Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

5763387061

MATHEMATICS (SYLLABUS D) **4024/11**

Paper 1 **May/June 2015**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 80.

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

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[Turn over

ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

1 **(a)** Evaluate $\frac{3}{8} + 1\frac{1}{3}$.

Answer ..... [1]

(b) Evaluate 5 – 3(2 – 1.4).

Answer ..... [1]

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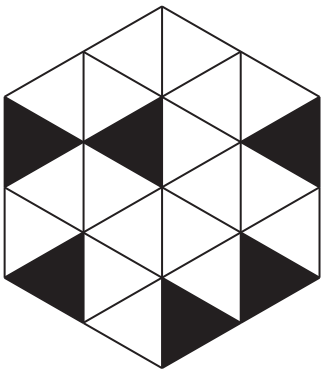
2 **(a)** In the diagram, six small triangles are shaded.

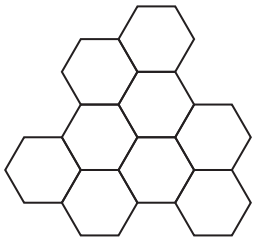
Shade one more small triangle, so that the diagram will then have one line of symmetry.



[1]

(b) The diagram below has rotational symmetry.

Mark the centre of rotational symmetry with a dot, and write down the order of rotational symmetry.



Answer Order of rotational symmetry = ... [1]

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3 **(a)** Express $3\frac{3}{4}\%$ as a fraction in its simplest form.

Answer ..... [1]

(b) Arrange these fractions in order, beginning with the smallest.

$$\frac{4}{5} \qquad \frac{3}{4} \qquad \frac{31}{40}$$

Answer ..... , ... , ... [1]
smallest

---

4 **(a)** Correct to 6 decimal places, $\sqrt{10} = 3.162\,278$, $3\frac{1}{6} = 3.166\,667$.

Find the difference between $3\frac{1}{6}$ and $\sqrt{10}$.

Give your answer correct to 2 significant figures.

Answer ..... [1]

(b) Estimate, correct to the nearest whole number, the value of $\sqrt{2.986^2 + 4.002^2}$.

Answer ..... [1]

---

5 $p = 4 \times 10^5 \qquad q = 7 \times 10^6$

Expressing each answer in standard form, find

(a) p^2,

Answer ..... [1]

(b) $p + q$.

Answer ..... [1]

---

6 A car manufacturer states that a particular car

- uses 5 litres of fuel in travelling 100 km,
- produces 110 grams of CO_2 for each kilometre travelled.

Use this information to calculate the mass of CO_2 produced by 1 litre of fuel.
Give your answer in kilograms.

Answer ..... kg [2]

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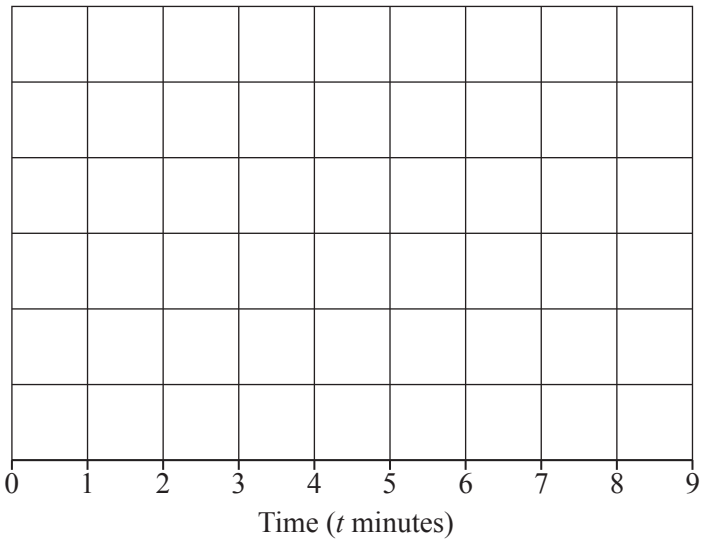
7 The times taken by each member of a group of people to run one kilometre were recorded. The results are shown in the table.

Time (t minutes)	$2 < t \leqslant 3$	$3 < t \leqslant 4$	$4 < t \leqslant 5$	$5 < t \leqslant 6$	$6 < t \leqslant 7$	$7 < t \leqslant 8$
Frequency	0	4	5	3	1	0

On the grid below, draw a frequency polygon to represent these results.



[2]

8 Find the integers n that satisfy $20 < 4n - 3 < 30$.

Answer ..... [2]

9 y is inversely proportional to the square of x.

Given that $y = 3$ when $x = 2$, find y when $x = 5$.

Answer $y =$ ..... [2]

10

$$\mathbf{P} = \begin{pmatrix} 3 & 4 & -5 \end{pmatrix} \qquad \mathbf{Q} = \begin{pmatrix} -1 & 1 \\ 1 & 0 \\ 0 & -1 \end{pmatrix}$$

Evaluate **PQ**.

Answer [2]

---

11 Express $\frac{1}{x} + 2 - \frac{3}{x+1}$ as a single fraction in its simplest form.

Answer ..... [3]

---

12 Given that $6^x = 9$, write down the value of

(a) 6^{-x},

Answer ..... [1]

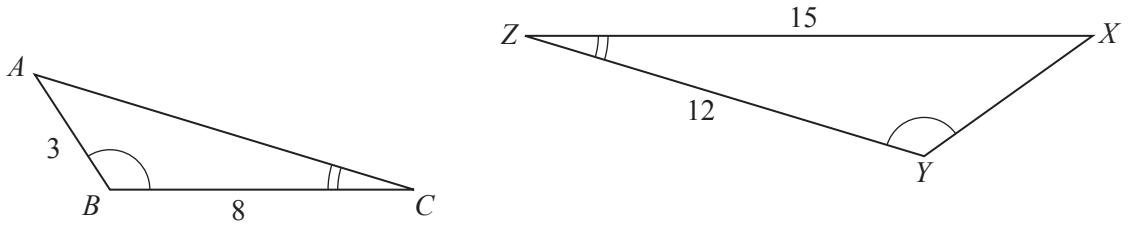
(b) $6^{\frac{x}{2}}$,

Answer ..... [1]

(c) $6^0 + 6^x$.

Answer ..... [1]

13



In the diagram, triangle ABC is similar to triangle XYZ.
$AB = 3$ cm, $BC = 8$ cm, $YZ = 12$ cm and $ZX = 15$ cm.

(a) Calculate XY.

Answer ..... cm [1]

(b) Given that the area of triangle ABC is $10\,\text{cm}^2$, calculate the area of triangle XYZ.

Answer ..... cm^2 [2]

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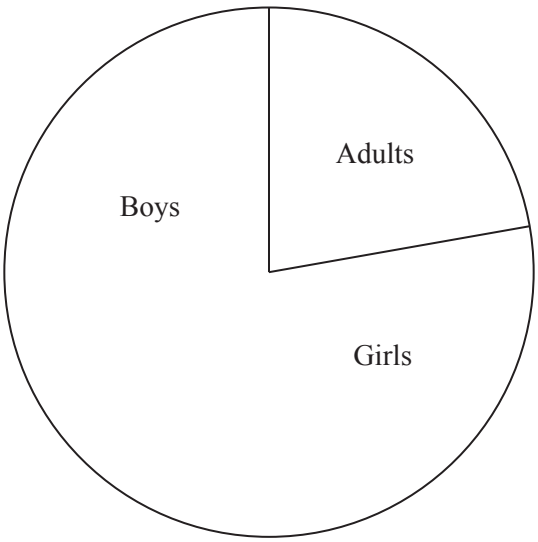
14



A pie chart is used to illustrate the numbers of adults, girls and boys in a group of people.
The angles for the adults and girls are 80° and 120° respectively.
The diagram shows part of the pie chart.

(a) Complete the pie chart. [1]

(b) Express the ratio of numbers of adults : girls : boys in the form $a : b : c$, where a, b and c are the smallest possible whole numbers.

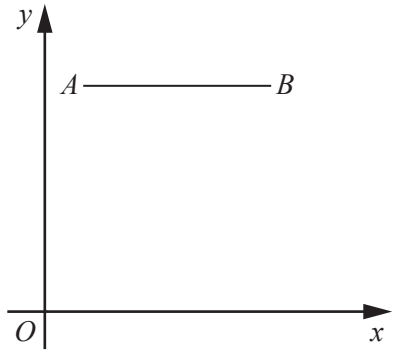
Answer ..... : ..... : ..... [1]

(c) There are 6 more girls than adults.

Calculate the number of people in the whole group.

Answer ..... [1]

15



A is the point (1, 7) B is the point (6, 7)

The line AB is mapped onto the line PQ by the translation $\begin{pmatrix} 0 \\ -5 \end{pmatrix}$.

(a) Find the coordinates of Q.

Answer (..... , ...) [1]

(b) What special type of quadrilateral is $ABQP$?

Answer ..... [1]

(c) Find the area of the quadrilateral $ABQP$.

Answer ..... units^2 [1]

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16 **(a)** Express as a single matrix $\begin{pmatrix} -1 & -3 \\ 1 & 0 \end{pmatrix} - \begin{pmatrix} 1 & -2 \\ 2 & -5 \end{pmatrix}$.

Answer ..... [1]

(b) Find the inverse of $\begin{pmatrix} 1 & -1 \\ 5 & 3 \end{pmatrix}$.

Answer ..... [2]

---

17 **(a)** Factorise completely $3 - 12a^2$.

Answer ..... [2]

(b) Factorise $x^2 - 6y + 2xy - 3x$.

Answer ..... [2]

---

18 **(a)** $\mathscr{E} = \{ x : x \text{ is an integer}, 40 \leqslant x \leqslant 50 \}$

$P = \{ x : x \text{ is a prime number} \}$

$Q = \{ x : x \text{ is a multiple of } 6 \}$

(i) Find $n(P)$.

Answer ..... [1]

(ii) List the members of Q.

Answer ..... [1]

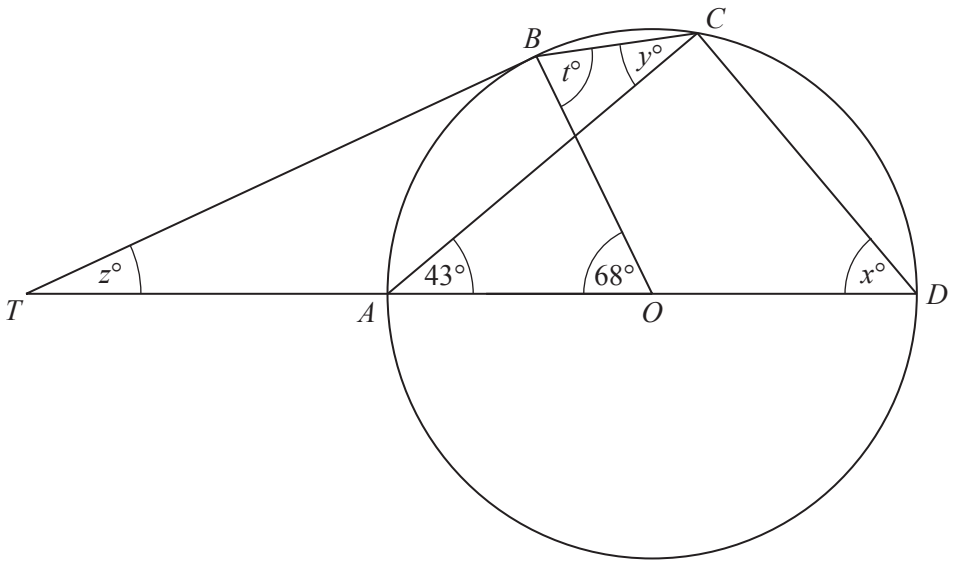
(b) In a group of 25 people,
11 people own both a bicycle and a skateboard,
6 people own neither a bicycle nor a skateboard,
n people own a bicycle.

Find the smallest and the largest possible values of n.

Answer smallest ..... [1]

largest ..... [1]

19



In the diagram, A, B, C and D lie on the circle, centre O.
AD is a diameter.
The tangent to the circle at B meets the line DA produced at T.

$A\hat{O}B = 68°$ and $C\hat{A}O = 43°$.

(a) Find x.

Answer $x =$ ..... [1]

(b) Find y.

Answer $y =$ ..... [1]

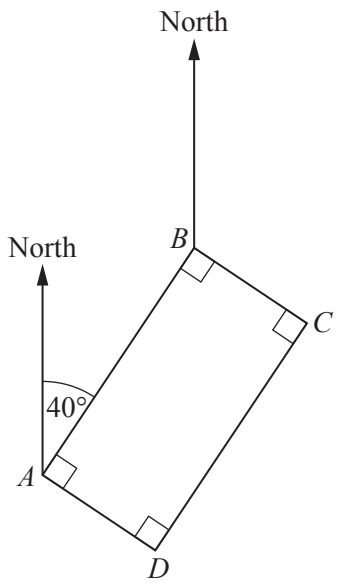
(c) Find z.

Answer $z =$ ..... [1]

(d) Find t.

Answer $t =$ ..... [1]

20



Four oil-rigs are positioned at the vertices of a rectangle *ABCD* .
The bearing of *B* from *A* is 040°.

(a) Find the bearing of

(i) *A* from *B*,

Answer ..... [1]

(ii) *C* from *B*,

Answer ..... [1]

(iii) *C* from *D*.

Answer ..... [1]

(b) A supply helicopter is due to arrive at *D* at 8.15 a.m.
It leaves its base at 7.33 a.m. and takes 49 minutes to fly to *D*.

How many minutes late does it arrive at *D*?

Answer ..... [1]

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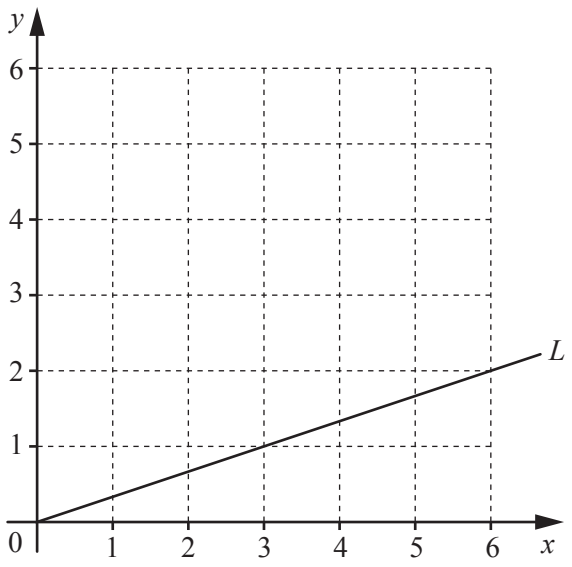
21



(a) On the grid, shade the region, R, given by these inequalities.

$$1 \leqslant x \leqslant 5$$
$$2 \leqslant y \leqslant 4$$

[2]

(b) The line L, with equation $y = \frac{1}{3}x$, is drawn on the grid.

(i) Draw the line $y = \frac{1}{3}x + k$ so that it passes through a point belonging to R such that k is as large as possible. [1]

(ii) Write down this largest value of k.

Answer $k =$ ..... [1]

22 The diagram shows the lines AB and BC.

(a) The point D is 11 cm from A and 9 cm from C.

On the diagram, construct the quadrilateral $ABCD$. [1]

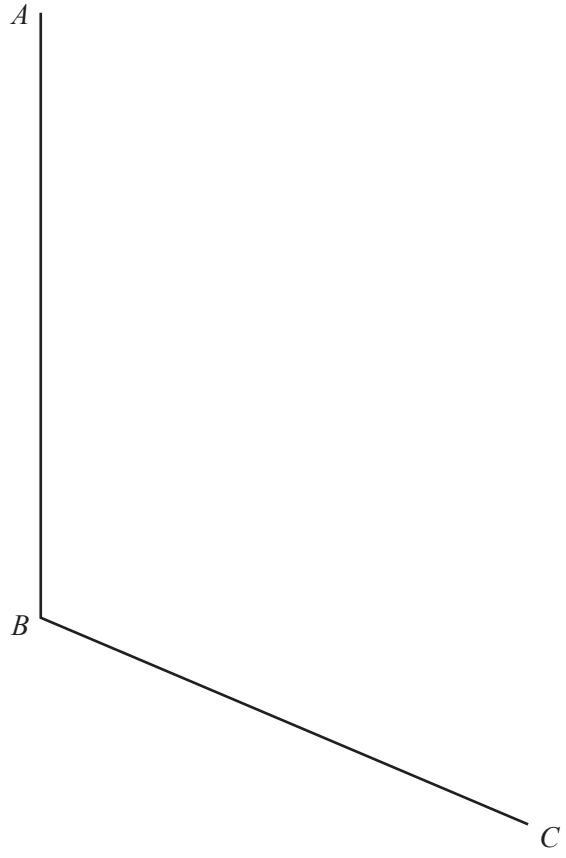
(b) On the diagram, construct the locus of points, **inside** quadrilateral $ABCD$, that are

(i) equidistant from B and C, [1]

(ii) equidistant from AB and BC. [1]

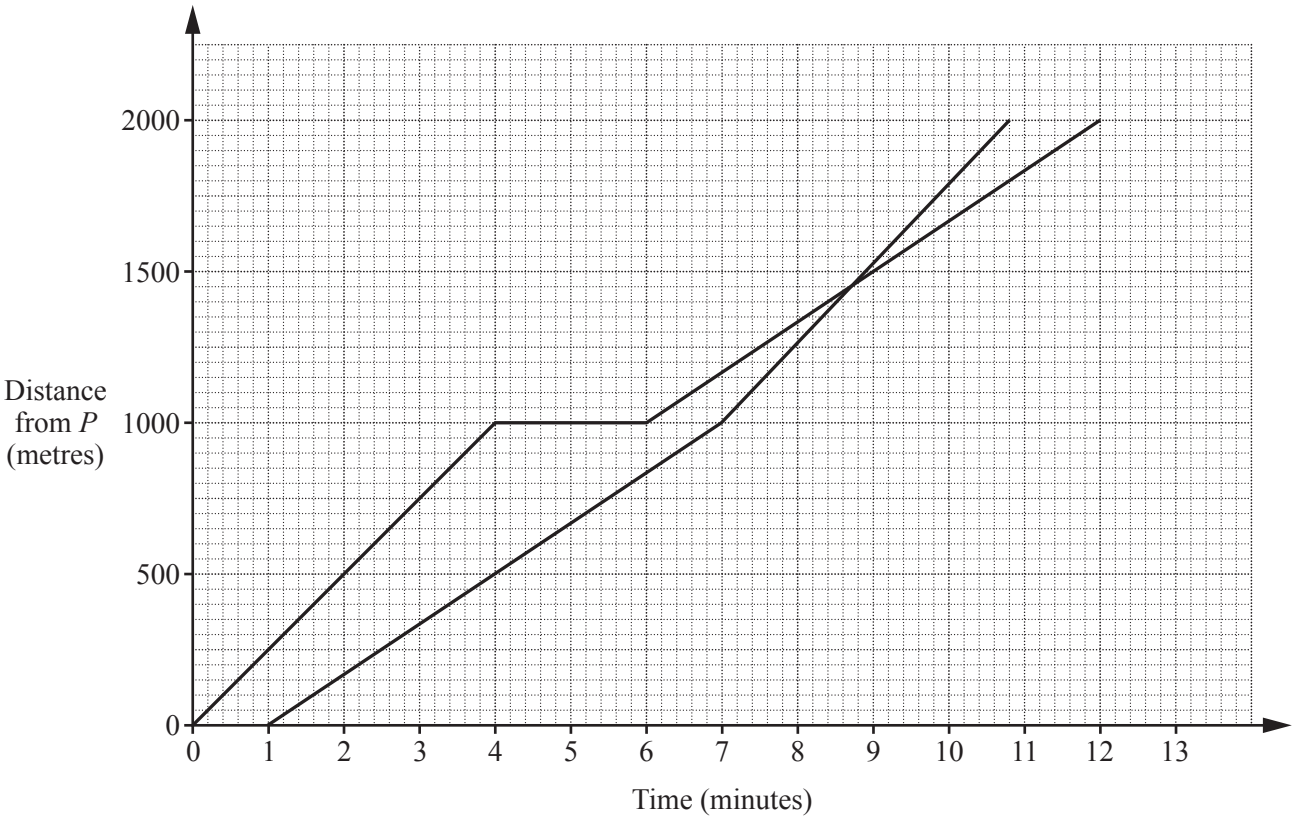
(c) These two loci meet at the point P.

Label the point P on the diagram and measure DP.



Answer DP = ... cm [1]

23 Kim and Lee run a 2000 metre cross-country course that starts at P and ends at Q.
Lee starts 1 minute after Kim.
Their distance-time graphs are shown in the diagram.



(a) Find the distance Lee has run when he overtakes Kim.

Answer ..... m [1]

(b) Find how much longer Kim takes to complete the course than Lee.

Answer ..... minutes [1]

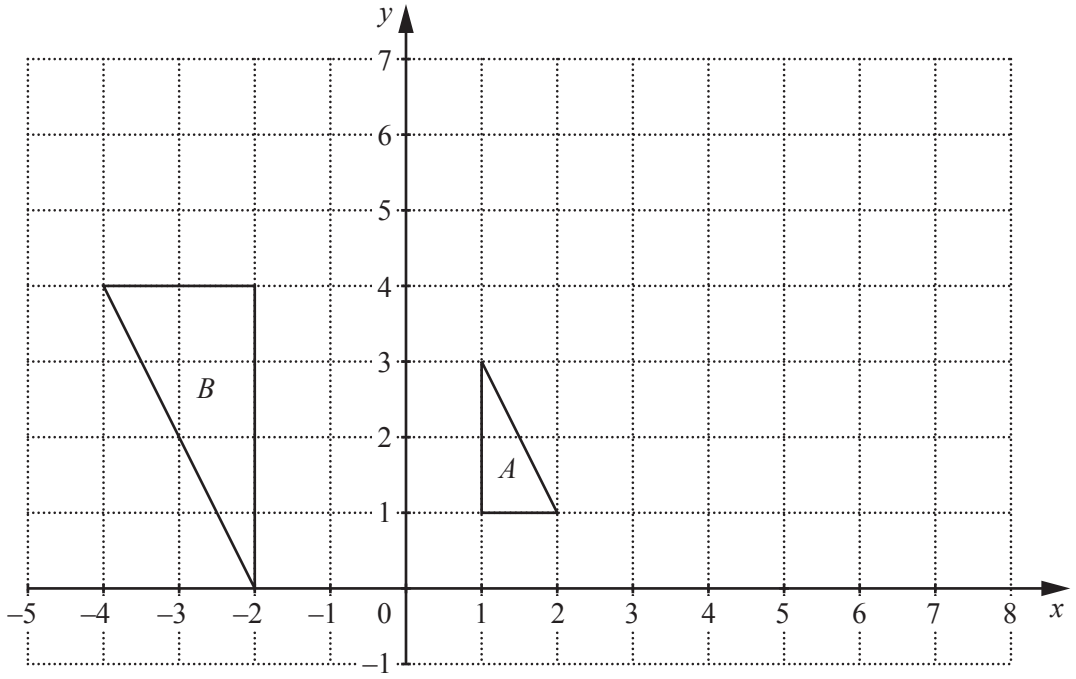
(c) Melvin starts 3 minutes after Kim.
He runs the course in the **opposite** direction to that taken by Kim and Lee.
He runs at a constant speed and takes 10 minutes to reach P.

(i) On the diagram, draw the distance-time graph for Melvin. [1]

(ii) Express Melvin's speed in km/h.

Answer ..... km/h [1]

24



The diagram shows triangles *A* and *B*.

(a) Triangle *A* is mapped onto triangle *B* by an enlargement.

Find the scale factor, and the centre, of this enlargement.

Answer scale factor = ... centre = ... [2]

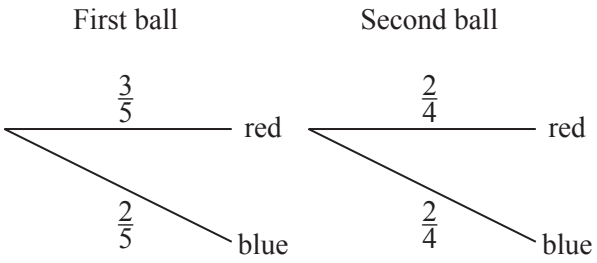
(b) Triangle *A* is mapped onto triangle *C* by a shear, with invariant line the *x*-axis and shear factor 2.

On the diagram, draw triangle *C*. [2]

25 A bag contains 5 balls, of which 3 are red and 2 are blue.

One ball is taken, at random, from the bag and is not replaced.
If this ball is red, another ball is taken, at random, from the bag and is not replaced.
This process is repeated until a blue ball is taken from the bag.

Part of the tree diagram that represents these outcomes is drawn below.



(a) Complete the tree diagram. [2]

(b) Expressing each answer as a fraction, find the probability that

(i) the second ball taken is blue,

Answer ..... [1]

(ii) a blue ball is the second, or the third, ball taken.

Answer ..... [2]

Question 26 is printed on the next page.

26 A pattern of numbers is given below.

Row 1 $\frac{1}{1\times 2}=\frac{1}{1}-\frac{1}{2}$

Row 2 $\frac{1}{2\times 3}=\frac{1}{2}-\frac{1}{3}$

Row 3 $\frac{1}{3\times 4}=\frac{1}{3}-\frac{1}{4}$

Row 4 $\frac{1}{4\times 5}=\frac{1}{4}-\frac{1}{5}$

(a) Write down Row 10.

Answer ..... [1]

(b) Adding the first two rows gives the result $\frac{1}{1\times 2}+\frac{1}{2\times 3}=\frac{1}{1}-\frac{1}{3}=\frac{2}{3}$.

Adding the first three rows gives the result $\frac{1}{1\times 2}+\frac{1}{2\times 3}+\frac{1}{3\times 4}=\frac{1}{1}-\frac{1}{4}=\frac{3}{4}$.

(i) Write down the result of adding the first four rows.

Answer ..... [1]

(ii) **Use the pattern** to write down

(a) the value of $\frac{1}{1\times 2}+\frac{1}{2\times 3}+\frac{1}{3\times 4}+...+\frac{1}{19\times 20}$,

Answer ..... [1]

(b) the number of rows that add up to $\frac{109}{110}$,

Answer ..... [1]

(c) an expression, in terms of n, for the result of adding the first n rows.

Answer ..... [1]

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