EXTENDED MATHEMATICS

2002 – 2011

CLASSIFIEDS ALGEBRA

Compiled & Edited
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2011

11 Factorise completely.

$$p^2x - 4q^2x$$

Answer ..... [3]

16 The time, t, for a pendulum to swing varies directly as the **square root** of its length, l.
When $l = 9$, $t = 6$.

(a) Find a formula for t in terms of l.

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

(b) Find t when $l = 2.25$.

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

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14 **(a)** Write down the value of x^{-1}, x^0, $x^{\frac{1}{2}}$, and x^2 when $x = \frac{1}{4}$.

Answer (a) x^{-1} .....

$x^0 =$ .....

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

$x^2 =$ ..... [2]

(b) Write y^{-1}, y^0, y^2 and y^3 in increasing order of size when $y < -1$.

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

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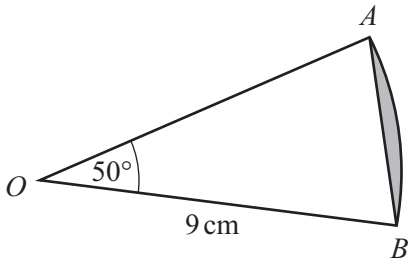
18 Write as a single fraction, in its simplest form.

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

Answer ..... [4]

19



NOT TO SCALE

The diagram shows a sector AOB of a circle, centre O, radius 9 cm with angle $AOB = 50°$.

Calculate the area of the segment shaded in the diagram.

Answer ..... cm^2 [4]

For Examiner's Use

2 **(a)** Find the integer values for x which satisfy the inequality $-3 < 2x - 1 \leqslant 6$.

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

(b) Simplify $\dfrac{x^2 + 3x - 10}{x^2 - 25}$.

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

(c) **(i)** Show that $\dfrac{5}{x-3} + \dfrac{2}{x+1} = 3$ can be simplified to $3x^2 - 13x - 8 = 0$.

Answer(c)(i)

[3]

(ii) Solve the equation $3x^2 - 13x - 8 = 0$.

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

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

1 Children go to camp on holiday.

(a) Fatima buys bananas and apples for the camp.

(i) Bananas cost \$0.85 per kilogram.

Fatima buys 20kg of bananas and receives a discount of 14%.

How much does she spend on bananas?

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

(ii) Fatima spends \$16.40 on apples after a discount of 18%.

Calculate the original price of the apples.

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

(iii) The ratio number of bananas : number of apples = 4 : 5.

There are 108 bananas.

Calculate the number of apples.

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

(b) The cost to hire a tent consists of two parts.

$c	+	$d per day

The total cost for 4 days is $27.10 and for 7 days is $34.30.

Write down two equations in c and d and solve them.

Answer(b) $c =$ .....

$d =$ ..... [4]

(c) The children travel 270 km to the camp, leaving at 07 43 and arriving at 15 13.

Calculate their average speed in km/h.

Answer(c) ..... km/h [3]

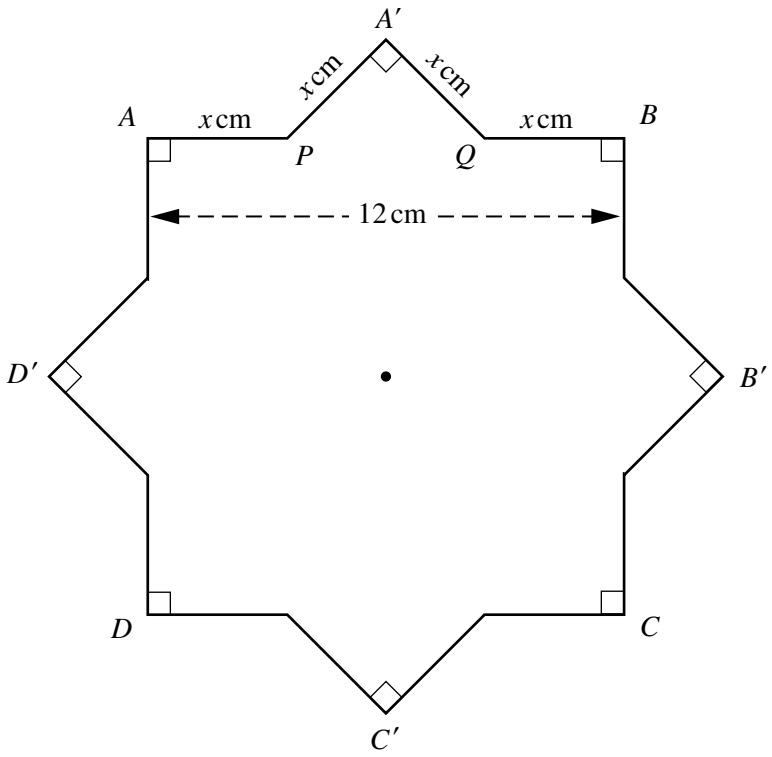
(d) Two years ago $540 was put in a savings account to pay for the holiday.

The account paid **compound** interest at a rate of 6% per year.

How much is in the account now?

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

6



An equilateral 16-sided figure $APA'QB$ …… is formed when the square $ABCD$ is rotated 45° clockwise about its centre to position $A'B'C'D'$.
$AB = 12$ cm and $AP = x$ cm.

(a) (i) Use triangle $PA'Q$ to explain why $2x^2 = (12 - 2x)^2$. [3]

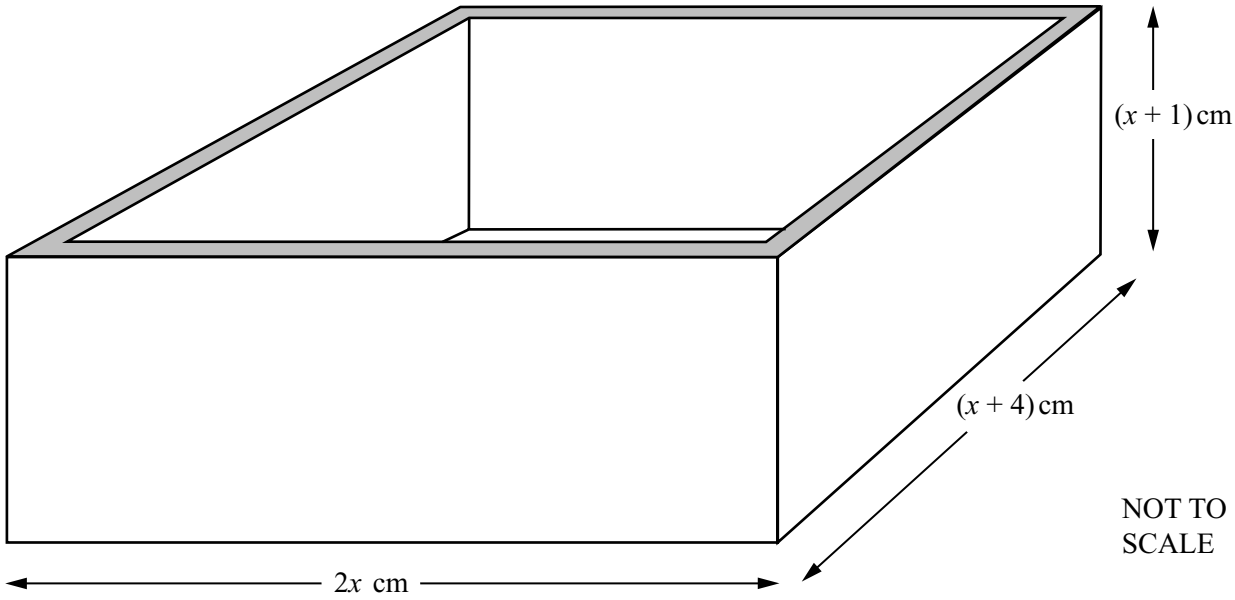
(ii) Show that this simplifies to $x^2 - 24x + 72 = 0$. [3]

(iii) Solve $x^2 - 24x + 72 = 0$. Give your answers correct to 2 decimal places. [4]

(b) (i) Calculate the perimeter of the 16-sided figure. [2]

(ii) Calculate the area of the 16-sided figure. [3]

6



A rectangular-based **open** box has **external** dimensions of $2x$ cm, $(x + 4)$ cm and $(x + 1)$ cm.

(a) **(i)** Write down the volume of a cuboid with these dimensions. [1]

(ii) Expand and simplify your answer. [1]

(b) The box is made from wood 1 cm thick.

(i) Write down the **internal** dimensions of the box in terms of x. [3]

(ii) Find the volume of the **inside** of the box and show that the volume of the wood is $8x^2 + 12x$ cubic centimetres. [3]

(c) The volume of the wood is 1980 cm^3.

(i) Show that $2x^2 + 3x - 495 = 0$ and solve this equation. [5]

(ii) Write down the **external** dimensions of the box. [2]

5 Maria walks 10 kilometres to a waterfall at an average speed of x kilometres per hour.

(a) Write down, in terms of x, the time taken in hours. [1]

(b) Maria returns from the waterfall but this time she walks the 10 kilometres at an average speed of $(x + 1)$ kilometres per hour. The time of the return journey is 30 minutes less than the time of the first journey.
Write down an equation in x and show that it simplifies to $x^2 + x - 20 = 0$. [4]

(c) Solve the equation $x^2 + x - 20 = 0$. [2]

(d) Find the time Maria takes to walk **to** the waterfall. [2]

7 To raise money for charity, Jalaj walks 22 km, correct to the nearest kilometre, every day for 5 days.

(a) Complete the statement in the answer space for the distance, d km, he walks in one day.

Answer (a) ..... $\leqslant d <$ ..... [2]

(b) He raises \$1.60 for every kilometre that he walks.
Calculate the least amount of money that he raises at the end of the 5 days.

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

---

8 Solve the simultaneous equations

$$\tfrac{1}{2}x + 2y = 16,$$

$$2x + \tfrac{1}{2}y = 19.$$

Answer $x =$ .....

$y =$ ..... [3]

---

9 The wavelength, w, of a radio signal is inversely proportional to its frequency, f.
When $f = 200$, $w = 1500$.

(a) Find an equation connecting f and w.

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

(b) Find the value of f when $w = 600$.

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

---

13 Solve the equation

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

Answer $x =$ ..... [3]

---

14 A company makes two models of television.
Model *A* has a rectangular screen that measures 44 cm by 32 cm.
Model *B* has a larger screen with these measurements increased in the ratio 5:4.

(a) Work out the measurements of the larger screen.

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

(b) Find the **fraction** $\frac{\text{model } A \text{ screen area}}{\text{model } B \text{ screen area}}$ in its simplest form.

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

---

15 Angharad had an operation costing \$500.
She was in hospital for x days.
The cost of nursing care was \$170 for each day she was in hospital.

(a) Write down, in terms of x, an expression for the total cost of her operation and nursing care.

Answer(a)\$ ..... [1]

(b) The total cost of her operation and nursing care was \$2370.
Work out how many days Angharad was in hospital.

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

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5 The length, y, of a solid is inversely proportional to the square of its height, x.

(a) Write down a general equation for x and y.
Show that when $x = 5$ and $y = 4.8$ the equation becomes $x^2y = 120$. [2]

(b) Find y when $x = 2$. [1]

(c) Find x when $y = 10$. [2]

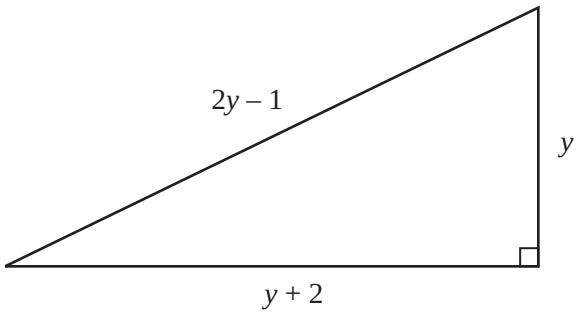
(d) Find x when $y = x$. [2]

(e) Describe exactly what happens to y when x is doubled. [2]

(f) Describe exactly what happens to x when y is decreased by 36%. [2]

(g) Make x the subject of the formula $x^2y = 120$. [2]

(b)



NOT TO SCALE

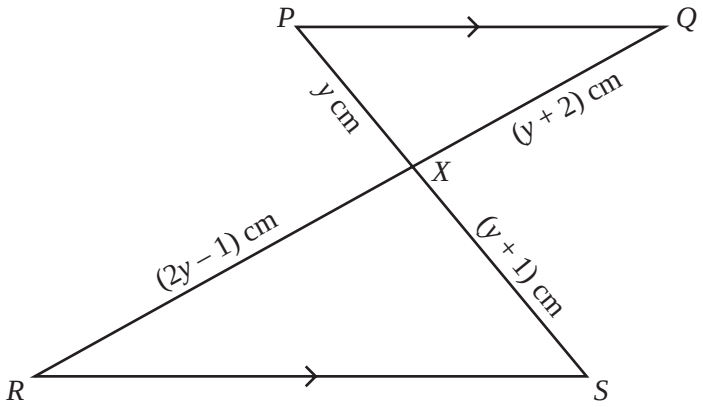
The diagram shows a right-angled triangle.
The lengths of the sides are given in terms of y.

(i) Show that $2y^2 - 8y - 3 = 0$. [3]

(ii) Solve the equation $2y^2 - 8y - 3 = 0$, giving your answers to 2 decimal places. [4]

(iii) Calculate the area of the triangle. [2]

(b)



NOT TO SCALE

In the diagram PQ is parallel to RS.

PS and QR intersect at X.

$PX = y$ cm, $QX = (y + 2)$ cm, $RX = (2y – 1)$ cm and $SX = (y + 1)$ cm.

(i) Show that $y^2 – 4y – 2 = 0$. [3]

(ii) Solve the equation $y^2 – 4y – 2 = 0$.

Show all your working and give your answers correct to two decimal places. [4]

(iii) Write down the length of RX. [1]

8 A packet of sweets contains chocolates and toffees.

(a) There are x chocolates which have a total mass of 105 grams.

Write down, in terms of x, the mean mass of a chocolate. [1]

(b) There are $x + 4$ toffees which have a total mass of 105 grams.

Write down, in terms of x, the mean mass of a toffee. [1]

(c) The difference between the two mean masses in **parts (a)** and **(b)** is 0.8 grams.

Write down an equation in x and show that it simplifies to $x^2 + 4x - 525 = 0$. [4]

(d) **(i)** Factorise $x^2 + 4x - 525$. [2]

(ii) Write down the solutions of $x^2 + 4x - 525 = 0$. [1]

(e) Write down the total number of sweets in the packet. [1]

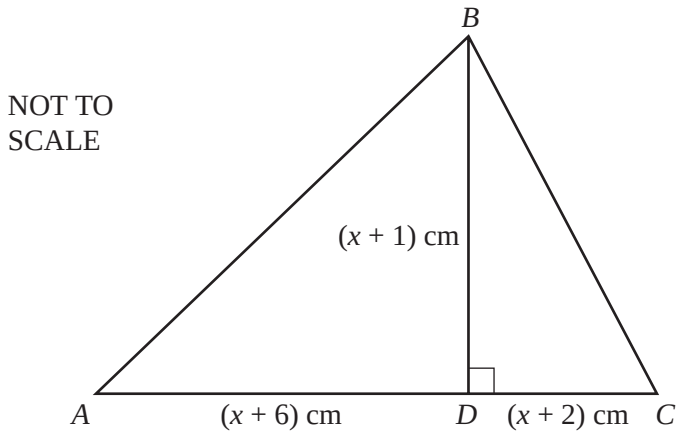
(f) Find the mean mass of a sweet in the packet. [2]

$m^4 - 16n^4$ can be written as $(m^2 - kn^2)(m^2 + kn^2)$.

Write down the value of k. [1]

Factorise completely $m^4n - 16n^5$. [2]

6 (a)



In triangle ABC, the line BD is perpendicular to AC.

$AD = (x + 6)$ cm, $DC = (x + 2)$ cm and the height $BD = (x + 1)$ cm.

The area of triangle ABC is $40\,\text{cm}^2$.

(i) Show that $x^2 + 5x - 36 = 0$.

Answer (a)(i)

[3]

(ii) Solve the equation $x^2 + 5x - 36 = 0$.

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

(iii) Calculate the length of BC.

Answer(a)(iii) $BC =$ ..... cm [2]

(b) Amira takes 9 hours 25 minutes to complete a long walk.

(i) Show that the time of 9 hours 25 minutes can be written as $\frac{113}{12}$ hours.

Answer (b)(i)

[1]

(ii) She walks $(3y + 2)$ kilometres at 3 km/h and then a further $(y + 4)$ kilometres at 2 km/h.

Show that the total time taken is $\frac{9y + 16}{6}$ hours.

Answer(b)(ii)

[2]

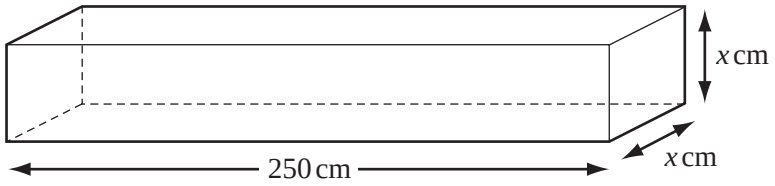
(iii) Solve the equation $\frac{9y + 16}{6} = \frac{113}{12}$.

Answer(b)(iii) $y =$ ..... [2]

(iv) Calculate Amira's average speed, in kilometres per hour, for the whole walk.

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

7



NOT TO SCALE

A solid metal bar is in the shape of a cuboid of length of 250 cm.
The cross-section is a square of side x cm.
The volume of the cuboid is 4840 cm^3.

(a) Show that $x = 4.4$.

Answer (a)

[2]

(b) The mass of 1 cm^3 of the metal is 8.8 grams.
Calculate the mass of the whole metal bar in kilograms.

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

(c) A box, in the shape of a cuboid measures 250 cm by 88 cm by h cm.
120 of the metal bars fit exactly in the box.
Calculate the value of h.

Answer(c) $h =$ ..... [2]

11 Make d the subject of the formula $c = \dfrac{5d + 4w}{2w}$.

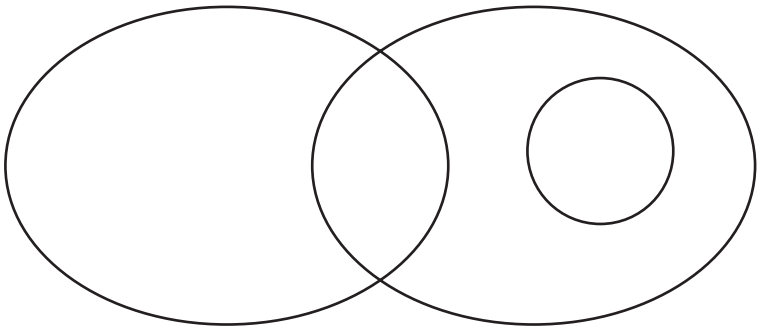
Answer $d =$

[3]

---

12 $Q = \{2, 4, 6, 8, 10\}$ and $R = \{5, 10, 15, 20\}$.
$15 \in P$, $n(P) = 1$ and $P \cap Q = \varnothing$.

Label each set and complete the Venn diagram to show this information.



[3]

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13 Solve the simultaneous equations.

$$\frac{2x + y}{2} = 7$$

$$\frac{2x - y}{2} = 17$$

Answer $x =$ .....

$y =$ ..... [3]

---

9 **(a)** Solve the following equations.

(i) $\frac{5}{w} = \frac{3}{w+1}$

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

(ii) $(y+1)^2 = 4$

Answer(a)(ii) $y =$ ..... or $y =$ ..... [2]

(iii) $\frac{x+1}{3} - \frac{x-2}{5} = 2$

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

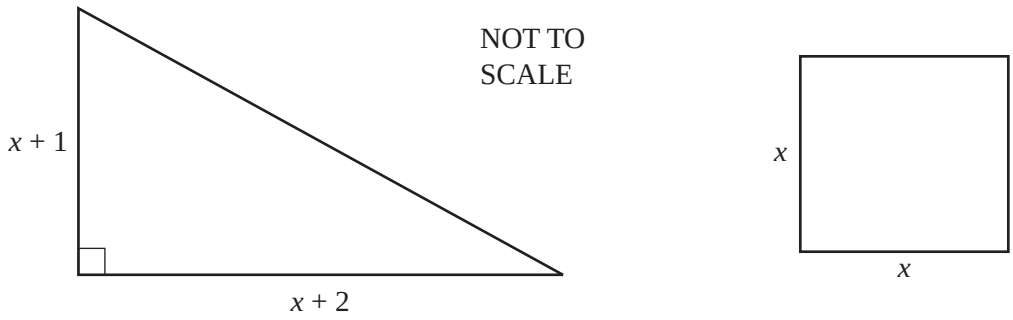
(b) **(i)** Factorise $u^2 - 9u - 10$.

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

(ii) Solve the equation $u^2 - 9u - 10 = 0$.

Answer(b)(ii) $u =$ ..... or $u =$ ..... [1]

(c)



The area of the triangle is equal to the area of the square.
All lengths are in centimetres.

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

Answer(c)(i)

[3]

(ii) Solve the equation $x^2 - 3x - 2 = 0$, giving your answers correct to 2 decimal places.
Show all your working.

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

(iii) Calculate the area of one of the shapes.

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

8 **(a)** y is 5 less than the square of the sum of p and q.

Write down a formula for y in terms of p and q.

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

(b) The cost of a magazine is \$$x$ and the cost of a newspaper is \$$(x - 3)$.

The total cost of 6 magazines and 9 newspapers is \$51.

Write down and solve an equation in x to find the cost of a magazine.

Answer(b) \$ ..... [4]

(c) Bus tickets cost \$3 for an adult and \$2 for a child.

There are a adults and c children on a bus.

The total number of people on the bus is 52.

The total cost of the 52 tickets is \$139.

Find the number of adults and the number of children on the bus.

Answer(c) Number of adults = ...

Number of children = ... [5]

9 **(a)** The cost of a bottle of water is $\$w$.

The cost of a bottle of juice is $\$j$.

The total cost of 8 bottles of water and 2 bottles of juice is \$12.

The total cost of 12 bottles of water and 18 bottles of juice is \$45.

Find the cost of a bottle of water and the cost of a bottle of juice.

Answer(a) Cost of a bottle of water = \$ .....

Cost of a bottle of juice = \$ ..... [5]

(b) Roshni cycles 2 kilometres at y km/h and then runs 4 kilometres at $(y - 4)$ km/h.
The whole journey takes 40 **minutes**.

(i) Write an equation in y and show that it simplifies to $y^2 - 13y + 12 = 0$.

Answer(b)(i)

[4]

(ii) Factorise $y^2 - 13y + 12$.

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

(iii) Solve the equation $y^2 - 13y + 12 = 0$.

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

(iv) Work out Roshni's running speed.

Answer(b)(iv) ..... km/h [1]

(c) Solve the equation

$$u^2 - u - 4 = 0.$$

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

Answer(c) $u =$ ..... or $u =$ ..... [4]

13 **(a)** Find the value of x when $\frac{18}{24} = \frac{27}{x}$.

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

(b) Show that $\frac{2}{3} \div 1\frac{1}{6} = \frac{4}{7}$.
Write down all the steps in your working.

Answer(b)

[2]

---

14 **(a)** A drinking glass contains 55 cl of water.
Write 55 cl in litres.

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

(b) The mass of grain in a sack is 35 kg.
The grain is divided equally into 140 bags.

Calculate the mass of grain in each bag.
Give your answer in grams.

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

---

15 **(a)** Write 67.499 correct to the nearest integer.

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

(b) Write 0.003040506 correct to 3 significant figures.

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

(c) $d = 56.4$, correct to 1 decimal place.

Write down the lower bound of d.

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

---

10 The cost of a cup of tea is t cents.

The cost of a cup of coffee is $(t + 5)$ cents.

The total cost of 7 cups of tea and 11 cups of coffee is 2215 cents.

Find the cost of one cup of tea.

Answer ..... cents [3]

---

11 The volume of a solid varies directly as the **cube** of its length.
When the length is 3 cm, the volume is 108 cm^3.

Find the volume when the length is 5 cm.

Answer ..... cm^3 [3]

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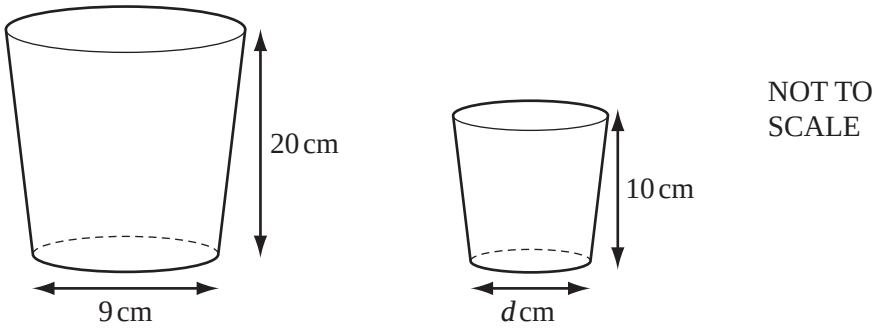
16 Write $\frac{2}{x-2}+\frac{3}{x+2}$ as a single fraction.

Give your answer in its simplest form.

Answer ..... [3]

17



The diagrams show two mathematically similar containers.
The larger container has a base with diameter 9 cm and a height 20 cm.
The smaller container has a base with diameter d cm and a height 10 cm.

(a) Find the value of d.

Answer(a) $d =$ ..... [1]

(b) The larger container has a capacity of 1600 ml.

Calculate the capacity of the smaller container.

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

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3 **(a)** $x = 3m - k$

Find the value of

(i) x when $m = 2$ and $k = -4$,

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

(ii) m when $x = 19$ and $k = 5$.

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

(b) Expand the brackets.

$g(7f - g^2)$

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

(c) Factorise completely.

$18h^2 - 12hj$

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

(d) Make m the subject of the formula.

$t = 8m + 15$

Answer(d) $m =$ ..... [2]

(e) Solve the equation.

$p + 3 = 3(p - 5)$

Answer(e) $p =$ ..... [3]

7 **(a)** Solve the equations.

(i) $2x + 3 = 15 - x$

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

(ii) $\frac{2y-1}{3} = 7$

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

(iii) $2 = \frac{1}{u-1}$

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

(b) Write down equations to show the following.

(i) p is equal to r plus two times q.

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

(ii) k is equal to the square of the sum of l and m.

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

(c) Pierre walks for 2 hours at w km/h and then for another 3 hours at $(w - 1)$ km/h.

The total distance of Pierre's journey is 11.5 km.

Find the value of w.

Answer(c) $w =$ ..... [4]

5 **(a)** Solve $9 < 3n + 6 \leqslant 21$ for integer values of n.

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

(b) Factorise completely.

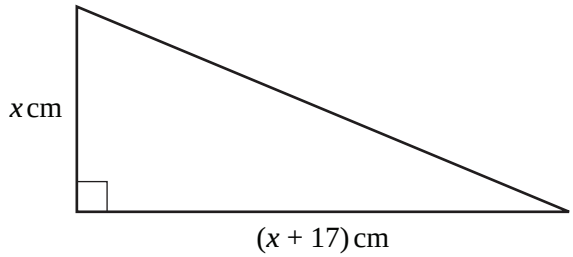
(i) $2x^2 + 10xy$

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

(ii) $3a^2 - 12b^2$

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

(c)



NOT TO SCALE

The area of this triangle is $84\,\text{cm}^2$.

(i) Show that $x^2 + 17x - 168 = 0$.

Answer (c)(i)

[2]

(ii) Factorise $x^2 + 17x - 168$.

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

(iii) Solve $x^2 + 17x - 168 = 0$.

Answer(c)(iii) $x =$ ..... or $x =$ ..... [1]

(d) Solve

$$\frac{15 - x}{2} = 3 - 2x.$$

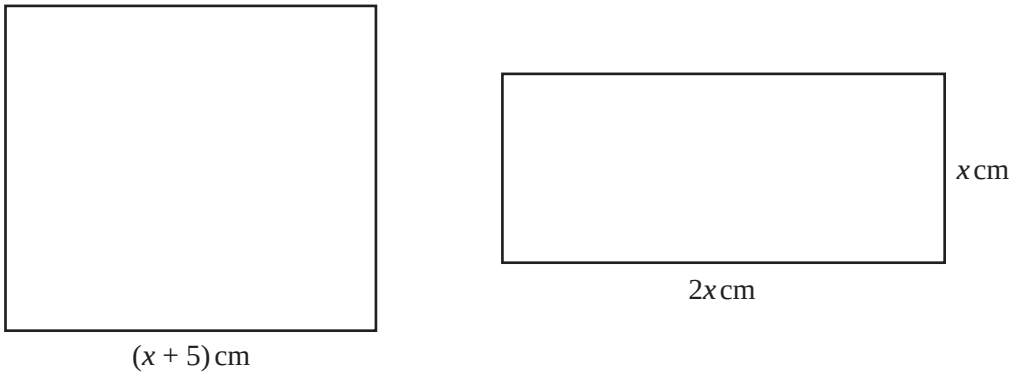
Answer(d) $x =$ ..... [3]

(e) Solve $2x^2 - 5x - 6 = 0$.

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

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

3



The diagram shows a square of side $(x + 5)$ cm and a rectangle which measures $2x$ cm by x cm.

The area of the square is 1 cm^2 more than the area of the rectangle.

(a) Show that $x^2 - 10x - 24 = 0$.

Answer(a)

[3]

(b) Find the value of x.

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

(c) Calculate the acute angle between the diagonals of the rectangle.

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

(c) Erik runs a race at an average speed of x m/s.
His time is $(3x - 9)$ seconds and the race distance is $(2x^2 - 8)$ metres.

(i) Write down an equation in x and show that it simplifies to

$x^2 - 9x + 8 = 0$. [2]

(ii) Solve $x^2 - 9x + 8 = 0$. [2]

(iii) Write down Erik's time and the race distance. [2]

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17 Solve the equation

$$x^2 + 4x - 22 = 0\,.$$

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

Answer $x =$ ..... or $x =$ ..... [4]

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8 **(a)** **(i)** The cost of a book is \$$x$.
Write down an expression in terms of x for the number of these books which are bought for \$40. [1]

(ii) The cost of each book is increased by \$2.
The number of books which are bought for \$40 is now one less than before.
Write down an equation in x and show that it simplifies to $x^2 + 2x - 80 = 0$. [4]

(iii) Solve the equation $x^2 + 2x - 80 = 0$. [2]

(iv) Find the original cost of one book. [1]

(b) Magazines cost \$$m$ each and newspapers cost \$$n$ each.
One magazine costs \$2.55 more than one newspaper.
The cost of two magazines is the same as the cost of five newspapers.

(i) Write down two equations in m and n to show this information. [2]

(ii) Find the values of m and n. [3]

1 Two quantities c and d are connected by the formula $c = 2d + 30$.
Find c when $d = -100$.

Answer ..... [1]

---

2 **(a)** $\frac{2}{3} + \frac{5}{6} = \frac{x}{2}$.

Find the value of x.

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

(b) $\frac{5}{3} \div \frac{3}{y} = \frac{40}{9}$.

Find the value of y.

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

---

3 Use your calculator to work out

(a) $\sqrt{(7 + 6 \times 243^{0.2})}$,

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

(b) $2 - \tan 30° \times \tan 60°$.

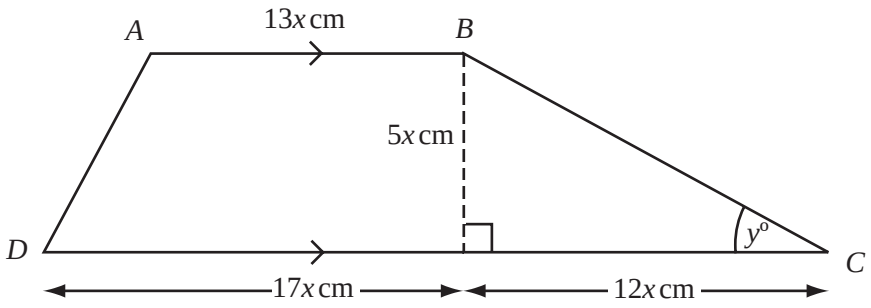
Answer(b) ..... [1]

---

4 Angharad sleeps for 8 hours each night, correct to the nearest 10 minutes.
The total time she sleeps in the month of November (30 nights) is T hours.
Between what limits does T lie?

Answer ..... $\leqslant T <$ ..... [2]

16



NOT TO SCALE

ABCD is a trapezium.

(a) Find the area of the trapezium in terms of x and simplify your answer.

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

(b) Angle $BCD = y°$. Calculate the value of y.

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

---

17 Solve the equations

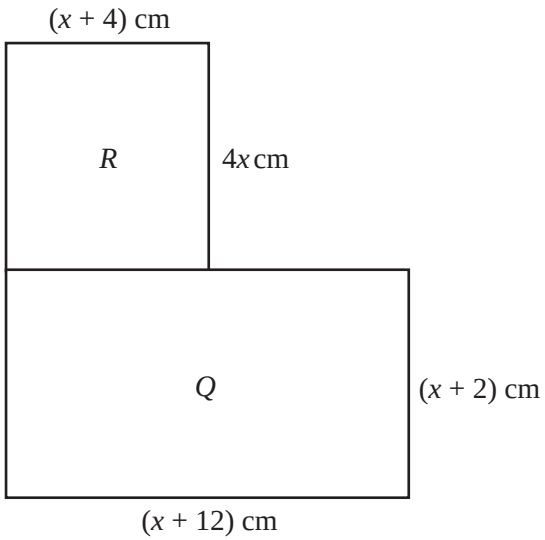
(a) $0.2x - 3 = 0.5x$,

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

(b) $2x^2 - 11x + 12 = 0$.

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

20



NOT TO SCALE

(a) (i) Write down an expression for the area of rectangle R.

Answer(a) (i) .....cm^2 [1]

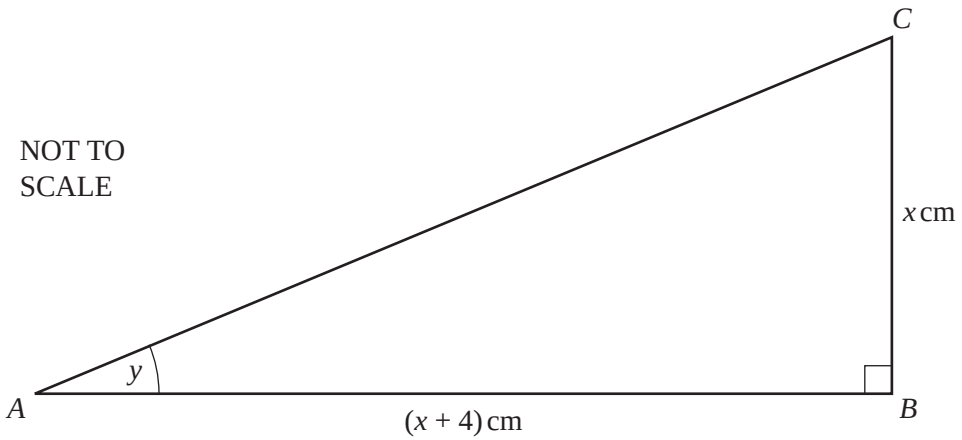
(ii) Show that the total area of rectangles R and Q is $5x^2 + 30x + 24$ square centimetres.

[1]

(b) The total area of rectangles R and Q is 64 cm^2.
Calculate the value of x correct to 1 decimal place.

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

2



(a) When the area of triangle ABC is $48\,\text{cm}^2$,

(i) show that $x^2 + 4x - 96 = 0$, [2]

(ii) solve the equation $x^2 + 4x - 96 = 0$, [2]

(iii) write down the length of AB. [1]

(b) When $\tan y = \frac{1}{6}$, find the value of x. [2]

(c) When the length of AC is $9\,\text{cm}$,

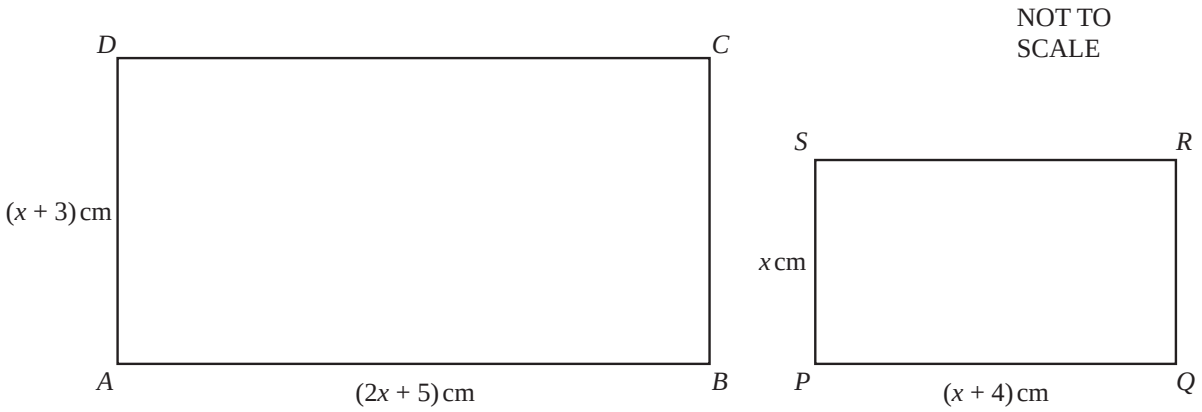
(i) show that $2x^2 + 8x - 65 = 0$, [2]

(ii) solve the equation $2x^2 + 8x - 65 = 0$,

(**Show your working** and give your answers correct to 2 decimal places.) [4]

(iii) calculate the perimeter of triangle ABC. [1]

5



The diagram shows two rectangles *ABCD* and *PQRS*.

$AB = (2x + 5)$ cm, $AD = (x + 3)$ cm, $PQ = (x + 4)$ cm and $PS = x$ cm.

(a) For one value of x, the area of rectangle *ABCD* is 59 cm^2 more than the area of rectangle *PQRS*.

(i) Show that $x^2 + 7x - 44 = 0$.

Answer(a)(i)

[3]

(ii) Factorise $x^2 + 7x - 44$.

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

(iii) Solve the equation $x^2 + 7x - 44 = 0$.

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

(iv) Calculate the size of angle *DBA*.

Answer(a)(iv) Angle *DBA* = ... [2]

(b) For a **different** value of x, the rectangles $ABCD$ and $PQRS$ are similar.

(i) Show that this value of x satisfies the equation $x^2 - 2x - 12 = 0$.

Answer(b)(i)

[3]

(ii) Solve the equation $x^2 - 2x - 12 = 0$, giving your answers correct to 2 decimal places.

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

(iii) Calculate the perimeter of the rectangle $PQRS$.

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

9 **(a)** Solve the equation $\frac{m-3}{4} + \frac{m+4}{3} = -7$.

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

(b) **(i)** $y = \frac{3}{x-1} - \frac{2}{x+3}$

Find the value of y when $x = 5$.

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

(ii) Write $\frac{3}{x-1} - \frac{2}{x+3}$ as a single fraction.

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

(iii) Solve the equation $\frac{3}{x-1} - \frac{2}{x+3} = \frac{1}{x}$.

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

(c) $p = \frac{t}{q-1}$

Find q in terms of p and t.

Answer(c) $q =$ [3]

12 The side of a square is 6.3 cm, correct to the nearest millimetre.
The lower bound of the perimeter of the square is u cm and the upper bound of the perimeter is v cm.
Calculate the value of

(a) u,

Answer(a) $u =$ ..... [1]

(b) $v - u$.

Answer(b) $v - u =$ ..... [1]

---

13 $a \times 10^7 + b \times 10^6 = c \times 10^6$

Find c in terms of a and b.
Give your answer in its simplest form.

Answer $c =$ ..... [2]

---

14 Priyantha completes a 10 km run in 55 minutes 20 seconds.
Calculate Priyantha's average speed in km/h.

Answer ..... km/h [3]

---

24 **(a)** Write $\frac{1}{y} - \frac{2}{x}$ as a single fraction in its lowest terms.

Answer(a) [2]

(b) Write $\frac{x^2 + x}{3x + 3}$ in its lowest terms.

Answer(b) [3]

---

25 $f: x \to 2x - 7$ $\quad$ $g: x \to \frac{1}{x}$

Find

(a) $fg\left(\frac{1}{2}\right)$,

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

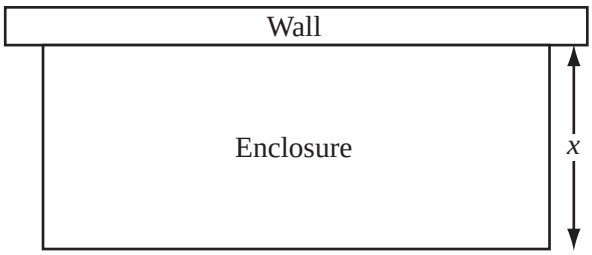
(b) $gf(x)$,

Answer(b) $gf(x) =$ [1]

(c) $f^{-1}(x)$.

Answer(c) $f^{-1}(x) =$ [2]

3



NOT TO SCALE

A farmer makes a rectangular enclosure for his animals.
He uses a wall for one side and a total of 72 metres of fencing for the other three sides.

The enclosure has width x metres and area A square metres.

(a) Show that $A = 72x - 2x^2$.

Answer (a)

[2]

(b) Factorise completely $72x - 2x^2$.

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

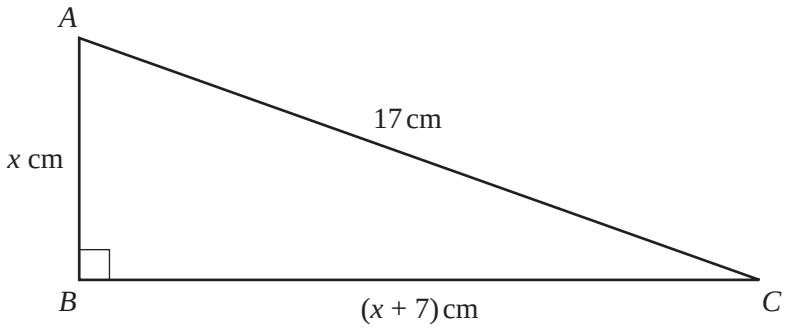
(c) Complete the table for $A = 72x - 2x^2$.

x	0	5	10	15	20	25	30	35
A	0	310	520			550	360	

[3]

(d) Draw the graph of $A = 72x - 2x^2$ for $0 \leqslant x \leqslant 35$ on the grid opposite.

5 (a)



NOT TO SCALE

In the right-angled triangle ABC, $AB = x$ cm, $BC = (x + 7)$ cm and $AC = 17$ cm.

(i) Show that $x^2 + 7x - 120 = 0$.

Answer(a)(i)

[3]

(ii) Factorise $x^2 + 7x - 120$.

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

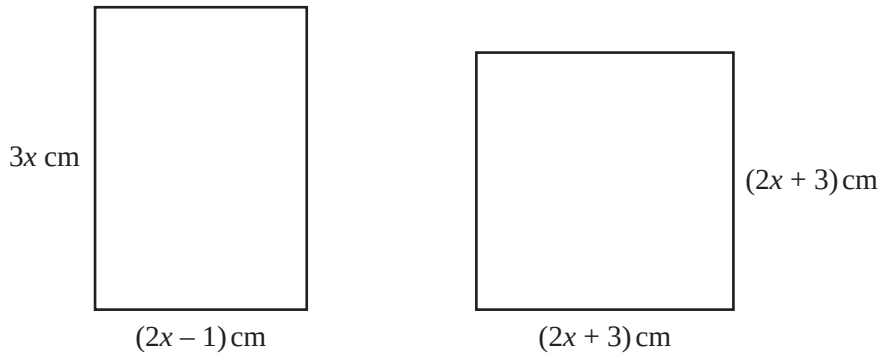
(iii) Write down the solutions of $x^2 + 7x - 120 = 0$.

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

(iv) Write down the length of BC.

Answer(a)(iv) $BC =$ ..... cm [1]

(b)



The rectangle and the square shown in the diagram above have the same area.

(i) Show that $2x^2 - 15x - 9 = 0$.

Answer(b)(i)

[3]

(ii) Solve the equation $2x^2 - 15x - 9 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

(iii) Calculate the perimeter of the square.

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

(d) Solve the equation.

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

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

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

15 **(a)** Factorise $t^2 - 4$.

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

(b) Factorise completely $at^2 - 4a + 2t^2 - 8$.

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

16

NOT TO SCALE

A set of Russian dolls is made so that the volume, V, of each of them varies directly as the cube of its height, h.
The doll with a height of 3 cm has a volume of 6.75 cm^3.

(a) Find an equation for V in terms of h.

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

(b) Find the volume of a doll with a height of 2.5 cm.

Answer (b) .....cm^3 [1]

EXTENDED MATHEMATICS

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