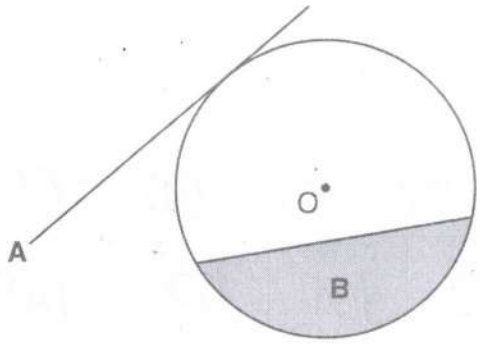
OCR-H Nov'17 P5

Answer **all** the questions.

1 The diagram shows a circle, centre O.



Write down the mathematical name of

(a) line **A**,

(a) tangent [1] ✓

(b) shaded region **B**.

(b) segment [1] ✓

2 **(a)** Write the next term in each of these sequences.

(i) 1 1 2 3 5 8 (+5) 13 ✓

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

(ii) 2 4 8 16 32 64 (×2) 128 ✓

(ii) .....[1]

(b) Write an expression for the *n*th term of the sequence below.

15 12 9 6

(-3)

-3 -6 -9 -12

(b) $-3n+18$ [2] ✓ ✓

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3 Andrew is thinking of a number.

- It is between 1 and 150.
- It is one more than a square number.
- It is three less than a cube number.
- It is not a prime number.

What is Andrew's number?
You must show all your reasoning.

n^2+1 2 ~~5~~ 10 17 26 37 50 65 ✓
82 101 122 145 ✓

n^3-3 -2 ~~5~~ 24 61 122 ✓

122 ✓

..... [4]

4 (a) Factorise.

$x^2 - 43^2$

(a) $(x+43)(x-43)$ ✓ [1]

(b) Calculate.

$57^2 - 43^2$

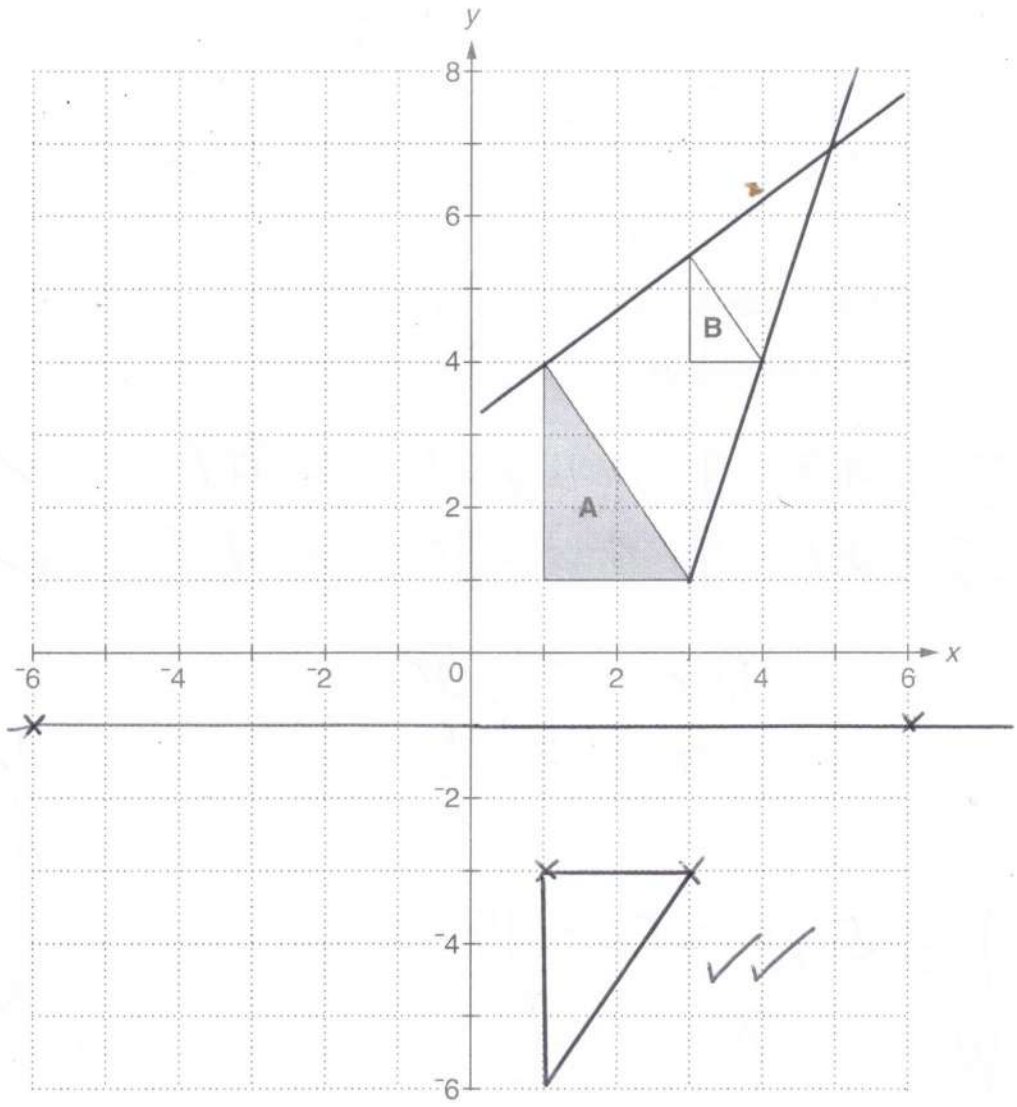
$(57+43)(57-43)$ ✓

$100 \times 14 = 1400$ ✓

(b) ..... [2]

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5 Here is a coordinate grid.



(a) Draw the image of triangle **A** after a reflection in the line $y = -1$. [2]

(b) Describe fully the **single** transformation that maps triangle **A** onto triangle **B**.

Enlargement ✓ centre (5, 7) ✓

scale factor = $\frac{1}{2}$ ✓ [3]

(c) Complete this statement.

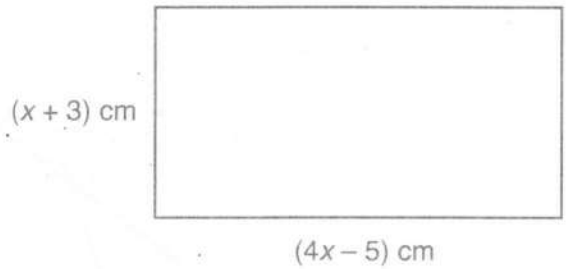
A rotation of 180° around (0, 0) has the same effect as an enlargement by

scale factor −1 with centre of enlargement (0, 0). [2]

✓ ✓

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6 This rectangle has length $(4x - 5)$ cm and width $(x + 3)$ cm.



Not to scale

The perimeter of the rectangle is 46 cm.

Calculate the area of the rectangle.

$2(x+3) + 2(4x-5) = 46$ ✓

$2x + 6 + 8x - 10 = 46$ ✓

$10x = 50$

$x = 5$ ✓

$L = 4 \times 5 - 5 = 15$

$W = 8$ ✓

$A = 15 \times 8 = 120$ ✓ ..... cm^2 **[5]**

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7 Naomi is given a 10% pay decrease.
Her new wage is £252 per week.

What would be her weekly wage if, instead, she had received a 10% pay increase?

$$\begin{array}{r} 28 \\ 9\overline{)252} \end{array}$$ ✓

90% = 252 ✓

10% = 28

110% = 28 × 11 ✓ ✓ (OE)

308 ✓

£ ..... [5]

8 The angles in a triangle are in the ratio 1 : 2 : 3. = 6

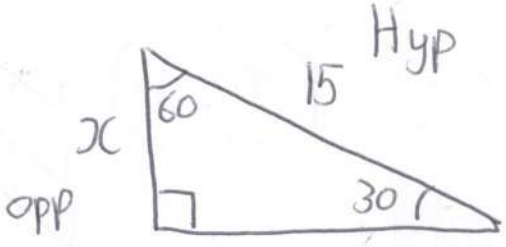
(a) Show that the triangle is a right-angled triangle. [2]

180° ÷ 6 = 30° ✓

Largest = 3 × 30 = 90° ✓

(b) The hypotenuse of the triangle is 15 cm long.

Calculate the length of the shortest side in the triangle.



SOH

$x = \sin 30 \times 15$ ✓✓

$= \frac{1}{2} \times 15$ ✓

$= 7.5$ ✓

(b) ..... cm [4]

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9 There is a total of 250 men, women and children on a train.
The ratio of men to women is 4 : 5.
The ratio of women to children is 10 : 7.

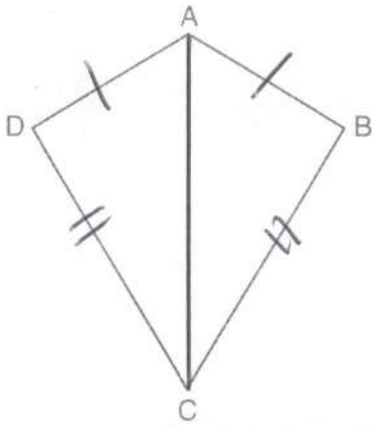
How many men are on the train?

	M	W	C	
	4	5		
×2	8 ✓	10	7	= 25 ✓

250 ÷ 25 = 10 ✓ 8 × 10 = 80 ✓

..... [4]

10 ABCD is a quadrilateral.
AD = AB and CD = CB.



Not to scale

Prove that angle ADC is equal to angle ABC.

AD = AB and CD = BC (given) ✓
AC is common ✓
SSS hence congruent ✓
∴ $\hat{ADC} = \hat{ABC}$ ✓

..... [4]

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11 Amelia buys a new car.
The expected future value of this car, £V, is given by

$$V = 16000 \times 0.75^t$$

where t is the age of the car in complete years.

(a) (i) Write down the value of the car when new.

(i) £ 16000 ✓ **[1]**

(ii) Write down the annual percentage decrease in the expected value of the car.

(ii) 25 ✓ % **[1]**

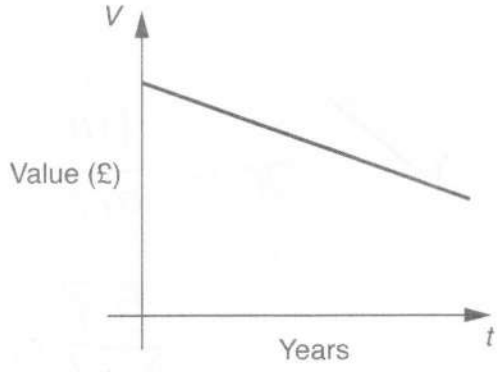
(iii) Show that the expected value of the car when 2 years old is £9000. **[2]**

16000×0.75^2 ✓

$= 16000 \times \left(\frac{3}{4}\right)^2$ ✓

$= \cancel{16000} \times \frac{9}{\cancel{16}} = 1000 \times 9 = 9000$

(b) Amelia sketches a graph to show the expected value of her car as it gets older.



Explain how you know that Amelia's graph is incorrect.

Equation would give a curve ✓OE

[1]

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(c) Amelia assumes that her car will have no value at all after 20 years.

Explain why her assumption is mathematically incorrect.

Graph never reaches x-axis ✓

OR Will always have scrap value [1]

12 (a) Write $\frac{5}{6}$ as a recurring decimal.

$$6\overline{)5.5^{2}0^{2}0}\quad 0.833$$ ✓

(a) $0.8\dot{3}$ ✓ [2]

(b) Convert $0.12\dot{6}$ to a fraction.
Give your answer in its lowest terms.

$x = 0.12\dot{6}$

$100x = 12.\dot{6}$

$1000x = 126.\dot{6}$ ✓

$900x = 114$

$x = \frac{114}{900}$ ✓

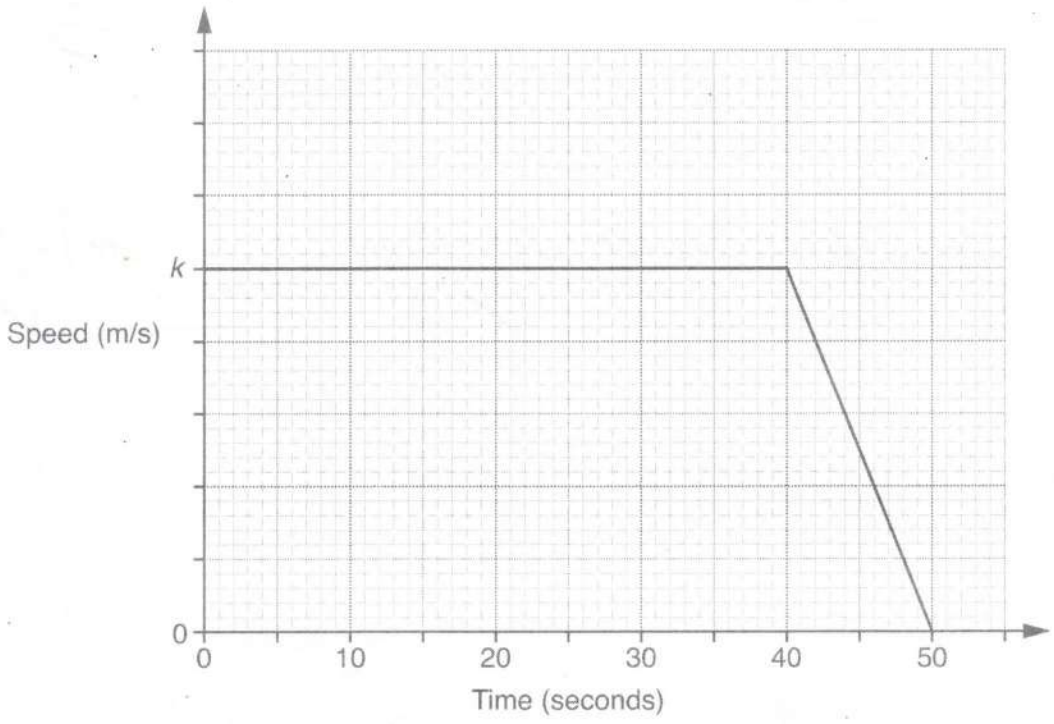
$= \frac{57}{450}$

$= \frac{19}{150}$ ✓

(b) [3]

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13 The graph shows information about the speed of a vehicle during the final 50 seconds of a journey.
At the start of the 50 seconds the speed is k metres per second.
The distance travelled during the 50 seconds is 1.35 kilometres. = 1350m



(a) Work out the average speed of the vehicle during the 50 seconds.
Give your answer in metres per second.

D
(S) T

$S = \frac{1350}{50}$ ✓

(a) 27 ✓ m/s **[2]**

(b) Work out the value of k.

$\frac{1}{2}(40+50) \times k = 1350$ ✓✓✓

$90k = 2700$ ✓

$k = \frac{2700}{90}$

(b) $k =$ 30 ✓ **[5]**

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(c) (i) Calculate the gradient of the graph in the final 10 seconds of the journey.

$\frac{-30}{10}$

(c)(i) -3 ✓ [1]

(ii) Describe what this gradient represents.

(constant) deceleration ✓ OE m/s^2 ✓ [2]

14 Adam has 10 sweets in a bag.
5 are cherry sweets, 4 are lemon sweets and 1 is an orange sweet.

Adam chooses a sweet at random from the bag and eats it.
He then takes another sweet at random from the bag and eats it.

(a) Adam says

The probability that I choose two cherry sweets is $\frac{25}{100}$.

He is incorrect. Explain his error.

Should be $\frac{5}{10} \times \frac{4}{9} = \frac{20}{90}$ ✓✓ [2]

(b) Find the probability that the two sweets he chooses have different flavours.

$= 1 - \text{same}$

$= 1 - CC - LL$ ✓ OE

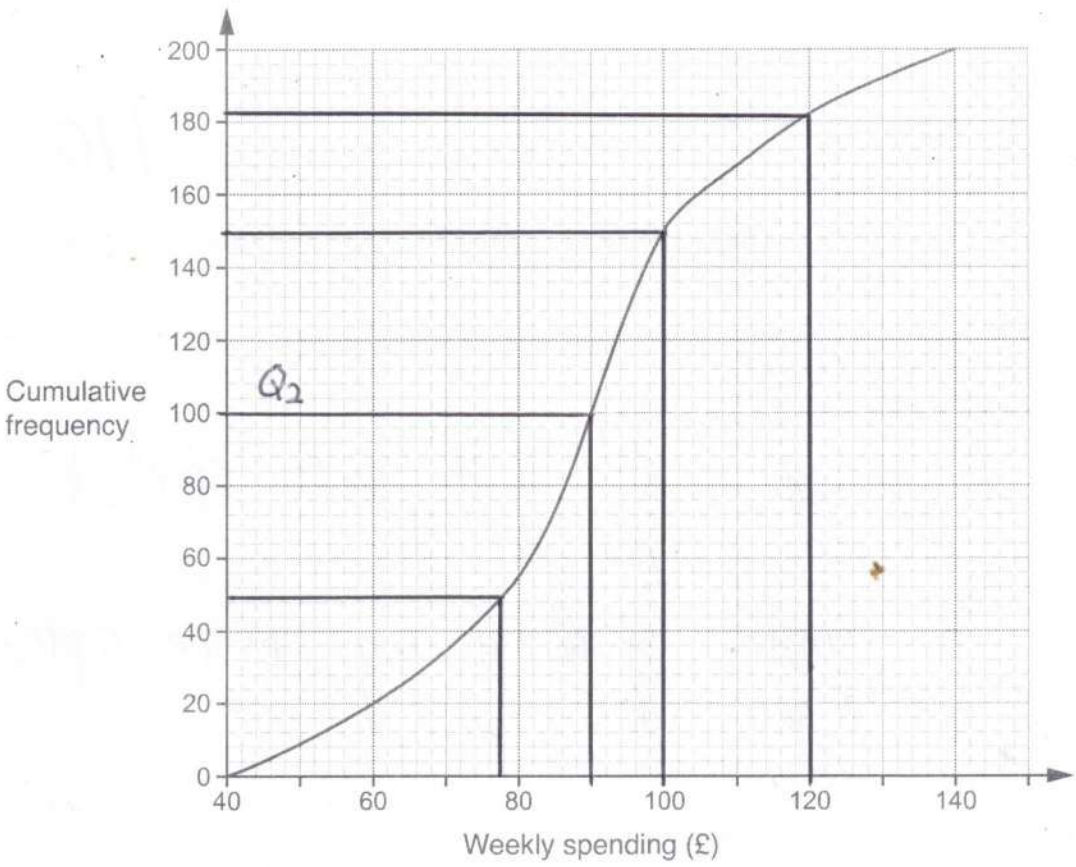
$= 1 - \frac{20}{90} - \frac{4}{10} \times \frac{3}{9}$ ✓✓

$= 1 - \frac{20}{90} - \frac{12}{90}$

(b) $\frac{58}{90}$ ✓ OE [4]

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15 Iqrah carries out a survey of 200 families in the **north** of England on their weekly spending on food.
The cumulative frequency diagram summarises the results.



(a) Find

(i) the median,

90 ✓

(a)(i) £ ..... **[1]**

(ii) the interquartile range.

100 − 79

✓

21 ✓

(ii) £ ..... **[2]**

[ms 21 → 23]

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(b) Iqrah says

15% of these families spent over £120.

Is her statement correct?
State the evidence you have used in making your decision.

>£120 = 18

15% of 200 = 30 so NO ✓ ✓ [2]

(c) In a survey of 200 families in the **south** of England, the median weekly amount spent on food was £84 and the interquartile range was £28.

Make two comparisons between the weekly amounts spent on food in the north of England and the south of England.
State the evidence you have used in making your comparisons.

1 On average families in the south spent less as ✓
their median is lower ✓ [2]

2 The south's spending was more spread ✓
as their IQR was larger ✓ [2]

16 **(a)** Write $\sqrt{12} + \sqrt{75}$ in the form $k\sqrt{3}$.

$= \sqrt{4}\sqrt{3} + \sqrt{25}\sqrt{3}$

$= 2\sqrt{3} + 5\sqrt{3}$ ✓✓

$7\sqrt{3}$ ✓

(a) ..... [3]

(b) Work out.

$16^{-\frac{3}{4}}$

$\frac{1}{\sqrt[4]{16^3}} = \frac{1}{2^3}$ ✓

✓

$\frac{1}{8}$ ✓

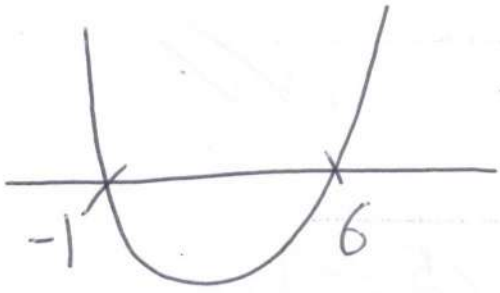
(b) ..... [3]

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17 Solve the inequality.

$$x^2 - 5x - 6 \leqslant 0$$

$(x-6)(x+1) \leq 0$ ✓✓



✓

$-1 \leq x \leq 6$ ✓

[4]

18 Prove that the difference between two consecutive square numbers is always odd. **[4]**

$(n+1)^2 - n^2$ ✓✓

$= n^2 + 2n + 1 - n^2$ ✓

$= 2n + 1$

which is always odd ✓

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19 Solve these simultaneous equations algebraically.

$y = 2x^2 - 7x + 4$
$y = 4x - 1$

$2x^2 - 7x + 4 = 4x - 1$ ✓

$2x^2 - 11x + 5 = 0$ ✓

$(2x - 1)(x - 5) = 0$ ✓✓

$x = \frac{1}{2}$

$y = 4 \times \frac{1}{2} - 1$

$= 2 - 1$

$= 1$

$x = 5$

$y = 4 \times 5 - 1$

$= 20 - 1$

$= 19$

$x = \frac{1}{2}$ $y = 1$ ✓

$x = 5$ $y = 19$ ✓ **[6]**

END OF QUESTION PAPER

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