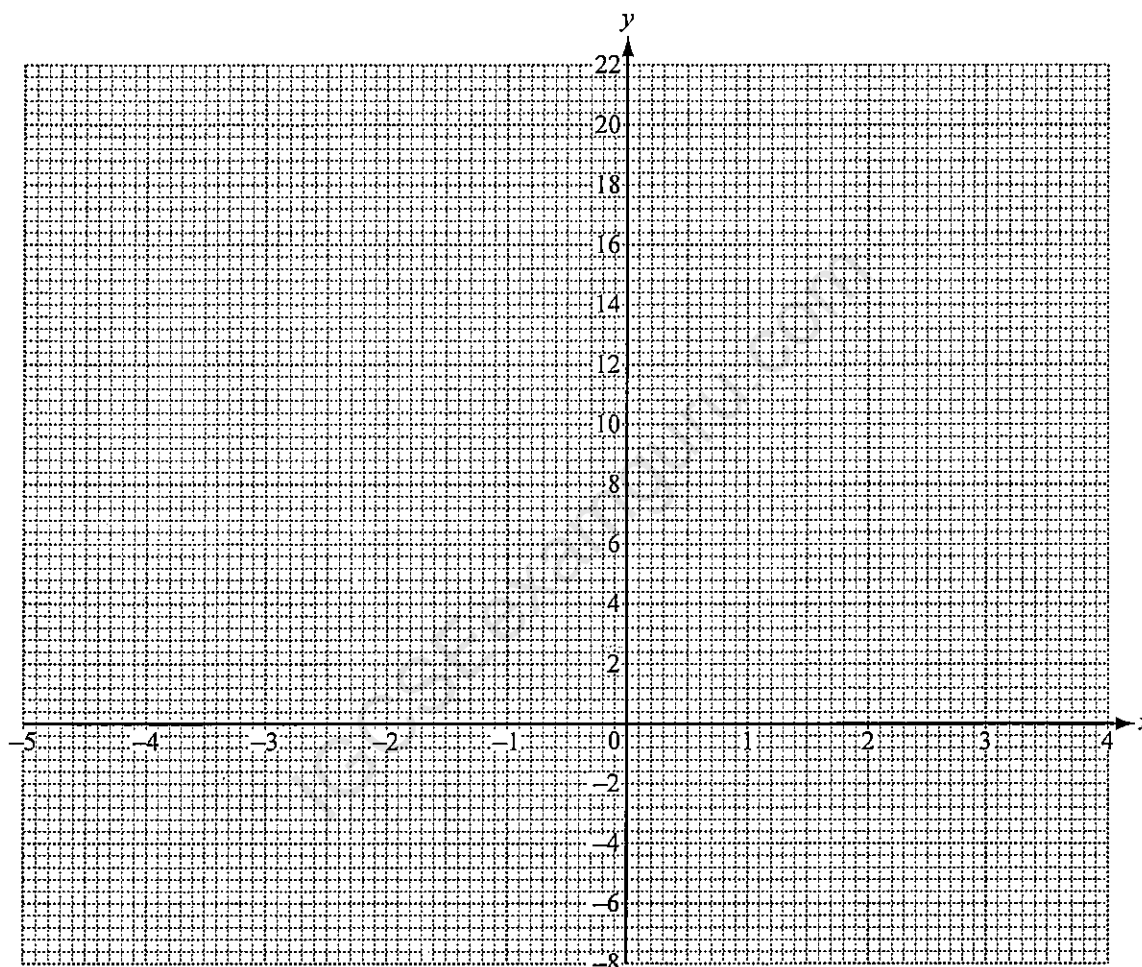
[4]

   (b)   Use your graph to solve the equation $\dfrac{1}{2}x^3 + x^2 - 7x = 2$.

Answer(b) x = ... or *x =* .... or *x =* ....   [3]

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(c) By drawing a suitable tangent, calculate an estimate of the gradient of the graph where $x = -4$.

Answer(c) .... [3]

(d) (i) On the grid draw the line $y = 10 - 5x$ for $-2 \leqslant x \leqslant 3$.   [3]

     (ii) Use your graphs to solve the equation $\dfrac{1}{2}x^3 + x^2 - 7x = 10 - 5x$.

Answer(d)(ii) $x =$ .... [1]

4   The graph of $y = f(x)$ is drawn on the grid for $0 \leqslant x \leqslant 3.2$.   Oct Nov 2012 Code 42
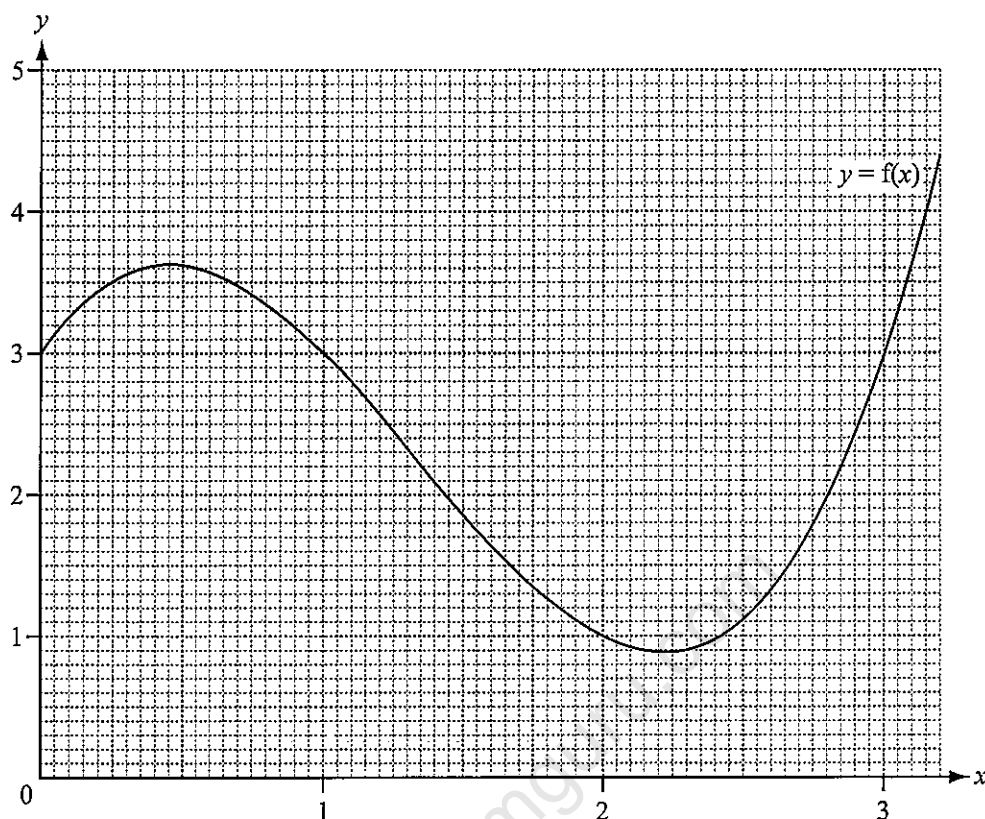
(a) (i)   Draw the tangent to the curve $y = f(x)$ at $x = 2.5$.   [1]

   (ii)   Use your tangent to estimate the gradient of the curve at $x = 2.5$.

Answer(a)(ii) .... [2]

(b) Use the graph to solve $f(x) = 2$,   for $0 \leqslant x \leqslant 3.2$.

Answer(b) x = ... or *x =* .... [2]

(c) $$g(x) = \frac{x}{2} + \frac{2}{x^2} \quad x \neq 0.$$

(i) Complete the table for values of $g(x)$, correct to 1 decimal place.

x	0.7	1	1.5	2	2.5	3
$g(x)$			1.6		1.6	1.7

[2]

(ii) On the grid opposite, draw the graph of $y = g(x)$ for $0.7 \leqslant x \leqslant 3$. [3]

(iii) Solve $f(x) = g(x)$ for $0.7 \leqslant x \leqslant 3$.

Answer(c) (iii) $x =$ .... or $x =$ .... or $x =$ .... [3]

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5

$$f(x) = \frac{2}{x^2} - 3x, \ x \neq 0$$

Oct Nov 2012 Code 43

(a) Complete the table.

x	-3	-2.5	-2	-1.5	-1	-0.5	0.5	1	1.5	2	2.5	3
$f(x)$	9.2	7.8	6.5	5.4		9.5	6.5		-3.6	-5.5	-7.2	-8.8

[2]

(b) On the grid, draw the graph of $y = f(x)$, for $-3 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 3$.

[5]
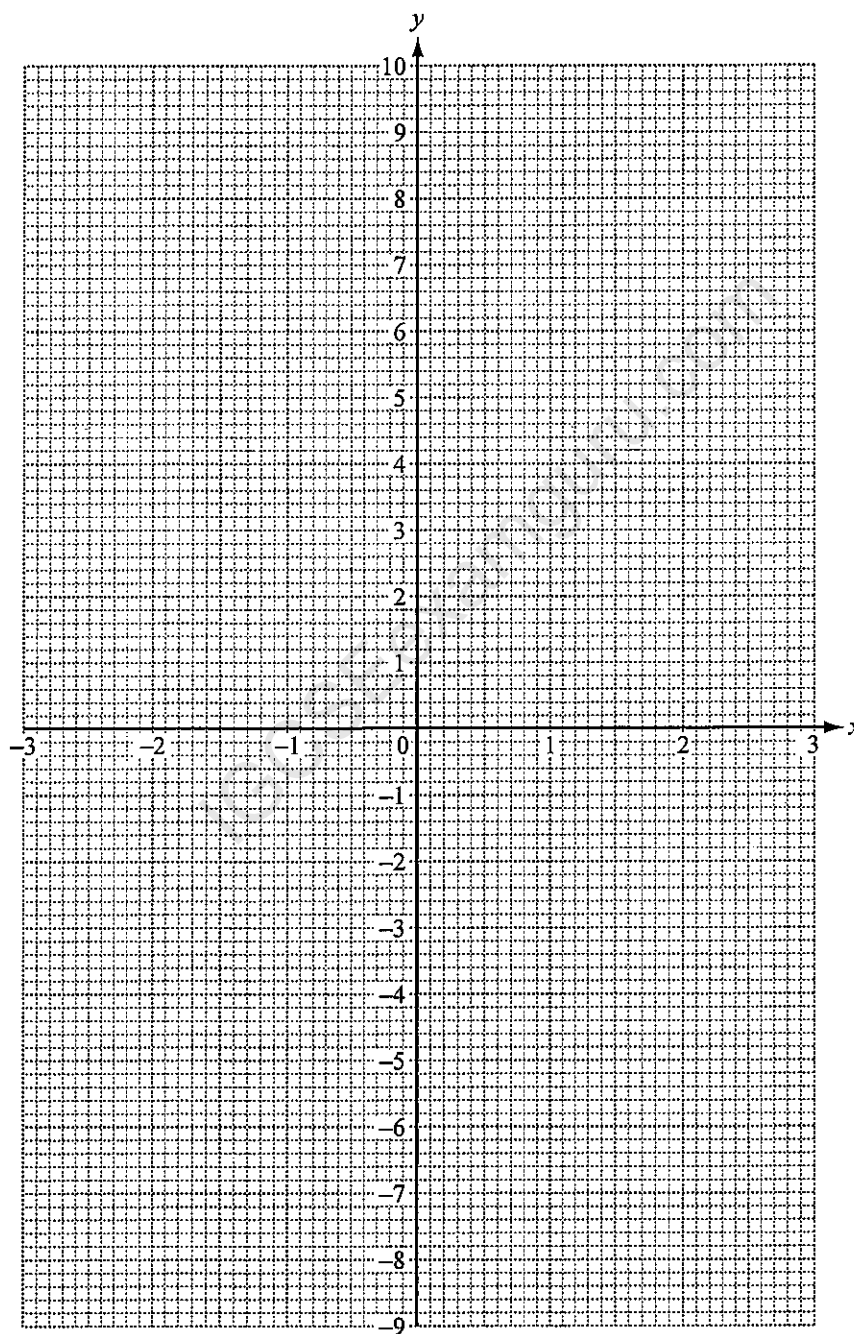
(c) Use your graph to solve the equations.

    (i) $f(x) = 4$

                                     Answer(c)(i) $x =$ .... [1]

    (ii) $f(x) = 3x$

                                       Answer(c)(ii) $x =$ .... [2]

(d) The equation $f(x) = 3x$ can be written as $x^3 = k$.

    Find the value of k.

                                       Answer(d) $k =$ .... [2]

(e) **(i)** Draw the straight line through the points $(-1, 5)$ and $(3, -9)$.   [1]

    (ii) Find the equation of this line.

                                   Answer(e)(ii) .... [3]

    (iii) Complete the statement.

        The straight line in **part (e)(ii)** is a .... to the graph of $y = f(x)$.   [1]

6

$$f(x) = 3 - x - x^2 \qquad g(x) = 3^x \qquad \text{May June 2013 Code 41}$$

(a) Complete the tables of values for f(x) and g(x).

x	−1.5	−1	−0.5	0	0.5	1	1.5
f(x)	2.25	3	3.25		2.25	1	−0.75

x	−1.5	−1	−0.5	0	0.5	1	1.5
g(x)	0.19		0.58		1.73	3	5.20

[3]

(b) On the grid, draw the graphs of $y = f(x)$ and $y = g(x)$ for $-1.5 \leqslant x \leqslant 1.5$.

[6]

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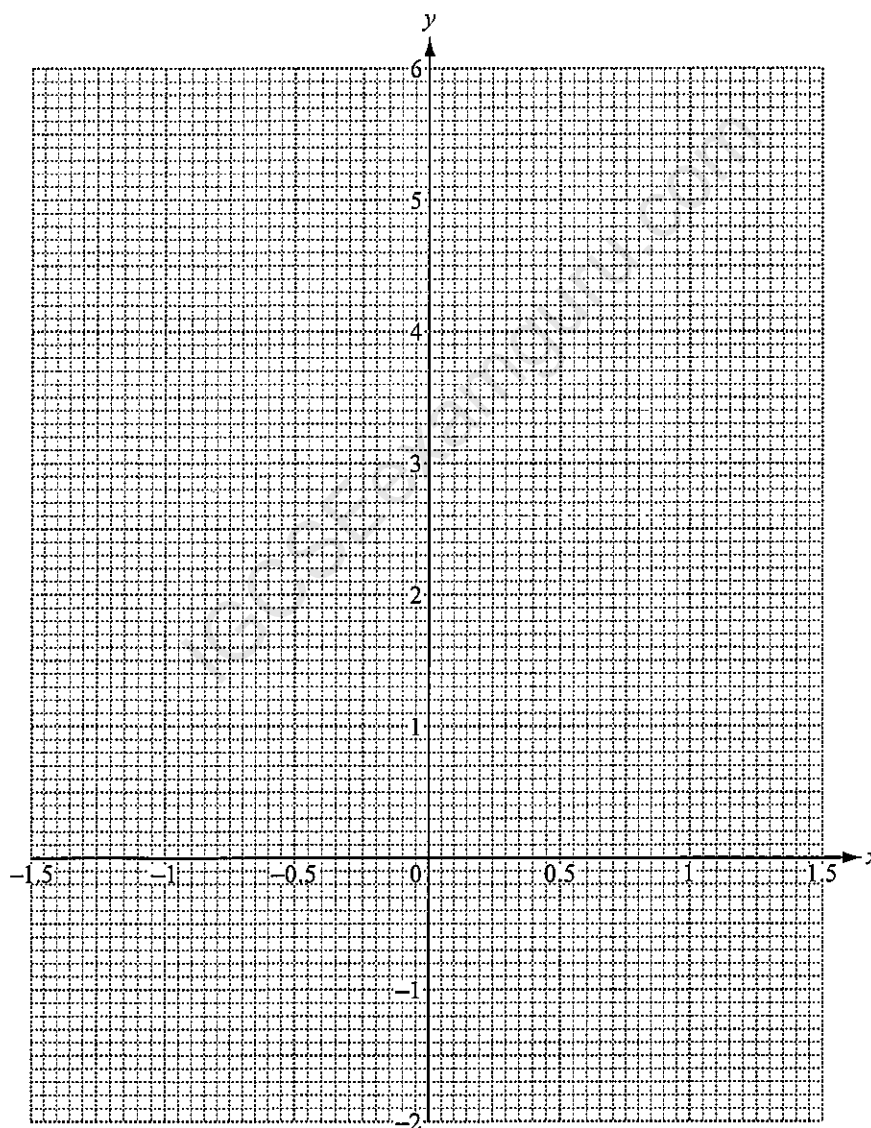
(c) For $-1.5 \leqslant x \leqslant 1.5$, use your graphs to solve

    (i) $f(x) = 0$,

Answer(c)(i) $x =$ .... [1]

    (ii) $g(x) = 4$,

Answer(c)(ii) $x =$ .... [1]

    (iii) $f(x) = g(x)$.

Answer(c)(iii) $x =$ .... [1]

(d) By drawing a suitable tangent, find an estimate of the gradient of the graph of $y = f(x)$ when $x = 0.5$.

Answer(d) .... [3]

7   The table shows some values for the function $y = 11x - 2x^2 - 12$ for $1 \leqslant x \leqslant 4.5$.

x	1	1.5	2	2.5	3	3.5	4	4.5
y	-3		2	3	3			

   (a)   Complete the table of values.   [3]

   (b)   On the grid below, draw the graph of $y = 11x - 2x^2 - 12$ for $1 \leqslant x \leqslant 4.5$.
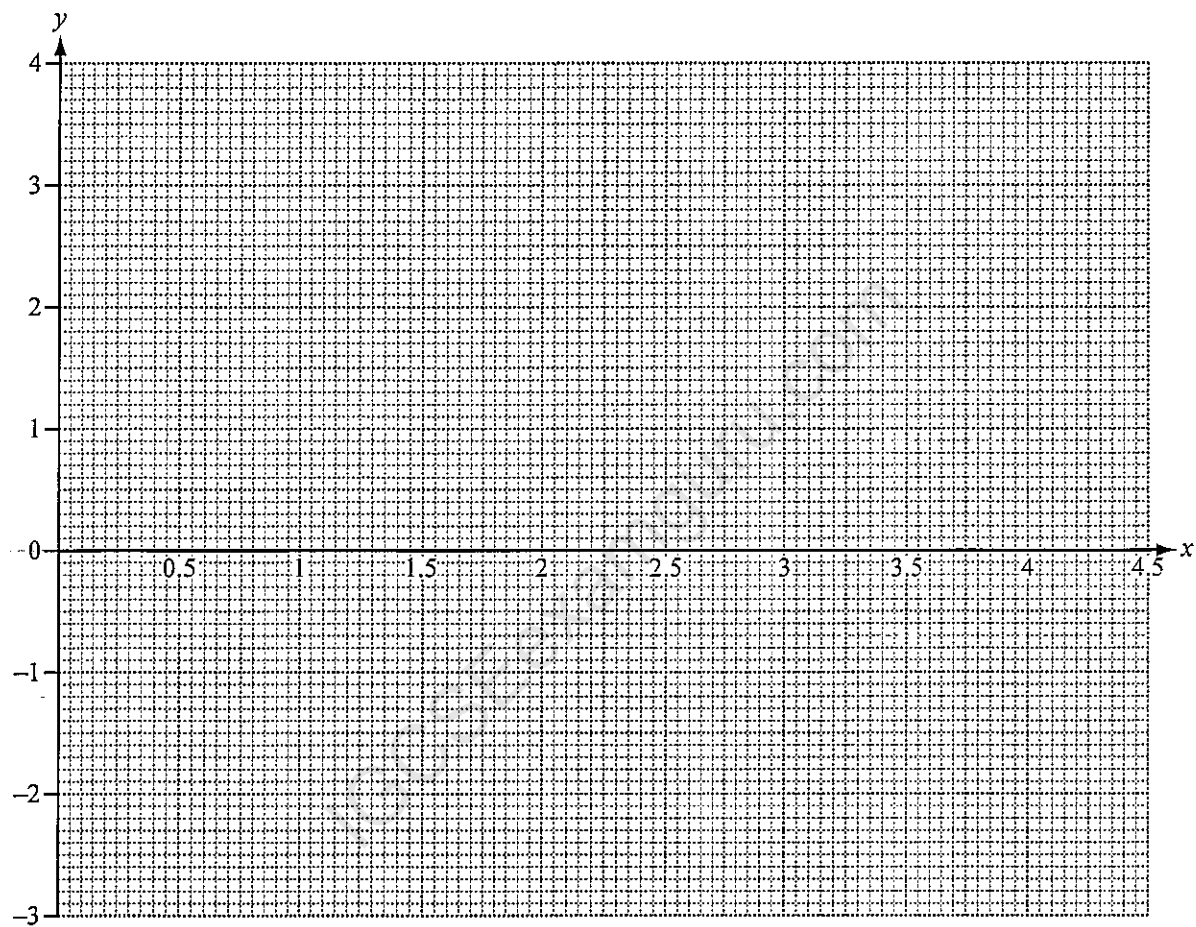
[4]

(c) By drawing a suitable line, use your graph to solve the equation $11x - 2x^2 = 11$.

Answer(c) $x =$ .... or $x =$ .... [2]

(d) The line $y = mx + 2$ is a tangent to the curve $y = 11x - 2x^2 - 12$ at the point P.

By drawing this tangent,

(i) nd the co-ordinates of the point P,

Answer(d)(i) (..................... , ...) [2]

(ii) work out the value of m.

Answer(d)(ii) $m =$ .... [2]

8   **(a)**   Complete this table of values for the function $f(x) = \frac{1}{x} - x^2$, $x \neq 0$.

x	–3	–2	–1	–0.5	–0.2		0.2	0.5	1	2	3
$f(x)$	–9.33	–4.5	–2	–2.25			4.96			–3.5	–8.67

[3]

     (b)   Draw the graph of $f(x) = \frac{1}{x} - x^2$ for $-3 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 3$.

May June 2013 Code 43

[5]
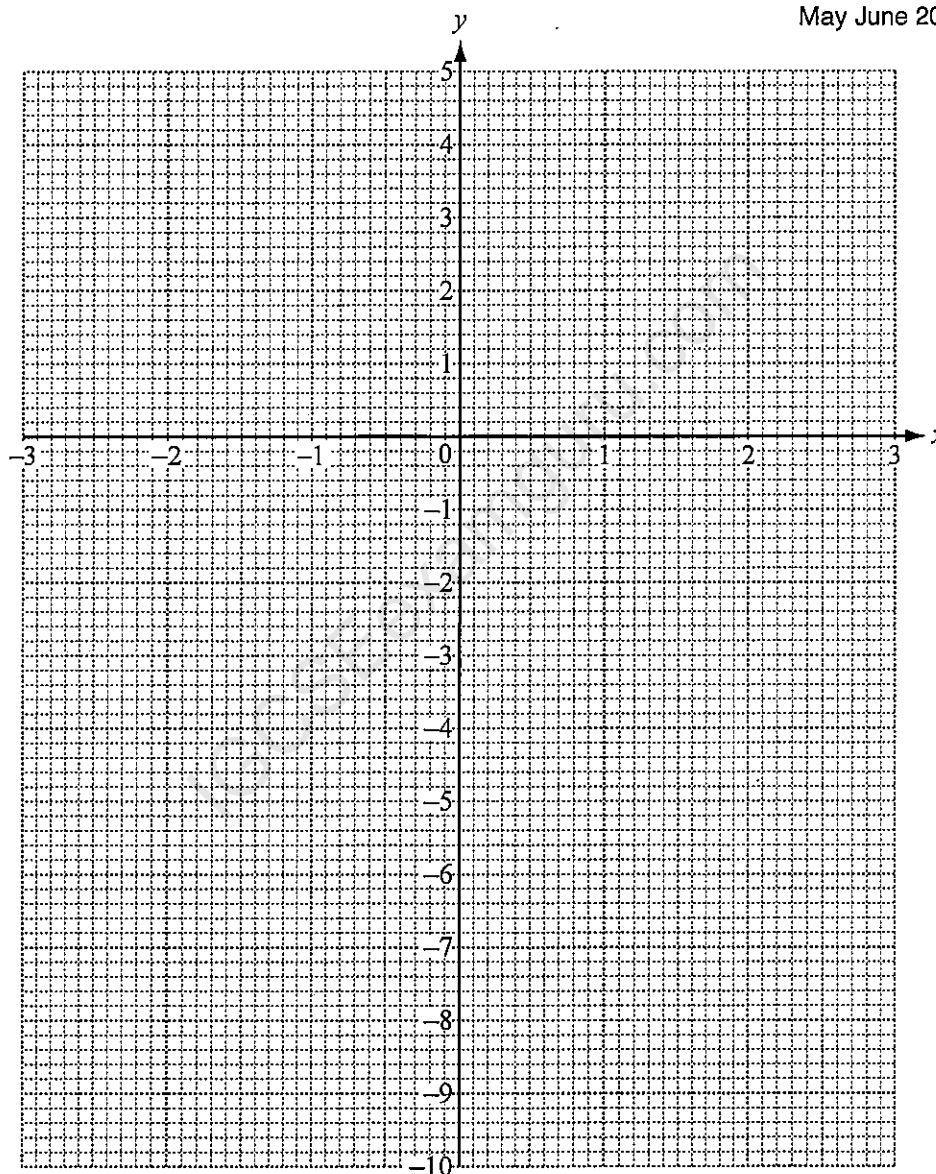
(c) Use your graph to solve $f(x) = -3$.

Answer(c) $x = $ .... or $x = $ .... or $x = $ .... [3]

(d) By drawing a suitable line on your graph, solve the equation $f(x) = 2x - 2$.

Answer(d) $x = $ .... or $x = $ .... or $x = $ .... [3]

(e) By drawing a suitable tangent, work out an estimate of the gradient of the curve at the point where $x = -2$.

You must show your working.

Answer(e) .... [3]

9   Emily cycles along a path for 2 minutes.

She starts from rest and accelerates at a constant rate until she reaches a speed of 5 m/s after 40 seconds.

She continues cycling at 5 m/s for 60 seconds.

She then decelerates at a constant rate until she stops after a further 20 seconds.

(a) On the grid, draw a speed-time graph to show Emily's journey.   Oct Nov 2013 Code 41
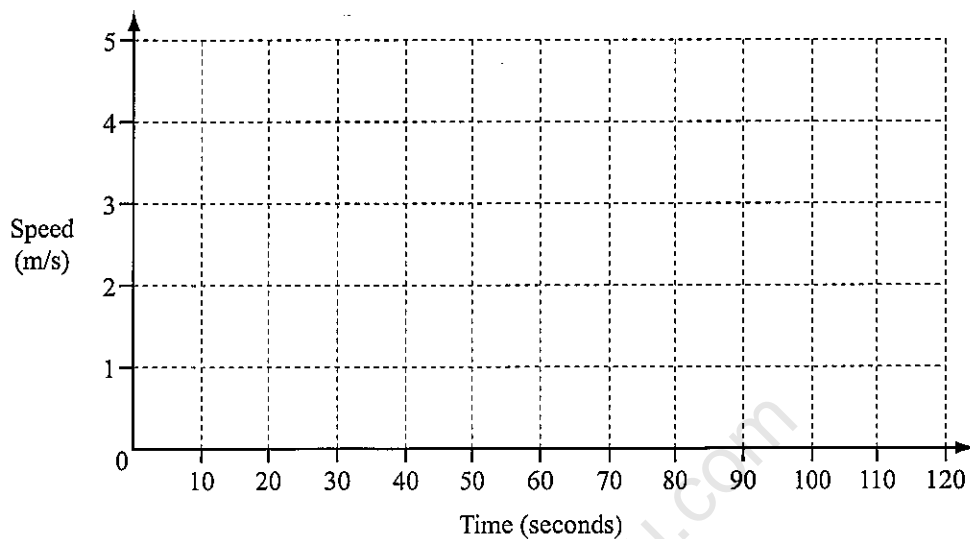
[2]

(b) Find Emily's acceleration.

Answer(b) .... m/s² [1]

(c) Calculate Emily's average speed for the journey.

Answer(c) .... m/s [4]

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10   **(a)**
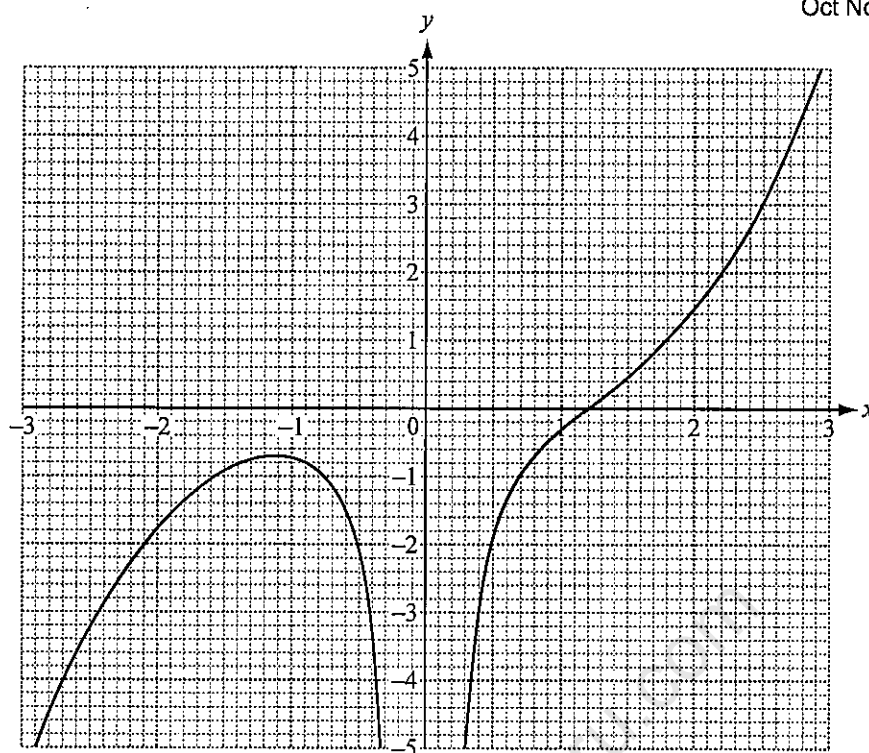
The diagram shows the graph of $y = f(x)$ for $-3 \leqslant x \leqslant 3$.

(i) Find f(2).

Answer(a)(i) .... [1]

(ii) Solve the equation $f(x) = 0$.

Answer(a)(ii) $x =$ .... [1]

(iii) Write down the value of the largest **integer**, k, for which the equation $f(x) = k$ has 3 solutions.

Answer(a)(iii) $k =$ .... [1]

(iv) By drawing a suitable straight line, solve the equation $f(x) = x$.

Answer(a)(iv) $x =$ .... or $x =$ .... or $x =$ .... [3]

(b) $g(x) = 1 - 2x$ $h(x) = x^2 - 1$

    (i)   Find $gh(3)$.

Answer(b)(i) .... [2]

    (ii)   Find $g^{-1}(x)$.

Answer(b)(ii) $g^{-1}(x) =$ .... [2]

    (iii)   Solve the equation $h(x) = 3$.

Answer(b)(iii) $x =$ .... or $x =$ .... [3]

    (iv)   Solve the equation $g(3x) = 2x$.

Answer(b)(iv) $x =$ .... [3]

11   **(a)** Complete the table of values for $y = \dfrac{2}{x^2} - \dfrac{1}{x} - 3x$.   Oct Nov 2013 Code 42

x	−3	−2	−1	−0.5	−0.3	0.3	0.5	1	2	3
y	9.6		6		26.5	18.0		−2	−6	−9.1

[3]

(b) Draw the graph of $y = \dfrac{2}{x^2} - \dfrac{1}{x} - 3x$ for $-3 \leqslant x \leqslant -0.3$ and $0.3 \leqslant x \leqslant 3$.

[5]
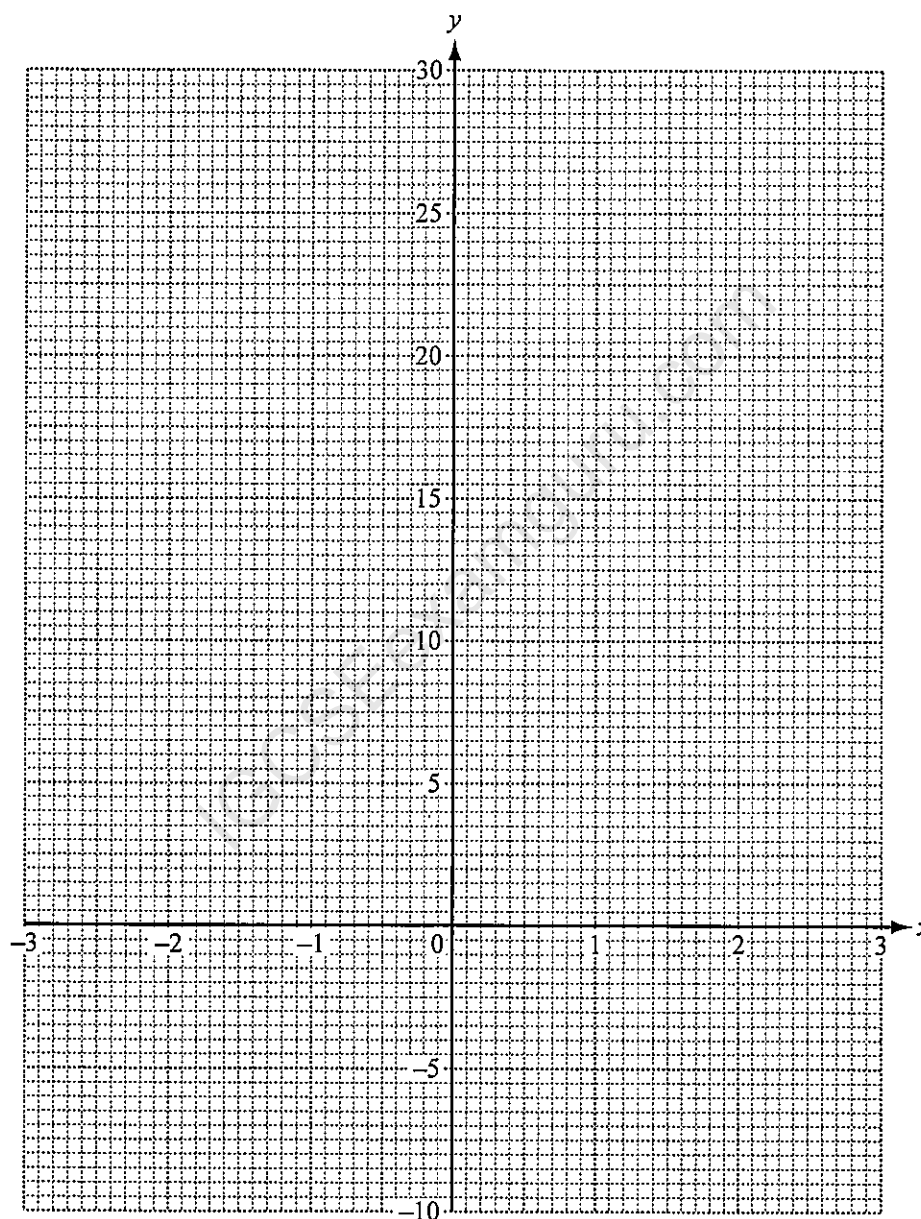
(c) Use your graph to solve these equations.

(i) $\dfrac{2}{x^2} - \dfrac{1}{x} - 3x = 0$

Answer(c)(i) $x = $ .... [1]

(ii) $\dfrac{2}{x^2} - \dfrac{1}{x} - 3x - 7.5 = 0$

Answer(c)(ii) $x = $ .... or $x = $ .... or $x = $ .... [3]

(d) **(i)** By drawing a suitable straight line on the graph, solve the equation $\dfrac{2}{x^2} - \dfrac{1}{x} - 3x = 10 - 3x$.

Answer(d)(i) $x = $ .... or $x = $ .... [4]

(ii) The equation $\dfrac{2}{x^2} - \dfrac{1}{x} - 3x = 10 - 3x$ can be written in the form $ax^2 + bx + c = 0$ where a, b and c are integers.

Find the values of a, b and c.

Answer(d)(ii) $a = $ .... , $b = $ .... , $c = $ .... [3]

12   A rectangular metal sheet measures 9 cm by 7 cm.   Oct Nov 2013 Code 43
A square, of side x cm, is cut from each corner.
The metal is then folded to make an open box of height x cm.
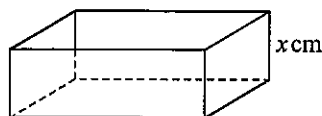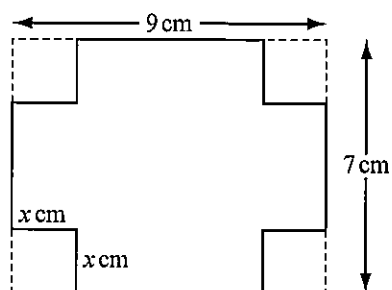
(a)   Write down, in terms of x, the length and width of the box.

Answer(a) Length = ...

Width = ... [2]

(b)   Show that the volume, V, of the box is $4x^3 - 32x^2 + 63x$.

Answer(b)

[2]

(c)   Complete this table of values for $V = 4x^3 - 32x^2 + 63x$.

x	0	0.5	1	1.5	2	2.5	3	3.5
V	0		35	36	30		9	0

[2]

(d)   On the grid opposite, draw the graph of $V = 4x^3 - 32x^2 + 63x$ for $0 \leqslant x \leqslant 3.5$.
Three of the points have been plotted for you.

[3]
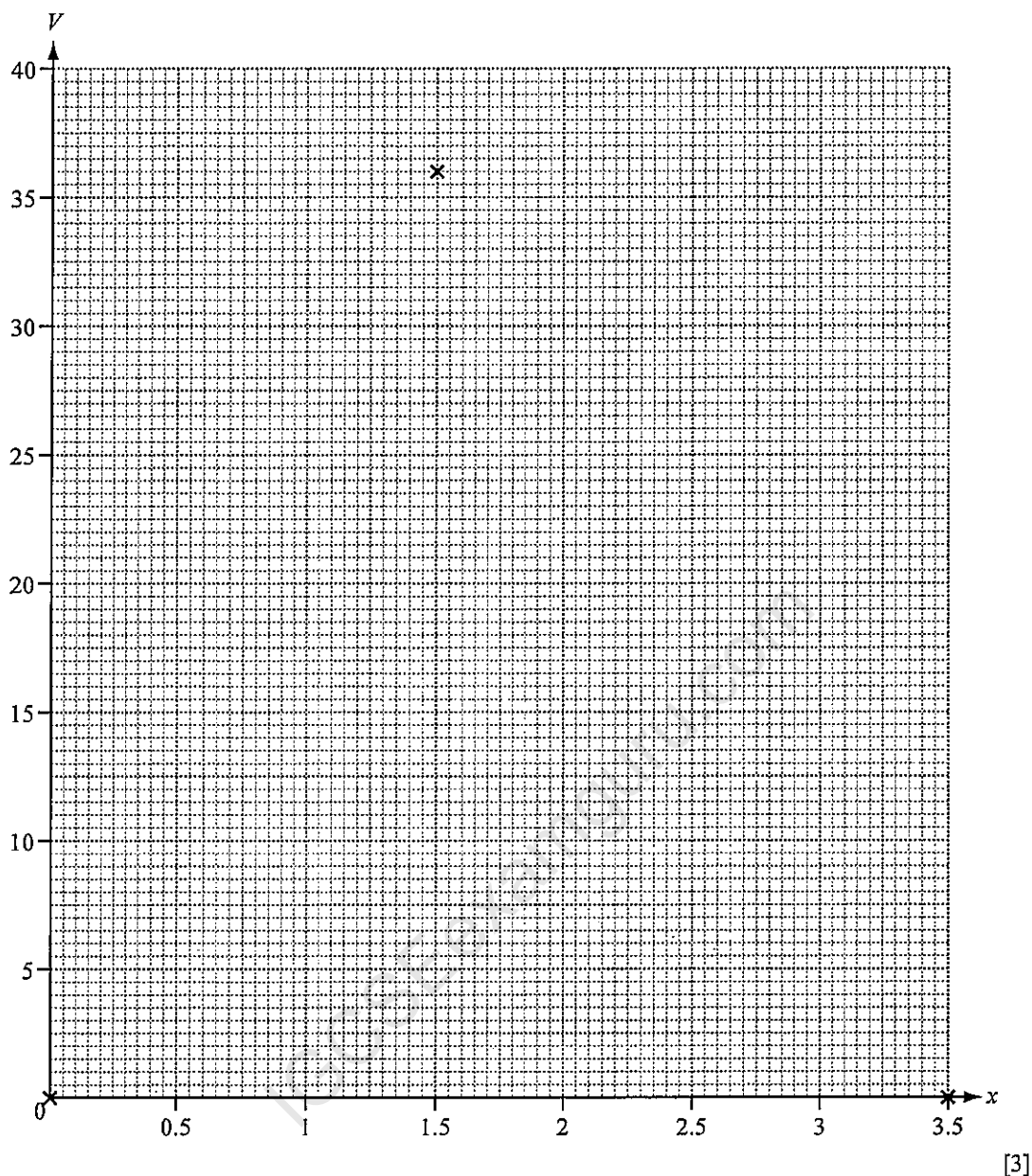
(e) The volume of the box is at least 30 cm³.
Write down, as an inequality, the possible values of x.

Answer(e) .... [2]

(f) **(i)** Write down the maximum volume of the box.

Answer(f)(i) .... cm³ [1]

(ii) Write down the value of x which gives the maximum volume.

Answer(f)(ii) .... [1]

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13   The diagram shows the speed-time graph for a car travelling between two sets of traf c lights.
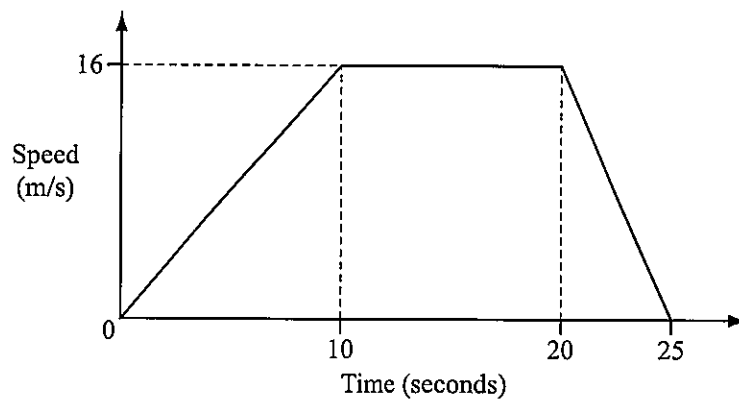
Oct Nov 2013 Code 43

(i) Calculate the deceleration of the car for the last 5 seconds of the journey.

Answer(c)(i) .... m/s² [1]

(ii) Calculate the average speed of the car between the two sets of traf c lights.

Answer(c)(ii) .... m/s [4]

14   Ali leaves home at 10 00 to cycle to his grandmother's house. He arrives at 13 00.
The distance-time graph represents his journey.

May June 2014 Code 41
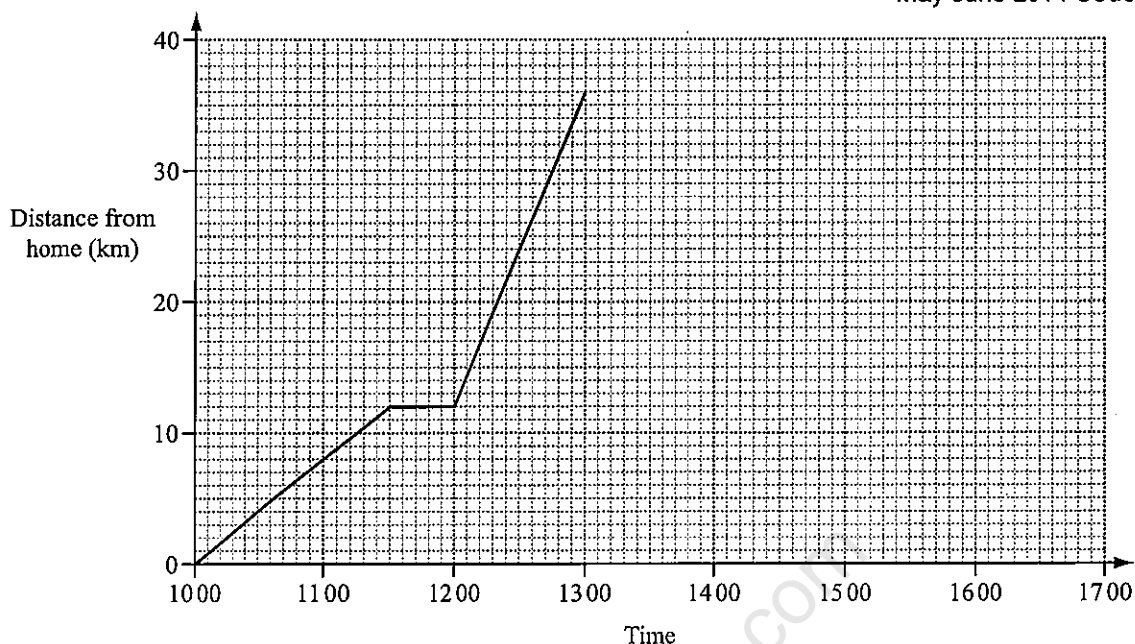
(a) Calculate Ali's speed between 10 00 and 11 30.
Give your answer in kilometres per hour.

Answer(a) .... km/h [2]

(b) Show that Ali's average speed for the whole journey to his grandmother's house is 12 km/h.

Answer(b)

[2]

(c) Change 12 kilometres per hour into metres per minute.

Answer(c) .... m/min [2]

(d) Ali stays for 45 minutes at his grandmother's house and then returns home.
He arrives home at 16 42.

Complete the distance-time graph.   [2]

15   **(a)** Complete the table of values for $y = x^3 - 3x + 1$.   May June 2014 Code 41

x	–2.5	–2	–1.5	–1	–0.5	0	0.5	1	1.5	2	2.5
y	–7.125	–1		3		1	–0.375	–1	–0.125	3	9.125

[2]

   (b) Draw the graph of $y = x^3 - 3x + 1$ for $-2.5 \leqslant x \leqslant 2.5$.

[4]

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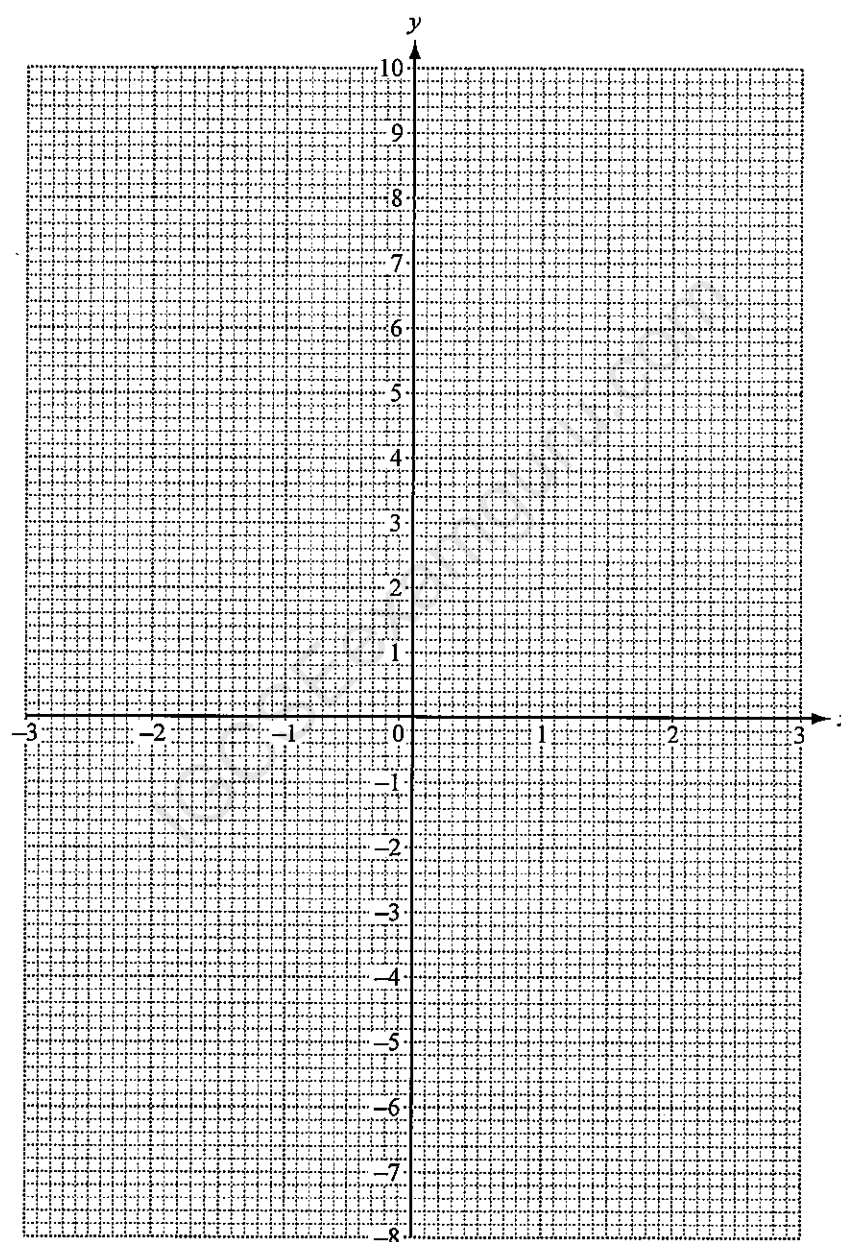
(c) By drawing a suitable tangent, estimate the gradient of the curve at the point where $x = 2$.

Answer(c) .... [3]

(d) Use your graph to solve the equation $x^3 - 3x + 1 = 1$.

Answer(d) $x =$ .... or $x =$ .... or $x =$ .... [2]

(e) Use your graph to complete the inequality in k for which the equation

$x^3 - 3x + 1 = k$ has three different solutions.

Answer(e) .... $< k <$ .... [2]

16 $f(x) = \dfrac{1}{x^2} - 2x$, $x \neq 0$

May June 2014 Code 42

(a) Complete the table of values for $f(x)$.

x	-3	-2.5	-2	-1.5	-1	-0.5	0.4	0.5	1	1.5	2
$f(x)$	6.1	5.2	4.3	3.4		5	5.5			-2.6	-3.8

[3]

(b) On the grid, draw the graph of $y = f(x)$ for $-3 \leqslant x \leqslant -0.5$ and $0.4 \leqslant x \leqslant 2$.
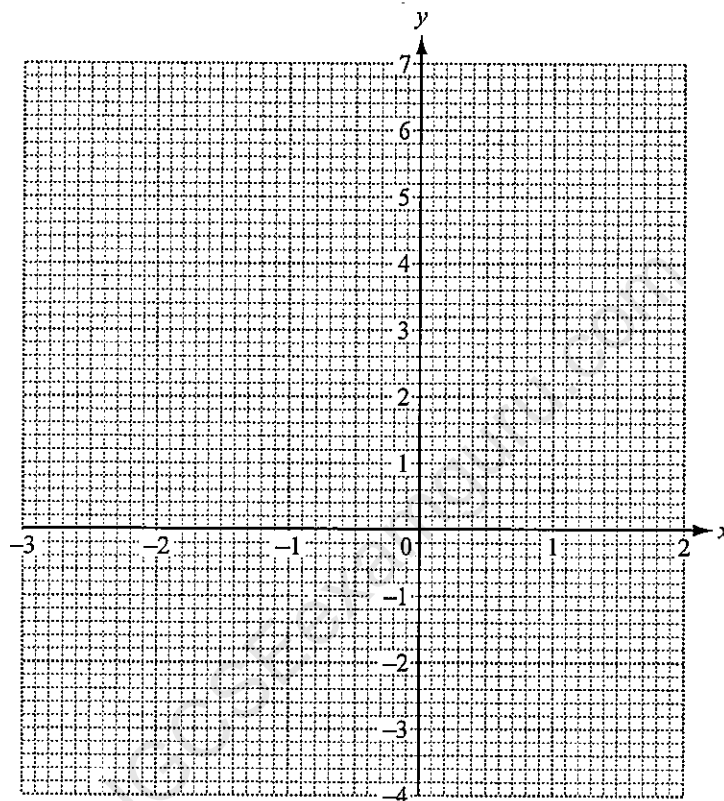
[5]

(c) Solve the equation $f(x) = 2$.

Answer(c) $x =$ .... [1]

(d) Solve the equation $f(x) = 2x + 3$.

Answer(d) $x =$ .... [3]

(e) (i) Draw the tangent to the graph of $y = f(x)$ at the point where $x = -1.5$.   [1]

(ii) Use the tangent to estimate the gradient of the graph of $y = f(x)$ where $x = -1.5$.

Answer(e)(ii) .... [2]

17   The table shows some values for the function $y = \dfrac{1}{x^2} + x$, $x \neq 0$.   May June 2014 Code 43

x	-3	-2	-1	-0.5	0.5	1	2	3	4
y	-2.89	-1.75		3.5		2	2.25		4.06

(a)   Complete the table of values.   [3]

(b)   On the grid, draw the graph of $y = \dfrac{1}{x^2} + x$ for $-3 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 4$.

[5]
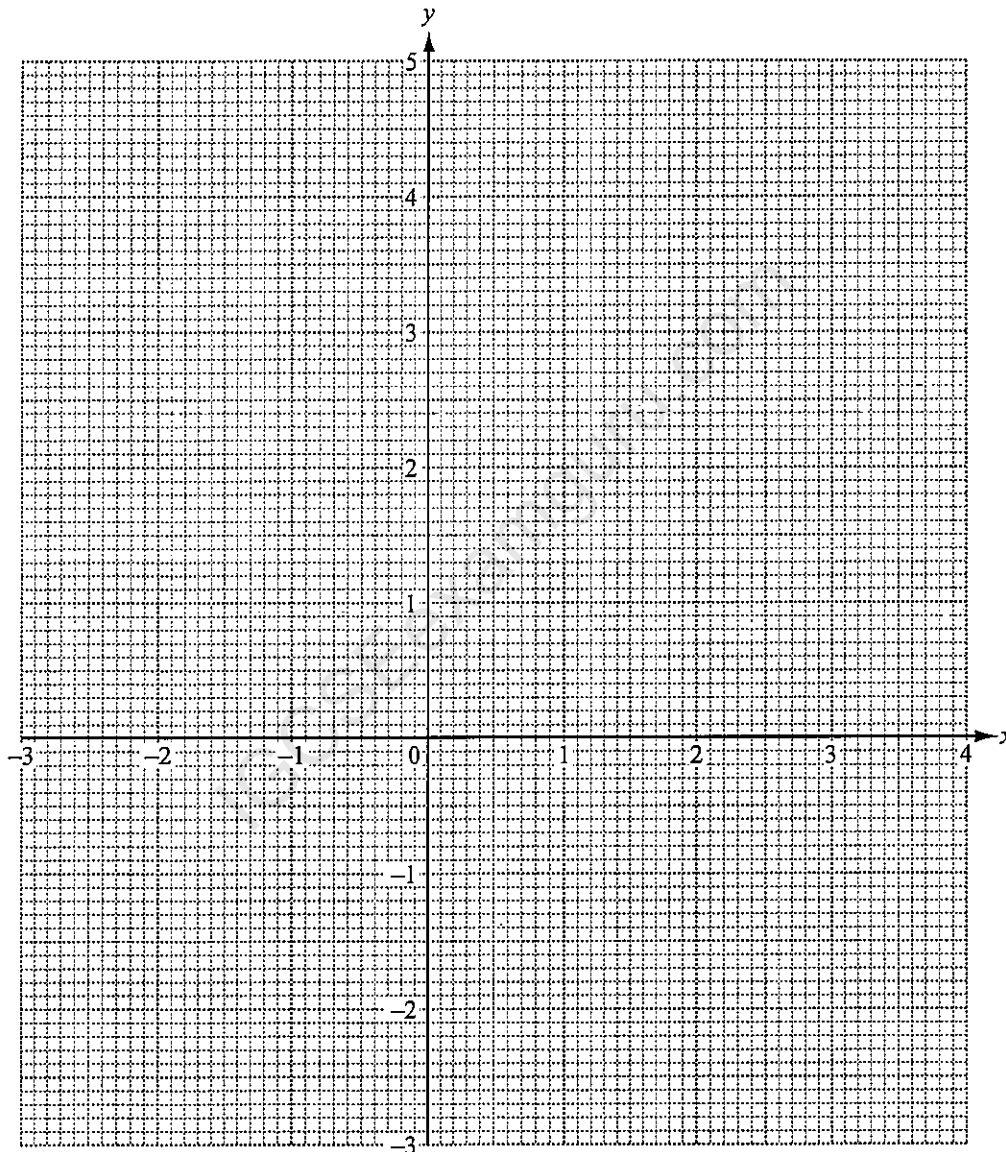
(c) Use your graph to solve the equation $\dfrac{1}{x^2} + x - 3 = 0$.

Answer(c) x = ... or x = ... or x = ... [3]

(d) Use your graph to solve the equation $\dfrac{1}{x^2} + x = 1 - x$.

Answer(d) x = ... [3]

(e) By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = 2$.

Answer(e) .... [3]

(f) Using algebra, show that you can use the graph at $y = 0$ to find $\sqrt[3]{-1}$.

Answer(f)

[3]

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18 **(c)** The diagram shows the speed-time graph for a car travelling along a road for T seconds.

Oct Nov 2014 Code 41

To begin with the car accelerated at $0.75 \, \text{m/s}^2$ for 20 seconds to reach a speed of v m/s.

(i) Show that the speed, v, of the car is $15 \, \text{m/s}$.

Answer(c)(i)

[1]

(ii) The total distance travelled is 1.8 **kilometres**.

Calculate the total time, T, of the journey.

Answer(c)(ii) .... seconds [4]

(d) Asma runs 22 kilometres, correct to the nearest kilometre.
She takes $2\frac{1}{2}$ hours, correct to the nearest half hour.

Calculate the upper bound of Asma's speed.

Answer(d) .... km/h [3]

19   **(a)** Complete the table of values for $y = x^2 + \dfrac{3}{x}$, $x \neq 0$.   Oct Nov 2014 Code 41

x	−3	−2	−1	−0.5	0.4	0.6	1	1.5	2	3
y	8	2.5		−5.8	7.7	5.4	4	4.3		10

[2]

   (b) Draw the graph of $y = x^2 + \dfrac{3}{x}$ for $-3 \leqslant x \leqslant -0.5$ and $0.4 \leqslant x \leqslant 3$.

[5]
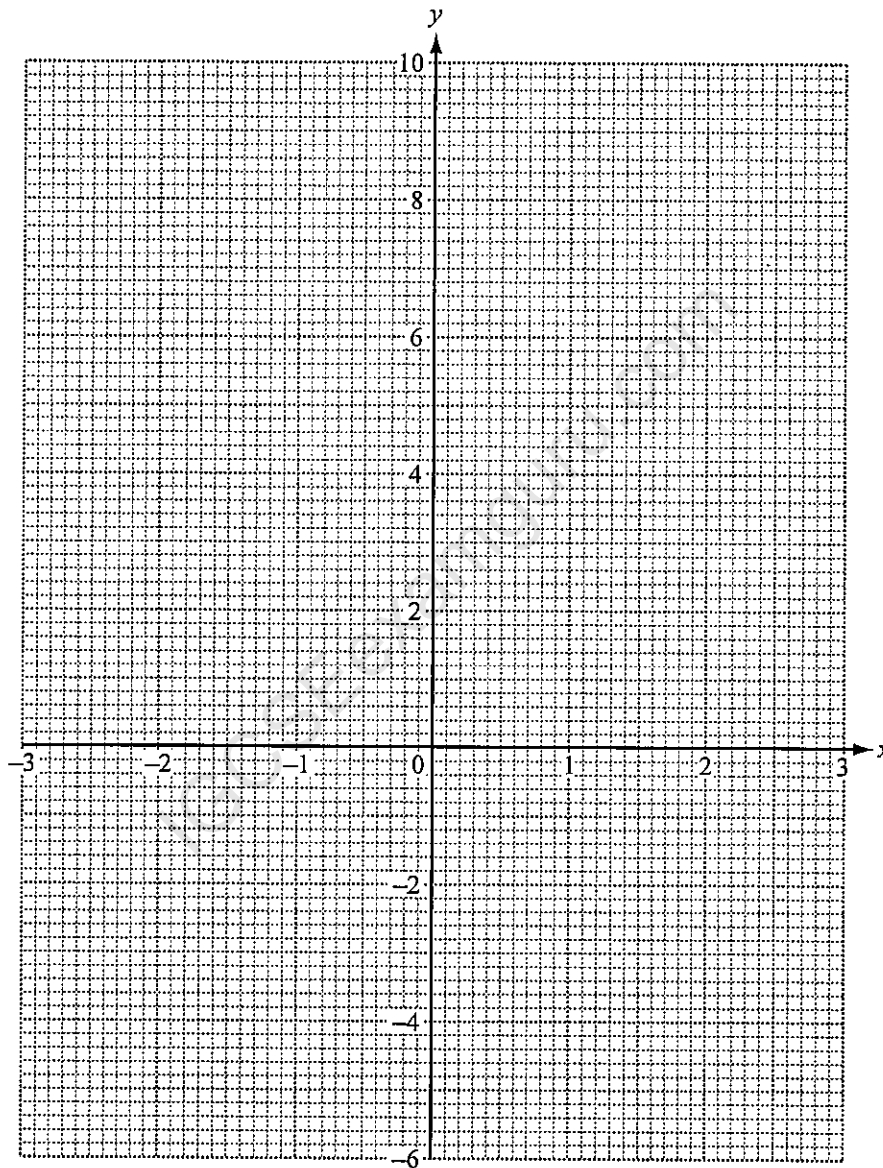
(c) Use your graph to solve the equation $x^2 + \dfrac{3}{x} = 5$.

Answer(c) $x =$ .... or $x =$ .... or $x =$ .... [3]

(d) By drawing a suitable straight line, solve the equation $x^2 + \dfrac{3}{x} = x + 5$.

Answer(d) $x =$ .... or $x =$ .... or $x =$ .... [4]

20 $f(x) = 5x^3 - 8x^2 + 10$

Oct Nov 2014 Code 42

(a) Complete the table of values.

x	−1.5	−1	−0.5	0	0.5	0.75	1	1.5	2
$f(x)$	−24.9			10	8.6	7.6	7		18

[3]

(b) Draw the graph of $y = f(x)$ for $-1.5 \leqslant x \leqslant 2$.
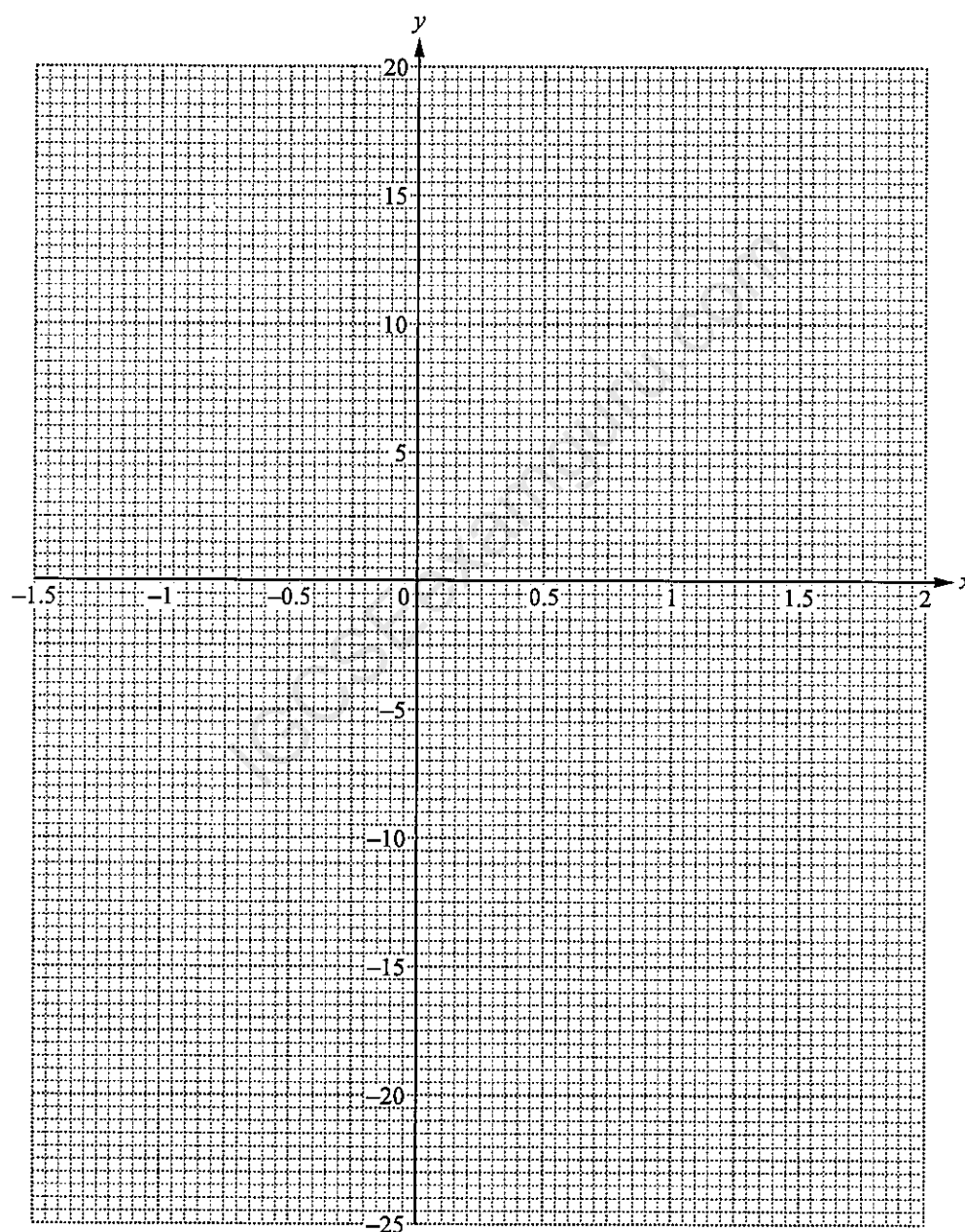
[4]

(c) Use your graph to nd an **integer** value of k so that $f(x) = k$ has

    (i)   exactly one solution,

Answer(c)(i) $k =$ .... [1]

    (ii)   three solutions.

Answer(c)(ii) $k =$ .... [1]

(d) By drawing a suitable straight line on the graph, solve the equation $f(x) = 15x + 2$ for $-1.5 \leqslant x \leqslant 2$.

Answer(d) $x =$ .... or $x =$ .... [4]

(e) Draw a tangent to the graph of $y = f(x)$ at the point where $x = 1.5$.

Use your tangent to estimate the gradient of $y = f(x)$ when $x = 1.5$.

Answer(e) .... [3]

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21   The table shows some values for $y = x^2 - \dfrac{1}{2x}$, $x \neq 0$.

x	-2	-1.5	-1	-0.5	-0.25	-0.2	0.2	0.25	0.5	1	1.5	2
y	4.25	2.58			2.06	2.54	-2.46	-1.94			1.92	3.75

(a)   Complete the table of values.   [4]

(b)   On the grid, draw the graph of $y = x^2 - \dfrac{1}{2x}$ for $-2 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 2$.

May June 2015 Code 41
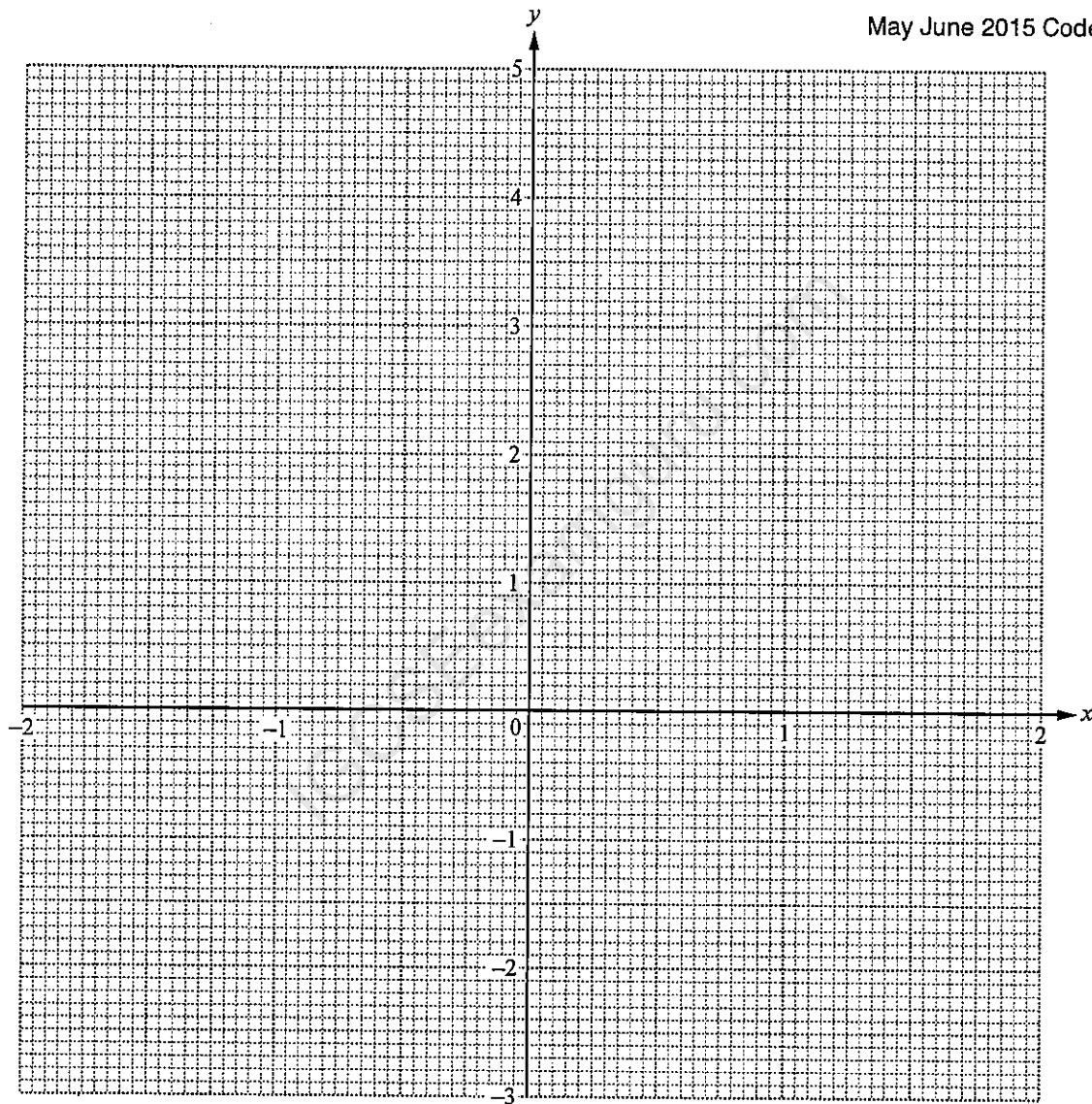
[5]

(c)   By drawing a suitable line, use your graph to solve the equation $x^2 - \dfrac{1}{2x} = 2$.

Answer(c) x = ... or *x =* .... or *x =* .... [3]

(d) The equation $x^2 - \dfrac{1}{2x} = k$ has only one solution.

Write down the range of values of k for which this is possible.

Answer(d) .... [2]

(e) By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = -1$.

Answer(e) .... [3]

22 $y = x^2 - 2x + \dfrac{12}{x}, \; x \neq 0$

May June 2015 Code 42

(a) Complete the table of values.

x	−4	−3	−2	−1	−0.5	0.5	1	2	3	4
y	21	11		−9	−22.75	23.25	11	6		11

[2]

(b) On the grid, draw the graph of $y = x^2 - 2x + \dfrac{12}{x}$ for $-4 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 4$.

[5]

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(c) By drawing a suitable tangent, find an estimate of the gradient of the graph at the point (1, 11).

Answer(c) .... [3]

(d) The equation $x^2 - 2x + \dfrac{12}{x} = k$ has exactly two distinct solutions.

Use the graph to find

(i) the value of k,

Answer(d)(i) $k =$ .... [1]

(ii) the solutions of $x^2 - 2x + \dfrac{12}{x} = k$.

Answer(d)(ii) $x =$ .... or $x =$ .... [2]

(e) The equation $x^3 + ax^2 + bx + c = 0$ can be solved by drawing the line $y = 3x + 1$ on the grid.

Find the value of a, the value of b and the value of c.

Answer(e) $a =$ ....

$b =$ ....

$c =$ .... [3]

More Notes and Topical Past Papers at https://IGCSEexamguru.com

23 $f(x) = \dfrac{8}{x^2} + \dfrac{x}{2}, \quad x \neq 0.$ May June 2015 Code 43

(a) Complete the table of values for f(x).

x	−5	−4	−3	−2	−1.5	1.5	2	2.5	3	3.5	4	5
f(x)	−2.2	−1.5	−0.6		2.8	4.3		2.5	2.4	2.4		2.8

[3]

(b) On the grid, draw the graph of $y = f(x)$ for $-5 \leqslant x \leqslant -1.5$ and $1.5 \leqslant x \leqslant 5$.

[5]
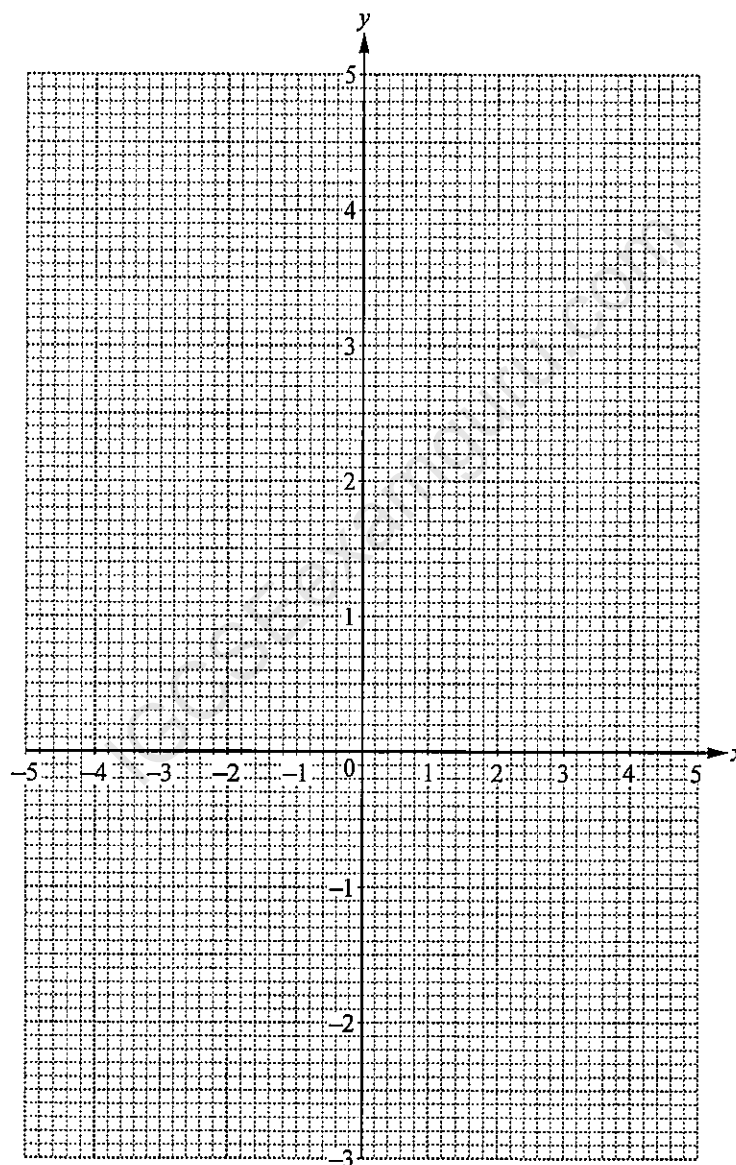
(c) Solve f(x) = 0.

Answer(c) x = ... [1]

(d) By drawing a suitable line on the grid, solve the equation f(x) = 1 − x.

Answer(d) x = ... [3]

(e) By drawing a tangent at the point (−3, −0.6), estimate the gradient of the graph of y = f(x) when x = −3.

Answer(e) .... [3]

0580/41/M/J/15

24 The table shows some values for $y = x^2 - \dfrac{1}{2x}$, $x \neq 0$.

x	-2	-1.5	-1	-0.5	-0.25	-0.2	0.2	0.25	0.5	1	1.5	2
y	4.25	2.58			2.06	2.54	-2.46	-1.94			1.92	3.75

     (a) Complete the table of values.   [4]

     (b) On the grid, draw the graph of $y = x^2 - \dfrac{1}{2x}$ for $-2 \leqslant x \leqslant -0.2$ and $0.2 \leqslant x \leqslant 2$.

                                                                [5]

     (c) By drawing a suitable line, use your graph to solve the equation $x^2 - \dfrac{1}{2x} = 2$.

Answer(c) x = ... or *x* = ... or *x* = ... [3]

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(d) The equation $x^2 - \dfrac{1}{2x} = k$ has only one solution.

Write down the range of values of k for which this is possible.

Answer(d) .... [2]

(e) By drawing a suitable tangent, find an estimate of the gradient of the curve at the point where $x = -1$.

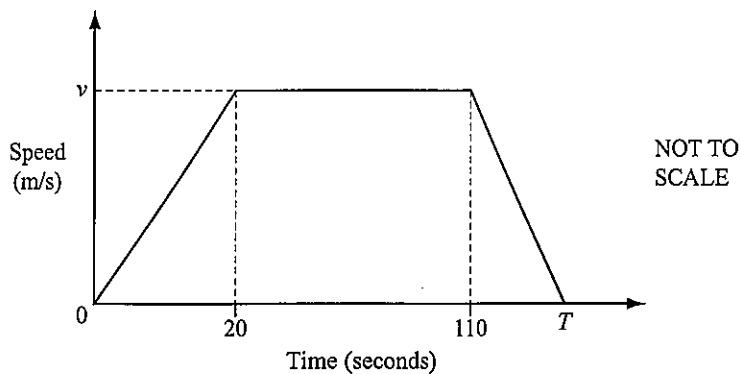*Answer(e)* .... [3]

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0580/42/M/J/15

25 $y = x^2 - 2x + \dfrac{12}{x}$, $x \neq 0$

    (a)   Complete the table of values.

x	-4	-3	-2	-1	-0.5	0.5	1	2	3	4
y	21	11		-9	-22.75	23.25	11	6		11

                                                                         [2]

    (b)   On the grid, draw the graph of $y = x^2 - 2x + \dfrac{12}{x}$ for $-4 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 4$.

                                                                          [5]

(c) By drawing a suitable tangent, find an estimate of the gradient of the graph at the point (1, 11).

Answer(c) .... [3]

(d) The equation $x^2 - 2x + \dfrac{12}{x} = k$ has exactly two distinct solutions.

Use the graph to find

(i) the value of k,

Answer(d)(i) $k =$ .... [1]

(ii) the solutions of $x^2 - 2x + \dfrac{12}{x} = k$.

Answer(d)(ii) $x =$ .... or $x =$ .... [2]

(e) The equation $x^3 + ax^2 + bx + c = 0$ can be solved by drawing the line $y = 3x + 1$ on the grid.

Find the value of a, the value of b and the value of c.

Answer(e) a = ...

b = ...

c = ... [3]

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0580/43/M/J/15

26 $f(x) = \dfrac{8}{x^2} + \dfrac{x}{2}, \quad x \neq 0.$

(a) Complete the table of values for f(x).

x	−5	−4	−3	−2	−1.5		1.5	2	2.5	3	3.5	4	5
f(x)	−2.2	−1.5	−0.6		2.8		4.3		2.5	2.4	2.4		2.8

[3]

(b) On the grid, draw the graph of y = f(x) for $-5 \leqslant x \leqslant -1.5$ and $1.5 \leqslant x \leqslant 5$.

[5]

(c) Solve f(x) = 0.

Answer(c) x = ... [1]

(d) By drawing a suitable line on the grid, solve the equation f(x) = 1 − x.

Answer(d) x = ... [3]

(e) By drawing a tangent at the point (−3, −0.6), estimate the gradient of the graph of y = f(x) when x = −3.

Answer(e) .... [3]

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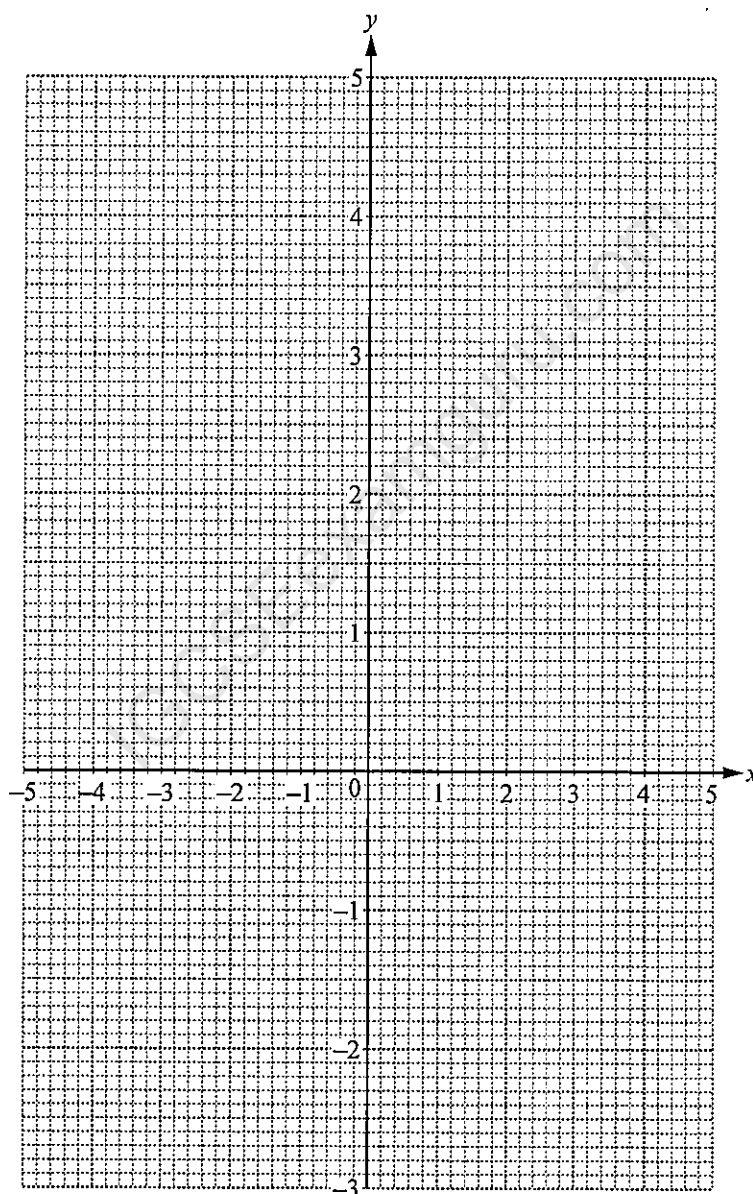
1 $\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ May June 2012 Code 41

        $E = \{x : x \text{ is an even number}\}$

        $F = \{2, 5, 7\}$

        $G = \{x : x^2 - 13x + 36 = 0\}$

(a)   List the elements of set E.

Answer(a) $E = \{$ $\}$ [1]

(b)   Write down $\text{n}(F)$.

Answer(b) $\text{n}(F) = $ ....   [1]

(c)   (i)   Factorise $x^2 - 13x + 36$.

Answer(c)(i) ....   [2]

     (ii)   Using your answer to **part (c)(i)**, solve $x^2 - 13x + 36 = 0$ to find the two elements of G.

Answer(c)(ii) $x = $ .... or $x = $ ....   [1]

(d)   Write all the elements of $\mathscr{E}$ in their correct place in the Venn diagram.
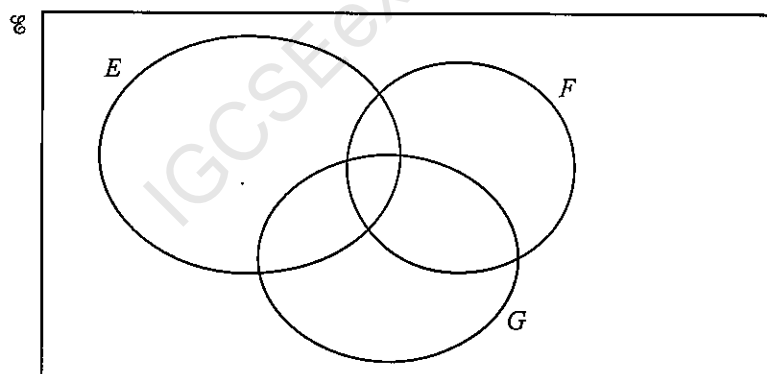
[2]

(e)   Use set notation to complete the following statements.

     (i) $F \cap G = $ ....   [1]

     (ii)   7 ..... E [1]

     (iii) $\text{n}(E$ ...... $F) = 6$ [1]

2

May June 2014 Code 41
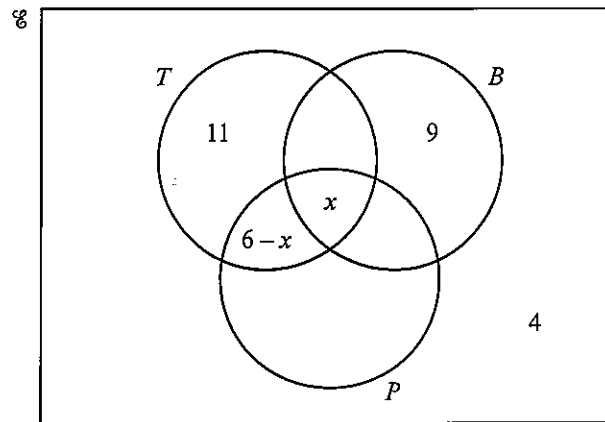
In the Venn diagram, $\mathscr{E}$ = {children in a nursery}

    B = {children who received a book for their birthday}
    T = {children who received a toy for their birthday}
    P = {children who received a puzzle for their birthday}

x children received a book and a toy and a puzzle.
6 children received a toy and a puzzle.

(a) 4 children received a book and a toy.
     5 children received a book and a puzzle.
     7 children received a puzzle but not a book and not a toy.

     Complete the Venn diagram above.   [3]

(b) There are 40 children in the nursery.

     Using the Venn diagram, write down and solve an equation in x.

     Answer(b)

[3]

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(c) Work out

   (i) the probability that a child, chosen at random, received a book but not a toy and not a puzzle,

Answer(c)(i) .... [1]

   (ii) the number of children who received a book and a puzzle but not a toy,

Answer(c)(ii) .... [1]

   (iii) n(B),

Answer(c)(iii) .... [1]

   (iv) n($B \cup P$),

Answer(c)(iv) .... [1]

   (v) n($B \cup T \cup P$)'.

Answer(c)(v) .... [1]

(d)

Shade the region $B \cap (T \cup P)'$.   [1]

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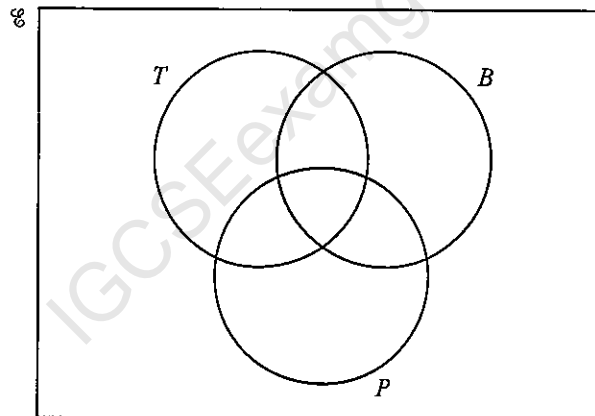
1   **(a)** P is the point $(2, 5)$ and $\overrightarrow{PQ} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$.

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Write down the co-ordinates of Q.

Answer(a) (............. , ...) [1]

(b)
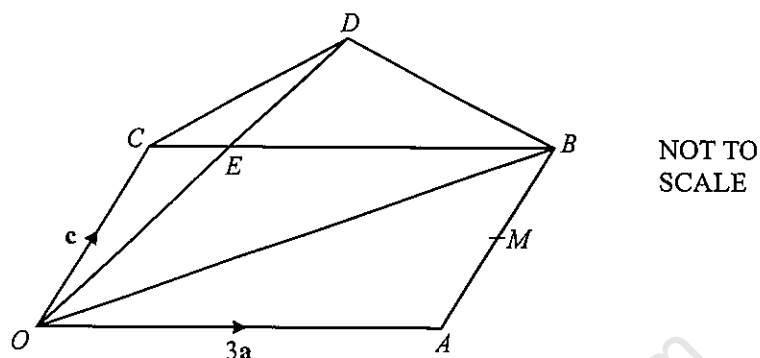
O is the origin and $OABC$ is a parallelogram.
M is the midpoint of AB.

$\overrightarrow{OC} = \mathbf{c}$, $\overrightarrow{OA} = 3\mathbf{a}$ and $CE = \frac{1}{3}CB$.

OED is a straight line with $OE : ED = 2 : 1$.

Find in terms of $\mathbf{a}$ and $\mathbf{c}$, in their simplest forms

(i) $\overrightarrow{OB}$,

Answer(b)(i) $\overrightarrow{OB} =$ .... [1]

(ii) the position vector of M,

Answer(b)(ii) .... [2]

(iii) $\overrightarrow{OE}$,

Answer(b)(iii) $\overrightarrow{OE} =$ .... [1]

(iv) $\overrightarrow{CD}$.

Answer(b)(iv) $\overrightarrow{CD} =$ .... [2]

(c) Write down two facts about the lines CD and OB.

Answer (c) ....

  .... [2]

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2   **(a)** $\mathbf{a} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 2 \\ -7 \end{pmatrix}$ $\mathbf{c} = \begin{pmatrix} -10 \\ 21 \end{pmatrix}$ Oct Nov 2012 Code 41

     (i)   Find $2\mathbf{a} + \mathbf{b}$.

Answer(a)(i) $\begin{pmatrix} \\ \end{pmatrix}$ [1]

     (ii)   Find $|\,\mathbf{b}\,|$.

Answer(a)(ii) ....   [2]

     (iii) $m\mathbf{a} + n\mathbf{b} = \mathbf{c}$

           Find the values of m and n.
           Show all your working.

Answer(a)(iii) $m =$ ....

$n =$ ....   [6]

(b)

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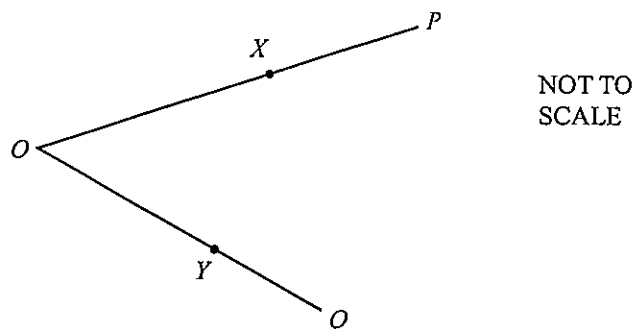
In the diagram, $OX:XP = 3:2$ and $OY:YQ = 3:2$.
$\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.

(i) Write $\overrightarrow{PQ}$ in terms of $\mathbf{p}$ and $\mathbf{q}$.

Answer(b)(i) $\overrightarrow{PQ} =$ .... [1]

(ii) Write $\overrightarrow{XY}$ in terms of $\mathbf{p}$ and $\mathbf{q}$.

Answer(b)(ii) $\overrightarrow{XY} =$ .... [1]

(iii) Complete the following sentences.

The lines XY and PQ are ....

The triangles OXY and OPQ are ....

The ratio of the area of triangle OXY to the area of triangle OPQ is .... : .... [3]

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3   **(a)**   Calculate the magnitude of the vector $\begin{pmatrix} 3 \\ -5 \end{pmatrix}$.   Oct Nov 2012 Code 42

Answer(a) .... [2]

(b)
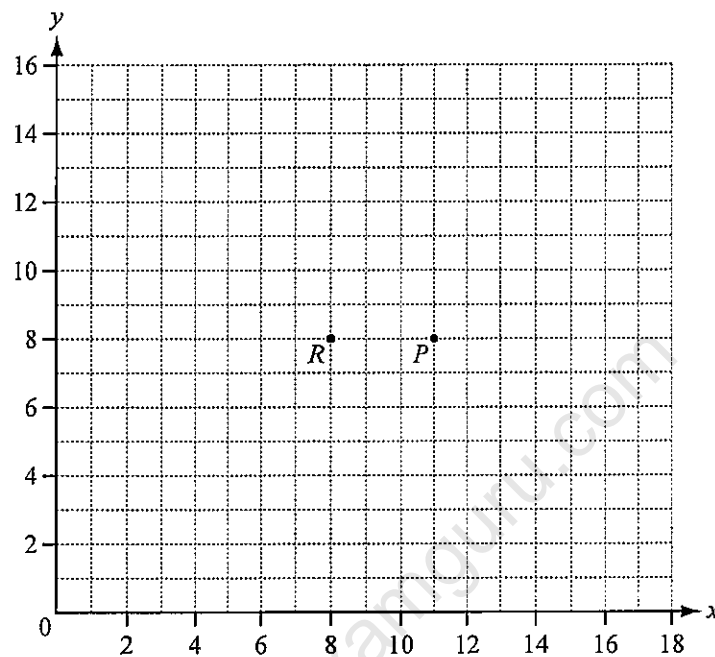
(i)   The points P and R are marked on the grid above.

$\overrightarrow{PQ} = \begin{pmatrix} 3 \\ -5 \end{pmatrix}$. Draw the vector $\overrightarrow{PQ}$ on the grid above.   [1]

(ii)   Draw the image of vector $\overrightarrow{PQ}$ after rotation by 90° anticlockwise about R.   [2]

(c) $\overrightarrow{DE} = 2\mathbf{a} + \mathbf{b}$ and $\overrightarrow{DC} = 3\mathbf{b} - \mathbf{a}$.

Find $\overrightarrow{CE}$ in terms of **a** and **b**. Write your answer in its simplest form.

Answer(c) $\overrightarrow{CE} = $ .... [2]

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(d) $\overrightarrow{OT} = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ and $\overrightarrow{OV} = \begin{pmatrix} 5 \\ -1 \end{pmatrix}$.

Write $\overrightarrow{TV}$ as a column vector.

Answer(d) $\overrightarrow{TV} = \begin{pmatrix} \\ \\ \end{pmatrix}$ [2]

(e)
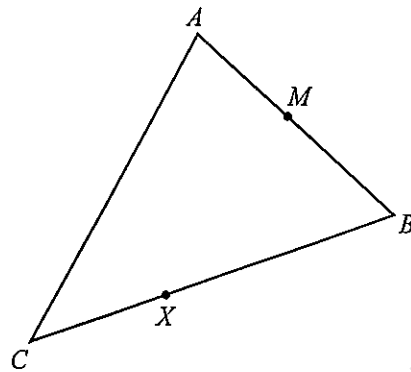
NOT TO SCALE

$\overrightarrow{AB} = \mathbf{b}$ and $\overrightarrow{AC} = \mathbf{c}$.

(i) Find $\overrightarrow{CB}$ in terms of **b** and **c**.

Answer(e)(i) $\overrightarrow{CB}$ = ... [1]

(ii) X divides CB in the ratio $1:3$.
M is the midpoint of AB.

Find $\overrightarrow{MX}$ in terms of **b** and **c**.
Show all your working and write your answer in its simplest form.

Answer(e)(ii) $\overrightarrow{MX}$ = ... [4]

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4   **(a)**   The co-ordinates of P are $(-4, -4)$ and the co-ordinates of Q are $(8, 14)$.

       (i)   Find the gradient of the line PQ.

                                    Answer(a)(i) .... [2]

       (ii)   Find the equation of the line PQ.

                                    Answer(a)(ii) .... [2]

       (iii)   Write $\overrightarrow{PQ}$ as a column vector.

                                    Answer(a)(iii) $\overrightarrow{PQ} = \begin{pmatrix} \\ \end{pmatrix}$ [1]

       (iv)   Find the magnitude of $\overrightarrow{PQ}$.

                                    Answer(a)(iv) .... [2]

(b)
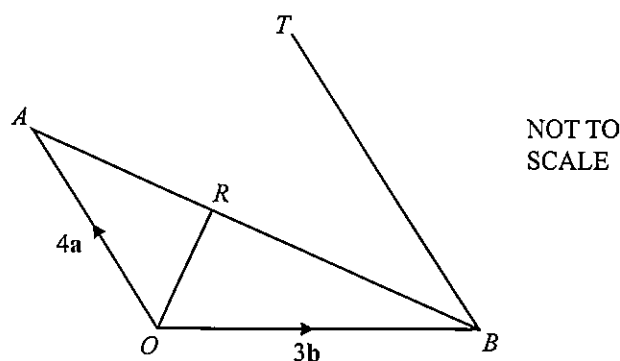
In the diagram, $\overrightarrow{OA}$ = 4a and $\overrightarrow{OB}$ = 3b.

R lies on AB such that $\overrightarrow{OR} = \frac{1}{5}$(12a + 6b).

T is the point such that $\overrightarrow{BT} = \frac{3}{2}\overrightarrow{OA}$.

(i) Find the following in terms of **a** and **b**, giving each answer in its simplest form.

(a) $\overrightarrow{AB}$

Answer(b)(i)(a) $\overrightarrow{AB}$ = ... [1]

(b) $\overrightarrow{AR}$

Answer(b)(i)(b) $\overrightarrow{AR}$ = ... [2]

(c) $\overrightarrow{OT}$

Answer(b)(i)(c) $\overrightarrow{OT}$ = ... [1]

(ii) Complete the following statement.

The points O, R and T are in a straight line because ....

.... [1]

(iii) Triangle OAR and triangle TBR are similar.

Find the value of $\dfrac{\text{area of triangle } TBR}{\text{area of triangle } OAR}$.

Answer(b)(iii) .... [2]

5   **(a)** $\overrightarrow{PQ} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$ May June 2014 Code 41

        (i) P is the point $(-2, 3)$.

        Work out the co-ordinates of Q.

Answer(a)(i) (.............. , ...) [1]

        (ii) Work out $|\overrightarrow{PQ}|$, the magnitude of $\overrightarrow{PQ}$.

Answer(a)(ii) .... [2]

(b)

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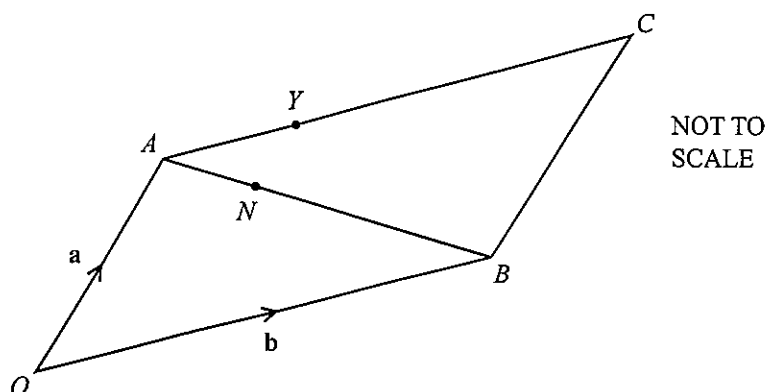
OACB is a parallelogram.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.
$AN:NB = 2:3$ and $AY = \frac{2}{5}AC$.

(i) Write each of the following in terms of **a** and/or **b**.
Give your answers in their simplest form.

(a) $\overrightarrow{ON}$

Answer(b)(i)(a) $\overrightarrow{ON}$ = ... [2]

(b) $\overrightarrow{NY}$

Answer(b)(i)(b) $\overrightarrow{NY}$ = ... [2]

(ii) Write down two conclusions you can make about the line segments *NY* and *BC*.

Answer(b)(ii) ....

.... [2]

6 (a)   May June 2014 Code 43
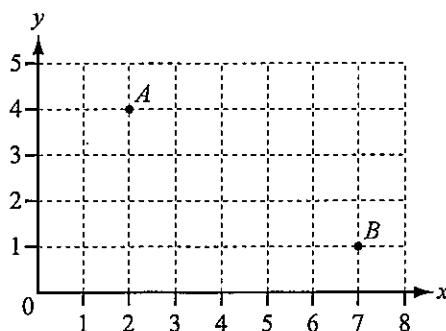
(i) Write down the position vector of A.

Answer(a)(i) $\begin{pmatrix} \\ \\ \end{pmatrix}$ [1]

(ii) Find $|\overrightarrow{AB}|$, the magnitude of $\overrightarrow{AB}$.

Answer(a)(ii) .... [2]

(b)
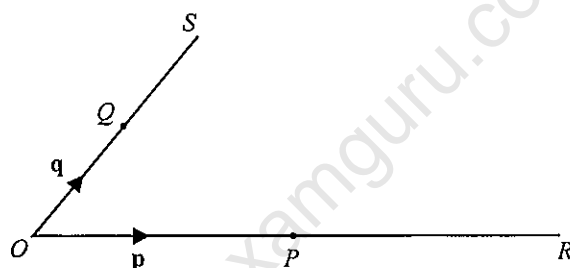
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O is the origin, $\overrightarrow{OP} = \mathbf{p}$ and $\overrightarrow{OQ} = \mathbf{q}$.
OP is extended to R so that $OP = PR$.
OQ is extended to S so that $OQ = QS$.

(i) Write down $\overrightarrow{RQ}$ in terms of $\mathbf{p}$ and $\mathbf{q}$.

Answer(b)(i) $\overrightarrow{RQ} =$ .... [1]

(ii) PS and RQ intersect at M and $RM = 2MQ$.

Use vectors to nd the ratio $PM : PS$, showing all your working.

Answer(b)(ii) $PM : PS =$ .... : .... [4]

7

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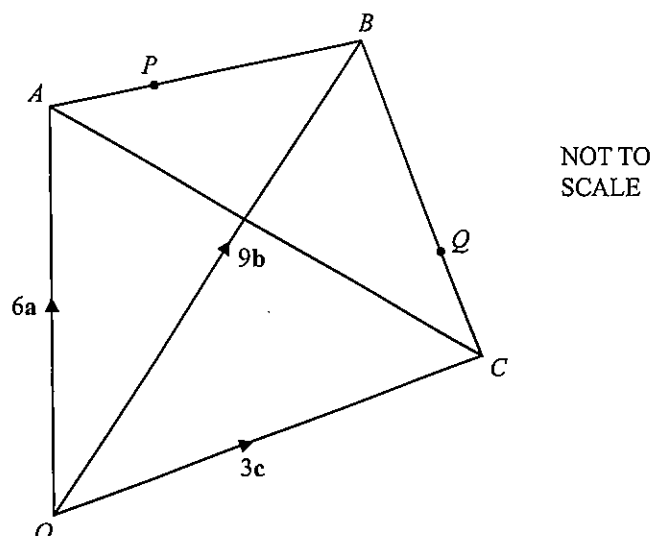
In the diagram, O is the origin and $\overrightarrow{OA} = 6\mathbf{a}$, $\overrightarrow{OB} = 9\mathbf{b}$ and $\overrightarrow{OC} = 3\mathbf{c}$.

The point P lies on AB such that $\overrightarrow{AP} = 3\mathbf{b} - 2\mathbf{a}$.

The point Q lies on BC such that $\overrightarrow{BQ} = 2\mathbf{c} - 6\mathbf{b}$.

(a) Find, in terms of $\mathbf{b}$ and $\mathbf{c}$, the position vector of Q.
    Give your answer in its simplest form.

Answer(a) .... [2]

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(b) Find, in terms of **a** and **c**, in its simplest form

   (i) $\overrightarrow{AC}$,

Answer(b)(i) $\overrightarrow{AC}$ = ... [1]

   (ii) $\overrightarrow{PQ}$.

Answer(b)(ii) $\overrightarrow{PQ}$ = ... [2]

(c) Explain what your answers in **part (b)** tell you about *PQ* and *AC*.

Answer(c) ....

.... [2]

8   (a) $\overrightarrow{PQ} = \begin{pmatrix} 5 \\ -8 \end{pmatrix}$

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     (i)   Find the value of $|\overrightarrow{PQ}|$.

Answer(a)(i) $|\overrightarrow{PQ}|$ = ... [2]

     (ii) Q is the point $(2, -3)$.

        Find the co-ordinates of the point P.

Answer(a)(ii) (...................... , ...) [1]

(b)

In the diagram, M is the midpoint of AB and L is the midpoint of OM.
The lines OM and AN intersect at L and $ON = \frac{1}{3} OB$.
$\overrightarrow{OA} = $ a and $\overrightarrow{OB} = $ b.

     (i)   Find, in terms of a and b, in its simplest form,

        (a) $\overrightarrow{OM}$,

Answer(b)(i)(a) $\overrightarrow{OM}$ = ... [2]

        (b) $\overrightarrow{OL}$,

Answer(b)(i)(b) $\overrightarrow{OL}$ = ... [1]

        (c) $\overrightarrow{AL}$.

Answer(b)(i)(c) $\overrightarrow{AL}$ = ... [2]

(ii) Find the ratio $AL:AN$ in its simplest form.
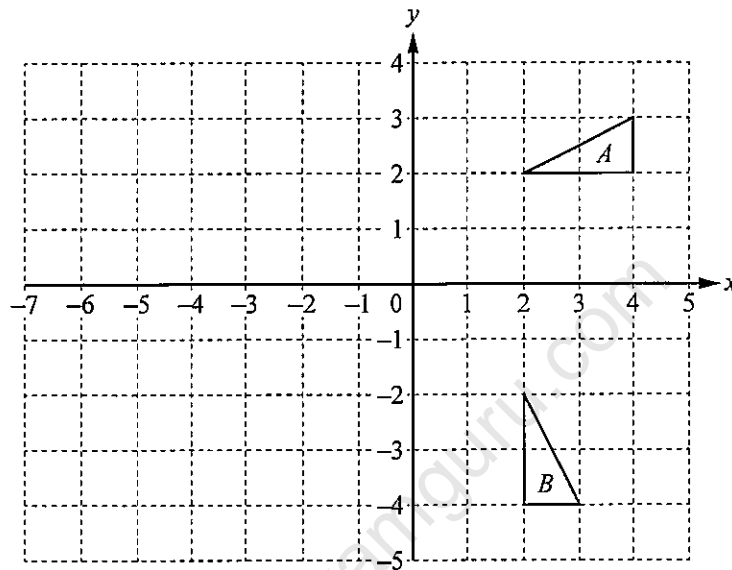
Answer(b)(ii) .... : .... [3]

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9   **(a)** $\overrightarrow{PQ} = \begin{pmatrix} 5 \\ -8 \end{pmatrix}$

        (i)   Find the value of $|\overrightarrow{PQ}|$.

Answer(a)(i) $|\overrightarrow{PQ}|$ = ... [2]

        (ii) Q is the point $(2, -3)$.

            Find the co-ordinates of the point P.

Answer(a)(ii) (....................... , ...) [1]

(b)

NOT TO SCALE

In the diagram, M is the midpoint of AB and L is the midpoint of OM.
The lines OM and AN intersect at L and $ON = \frac{1}{3}OB$.
$\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

        (i)   Find, in terms of $\mathbf{a}$ and $\mathbf{b}$, in its simplest form,

            (a) $\overrightarrow{OM}$,

Answer(b)(i)(a) $\overrightarrow{OM}$ = ... [2]

            (b) $\overrightarrow{OL}$,

Answer(b)(i)(b) $\overrightarrow{OL}$ = ... [1]

            (c) $\overrightarrow{AL}$.

Answer(b)(i)(c) $\overrightarrow{AL}$ = ... [2]

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    (ii)   Find the ratio $AL:AN$ in its simplest form.

Answer(b)(ii) .... : .... [3]

(c)

    (i)   On the grid, draw the image of triangle A after the transformation represented by the

    matrix $\begin{pmatrix} -1.5 & 0 \\ 0 & -1.5 \end{pmatrix}$.   [3]

    (ii)   Find the 2×2 matrix which represents the transformation that maps triangle A onto triangle B.

Answer(c)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

1

May June 2012 Code 41
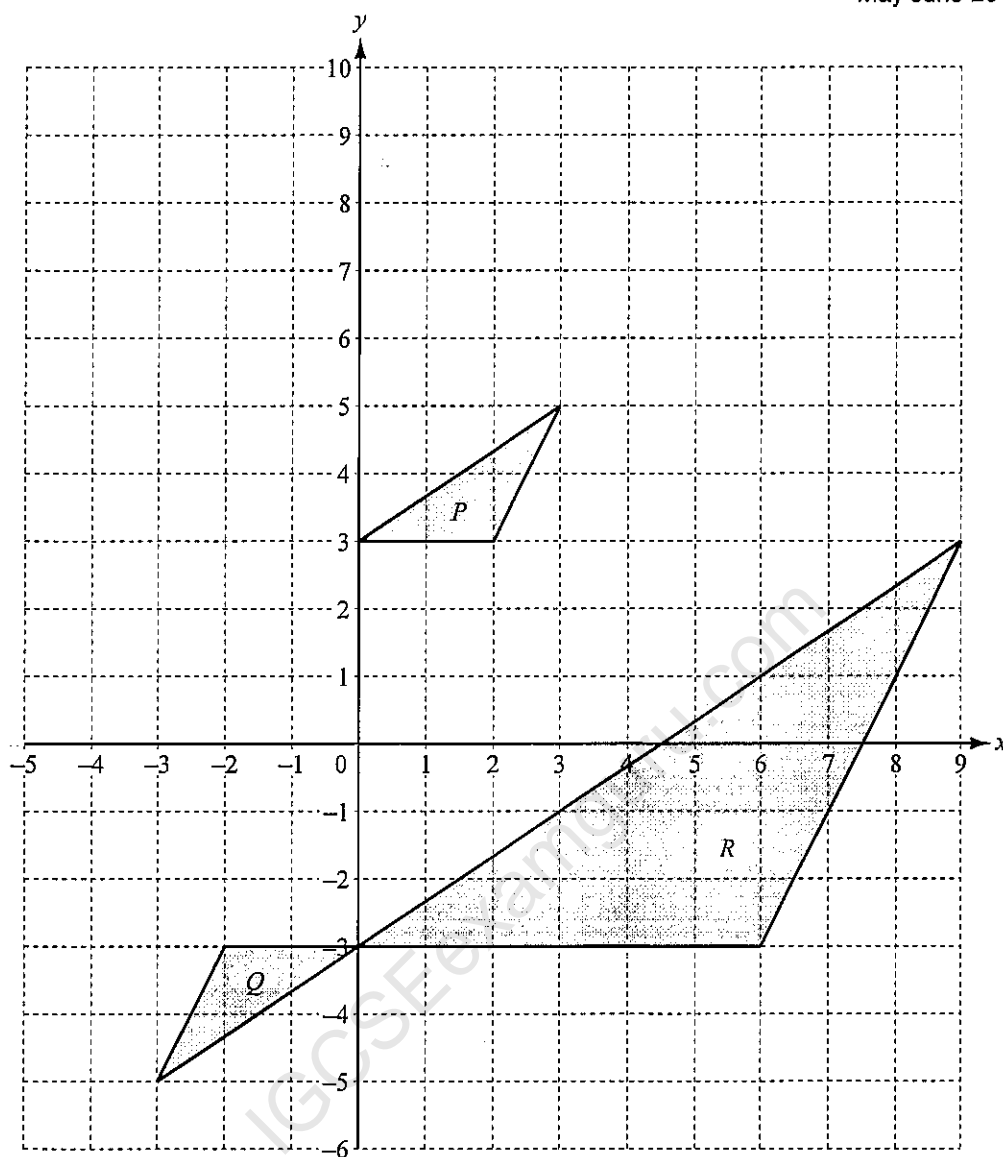
(a) Describe fully

    (i)   the **single** transformation which maps **triangle** *P* onto triangle *Q*,

    Answer(a)(i)   ....   [3]

    (ii)   the **single** transformation which maps **triangle** *Q* onto triangle *R*,

    Answer(a)(ii)   ....   [3]

    (iii)   the **single** transformation which maps **triangle** *R* onto triangle *P*.

    Answer(a)(iii)   ....   [3]

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(b) On the grid, draw the image of

    (i)   **triangle** P after translation by $\begin{pmatrix} -4 \\ -5 \end{pmatrix}$,   [2]

    (ii)   **triangle** P after reflection in the line $x = -1$.   [2]

(c) **(i)**   On the grid, draw the image of **triangle** P after a stretch, scale factor 2 and the y-axis as the invariant line.   [2]

    (ii)   Find the matrix which represents this stretch.

$$Answer(c)(ii) \quad \begin{pmatrix} \\ \end{pmatrix} \quad [2]$$

2
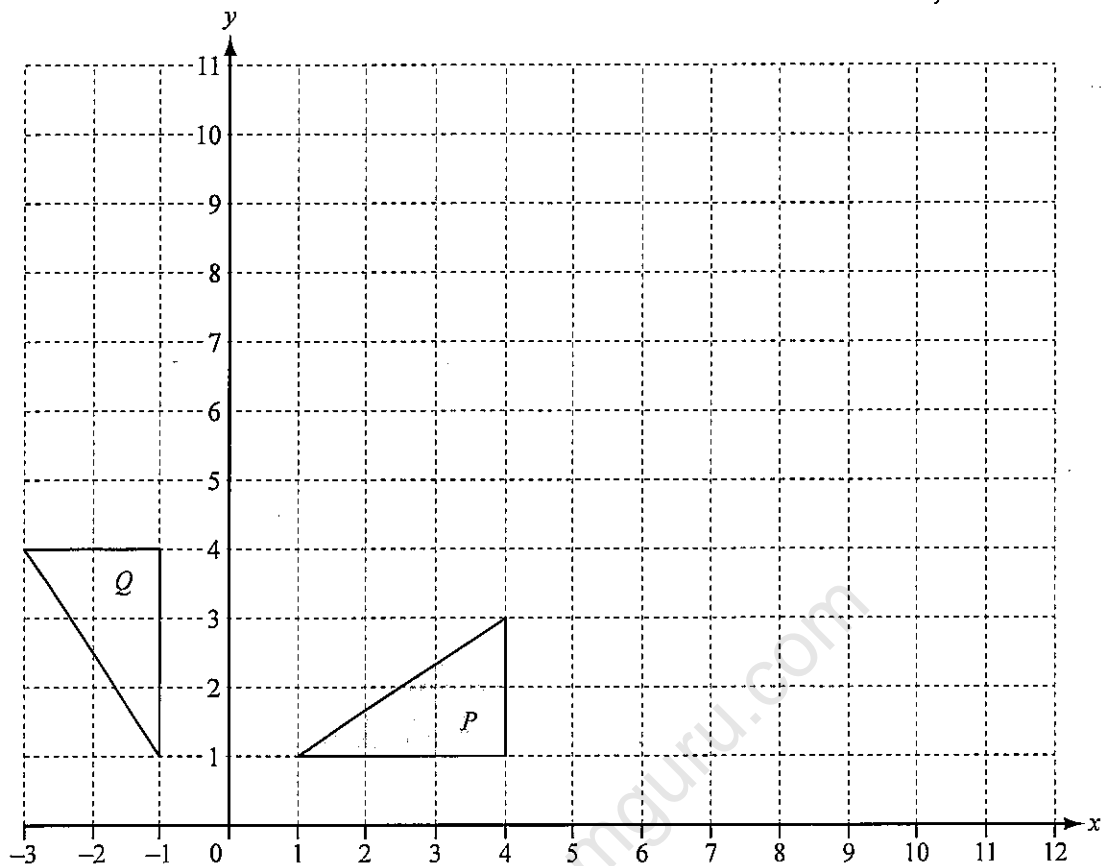
(a) Draw the translation of triangle P by $\begin{pmatrix} 5 \\ 3 \end{pmatrix}$. [2]

(b) Draw the reflection of triangle P in the line $x = 6$. [2]

(c) (i) Describe fully the **single** transformation that maps triangle P onto triangle Q.

Answer(c)(i) .... [3]

(ii) Find the 2 by 2 matrix which represents the transformation in **part(c)(i)**.

Answer(c)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(d) (i) Draw the stretch of triangle P with scale factor 3 and the x-axis as the invariant line. [2]

(ii) Find the 2 by 2 matrix which represents a stretch, scale factor 3 and x-axis invariant.

Answer(d)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

3   **(a)**
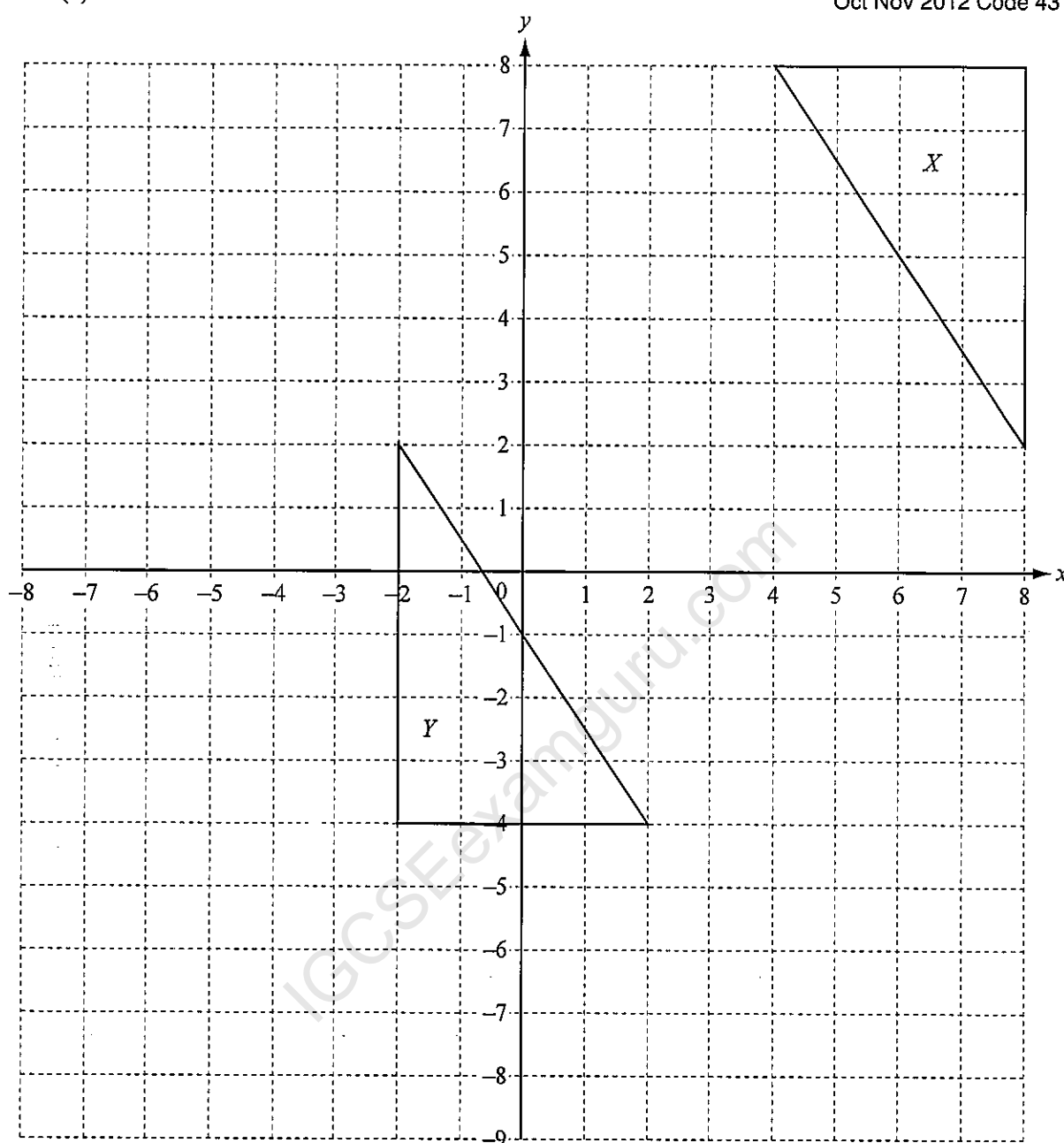
(i)   Draw the translation of triangle X by the vector $\begin{pmatrix} -11 \\ -1 \end{pmatrix}$.   [2]

(ii)   Draw the enlargement of triangle Y with centre $(-6, -4)$ and scale factor $\dfrac{1}{2}$.   [2]

(b)
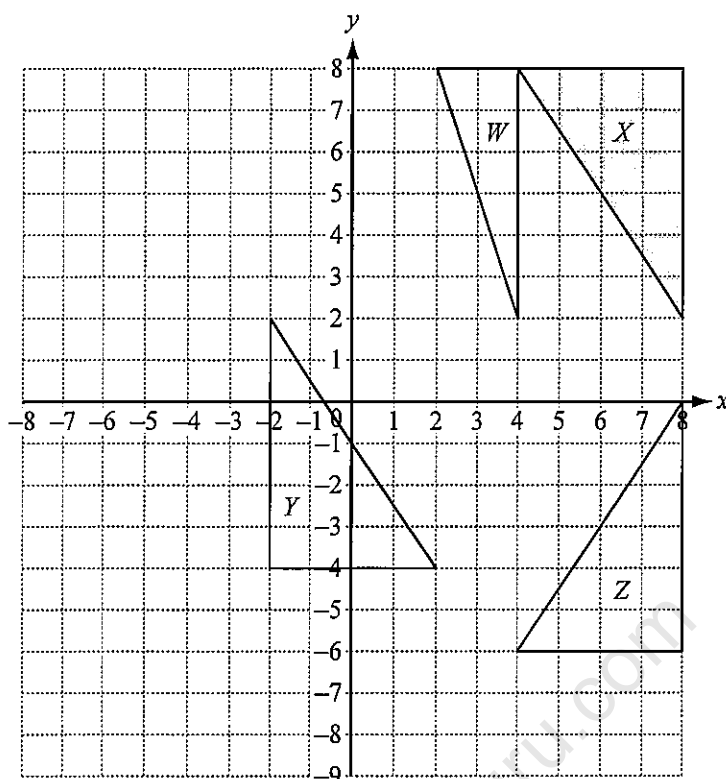
Describe fully the **single** transformation that maps

(i) triangle X onto triangle Z,

Answer(b)(i) .... [2]

(ii) triangle X onto triangle Y,

Answer(b)(ii) .... [3]

(iii) triangle X onto triangle W.

Answer(b)(iii) .... [3]

(c) Find the matrix that represents the transformation in **part (b)(iii)**.

Answer(c) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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4

May June 2013 Code 41
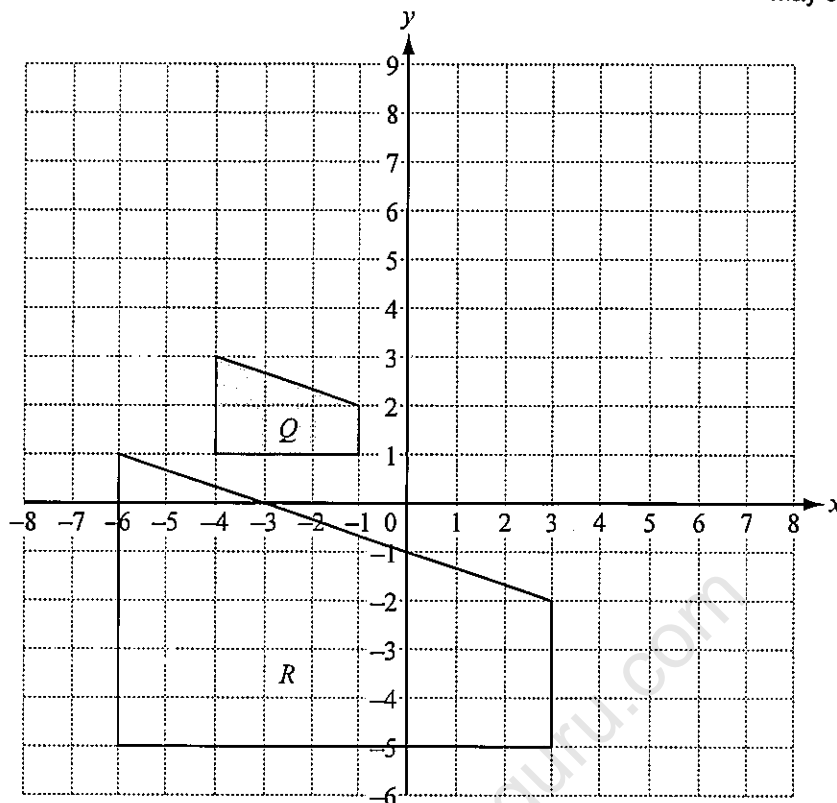
(a) Describe fully the **single** transformation that maps shape Q onto shape R.

Answer(a) ....

(b) (i) Draw the image when shape Q is translated by the vector $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$.

   (ii) Draw the image when shape Q is reflected in the line $x = 2$.

   (iii) Draw the image when shape Q is stretched, factor 3, x-axis invariant.

   (iv) Find the 2×2 matrix that represents a stretch of factor 3, x-axis invariant.

$$Answer(b)(iv) \quad \Bigg($$

(c) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$.

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5   **(a)**   May June 2013 Code 42
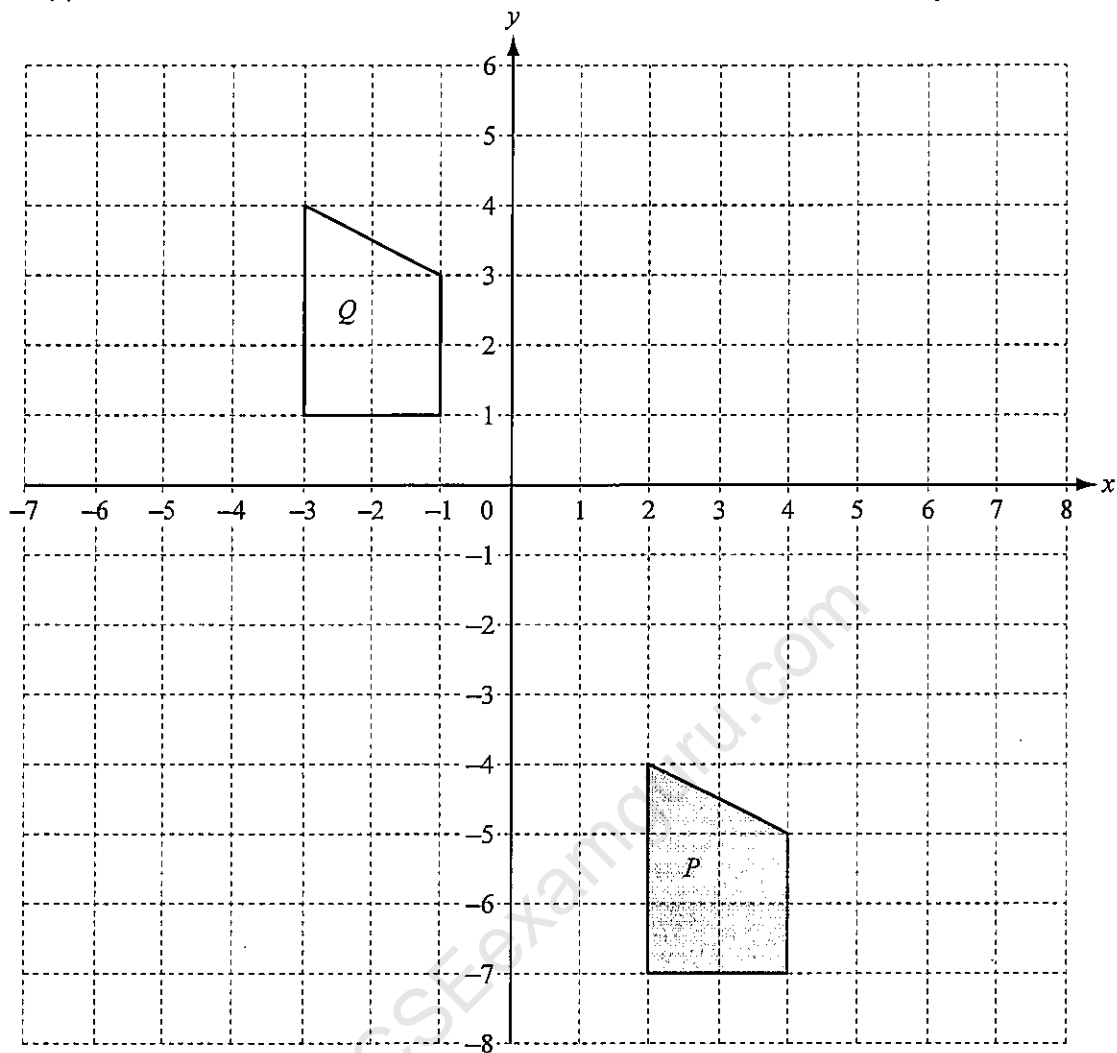
   (i)   Describe fully the **single** transformation which maps shape P onto shape Q.

     Answer(a)(i) .... [2]

  (ii)   On the grid above, draw the image of shape P after reflection in the line $y = -1$.   [2]

 (iii)   On the grid above, draw the image of shape P under the transformation represented by the
       matrix $\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$.   [3]

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(b)

(i) Describe fully the **single** transformation which maps shape M onto shape L.

Answer(b)(i) .... [3]

(ii) On the grid above, draw the image of shape M after enlargement by scale factor 2, centre $(5, 0)$. [2]

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6 $A = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$ $B = (6 \quad -4)$ $C = \begin{pmatrix} 2 & 4 \\ 1 & 3 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 9 \\ -1 & -3 \end{pmatrix}$

(a) Calculate the result of each of the following, if possible.

         May June 2013 Code 42

     If a calculation is not possible, write "not possible" in the answer space.

     (i)   3A

                               Answer(a)(i)   [1]

     (ii)   **AC**

                               Answer(a)(ii)   [1]

     (iii)   **BA**

                               Answer(a)(iii)   [2]

     (iv)   **C + D**

                               Answer(a)(iv)   [1]

     (v) D^2

                               Answer(a)(v)   [2]

(b) Calculate C^{-1}, the inverse of **C**.

                               Answer(b)   [2]

7
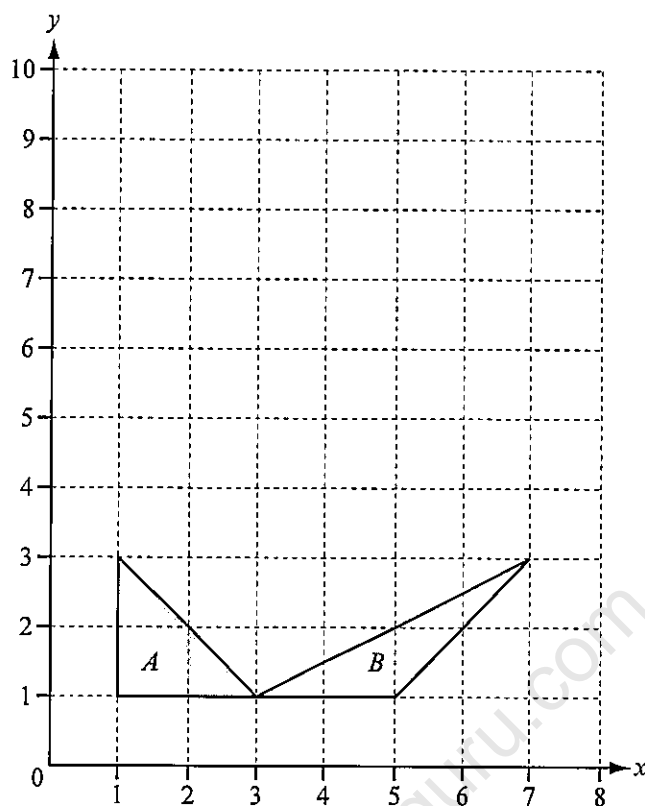
(a) **(i)** Draw the image of shape A after a stretch, factor 3, x-axis invariant. [2]

    (ii) Write down the matrix representing a stretch, factor 3, x-axis invariant.

Answer(a)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) **(i)** Describe fully the **single** transformation which maps shape A onto shape B.

Answer(b)(i) .... [3]

    (ii) Write down the matrix representing the transformation which maps shape A onto shape B.

Answer(b)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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8   **(a)**

Oct Nov 2013 Code 41
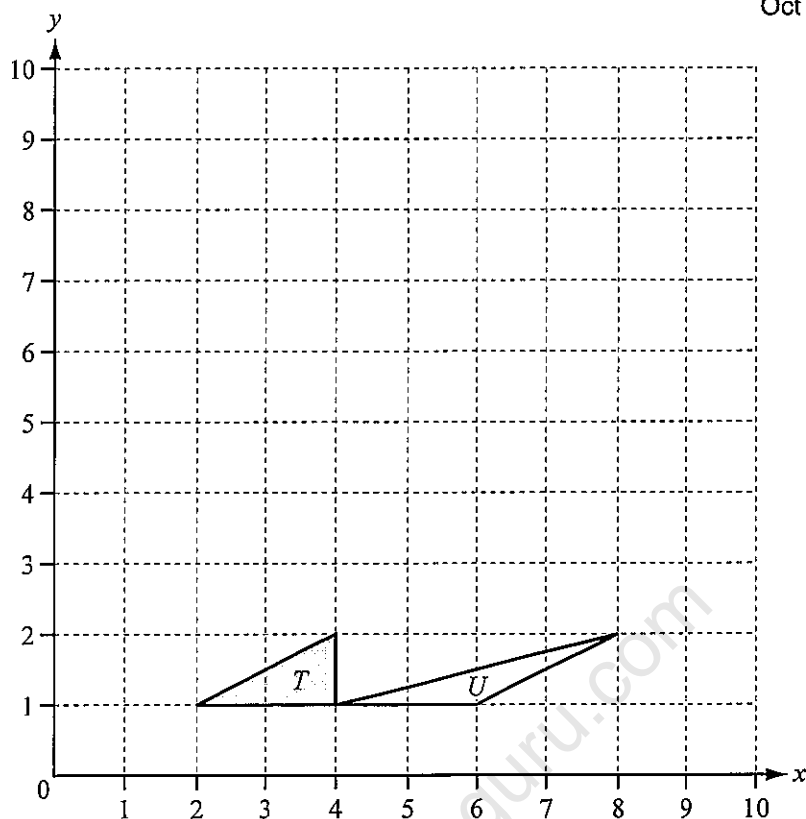
(i)   Draw the reflection of triangle T in the line $y = 5$.   [2]

(ii)   Draw the rotation of triangle T about the point $(4, 2)$ through $180°$.   [2]

(iii)   Describe fully the **single** transformation that maps triangle T onto triangle U.

Answer(a)(iii) .... [3]

(iv)   Find the 2×2 matrix which represents the transformation in **part (a)(iii)**.

Answer(a)(iv) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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(b)
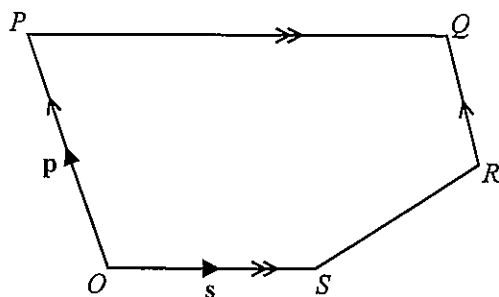
In the pentagon *OPQRS*, *OP* is parallel to *RQ* and *OS* is parallel to *PQ*.
PQ = 2*OS* and *OP* = 2*RQ*.
O is the origin, $\overrightarrow{OP}$ = **p** and $\overrightarrow{OS}$ = **s**.

Find, in terms of **p** and **s**, in their simplest form,

(i) the position vector of *Q*,

Answer(b)(i) .... [2]

(ii) $\overrightarrow{SR}$.

Answer(b)(ii) $\overrightarrow{SR}$ = ... [2]

(c) Explain what your answers in **part (b)** tell you about the lines *OQ* and *SR*.

Answer(c) .... [1]

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9
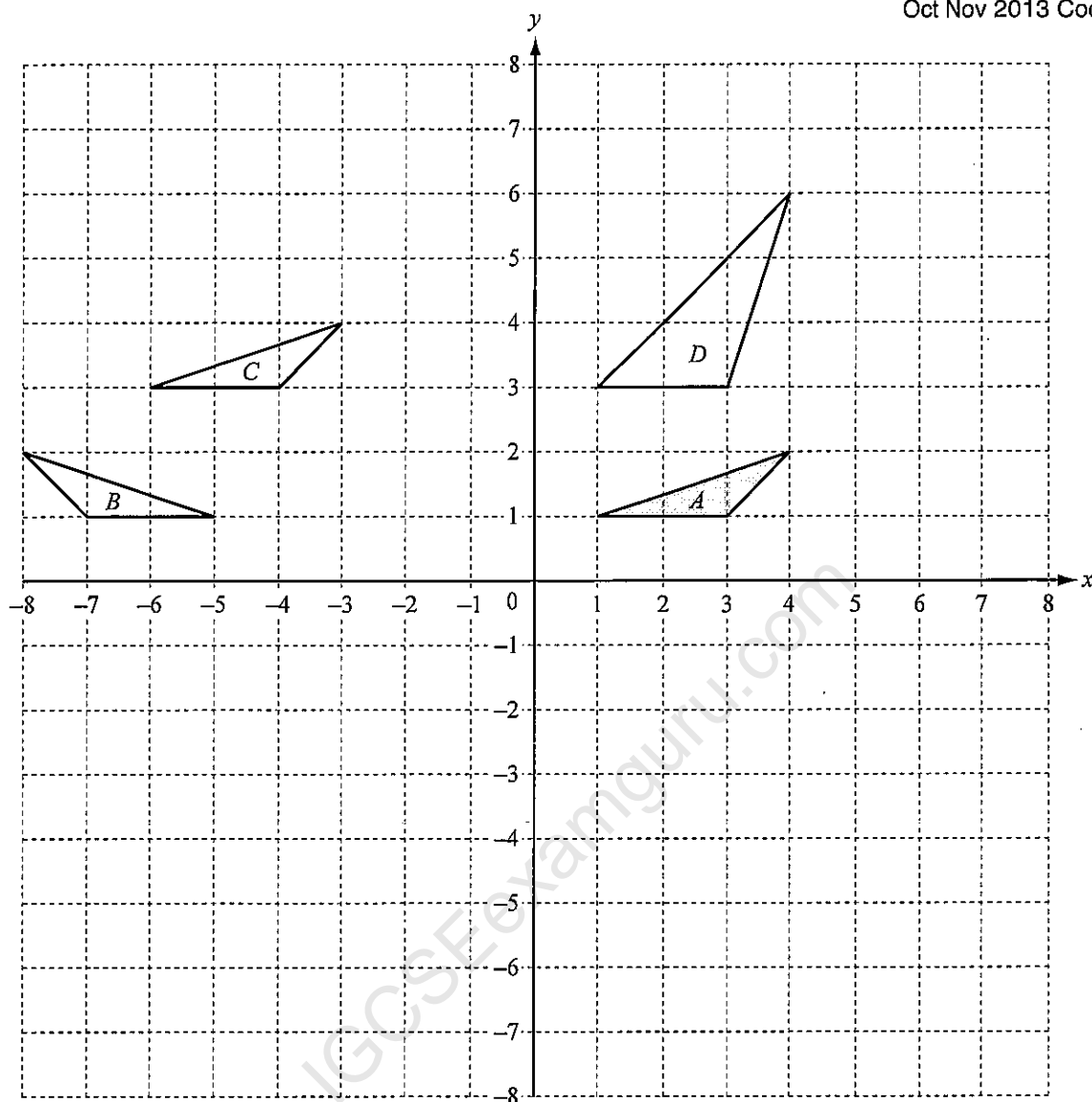
(a) Describe fully the **single** transformation that maps triangle *A* onto

   (i) triangle *B*,

      Answer(a)(i) .... [2]

   (ii) triangle *C*,

      Answer(a)(ii) .... [2]

   (iii) triangle *D*.

      Answer(a)(iii) .... [3]

(b) On the grid, draw

    (i)   the rotation of triangle A about (6, 0) through 90° clockwise,   [2]

    (ii)   the enlargement of triangle A by scale factor −2 with centre (0, −1),   [2]

    (iii)   the shear of triangle A by shear factor −2 with the y-axis invariant.   [2]

(c) Find the matrix that represents the transformation in **part (b)(iii)**.

Answer(c) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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10 $A = \begin{pmatrix} 3 & 2 \\ -1 & 1 \end{pmatrix}$ $B = (-2 \quad 5)$ $C = \begin{pmatrix} -2 \\ 5 \end{pmatrix}$ $D = \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$ May June 2014 Code 41

 (a) Work out, when possible, each of the following.
   If it is not possible, write 'not possible' in the answer space.

   (i)   **2A**

                      Answer(a)(i)   [1]

   (ii)   **B + C**

                      Answer(a)(ii)   [1]

   (iii)   **AD**

                      Answer(a)(iii)   [2]

   (iv) A^{-1}, the inverse of **A**.

                      Answer(a)(iv)   [2]

 (b) Explain why it is not possible to work out **CD**.

   Answer(b) .... [1]

 (c) Describe fully the **single** transformation represented by the matrix **D**.

   Answer(c) ....

      .... [3]

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11   May June 2014 Code 41
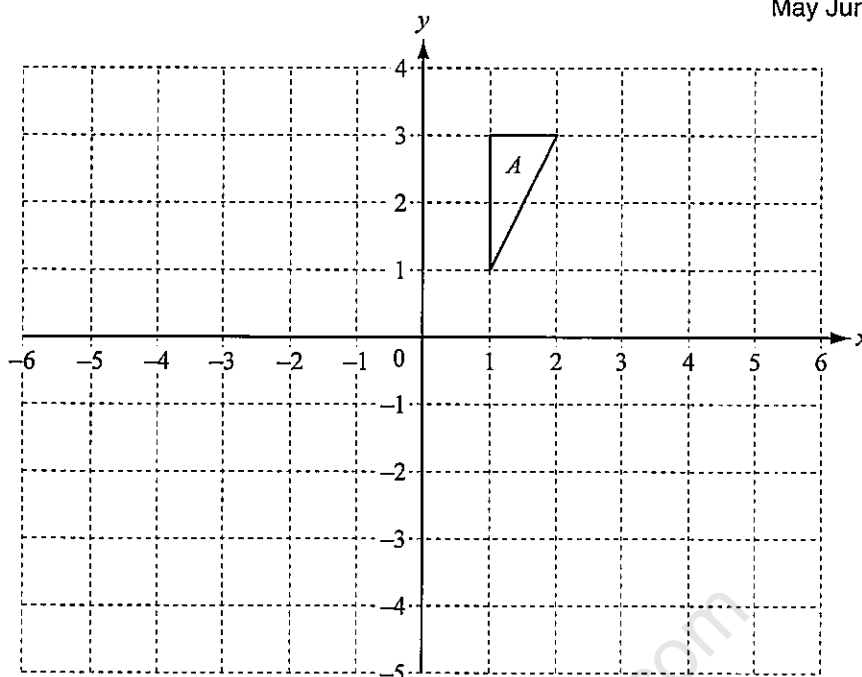
(a) On the grid,

     (i) draw the image of shape A after a translation by the vector $\begin{pmatrix} -5 \\ -4 \end{pmatrix}$,   [2]

     (ii) draw the image of shape A after a rotation through 90° clockwise about the origin.   [2]

(b) **(i)** On the grid, draw the image of shape A after the transformation represented by the matrix $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$.

                                                                        [3]

     (ii) Describe fully the **single** transformation represented by the matrix $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$.

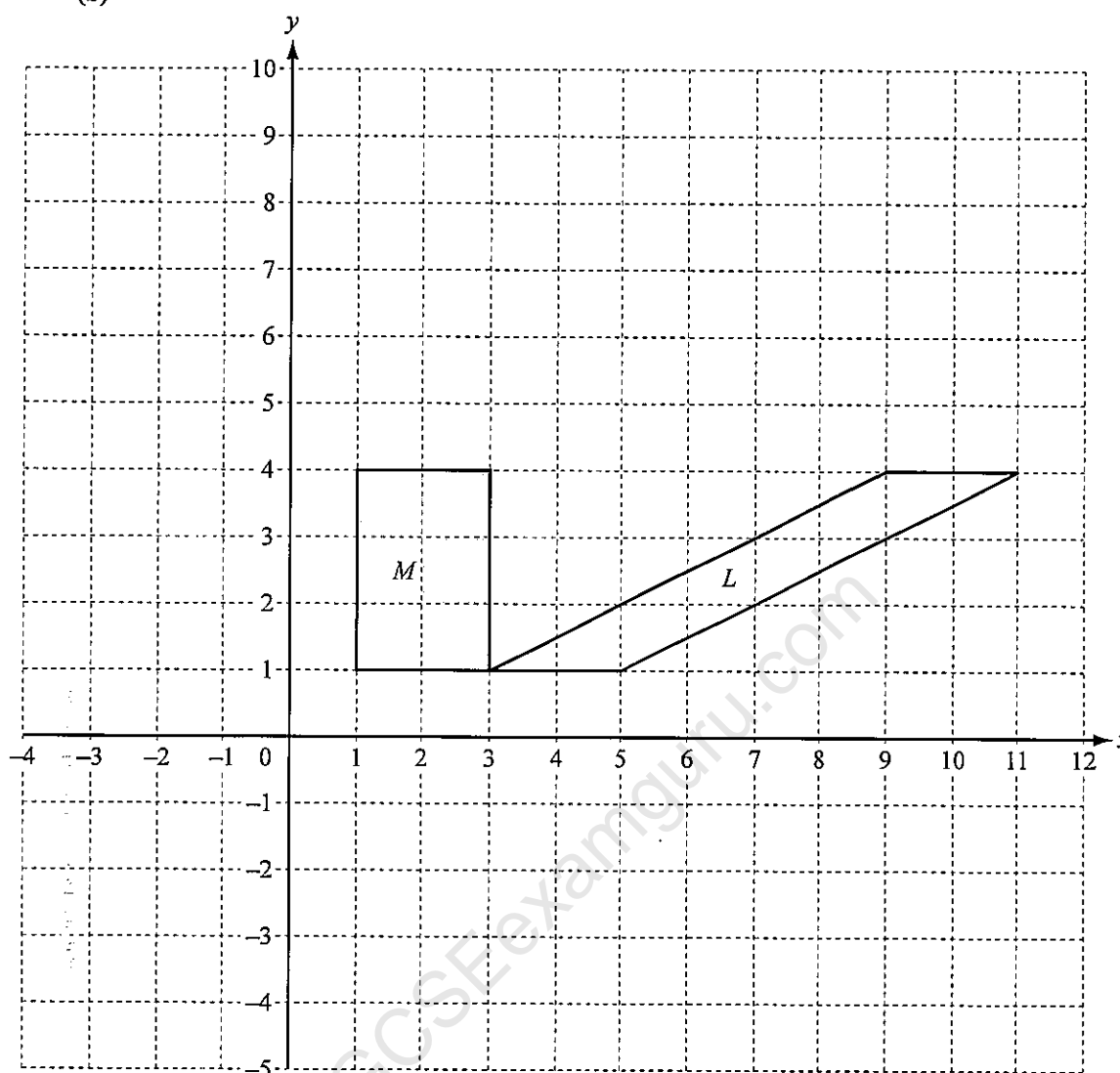   *Answer(b)(ii)* ....

     .... [3]

12   May June 2014 Code 42
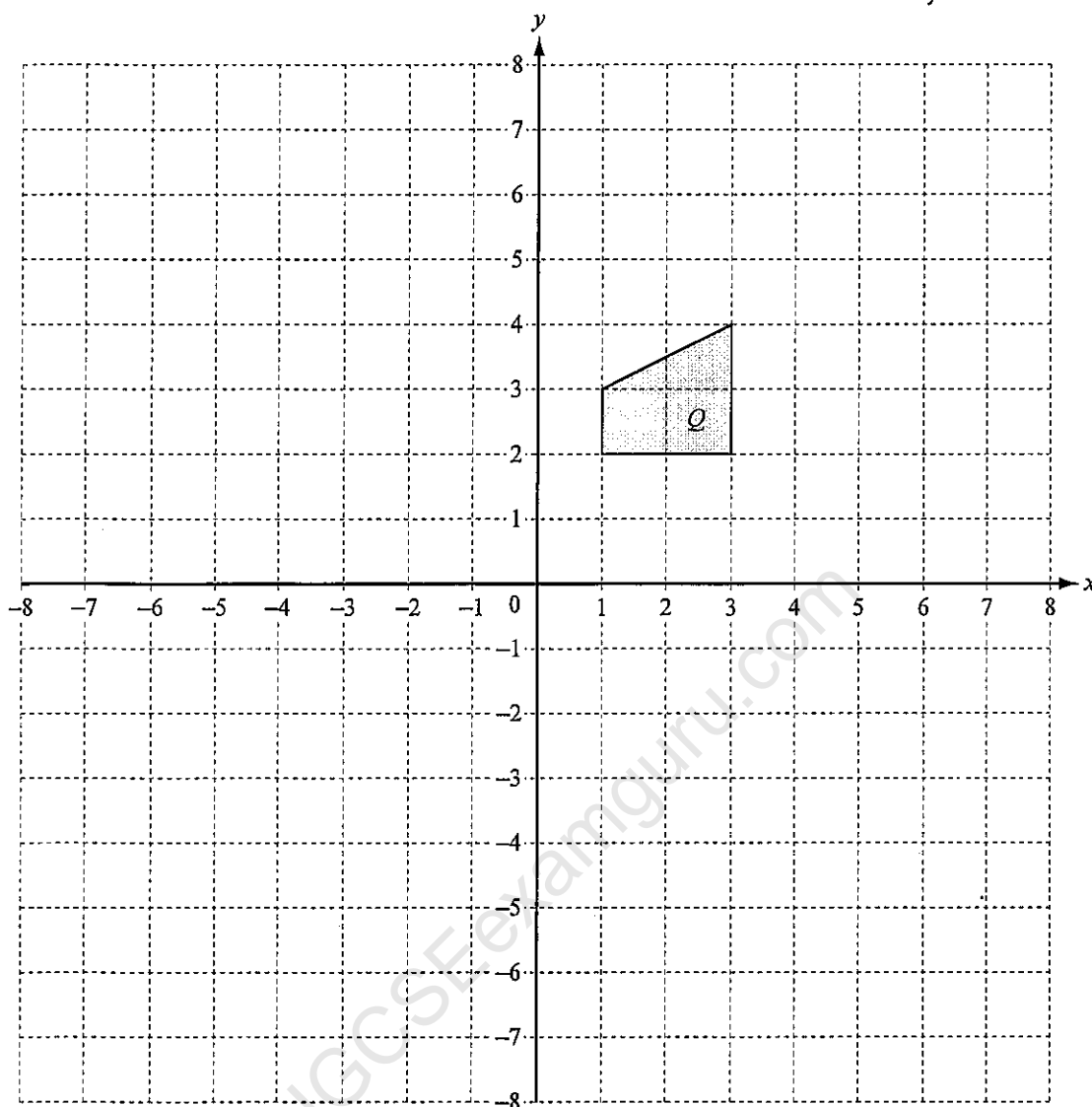
(a) Draw the re ection of shape Q in the line $x = -1$.   [2]

(b) (i) Draw the enlargement of shape Q, centre $(0, 0)$, scale factor -2 .   [2]

    (ii) Find the 2×2 matrix that represents an enlargement, centre $(0, 0)$, scale factor -2 .

Answer(b)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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(c) **(i)** Draw the stretch of shape Q, factor 2, x-axis invariant.   [2]

(ii) Find the 2×2 matrix that represents a stretch, factor 2, x-axis invariant.

Answer(c)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(iii) Find the inverse of the matrix in **part (c)(ii)**.

Answer(c)(iii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(iv) Describe fully the **single** transformation represented by the matrix in **part (c)(iii)**.

Answer(c)(iv) ....

.... [3]

13

Oct Nov 2014 Code 41
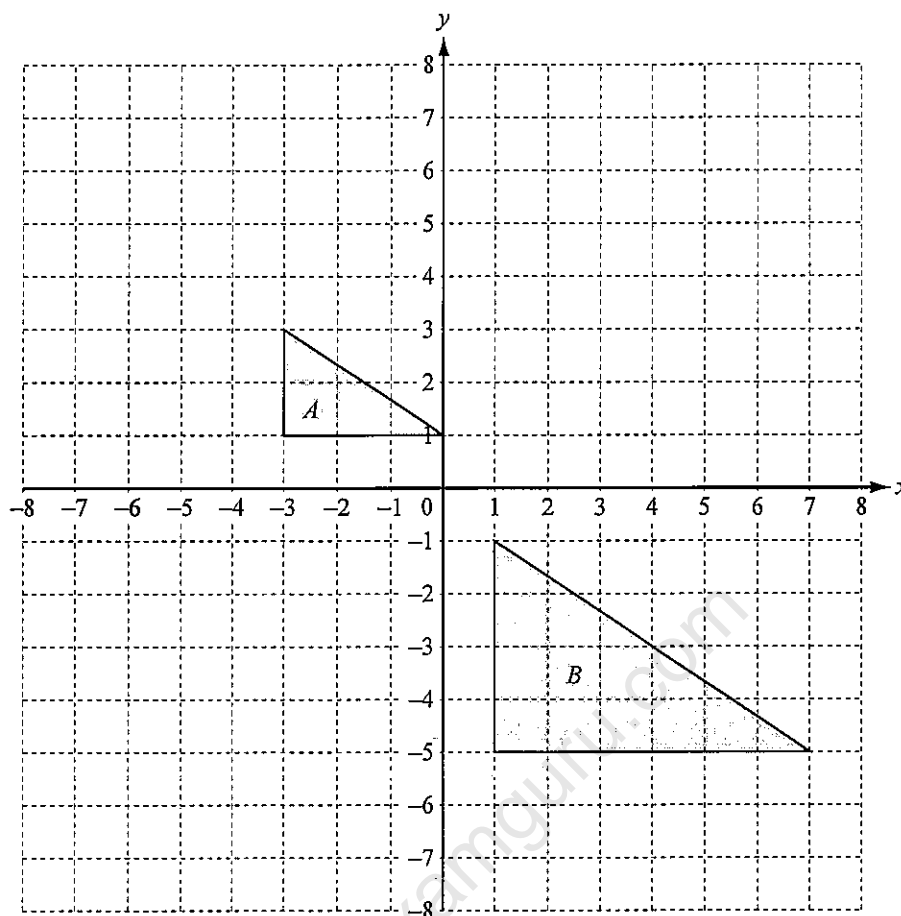
(a) Draw the image when triangle A is reflected in the line $x = 0$. [1]

(b) Draw the image when triangle A is rotated through 90° anticlockwise about (–4, 0). [2]

(c) (i) Describe fully the single transformation that maps triangle A onto triangle B.

Answer(c)(i) ....

.... [3]

(ii) Complete the following statement.

Area of triangle A : Area of triangle B = ... : .... [2]

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(d) Write down the matrix that represents a stretch, factor 4 with the y-axis invariant.

Answer(d) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(e) (i) On the grid, draw the image of triangle A after the transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$.

[3]

(ii) Describe fully this **single** transformation.

Answer(e)(ii) ....

.... [3]

(iii) Find the inverse of the matrix $\begin{pmatrix} 1 & 0 \\ 2 & 1 \end{pmatrix}$.

Answer(e)(iii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

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14
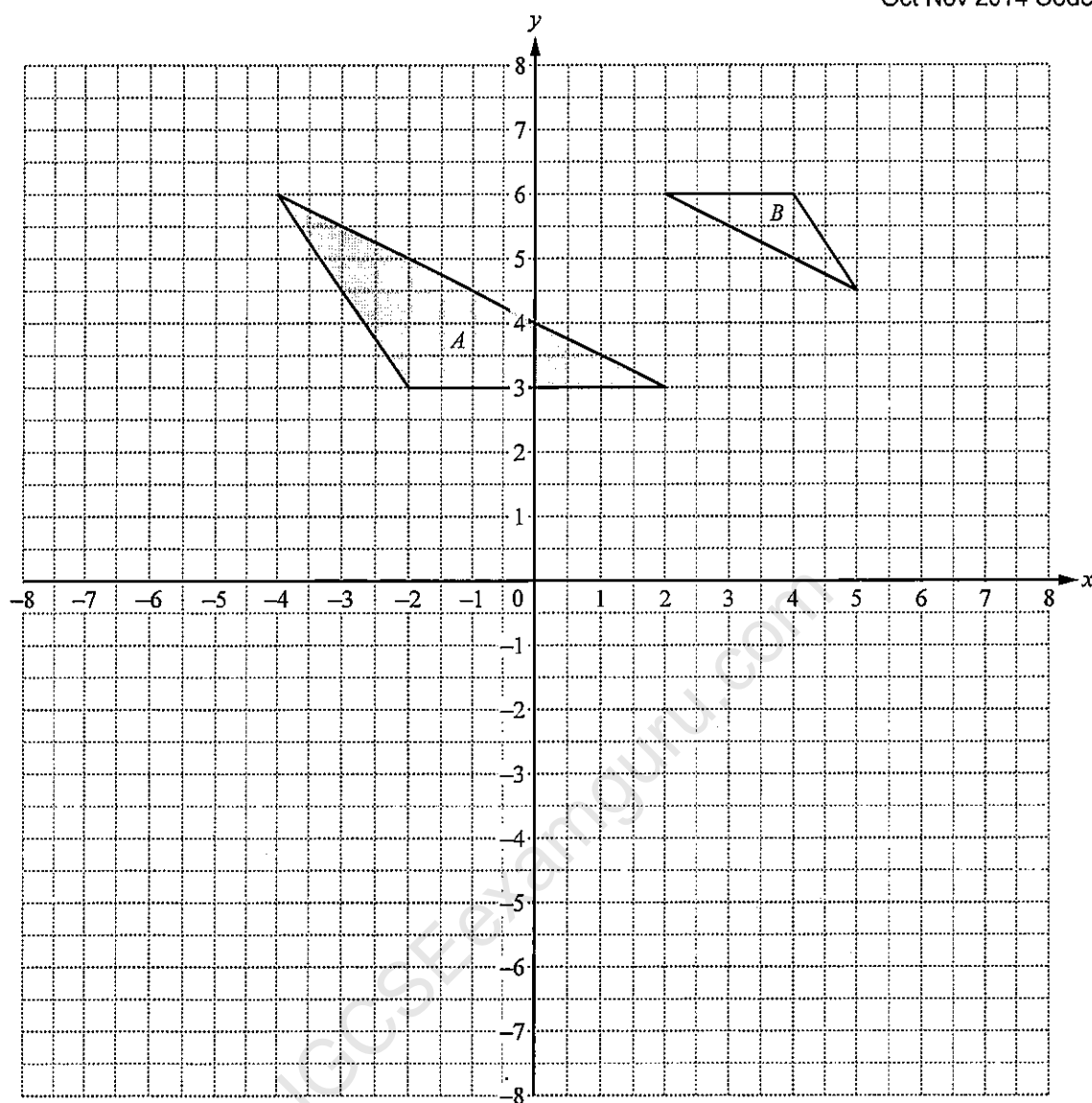
(a) Describe fully the **single** transformation that maps triangle A onto triangle B.

Answer(a) ....

(b) On the grid, draw the image of

    (i)   triangle A after a reflection in the line $x = -3$,   [2]

    (ii)   triangle A after a rotation about the origin through 270° anticlockwise,   [2]

    (iii)   triangle A after a translation by the vector $\begin{pmatrix} -1 \\ -5 \end{pmatrix}$.   [2]

(c)   **M** is the matrix that represents the transformation in **part (b)(ii)**.

    (i)   Find **M**.

$$\textit{Answer(c)}(i)\ \mathbf{M} = \begin{pmatrix} & \\ & \end{pmatrix} \qquad [2]$$

    (ii)   Describe fully the **single** transformation represented by $\mathbf{M}^{-1}$, the inverse of **M**.

    Answer(c)(ii) ....

    .... [2]

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15

$$P = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \qquad Q = \begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix} \qquad R = \begin{pmatrix} -3 \\ 5 \end{pmatrix}$$

Oct Nov 2014 Code 43

(a) Work out

(i) $4P$,

Answer(a)(i)   [1]

(ii) $P - Q$,

Answer(a)(ii)   [1]

(iii) P^2,

Answer(a)(iii)   [2]

(iv) QR.

Answer(a)(iv)   [2]

(b) Find the matrix S, so that $QS = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

Answer(b)   [3]

16

(a) Draw the image of

   (i) shape A after a translation by $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$,   [2]

   (ii) shape A after a rotation through 180° about the point (0, 0),   [2]

   (iii) shape A after the transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$.   [3]

(b) Describe fully the **single** transformation that maps shape A onto shape B.

   Answer(b) ....

   .... [3]

(c) Find the matrix which represents the transformation that maps shape A onto shape C.

                                      Answer(c) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

17   May June 2015 Code 42

(i)   On the grid, draw the image of triangle A after the transformation represented by the

matrix $\begin{pmatrix} -1.5 & 0 \\ 0 & -1.5 \end{pmatrix}$.   [3]

(ii)   Find the 2 × 2 matrix which represents the transformation that maps triangle A onto triangle B.

Answer(c)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

18   May June 2015 Code 43

(a) On the grid, draw the image of

    (i)   triangle T after a reflection in the line $x = -1$,   [2]

    (ii)   triangle T after a rotation through 180° about (0, 0).   [2]

(b) Describe fully the **single** transformation that maps

    (i)   triangle T onto triangle U,

    Answer(b)(i) ....

    .... [2]

    (ii)   triangle T onto triangle V.

    Answer(b)(ii) ....

    .... [3]

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19 $P = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$ $Q = \begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix}$ $R = \begin{pmatrix} 0 & u \\ 1 & v \end{pmatrix}$ $S = \begin{pmatrix} w & 3 \\ 8 & 2 \end{pmatrix}$

    (a)   Work out **PQ**.

<div align="right">May June 2015 Code 43</div>

<div align="right">Answer(a) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]</div>

    (b)   Find Q^{-1}.

<div align="right">Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]</div>

    (c)   **PR = RP**

        Find the value of u and the value of v.

<div align="right">Answer(c) $u =$ ....</div>

<div align="right">$v =$ .... [3]</div>

    (d)   The determinant of **S** is 0.

        Find the value of w.

<div align="right">Answer(d) $w =$ .... [2]</div>

0580/41/M/J/15

20
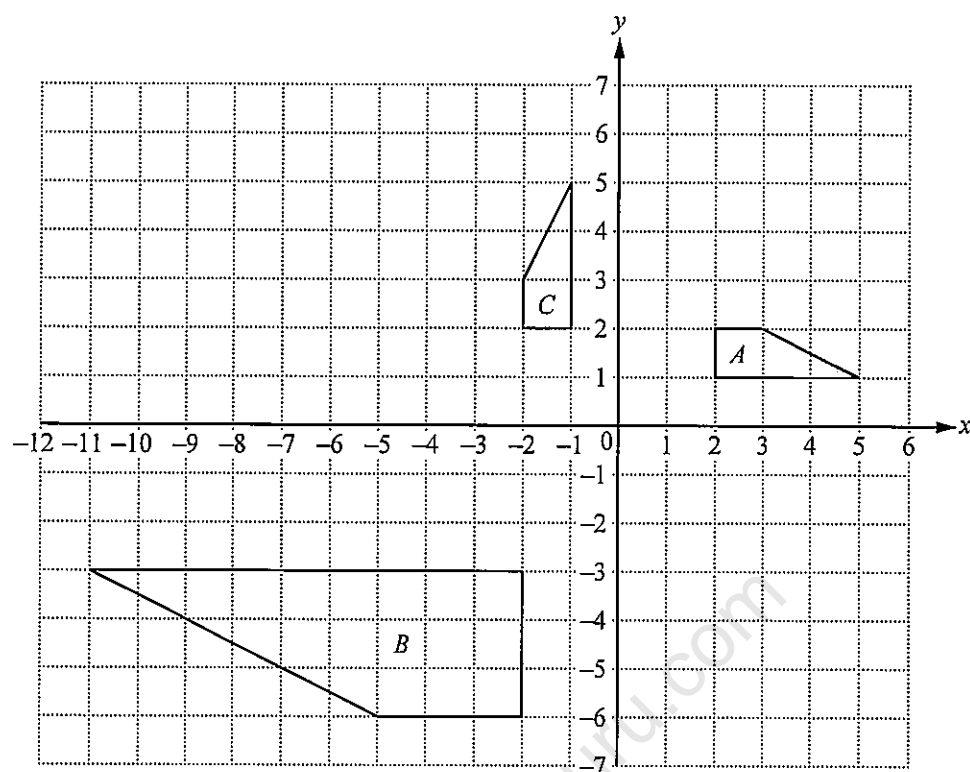
(a) Draw the image of

    (i)   shape A after a translation by $\begin{pmatrix} -1 \\ 3 \end{pmatrix}$,   **[2]**

    (ii)   shape A after a rotation through 180° about the point $(0, 0)$,   **[2]**

    (iii) shape A after the transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$.   **[3]**

(b) Describe fully the **single** transformation that maps shape A onto shape B.

    Answer(b) ....

    .... **[3]**

(c) Find the matrix which represents the transformation that maps shape A onto shape C.

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

0580/43/M/J/15

21
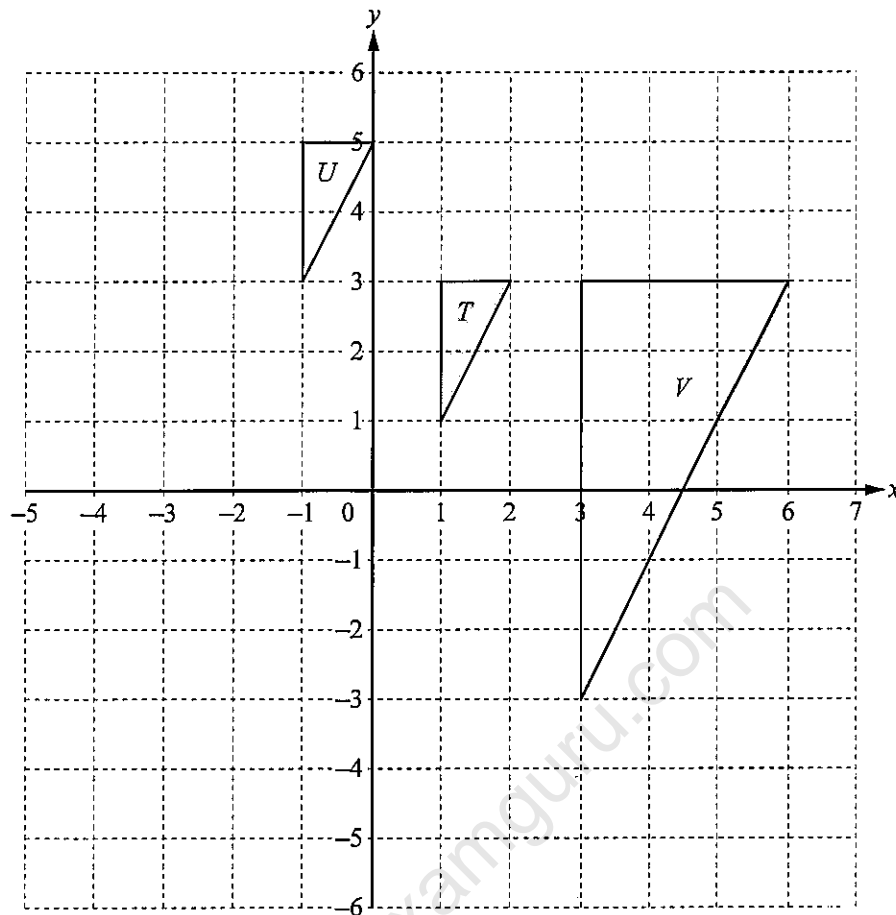
(a) On the grid, draw the image of

    (i) triangle T after a reflection in the line $x = -1$,   [2]

    (ii) triangle T after a rotation through 180° about (0, 0).   [2]

(b) Describe fully the **single** transformation that maps

    (i) triangle T onto triangle U,

    Answer(b)(i) ....

    .... [2]

    (ii) triangle T onto triangle V.

    Answer(b)(ii) ....

    .... [3]

0580/43/M/J/15

22 $P = \begin{pmatrix} 2 & 3 \\ 1 & 4 \end{pmatrix}$ $Q = \begin{pmatrix} 1 & 2 \\ 0 & 3 \end{pmatrix}$ $R = \begin{pmatrix} 0 & u \\ 1 & v \end{pmatrix}$ $S = \begin{pmatrix} w & 3 \\ 8 & 2 \end{pmatrix}$

   (a)   Work out **PQ**.

Answer(a) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

   (b)   Find Q^{-1}.

Answer(b) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

   (c)   **PR = RP**

      Find the value of u and the value of v.

Answer(c) $u =$ ....

$v =$ .... [3]

   (d)   The determinant of **S** is 0.

      Find the value of w.

Answer(d) $w =$ .... [2]

1   Felix asked 80 motorists how many hours their journey took that day.   May June 2012 Code 41
He used the results to draw a cumulative frequency diagram.

Cumulative
frequency

Time (hours)
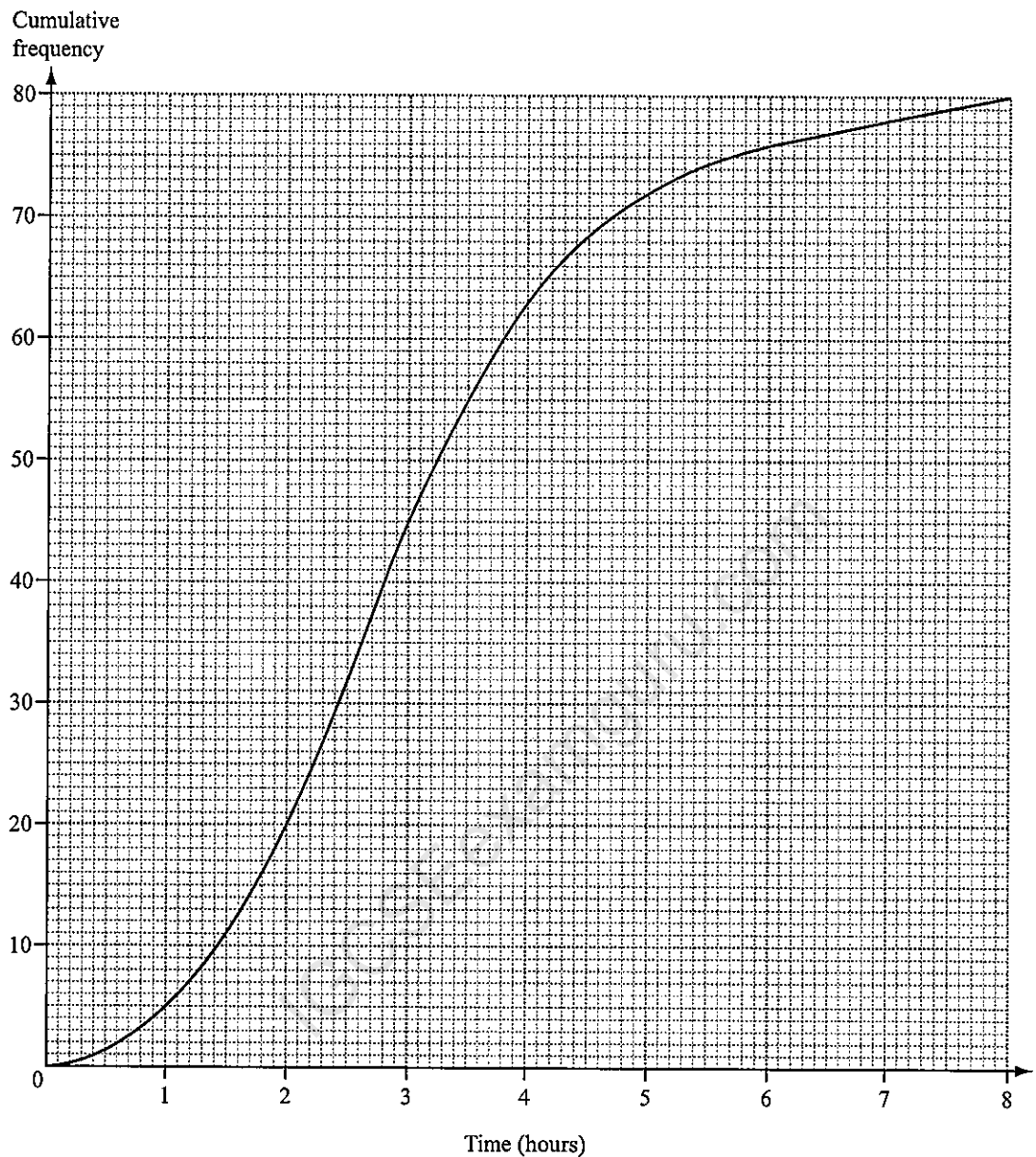
(a)   Find

     (i)   the median,

                                    Answer(a)(i)   .... h [1]

     (ii)   the upper quartile,

                                      Answer(a)(ii)   .... h [1]

     (iii)   the inter-quartile range.

                                      Answer(a)(iii)   .... h [1]

(b) Find the number of motorists whose journey took more than 5 hours but no more than 7 hours.

Answer(b) .... [1]

(c) The frequency table shows some of the information about the 80 journeys.

Time in hours (t)	$0 < t \leqslant 2$	$2 < t \leqslant 3$	$3 < t \leqslant 4$	$4 < t \leqslant 5$	$5 < t \leqslant 6$	$6 < t \leqslant 8$
Frequency	20	25	18			

     (i) Use the cumulative frequency diagram to complete the table above.   [2]

     (ii) Calculate an estimate of the mean number of hours the 80 journeys took.

Answer(c)(ii) .... h [4]

(d) On the grid, draw a histogram to represent the information in your table in **part (c)**.

[5]

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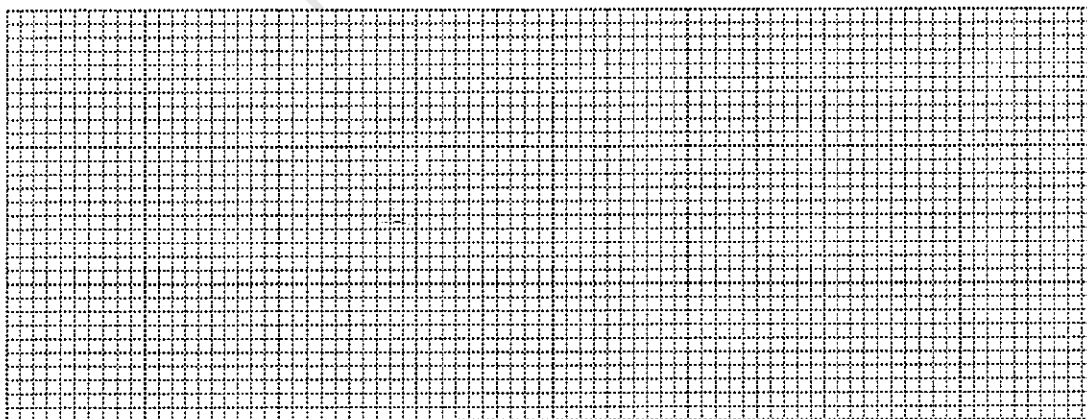
2

Mathematics mark	30	50	35	25	5	39	48	40	10	15
English mark	26	39	35	28	9	37	45	33	16	12

The table shows the test marks in Mathematics and English for 10 students.

(a) (i) On the grid, complete the scatter diagram to show the Mathematics and English marks for the 10 students. The first four points have been plotted for you.

Mathematics mark

[2]
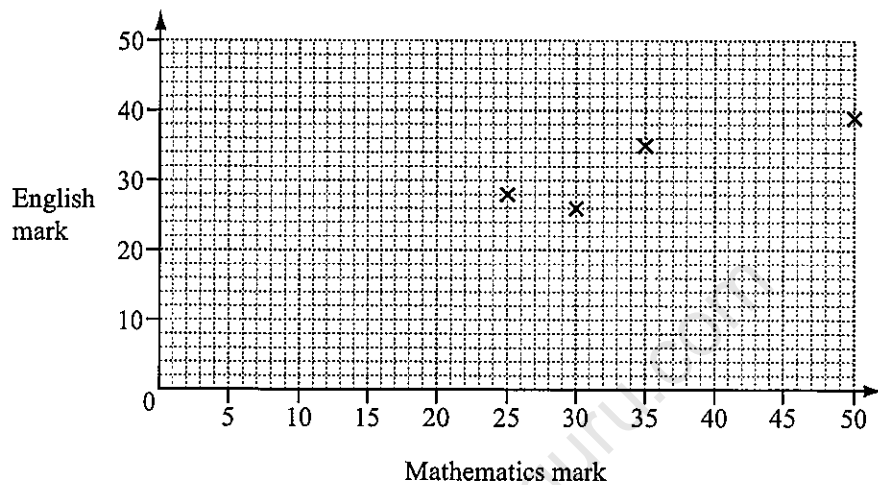
(ii) What type of correlation does your scatter diagram show?

Answer(a)(ii) .... [1]

(iii) Draw a line of best fit on the grid. [1]

(iv) Ann missed the English test but scored 22 marks in the Mathematics test.
Use your line of best fit to estimate a possible English mark for Ann.

Answer(a)(iv) .... [1]

(b) Show that the mean English mark for the 10 students is 28.

Answer(b)

[2]

(c) Two new students do the English test. They both score the **same** mark.
The mean English mark for the 12 students is 31.
Calculate the English mark for the new students.

Answer(c) .... [3]

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3   In all parts of this question give your answer as a fraction in its lowest terms.

    (a)   **(i)** The probability that it will rain today is $\frac{1}{3}$.

                                                                               May June 2012 Code 42

              What is the probability that it will not rain today?

                                                          Answer(a)(i)   .... [1]

      (ii) If it rains today, the probability that it will rain tomorrow is $\frac{2}{5}$.

              If it does not rain today, the probability that it will rain tomorrow is $\frac{1}{6}$.

              Complete the tree diagram.
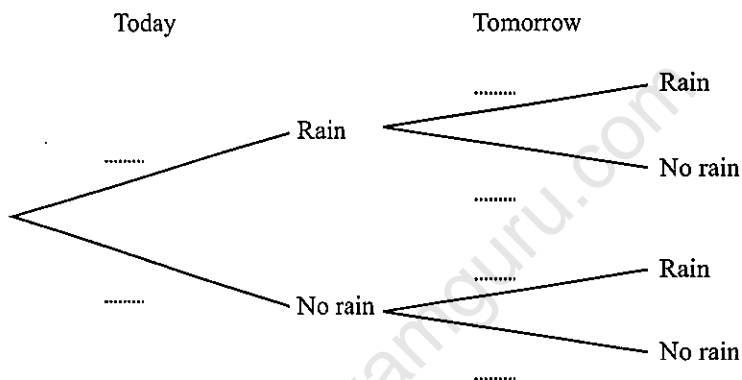
                                                                                   [2]

    (b) Find the probability that it will rain on at least one of these two days.

                                                          Answer(b)   .... [3]

    (c) Find the probability that it will rain on only one of these two days.

                                                          Answer(c)   .... [3]

4   **(a)** In a football league a team is given 3 points for a win, 1 point for a draw and 0 points for a loss.

The table shows the 20 results for Athletico Cambridge.

Points	3	1	0
Frequency	10	3	7

   (i) Find the median and the mode.

Answer(a)(i) Median = ...

Mode = ... [3]

   (ii) Thomas wants to draw a pie chart using the information in the table.

Calculate the angle of the sector which shows the number of times Athletico Cambridge were given 1 point.

Answer(a)(ii) .... [2]

   (b) Athletico Cambridge has 20 players.

The table shows information about the heights (h centimetres) of the players.

Height (h cm)	$170 < h \leqslant 180$	$180 < h \leqslant 190$	$190 < h \leqslant 200$
Frequency	5	12	3

Calculate an estimate of the mean height of the players.

May June 2012 Code 43

Answer(b) .... cm [4]

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5
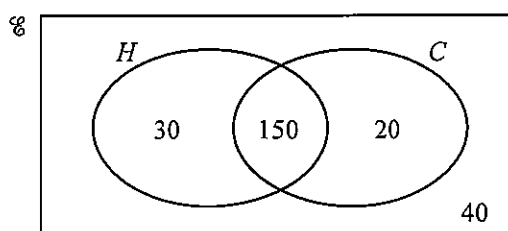
May June 2012 Code 43

$\mathscr{E}$ = {240 passengers who arrive on a flight in Cyprus}

H = {passengers who are on holiday}

C = {passengers who hire a car}

(a) Write down the number of passengers who

     (i) are on holiday,

                            Answer(a)(i) .... [1]

     (ii) hire a car but are not on holiday.

                            Answer(a)(ii) .... [1]

(b) Find the value of $n(H \cup C')$.

                            Answer(b) .... [1]

(c) One of the 240 passengers is chosen at random.

     Write down the probability that this passenger

     (i) hires a car,

                            Answer(c)(i) .... [1]

     (ii) is on holiday and hires a car.

                            Answer(c)(ii) .... [1]

(d) **Give your answers to this part correct to 4 decimal places.**

Two of the 240 passengers are chosen at random.

Find the probability that

    (i)   they are both on holiday,

                                                    Answer(d)(i) .... [2]

    (ii)   exactly one of the two passengers is on holiday.

                                                    Answer(d)(ii) .... [3]

(e) **Give your answer to this part correct to 4 decimal places.**

Two passengers are chosen at random from those on holiday.

Find the probability that they both hire a car.

                                                    Answer(e) .... [3]

6   Oct Nov 2012 Code 41
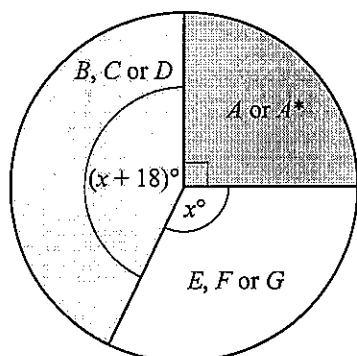
NOT TO SCALE

Girls   Boys
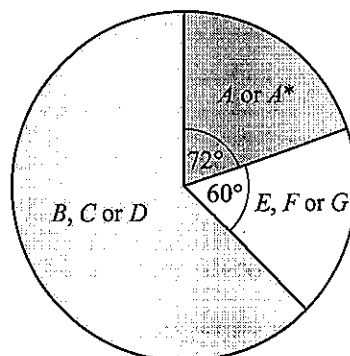
The pie charts show information on the grades achieved in mathematics by the girls and boys at a school.

(a) For the **Girls'** pie chart, calculate

  (i) x,

Answer(a)(i) $x =$ .... [2]

  (ii) the angle for grades B, C or D.

Answer(a)(ii) .... [1]

(b) Calculate the percentage of the **Boys** who achieved grades E, F or G.

Answer(b) .... % [2]

(c) There were 140 girls and 180 boys.

  (i) Calculate the percentage of students (girls and boys) who achieved grades A or A^*.

Answer(c)(i) .... % [3]

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(ii) How many more boys than girls achieved grades *B*, *C* or *D*?

Answer(c)(ii) .... [2]

(d) The table shows information about the times, *t* minutes, taken by 80 of the girls to complete their mathematics examination.

Time taken (*t* minutes)	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 120$	$120 < t \leqslant 150$
Frequency	5	14	29	32

(i) Calculate an estimate of the mean time taken by these 80 girls to complete the examination.

Answer(d)(i) .... min [4]

(ii) On a histogram, the height of the column for the interval $60 < t \leqslant 80$ is 2.8 cm.

Calculate the heights of the other three columns.
Do not draw the histogram.

Answer(d)(ii) $40 < t \leqslant 60$ column height = ... cm

$80 < t \leqslant 120$ column height = ... cm

$120 < t \leqslant 150$ column height = ... cm [4]

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7 90 students are asked which school clubs they attend.   Oct Nov 2012 Code 41

$D = $ {students who attend drama club}
$M = $ {students who attend music club}
$S = $ { students who attend sports club}

39 students attend music club.
26 students attend **exactly two** clubs.
35 students attend drama club.
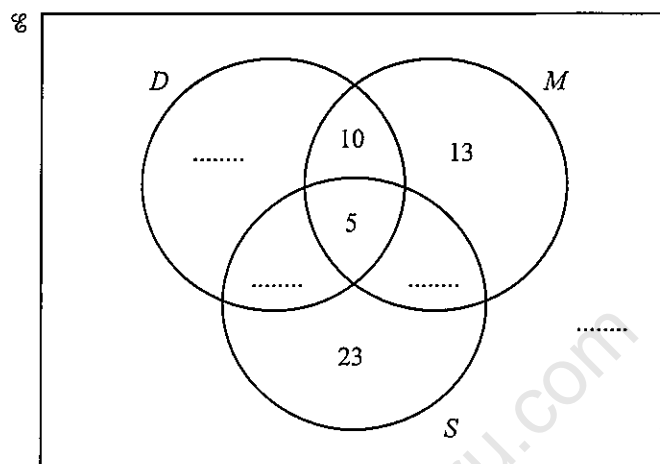
(a) Write the four missing values in the Venn diagram.   [4]

(b) How many students attend

  (i) all three clubs,

                Answer(b)(i) .... [1]

  (ii) one club only?

                Answer(b)(ii) .... [1]

(c) Find

  (i) $n(D \cap M)$,

                Answer(c)(i) .... [1]

  (ii) $n((D \cap M) \cap S')$.

                Answer(c)(ii) .... [1]

(d) One of the 90 students is chosen at random.

Find the probability that the student

(i) **only** attends music club,

Answer(d)(i) .... [1]

(ii) attends **both** music and drama clubs.

Answer(d)(ii) .... [1]

(e) Two of the 90 students are chosen at random without replacement.

Find the probability that

(i) they **both** attend all three clubs,

Answer(e)(i) .... [2]

(ii) one of them attends sports club only and the other attends music club only.

Answer(e)(ii) .... [3]

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8   **(a)** A farmer takes a sample of 158 potatoes from his crop. He records the mass of each potato and the results are shown in the table.

Oct Nov 2012 Code 42

Mass (m grams)	Frequency
$0 < m \leqslant 40$	6
$40 < m \leqslant 80$	10
$80 < m \leqslant 120$	28
$120 < m \leqslant 160$	76
$160 < m \leqslant 200$	22
$200 < m \leqslant 240$	16

Calculate an estimate of the mean mass.
Show all your working.

Answer(a) .... g [4]

(b) A new frequency table is made from the results shown in the table in **part (a)**.

Mass (m grams)	Frequency
$0 < m \leqslant 80$	
$80 < m \leqslant 200$	
$200 < m \leqslant 240$	16

    (i) Complete the table above.   [2]

    (ii) On the grid opposite, complete the histogram to show the information in this new table.

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9

Mass (grams)

[3]
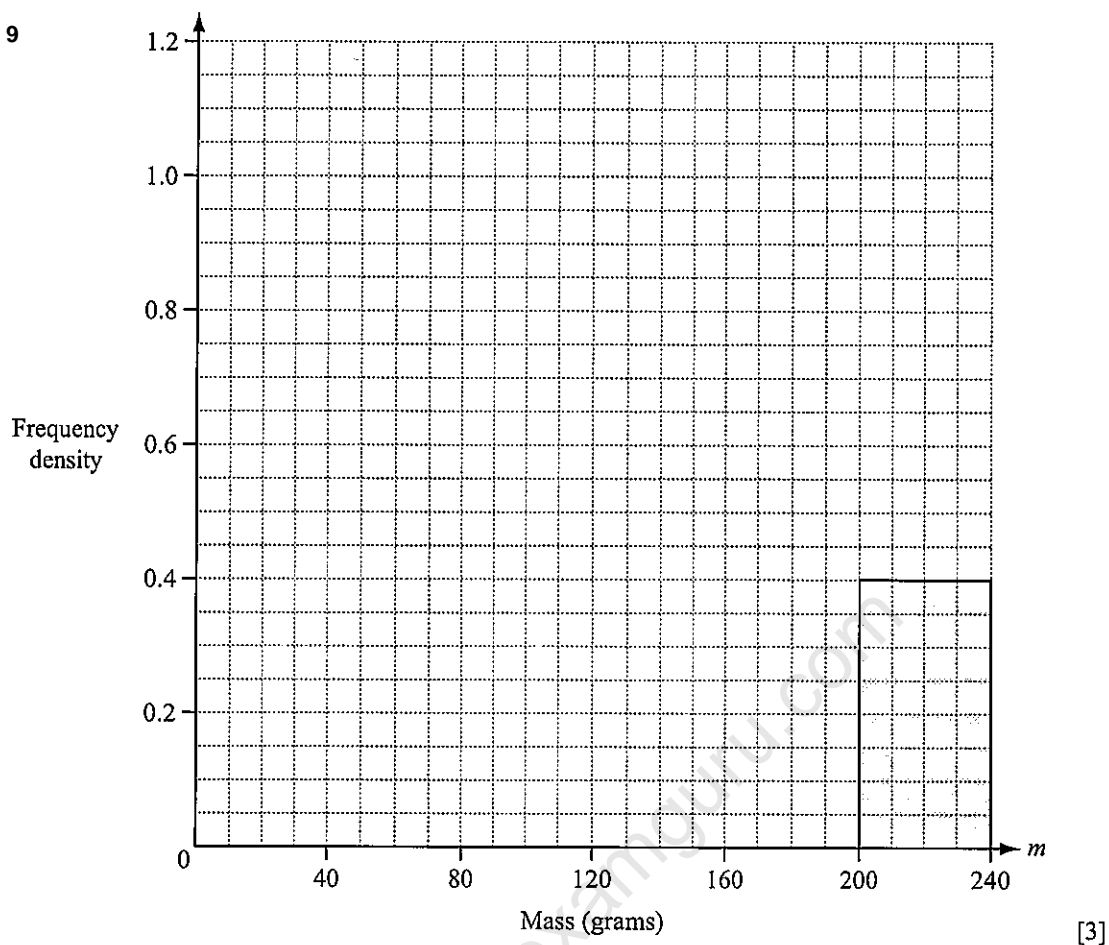
(c) A bag contains 15 potatoes which have a mean mass of 136 g.
The farmer puts 3 potatoes which have a mean mass of 130 g into the bag.

Calculate the mean mass of all the potatoes in the bag.

Answer(c) .... g [3]

10   (a) $\mathscr{E}$ = {25 students in a class}   Oct Nov 2012 Code 42

F = {students who study French}

S = {students who study Spanish}

16 students study French and 18 students study Spanish.

2 students study neither of these.

(i)   Complete the Venn diagram to show this information.

[2]
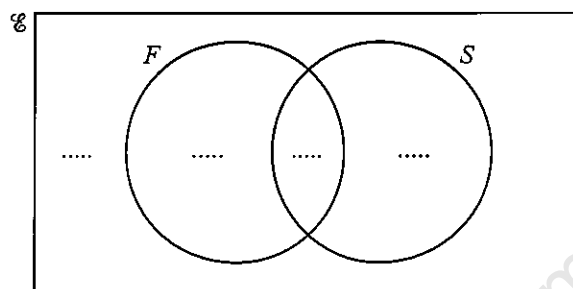
(ii) Find n(F').

Answer(a)(ii)   ....   [1]

(iii) Find n($F \cap S$)'.

Answer(a)(iii)   ....   [1]

(iv) One student is chosen at random.

Find the probability that this student studies both French and Spanish.

Answer(a)(iv)   ....   [1]

(v)   Two students are chosen at random without replacement.

Find the probability that they both study only Spanish.

Answer(a)(v)   ....   [2]

(b) In another class the students all study at least one language from French, German and Spanish.

No student studies all three languages.

The set of students who study German is a proper subset of the set of students who study French.

4 students study both French and German.

12 students study Spanish but not French.

9 students study French but not Spanish.

A total of 16 students study French.

(i) Draw a Venn diagram to represent this information.

[4]

(ii) Find the total number of students in this class.

Answer(b)(ii) .... [1]

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11   **(a)**

① ② ② ③ ④   Oct Nov 2012 Code 43

Two discs are chosen at random **without** replacement from the five discs shown in the diagram.

(i) Find the probability that both discs are numbered 2.

Answer(a)(i) ....   [2]

(ii) Find the probability that the numbers on the **two** discs have a total of 5.

Answer(a)(ii) ....   [3]

(iii) Find the probability that the numbers on the two discs do **not** have a total of 5.

Answer(a)(iii) ....   [1]

(b) A group of international students take part in a survey on the nationality of their parents.

E = {students with an English parent}
F = {students with a French parent}

$n(\mathcal{E}) = 50$, $n(E) = 15$, $n(F) = 9$ and $n(E \cup F)' = 33$.
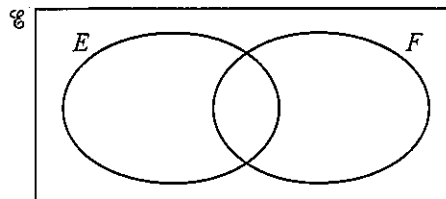
(i) Find $n(E \cap F)$.

Answer(b)(i) ....   [1]

(ii) Find $n(E' \cup F)$.

Answer(b)(ii) ....   [1]

(iii) A student is chosen at random.
Find the probability that this student has an English parent and a French parent.

Answer(b)(iii) ....   [1]

(iv) A student who has a French parent is chosen at random.
Find the probability that this student also has an English parent.

Answer(b)(iv) ....   [1]

12   200 students take a Mathematics examination.
        The cumulative frequency diagram shows information about the times taken, t minutes, to complete
        the examination.

                                                        Oct Nov 2012 Code 43
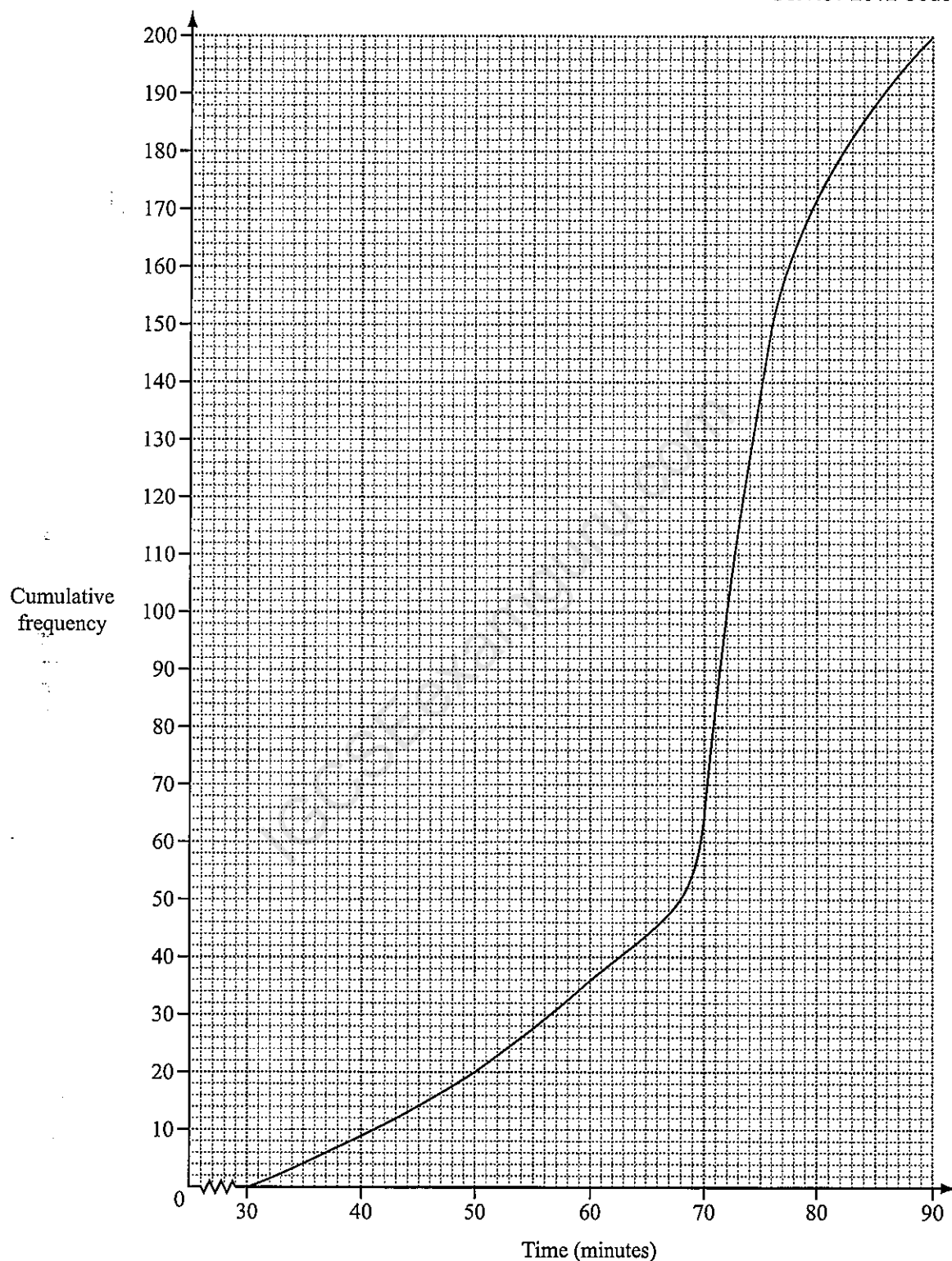
More Notes and Topical Past Papers at https://IGCSEexamguru.com

(a) Find

   (i) the median,

Answer(a)(i) .... min [1]

   (ii) the lower quartile,

Answer(a)(ii) .... min [1]

   (iii) the inter-quartile range,

Answer(a)(iii) .... min [1]

   (iv) the number of students who took more than 1 hour.

Answer(a)(iv) .... [2]

(b) **(i)** Use the cumulative frequency diagram to complete the grouped frequency table.

Time, t minutes	$30 < t \leqslant 40$	$40 < t \leqslant 50$	$50 < t \leqslant 60$	$60 < t \leqslant 70$	$70 < t \leqslant 80$	$80 < t \leqslant 9$
Frequency	9		16	28	108	28

[1]

   (ii) Calculate an estimate of the mean time taken by the 200 students to complete the examination.
Show all your working.

Answer(b)(ii) .... min [4]

13   200 students estimate the mass (m grams) of a coin.   May June 2013 Code 41
        The cumulative frequency diagram shows the results.
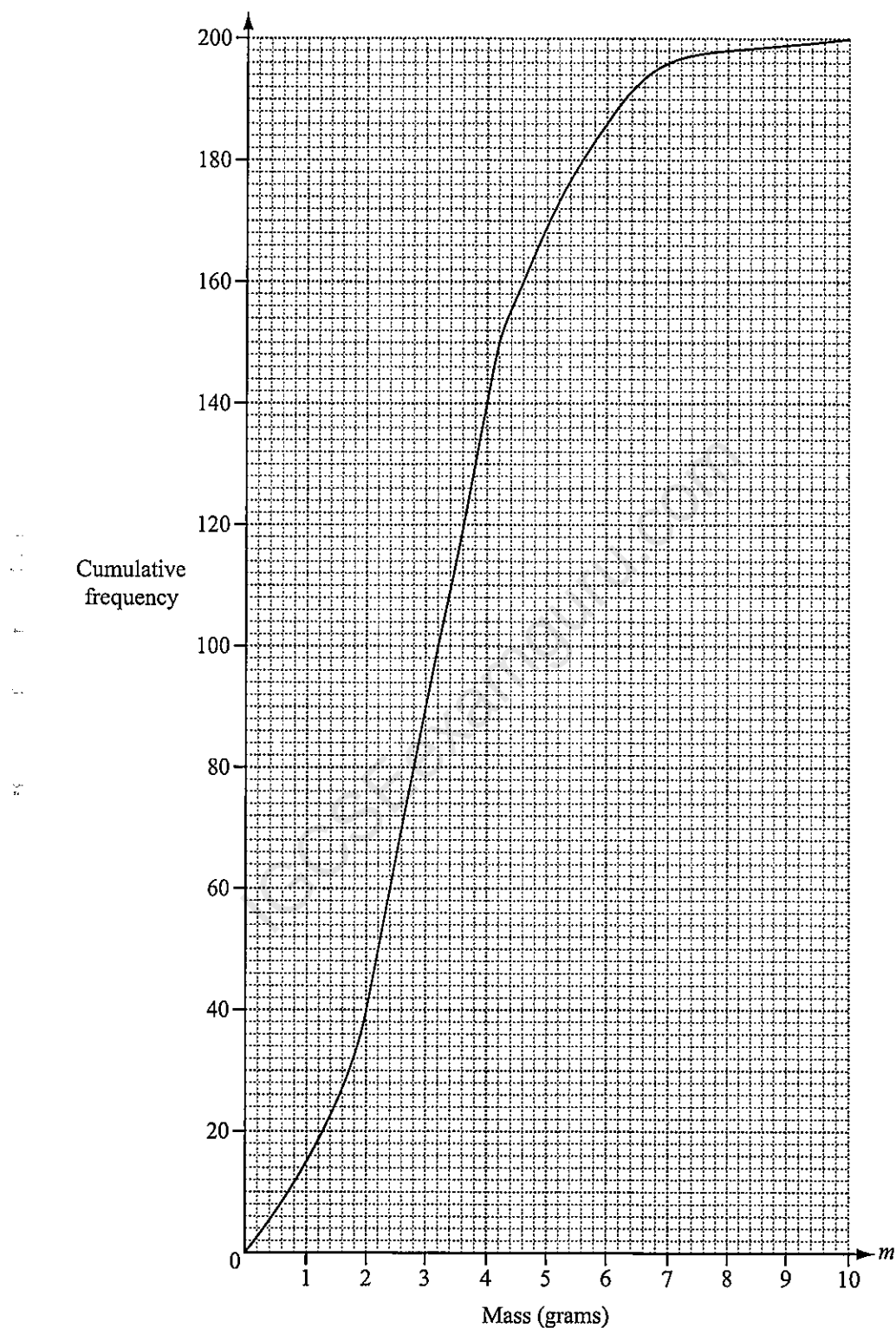
(a) Find

    (i) the median,

Answer(a)(i) .... g [1]

    (ii) the upper quartile,

Answer(a)(ii) .... g [1]

    (iii) the 80th percentile,

Answer(a)(iii) .... g [1]

    (iv) the number of students whose estimate is 7 g or less.

Answer(a)(iv) .... [1]

(b) **(i)** Use the cumulative frequency diagram to complete the frequency table.

Mass (m grams)	$0 < m \leqslant 2$	$2 < m \leqslant 4$	$4 < m \leqslant 6$	$6 < m \leqslant 8$	$8 < m \leqslant 10$
Frequency	40				2

[2]

    (ii) A student is chosen at random.
The probability that the student estimates that the mass is greater than M grams is 0.3.

Find the value of M.

Answer(b)(ii) $M =$ .... [2]

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14

Height (h cm)	$150 < h \le 160$	$160 < h \le 165$	$165 < h \le 180$	$180 < h \le 190$
Frequency	5	9	18	10

The table shows information about the heights of a group of 42 students.

(a) Using mid-interval values, calculate an estimate of the mean height of the students.
Show your working.

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Answer(a) .... cm [3]

(b) Write down the interval which contains the lower quartile.

Answer(b) .... [1]

(c) Complete the histogram to show the information in the table.
One column has already been drawn for you.

Height (cm)
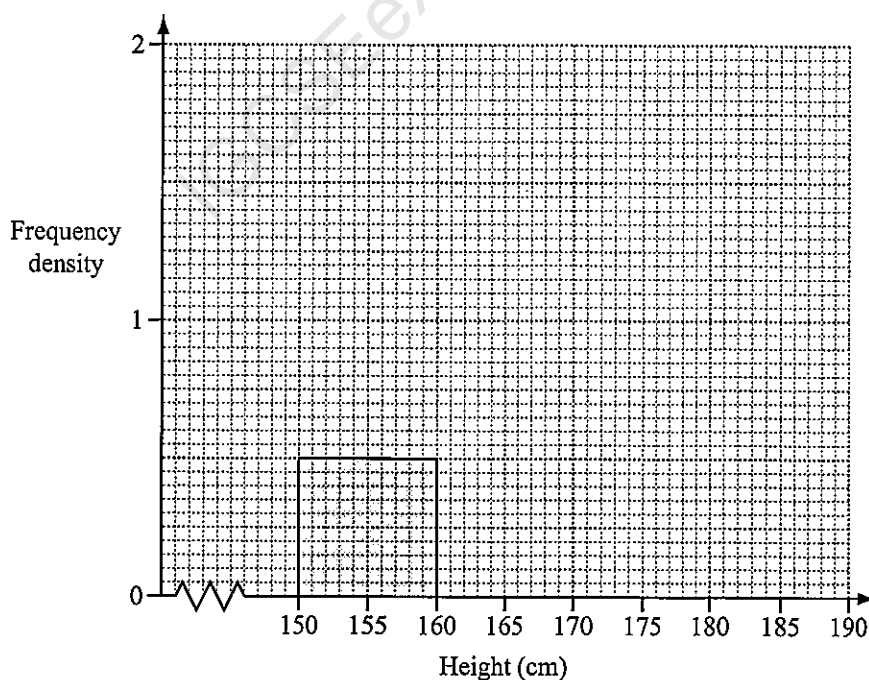
[4]

15 **In this question, give all your answers as fractions.**

When Ivan goes to school in winter, the probability that he wears a hat is $\frac{5}{8}$.

If he wears a hat, the probability that he wears a scarf is $\frac{2}{3}$.

If he does not wear a hat, the probability that he wears a scarf is $\frac{1}{6}$.

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(a) Complete the tree diagram.

```
                          ........          Scarf
                Hat  <
      ........ /            No scarf
             /       ........
             \
      ........ \     ........          Scarf
               No hat  <
                          No scarf
                          ........
```
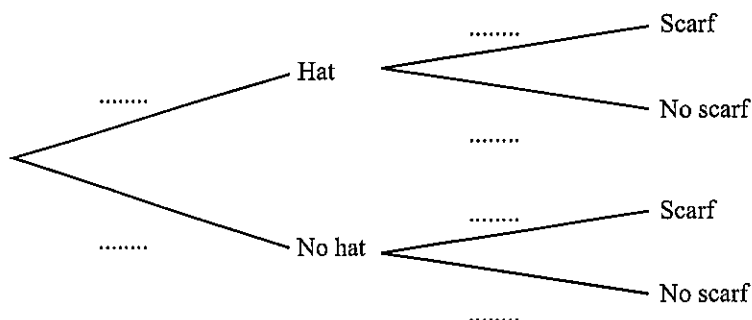
[3]

(b) Find the probability that Ivan

   (i) does not wear a hat and does not wear a scarf,

   Answer(b)(i) .... [2]

   (ii) wears a hat but does not wear a scarf,

   Answer(b)(ii) .... [2]

   (iii) wears a hat or a scarf but not both.

   Answer(b)(iii) .... [2]

(c) If Ivan wears a hat and a scarf, the probability that he wears gloves is $\frac{7}{10}$.

Calculate the probability that Ivan does **not** wear all three of hat, scarf and gloves.

   Answer(c) .... [3]

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16   Sam asked 80 people how many minutes their journey to work took on one day.
The cumulative frequency diagram shows the times taken (m minutes).

May June 2013 Code 43
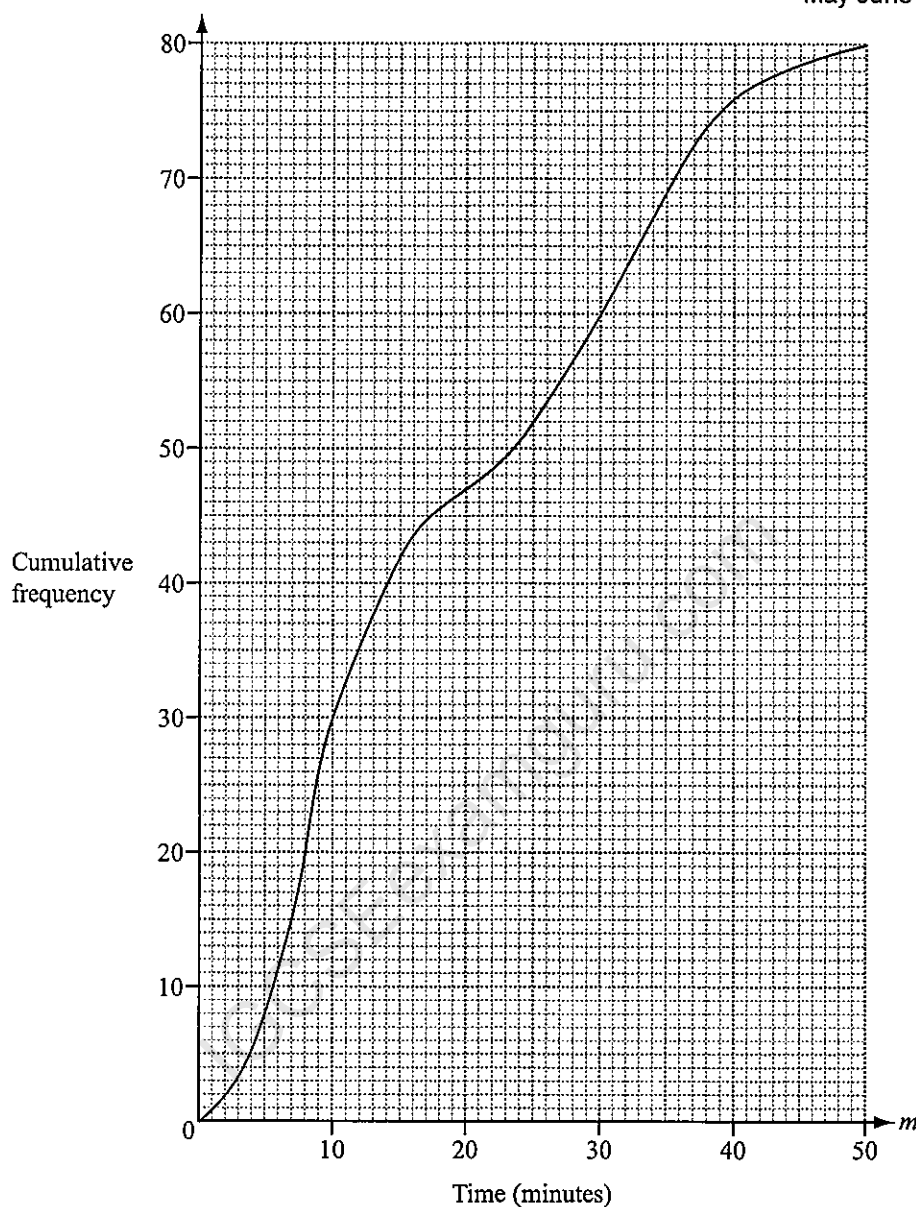
Cumulative frequency

Time (minutes)

(a) Find

    (i)   the median,

Answer(a)(i) .... min [1]

    (ii)   the lower quartile,

Answer(a)(ii) .... min [1]

    (iii)   the inter-quartile range.

Answer(a)(iii) .... min [1]

(b) One of the 80 people is chosen at random.

Find the probability that their journey to work took more than 35 minutes.
Give your answer as a fraction.

Answer(b) .... [2]

(c) Use the cumulative frequency diagram to complete this frequency table.

Time (m minutes)	$0 < m \leq 10$	$10 < m \leq 15$	$15 < m \leq 30$	$30 < m \leq 40$	$40 < m \leq 50$
Frequency	30	12	18		

[2]

(d) Using mid-interval values, calculate an estimate of the mean journey time for the 80 people.

Answer(d) .... min [3]

(e) Use the table in **part (c)** to complete the histogram to show the times taken by the 80 people.
One column has already been completed for you.

Time (minutes)
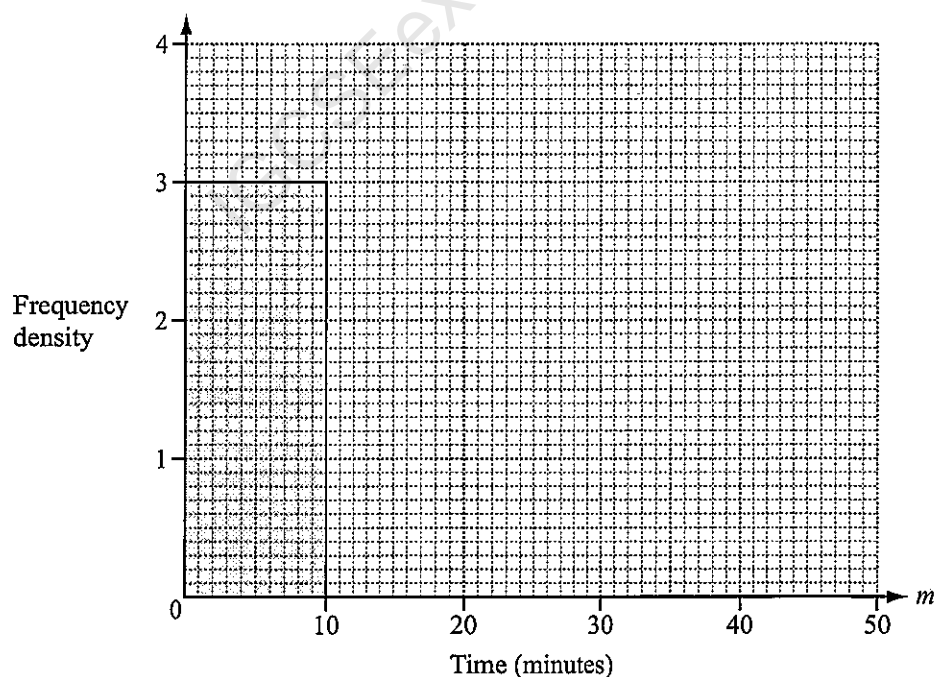
[5]

17   120 students are asked to answer a question.
The time, t seconds, taken by each student to answer the question is measured.
The frequency table shows the results.

Time	$0 < t \leqslant 10$	$10 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 50$	$50 < t \leqslant 60$
Frequency	6	44	40	14	10	6

(a) Calculate an estimate of the mean time.

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Answer(a) .... s [4]

(b) (i) Complete the cumulative frequency table.

Time	$t \leqslant 10$	$t \leqslant 20$	$t \leqslant 30$	$t \leqslant 40$	$t \leqslant 50$	$t \leqslant 60$
Cumulative frequency	6			104		120

[2]

(ii) On the grid below, draw a cumulative frequency diagram to show this information.

Time (seconds)
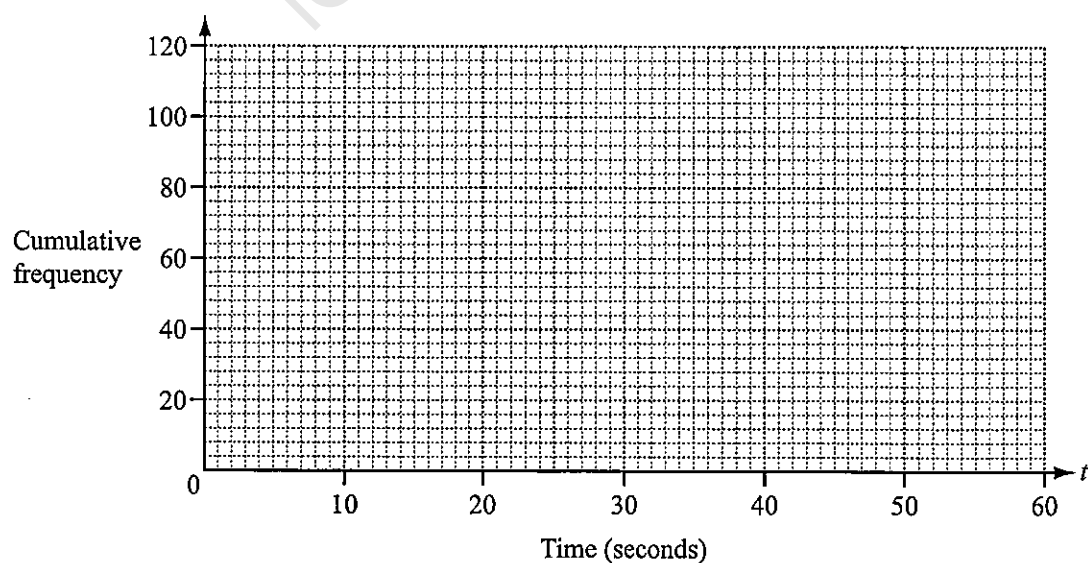
[3]

(iii) Use your cumulative frequency diagram to nd the median, the lower quartile and the 60th percentile.

Answer(b)(iii)   Median .... s

Lower quartile .... s

60th percentile .... s   [4]

(c) The intervals for the times taken are changed.

(i) Use the information in the **frequency table** on the opposite page to complete this new table.

Time	$0 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 60$
Frequency		40	

[2]

(ii) On the grid below, complete the histogram to show the information in the new table. One column has already been drawn for you.

Time (seconds)

[3]

18

| E | N | L | A | R | G | E | M | E | N | T |
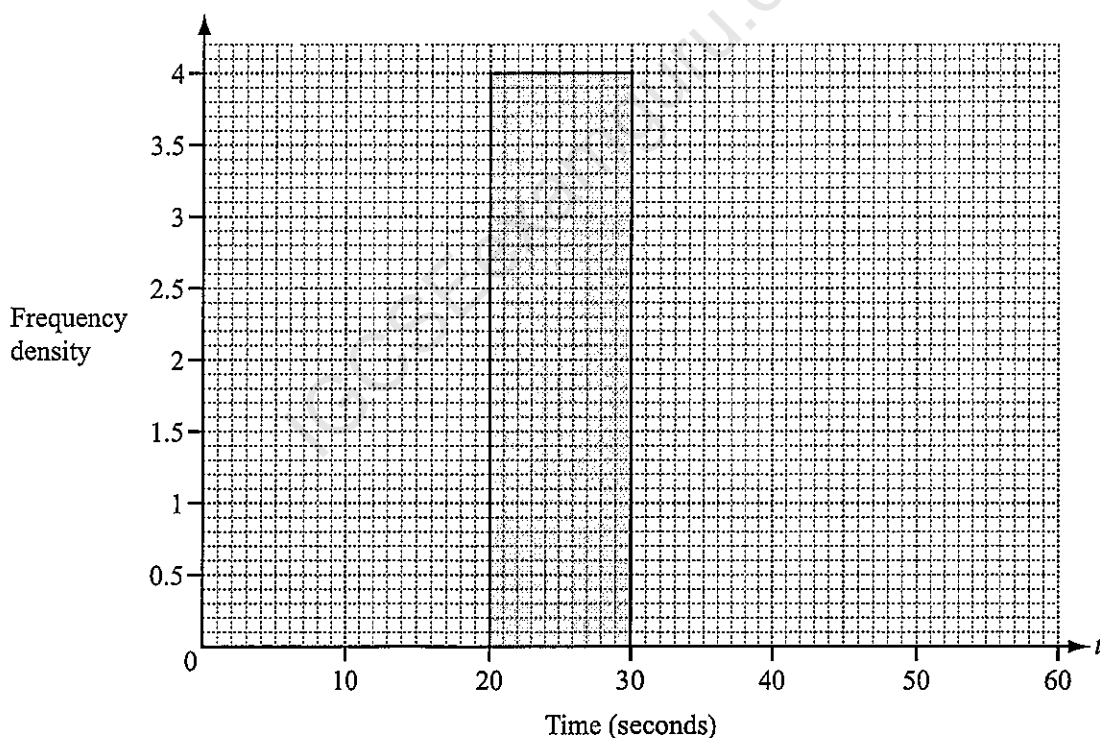
Prettie picks a card at random from the 11 cards above and does not replace it.
She then picks a second card at random and does not replace it.

(a) Find the probability that she picks

(i) the letter L and then the letter G,   Oct Nov 2013 Code 42

Answer(a)(i) .... [2]

(ii) the letter E twice,

Answer(a)(ii) .... [2]

(iii) two letters that are the same.

Answer(a)(iii) .... [2]

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(b) The probability that Chaminda uses the internet on any day is $\frac{3}{5}$.

The probability that Niluka uses the internet on any day is $\frac{3}{4}$.

(i) Complete the tree diagram.

Chaminda   Niluka

[2]
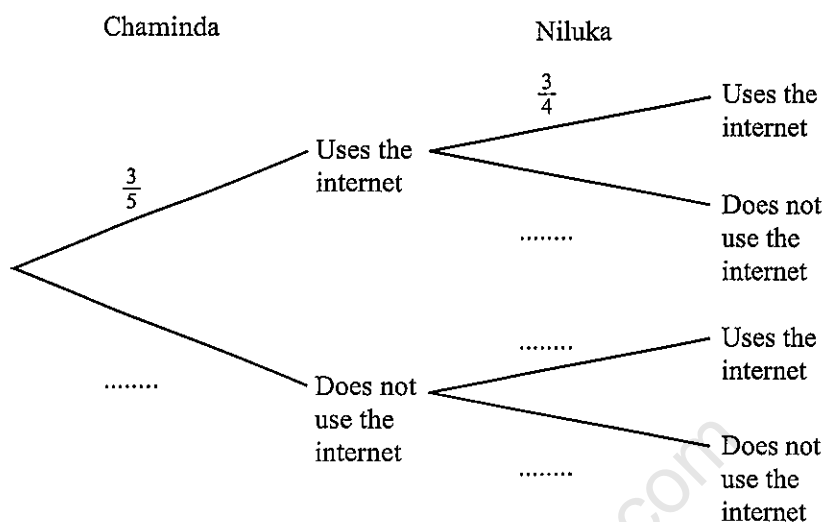
(ii) Calculate the probability, that on any day, at least one of the two students uses the internet.

Answer(b)(ii) .... [3]

(iii) Calculate the probability that Chaminda uses the internet on three consecutive days.

Answer(b)(iii) .... [2]

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19   **(a)** A square spinner is biased.
        The probabilities of obtaining the scores 1, 2, 3 and 4 when it is spun are given in the table.

Score	1	2	3	4
Probability	0.1	0.2	0.4	0.3

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     (i) Work out the probability that on one spin the score is 2 or 3.

Answer(a)(i) .... [2]

     (ii) In 5000 spins, how many times would you expect to score 4 with this spinner?

Answer(a)(ii) .... [1]

     (iii) Work out the probability of scoring 1 on the first spin and 4 on the second spin.

Answer(a)(iii) .... [2]

   (b) In a bag there are 7 red discs and 5 blue discs.
       From the bag a disc is chosen at random and not replaced.
       A second disc is then chosen at random.

       Work out the probability that at least one of the discs is red.
       Give your answer as a fraction.

Answer(b) .... [3]

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     May June 2014 Code 41
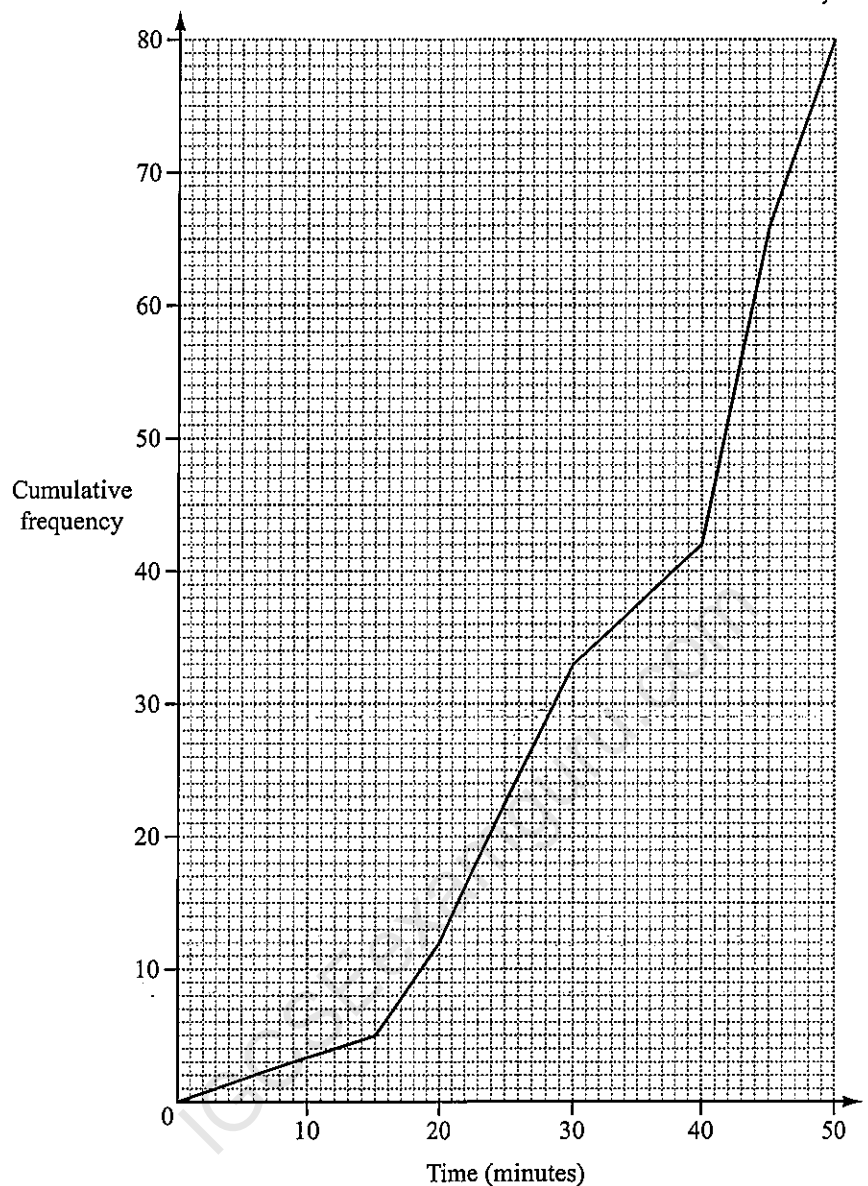
Time (minutes)

The times (t minutes) taken by 80 people to complete a charity swim were recorded.
The results are shown in the cumulative frequency diagram above.

(a) Find

    (i) the median,

                         Answer(a)(i) .... min [1]

    (ii) the inter-quartile range,

                         Answer(a)(ii) .... min [2]

(iii) the 70th percentile.

Answer(a)(iii) .... min [2]

(b) The times taken by the 80 people are shown in this grouped frequency table.

Time (t minutes)	$0 < t \leqslant 20$	$20 < t \leqslant 30$	$30 < t \leqslant 45$	$45 < t \leqslant 50$
Frequency	12	21	33	14

(i) Calculate an estimate of the mean time.

Answer(b)(i) .... min [4]

(ii) Draw a histogram to represent the grouped frequency table.

Time (minutes)

[4]

21   **(a)**

Mass (grams)
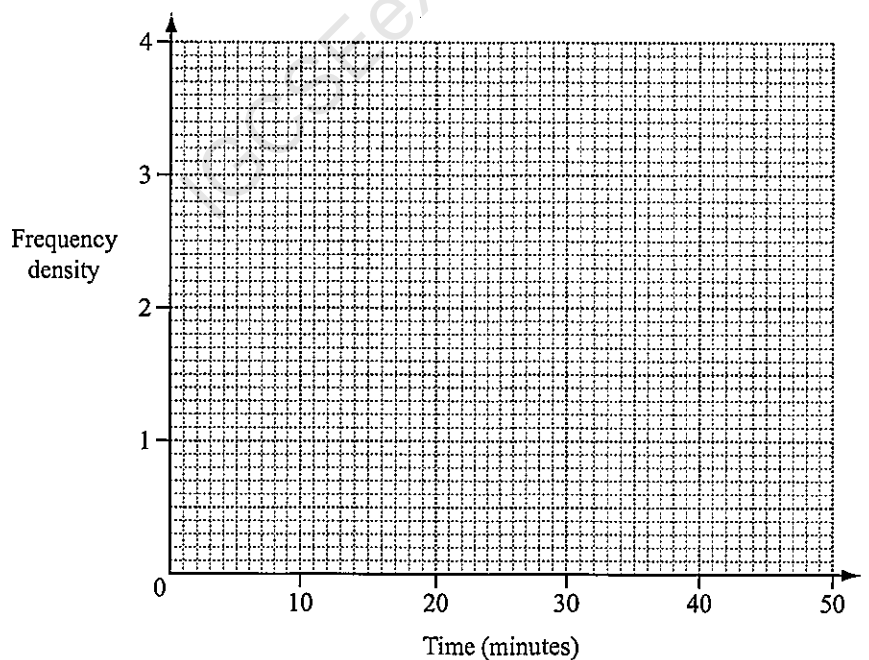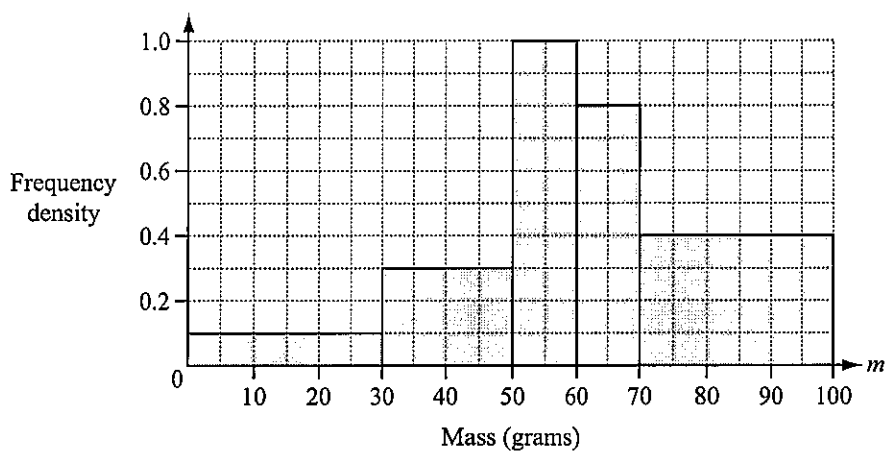
The histogram shows some information about the masses (*m* grams) of 39 apples.

(i) Show that there are 12 apples in the interval $70 < m \leqslant 100$.

Answer(a)(i)   May June 2014 Code 42

[1]

(ii) Calculate an estimate of the mean mass of the 39 apples.

Answer(a)(ii) .... g [5]

(b) The mean mass of 20 oranges is 70 g.
One orange is eaten.
The mean mass of the remaining oranges is 70.5 g.

Find the mass of the orange that was eaten.

Answer(b) .... g [3]

22   If the weather is fine the probability that Carlos is late arriving at school is $\frac{1}{10}$.

If the weather is not fine the probability that he is late arriving at school is $\frac{1}{3}$.

The probability that the weather is fine on any day is $\frac{3}{4}$.

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(a) Complete the tree diagram to show this information.

Weather   Arriving at school

```
                              1/10 ──────── Late
                    ┌─ Fine ◄
          3/4      /            ──────── Not late
            \     /             ........
             \   /
              ◄              ........ ──────── Late
             /   \
            /     ◄
   ........    Not fine      ──────── Not late
                               ........
```
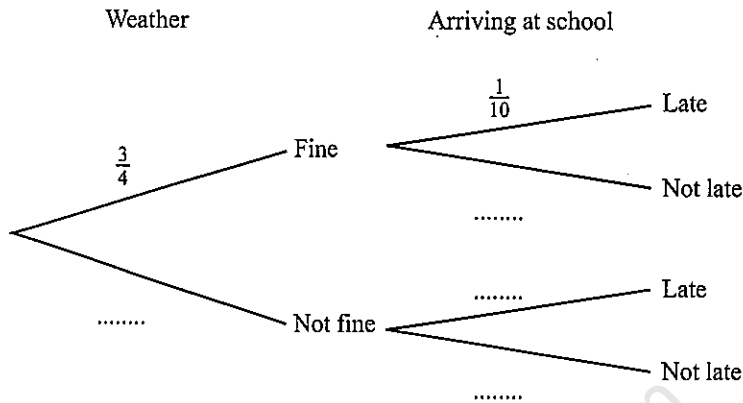
[3]

(b) In a school term of 60 days, find the number of days the weather is expected to be fine.

Answer(b) .... [1]

(c) Find the probability that the weather is fine and Carlos is late arriving at school.

Answer(c) .... [2]

(d) Find the probability that Carlos is not late arriving at school.

Answer(d) .... [3]

(e) Find the probability that the weather is not fine on at least one day in a school week of 5 days.

Answer(e) .... [2]

23   May June 2014 Code 43
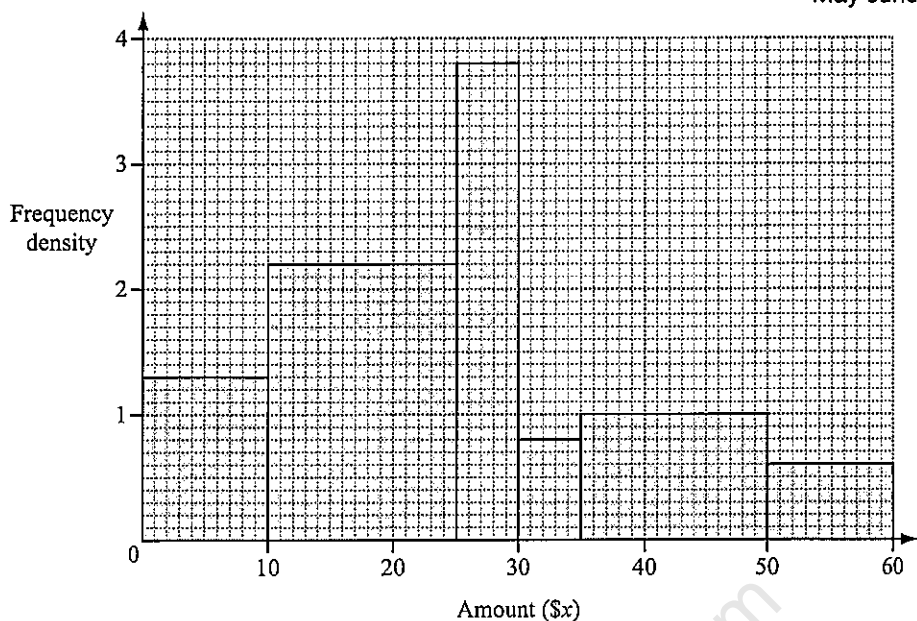
A survey asked 90 people how much money they gave to charity in one month.
The histogram shows the results of the survey.

(a) Complete the frequency table for the six columns in the histogram.

Amount ($x)	$0 < x \leqslant 10$					
Frequency				4		

[5]

(b) Use your frequency table to calculate an estimate of the mean amount these 90 people gave to charity.

Answer(b) $ .... [4]

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24 In this question, give all your answers as fractions.   May June 2014 Code 43

$$\boxed{N}\ \boxed{A}\ \boxed{T}\ \boxed{I}\ \boxed{O}\ \boxed{N}$$

The letters of the word **NATION** are printed on 6 cards.

(a) A card is chosen at random.

   Write down the probability that

   (i) it has the letter **T** printed on it,

   Answer(a)(i) .... [1]

   (ii) it does not have the letter **N** printed on it,

   Answer(a)(ii) .... [1]

   (iii) the letter printed on it has no lines of symmetry.

   Answer(a)(iii) .... [1]

(b) Lara chooses a card at random, replaces it, then chooses a card again.

   Calculate the probability that only **one** of the cards she chooses has the letter **N** printed on it.

   Answer(b) .... [3]

(c) Jacob chooses a card at random and does not replace it.
     He continues until he chooses a card with the letter **N** printed on it.

   Find the probability that this happens when he chooses the 4th card.

   Answer(c) .... [3]

25   A company tested 200 light bulbs to nd the lifetime, T hours, of each bulb.   Oct Nov 2014 Code 41
      The results are shown in the table.

Lifetime (T hours)	Number of bulbs
$0 < T \leqslant 1000$	10
$1000 < T \leqslant 1500$	30
$1500 < T \leqslant 2000$	55
$2000 < T \leqslant 2500$	72
$2500 < T \leqslant 3500$	33

(a) Calculate an estimate of the mean lifetime for the 200 light bulbs.

Answer(a) .... hours [4]

(b) **(i)** Complete the cumulative frequency table.

Lifetime (T hours)	$T \leqslant 1000$	$T \leqslant 1500$	$T \leqslant 2000$	$T \leqslant 2500$	$T \leqslant 3500$
Number of bulbs					

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.
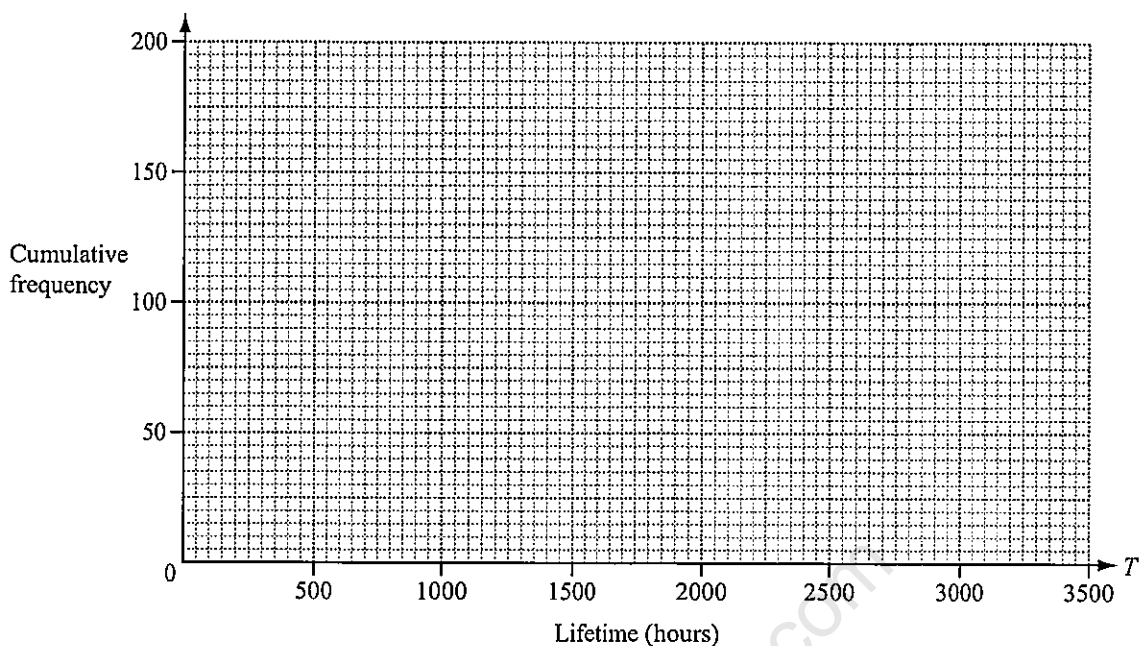
[3]

(iii) The company says that the average lifetime of a bulb is 2200 hours.

Estimate the number of bulbs that lasted longer than 2200 hours.

Answer(b)(iii) .... [2]

(c) Robert buys one energy saving bulb and one halogen bulb.

The probability that the energy saving bulb lasts longer than 3500 hours is $\frac{9}{10}$.

The probability that the halogen bulb lasts longer than 3500 hours is $\frac{3}{5}$.

Work out the probability that exactly one of the bulbs will last longer than 3500 hours.

Answer(c) .... [4]

26 The time, t seconds, taken for each of 50 chefs to cook an omelette is recorded.

Time (t seconds)	$20 < t \leqslant 25$	$25 < t \leqslant 30$	$30 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 45$	$45 < t \leqslant 50$
Frequency	2	6	7	19	9	7

Oct Nov 2014 Code 42

(a) Write down the modal time interval.

Answer(a) .... s [1]

(b) Calculate an estimate of the mean time.
Show all your working.

Answer(b) .... s [4]

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(c) A new frequency table is made from the results shown in the table opposite.

Time (t seconds)	$20 < t \leqslant 35$	$35 < t \leqslant 40$	$40 < t \leqslant 50$
Frequency			

(i) Complete the table. [1]

(ii) On the grid, draw a histogram to show the information in this new table.

Time (seconds)
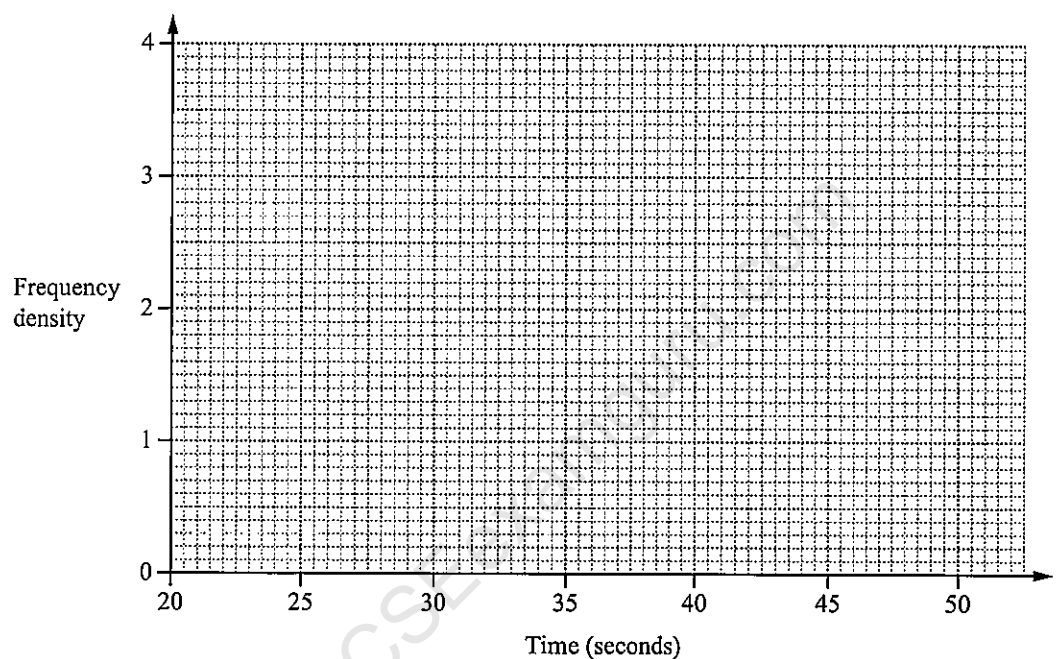
[3]

27   Kenwyn plays a board game.   Oct Nov 2014 Code 42
Two cubes (dice) each have faces numbered 1, 2, 3, 4, 5 and 6.
In the game, a **throw** is rolling the two fair 6-sided dice and then adding the numbers on their top faces.
This total is the number of spaces to move on the board.
For example, if the numbers are 4 and 3, he moves 7 spaces.

   (a)   Giving each of your answers as a fraction in its simplest form, nd the probability that he moves

      (i)   two spaces with his next throw,

                                               Answer(a)(i) .... [2]

      (ii)   ten spaces with his next throw.

                                               Answer(a)(ii) .... [3]

   (b)   What is the most likely number of spaces that Kenwyn will move with his next throw?
Explain your answer.

      Answer(b) .... because ....

      .... [2]

(c)

95	96	97	98	99 Go back 3 spaces	100 WIN

To win the game he must move **exactly** to the 100th space.
Kenwyn is on the 97th space.
If his next throw takes him to 99, he has to move back to 96.
If his next throw takes him over 100, he stays on 97.

Find the probability that he reaches 100 in either of his next two throws.

Answer(c) .... [5]

28   Yeung and Ariven compete in a triathlon race.   Oct Nov 2014 Code 43

The probability that Yeung nishes this race is $\frac{3}{5}$.

The probability that Ariven nishes this race is $\frac{2}{3}$.

(a)   **(i)**   Which of them is more likely to nish this race?
Give a reason for your answer.

Answer(a)(i) .... because ....

.... [1]

     (ii)   Find the probability that they both nish this race.

Answer(a)(ii) .... [2]

     (iii)   Find the probability that only one of them nishes this race.

Answer(a)(iii) .... [3]

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(b) After the rst race, **Yeung** competes in two further triathlon races.

(i) Complete the tree diagram.

First race   Second race   Third race

[3]
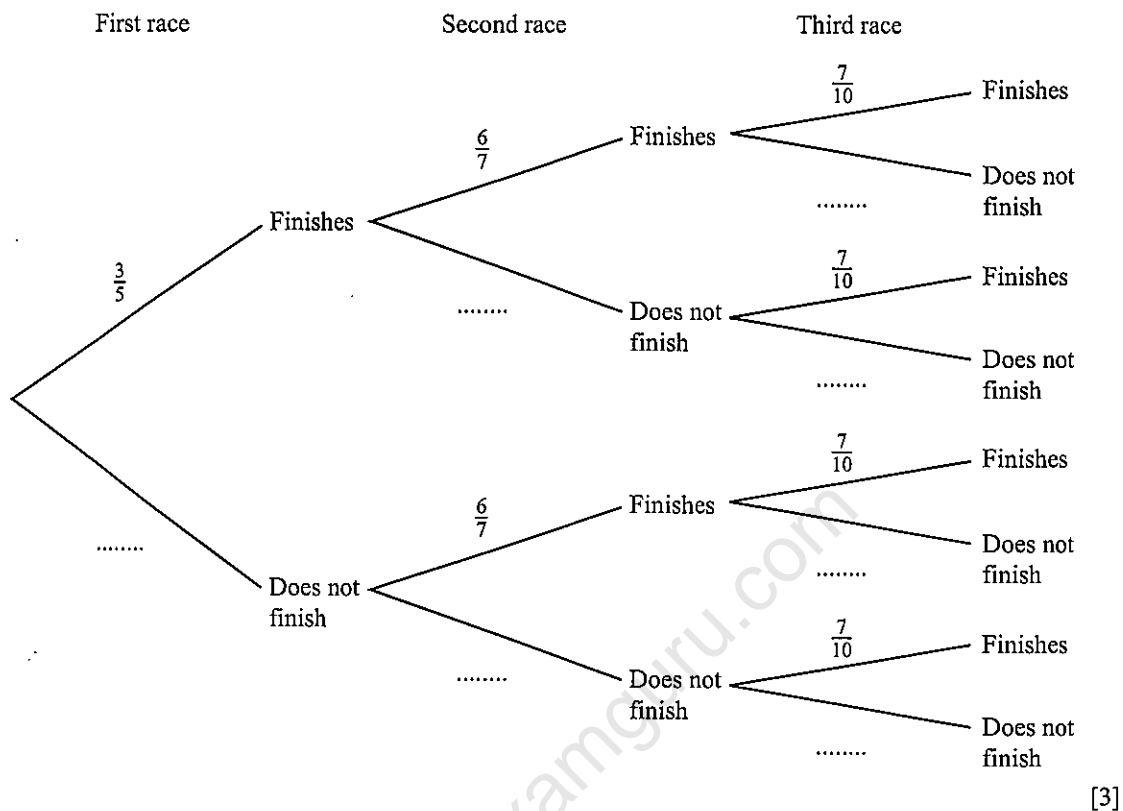
(ii) Calculate the probability that Yeung nishes all three of his races.

Answer(b)(ii) .... [2]

(iii) Calculate the probability that Yeung nishes at least one of his races.

Answer(b)(iii) .... [3]

29 **(a)** Ricardo asks some motorists how many litres of fuel they use in one day.
The numbers of litres, correct to the nearest litre, are shown in the table.

Number of litres	16	17	18	19	20
Number of motorists	11	10	p	4	8

   (i) For this table, the mean number of litres is 17.7 .

   Calculate the value of p.

<div align="right">Oct Nov 2014 Code 43</div>

<div align="right">*Answer(a)*(i) $p =$ .... [4]</div>

   (ii) Find the median number of litres.

<div align="right">*Answer(a)*(ii) .... litres [1]</div>

(b) Manuel completed a journey of 320 km in his car.
The fuel for the journey cost $1.28 for every 6.4 km travelled.

   (i) Calculate the cost of fuel for this journey.

<div align="right">*Answer(b)*(i) $... [2]</div>

   (ii) When Manuel travelled 480 km in his car it used 60 litres of fuel.
Manuel's car used fuel at the same rate for the journey of 320 km.

   Calculate the number of litres of fuel the car used for the journey of 320 km.

<div align="right">*Answer(b)*(ii) .... litres [2]</div>

   (iii) Calculate the cost per litre of fuel used for the journey of 320 km.

<div align="right">*Answer(b)*(iii) $... [2]</div>

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(c) Ellie drives a car at a constant speed of 30 m/s correct to the nearest 5 m/s.
She maintains this speed for 5 minutes correct to the nearest 10 seconds.

Calculate the upper bound of the distance in **kilometres** that Ellie could have travelled.

Answer(c) .... km [5]

30   30 students were asked if they had a bicycle (B), a mobile phone (M) and a computer (C).
The results are shown in the Venn diagram.
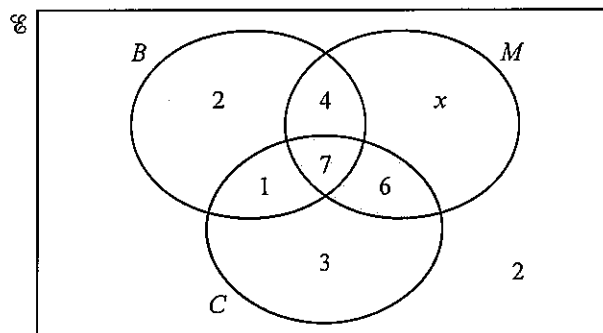
(a)   Work out the value of x.   May June 2015 Code 41

Answer(a) x = ... [1]

(b)   Use set notation to describe the shaded region in the Venn diagram.

Answer(b) .... [1]

(c)   Find $n(C \cap (M \cup B)')$.

Answer(c) .... [1]

(d)   A student is chosen at random.

     (i)   Write down the probability that the student is a member of the set M'.

Answer(d)(i) .... [1]

     (ii)   Write down the probability that the student has a bicycle.

Answer(d)(ii) .... [1]

(e)   Two students are chosen at random from the students who have computers.

     Find the probability that each of these students has a mobile phone but no bicycle.

Answer(e) .... [3]

31 The table shows the time, t minutes, that 400 people take to complete a test.

Time taken (t mins)	$0 < t \leqslant 10$	$10 < t \leqslant 24$	$24 < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 70$
Frequency	10	90	135	85	70	10

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(a) (i) Write down the modal time interval.

Answer(a)(i) .... min [1]

(ii) Calculate an estimate of the mean time taken to complete the test.

Answer(a)(ii) .... min [4]

(b) (i) Complete the table of cumulative frequencies.

Time taken (t mins)	$t \leqslant 10$	$t \leqslant 24$	$t \leqslant 30$	$t \leqslant 40$	$t \leqslant 60$	$t \leqslant 70$
Cumulative frequency	10	100				400

[2]

(ii) On the grid opposite, draw a cumulative frequency diagram to show this information.

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[3]
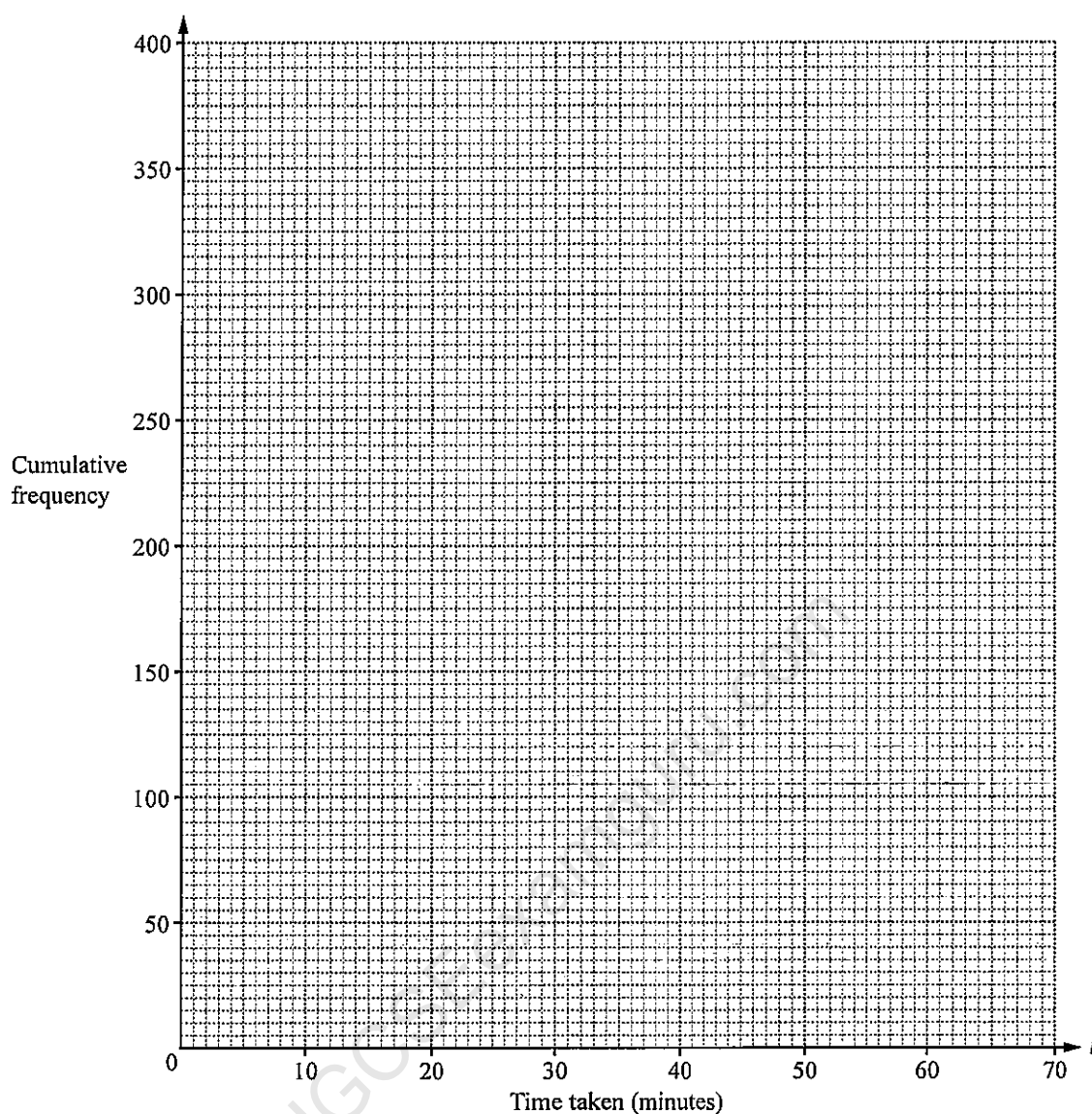
(c) Use your graph to estimate

    (i) the median time,

                                                          Answer(c)(i) .... min [1]

    (ii) the inter-quartile range,

                                                          Answer(c)(ii) .... min [2]

    (iii) the 15th percentile,

                                                           Answer(c)(iii) .... min [2]

    (iv) the number of people who took more than 50 minutes.

                                                          Answer(c)(iv) .... [2]

32   **(a)** A group of 50 students estimated the mass, M grams, of sweets in a jar.
The results are shown in the table.   May June 2015 Code 42

Mass (M grams)	Number of students
$0 < M \leqslant 200$	5
$200 < M \leqslant 300$	9
$300 < M \leqslant 350$	18
$350 < M \leqslant 400$	12
$400 < M \leqslant 500$	6

    (i)   Calculate an estimate of the mean.

Answer(a)(i) .... grams [4]

    (ii) Complete this histogram to show the information in the table.

[3]

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(b) A group of 50 adults also estimated the mass, M grams, of the sweets in the jar.
The histogram below shows information about their estimates.

Use the histograms to make two comparisons between the distributions of the estimates of the students and the adults.

Frequency density

Mass (grams)

Answer(b)

1 ....

....

2 ....

.... [2]

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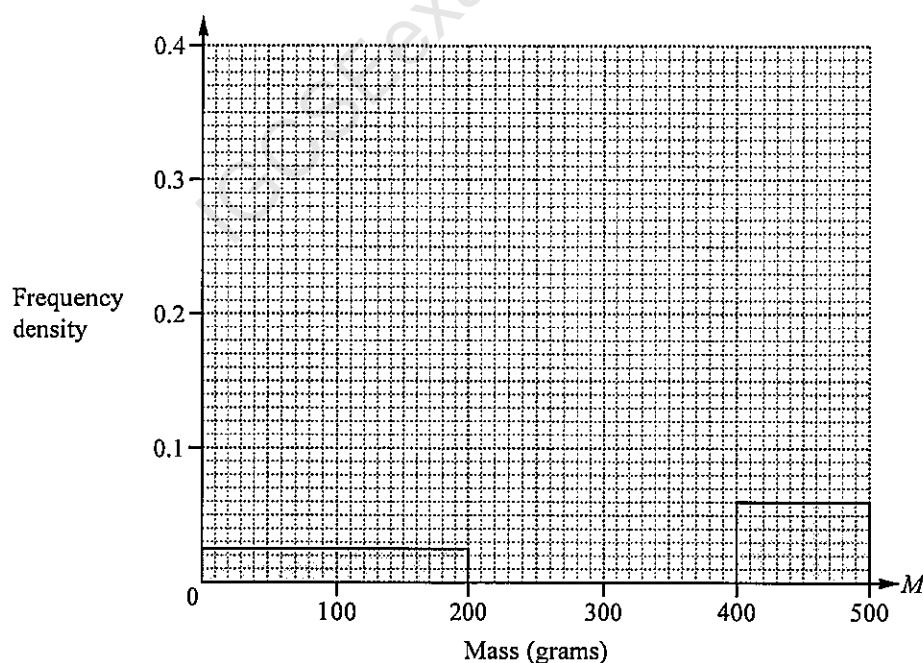
33   Gareth has 8 sweets in a bag.
       4 sweets are orange flavoured, 3 are lemon flavoured and 1 is strawberry flavoured.

   (a)   He chooses two of the sweets at random.

        Find the probability that the two sweets have different flavours.

<div align="right">May June 2015 Code 42</div>

<div align="right">*Answer(a)* .... [4]</div>

   (b)   Gareth now chooses a third sweet.

      — Find the probability that **none** of the three sweets is lemon flavoured.

<div align="right">*Answer(b)* .... [2]</div>

34   The table shows the times, t minutes, taken by 200 students to complete an IGCSE paper.

Time (t minutes)	$40 < t \leqslant 60$	$60 < t \leqslant 70$	$70 < t \leqslant 75$	$75 < t \leqslant 90$
Frequency	10	50	80	60

(a)   By using mid-interval values, calculate an estimate of the mean time.

May June 2015 Code 43

Answer(a) .... min [3]

(b)   On the grid, draw a histogram to show the information in the table.
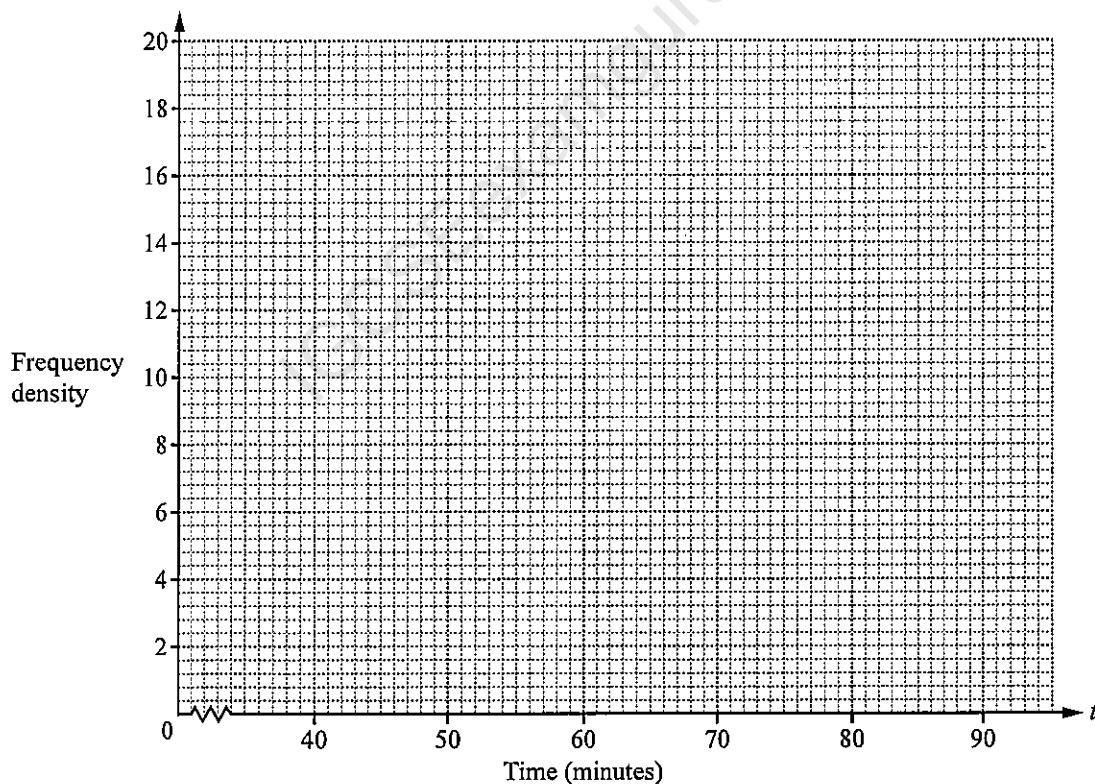
Time (minutes)

[4]

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35   May June 2015 Code 43

| A | A | A | A | B | B | C |

(a) One of these 7 cards is chosen at random.

Write down the probability that the card

    (i) shows the letter A,

                                 Answer(a)(i) .... [1]

    (ii) shows the letter A or B,

                                 Answer(a)(ii) .... [1]

    (iii) does not show the letter B.

                                 Answer(a)(iii) .... [1]

(b) Two of the cards are chosen at random, without replacement.

Find the probability that

    (i) both show the letter A,

                                 Answer(b)(i) .... [2]

    (ii) the two letters are different.

                                 Answer(b)(ii) .... [3]

(c) Three of the cards are chosen at random, without replacement.

Find the probability that the cards do not show the letter C.

                                 Answer(c) .... [2]

0580/41/M/J/15

36 30 students were asked if they had a bicycle (B), a mobile phone (M) and a computer (C).
The results are shown in the Venn diagram.
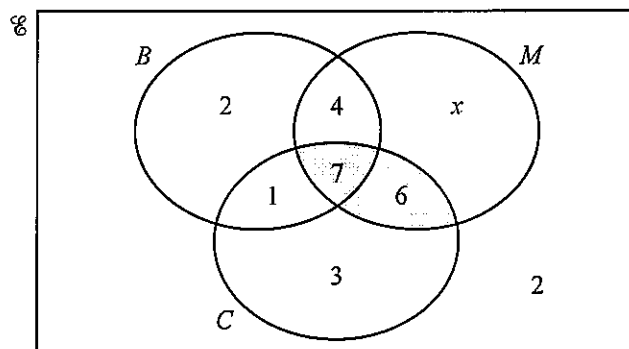
(a) Work out the value of x.

Answer(a) x = ... [1]

(b) Use set notation to describe the shaded region in the Venn diagram.

Answer(b) .... [1]

(c) Find n($C \cap (M \cup B)'$).

Answer(c) .... [1]

(d) A student is chosen at random.

   (i) Write down the probability that the student is a member of the set M'.

Answer(d)(i) .... [1]

   (ii) Write down the probability that the student has a bicycle.

Answer(d)(ii) .... [1]

(e) Two students are chosen at random from the students who have computers.

Find the probability that each of these students has a mobile phone but no bicycle.

Answer(e) .... [3]

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37 The table shows the time, t minutes, that 400 people take to complete a test.

Time taken (t mins)	$0 < t \leqslant 10$	$10 < t \leqslant 24$	$24 < t \leqslant 30$	$30 < t \leqslant 40$	$40 < t \leqslant 60$	$60 < t \leqslant 70$
Frequency	10	90	135	85	70	10

(a) **(i)** Write down the modal time interval.

Answer(a)(i) .... min [1]

(ii) Calculate an estimate of the mean time taken to complete the test.

Answer(a)(ii) .... min [4]

(b) **(i)** Complete the table of cumulative frequencies.

Time taken (t mins)	$t \leqslant 10$	$t \leqslant 24$	$t \leqslant 30$	$t \leqslant 40$	$t \leqslant 60$	$t \leqslant 70$
Cumulative frequency	10	100				400

[2]

(ii) On the grid opposite, draw a cumulative frequency diagram to show this information.

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[3]

(c) Use your graph to estimate

    (i)   the median time,

                                   Answer(c)(i) .... min [1]

    (ii)   the inter-quartile range,

                                     Answer(c)(ii) .... min [2]

    (iii)   the 15th percentile,

                                     Answer(c)(iii) .... min [2]

    (iv)   the number of people who took more than 50 minutes.

                                     Answer(c)(iv) .... [2]

0580/42/M/J/15

38 (a) A group of 50 students estimated the mass, M grams, of sweets in a jar.
The results are shown in the table.

Mass (M grams)	Number of students
$0 < M \leqslant 200$	5
$200 < M \leqslant 300$	9
$300 < M \leqslant 350$	18
$350 < M \leqslant 400$	12
$400 < M \leqslant 500$	6

(i) Calculate an estimate of the mean.

Answer(a)(i) .... grams [4]

(ii) Complete this histogram to show the information in the table.

Mass (grams)

[3]

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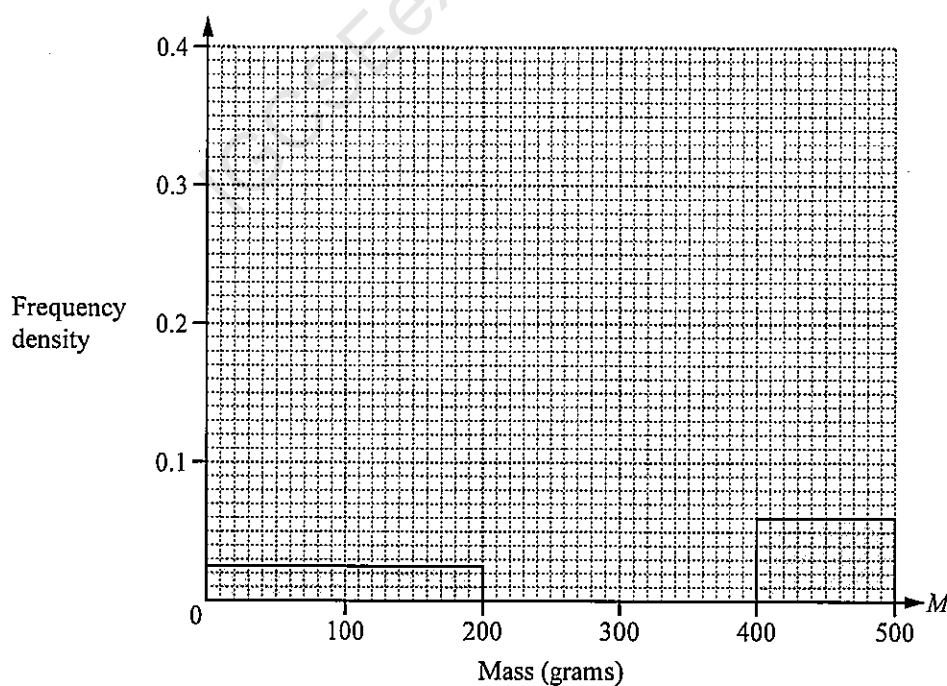
(b) A group of 50 adults also estimated the mass, M grams, of the sweets in the jar.
The histogram below shows information about their estimates.

Use the histograms to make two comparisons between the distributions of the estimates of the students and the adults.

Answer(b)

1 ....

....

2 ....

.... [2]

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39   Gareth has 8 sweets in a bag.
       4 sweets are orange flavoured, 3 are lemon flavoured and 1 is strawberry flavoured.

   (a)   He chooses two of the sweets at random.

       Find the probability that the two sweets have different flavours.

Answer(a) .... [4]

   (b)   Gareth now chooses a third sweet.

       Find the probability that **none** of the three sweets is lemon flavoured.

Answer(b) .... [2]

0580/43/M/J/15

40 The table shows the times, t minutes, taken by 200 students to complete an IGCSE paper.

Time (t minutes)	$40 < t \leqslant 60$	$60 < t \leqslant 70$	$70 < t \leqslant 75$	$75 < t \leqslant 90$
Frequency	10	50	80	60

(a) By using mid-interval values, calculate an estimate of the mean time.

Answer(a) .... min [3]

(b) On the grid, draw a histogram to show the information in the table.
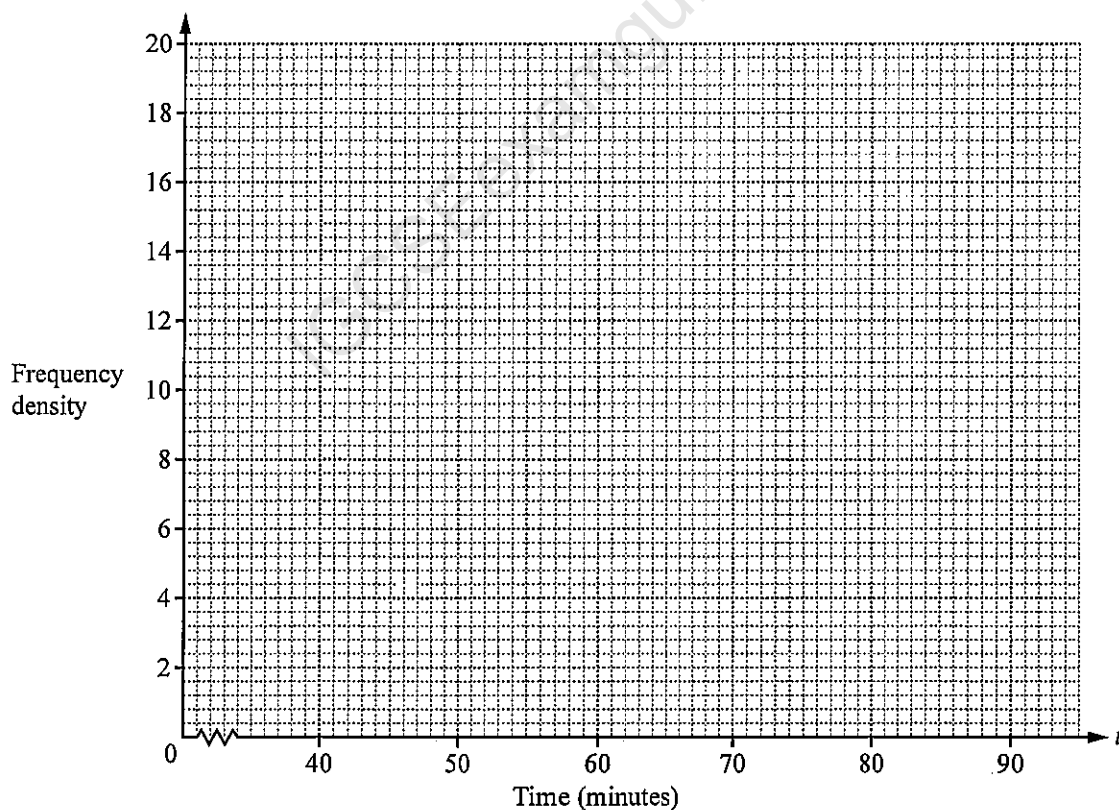
[4]

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41

(a) One of these 7 cards is chosen at random.

Write down the probability that the card

(i) shows the letter *A*,

Answer(a)(i) .... [1]

(ii) shows the letter *A* or *B*,

Answer(a)(ii) .... [1]

(iii) does not show the letter *B*.

Answer(a)(iii) .... [1]

(b) Two of the cards are chosen at random, without replacement.

Find the probability that

(i) both show the letter *A*,

Answer(b)(i) .... [2]

(ii) the two letters are different.

Answer(b)(ii) .... [3]

(c) Three of the cards are chosen at random, without replacement.

Find the probability that the cards do not show the letter *C*.

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1

$$f(x) = 3x + 5 \qquad g(x) = 7 - 2x \qquad h(x) = x^2 - 8$$

(a) Find

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    (i) $f(3)$,

Answer(a)(i) .... [1]

    (ii) $g(x - 3)$ in terms of x in its simplest form,

Answer(a)(ii) .... [2]

    (iii) $h(5x)$ in terms of x in its simplest form.

Answer(a)(iii) .... [1]

(b) Find the inverse function $g^{-1}(x)$.

Answer(b) $g^{-1}(x) =$ .... [2]

(c) Find $hf(x)$ in the form $ax^2 + bx + c$.

Answer(c) $hf(x) =$ .... [3]

(d) Solve the equation $ff(x) = 83$.

Answer(d) $x =$ .... [3]

(e) Solve the inequality $2f(x) < g(x)$.

Answer(e) .... [3]

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2 $f(x) = 1 - 2x$ $g(x) = \dfrac{1}{x}, \ x \neq 0$ $h(x) = x^3 + 1$ May June 2012 Code 43

(a) Find the value of

    (i) gf(2),

                                            Answer(a)(i)   ....   [2]

    (ii) h(−2).

                                            Answer(a)(ii)   ....   [1]

(b) Find fg(x).
    Write your answer as a single fraction.

                                            Answer(b) fg(x) = ...   [2]

(c) Find $h^{-1}(x)$, the inverse of h(x).

                                            Answer(c) $h^{-1}(x)$ = ...   [2]

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(d) Write down which of these sketches shows the graph of each of $y = f(x)$, $y = g(x)$ and $y = h(x)$.

Graph A

Graph B

Graph C

Graph D
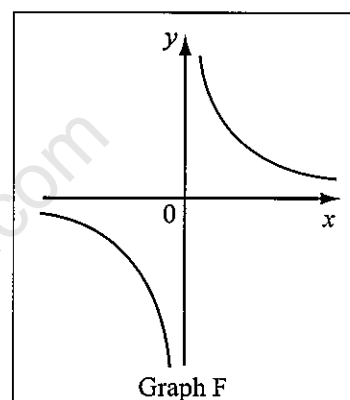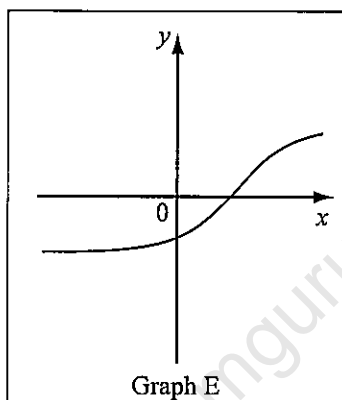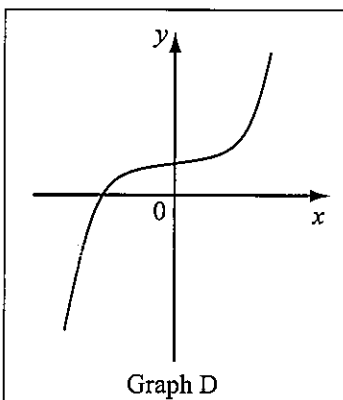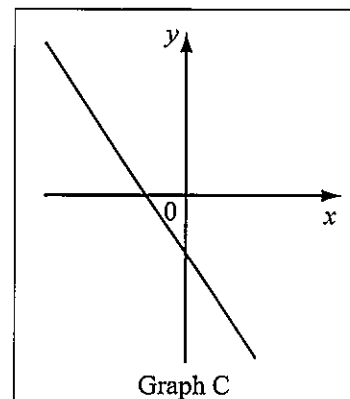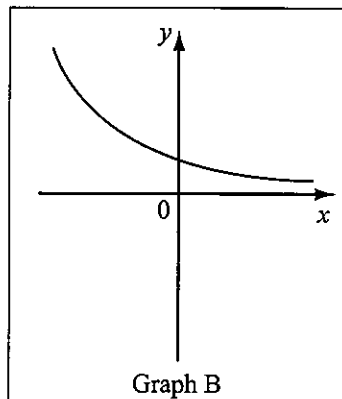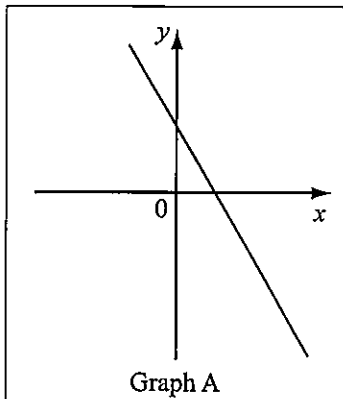
Graph E

Graph F

Answer(d) $y = f(x)$ Graph   ....

$y = g(x)$ Graph   ....

$y = h(x)$ Graph   ....   [3]

(e) $k(x) = x^5 - 3$

Solve the equation $k^{-1}(x) = 2$.

Answer(e) $x =$ ....   [2]

3 $f(x) = x^2 + x - 3$ $g(x) = 2x + 7$ $h(x) = 2^x$ May June 2013 Code 41

(a) Solve the equation $f(x) = 0$.

Show all your working and give your answers correct to 2 decimal places.

Answer(a) $x =$ .... or $x =$ .... [4]

(b) $fg(x) = px^2 + qx + r$

Find the values of p, q and r.

Answer(b) $p =$ ....

$q =$ ....

$r =$ .... [3]

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(c) Find $g^{-1}(x)$.

Answer(c) $g^{-1}(x) =$ .... [2]

(d) Find x when $h(x) = 0.25$.

Answer(d) $x =$ .... [1]

(e) Find hhh(3).
Give your answer in standard form, correct to 4 significant figures.

Answer(e) .... [4]

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4 $f(x) = 4x + 3$ $g(x) = \dfrac{7}{x+1}$ $(x \neq -1)$ $h(x) = x^2 + 5x$

(a) Work out

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    (i) $h(-3)$,

Answer(a)(i) .... [1]

    (ii) $hg(13)$.

Answer(a)(ii) .... [2]

(b) Find $f^{-1}(x)$.

Answer(b) $f^{-1}(x) =$ .... [2]

(c) (i) Solve the equation $f(x) = 23$.

Answer(c)(i) $x =$ .... [2]

(ii) Solve the equation $h(x) = 7$.

Show all your working and give your answers correct to 2 decimal places.

Answer(c)(ii) $x =$ .... or $x =$ .... [5]

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5   **(a)** $f(x) = 2x - 3$ $g(x) = \dfrac{1}{x+1} + 2$ $h(x) = 3^x$

     (i)   Work out f(4).

<div align="right">May June 2014 Code 41</div>

<div align="right">Answer(a)(i) .... [1]</div>

     (ii)   Work out fh(−1).

<div align="right">Answer(a)(ii) .... [2]</div>

     (iii)   Find $f^{-1}(x)$, the inverse of f(x).

<div align="right">Answer(a)(iii) $f^{-1}(x) =$ .... [2]</div>

     (iv)   Find ff(x) in its simplest form.

<div align="right">Answer(a)(iv) ff(x) = ... [2]</div>

(v) Show that the equation $f(x) = g(x)$ simplifies to $2x^2 - 3x - 6 = 0$.

Answer(a)(v)

[3]

(vi) Solve the equation $2x^2 - 3x - 6 = 0$.

Give your answers correct to 2 decimal places.
Show all your working.

Answer(a)(vi) $x =$ .... or $x =$ .... [4]

(b) Simplify $\dfrac{x^2 - 3x + 2}{x^2 + 3x - 10}$.

Answer(b) .... [4]

6 $f(x) = \dfrac{1}{x}$, $x \neq 0$ $g(x) = 1 - x$ $h(x) = x^2 + 1$

(a) Find $fg\left(\dfrac{1}{2}\right)$.

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Answer(a) .... [2]

(b) Find $g^{-1}(x)$, the inverse of $g(x)$.

Answer(b) $g^{-1}(x) =$ .... [1]

(c) Find $hg(x)$, giving your answer in its simplest form.

Answer(c) $hg(x) =$ .... [3]

(d) Find the value of x when $g(x) = 7$.

Answer(d) $x =$ .... [1]

(e) Solve the equation $h(x) = 3x$.
Show your working and give your answers correct to 2 decimal places.

Answer(e) $x =$ .... or $x =$ .... [4]

(f) A function $k(x)$ is its own inverse when $k^{-1}(x) = k(x)$.

For which of the functions $f(x)$, $g(x)$ and $h(x)$ is this true?

Answer(f) .... [1]

7 $f(x) = 4 - 3x$ $g(x) = 3^{-x}$ May June 2014 Code 43

(a) Find f(2x) in terms of x.

Answer(a) f(2x) = ... [1]

(b) Find ff(x) in its simplest form.

Answer(b) ff(x) = ... [2]

(c) Work out gg(–1).
Give your answer as a fraction.

Answer(c) .... [3]

(d) Find $f^{-1}(x)$, the inverse of f(x).

Answer(d) $f^{-1}(x)$ = ... [2]

(e) Solve the equation gf(x) = 1.

Answer(e) x = ... [3]

8 $f(x) = 5x - 2$ $g(x) = \dfrac{7}{x-3}$, $x \neq 3$ $h(x) = 2x^2 + 7x$

(a) Work out

     (i) $f(2)$,   Oct Nov 2014 Code 42

Answer(a)(i) .... [1]

     (ii) $hg(17)$.

Answer(a)(ii) .... [2]

(b) Solve $g(x) = x + 3$.

Answer(b) $x =$ .... or $x =$ .... [3]

(c) Solve $h(x) = 11$, showing all your working and giving your answers correct to 2 decimal places.

Answer(c) x = ... or *x =* .... [5]

(d) Find $f^{-1}(x)$.

Answer(d) $f^{-1}(x) =$ .... [2]

(e) Solve $g^{-1}(x) = -0.5$.

Answer(e) x = ... [1]

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9 $f(x) = 2x - 1$ $g(x) = x^2 + x$ $h(x) = \dfrac{2}{x}$, $x \neq 0$

(a)   Find ff(3).

                                                                    May June 2015 Code 43

Answer(a) .... [2]

(b)   Find gf(x), giving your answer in its simplest form.

Answer(b) .... [3]

(c)   Find $f^{-1}(x)$.

Answer(c) $f^{-1}(x) =$ .... [2]

(d)   Find $h(x) + h(x + 2)$, giving your answer as a single fraction.

Answer(d) .... [4]

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10 $f(x) = 2x - 1$ $g(x) = x^2 + x$ $h(x) = \dfrac{2}{x}$, $x \neq 0$

(a) Find ff(3).

Answer(a) .... [2]

(b) Find gf(x), giving your answer in its simplest form.

Answer(b) .... [3]

(c) Find $f^{-1}(x)$.

Answer(c) $f^{-1}(x) = $ .... [2]

(d) Find $h(x) + h(x + 2)$, giving your answer as a single fraction.

Answer(d) .... [4]

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1   Pablo plants x lemon trees and y orange trees.

   (a)   **(i)**   He plants at least 4 lemon trees.

        Write down an inequality in x to show this information.

                             Answer(a)(i)   ....   [1]

      (ii)   Pablo plants at least 9 orange trees.

        Write down an inequality in y to show this information.

                             Answer(a)(ii)   ....   [1]

     (iii)   The greatest possible number of trees he can plant is 20.

        Write down an inequality in x and y to show this information.

                             Answer(a)(iii)   ....   [1]

   (b)   Lemon trees cost \$5 each and orange trees cost \$10 each.

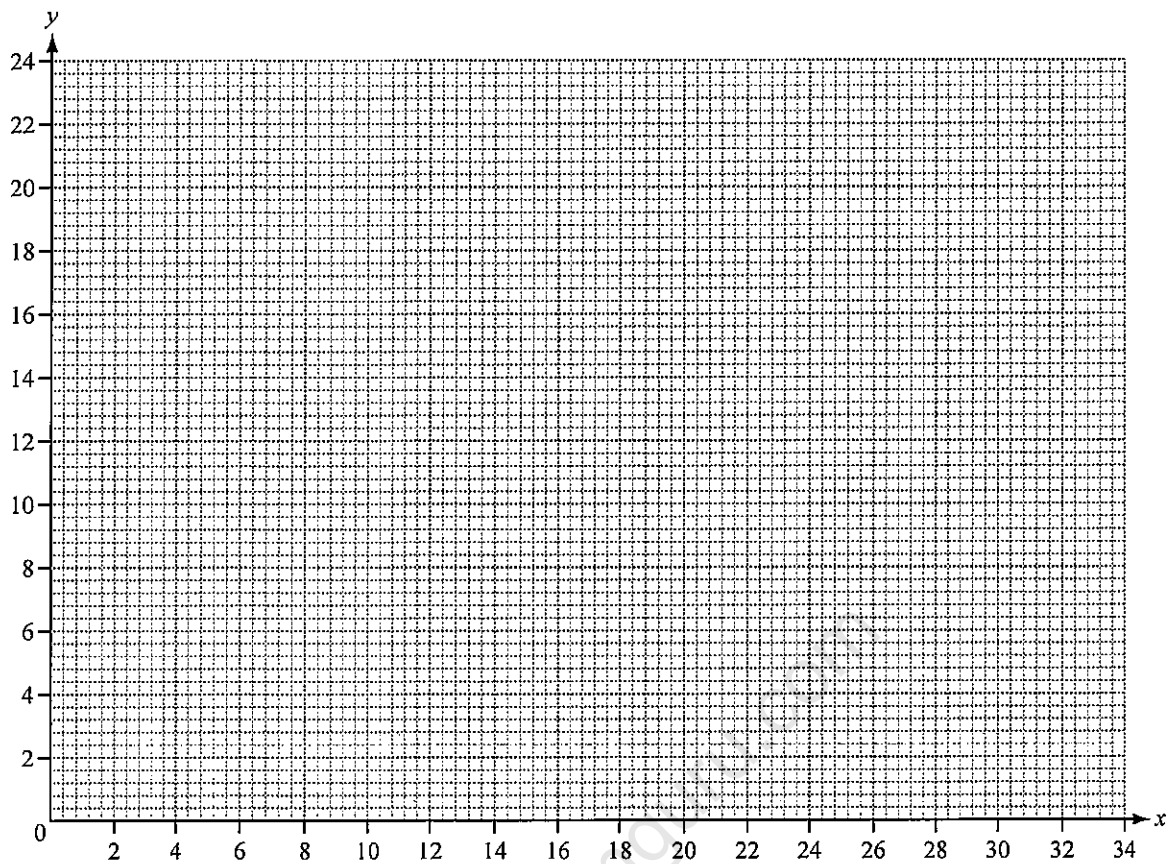   The maximum Pablo can spend is \$170.

      Write down an inequality in x and y and show that it simplifies to $x + 2y \leqslant 34$.

      Answer (b)

                                              [1]

   (c)   **(i)**   On the grid opposite, draw four lines to show the four inequalities and shade the **unwanted** region.

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[7]

(ii) Calculate the smallest cost when Pablo buys a total of 20 trees.

Answer(c)(ii) $ .... [2]

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2   Jay makes wooden boxes in two sizes. He makes x small boxes and y large boxes.
     He makes at least 5 **small** boxes.
     The greatest number of **large** boxes he can make is 8.
     The greatest total number of boxes is 14.
     The number of **large** boxes is at least half the number of **small** boxes.

(a) (i) Write down four inequalities in x and y to show this information.

Answer(a)(i)   ....

....
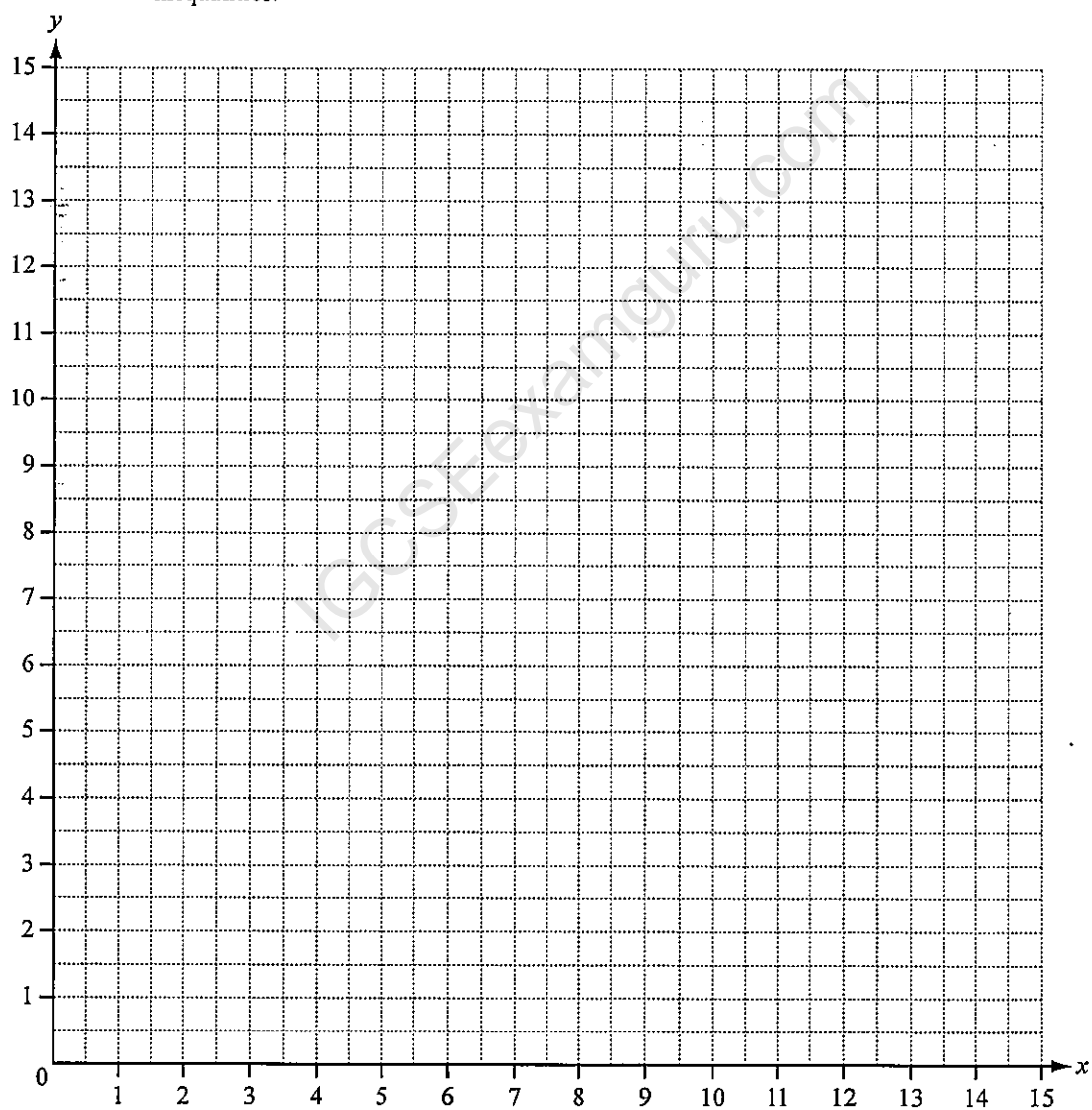
....

....   [4]

(ii) Draw four lines on the grid and write the letter R in the region which represents these inequalities.

[5]

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(b) The price of the small box is $20 and the price of the large box is $45.

    (i) What is the greatest amount of money he receives when he sells all the boxes he has made?

Answer(b)(i) $ .... [2]

    (ii) For this amount of money, how many boxes of each size did he make?

Answer(b)(ii) .... small boxes and .... large boxes [1]

3   **(a)**   Luk wants to buy x goats and y sheep.   May June 2013 Code 43

       (i)   He wants to buy at least 5 goats.

          Write down an inequality in x to represent this condition.

                                  Answer(a)(i) .... [1]

       (ii)   He wants to buy at least 11 sheep.

          Write down an inequality in y to represent this condition.

                                  Answer(a)(ii) .... [1]

       (iii)   He wants to buy at least 20 animals.

          Write down an inequality in x and y to represent this condition.

                                  Answer(a)(iii) .... [1]
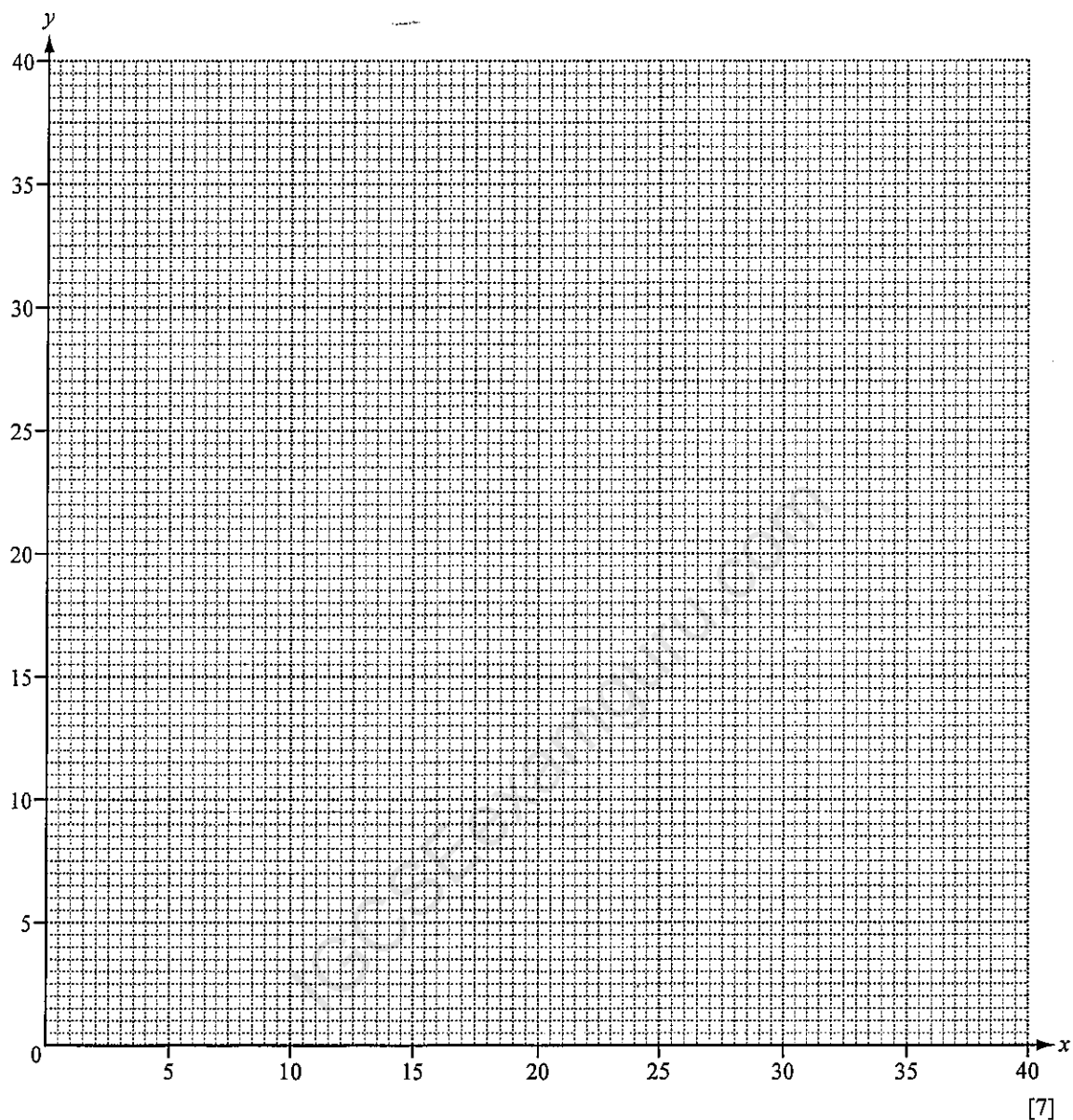
   (b)   Goats cost \$4 and sheep cost \$8.
The maximum Luk can spend is \$160.

       Write down an inequality in x and y and show that it simplifies to $x + 2y \leqslant 40$.

       Answer(b)

                                                   [1]

(c) **(i)** On the grid below, draw four lines to show the four inequalities and shade the **unwanted** regions.
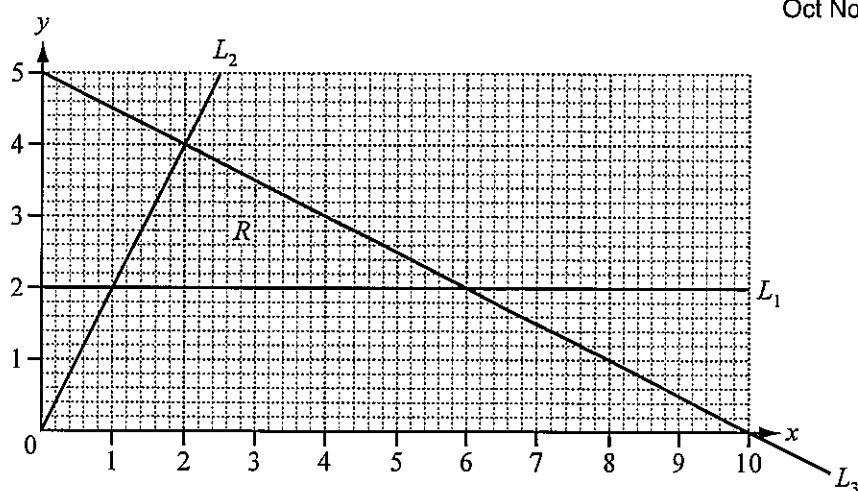

[7]

(ii) Work out the maximum number of animals that Luk can buy.

Answer(c)(ii) .... [2]

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4

(a) Find the equations of the lines L_1, L_2 and L_3.

Answer(a) L_1 ....

L_2 ....

L_3 .... [5]

(b) Write down the three inequalities that define the shaded region, R.

Answer(b) ....

....

.... [3]

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(c) A gardener buys x bushes and y trees.
The cost of a bush is $30 and the cost of a tree is $200.
The shaded region R shows the only possible numbers of bushes and trees the gardener can buy.

(i) Find the number of bushes and the number of trees when the total cost is $720.

Answer(c)(i) .... bushes

.... trees [2]

(ii) Find the number of bushes and the number of trees which give the greatest possible total cost.
Write down this greatest possible total cost.

Answer(c)(ii) .... bushes

.... trees

Greatest possible total cost = $ .... [3]

5   Sima sells x biscuits and y cakes.

May June 2015 Code 42

     (a)   **(i)**   She sells at least 100 biscuits.

             Write down an inequality in x.

Answer(a)(i) .... [1]

        (ii)   She sells at least 120 cakes.

             Write down an inequality in y.

Answer(a)(ii) .... [1]

       (iii)   She sells a maximum of 300 biscuits and cakes altogether.

             Write down an inequality in x and y.

Answer(a)(iii) .... [1]
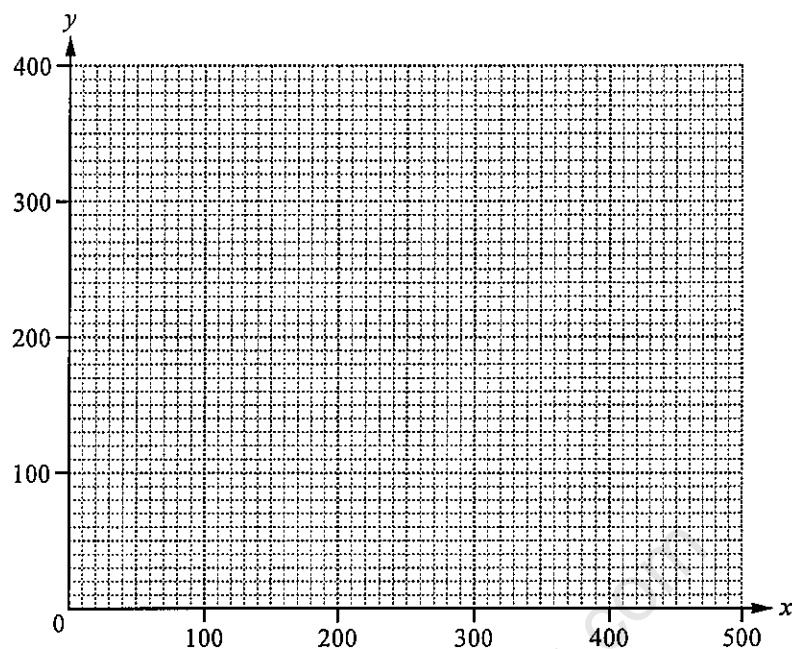
       (iv)   Sima makes a profit of 40 cents on each biscuit and 80 cents on each cake.
             Her total profit is at least \$160.

             Show that $x + 2y \geqslant 400$.

Answer(a)(iv)

[1]

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(b) On the grid, draw four lines to show the four inequalities and shade the unwanted regions.

[6]

(c) Calculate Sima's maximum profit.
Give your answer in dollars.

Answer(c) $ .... [2]

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0580/42/M/J/15

6   Sima sells x biscuits and y cakes.

     (a)   **(i)**   She sells at least 100 biscuits.

                 Write down an inequality in x.

                                              Answer(a)(i) .... [1]

        (ii)   She sells at least 120 cakes.

                 Write down an inequality in y.

                                              Answer(a)(ii) .... [1]

        (iii)   She sells a maximum of 300 biscuits and cakes altogether.

                  Write down an inequality in x and y.

                                              Answer(a)(iii) .... [1]

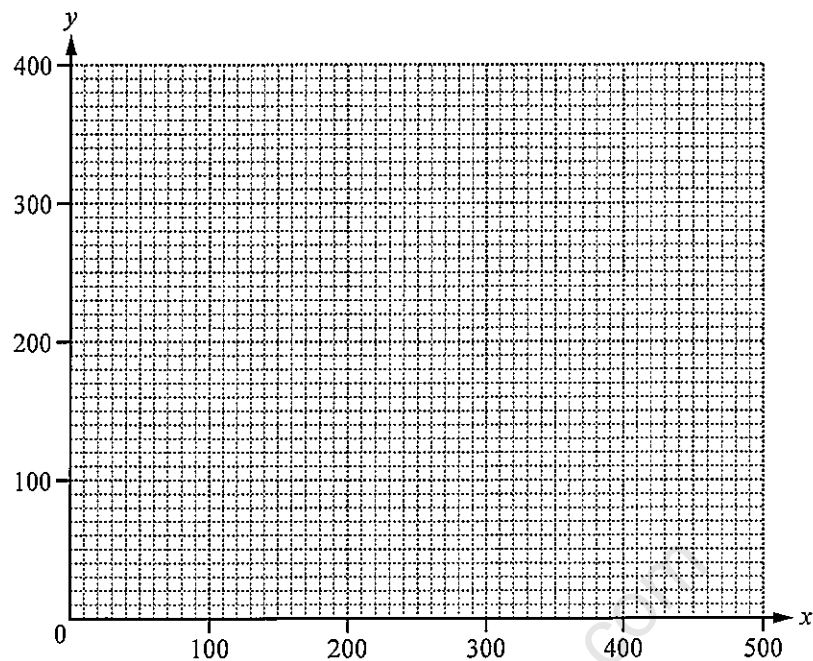   **(iv)**   Sima makes a profit of 40 cents on each biscuit and 80 cents on each cake. Her total profit is at least \$160.

                  Show that $x + 2y \geqslant 400$.

                  Answer(a)(iv)

                                                                                     [1]

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(b) On the grid, draw four lines to show the four inequalities and shade the unwanted regions.

[6]

(c) Calculate Sima's maximum profit.
Give your answer in dollars.

Answer(c) $ .... [2]
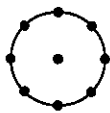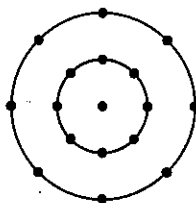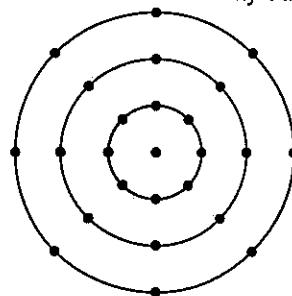
1

Diagram 1　　　　　　　Diagram 2　　　　　　　Diagram 3

The diagrams show a sequence of dots and circles.
Each diagram has one dot at the centre and 8 dots on each circle.
The radius of the first circle is 1 unit.
The radius of each new circle is 1 unit greater than the radius of the previous circle.

(a) Complete the table for diagrams 4 and 5.

Diagram	1	2	3	4	5
Number of dots	9	17	25		
Area of the largest circle	π	4π	9π		
Total length of the circumferences of the circles	2π	6π	12π		

[4]

(b) (i) Write down, in terms of n, the number of dots in diagram n.

Answer(b)(i) .... [2]

(ii) Find n, when the number of dots in diagram n is 1097.

Answer(b)(ii) $n =$ .... [2]

(c) Write down, in terms of n and π, the area of the largest circle in

(i) diagram n,

Answer(c)(i) .... [1]

(ii) diagram $3n$.

Answer(c)(ii) .... [1]

(d) Find, in terms of n and π, the total length of the circumferences of the circles in diagram n.

Answer(d) .... [2]

2   Consecutive integers are set out in rows in a grid.   Oct Nov 2012 Code 42

(a) This grid has 5 columns.

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35

a		b
	n	
c		d

The shape drawn encloses five numbers 7, 9, 13, 17 and 19. This is the $n = 13$ shape.

In this shape, $a = 7$, $b = 9$, $c = 17$ and $d = 19$.

(i) Calculate $bc - ad$ for the $n = 13$ shape.

Answer(a)(i) .... [1]

(ii) For the 5 column grid, $a = n - 6$.

Write down b, c and d in terms of n for this grid.

Answer(a)(ii) $b =$ ....

$c =$ ....

$d =$ .... [2]

(iii) Write down $bc - ad$ in terms of n.
Show clearly that it simplifies to 20.

Answer(a)(iii)

[2]

(b) This grid has 6 columns. The shape is drawn for $n = 10$.

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

a		b
	n	
c		d

(i) Calculate the value of $bc - ad$ for $n = 10$.

Answer(b)(i) .... [1]

(ii) Without simplifying, write down $bc - ad$ in terms of n for this grid.

Answer(b)(ii) .... [2]

(c) This grid has 7 columns.

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35

a		b
	n	
c		d

Show clearly that $bc - ad = 28$ for $n = 17$.

Answer(c)

[1]

3   **(a)** Complete the table for the 6th term and the nth term in each sequence.

	Sequence	6th term		nth term
A	11, 9, 7, 5, 3			
B	1, 4, 9, 16, 25			
C	2, 6, 12, 20, 30			
D	3, 9, 27, 81, 243			
E	1, 3, 15, 61, 213			

[12]

Oct Nov 2012 Code 43

(b) Find the value of the 100th term in

    (i) Sequence A,

Answer(b)(i) .... [1]

    (ii) Sequence C.

Answer(b)(ii) .... [1]

(c) Find the value of n in Sequence D when the nth term is equal to 6561.

Answer(c) n = ... [1]

(d) Find the value of the 10th term in Sequence E.

Answer(d) .... [1]

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4
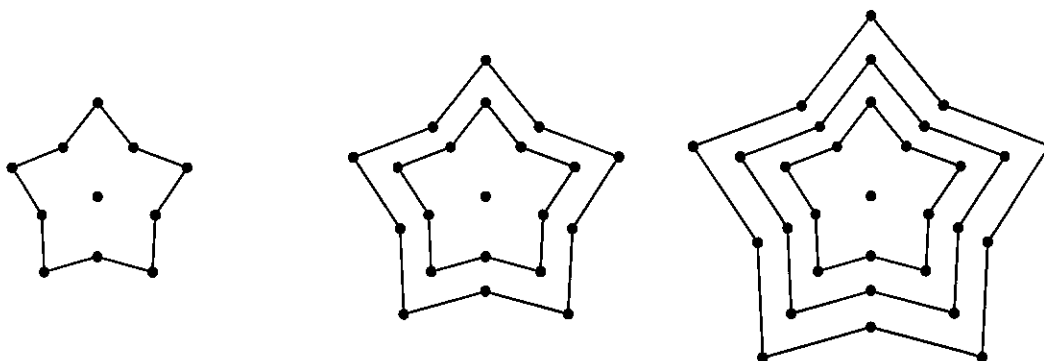
Star 1   Star 2   Star 3

The diagrams show a sequence of stars made of lines and dots.   May June 2013 Code 41

(a) Complete the table for Star 5, Star 7 and Star n.

	Star 1	Star 2	Star 3	Star 4	Star 5	Star 7	Star n
Number of lines	10	20	30	40			
Number of dots	11	21	31	41			

[4]

(b) The sums of the number of dots in two consecutive stars are shown in the table.

Star 1 and Star 2	Star 2 and Star 3	Star 3 and Star 4
32	52	72

Find the sum of the number of dots in

(i) Star 10 and Star 11,

Answer(b)(i) .... [1]

(ii) Star n and Star $(n + 1)$,

Answer(b)(ii) .... [1]

(iii) Star $(n + 7)$ and Star $(n + 8)$.

Answer(b)(iii) .... [1]

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(c) The **total number of dots** in the rst n stars is given by the expression $5n^2 + 6n$.

    (i) Show that this expression is correct when $n = 3$.

       Answer(c)(i)

                                                                                                       [2]

    (ii) Find the total number of dots in the rst 10 stars.

                                         Answer(c)(ii) .... [1]

(d) The total number of dots in the rst n stars is $5n^2 + 6n$.
    The number of dots in the $(n + 1)$th star is $10(n + 1) + 1$.

    Add these two expressions to show that the total number of dots in the rst $(n + 1)$ stars is

$$5(n + 1)^2 + 6(n + 1) .$$

    You must show each step of your working.

    Answer(d)

                                                                                                                                                                   [4]

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5   **(a)**

$$1 = 1$$
$$1 + 2 = 3$$
$$1 + 2 + 3 = 6$$
$$1 + 2 + 3 + 4 = 10$$

Oct Nov 2013 Code 41

   (i) Write down the next line of this pattern.

Answer(a)(i) .... [1]

   (ii) The sum of the first n integers is $\dfrac{n}{k}(n + 1)$.

Show that $k = 2$.

Answer(a)(ii)

[2]

   (iii) Find the sum of the first 60 integers.

Answer(a)(iii) .... [1]

   (iv) Find n when the sum of the first n integers is 465.

Answer(a)(iv) $n =$ .... [2]

   (v) $1 + 2 + 3 + 4 + \ldots + x = \dfrac{(n - 8)(n - 7)}{2}$

Write x in terms of n.

Answer(a)(v) $x =$ .... [1]

(b)

$$1^3 = 1$$

$$1^3 + 2^3 = 9$$

$$1^3 + 2^3 + 3^3 = 36$$

$$1^3 + 2^3 + 3^3 + 4^3 = 100$$

(i) Complete the statement.

$1^3 + 2^3 + 3^3 + 4^3 + 5^3 = $ .... $= ($ ....$)^2$ [2]

(ii) The sum of the first n integers is $\dfrac{n}{2}(n + 1)$.

Find an expression, in terms of n, for the sum of the first n cubes.

Answer(b)(ii) .... [1]

(iii) Find the sum of the first 19 cubes.

Answer(b)(iii) .... [2]

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6   Complete the table for the following sequences.
The first row has been completed for you.   Oct Nov 2013 Code 42

	Sequence				Next two terms	nth term	
	1	5	9	13	17 21	$4n - 3$	
(a)	12	21	30	39			[3]
(b)	80	74	68	62			[3]
(c)	1	8	27	64			[2]
(d)	2	10	30	68			[2]

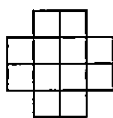7   The rst four diagrams in a sequence are shown below.   Oct Nov 2013 Code 43
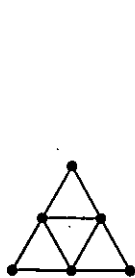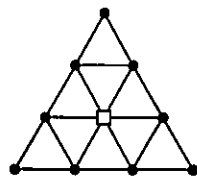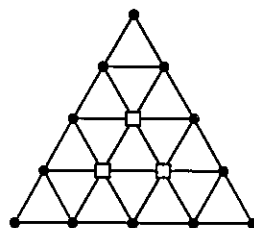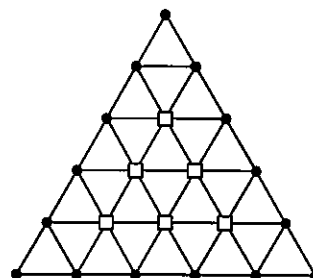
Diagram 1   Diagram 2   Diagram 3   Diagram 4

The diagrams are made from dots (•) and squares (□) joined by lines.

(a) Complete the table.

Diagram	1	2	3	4	5		n
Number of dots	6	9	12				
Number of squares	0	1	3				$\frac{1}{2}n(n-1)$
Number of triangles	4	9	16				
Number of lines	9	18	30	45	63		$\frac{3}{2}(n+1)(n+2)$

[9]

(b) Which diagram has 360 lines?

Answer(b) .... [2]

8
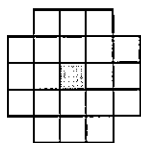
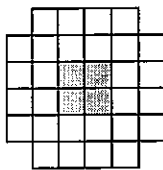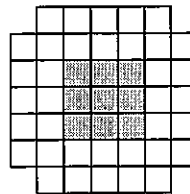Diagram 1   Diagram 2   Diagram 3   Diagram 4

The first four diagrams in a sequence are shown above.
The diagrams are drawn using white squares ☐ and grey squares ▦.   Oct Nov 2014 Code 41

(a) Complete the columns in the table for Diagram 4 and Diagram n.

Diagram	1	2	3	4		n
Number of white squares	12	20	28			
Number of grey squares	0	1	4			
Total number of squares	12	21	32			$(n+1)(n+5)$

[6]

(b) Work out the number of the diagram which has a total of 480 squares.

Answer(b) .... [2]

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(c) The **total** number of squares in the first n **diagrams** is

$$\frac{1}{3}n^3 + pn^2 + qn.$$

(i) Use $n = 1$ in this expression to show that $p + q = 11\frac{2}{3}$.

Answer(c)(i)

[1]

(ii) Use $n = 2$ in the expression to show that $4p + 2q = 30\frac{1}{3}$.

Answer(c)(ii)

[2]

(iii) Find the values of p and q.

Answer(c)(iii) $p =$ ....

$q =$ .... [3]

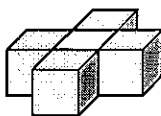More Notes and Topical Past Papers at https://IGCSEexamguru.com
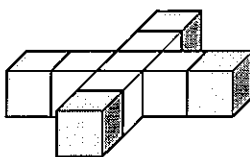
9

Layer 1

Oct Nov 2014 Code 42

Layer 2

Layer 3

The diagrams show layers of white and grey cubes.
Khadega places these layers on top of each other to make a tower.

(a) Complete the table for towers with 5 and 6 layers.

Number of layers	1	2	3	4	5	6
Total number of **white** cubes	0	1	6	15		
Total number of **grey** cubes	1	5	9	13		
Total number of cubes	1	6	15	28		

[4]

(b) (i) Find, in terms of n, the **total** number of **grey** cubes in a tower with n layers.

Answer(b)(i) .... [2]

(ii) Find the total number of grey cubes in a tower with 60 layers.

Answer(b)(ii) .... [1]

(iii) Khadega has plenty of white cubes but only 200 grey cubes.
How many layers are there in the highest tower that she can build?

Answer(b)(iii) .... [2]

(c) The expression for the **total** number of white cubes in a tower with n layers is $pn^2 + qn + 3$.

Find the value of p and the value of q.
Show all your working.

Answer(c) p = ...

q = ... [5]

(d) Find an expression, in terms of n, for the **total** number of cubes in a tower with n layers.
Give your answer in its simplest form.

Answer(d) .... [2]

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10 The first four terms of sequences A, B, C and D are shown in the table.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	$\frac{1}{3}$	$\frac{2}{4}$	$\frac{3}{5}$	$\frac{4}{6}$			
B	3	4	5	6			
C	−1	0	1	2			
D	−3	0	5	12			

(a) Complete the table.

[8]

(b) Which term in sequence A is equal to $\frac{36}{37}$?

Answer(b) .... [2]

(c) Which term in sequence D is equal to 725?

Answer(c) .... [2]

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0580/43/M/J/15

11 The first four terms of sequences A, B, C and D are shown in the table.

Sequence	1st term	2nd term	3rd term	4th term	5th term		nth term
A	$\frac{1}{3}$	$\frac{2}{4}$	$\frac{3}{5}$	$\frac{4}{6}$			
B	3	4	5	6			
C	-1	0	1	2			
D	-3	0	5	12			

(a) Complete the table.

[8]

(b) Which term in sequence A is equal to $\frac{36}{37}$?

Answer(b) .... [2]

(c) Which term in sequence D is equal to 725?

Answer(c) .... [2]

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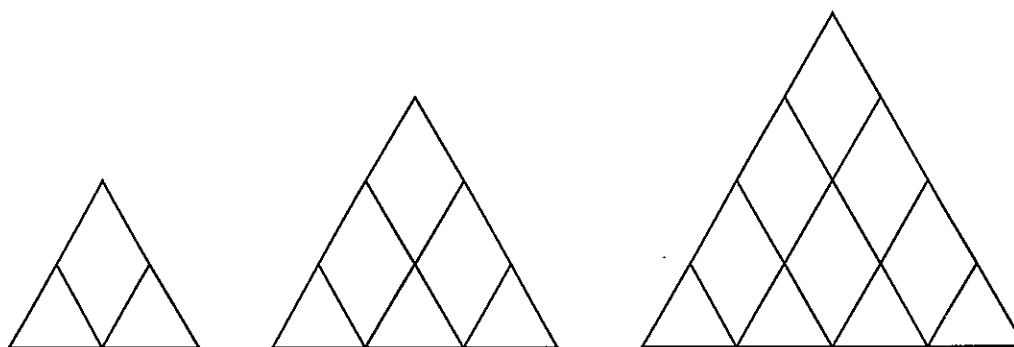
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12

Diagram 1   Diagram 2   Diagram 3

Each diagram is made from tiles in the shape of equilateral triangles and rhombuses.
The length of a side of each tile is 1 unit.

(a) Complete the table below for this sequence of diagrams.

Diagram	1	2	3	4	5
Number of equilateral triangle shaped tiles	2	3	4	5	6
Number of rhombus shaped tiles	1	3	6		
Total number of tiles	3	6	10		
Number of 1 unit lengths	8	15	24		

[6]

(b) (i) The number of 1 unit lengths in Diagram n is $n^2 + 4n + p$.

Find the value of p.

$p =$ .... [2]

(ii) Calculate the number of 1 unit lengths in Diagram 10.

.... [1]

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UPPER AND LOWER BOUND (2018)

1.

(a) In 2017, the membership fee for a sports club was $79.50 .
This was an increase of 6% on the fee in 2016.

Calculate the fee in 2016.

$ .... [3]

(b) On one day, the number of members using the exercise machines was 40, correct to the nearest 10.
Each member used a machine for 30 minutes, correct to the nearest 5 minutes.

Calculate the lower bound for the number of minutes the exercise machines were used on this day.

.... min [2]

(c) On another day, the number of members using the exercise machines (E), the swimming pool (S) and the tennis courts (T) is shown on the Venn diagram.
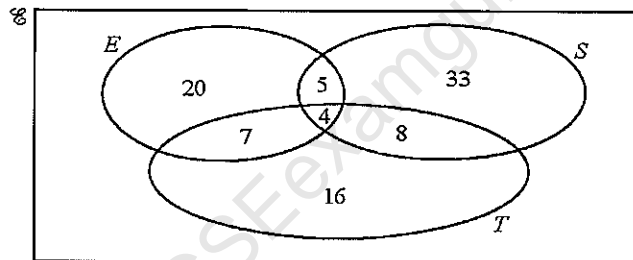
(i) Find the number of members using only the tennis courts.

.... [1]

(ii) Find the number of members using the swimming pool.

.... [1]

(iii) A member using the swimming pool is chosen at random.

Find the probability that this member also uses the tennis courts and the exercise machines.

.... [2]

(iv) Find $n(T \cap (E \cup S))$.

.... [1]

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RATIO AND PROPORTION (2018)

1.

Adele, Barbara and Collette share $680 in the ratio $9 : 7 : 4$.

(a) Show that Adele receives $306.

[1]

(b) Calculate the amount that Barbara and Collette each receives.

Barbara $ ....

Collette $ .... [3]

(c) Adele changes her $306 into euros (€) when the exchange rate is €1 = $1.125 .

Calculate the number of euros she receives.

€ .... [2]

(d) Barbara spends a total of $17.56 on 5 kg of apples and 3 kg of bananas.
Apples cost $2.69 per kilogram.

Calculate the cost per kilogram of bananas.

$ .... [3]

(e) Collette spends half of her share on clothes and $\frac{1}{5}$ of her share on books.

Calculate the amount she has left.

$ .... [3]

PERCENTAGES (2018)

1.

(a) Here is a list of ingredients to make 20 biscuits.

> 260g of butter
> 500g of sugar
> 650g of flour
> 425g of rice

(i) Find the mass of rice as a percentage of the mass of sugar.

.... % [1]

(ii) Find the mass of butter needed to make 35 of these biscuits.

.... g [2]

(iii) Michel has 2 kg of each ingredient.

Work out the greatest number of these biscuits that he can make.

.... [3]

(b) A company makes these biscuits at a cost of $1.35 per packet.
These biscuits are sold for $1.89 per packet.

(i) Calculate the percentage profit the company makes on each packet.

.... % [3]

(ii) The selling price of $1.89 has increased by 8% from last year.

Calculate the selling price last year.

$ .... [3]

(c) Over a period of 3 years, the company's sales of biscuits increased from 15.6 million packets to 20.8 million packets.
The sales increased exponentially by the same percentage each year.

Calculate the percentage increase each year.

.... % [3]

(d) The people who work for the company are in the following age groups.

Group A	Group B	Group C
Under 30 years	30 to 50 years	Over 50 years

The ratio of the number in group A to the number in group B is   7 : 10.
The ratio of the number in group B to the number in group C is   4 : 3.

(i) Find the ratio of the number in group A to the number in group C.
Give your answer in its simplest form.

.... : .... [3]

(ii) There are 45 people in group C.

Find the total number of people who work for the company.

.... [3]

SIMPLE AND COMPOUND INTEREST (2018)

1.

(a) Rowena buys and sells clothes.

    (i) She buys a jacket for $40 and sells it for $45.40 .

    Calculate the percentage profit.

.... % [3]

    (ii) She sells a dress for $42.60 after making a profit of 20% on the cost price.

    Calculate the cost price.

$ .... [3]

(b) Sara invests $500 for 15 years at a rate of 2% per year simple interest.

Calculate the total interest Sara receives.

$ .... [2]

(c) Tomas has two cars.

   (i) The value, today, of one car is $21 000.
   The value of this car decreases exponentially by 18% each year.

   Calculate the value of this car after 5 years.
   Give your answer correct to the nearest hundred dollars.

   $ .... [3]

   (ii) The value, today, of the other car is $15 000.
   The value of this car increases exponentially by x% each year.
   After 12 years the value of the car will be $42 190.

   Calculate the value of x.

   $x =$ .... [3]

LINEAR EQUAETIONS (2018)

1.

(a) Simplify.

(i) $(3p^2)^5$

....[2]

(ii) $18x^2y^6 \div 2xy^2$

....[2]

(iii) $\left(\dfrac{5}{m}\right)^{-2}$

....[1]

(b) In this part, all measurements are in metres.

$5x - 9$

w

$3x + 7$

NOT TO
SCALE

The diagram shows a rectangle.
The area of the rectangle is $310\,\text{m}^2$.

Work out the value of w.

$w =$ ....[4]

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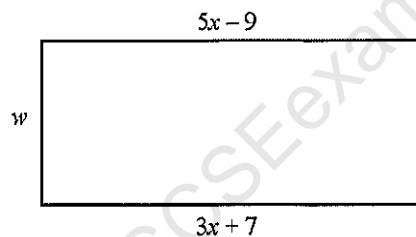
SIMULTANEOUS EQUATIONS (2018)

1.

(a) Factorise.

 (i) $2mn + m^2 - 6n - 3m$

.... [2]

 (ii) $4y^2 - 81$

.... [1]

 (iii) $t^2 - 6t + 8$

.... [2]

(b) Rearrange the formula to make x the subject.

$$k = \frac{2m - x}{x}$$

$x =$ .... [4]

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(c) Solve the simultaneous equations.
You must show all your working.

$$\tfrac{1}{2}x - 3y = 9$$
$$5x + y = 28$$

$x = $ ....

$y = $ .... [3]

(d) $\dfrac{3}{m+4} - \dfrac{4}{m} = 6$

(i) Show that this equation can be written as $6m^2 + 25m + 16 = 0$.

[3]

(ii) Solve the equation $6m^2 + 25m + 16 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$m = $ .... or $m = $ .... [4]

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FACTORISING (2018)

1.

(a) Factorise.

    (i) $2mn + m^2 - 6n - 3m$

    .... [2]

    (ii) $4y^2 - 81$

    .... [1]

    (iii) $t^2 - 6t + 8$

    .... [2]

(b) Rearrange the formula to make x the subject.

$$k = \frac{2m - x}{x}$$

$x =$ .... [4]

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(c) In a shop, the price of a monthly magazine is $\$m$ and the price of a weekly magazine is $\$(m-0.75)$.
One day, the shop receives
- $168 from selling monthly magazines
- $207 from selling weekly magazines.

The total number of these magazines sold during this day is 100.

(i) Show that $50m^2 - 225m + 63 = 0$.

[3]

(ii) Find the price of a monthly magazine.
Show all your working.

$ .... [3]

QUADRATIC EQUATIONS (2018)

1.

(a) Factorise.

(i) $2mn + m^2 - 6n - 3m$

.... [2]

(ii) $4y^2 - 81$

.... [1]

(iii) $t^2 - 6t + 8$

.... [2]

(b) Rearrange the formula to make x the subject.

$$k = \frac{2m - x}{x}$$

$x = $ .... [4]

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(c) Solve the simultaneous equations.
You must show all your working.

$$\frac{1}{2}x - 3y = 9$$
$$5x + y = 28$$

$x =$ ....

$y =$ .... [3]

(d) $\dfrac{3}{m+4} - \dfrac{4}{m} = 6$

    (i) Show that this equation can be written as $6m^2 + 25m + 16 = 0$.

[3]

    (ii) Solve the equation $6m^2 + 25m + 16 = 0$.
Show all your working and give your answers correct to 2 decimal places.

$m =$ .... or $m =$ .... [4]

INDICES (2018)

1.

(a) Simplify.

(i) $(3p^2)^5$

.... [2]

(ii) $18x^2y^6 \div 2xy^2$

.... [2]

(iii) $\left(\dfrac{5}{m}\right)^{-2}$

.... [1]

(b) In this part, all measurements are in metres.

```
            5x − 9
   ┌─────────────────────┐
 w │                     │     NOT TO
   │                     │     SCALE
   └─────────────────────┘
            3x + 7
```
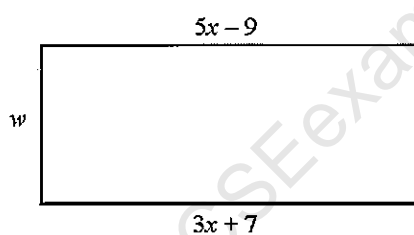
The diagram shows a rectangle.
The area of the rectangle is $310\,\text{m}^2$.

Work out the value of w.

$w =$ .... [4]

PYTHAGORAS THEOREM (2018)

1.

(a)
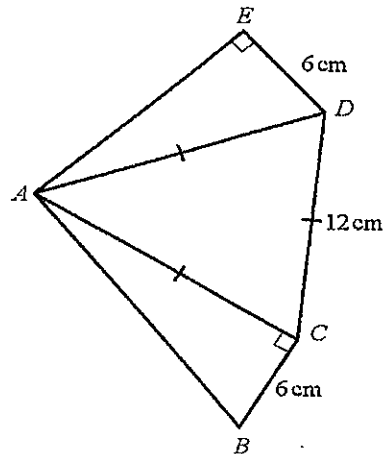
In the pentagon *ABCDE*, angle *ACB* = angle *AED* = 90°.
Triangle *ACD* is equilateral with side length 12 cm.
DE = *BC* = 6 cm.

(i) Calculate angle *BAE*.

Angle *BAE* = ... [4]

(ii) Calculate *AB*.

AB = ... cm [2]

(iii) Calculate *AE*.

AE = ... cm [3]

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(iv) Calculate the area of the pentagon.

.... cm² [4]

(b)

The diagram shows a cuboid.
$AB = 8\,cm$, $BC = 4\,cm$ and $CR = 5\,cm$.

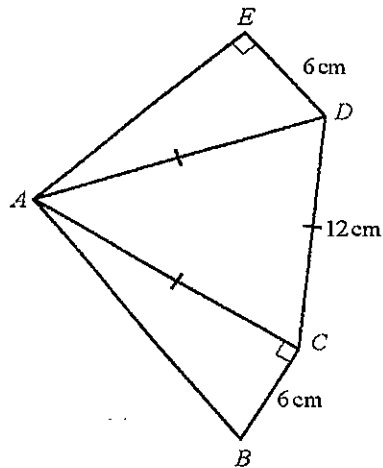(i)   Write down the number of planes of symmetry of this cuboid.

.... [1]

(ii)   Calculate the angle between the diagonal AR and the plane $BCRQ$.

.... [4]

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SYMMETRY (2018)

1.

(a)

In the pentagon $ABCDE$, angle ACB = angle AED = 90°.
Triangle ACD is equilateral with side length 12 cm.
$DE = BC = 6$ cm.

(i) Calculate angle BAE.

Angle $BAE =$ .... [4]

(ii) Calculate AB.

$AB =$ .... cm [2]

(iii) Calculate AE.

$AE =$ .... cm [3]

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(iv) Calculate the area of the pentagon.

.... cm^2 [4]

(b)

NOT TO
SCALE

The diagram shows a cuboid.
$AB = 8$ cm, $BC = 4$ cm and $CR = 5$ cm.

(i) Write down the number of planes of symmetry of this cuboid.

.... [1]

(ii) Calculate the angle between the diagonal AR and the plane $BCRQ$.

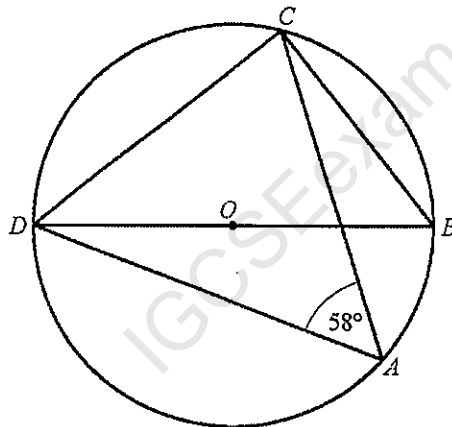.. [4]

CIRCLE THEOREM (2018)

1.

(a) The exterior angle of a regular polygon is $x°$ and the interior angle is $8x°$.

Calculate the number of sides of the polygon.

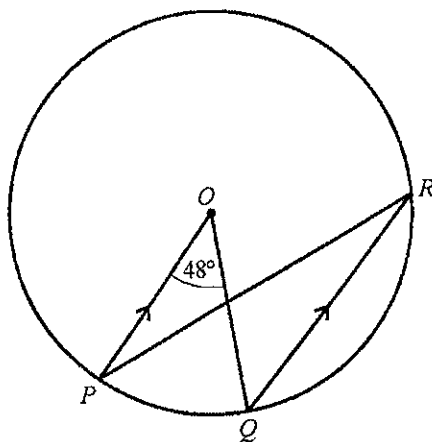.. [3]

(b)

NOT TO
SCALE

A, B, C and D are points on the circumference of the circle, centre O.
DOB is a straight line and angle $DAC = 58°$.

Find angle CDB.

Angle $CDB =$ .... [3]

(c)

NOT TO SCALE

P, *Q* and *R* are points on the circumference of the circle, centre *O*.
PO is parallel to *QR* and angle *POQ* = 48°.

(i) Find angle *OPR*.

Angle *OPR* = ... [2]

(ii) The radius of the circle is 5.4 cm.

Calculate the length of the **major** arc *PQ*.

.... cm [3]

CONSTRUCTIONS AND LOCI (2018)

1.

The scale drawing shows two boundaries, *AB* and *BC*, of a field *ABCD*.
The scale of the drawing is 1 cm represents 8 m.

Scale: 1 cm to 8 m

(a) The boundaries *CD* and *AD* of the field are each 72 m long.

    (i) Work out the length of *CD* and *AD* on the scale drawing.

        .... cm [1]

    (ii) Using a ruler and compasses only, complete accurately the scale drawing of the field.   [2]

(b) A tree in the field is

        •   equidistant from *A* and *B*

  and

        •   equidistant from *AB* and *BC*.

On the scale drawing, construct two lines to find the position of the tree.
Use a straight edge and compasses only and leave in your construction arcs.   [4]

PLOTTING CURVES (2018)

1.

(a) (i) $y = 2^x$
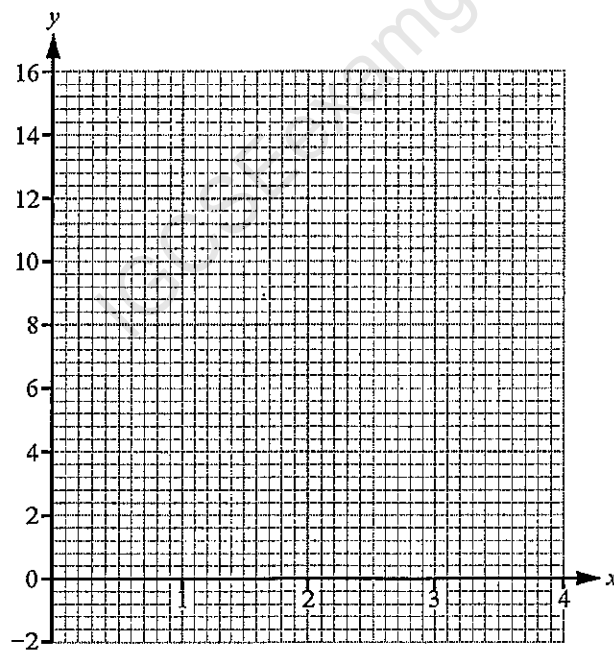
Complete the table.

x	0	1	2	3	4
y		2	4	8	

[2]

(ii) $y = 14 - x^2$

Complete the table.

x	0	1	2	3	4
y		13	10	5	

[2]

(b) On the grid, draw the graphs of $y = 2^x$ and $y = 14 - x^2$ for $0 \leqslant x \leqslant 4$.

[6]

(c) Use your graphs to solve the equations.

(i) $2^x = 12$

$x =$ .... [1]

(ii) $2^x = 14 - x^2$

$x =$ .... [1]

(d) (i) On the grid, draw the line from the point (4, 2) that has a gradient of -4. [1]

(ii) Complete the statement.

This straight line is a .... to the graph of $y = 14 - x^2$

at the point (.......... , ...). [2]

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GRAPHICAL SOLUTION OF EQUATIONS
(2018)

1.

(a) (i) $y = 2^x$

Complete the table.

x	0	1	2	3	4
y		2	4	8	

[2]

(ii) $y = 14 - x^2$

Complete the table.

x	0	1	2	3	4
y		13	10	5	

[2]

(b) On the grid, draw the graphs of $y = 2^x$ and $y = 14 - x^2$ for $0 \leqslant x \leqslant 4$.

[6]

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(c) Use your graphs to solve the equations.

    (i) $2^x = 12$

$x =$ .... [1]

    (ii) $2^x = 14 - x^2$

$x =$ .... [1]

(d) (i)   On the grid, draw the line from the point (4, 2) that has a gradient of -4.   [1]

    (ii)   Complete the statement.

This straight line is a .... to the graph of $y = 14 - x^2$

at the point (.......... , ...).   [2]

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