IGCSE CLASSIFIED PAST PAPERS

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Cambridge International Education CIE
Extended mathematics 0580

P AP ER2

P art 1

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Paper 2 (1)

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Number Theory

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3 p is the largest prime number between 50 and 100.
q is the smallest prime number between 50 and 100.

Calculate the value of $p - q$

Answer ..... [2]

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2) June 2011 V2

2 Which of the following numbers are irrational?

$\frac{2}{3}$ $\sqrt{36}$ $\sqrt{3} + \sqrt{6}$ π 0.75 48% $8^{\frac{1}{3}}$

Answer ..... [2]

3) November 2011 V3

2 210 211 212 213 214 215 216

From the list of numbers, find

(a) a prime number,

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

(b) a cube number.

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

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4) November 2012 V2

11 List all the **prime numbers** which satisfy this inequality.

$$16 < 2x - 5 < 48$$

Answer ..... [3]

5) June 2013 V3

11 The sum of the prime numbers less than 8 is equal to 17.

(a) Find the sum of the prime numbers less than 21.

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

(b) The sum of the prime numbers less than x is 58.

Find an integer value for x

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

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6) June 2016 V2

5 8 9 10 11 12 13 14 15 16

From the list of numbers, write down

(a) the square numbers,

..... [1]

(b) a prime factor of 99.

[1]

7) June 2016 V3

1 Find the cube root of 4913.

..... [1]

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8) November 2015 V3

5 11 12 13 14 15 16

From the list of numbers, write down

(a) the factors of 60,

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

(b) the prime numbers.

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

9) November 2014 V2

15 **(a)** Write 90 as a product of prime factors.

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

(b) Find the lowest common multiple of 90 and 105.

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

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10) June 2015 V1

17 **(a)** Write 30 as a product of its prime factors.

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

(b) Find the lowest common multiple (LCM) of 30 and 45.

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

11) November 2015 V1

7 Work out the highest common factor (HCF) of 36 and 90.

Answer ..... [2]

2 Find the lowest common multiple (LCM) of 24 and 32.

Answer [2]

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13) March 2016 V2

13 **(a)** Write 2016 as the product of prime factors.

..... [3]

(b) Write 2016 in standard form.

.....[1]

14) June 2016 V1

6 Find the lowest common multiple (LCM) of 36 and 48.

..... [2]

15) June 2016 V3

10 Find the highest common factor (HCF) of 56 and 70.

..... [2]

15) November 2020 V2

2 Insert one pair of brackets to make this calculation correct.

$$7 - 5 - 3 + 4 = 9$$

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

Directed Numbers

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1 Write down the number which is 3.6 less than -4.7 .

Answer ..... [1]

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2) November 2012 V1

1 On a mountain, the temperature decreases by 6.5 °C for every 1000 metres increase in height.
At 2000 metres the temperature is 10 °C.

Find the temperature at 6000 metres.

Answer ..... °C [2]

3) June 2013 V1

1 One January day in Munich, the temperature at noon was 3°C.
At midnight the temperature was –8°C.

Write down the difference between these two temperatures.

Answer ..... °C [1]

4) June 2014 V3

1 In March 2011, the average temperature in Kiev was 3°C.
In March 2012, the average temperature in Kiev was 19°C lower than in March 2011.

Write down the average temperature in Kiev in March 2012.

Answer ..... °C [1]

5) June 2015 V1

1 At noon the temperature was 4 °C.
At midnight the temperature was –5.5 °C.

Work out the difference in temperature between noon and midnight.

Answer ..... °C [1]

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6) November 2015 V1

1 At midnight the temperature in Newtown was –8 °C.
At noon the next day the temperature in Newtown was 9 °C.

Work out the rise in temperature from midnight to noon.

Answer ..... °C [1]

7) November 2015 V2

1 Write down the difference in temperature between 8°C and −9°C.

Answer .....°C [1]

8) November 2016 V1

1 Write down the temperature which is 5 °C below –2 °C.

..... °C [1]

Fractions and Decimals

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1) June 2010 V1

1 Write the numbers in order of size with the **smallest** first.

$\sqrt{10}$ 3.14 $\frac{22}{7}$ π

Answer ..... < ..... < ..... < ..... [2]

2) June 2010 V2

3 Write the following in order of size, **smallest** first.

$\frac{2}{\sqrt{3}}$ $2\sqrt{3}$ $\sqrt{3}$ $2\frac{\sqrt{3}}{2}$

Answer ..... < ..... < ..... < ..... [2]

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3) November 2010 V3

6 Write the following in order of size, **smallest** first.

$\frac{20}{41}$ $\frac{80}{161}$ 0.492 4.93%

Answer ..... < ..... < ..... < ..... [2]

4) June 2011 V2

4 $\frac{3}{5} < p < \frac{2}{3}$

Which of the following could be a value of p?

$\frac{16}{27}$ 0.67 60% $(0.8)^2$ $\sqrt{\frac{4}{9}}$

Answer ..... [2]

5) June 2012 V2

3 For this question, $1 < x < 2$

Write the following in order of size, **smallest** first.

$\frac{5}{x}$ $\quad 5x \quad$ $\frac{x}{5}$ $\quad x \quad 5$

Answer ..... < ..... < ..... < ..... [2]

6) November 2016 V3

7 Write these in order of size, smallest first.

0.6^3 $\quad 0.22 \quad$ $\sqrt{0.09}$ $\quad 0.4^2$

..... < ..... < ..... < .....[2]

smallest

2 Write the following in order of size, smallest first.

π 3.14 $\frac{22}{7}$ 3.142 3

Answer ..... < ..... < ..... < ..... < ..... [2]
smallest

13 Pam wins the student of the year award in New Zealand.
She sends three photographs of the award ceremony by post to her relatives.

- one of size 13 cm by 23 cm to her uncle in Australia
- one of size 15 cm by 23 cm to her sister in China
- one of size 23 cm by 35 cm to her mother in the UK

Maximum lengths	Australia	Rest of the world
13 cm by 23.5 cm	$1.90	$2.50
15.5 cm by 23.5 cm	$2.40	$2.90
23 cm by 32.5 cm	$2.80	$3.40
26 cm by 38.5 cm	$3.60	$5.20

The cost of postage is shown in the table above.
Use this information to calculate the total cost.

Answer $ ..... [3]

9) June 2009 V1

3 At 0506 Mr Ho bought 850 fish at a fish market for \$2.62 each.
95 minutes later he sold them all to a supermarket for \$2.86 each.

(a) What was the time when he sold the fish?

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

(b) Calculate his total profit.

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

10) November 2010 V1

2 Use a calculator to work out the **exact** value of

$$1 + \frac{1}{5} + \left(\frac{1}{5}\right)^2 + \left(\frac{1}{5}\right)^3 + \left(\frac{1}{5}\right)^4 .$$

Answer ..... [2]

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11) November 2010 V2

8 Show that $\frac{7}{27} + 1\frac{7}{9} = 2\frac{1}{27}$.

Write down all the steps in your working.

Answer

[2]

12) November 2010 V3

5 Show that $3\frac{3}{4} + 1\frac{1}{3} = 5\frac{1}{12}$.

Write down all the steps in your working.

Answer

[2]

13) June 2011 V2

3 Show that $1\frac{5}{9} \div 1\frac{7}{9} = \frac{7}{8}$

Write down all the steps in your working.

Answer

[2]

14) June 2011 V3

7 **(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]

17) November 2011 V1

1 Use your calculator to find $\sqrt{\frac{45\times 5.75}{3.1+1.5}}$.

Answer ..... [2]

18) November 2011 V1

4 Write down all the working to show that $\frac{\frac{3}{5}+\frac{2}{3}}{\frac{3}{5}\times\frac{2}{3}} = 3\frac{1}{6}$.

Answer

[3]

19) November 2011 V2

5 Jiwan incorrectly wrote $1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} = 1\frac{3}{9}$.

Show the correct working and write down the answer as a mixed number.

Answer ..... [3]

20) November 2011 V3

8 Find the value of $\frac{\sqrt[3]{17.1 \quad 1.89}}{10.4 + \sqrt{8.36}}$.

Answer ..... [2]

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12 **Without using your calculator**, work out $1\frac{5}{6}+\frac{9}{10}$.

You must show your working and give your answer as a mixed number in its simplest form.

Answer ..... [3]

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4 $1\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = \frac{p}{12}$

Work out the value of p.

Show all your working.

Answer p = ... [2]

12 **Without using your calculator**, work out the following.
Show all the steps of your working and give each answer as a fraction in its simplest form.

(a) $\frac{11}{12} - \frac{1}{3}$

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

(b) $\frac{1}{4} \div \frac{11}{13}$

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

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25) November 2012 V1

2 Use your calculator to find the value of

$$\frac{8.1^2 + 6.2^2 - 4.3^2}{2 \times 8.1 \times 6.2}$$

Answer ..... [2]

26) November 2012 V1

4 Write down all your working to show that the following statement is correct.

$$\frac{1 + \frac{8}{9}}{2 + \frac{1}{2}} = \frac{34}{45}$$

Answer

[2]

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27) November 2012 V3

2 Show that $\left(\frac{1}{10}\right)^2 + \left(\frac{2}{5}\right)^2 = 0.17$.

Write down all the steps in your working.

Answer

[2]

28) June 2013 V1

5 Show that $1\frac{1}{2} \div \frac{3}{16} = 8$.

Do not use a calculator and show all the steps of your working.

Answer

[2]

29) June 2013 V2

11 Without using a calculator, work out $\frac{6}{7} \div 1\frac{2}{3}$

Write down all the steps in your working.

Answer ..... [3]

30) June 2013 V3

4 Use a calculator to find

(a) $\sqrt{5\frac{5}{24}}$,

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

(b) $\frac{\cos 40°}{7}$

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

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31) June 2013 V3

5 Write the following in order of size, **smallest** first.

$(1.5)^{\frac{2}{3}}$ $\left(\frac{2}{3}\right)^{1.5}$ $\left(\frac{2}{3}\right)^{1.5}$ $\left(-\frac{2}{3}\right)^{\frac{2}{3}}$

Answer ..... < ..... < ..... < ..... [2]

32) November 2013 V1

15 **Do not use a calculator in this question and show all the steps of your working.**

Give each answer as a fraction in its lowest terms.

Work out.

(a) $\frac{3}{4} - \frac{1}{12}$

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

(b) $2\frac{1}{2} \times \frac{4}{25}$

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

33) June 2014 V1

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

Find the value of y when $x = 6$.
Give your answer as a mixed number in its simplest form.

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

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1 Calculate $\frac{\sqrt[3]{16}}{1.3^2}$.

Answer ..... [1]

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35) June 2014 V2

8 Without using your calculator, work out $\frac{5}{6} - \left(\frac{1}{2} \times 1\frac{1}{2}\right)$

Write down all the steps of your working.

Answer ..... [3]

36) June 2014 V3

10 Without using a calculator, work out $1\frac{1}{4} - \frac{7}{9}$

Write down all the steps in your working.

Answer ..... [3]

5 Without using a calculator, work out $\frac{1}{4} + \frac{1}{6}$.

Write down all the steps in your working and give your answer as a fraction in its simplest form.

Answer ..... [2]

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38) November 2014 V2

2 Calculate $\dfrac{8.24 + 2.56}{1.26 - 0.72}$

Answer ..... [1]

39) November 2014 V2

8 **Without using a calculator**, work out $1\frac{1}{6} \div \frac{7}{8}$

Show all your working and give your answer as a fraction in its lowest terms.

Answer ..... [3]

40) November 2014 V3

2 Write the following in order of size, smallest first.

$0.34 \qquad \sqrt{0.6} \qquad 0.6^2 \qquad 0.7^3$

Answer ..... < ..... < ..... < ..... [2]
smallest

41) June 2015 V1

2 Use your calculator to work out $\sqrt{10 + 0.6 \times (8.3^2 + 5)}$.

Answer ..... [1]

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42) June 2015 V2

12 Without using a calculator, work out $\frac{4}{5} \div 2\frac{2}{3}$.

Write down all the steps of your working and give your answer as a fraction in its simplest form.

Answer ..... [3]

43) June 2015 V3

8 **Without using a calculator**, work out $1\frac{7}{8} \div \frac{5}{9}$.

Show all your working and give your answer as a fraction in its lowest terms.

Answer ..... [3]

44) November 2015 V2

12 Without using your calculator, work out $2\frac{1}{4} - \frac{11}{12}$.

You must show all your working and give your answer as a fraction in its lowest terms.

Answer ..... [3]

45) November 2015 V3

2 Calculate $\frac{2.07 - 1.89}{5.71 - 3.92}$.

Answer ..... [1]

46) November 2015 V3

15 Work out $\frac{2}{3} + \frac{1}{6} \quad \frac{1}{4}$, giving your answer as a fraction in its lowest terms.

Do not use a calculator and show all the steps of your working.

Answer ..... [3]

47) March 2015 V2

16 **Without using your calculator**, work out $2\frac{7}{9} \div \frac{5}{6}$.

Give your answer as a fraction in its lowest terms.
You must show each step of your working.

Answer ..... [4]

9 **Without using a calculator**, work out $1\frac{4}{5} \div \frac{3}{7}$

Show all your working and give your answer as a fraction in its lowest terms.

Answer ..... [3]

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10 Jason receives some money for his birthday.
He spends $\frac{11}{15}$ of the money and has \$14.40 left.

Calculate how much money he received for his birthday.

Answer \$ ..... [3]

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9 **Without using your calculator**, work out $1\frac{7}{12} + \frac{13}{20}$

You must show all your working and give your answer as a mixed number in its simplest form.

..... [3]

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51) June 2016 V1

16 **Without using a calculator**, work out $\frac{6}{7} \div 1\frac{2}{3}$.

Show all your working and give your answer as a fraction in its lowest terms.

..... [3]

52) June 2016 V2

2 Calculate.

$$\frac{3.07 + 2^4}{5.03 \quad 1.79}$$

..... [1]

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53) June 2016 V2

14 **Without using a calculator**, work out $2\frac{5}{8} \times \frac{3}{7}$.

Show all your working and give your answer as a mixed number in its lowest terms.

[3]

54) June 2016 V3

5 **Without using a calculator**, work out $\frac{1}{12} \times 1\frac{1}{5}$.

Show all your working and give your answer as a fraction in its lowest terms.

..... [2]

55) November 2016 V1

4 Work out $\frac{2}{3} - \frac{1}{4}$, giving your answer as a fraction in its lowest terms.

Do not use a calculator and show all the steps of your working.

.....[2]

56) November 2016 V1

14 **Without using your calculator**, work out $\frac{3}{4} + \frac{2}{3} - \frac{1}{8}$.

You must show all your working and give your answer as a mixed number in its simplest form.

..... [4]

57) November 2016 V3

5 **Without using a calculator**, work out $\frac{3}{5}+\frac{1}{6}$.

Write down all the steps of your working and give your answer as a fraction in its simplest form.

..... [2]

58) November 2016 V3

13 Write the recurring decimal $0.\dot{2}$ as a fraction.
[$0.\dot{2}$ means 0.222…]

..... [2]

59) June 2015 V2

9 Write the recurring decimal $0.2\dot{5}$ as a fraction.
[$0.2\dot{5}$ means 0.2555...]

Answer ..... [2]

60) November 2015 V1

10 Write the recurring decimal $0.1\dot{5}$ as a fraction.
[$0.1\dot{5}$ means 0.1555...]

Answer ..... [2]

61) March 2016 V2

6 Write the recurring decimal $0.\dot{4}$ as a fraction.
[$0.\dot{4}$ means 0.444…]

..... [2]

62) June 2016 V2

12 Write the recurring decimal $0.3\dot{6}$ as a fraction.
Give your answer in its simplest form.
[0.36 means $0.3666\ldots$]

..... [3]

63) June 2016 V3

8 Write the recurring decimal $0.3\dot{2}$ as a fraction
[$0.3\dot{2}$ means $0.3222\ldots$]

..... [2]

64) November 2016 V1

12 **(a)** Write \$0.70 as a fraction of \$5.60, giving your answer in its lowest terms.

..... [1]

(b) Write the recurring decimal $0.\dot{1}\dot{8}$ as a fraction in its lowest terms.
[$0.\dot{1}\dot{8}$ means 0.181818…]

..... [2]

65) June 2018 V1

3 Write the recurring decimal $0.\dot{6}\dot{3}$ as a fraction.

..... [1]

Ratio and Percentage

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1) November 2013 V1

1 Work out 72 cents as a percentage of 83 cents.

Answer ..... % [1]

2) November 2013 V1

4 Calculate 17.5% of 44kg.

Answer ..... kg [2]

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3) June 2011 V1

1 A concert hall has 1540 seats.

Calculate the number of people in the hall when 55% of the seats are occupied.

Answer ..... [1]

4) June 2016 V1

2 From a sample of 80 batteries, 3 are faulty.

Work out the percentage of faulty batteries.

..... % [1]

10 Maria decides to increase her homework time of 8 hours per week by 15%.

Calculate her new homework time.
Give your answer in hours and minutes.

Answer ..... h ..... min [3]

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6) November 2012 V3

5 Maria pays $84 rent.
The rent is increased by 5%.

Calculate Maria's new rent.

Answer $ ..... [2]

7) June 2015 V3

10 In a sale, the cost of a coat is reduced from $85 to $67.50 .

Calculate the percentage reduction in the cost of the coat.

Answer ..... % [3]

8) June 2014 V2

9 At the beginning of July, Kim had a mass of 63 kg.
At the end of July, his mass was 61 kg.

Calculate the percentage loss in Kim's mass.

Answer ..... % [3]

11 Ahmed paid $34 000 for a car.
His car decreased in value by 40% at the end of the first year.
The value at the end of the second year was 10% less than the value at the end of the first year.

Calculate the value of Ahmed's car after 2 years.

$ ..... [2]

5 Amalie makes a profit of 20% when she sells a shirt for $21.60.

Calculate how much Amalie paid for the shirt.

Answer $ ..... [2]

11) November 2012 V2

5 The Tiger Sky Tower in Singapore has a viewing capsule which holds 72 people.
This number is 75% of the population of Singapore when it was founded in 1819.
What was the population of Singapore in 1819?

Answer ..... [2]

12) November 2013 V3

6 In 2012 the cost of a ticket to an arts festival was $30.
This was 20% more than the ticket cost in 2011.

Calculate the cost of the ticket in 2011.

Answer $ ..... [3]

13) June 2014 V2

11 Anita buys a computer for $391 in a sale.
The sale price is 15% less than the original price.

Calculate the original price of the computer.

Answer $ ..... [3]

14) November 2015 V2

14 Jasjeet and her brother collect stamps.
When Jasjeet gives her brother 1% of her stamps, she has 2475 stamps left.

Calculate how many stamps Jasjeet had originally.

Answer ..... [3]

14*) November 2020 V2

16 The selling price of a shirt is $26.50 .
This includes a tax of 6%.

Calculate the price of the shirt before the tax was added.

$ ..... [2]

15) June 2010 V1

2 Michel changed \$600 into pounds (£) when the exchange rate was £1 = \$2.40.
He later changed all the pounds back into dollars when the exchange rate was £1 = \$2.60.

How many dollars did he receive?

Answer \$ ..... [2]

16) June 2010 V3

3 Ricardo changed \$600 into pounds (£) when the exchange rate was \$1 = £0.60.
He later changed all the pounds back into dollars when the exchange rate was \$1 = £0.72.

How many dollars did he receive?

Answer \$ ..... [2]

19 Reina went on holiday to New Zealand.

(a) She travelled the 65 km from Tokyo to Narita Airport by taxi.

The taxi journey cost 300 yen (¥) per kilometre plus a fixed charge of ¥700.

Calculate the cost of the taxi journey.

Answer(a) ¥ ..... [2]

(b) At Narita Airport, Reina changed ¥71 190 into New Zealand dollars (NZ$).

The exchange rate was NZ$1 = ¥56.5.

How many New Zealand dollars did she receive?

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

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18) November 2010 V2

15 The air fare from Singapore to Stockholm can be paid for in Singapore dollars (S$) or Malaysian Ringitts (RM).
One day the fare was S$740 or RM1900 and the exchange rate was S$1= RM2.448 .

How much less would it cost to pay in Singapore dollars?
Give your answer in Singapore dollars correct to the nearest Singapore dollar.

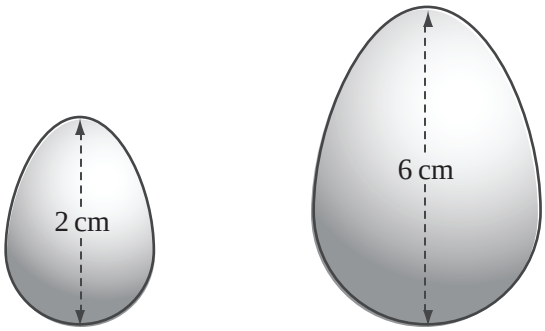
Answer S$ ..... [3]

19) November 2010 V3

7 In France, the cost of one kilogram of apricots is €3.38 .
In the UK, the cost of one kilogram of apricots is £4.39 .
£1 = €1.04
Calculate the difference between these prices.
Give your answer in pounds (£).

Answer £ ..... [2]

6



NOT TO SCALE

A company makes solid chocolate eggs and their shapes are mathematically similar.
The diagram shows eggs of height 2 cm and 6cm.
The mass of the small egg is 4 g.

Calculate the mass of the large egg.

Answer ..... g [2]

13 The scale on a map is 1: 20 000.

(a) Calculate the actual distance between two points which are 2.7 cm apart on the map.
Give your answer in kilometres.

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

(b) A field has an area of 64 400 m^2
Calculate the area of the field on the map in cm^2.

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

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22) June 2011 V2

5 A meal on a boat costs 6 euros (€) or 11.5 Brunei dollars ($).

In which currency does the meal cost less, on a day when the exchange rate is €1 = $1.9037?
Write down all the steps in your working.

Answer ..... [2]

23) June 2011 V3

12 Federico changed 400 euros (€) into New Zealand dollars (NZ$) at a rate of €1 = NZ$ 2.1 .
He spent x New Zealand dollars and changed the rest back into euros at a rate of €1 = NZ$ d.

Find an expression, in terms of x and d, for the number of euros Federico received.

Answer € ..... [3]

19 The scale of a map is $1 : 250\,000$.

(a) The actual distance between two cities is 80km.

Calculate this distance on the map. Give your answer in centimetres.

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

(b) On the map a large forest has an area of $6\,cm^2$.

Calculate the actual area of the forest. Give your answer in square kilometres.

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

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1 Martha divides \$240 between spending and saving in the ratio

spending : saving = 7 : 8 .

Calculate the amount Martha has for spending.

Answer \$ ..... [2]

26) November 2011 V3

12 Alberto changes 800 Argentine pesos (ARS) into dollars ($) when the rate is $1 = 3.8235 ARS. He spends $150 and changes the remaining dollars back into pesos when the rate is $1 = 3.8025 ARS.

Calculate the amount Alberto now has in pesos.

Answer ..... ARS [3]

27) November 2011 V3

13 During a marathon race an athlete loses 2 % of his mass. At the end of the race his mass is 67.13 kg.

Calculate his mass before the race.

Answer ..... kg [3]

28) June 2012 V1

1 The price of a ticket for a football match is $124

(a) Calculate the amount received when 76500 tickets are sold.

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

(b) Write your answer to **part (a)** in standard form.

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

29) June 2012 V1

2 Gregor changes $700 into euros (€) when the rate is €1 = $1.4131 .

Calculate the amount he receives.

Answer € ..... [2]

15 The scale of a map is $1 : 500\,000$.

(a) The actual distance between two towns is 172 km.
Calculate the distance, in centimetres, between the towns on the map.

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

(b) The area of a lake on the map is $12\,cm^2$
Calculate the actual area of the lake in km^2.

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

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31) June 2012 V2

13 The taxi fare in a city is \$3 **and** then \$0.40 for every kilometre travelled.

(a) A taxi fare is \$9.

How far has the taxi travelled?

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

(b) Taxi fares cost 30% more at night.

How much does a \$9 daytime journey cost at night?

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

32) June 2012 V3

8 During her holiday, Hannah rents a bike.
She pays a fixed cost of \$8 and then a cost of \$4.50 per day.
Hannah pays with a \$50 note and receives \$10.50 change.

Calculate for how many days Hannah rents the bike.

Answer ..... days [3]

7 The train fare from Bangkok to Chiang Mai is 768 baht.
The exchange rate is £1 = 48 baht.

Calculate the train fare in pounds (£).

Answer £ ..... [2]

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3 Jamie needs 300 g of flour to make 20 cakes.

How much flour does he need to make 12 cakes?

Answer ..... g [2]

3 Pedro and Eva do their homework.
Pedro takes 84 minutes to do his homework.

The ratio Pedro's time : Eva's time = 7 : 6.

Work out the number of minutes Eva takes to do her homework.

Answer ..... min [2]

36) June 2013 V1

13 Martina changed 200 Swiss francs (CHF) into euros (€).
The exchange rate was €1 = 1.14 CHF.

Calculate how much Martina received.
Give your answer correct to the nearest euro.

Answer € ..... [3]

37) June 2013 V2

6 George and his friend Jane buy copies of the same book on the internet.
George pays $16.95 and Jane pays £11.99 on a day when the exchange rate is $1 = £0.626.

Calculate, in dollars, how much more Jane pays.

Answer $ ..... [2]

38) June 2013 V3

1 Sheila can pay her hotel bill in Euros (€) or Pounds (£).
The bill was €425 or £365 when the exchange rate was £1 = €1.14 .

In which currency was the bill cheaper?
Show all your working.

Answer ..... [2]

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10 The table shows how the dollar to euro conversion rate changed during one day.

Time	1000	1100	1200	1300	1400	1500	1600
$1	€1.3311	€1.3362	€1.3207	€1.3199	€1.3200	€1.3352	€1.3401

Khalil changed $500 into euros (€).

How many more euros did Khalil receive if he changed his money at the highest rate compared to the lowest rate?

Answer € ..... [3]

6 Carlo changed 800 euros (€) into dollars for his holiday when the exchange rate was €1 = $1.50 .
His holiday was then cancelled.
He changed all his dollars back into euros and he received €750.

Find the new exchange rate.

Answer €1 = $..... [3]

3 Chris changes $1350 into euros (€) when €1 = $1.313 .

Calculate how much he receives.

Answer €..... [2]

8 On a ship, the price of a gift is 24 euros (€) or $30.

What is the difference in the price on a day when the exchange rate is €1 = $1.2378?
Give your answer in dollars, correct to the nearest cent.

Answer $..... [3]

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43) November 2014 V2

7 For her holiday, Alyssa changed 2800 Malaysian Ringgits (MYR) to US dollars ($) when the exchange rate was 1 MYR = $0.325 .

At the end of her holiday she had $210 left.

(a) How many dollars did she spend?

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

(b) She changed the $210 for 750 MYR.

What was the exchange rate in dollars for 1 MYR?

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

44) November 2014 V3

1 $1 = 8.2 rand

Change $350 into rands.

Answer ..... rand [2]

45) June 2015 V3

1 Ahmed and Babar share 240 g of sweets in the ratio 7 : 3.

Calculate the amount Ahmed receives.

Answer ..... g [2]

46) June 2015 V3

7 James buys a drink for 2 euros (€).

Work out the cost of the drink in pounds (£) when £1 = €1.252 .
Give your answer correct to 2 decimal places.

Answer £ ..... [3]

4 Pip and Ali share \$785 in the ratio Pip : Ali = 4 : 1.

Work out Pip's share.

Answer \$ ..... [2]

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48) November 2015 V2

3 Carlos changed \$950 into euros (€) when the exchange rate was €1 = \$1.368 .

Calculate how many euros Carlos received.

Answer € ..... [2]

49) March 2015 V2

9 Ahmed, Batuk and Chand share \$1000 in the ratio 8: 7: 5.

Calculate the amount each receives.

Answer Ahmed \$

Batuk \$ .....

Chand \$ ..... [3]

50) June 2016 V1

5 Omar changes 2000 Saudi Arabian riyals (SAR) into euros (€) when the exchange rate is €1 = 5.087 SAR.

Work out how much Omar receives, giving your answer correct to the nearest euro.

€ .....[2]

51) November 2016 V1

3 The price of a toy is 12 euros (€) in Germany and 14 Swiss francs in Switzerland.
1 Swiss franc = €0.905

Calculate the difference between these two prices.
Give your answer in euros.

€ .....[2]

12 Ralf and Susie share \$57 in the ratio 2 : 1.

(a) Calculate the amount Ralf receives.

\$ ..... [2]

(b) Ralf gives \$2 to Susie.

Calculate the new ratio Ralf's money : Susie's money.
Give your answer in its simplest form.

..... : .....[2]

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Simple and Compound Interest

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9 Johan invested \$600 for 3 years at 4% per year **compound** interest.

Calculate the final amount he had after three years.

Answer \$ ..... [3]

2) November 2010 V3

10 Nikhil invests \$200 for 2 years at 4% per year **compound** interest.
Calculate the **exact** amount Nikhil has after 2 years.

Answer \$ ..... [2]

3) June 2011 V3

9 Eva invests \$120 at a rate of 3% per year **compound interest**.

Calculate the total amount Eva has after 2 years.
Give your answer correct to 2 decimal places.

Answer \$ ..... [3]

4) November 2011 V3

6 Pedro invested \$800 at a rate of 5% per year **compound** interest.
Calculate the **total** amount he has after 2 years.

Answer \$ ..... [2]

5) June 2012 V1

10 Shania invests \$750 at a rate of $2\frac{1}{2}$% per year simple interest.

Calculate the **total** amount Shania has after 5 years.

Answer \$ ..... [3]

6) June 2012 V3

2 Hans invests $750 for 8 years at a rate of 2% per year simple interest.

Calculate the interest Hans receives.

Answer $ ..... [2]

7) June 2012 V3

11 Boris invests $280 for 2 years at a rate of 3% per year compound interest.

Calculate the interest Boris receives at the end of the 2 years.
Give your answer correct to 2 decimal places.

Answer $ ..... [4]

8) November 2012 V1

8 Acri invested $500 for 3 years at a rate of 2.8% per year compound interest.

Calculate the final amount he has after 3 years.

Answer $ ..... [3]

9) November 2012 V3

1 Samantha invests $600 at a rate of 2% per year simple interest.

Calculate the interest Samantha earns in 8 years.

Answer $ ..... [2]

10) June 2013 V1

14 Bruce invested $420 at a rate of 4% per year compound interest.

Calculate the **total** amount Bruce has after 2 years.
Give your answer correct to 2 decimal places.

Answer $ ..... [3]

11) June 2013 V2

13 Carol invests $6250 at a rate of 2% per year compound interest.

Calculate the **total** amount Carol has after 3 years.

Answer $ ..... [3]

12) November 2013 V1

8 Emily invests $\$x$ at a rate of 3% per year simple interest.
After 5 years she has \$20.10 interest.

Find the value of x

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

13) November 2014 V1

7 The population of Dubai at the end of 2012 was 2.1 million.
This was predicted to increase at a rate of 6% each year.

Calculate the predicted population of Dubai at the end of 2015.

Answer ..... million [3]

14) November 2014 V2

17 Alex invests $200 for 2 years at a rate of 2% per year simple interest.
Chris invests $200 for 2 years at a rate of 2% per year compound interest.

Calculate how much more interest Chris has than Alex.

Answer $..... [4]

15) November 2014 V3

10 Maryah borrows $12 000 to start a business.
The loan is for 3 years at a rate of 5% per year compound interest.
The loan has to be paid back at the end of the 3 years.

Calculate the total amount to be paid back.

Answer $..... [3]

16) June 2015 V1

16 Georg invests \$5000 for 14 years at a rate of 2% per year compound interest.

Calculate the interest he receives.
Give your answer correct to the nearest dollar.

Answer \$ ..... [4]

17) November 2015 V1

16 Hazel invests \$1800 for 7 years at a rate of 1.5% per year compound interest.

Calculate how much interest she will receive after the 7 years.
Give your answer correct to the nearest dollar.

Answer \$ ..... [4]

24 Marcel invests \$2500 for 3 years at a rate of 1.6% per year simple interest.
Jacques invests \$2000 for 3 years at a rate of x% per year compound interest.
At the end of the 3 years Marcel and Jacques receive the same amount of interest.

Calculate the value of x correct to 3 significant figures.

$x =$ .....[5]

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8 Robert buys a car for $8000.
At the end of each year the value of the car has decreased by 10% of its value at the beginning of that year.

Calculate the value of the car at the end of 7 years.

Answer $ ..... [2]

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12 The population of Olton is decreasing at a rate of 3% per year.
In 2013, the population was 50 000.

Calculate the population after 4 years.
Give your answer correct to the nearest hundred.

Answer ..... [3]

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19 It is estimated that the world's population is growing at a rate of 1.14% per year.
On January 1st 2014 the population was 7.23 billion.

(a) Find the expected population on January 1st 2020.

.....billion [2]

(b) Find the year when the population is expected to reach 10 billion.

..... [2]

19 At the start of an experiment there are 20000 bacteria
The number of bacteria increases at a rate of 30% per hour.

(a) Work out the number of bacteria after 4 hours.

..... [2]

(b) After how many **whole** hours, from the start of the experiment, will the number of bacteria be greater than one million?

hours [2]

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Rounding Numbers

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1) June 2010 V1

6 Calculate the value of $\frac{1}{2}\sqrt{\frac{1}{2}+\frac{1}{2}\sqrt{\frac{1}{2}}}$

(a) writing down all the figures in your calculator answer,

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

(b) writing your answer correct to 4 significant figures.

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

2) November 2010 V1

1 Write each number correct to 1 significant figure and estimate the value of the calculation.
You must show your working.

$$2.65 \times 4.1758 + 7.917$$

Answer ..... [2]

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3) November 2010 V3

3 Calculate $\sqrt[3]{2.35^2 - 1.09^2}$

Give your answer correct to 4 decimal places.

Answer ..... [2]

4) June 2011 V2

6 Use your calculator to find the value of $2^{\sqrt{3}}$.

Give your answer correct to 4 significant figures.

Answer ..... [2]

5) June 2012 V2

5 A lake has an area of $63\,800\,000\,000$ square metres.

Write this area in square kilometres, correct to 2 significant figures.

Answer ..... km^2 [2]

6) June 2012 V3

3 **(a)** Calculate $\sqrt[3]{7^{1.5} + 22^{0.9}}$ and write down your full calculator display.

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

(b) Write your answer to **part (a)** correct to 4 significant figures.

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

7) November 2012 V2

1 Write the following numbers correct to one significant figure.

(a) 7682

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

(b) 0.07682

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

8) November 2012 V2

2 Work out $11.3139 - 2.28 \times \sqrt[3]{9^2}$.

Give your answer correct to one decimal place.

Answer ..... [2]

9) November 2012 V3

7 Find the value of $\dfrac{7.2}{11.8 - 10.95}$.

Give your answer correct to 4 significant figures.

Answer ..... [2]

10) June 2013 V1

2 **(a)** Calculate $\sqrt{5.7} - 1.03^2$

Write down all the numbers displayed on your calculator.

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

(b) Write your answer to **part (a)** correct to 3 decimal places.

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

11) June 2013 V2

7 **(a)** Use your calculator to work out $\sqrt{65} - 1.7^2$.

Write down all the numbers displayed on your calculator.

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

(b) Write your answer to **part (a)** correct to 2 significant figures.

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

12) November 2013 V1

2 Calculate $\frac{5.27 - 0.93}{4.89 - 4.07}$

Give your answer correct to 4 significant figures.

Answer ..... [2]

13) June 2014 V1

1 Use your calculator to work out $\sqrt{\frac{3}{4}} + 2^{-1}$.

Give your answer correct to 2 decimal places.

Answer ..... [2]

14) June 2014 V1

4

$$p = \frac{4.8 \times 1.98276}{16.83}$$

(a) In the spaces provided, write each number in this calculation correct to 1 significant figure.

Answer(a)

..... × .....

.....

[1]

(b) Use your answer to **part (a)** to estimate the value of p.

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

15) June 2014 V2

2 **(a)** Write 569000 correct to 2 significant figures.

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

(b) Write 569000 in standard form.

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

16) November 2014 V1

1 Use your calculator to find the value of 1.35^7.

Give your answer correct to 5 significant figures.

Answer ..... [2]

17) November 2014 V1

6 Write 15.0782 correct to

(a) one decimal place,

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

(b) the nearest 10.

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

18) November 2015 V1

6 By writing each number correct to 1 significant figure, estimate the value of $\frac{\sqrt{3.9} \times 29.3}{8.9 - 2.7}$.

Show all your working.

Answer ..... [2]

19) November 2015 V3

1 Write 168.9 correct to 2 significant figures.

Answer ..... [1]

20) June 2016 V1

4 Calculate $(2.1 - 0.078)^{17}$, giving your answer correct to 4 significant figures.

[2]

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21) June 2016 V2

3 Write 3.5897 correct to 4 significant figures.

..... [1]

22) June 2016 V3

2 Write 71496 correct to 2 significant figures.

[1]

23) November 2016 V1

2 Write 0.040 190 7 correct to

(a) 3 significant figures,

.....[1]

(b) 3 decimal places.

.....[1]

1 **(a)** Write 14 835 correct to the nearest thousand.

..... [1]

(b) Write your answer to **part (a)** in standard form.

..... [1]

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Standard Form

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5 Calculate the value of $5(6 \times 10^3 + 400)$, giving your answer in standard form.

Answer ..... [2]

2) June 2010 V2

6 Change 64 square metres into square millimetres.
Give your answer in standard form.

Answer ..... mm^2 [2]

3) June 2010 V3

9 1 second = 10^6 microseconds.

Change 3×10^{13} microseconds into minutes. Give your answer in standard form.

Answer ..... min [2]

4) November 2010 V1

6 Work out $\dfrac{240^2}{5\times 10^6}$.

Give your answer in standard form.

Answer ..... [2]

5) November 2010 V2

6 Write 0.00658

(a) in standard form,

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

(b) correct to 2 significant figures.

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

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6) June 2011 V1

5 A hummingbird beats its wings 24 times per second.

(a) Calculate the number of times the hummingbird beats its wings in one hour.

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

(b) Write your answer to **part (a)** in standard form.

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

7) June 2011 V2

7 Solve the equation $4x + 6 \times 10^3 = 8 \times 10^4$.

Give your answer in standard form.

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

8) June 2011 V3

6 **(a)** Write 16 460000 in standard form.

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

(b) Calculate $7.85 \div (2.366 \times 10^2)$, giving your answer in standard form.

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

9) November 2011 V1

2 Work out $2(3 \times 10^8 - 4 \times 10^6)$, giving your answer in standard form.

Answer ..... [2]

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10) November 2011 V3

5 The population of a city is 128 000, correct to the nearest thousand.

(a) Write 128 000 in standard form.

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

(b) Write down the upper bound of the population.

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

11) June 2013 V2

4 Calculate $(4.3 \times 10^8) + (2.5 \times 10^7)$.

Give your answer in standard form.

Answer ..... [2]

12) June 2013 V3

9 Calculate, giving your answers in standard form,

(a) $2 \times (5.5 \times 10^4)$,

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

(b) $(5.5 \times 10^4) - (5 \times 10^4)$.

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

13) November 2013 V3

12 Write the answer to the following calculations in standard form.

(a) $600 \div 8000$

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

(b) $10^8 - 7 \times 10^6$

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

14) June 2014 V1

12 $p = 4 \times 10^5$ $q = 5 \times 10^4$

Find, giving your answer in standard form,

(a) pq,

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

(b) $\frac{q}{p}$.

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

15) June 2014 V3

5 **(a)** Use your calculator to find the value of $7.5^{-0.4} \div \sqrt{57}$.
Write down your full calculator display.

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

(b) Write your answer to **part (a)** in standard form.

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

16) November 2014 V1

9 **(a)** Write 2.8×10^2 as an ordinary number.

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

(b) Work out $2.5 \times 10^8 \times 2 \times 10^{-2}$.
Give your answer in standard form.

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

17) November 2014 V3

3 Work out $4 \times 10^{-5} \times 6 \times 10^{12}$.
Give your answer in standard form.

Answer ..... [2]

18) June 2015 V1

3 Write 270 000 in standard form.

Answer ..... [1]

19) June 2015 V2

1 Write 53 400 000 in standard form.

Answer ..... [1]

20) November 2015 V3

3 Write 1.7×10^{-4} as an ordinary number.

Answer ..... [1]

4 Write in standard form.

(a) 2 470 000

..... [1]

(b) 0.0079

..... [1]

22) June 2016 V1

3 Write 1.27×10^{-3} as an ordinary number.

..... [1]

23) June 2016 V2

1 Write 0.000 057 4 in standard form.

..... [1]

24) November 2016 V1

5 **(a)** Write 5^{3} as a fraction.

..... [1]

(b) Write 0.004 56 in standard form.

..... [1]

25) June 2018 V2

8 Here are some numbers written in standard form.

3.4×10^{1} 1.36×10^{6} 7.9×10^{0} 2.4×10^{5} 5.21×10^{3} 4.3×10^{2}

From these numbers, write down

(a) the largest number,

..... [1]

(b) the smallest number.

..... [1]

26) November 2020 V2

14 Work out $(3 \times 10^{199}) + (2 \times 10^{201})$.
Give your answer in standard form.

..... [2]

Limits of Accuracy

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8 A carton contains 250ml of juice, correct to the nearest millilitre.

Complete the statement about the amount of juice, j ml, in the carton.

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

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2) November 2013 V1

7 The length, p cm, of a car is 440 cm, correct to the nearest 10 cm.

Complete the statement about p.

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

3) November 2014 V2

6 The length, l metres, of a football pitch is 96 m, correct to the nearest metre.

Complete the statement about the length of this football pitch.

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

4) November 2016 V3

8 The length of a car is 4.2 m, correct to 1 decimal place.

Write down the upper bound and the lower bound of the length of this car.

Upper bound = ... m

Lower bound = ... m [2]

5) June 2010 V2

9 A fence is made from 32 identical pieces of wood, each of length 2 metres correct to the nearest centimetre.

Calculate the lower bound for the total length of the wood used to make this fence.

Write down your full calculator display.

Answer ..... m [3]

6) June 2010 V3

10 The length of each side of an equilateral triangle is 74 mm, correct to the nearest millimetre.

Calculate the smallest possible perimeter of the triangle.

Answer ..... mm [2]

7) November 2010 V1

8 The length of a side of a regular hexagon is 6.8cm, correct to one decimal place.

Find the smallest possible perimeter of the hexagon.

Answer ..... cm [2]

8) November 2010 V2

9 When a car wheel turns once, the car travels 120cm, correct to the nearest centimetre.

Calculate the lower and upper bounds for the distance travelled by the car when the wheel turns 20 times.

Answer lower bound ..... cm

upper bound ..... cm [2]

9) November 2010 V3

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]

10) June 2011 V2

9 Ashraf takes 1500 steps to walk d **metres** from his home to the station.
Each step is 90 centimetres correct to the nearest 10 cm.

Find the lower bound and the upper bound for d

Answer ..... $\leqslant d <$ ..... [3]

11) June 2011 V3

4 Helen measures a rectangular sheet of paper as 197 mm by 210 mm, each correct to the nearest millimetre.
Calculate the upper bound for the perimeter of the sheet of paper.

Answer ..... mm [2]

12) November 2011 V2

4 The cost of making a chair is $28 correct to the nearest dollar.

Calculate the lower and upper bounds for the cost of making 450 chairs.

Answer lower bound $ .....

upper bound $ ..... [2]

13) June 2012 V1

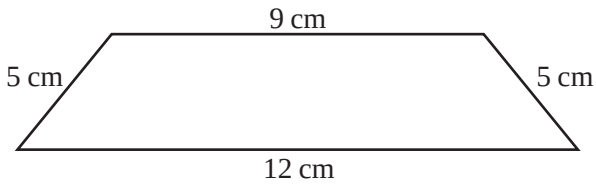
7 The sides of a rectangle are 6.3 cm and 4.8 cm, each correct to 1 decimal place.

Calculate the upper bound for the area of the rectangle.

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

14) June 2012 V3

5



NOT TO SCALE

The diagram shows a quadrilateral.
The lengths of the sides are given to the nearest centimetre.

Calculate the upper bound of the perimeter of the quadrilateral.

Answer ..... cm [2]

15) November 2012 V1

10 A large water bottle holds 25 litres of water correct to the nearest litre.
A drinking glass holds 0.3 litres correct to the nearest 0.1 litre.

Calculate the lower bound for the number of glasses of water which can be filled from the bottle.

Answer ..... [3]

16) November 2012 V2

7 The number of spectators at the 2010 World Cup match between Argentina and Mexico was 82 000 correct to the nearest thousand.
If each spectator paid 2600 Rand (R) to attend the game, what is the lower bound for the total amount paid?
Write your answer in standard form.

Answer R ..... [3]

17) June 2013 V1

9 An equilateral triangle has sides of length 16.1 cm, correct to the nearest millimetre.

Find the lower and upper bounds of the perimeter of the triangle.

Answer Lower bound = ... cm

Upper bound = ... cm [2]

18) June 2013 V2

8 Joe measures the side of a square correct to 1 decimal place.
He calculates the **upper** bound for the area of the square as 37.8225 cm^2

Work out Joe's measurement for the side of the square.

Answer ..... cm [2]

19) November 2013 V2

12 A circle has a radius of 8.5 cm correct to the nearest 0.1 cm.
The lower bound for the area of the circle is $p\pi$ cm^2
The upper bound for the area of the circle is $q\pi$ cm^2.

Find the value of p and the value of q.

Answer p = ...

q = ... [3]

20) June 2014 V2

6 The mass of 1cm^3 of copper is 8.5 grams, correct to 1 decimal place.

Complete the statement about the total mass, T grams, of 12 cm^3 of copper.

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

15 A rectangle has length 127.3 cm and width 86.5 cm, both correct to 1 decimal place.

Calculate the upper bound and the lower bound for the perimeter of the rectangle.

Answer Upper bound = ... cm

Lower bound = ... cm [3]

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22) June 2015 V1

6 Rice is sold in 75 gram packs and 120 gram packs.
The masses of both packs are given correct to the nearest gram.

Calculate the lower bound for the difference in mass between the two packs.

Answer ..... g [2]

23) June 2015 V2

10 One year ago Ahmed's height was 114 cm.
Today his height is 120 cm.
Both measurements are correct to the nearest centimetre.

Work out the upper bound for the increase in Ahmed's height.

Answer ..... cm [2]

24) June 2015 V3

4 An equilateral triangle has sides of length 6.2 cm, correct to the nearest millimetre.

Complete the statement about the perimeter, P cm, of the triangle.

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

25) November 2015 V2

18 A rectangle has length 5.8 cm and width 2.4 cm, both correct to 1 decimal place.

Calculate the lower bound and the upper bound of the perimeter of this rectangle.

Answer Lower bound ..... cm

Upper bound ..... cm [3]

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26) November 2015 V3

20 The volume of a cuboid is 878 cm^3, correct to the nearest cubic centimetre.
The length of the base of the cuboid is 7 cm, correct to the nearest centimetre.
The width of the base of the cuboid is 6 cm, correct to the nearest centimetre.

Calculate the lower bound for the height of the cuboid.

Answer ..... cm [3]

27) March 2016 V2

12 A metal pole is 500 cm long, correct to the nearest centimetre.
The pole is cut into rods each of length 5.8 cm, correct to the nearest millimetre.

Calculate the largest number of rods that the pole can be cut into.

..... [3]

28) June 2016 V2

13 The base of a triangle is 9 cm correct to the nearest cm.
The area of this triangle is 40 cm^2 correct to the nearest 5 cm^2

Calculate the upper bound for the perpendicular height of this triangle.

..... cm [3]

29) June 2016 V3

17 **(a)** $V = IR$

In an experiment I and R are both measured correct to 1 decimal place.

When $I = 4.0$ and $R = 2.7$, find the **lower** bound for V

..... [2]

(b) $S = \frac{D}{T}$

In an experiment D and T are both measured correct to 2 significant figures.

When $D = 7.6$ and $T = 0.23$, find the **upper** bound for S.

[2]

30) November 2016 V2

6 The sides of a square are 8 cm, correct to the nearest centimetre.

Calculate the upper bound for the area of the square.

..... cm^2 [2]

31) June 2018 V2

12 Anna walks 31 km at a speed of 5 km/h.
Both values are correct to the nearest whole number.

Work out the upper bound of the time taken for Anna's walk.

..... hours [2]

32) November 2020 V2

18 The sides of an isosceles triangle are measured correct to the nearest millimetre.
One side has a length of 8.2 cm and another has a length of 9.4 cm.

Find the largest possible value of the perimeter of this triangle.

..... cm [3]

Exponents and Surds

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1) June 2010 V1

16 Simplify

(a) $\left(\frac{p^4}{16}\right)^{0.75}$,

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

(b) $3^2q^{-3} \div 2^3q^{-2}$.

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

2) June 2010 V2

5 Write $2^8 \times 8^2 \times 4^2$ in the form 2^n.

Answer ..... [2]

3) June 2010 V3

6 $3^x \times 9^4 = 3^n$.

Find n in terms of x.

Answer $n =$ ..... [2]

4) November 2010 V1

4 Write the following in order of size, **smallest** first.

$\sqrt{0.9}$ $\sqrt[3]{0.9}$ 0.9^2 0.9^3

Answer ..... < ..... < ..... < ..... [2]

5) November 2010 V1

14 Find the value of n in the following equations.

(a) $2^n = 1024$

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

(b) $4^{2n-3} = 16$

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

6) November 2010 V2

16 Simplify

(a) $\left(\frac{16}{81}x^{16}\right)^{\frac{1}{2}}$,

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

(b) $\frac{16y^{10} \times 4y^{-4}}{32y^{7}}$.

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

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7) June 2011 V1

3 Calculate $81^{0.25} \div 4^{-2}$.

Answer ..... [2]

8) June 2011 V1

4 **(a)** Find m when $4^m \times 4^2 = 4^{12}$.

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

(b) Find p when $6^p \div 6^5 = \sqrt{6}$.

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

9) June 2011 V2

17 Simplify

(a) $32x^8 \div 8x^{32}$,

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

(b) $\left(\frac{x^3}{64}\right)^{\frac{2}{3}}$.

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

10) June 2011 V3

18 Simplify the following.

(a) $(3x^3)^3$

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

(b) $(125x^6)^{\frac{2}{3}}$

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

11) November 2011 V2

3 Use your calculator to find the value of

(a) $3^0 \times 2.5^2$,

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

(b) 2.5^{-2}.

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

12) November 2011 V2

11 Find the values of m and n.

(a) $2^m = 0.125$

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

(b) $2^{4n} \times 2^{2n} = 512$

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

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13) November 2011 V3

4 Find the value of $\left(\frac{27}{8}\right)^{-\frac{4}{3}}$.

Give your answer as an exact fraction.

Answer ..... [2]

14) November 2011 V3

7 Show that $3^{-2} + 2^{-2} = \frac{13}{36}$.

Write down all the steps of your working.

Answer

[2]

25) June 2012 V1

8 Find r when $(5)^{\frac{r}{3}} = 125$.

Answer $r =$ ..... [2]

26) June 2012 V3

14 Simplify the following.

(a) $(4pq^2)^3$

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

(b) $(16x^8)^{-\frac{1}{4}}$

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

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14 **(a)** $\left(\frac{3}{8}\right)^{\frac{3}{8}} \times \left(\frac{3}{8}\right)^{\frac{1}{8}} = p^q$

Find the value of p and the value of q.

Answer(a) $p =$ .....

$q =$ ..... [2]

(b) $5^{-3} + 5^{-4} = k \times 5^{-4}$

Find the value of k.

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

28) November 2012 V3

10 Without using a calculator, show that $\left(\frac{49}{16}\right)^{\frac{3}{2}} = \frac{64}{343}$.

Write down all the steps in your working.

Answer

[2]

29) November 2012 V3

11 Simplify $(256w^{256})^{\frac{1}{4}}$.

Answer ..... [2]

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30) June 2013 V1

11 Write $(27x^{12})^{\frac{1}{3}}$ in its simplest form.

Answer ..... [2]

31) November 2013 V1

13 **(a)** $3^x = \sqrt[4]{3^5}$

Find the value of x.

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

(b) Simplify $(32y^{15})^{\frac{2}{5}}$.

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

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14 **(a)** Simplify $(64q^{-2})^{\frac{1}{2}}$

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

(b) $5^7 \div 5^9 = p^2$

Find p

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

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33) June 2014 V1

5 Write the following in order of size, smallest first.

0.5^2 $\quad$ 0.5 $\quad$ 0.5^3 $\quad$ $\sqrt[3]{0.5}$

Answer ..... < ..... < ..... < ..... [2]

34) June 2014 V1

16 **(a)** $(2^{24})^{\frac{1}{2}} = p^4$

Find the value of p.

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

(b) Simplify $\dfrac{q^2 + q^2}{q^{\frac{1}{4}} \times q^{\frac{1}{4}}}$.

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

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35) June 2014 V2

17 **(a)** Simplify $(3125t^{125})^{\frac{1}{5}}$.

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

(b) Find the value of p when $3^p = \frac{1}{9}$.

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

(c) Find the value of w when $x^{72} \div x^w = x^8$.

Answer(c) $w =$ ..... [1]

36) June 2014 V3

6 Simplify.

$3x^2y^3 \times x^4y$

Answer ..... [2]

37) November 2014 V1

11 **(a)** Simplify $x^8 \div x^2$.

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

(b) Simplify $\left(\frac{x^6}{27}\right)^{\frac{1}{3}}$.

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

38) June 2015 V1

7 Simplify.

$6uw^{-3} \times 4uw^6$

Answer ..... [2]

3 $81^x = 3$

Find the value of x

Answer x = ... [1]

16 **(a)** Find the value of

(i) $\left(\frac{1}{4}\right)^{0.5}$,

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

(ii) $(-8)^{\frac{2}{3}}$.

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

(b) Use a calculator to find the decimal value of $\frac{\sqrt{29} \quad 3 \times 32^{0.4}}{3}$.

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

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40) June 2015 V3

13 Simplify.

(a) $12x^{12} \div 3x^3$

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

(b) $(256y^{256})^{\frac{1}{8}}$

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

41) November 2015 V3

10 Find the value of

(a) $(\sqrt{5})^8$,

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

(b) $\left(\frac{1}{27}\right)^{-\frac{2}{3}}$

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

42) November 2015 V3

17 Simplify.

$$\left(\frac{x^{64}}{16y^{16}}\right)^{\frac{1}{4}}$$

Answer ..... [3]

43) March 2015 V2

21 **(a)** Simplify

(i) x^0,

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

(ii) $m^4 \times m^3$,

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

(iii) $(8p^6)^{\frac{1}{3}}$.

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

(b) $243^x = 3^2$

Find the value of x.

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

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44) March 2016 V2

14 Simplify.

(a) $x^3y^4 \times x^5y^3$

..... [2]

(b) $(3p^2m^5)^3$

..... [2]

45) June 2016 V2

6 Simplify.

$$\left(\frac{1}{2}x^{\frac{2}{3}}\right)^3$$

..... [2]

46) June 2016 V3

7 Simplify.

$$(32x^{10})^{\frac{3}{5}}$$

..... [2]

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47) November 2016 V1

10 Simplify.

$$(36x^{16})^{\frac{1}{2}}$$

..... [2]

48) November 2016 V3

2 Simplify.

$$n^2 \times n^5$$

..... [1]

49) June 2018 V1

9 $3^{-q} \times \frac{1}{27} = 81$

Find the value of q.

$q =$ ..... [2]

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Changing the Subject of Formula

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1) June 2010 V1

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

Answer $d =$ [3]

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2) June 2010 V2

10 Make x the subject of the formula.

$$P = \frac{x + 3}{x}$$

Answer $x =$ [4]

3) June 2010 V3

16 Make y the subject of the formula. $A = \frac{r(y + 2)}{5}$

Answer $y =$ [3]

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4) November 2010 V1

12 Make x the subject of $y = \frac{(x+3)^2}{5}$.

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

5) November 2010 V2

3 Rearrange the formula $J = mv - mu$ to make m the subject.

Answer $m =$ [2]

6) November 2010 V3

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]

7) November 2010 V3

16 $\frac{g}{2} = \sqrt{\frac{h}{i}}$

Find i in terms of g and h.

Answer $i =$ [3]

8) June 2011 V2

11 Rearrange the formula $c = \frac{4}{a\ \ b}$ to make a the subject.

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

9) June 2011 V3

2 Make x the subject of the formula. $y = \frac{x}{3} + 5$

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

14 $T = 2\pi\sqrt{\frac{\ell}{g}}$

(a) Find T when $g = 9.8$ and $\ell = 2$.

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

(b) Make g the subject of the formula.

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

11) November 2011 V2

18 $w = \dfrac{1}{\sqrt{LC}}$

(a) Find w when $L = 8 \times 10^{3}$ and $C = 2 \times 10^{9}$.
Give your answer in standard form.

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

(b) Rearrange the formula to make C the subject.

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

12) November 2011 V3

15 $ap = px + c$

Write p in terms of a, c and x

Answer $p =$ ..... [3]

13) June 2012 V1

17 Make w the subject of the formula.

$$c = \frac{4 + w}{w + 3}$$

Answer $w =$ ..... [4]

14) June 2012 V3

9 Make w the subject of the formula.

$$t = 2 - \frac{3w}{a}$$

Answer $w =$ ..... [3]

15) November 2012 V1

16 Rearrange the formula $y = \frac{x+2}{x-4}$ to make x the subject.

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

16) November 2012 V2

3 $m = \frac{1}{4}[3h^2 + 8ah + 3a^2]$

Calculate the exact value of m when $h = 20$ and $a = 5$.

Answer $m =$ ..... [2]

16 Make y the subject of the formula.

$$A = \pi x^2 - \pi y^2$$

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

20 (a)

$$y = \sqrt{8 + \frac{4}{x}}$$

Find y when $x = 2$.
Give your answer correct to 4 decimal places.

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

(b) Rearrange $y = \sqrt{8 + \frac{4}{x}}$ to make x the subject.

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

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19) November 2013 V1

10 Make b the subject of the formula.

$$c = \sqrt{a^2 + b^2}$$

Answer $b =$ ..... [3]

20) November 2013 V2

6 Rearrange the formula to make x the subject.

$$y = x^2 + 4$$

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

21) June 2014 V1

7 Make x the subject of the formula.

$$y = (x - 4)^2 + 6$$

Answer x = ... [3]

22) June 2014 V2

10 $V = \frac{1}{3}Ah$

(a) Find V when $A = 15$ and $h = 7$.

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

(b) Make h the subject of the formula.

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

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23) November 2014 V2

5 Make r the subject of this formula.

$$v = \sqrt[3]{p + r}$$

Answer r = ... [2]

24) November 2014 V3

8 Make x the subject of the formula.

$$y = 2 + \sqrt{x \quad 8}$$

Answer x = ... [3]

25) November 2015 V1

13 Make x the subject of the formula.

$$y = ax^2 + b$$

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

26) November 2015 V3

16 Make a the subject of the formula $s = ut + \frac{1}{2}at^2$.

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

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27) June 2016 V1

8 $y = \frac{qx}{p}$

Write x in terms of p, q and y.

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

28) June 2016 V2

10 Make p the subject of the formula.

$$rp + 5 = 3p + 8r$$

$p =$ [3]

29) November 2016 V1

18 $y = p^2 + qr$

(a) Find y when $p = -5$, $q = 3$ and $r = -7$.

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

(b) Write p in terms of q, r and y.

$p =$ ..... [2]

30) November 2017 V2

25 Factorise completely.

(a) $x^2 - x - 132$

..... [2]

(b) $x^3 \quad 4x$

..... [2]

Simplifying Algebraic Expressions

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1) June 2010 V3

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

Answer ..... [3]

2) November 2010 V1

3 Expand the brackets and simplify.

$$\frac{1}{2}(6x-2)-3(x-1)$$

Answer ..... [2]

3) June 2011 V3

1 Factorise completely.

$2xy - 4yz$

Answer ..... [2]

4) November 2011 V2

2 Factorise completely $ax + bx + ay + by$.

Answer ..... [2]

5) November 2011 V3

11 Factorise completely.

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

Answer ..... [3]

6) June 2012 V1

3 Factorise completely.

$$15p^2 + 24pt$$

Answer ..... [2]

13 **(a)** Find the value of $7p - 3q$ when $p = 8$ and $q = -5$.

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

(b) Factorise completely.

$3uv + 9vw$

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

8) November 2012 V1

5 Simplify the expression.

$$(a^{\frac{1}{2}} - b^{\frac{1}{2}})(a^{\frac{1}{2}} + b^{\frac{1}{2}})$$

Answer ..... [2]

9) November 2012 V3

4 Expand the brackets.

$$y(3 - y^3)$$

Answer ..... [2]

10) June 2013 V1

6 Factorise completely.

$12xy - 3x^2$

Answer ..... [2]

11) June 2013 V1

10 Factorise completely.

$ap + bp - 2a - 2b$

Answer ..... [2]

12) June 2013 V2

2 Factorise completely.

$kp + 3k + mp + 3m$

Answer ..... [2]

13) November 2013 V1

17 Factorise completely.

(a) $a + b + at + bt$

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

(b) $x^2 - 2x - 24$

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

14) November 2013 V3

9 **(a)** Expand and simplify $(a+b)^2$.

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

(b) Find the value of $a^2 + b^2$ when $a + b = 6$ and $ab = 7$.

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

15) June 2014 V1

10 Factorise completely.

(a) $ax + ay + bx + by$

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

(b) $3(x-1)^2 + (x-1)$

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

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16) June 2014 V2

16 Factorise completely.

(a) $4p^2q - 6pq^2$

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

(b) $u + 4t + ux + 4tx$

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

17) June 2014 V3

4 Factorise completely.

$15a^3 - 5ab$

Answer ..... [2]

18) June 2015 V1

4 Expand and simplify.

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

Answer ..... [2]

19) June 2015 V1

20 Factorise completely.

(a) $yp + yt + 2xp + 2xt$

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

(b) $7(h + k)^2 - 21(h + k)$

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

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20) June 2015 V3

2 Factorise completely.

$9x^2 - 6x$

Answer ..... [2]

21) June 2015 V3

5 Factorise $2x^2 - 5x - 3$.

Answer ..... [2]

22) November 2015 V1

9 Factorise completely.

(a) $ax + ay + 3cx + 3cy$

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

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

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

23) November 2015 V2

15 Factorise

(a) $9w^2 - 100$,

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

(b) $mp + np - 6mq - 6nq$

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

24) November 2015 V3

6 Simplify.

$1 - 2u + u + 4$

Answer ..... [2]

25) November 2015 V3

7 Factorise completely.

$2x - 4x^2$

Answer ..... [2]

26) March 2015 V2

4 Factorise $14p^2 + 21pq$.

Answer ..... [2]

2 Factorise $2x - 4xy$.

..... [2]

24 Factorise completely.

(a) $2a + 4 + ap + 2p$

..... [2]

(b) $162 - 8t^2$

..... [2]

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29) June 2016 V2

15 $y = x^2 + 7x - 5$ can be written in the form $y = (x + a)^2 + b$

Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [3]

30) November 2016 V1

13 Factorise completely.

(a) $4p^2 - 9$

..... [1]

(b) $2ax - 4bx - ay + 2by$

..... [2]

31) November 2016 V2

5 Simplify.

$36y^5 \div 4y^2$

..... [2]

13 Factorise.

(a) $m^3 + m$

..... [1]

(b) $25 - y^2$

..... [1]

(c) $x^2 + 3x - 28$

..... [2]

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Algebraic Fractions

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1) November 2010 V1

16 Simplify this fraction.

$$\frac{x^2 - 5x + 6}{x^2 - 4}$$

Answer [4]

2) June 2010 V2

4 Write as a single fraction $\frac{3a}{8} + \frac{4}{5}$

Answer ..... [2]

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3) June 2010 V3

8 Write as a single fraction in its simplest form

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

Answer ..... [2]

4) November 2010 V1

7 Write as a single fraction in its simplest form.

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

Answer [2]

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

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

Answer [3]

6) November 2010 V3

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]

7) June 2011 V2

15 Write the following as a single fraction in its simplest form.

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

Answer ..... [4]

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8) June 2011 V3

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

Give your answer in its simplest form.

Answer ..... [3]

9) November 2011 V2

10 Write as a single fraction in its simplest form.

$$\frac{3}{x+10}-\frac{1}{x+4}$$

Answer ..... [3]

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10) November 2011 V3

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

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

Answer ..... [4]

11) November 2012 V3

13 Write the following as a single fraction in its simplest form.

$$\frac{x+2}{3} - \frac{2x-1}{4} + 1$$

Answer ..... [3]

12) November 2012 V3

21 Simplify the following.

$$\frac{h^2 - h - 20}{h^2 - 25}$$

Answer ..... [4]

13) June 2012 V3

20 Simplify fully.

$$\frac{x^2 - x - 20}{x^3 \quad 10x^2 + 25x}$$

Answer ..... [5]

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18 **(a)** Factorise $x^2 + x - 30$.

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

(b) Simplify $\dfrac{(x-5)(x+4)}{x^2+x-30}$.

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

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22 Write as a single fraction in its simplest form.

$$\frac{2}{x+3} + \frac{3}{x+2}$$

Answer ..... [3]

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13 Write as a single fraction in its simplest form.

$$\frac{x+3}{x\quad 3} - \frac{x-1}{x+1}$$

Answer ..... [4]

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17) November 2013 V1

14 Write as a single fraction in its simplest form.

$$3-\frac{t+2}{t-1}$$

Answer ..... [3]

18) June 2014 V1

8 Write as a single fraction in its simplest form.

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

Answer ..... [3]

19) June 2014 V2

12 Solve the equation.

$$\frac{3}{2x} + \frac{1}{x+1} = 0$$

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

20) June 2014 V2

19 Simplify.

$$\frac{x^2 + 6x - 7}{3x + 21}$$

Answer ..... [4]

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

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

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

(b) Simplify.

$$\frac{4x^2 - 16x}{2x^2 + 6x - 56}$$

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

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22) November 2014 V3

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

$$\frac{3}{2x} + \frac{2x}{3} + 3 + 2x$$

Answer ..... [4]

23) June 2015 V2

15 Write as a single fraction in its simplest form.

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

Answer ..... [3]

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24) November 2015 V1

15 Simplify. $\dfrac{x^2 - 16}{x^2 - 3x - 4}$

Answer ..... [4]

25) November 2015 V3

11 Write the following as single fractions.

(a) $x + \dfrac{x}{2}$

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

(b) $x + \dfrac{2}{x}$

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

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26) November 2015 V3

22 Simplify.

$$\frac{4+10w}{8-50w^2}$$

Answer ..... [4]

27) November 2016 V1

7 Simplify. $\dfrac{x^3y+2xy^3}{x^2y^2}$

..... [2]

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28) November 2016 V1

8 Write as a single fraction.

$$1-\frac{2}{p}-\frac{3}{t}$$

..... [2]

29) November 2016 V3

23 Simplify.

$$\frac{42np-7n}{12pt-2t+18mp-3m}$$

..... [4]

30) November 2020 V2

26 Simplify.

$$\frac{ux-2u-x+2}{u^2-1}$$

..... [4]

Solving Equations and Inequalities

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14 Solve the equation $3(y-4)+\frac{y}{2}=9$.

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

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2) November 2012 V2

10 Solve the equation $4x - 12 = 2(11 - 3x)$.

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

3) June 2013 V2

12 Solve the equation.

$5(2y - 17) = 60$

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

5 Solve the equation.

$5 - 2x = 3x - 19$

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

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5) November 2013 V3

3 Solve the equation $1 + 2x = -15$.

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

6) June 2014 V1

3 Solve the equation. $\frac{n-8}{2} = 11$

Answer $n =$ ..... [2]

10 Solve the equation.

$$\frac{x+5}{x} = \frac{7}{3}$$

Answer x = ... [3]

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8) November 2014 V3

6 Solve the equation.

$$\frac{2x + 5}{3} = 8$$

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

9) June 2015 V2

6 Solve.

$$5(w + 4 \times 10^3) = 6 \times 10^4$$

Answer $w =$ ..... [2]

10) June 2015 V3

9 Solve the equation.

$$3(x + 4) = 2(4x - 1)$$

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

11) March 2016 V2

1 Solve $(x - 7)(x + 4) = 0$.

$x =$ ..... or $x =$ .....[1]

12) June 2016 V3

4 Solve the equation.

$6(y + 1) = 9$

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

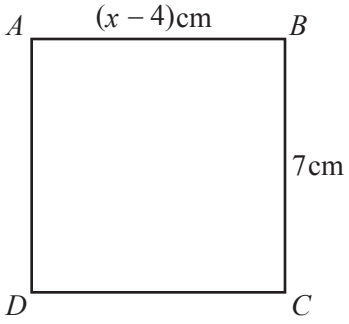
13) November 2016 V2

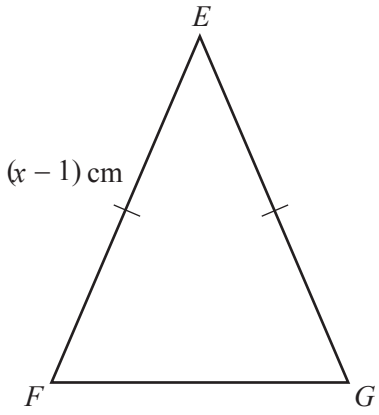
3 Solve the equation.

$6(k - 8) = 78$

$k =$ ..... [2]

13





NOT TO SCALE

(a) *ABCD* is a square.

Find the value of *x*.

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

(b) Square *ABCD* and isosceles triangle *EFG* have the same perimeter.

Work out the length of *FG*

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

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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]

10 Pavan saves $\$x$ each month.
His two brothers **each** save \$4 more than Pavan each month.

Altogether the three boys save \$26 each month.

(a) Write down an equation in x.

Answer(a) [1]

(b) Solve your equation to find the amount Pavan saves each month.

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

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7 The solutions of the equation $x^2 - 6x + d = 0$ are both integers.
d is a prime number.

Find d

Answer $d =$ ..... [3]

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12 **(a)** Factorise $3x^2 + 2x - 8$.

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

(b) Solve the equation $3x^2 + 2x - 8 = 0$.

Answer(b) x = ... or x = ... [1]

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

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

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20 Solve the equation.

$$x^2 - 8x + 6 = 0$$

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

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

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

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

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15 Use the quadratic equation formula to solve

$$2x^2 + 7x - 3 = 0 .$$

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

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

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14 Solve the equation.

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

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

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

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24) November 2015 V2

19 Solve the equation $5x^2 - 6x - 3 = 0$
Show all your working and give your answers correct to 2 decimal places.

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

25) November 2015 V3

21 Solve the equation $3x^2 + 4x - 5 = 0$.
Show all your working and give your answers correct to 2 decimal places.

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

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17 Solve the equation $3x^2 - 11x + 4 = 0$
Show all your working and give your answers correct to 2 decimal places.

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

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

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

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13 Solve the inequality. $2x + 5 < \frac{x-1}{4}$

Answer ..... [3]

29) June 2012 V2

6 x is a positive integer and $15x - 43 < 5x + 2$.

Work out the possible values of x.

Answer ..... [3]

30) June 2012 V3

4 Solve the inequality.

$$3y + 7 \leqslant 2 - y$$

Answer ..... [2]

31) November 2012 V1

9 Solve the inequality.

$$\frac{2x-3}{5} - \frac{x}{3} \leqslant 2$$

Answer ..... [3]

32) November 2013 V2

16 Solve the inequality.

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

Answer ..... [4]

8 Solve the inequality.

$$3x - 1 \leqslant 11x + 2$$

Answer ..... [2]

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34) June 2013 V2

18 Solve $6x + 3 < x < 3x + 9$ for **integer** values of x

Answer ..... [4]

35) June 2013 V3

14 **(a)** Solve $3n + 23 < n + 41$.

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

(b) Factorise completely $ab + bc + ad + cd$.

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

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15 Solve the inequality for positive integer values of x.

$$\frac{21 + x}{5} > x + 1$$

Answer ..... [4]

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9 Solve the inequality.

$$5t + 23 < 17 - 2t$$

Answer ..... [2]

4 Solve the inequality.

$$6n + 3 > 8n$$

..... [2]

39) June 2016 V2

8 Solve the inequality $\frac{x}{3}+5>2$.

..... [2]

40) November 2016 V2

7 Find the positive integers that satisfy the inequality $t+2 > 3t-6$.

..... [3]

41) June 2018 V1

12 Solve the inequality.

$$3n-5>17+8n$$

..... [2]

Simultaneous Equations

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1) June 2010 V1

13 Solve the simultaneous equations.

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

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

Answer $x =$ .....

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

2) November 2010 V1

10 Solve the simultaneous equations $2x + y = 5$ and $2y = x - 10$.

Answer $x =$ .....

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

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3) November 2010 V3

17 Solve the simultaneous equations.

$$5x - y = -10$$
$$x + 2y = 9$$

Answer $x =$ .....

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

4) June 2011 V1

10 Solve the simultaneous equations.

$$3x + y = 30$$
$$2x - 3y = 53$$

Answer $x =$ .....

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

5) June 2011 V2

12 Solve the simultaneous equations.

$$x - 5y = 0$$
$$15x + 10y = 17$$

Answer $x =$ .....

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

6) June 2011 V3

8 Solve the simultaneous equations.

$$x + 2y = 3$$
$$2x - 3y = 13$$

Answer $x =$ .....

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

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7) November 2011 V3

3 Solve the simultaneous equations.

$$x + 5y = 22$$
$$x + 3y = 12$$

Answer $x =$ .....

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

8) June 2012 V1

11 Solve the simultaneous equations.

$$3x + 5y = 24$$
$$x + 7y = 56$$

Answer $x =$ .....

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

10 Find the value of $2x + y$ for the simultaneous equations.

$$3x + 5y = 48$$
$$2x - y = 19$$

Answer $2x + y =$ ..... [4]

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10) November 2013 V2

15 Find the co-ordinates of the point of intersection of the two lines.

$$2x - 7y = 2$$
$$4x + 5y = 42$$

Answer (..... , ...) [3]

11) June 2014 V2

3 Solve the simultaneous equations.

$$2x - y = 7$$
$$3x + y = 3$$

Answer x = ...

y = ... [2]

12 Solve the simultaneous equations.

$$0.4x - 5y = 27$$
$$2x + 0.2y = 9$$

Answer x = ...

y = ... [3]

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13) June 2015 V1

18 Solve the simultaneous equations.
You must show all your working.

$5x + 2y = -2$
$3x - 5y = 17.4$

Answer $x =$ .....

$y =$ ..... [4]

14) March 2015 V2

11 Solve the simultaneous equations.
You must show all your working.

$\frac{1}{2}x - 8y = 1$
$x + 2y = 6\frac{1}{2}$

Answer $x =$ .....

$y =$ [3]

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15) November 2016 V1

11 Solve the simultaneous equations.
You must show all your working.

$$2x + 3y = 13$$
$$x + 2y = 9$$

$x =$ .....

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

16) November 2016 V2

8 Solve the simultaneous equations.
You must show all your working.

$$\tfrac{1}{2}x + y = 8$$
$$x - 2y = 2$$

$x =$ .....

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

17) June 2016 V2

16 Solve the simultaneous equations.
Show all your working.

$3x + 4y = 14$
$5x + 2y = 21$

$x =$ .....

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

18) June 2014 V3

19 Robbie pays \$10.80 when he buys 3 notebooks and 4 pencils.
Paniz pays \$14.50 when she buys 5 notebooks and 2 pencils.

Write down simultaneous equations and use them to find the cost of a notebook and the cost of a pencil.

Answer Cost of a notebook = \$.....

Cost of a pencil = \$..... [5]

Variation

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1) June 2010 V1

14 y varies inversely as the square of x.
$y = 1.5$ when $x = 8$.

Find y when $x = 5$.

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

2) November 2010 V2

11 The resistance, R, of an object being towed through the water varies directly as the **square** of the speed, v.

$R = 50$ when $v = 10$.

Find R when $v = 16$.

Answer $R =$ ..... [3]

3) June 2011 V2

8 p varies directly as the square root of q.
$p = 8$ when $q = 25$.

Find p when $q = 100$.

Answer $p =$ ..... [3]

4) November 2011 V1

8 Seismic shock waves travel at speed v through rock of density d.
v varies **inversely** as the **square root** of d.

$v = 3$ when $d = 2.25$.

Find v when $d = 2.56$.

Answer $v =$ ..... [3]

5) November 2011 V2

6 The force, F, between two magnets varies **inversely** as the **square** of the distance, d, between them.

$F = 150$ when $d = 2$.

Calculate F when $d = 4$.

Answer $F =$ ..... [3]

6) November 2011 V3

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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7) June 2012 V1

13 y is **inversely** proportional to x^2.
When $x = 4$, $y = 3$.

Find y when $x = 5$.

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

8) June 2012 V2

11 y varies directly as the square of $(x - 3)$.
$y = 16$ when $x = 1$.

Find y when $x = 10$.

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

9) June 2012 V3

10 The periodic time, T, of a pendulum varies directly as the square root of its length, l.
$T = 6$ when $l = 9$.

Find T when $l = 25$.

Answer $T =$ ..... [3]

10) November 2012 V1

The electrical resistance, R, of a length of cylindrical wire varies inversely as the square of the diameter, d, of the wire.
$R = 10$ when $d = 2$.

11

Find R when $d = 4$.

Answer $R =$ ..... [3]

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1) November 2012 V2

13 The mass, m, of an object varies directly as the **cube** of its length, l.

$m = 250$ when $l = 5$.

Find m when $l = 7$.

Answer $m =$ ..... [3]

2) November 2012 V3

14 y varies inversely as the square root of x.
When $x = 9, y = 6$.

Find y when $x = 36$.

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

13) June 2013 V1

19 t varies inversely as the square root of u
$t = 3$ when $u = 4$.

Find t when $u = 49$.

Answer $t =$ ..... [3]

14) June 2013 V2

14 y is inversely proportional to x^3.
$y = 5$ when $x = 2$.

Find y when $x = 4$.

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

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15) June 2013 V3

8 The mass, m, of a sphere varies directly with the **cube** of its radius, r.
$m = 160$ when $r = 2$.

Find m when $r = 5$.

Answer $m =$ ..... [3]

16) November 2013 V2

11 The speed, v, of a wave is inversely proportional to the square root of the depth, d, of the water.
$v = 30$ when $d = 400$.

Find v when $d = 25$.

Answer $v =$ ..... [3]

17) November 2013 V3

8 m varies directly as the cube of x.
$m = 200$ when $x = 2$.

Find m when $x = 0.4$.

Answer $m =$ ..... [3]

18) June 2014 V2

13 w varies inversely as the square root of x.
When $x = 4$, $w = 4$.

Find w when $x = 25$.

Answer $w =$ ..... [3]

19) June 2014 V3

11 y varies as the cube root of $(x + 3)$.
When $x = 5, y = 1$.

Find the value of y when $x = 340$.

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

20) November 2014 V1

13 y varies directly with $\sqrt{x + 5}$.
$y = 4$ when $x = -1$.

Find y when $x = 11$.

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

21) November 2014 V2

10 The cost of a circular patio, \$ C, varies as the square of the radius, r metres.
$C = 202.80$ when $r = 2.6$.

Calculate the cost of a circular patio with $r = 1.8$.

Answer \$..... [3]

22) November 2014 V3

9 y varies inversely as $(x + 5)$.
$y = 6$ when $x = 3$.

Find y when $x = 7$.

Answer y = ... [3]

23) June 2015 V1

12 p is inversely proportional to the square of $(q + 4)$.
$p = 2$ when $q = 2$.

Find the value of p when $q = -2$.

Answer $p =$ ..... [3]

24) November 2015 V1

12 V is directly proportional to the cube of $(r + 1)$.
When $r = 1$, $V = 24$.

Work out the value of V when $r = 2$.

Answer $V =$ ..... [3]

25) November 2015 V2

17 y is directly proportional to the square of $(x - 1)$.
$y = 63$ when $x = 4$.

Find the value of y when $x = 6$.

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

26) November 2015 V3

19 y is inversely proportional to $(x + 2)^2$.
When $x = 1, y = 2$.

Find y in terms of x.

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

27) March 2015 V2

13 x varies directly as the cube root of y
$x = 6$ when $y = 8$.

Find the value of x when $y = 64$.

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

28) June 2016 V1

21 y is directly proportional to the positive square root of x.
When $x = 9, y = 12$.

Find y when $x = \frac{1}{4}$

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

29) June 2016 V3

16 y is directly proportional to $(x + 2)^2$
When $x = 8$, $y = 250$.

Find y when $x = 4$.

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

30) November 2016 V1

14 y is directly proportional to the square root of $(x + 2)$.
When $x = 7$, $y = 2$.

Find y when $x = 98$.

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

31) November 2016 V3

1 $V = 4p^2$

Find V when $p = 3$.

$V =$ .....[1]

32) November 2016 V3

16 d is inversely proportional to $(w + 1)^2$.
$d = 3.2$ when $w = 4$.

Find d when $w = 7$.

$d =$ ..... [3]

33) June 2018 V1

15 y is directly proportional to $(x - 1)^2$.
When $x = 5$, $y = 4$.

Find y when $x = 7$.

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

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Sequences

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18 The first four terms of a sequence are

$T_1 = 1^2$ $T_2 = 1^2 + 2^2$ $T_3 = 1^2 + 2^2 + 3^2$ $T_4 = 1^2 + 2^2 + 3^2 + 4^2$.

(a) The nth term is given by $T_n = \frac{1}{6} n(n + 1)(2n + 1)$.

Work out the value of T_{23}.

Answer(a) T_{23} = ... [2]

(b) A new sequence is formed as follows.

$U_1 = T_2 - T_1$ $U_2 = T_3 - T_2$ $U_3 = T_4 - T_3$ .....

(i) Find the values of U_1 and U_2.

Answer(b)(i) U_1 = ... and U_2 = ... [2]

(ii) Write down a formula for the nth term, U_n

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

(c) The first four terms of another sequence are

$V_1 = 2^2$ $V_2 = 2^2 + 4^2$ $V_3 = 2^2 + 4^2 + 6^2$ $V_4 = 2^2 + 4^2 + 6^2 + 8^2$.

By comparing this sequence with the one in **part (a)**, find a formula for the nth term, V_n.

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

2) November 2011 V2

9 A sequence is given by $u_1 = \sqrt{1}$, $u_2 = \sqrt{3}$, $u_3 = \sqrt{5}$, $u_4 = \sqrt{7}$, …

(a) Find a formula for u_n, the nth term.

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

(b) Find u_{29}

Answer(b) $u_{29} =$ ..... [1]

3) June 2013 V2

3 The first five terms of a sequence are shown below.

13 9 5 1 –3

Find the nth term of this sequence.

Answer ..... [2]

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4) November 2013 V1

9 Find the nth term in each of the following sequences.

(a) $\frac{1}{3}, \frac{2}{4}, \frac{3}{5}, \frac{4}{6}, \frac{5}{7}, \ldots$

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

(b) 0, 3, 8, 15, 24, ...

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

5) June 2014 V2

20 32 25 18 11 4

These are the first 5 terms of a sequence.

Find

(a) the 6th term,

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

(b) the nth term,

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

(c) which term is equal to –332.

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

11 **(a)** Here are the first three terms of a sequence.

$U_1 = 1^3$ $U_2 = 1^3 + 2^3$ $U_3 = 1^3 + 2^3 + 3^3$

The nth term is given by $U_n = \frac{1}{4}n^2 (n + 1)^2$.

Work out the value of U_{39} .

Answer(a) U_{39} = ... [2]

(b) Here are the first three terms of another sequence.

$V_1 = 2^3$ $V_2 = 2^3 + 4^3$ $V_3 = 2^3 + 4^3 + 6^3$

By comparing this sequence with the sequence in **part (a)**, find a formula for the n th term, V_n .

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

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7) June 2015 V1

11 Find the nth term of each sequence.

(a) 4, 8, 12, 16, 20, ...

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

(b) 11, 20, 35, 56, 83, ...

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

8) June 2015 V2

8 5, 11, 21, 35, 53, ...

Find the nth term of this sequence.

Answer ..... [2]

9) March 2015 V2

5 These are the first five terms of a sequence.

13 8 3 –2 –7

Find the nth term of this sequence.

Answer ..... [2]

10) March 2016 V2

20 The nth term of a sequence is $an^2 + bn$.

(a) Write down an expression, in terms of a and b, for the 3rd term.

..... [1]

(b) The 3rd term of this sequence is 21 and the 6th term is 96.

Find the value of a and the value of b
You must show all your working.

a = ...

b = ... [4]

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11) June 2016 V1

15 7, 5, 3, 1, – 1, …

(a) Find the next term in this sequence.

..... [1]

(b) Find the nth term of the sequence.

..... [2]

12) June 2016 V2

18 Find the nth term of each of these sequences.

(a) 16, 19, 22, 25, 28, …

[2]

(b) 1, 3, 9, 27, 81, …

..... [2]

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13) November 2016 V1

19 Find the *n*th term of each sequence.

(a) 7, 13, 19, 25, 31, …

..... [2]

(b) 9, 16, 25, 36, 49, …

..... [2]

14) June 2018 V2

3 Here is a sequence.

a, 13, 9, 3, –5, –15, *b*, …

Find the value of *a* and the value of *b*.

a = ...

b = ... [2]

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Coordinate Geometry and Differentiation

Mr.Yasser Elsayed

002 012 013 222 97

1) June 2009 V1

7 Find the co-ordinates of the mid-point of the line joining the points $A(2, -5)$ and $B(6, 9)$.

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

2) November 2009 V1

8 Find the length of the line joining the points $A(-4, 8)$ and $B(-1, 4)$.

Answer AB = ... [2]

3) June 2011 V1

7 Find the length of the straight line from $Q(-8, 1)$ to $R(4, 6)$.

Answer QR = ... [3]

4) June 2015 V1

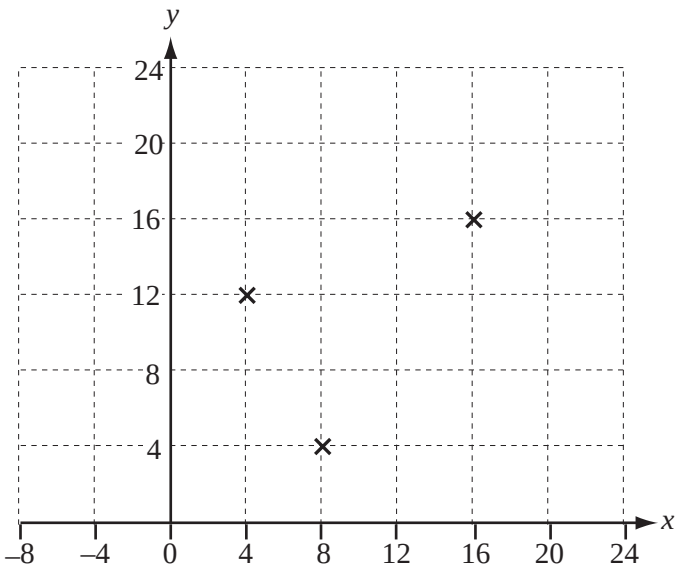
8 The point A has co-ordinates $(-4, 6)$ and the point B has co-ordinates $(7, -2)$.

Calculate the length of the line AB.

Answer AB = ... units [3]

5) November 2013 V3

2 Three of the vertices of a parallelogram are at (4, 12), (8, 4) and (16, 16).



Write down the co-ordinates of two possible positions of the fourth vertex.

Answer (..... , ...) and (..... , ...) [2]

6) June 2016 V1

7 $y = mx + c$

Find the value of y when $m = -2, x = -7$ and $c = -3$.

$y =$ [2]

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17 Find the equation of the line passing through the points (0, –1) and (3, 5).

Answer ..... [3]

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15 Find the equation of the straight line which passes through the points (0, 8) and (3, 2).

Answer ..... [3]

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13 Find the equation of the line passing through the points with co-ordinates (5, 9) and (–3, 13).

Answer ..... [3]

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15 The points (2, 5), (3, 3) and (k, 1) all lie in a straight line.

(a) Find the value of k.

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

(b) Find the equation of the line.

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

18 $A(5, 23)$ and $B(-2, 2)$ are two points.

(a) Find the co-ordinates of the midpoint of the line AB.

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

(b) Find the equation of the line AB.

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

(c) Show that the point (3, 17) lies on the line AB.

Answer(c)

[1]

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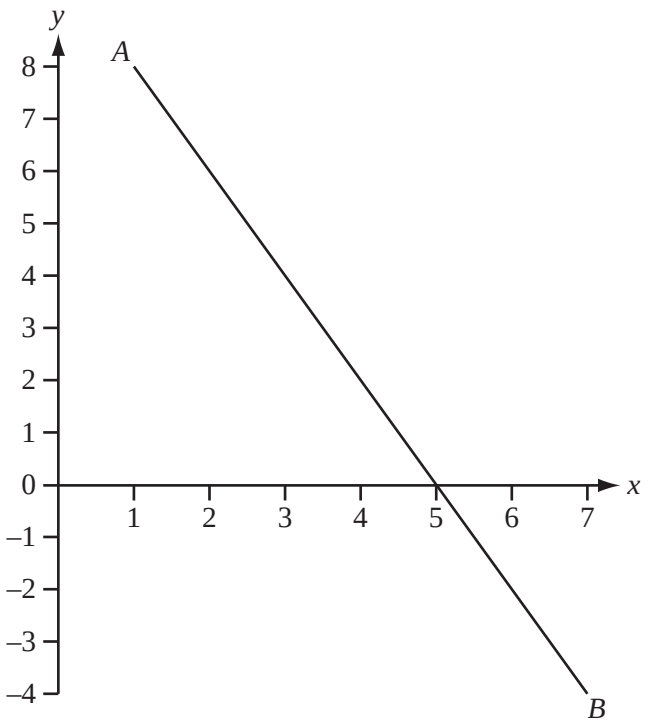
21



(a) **Using a straight edge and compasses only,** construct the perpendicular bisector of AB on the diagram above. [2]

(b) Write down the co-ordinates of the midpoint of the line segment joining $A(1, 8)$ to $B(7, -4)$.

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

(c) Find the equation of the line AB.

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

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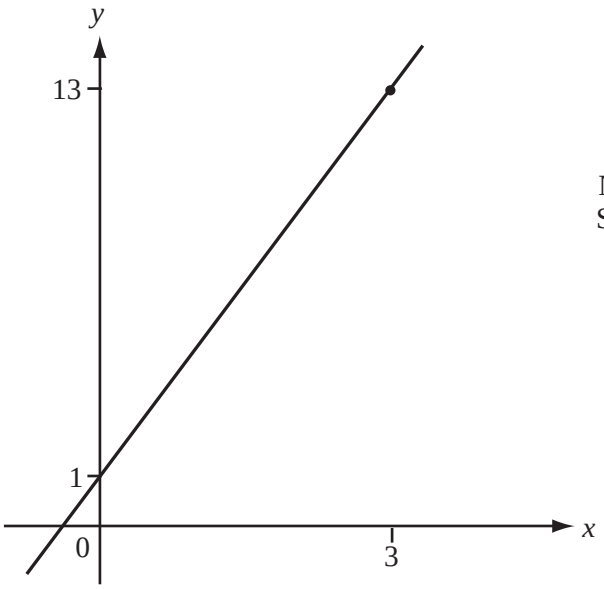
14



NOT TO SCALE

The diagram shows the straight line which passes through the points (0, 1) and (3, 13).

Find the equation of the straight line.

Answer ..... [3]

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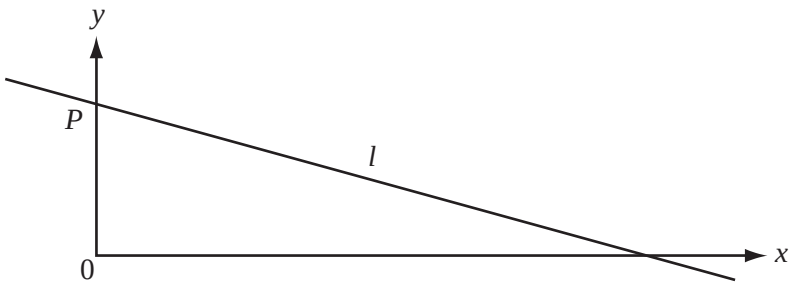
5



NOT TO SCALE

The equation of the line l in the diagram is $y = 5 - x$

(a) The line cuts the y-axis at P

Write down the co-ordinates of P.

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

(b) Write down the gradient of the line l.

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

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20 **(a)** The two lines $y = 2x + 8$ and $y = 2x - 12$ intersect the x-axis at P and Q.

Work out the distance PQ.

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

(b) Write down the equation of the line with gradient -4 passing through (0, 5).

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

(c) Find the equation of the line parallel to the line in **part (b)** passing through (5, 4).

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

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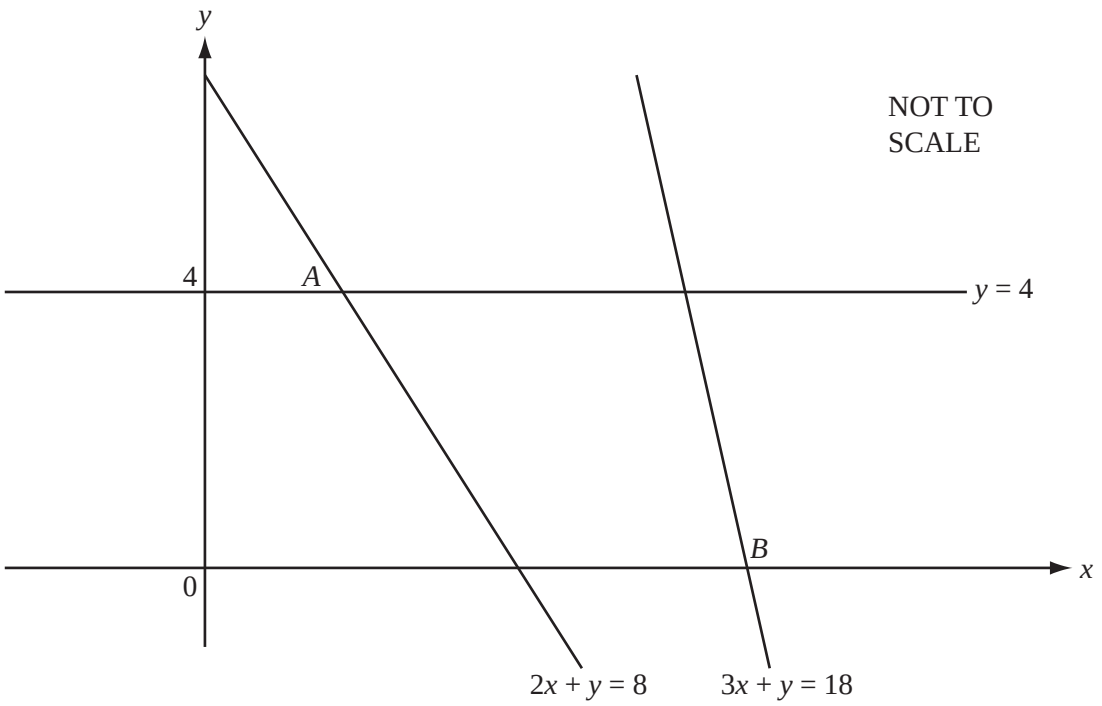
15



(a) The line $y = 4$ meets the line $2x + y = 8$ at the point A.
Find the co-ordinates of A.

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

(b) The line $3x + y = 18$ meets the x axis at the point B.
Find the co-ordinates of B.

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

(c) **(i)** Find the co-ordinates of the mid-point M of the line joining A to B.

Answer(c)(i) M (..... , ...) [1]

(ii) Find the equation of the line through M parallel to $3x + y = 18$.

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

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22 **(a)** The line $y = 2x + 7$ meets the y-axis at A.

Write down the co-ordinates of A.

Answer(a) A = (..... , ...) [1]

(b) A line parallel to $y = 2x + 7$ passes through $B(0, 3)$.

(i) Find the equation of this line.

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

(ii) C is the point on the line $y = 2x + 1$ where $x = 2$.

Find the co-ordinates of the midpoint of BC.

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

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17 **(a)** Find the co-ordinates of the midpoint of the line joining $A(-8, 3)$ and $B(-2, -3)$.

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

(b) The line $y = 4x + c$ passes through $(2, 6)$.

Find the value of c.

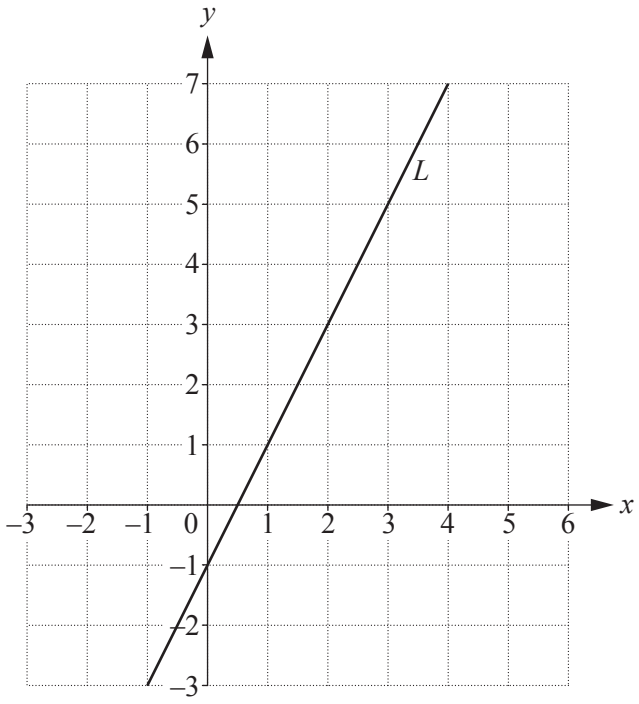
Answer(b) $c =$ ..... [1]

(c) The lines $5x = 4y + 10$ and $2y = kx - 4$ are parallel.

Find the value of k.

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

18



(a) Work out the gradient of the line L.

..... [2]

(b) Write down the equation of the line parallel to the line L that passes through the point (0, 6).

..... [2]

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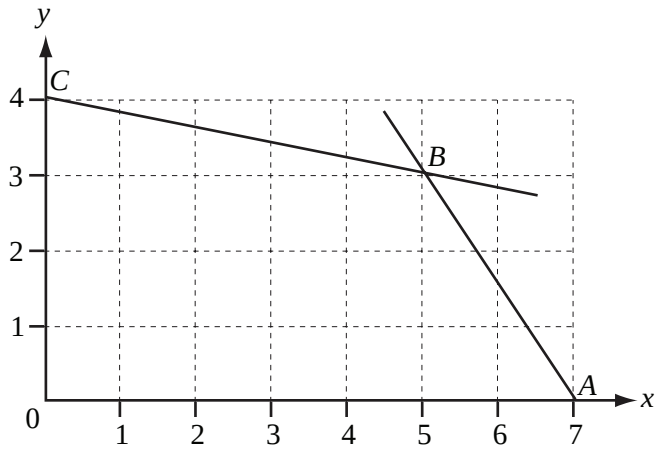
18



The lines AB and CB intersect at B

(a) Find the co-ordinates of the midpoint of AB.

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

(b) Find the equation of the line CB.

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

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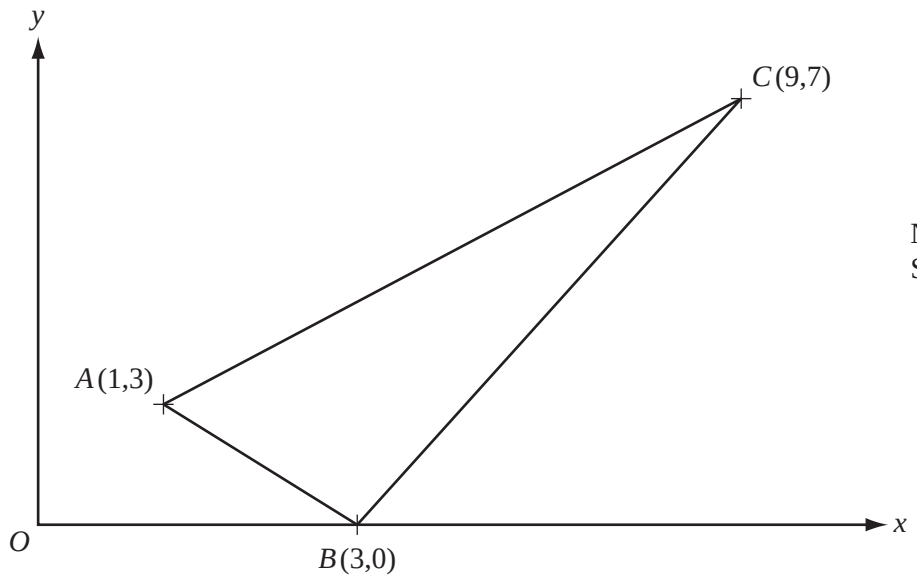
16



NOT TO SCALE

The co-ordinates of A, B and C are shown on the diagram, which is not to scale.

(a) Find the length of the line AB.

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

(b) Find the equation of the line AC.

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

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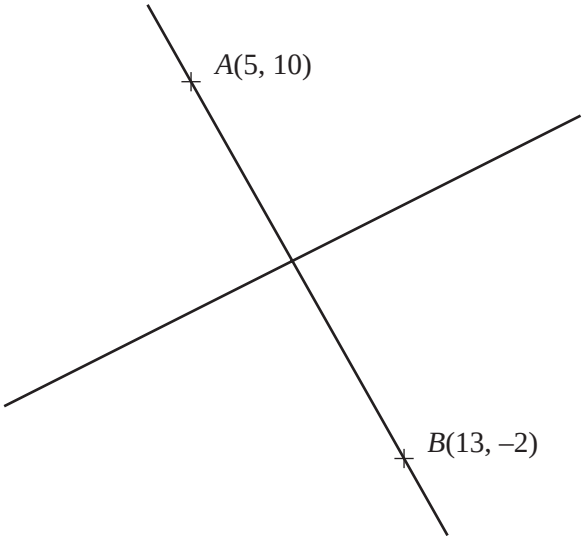
14



NOT TO SCALE

$A(5, 10)$ and $B(13, -2)$ are two points on the line AB.
The perpendicular bisector of the line AB has gradient $\frac{2}{3}$.

Find the equation of the perpendicular bisector of AB.

Answer ..... [4]

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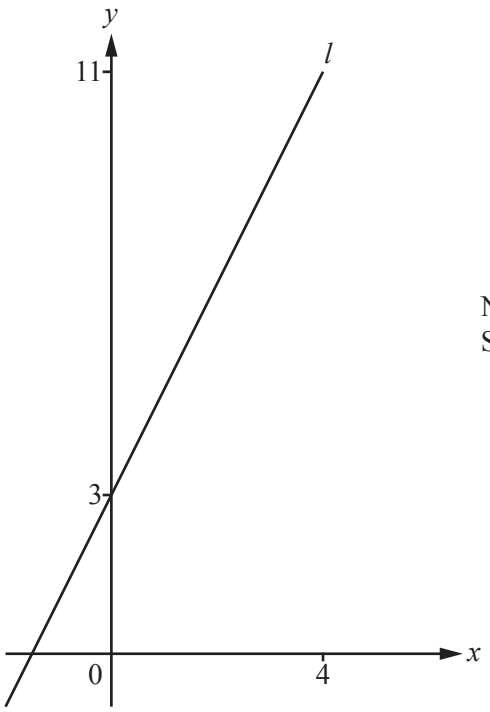
17



NOT TO SCALE

The diagram shows the straight line, l, which passes through the points (0, 3) and (4, 11).

(a) Find the equation of line l in the form $y = mx + c$.

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

(b) Line p is perpendicular to line l.

Write down the gradient of line p.

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

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24) March 2015 V2

14 Find the equation of the line that

- is perpendicular to the line $y = 3x - 1$

and

- passes through the point (7, 4).

Answer ..... [3]

25) June 2016 V1

25 A is the point (4, 1) and B is the point (10, 15).

Find the equation of the perpendicular bisector of the line AB.

..... [6]

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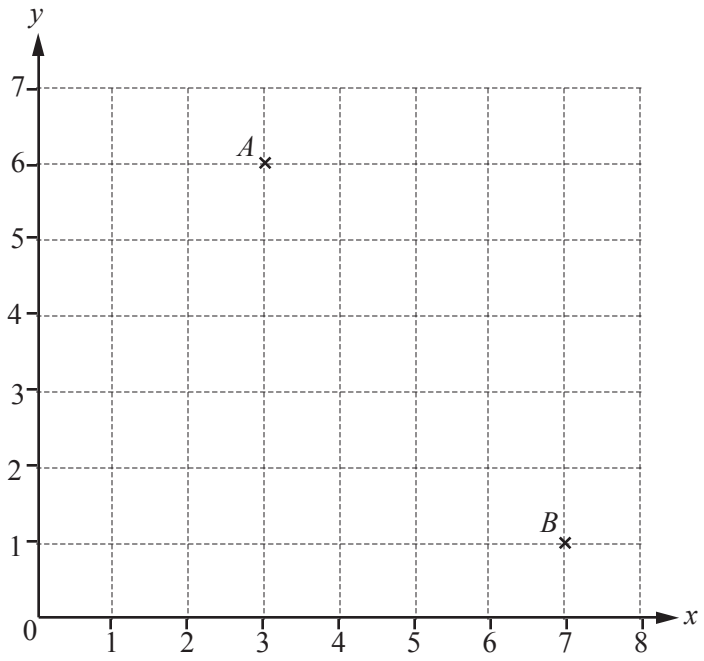
20



Point A has co-ordinates (3, 6).

(a) Write down the co-ordinates of point B.

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

(b) Find the gradient of the line AB

..... [2]

(c) Find the equation of the line that

- is perpendicular to the line AB

and

- passes through the point (0, 2).

..... [3]

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27) November 2016 V3

17 A is the point (8, 3) and B is the point (12, 1).

Find the equation of the line, perpendicular to the line AB, which passes through the point (0, 0).

..... [3]

28) June 2018 V1

24 **(a)** Point A has co-ordinates (1, 0) and point B has co-ordinates (2, 5).

Calculate the angle between the line AB and the x-axis.

..... [3]

(b) The line PQ has equation $y = 3x - 8$ and point P has co-ordinates (6, 10).

Find the equation of the line that passes through P and is perpendicular to PQ.
Give your answer in the form $y = mx + c$.

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

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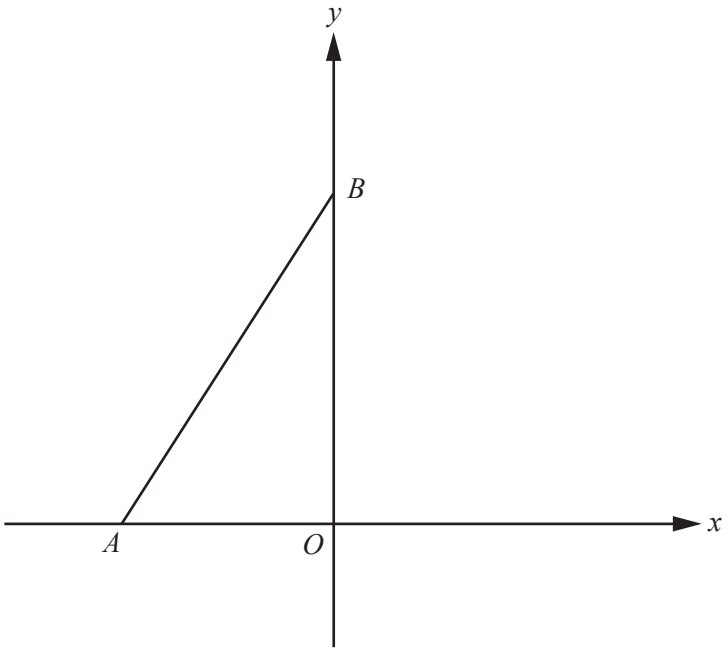
27



NOT TO SCALE

A is the point $(-2, 0)$ and B is the point $(0, 4)$.

(a) Find the equation of the straight line joining A and B.

..... [3]

(b) Find the equation of the perpendicular bisector of AB.

..... [4]

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25 P is the point (16, 9) and Q is the point (22, 24).

(a) Find the equation of the line perpendicular to PQ that passes through the point (5, 1).
Give your answer in the form $y = mx + c$.

$y =$ ..... [4]

(b) N is the point on PQ such that $PN = 2NQ$.

Find the co-ordinates of N.

(..... , ...) [2]

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31) November 2020 V2

21 **(a)** Differentiate $6+4x-x^2$.

..... [2]

(b) Find the coordinates of the turning point of the graph of $y = 6+4x-x^2$.

(..... , ...) [2]

32) November 2020 V2

24 A line from the point (2, 3) is perpendicular to the line $y = \frac{1}{3}x+1$.
The two lines meet at the point P.

Find the coordinates of P.

(..... , ...) [5]

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Graphs of Functions

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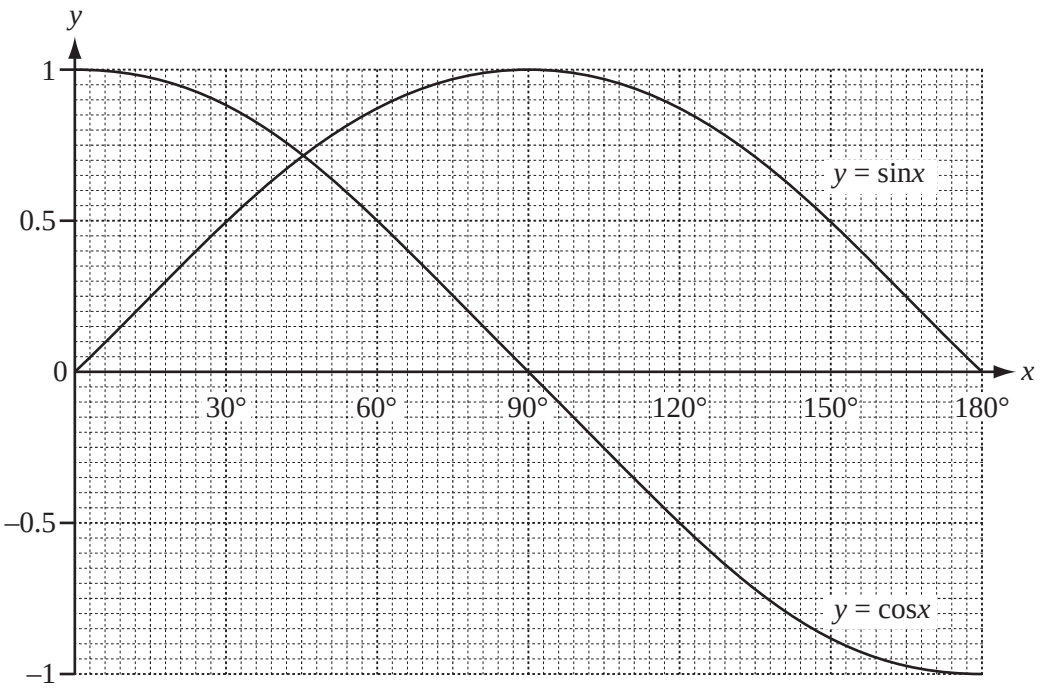
8



The diagram shows accurate graphs of $y = \sin x$ and $y = \cos x$ for $0° \leqslant x \leqslant 180°$.

Use the graph to solve the equations

(a) $\sin x - \cos x = 0$,

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

(b) $\sin x - \cos x = 0.5$.

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

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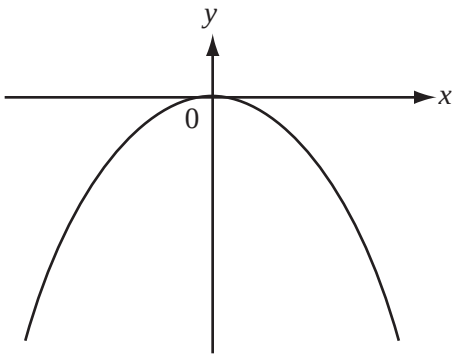

NOT TO SCALE

The sketch shows the graph of $y = ax^n$ where a and n are integers.

Write down a possible value for a and a possible value for n.

Answer $a =$ .....

$n =$ ..... [2]

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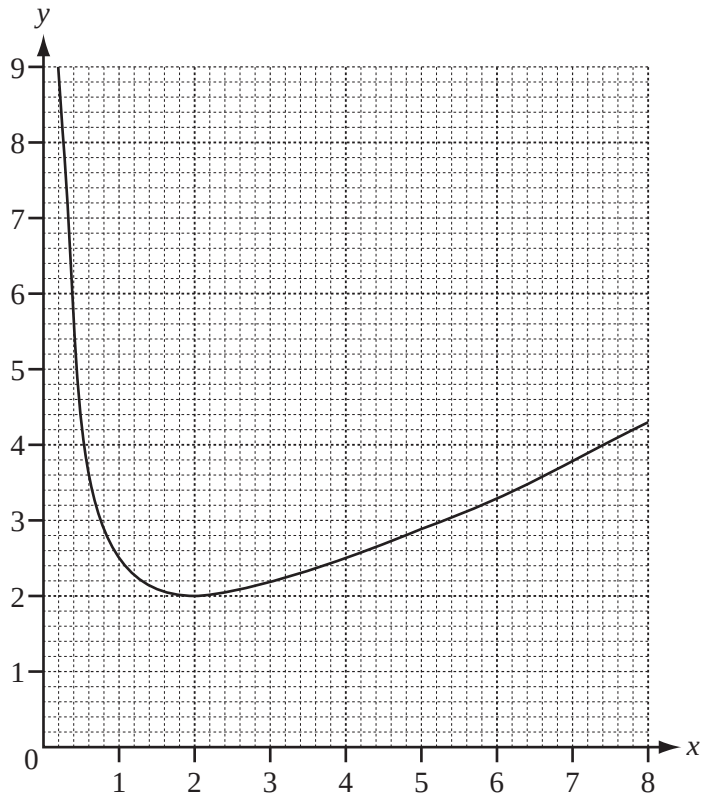
16



The diagram shows the graph of $y = \frac{x}{2} + \frac{2}{x}$, for $0 < x \leqslant 8$.

(a) Use the graph to solve the equation $\frac{x}{2} + \frac{2}{x} = 3$.

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

(b) By drawing a suitable tangent, work out an estimate of the gradient of the graph where $x = 1$.

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

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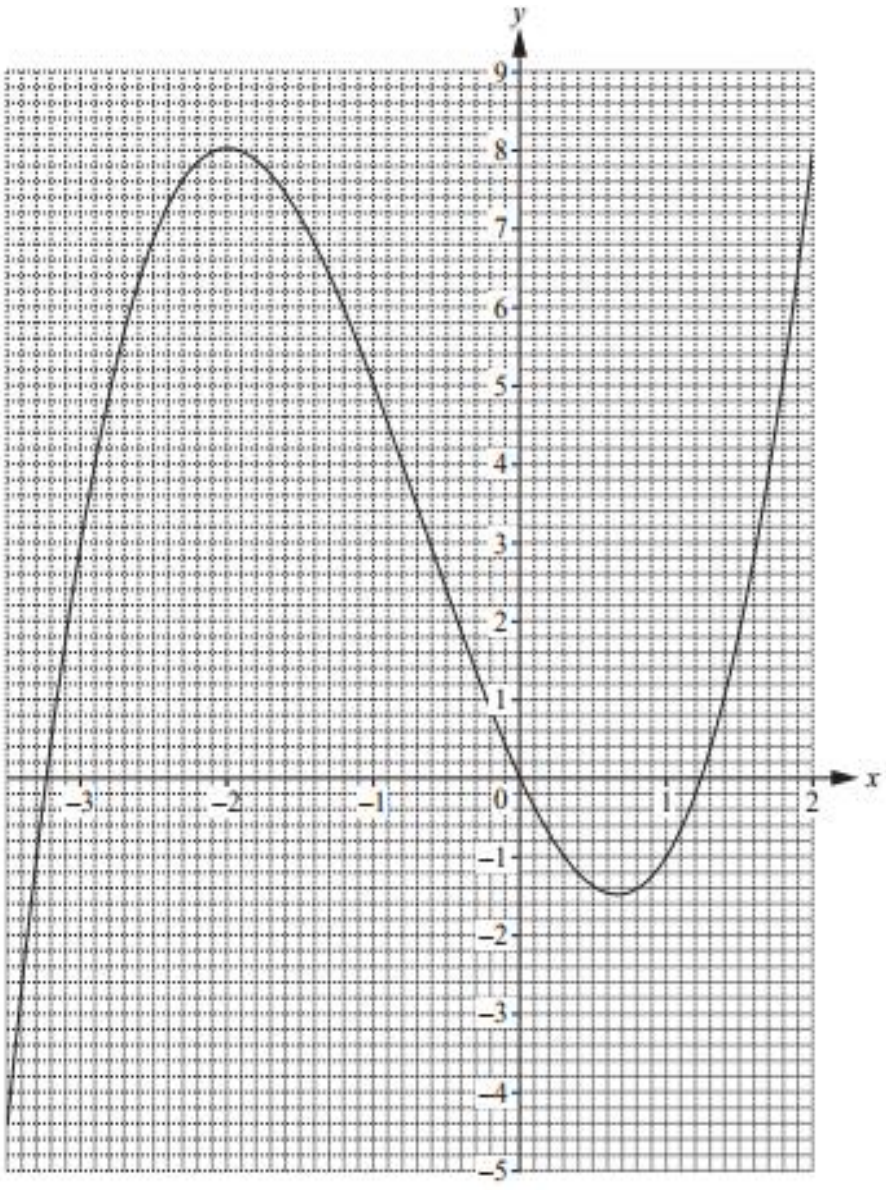
19 The curve $y = x^3 + 2x^2 - 4x$ is shown on the grid.



(a) By drawing a suitable tangent, find an estimate of the gradient of the curve when $x = 1$.

..... [3]

(b) A point D lies on the curve.
The x co-ordinate of D is negative.
The gradient of the tangent at D is 0.

Write down the co-ordinates of D.

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

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Functions

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20 $f(x) = (x - 1)^3$ $g(x) = (x - 1)^2$ $h(x) = 3x + 1$

(a) Work out fg(-1).

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

(b) Find gh(x) in its simplest form.

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

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

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

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18 $f(x) = x^2 + 2$ $g(x) = (x + 2)^2$ $h(x) = 3x - 5$

Find

(a) gf(–2),

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

(b) $h^{-1}(22)$.

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

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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]

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20 $f(x) = x^3$ $g(x) = 2x - 3$

(a) Find

(i) g(6),

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

(ii) f(2x).

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

(b) Solve fg(x) = 125.

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

(c) Find the inverse function $g^{-1}(x)$.

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

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19 $f(x) = x^2$ $g(x) = 2^x$ $h(x) = 2x - 3$

(a) Find g(3).

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

(b) Find hh(x) in its simplest form.

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

(c) Find fg($x + 1$) in its simplest form.

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

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17 $f(x) = \dfrac{1}{x+4} \quad (x \neq -4)$

$g(x) = x^2 - 3x$

$h(x) = x^3 + 1$

(a) Work out fg(1).

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

(b) Find $h^{-1}(x)$.

Answer(b) $h^{1}(x) =$ ..... [2]

(c) Solve the equation $g(x) = -2$.

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

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18 $f(x) = (x + 2)^3 - 5$ $g(x) = 2x + 10$ $h(x) = \frac{1}{x},\ x \neq 0$

Find

(a) $gf(x)$,

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

(b) $f^{-1}(x)$,

Answer(b) $f^{-1}(x) =$ ..... [3]

(c) $gh(-\frac{1}{5})$.

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

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20 $f(x) = 4(x + 1)$ $g(x) = \frac{x^3}{2} - 1$

(a) Write down the value of x when $f^{-1}(x) = 2$.

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

(b) Find $fg(x)$. Give your answer in its simplest form.

Answer(b) $fg(x) =$ ..... [2]

(c) Find $g^{-1}(x)$.

Answer(c) $g^{-1}(x) =$ ..... [3]

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19 $f(x) = x^2 + 1$ $\quad g(x) = \dfrac{x+2}{3}$

(a) Work out ff(1).

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

(b) Find gf(3x), simplifying your answer as far as possible.

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

(c) Find g $^{1}(x)$.

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

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21 $f(x) = 5x + 4$ $g(x) = \frac{1}{2x}$, $x \neq 0$ $h(x) = \left(\frac{1}{2}\right)^x$

Find

(a) fg(5) ,

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

(b) gg(x) in its simplest form,

Answer(b) gg(x) = ... [2]

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

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

(d) the value of x when $h(x) = 8$.

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

16 $f(x) = x + \frac{2}{x} - 3,\ x \neq 0$ $g(x) = \frac{x}{2} - 5$

Find

(a) fg(18),

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

(b) $g^{-1}(x)$.

Answer(b) $g^{-1}(x)$ = ... [2]

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19 $f(x) = 2x + 3$ $g(x) = x^2$

(a) Find $fg(6)$.

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

(b) Solve the equation $gf(x) = 100$.

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

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

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

(d) Find $ff^{-1}(5)$.

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

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20 $f(x) = 3x - 2$ $g(x) = \frac{2}{x+1}$, $x \neq -1$

(a) Find $gf(2)$.

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

(b) Solve $g(x) = 10$.

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

(c) Simplify.

$f(2x) - f(x + 2)$

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

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16 $f(x) = (x - 3)^2$ $g(x) = \frac{x-1}{4}$ $h(x) = x^3$

Find

(a) hf(1),

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

(b) $g^{-1}(x)$,

Answer(b) $g^{-1}(x)$ = ... [2]

(c) gh(x),

Answer(c) gh(x) = ... [1]

(d) the solution to the equation $f(x) = 0$.

Answer(d) x = ... [1]

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23 $f(x) = 5 - 3x$

(a) Find f(6).

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

(b) Find $f(x + 2)$.

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

(c) Find $ff(x)$, in its simplest form.

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

(d) Find $f^{-1}(x)$, the inverse of $f(x)$.

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

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21 $f(x) = x^2 + 4x - 6$

(a) $f(x)$ can be written in the form $(x + m)^2 + n$.

Find the value of m and the value of n.

Answer(a) m = ...

n = ... [2]

(b) Use your answer to **part (a)** to find the positive solution to $x^2 + 4x - 6 = 0$.

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

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24 $f(x) = 3x + 5$ $g(x) = x^2$

(a) Find $g(3x)$.

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

(b) Find $f^{-1}(x)$, the inverse function.

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

(c) Find $ff(x)$.
Give your answer in its simplest form.

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

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21 $f(x) = x^3$ $g(x) = 3x - 5$ $h(x) = 2x + 1$

Work out

(a) ff(2),

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

(b) gh(x) and simplify your answer,

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

(c) $h^{-1}(x)$, the inverse of $h(x)$.

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

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22 $f(x) = 5x - 3$ $g(x) = x^2$

(a) Find $fg(-2)$.

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

(b) Find $gf(x)$, in terms of x, in its simplest form.

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

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

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

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18 $f(x) = x^2$ $g(x) = \frac{x}{2}^3$

Find

(a) $f(-5)$,

..... [1]

(b) $gf(x)$,

..... [1]

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

$g^{-1}(x) =$ ..... [2]

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Speed, Distance and Time

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1) June 2010 V1

4 A person in a car, travelling at 108 kilometres per hour, takes 1 second to go past a building on the side of the road.

Calculate the length of the building in metres.

Answer ..... m [2]

2) June 2010 V1

9 A cyclist left Melbourne on Wednesday 21 May at 0945 to travel to Sydney.
The journey took 97 hours.

Write down the day, date and time that the cyclist arrived in Sydney.

Answer Day ..... Date ..... Time ..... [3]

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4 The maximum speed of a car is 252 km/h.

Change this speed into metres per second.

Answer ..... m/s [2]

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4) November 2010 V3

2 A plane took 1 hour and 10 minutes to fly from Riyadh to Jeddah.
The plane arrived in Jeddah at 2305.
At what time did the plane depart from Riyadh?

Answer ..... [1]

5) November 2010 V3

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

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

12 A train leaves Barcelona at 21 28 and takes 10 hours and 33 minutes to reach Paris.

(a) Calculate the time the next day when the train arrives in Paris.

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

(b) The distance from Barcelona to Paris is 827 km.

Calculate the average speed of the train in kilometres per hour.

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

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10 The table shows the opening and closing times of a café.

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Opening time	0600	0600	0600	0600	0600	(*a*)	0800
Closing time	2200	2200	2200	2200	2200	2200	1300

(a) The café is open for a total of 100 hours each week.
Work out the opening time on Saturday.

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

(b) The owner decides to close the café at a later time on Sunday. This increases the **total** number of hours the café is open by 4%.
Work out the new closing time on Sunday.

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

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8) November 2011 V2

1 A bus leaves a port every 15 minutes, starting at 0900.
The last bus leaves at 1730.

How many times does a bus leave the port during one day?

Answer ..... [2]

9) November 2011 V2

8 A cruise ship travels at 22 knots.

[1 knot is 1.852 kilometres per hour.]

Convert this speed into metres per second.

Answer ..... m/s [3]

9 A shop is open during the following hours.

	Monday to Friday	Saturday	Sunday
Opening time	0645	0730	0845
Closing time	1730	1730	1200

(a) Write the closing time on Saturday in the 12-hour clock time.

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

(b) Calculate the total number of hours the shop is open in one week.

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

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11) June 2013 V3

3 The time in Lisbon is the same as the time in Funchal.
A plane left Lisbon at 0830 and arrived in Funchal at 10 20.
It then left Funchal at 1255 and returned to Lisbon.
The return journey took 15 minutes more.

What time did the plane arrive in Lisbon?

Answer ..... [2]

12) November 2013 V1

19 **(a)** Convert 144 km/h into metres per second.

Answer(a) ..... m/s [2]

(b) A train of length 120 m is travelling at 144 km/h.
It passes under a bridge of width 20 m.

Find the time taken for the whole train to pass under the bridge.
Give your answer in seconds.

Answer(b) s [2]

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1 Christa had a music lesson every week for one year.
Each of the 52 lessons lasted for 45 minutes.

Calculate the total time that Christa spent in music lessons.
Give your time in hours.

Answer ..... h [2]

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9 A bus company in Dubai has the following operating times.

Day	Starting time	Finishing time
Saturday	06 00	2400
Sunday	06 00	2400
Monday	06 00	2400
Tuesday	06 00	2400
Wednesday	06 00	2400
Thursday	06 00	2400
Friday	13 00	2400

(a) Calculate the total number of hours that the bus company operates in one week.

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

(b) Write the starting time on Friday in the 12-hour clock.

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

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5 A train takes 65 minutes to travel 52 km.

Calculate the average speed of the train in kilometres per hour.

Answer ..... km/h [2]

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16) June 2015 V1

13 A car travels a distance of 1280 **metres** at an average speed of 64 kilometres per hour.

Calculate the time it takes for the car to travel this distance.
Give your answer in **seconds**.

Answer ..... s [3]

17) June 2015 V2

2 A doctor starts work at 20 40 and finishes work at 06 10 the next day.

How long is the doctor at work?
Give your answer in hours and minutes.

Answer ..... h ..... min [1]

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14 A car travels at 56 km/h.

Find the time it takes to travel 300 metres.
Give your answer in seconds correct to the nearest second.

Answer ..... s [4]

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19) March 2015 V2

19 Fritz drives a distance of 381 km in 2 hours and 18 minutes.
He then drives 75 km at a constant speed of 30 km/h.

Calculate his average speed for the whole journey.

Answer ..... km/h [4]

20) June 2016 V1

1 A train leaves Zurich at 22 40 and arrives in Vienna at 07 32 the next day.

Work out the time taken.

..... h ..... min [1]

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21) June 2016 V1

18 A car of length 4.3 m is travelling at 105 km/h.
It passes over a bridge of length 36 m.

Calculate the time, in seconds, it takes to pass over the bridge **completely**.

..... s [3]

22) June 2012 V2

1 The ferry from Helsinki to Travemunde leaves Helsinki at 1730 on a Tuesday.
The journey takes 28 hours 45 minutes.

Work out the day and time that the ferry arrives in Travemunde.

Answer Day ..... Time ..... [2]

23) June 2016 V1

1 A train leaves Zurich at 2240 and arrives in Vienna at 07 32 the next day.

Work out the time taken.

..... h ..... min [1]

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20 A train travels for m minutes at a speed of x metres per second.

(a) Find the distance travelled, in **kilometres**, in terms of m and x.
Give your answer in its simplest form.

..... km [2]

(b) When $m = 5$, the train travels 10.5 km.

Find the value of x.

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

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19 The braking distance, d metres, for Alex's car travelling at v km/h is given by the formula

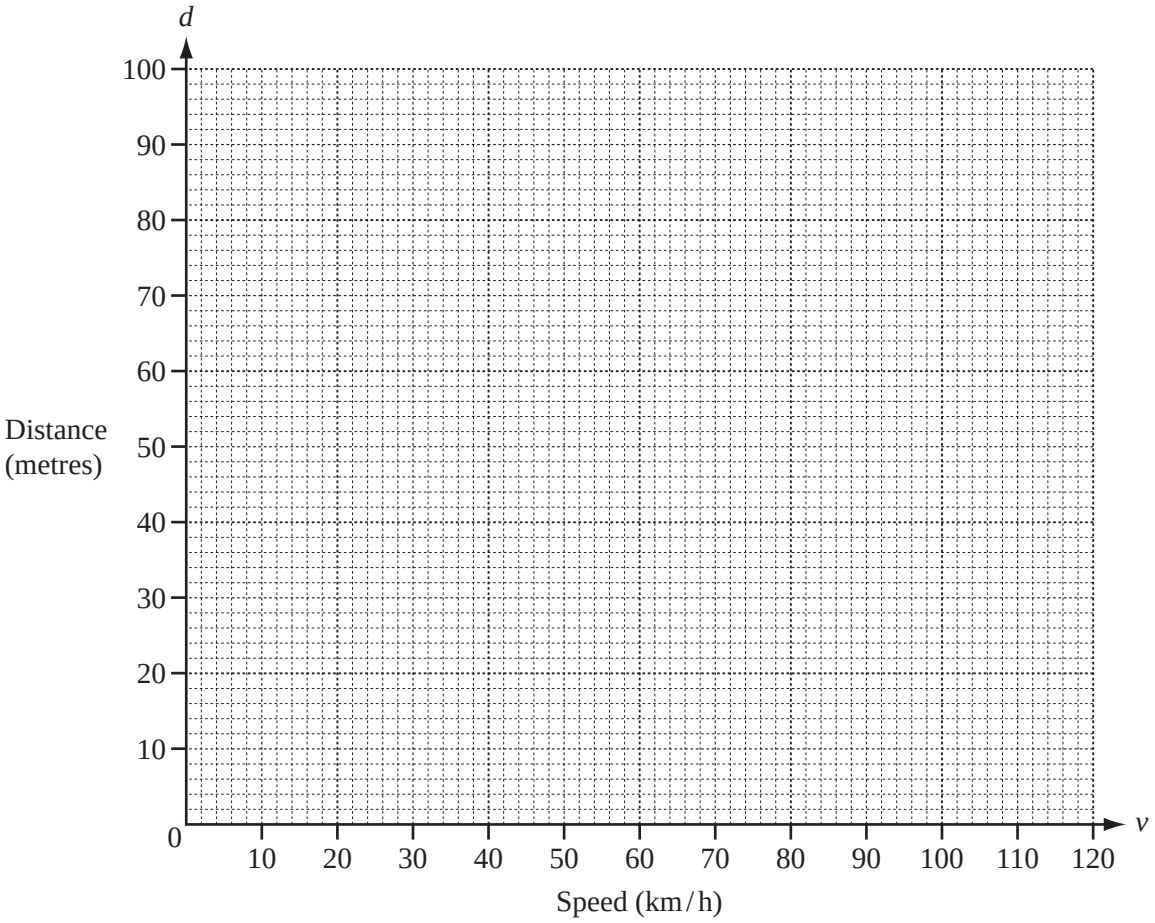
$$200d = v(v + 40).$$

(a) Calculate the missing values in the table.

v (km/h)	0	20	40	60	80	100	120
d (metres)	0		16		48		96

[2]

(b) On the grid below, draw the graph of $200d = v(v + 40)$ for $0 \leqslant v \leqslant 120$.



[3]

(c) Find the braking distance when the car is travelling at 110 km/h.

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

(d) Find the speed of the car when the braking distance is 80 m.

Answer(d) ..... km/h [1]

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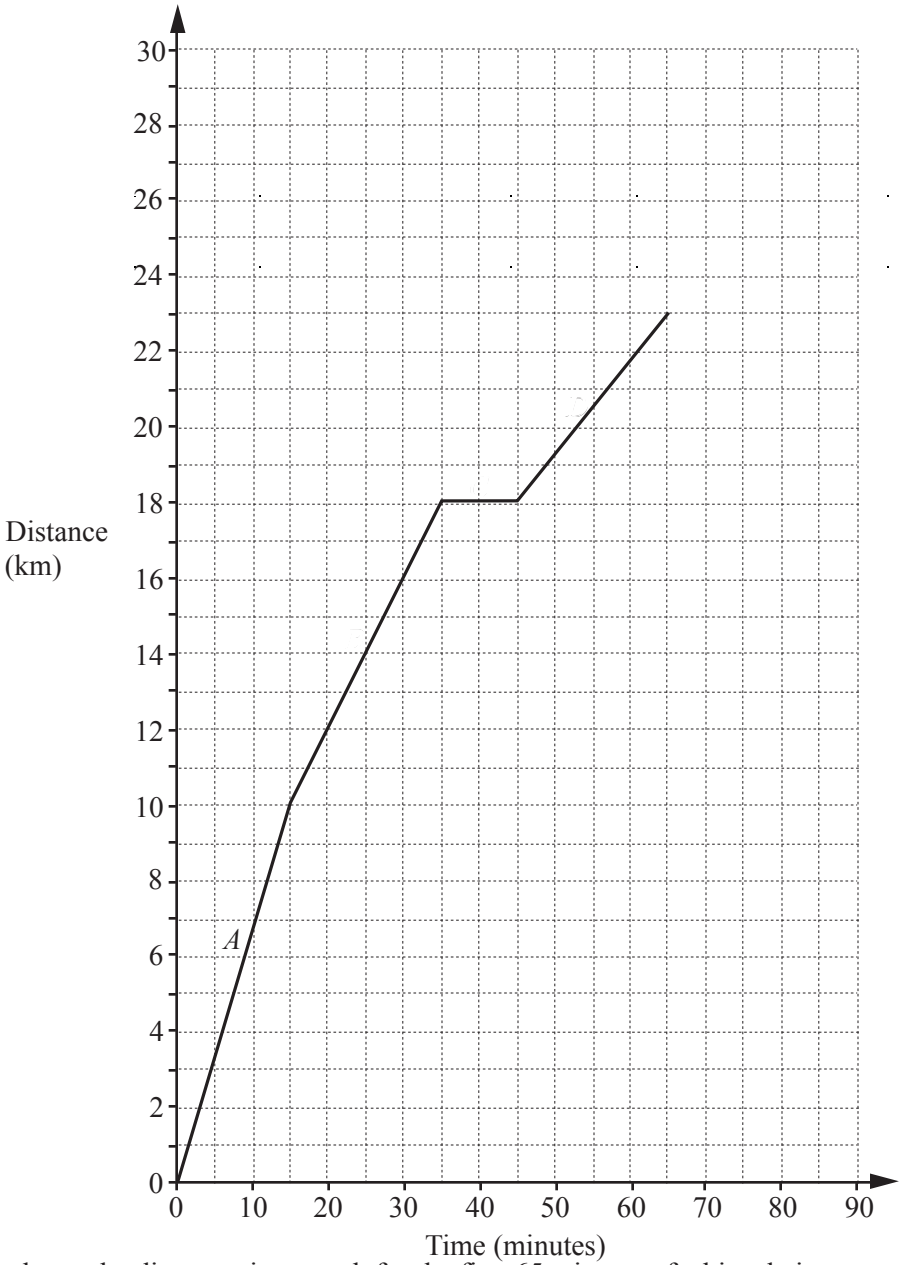
9



The diagram shows the distance-time graph for the first 65 minutes of a bicycle journey.

(a) There are four different parts to the journey labelled A, B, C and D.

Write down the part of the journey with the fastest speed.

..... [1]

(b) After the first 65 minutes the bicycle travels at a constant speed of 20 km/h for 15 minutes.
Draw this part of the journey on the diagram. [1]

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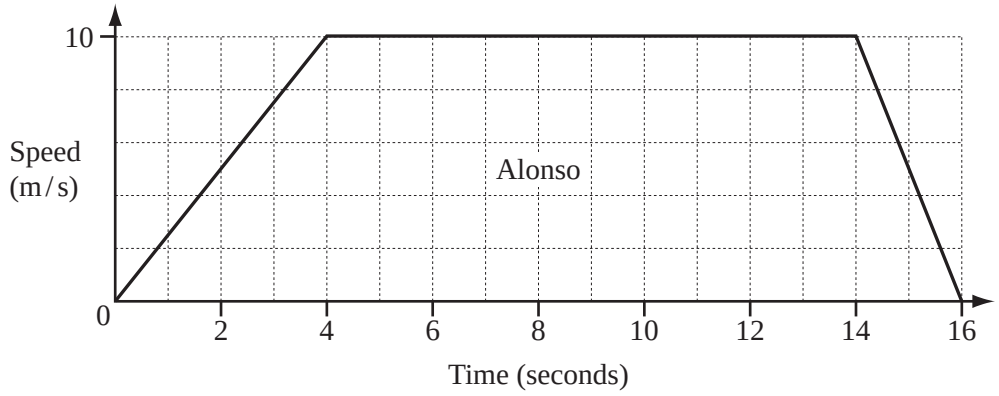
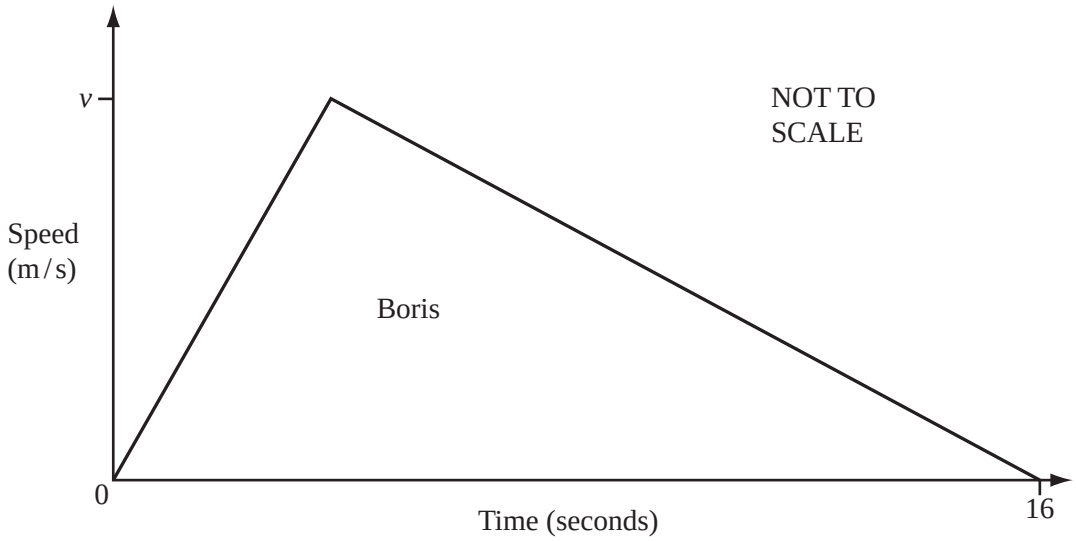
16 The graphs show the speeds of two cyclists, Alonso and Boris.

Alonso accelerated to 10 m/s, travelled at a steady speed and then slowed to a stop.



Boris accelerated to his maximum speed, *v* m/s, and then slowed to a stop.



Both cyclists travelled the same distance in the 16 seconds.

Calculate the maximum speed for Boris.
Show all your working.

Answer ..... m/s [5]

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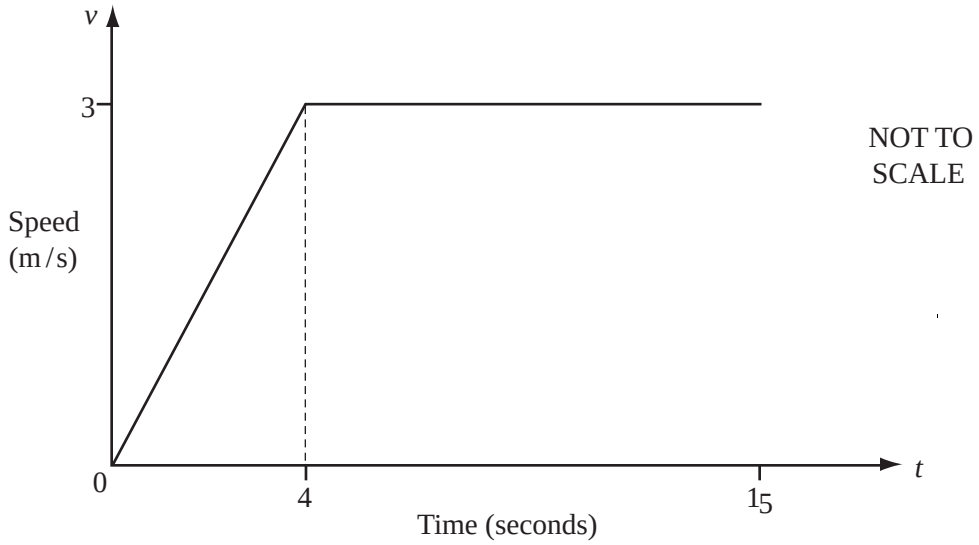
19



The diagram shows the speed-time graph for 15 seconds of the journey of a cyclist.

(a) Calculate the acceleration of the cyclist during the first 4 seconds.

Answer(a) ..... m/s^2 [1]

(b) Calculate the average speed for the first 15 seconds.

Answer(b) ..... m/s [3]

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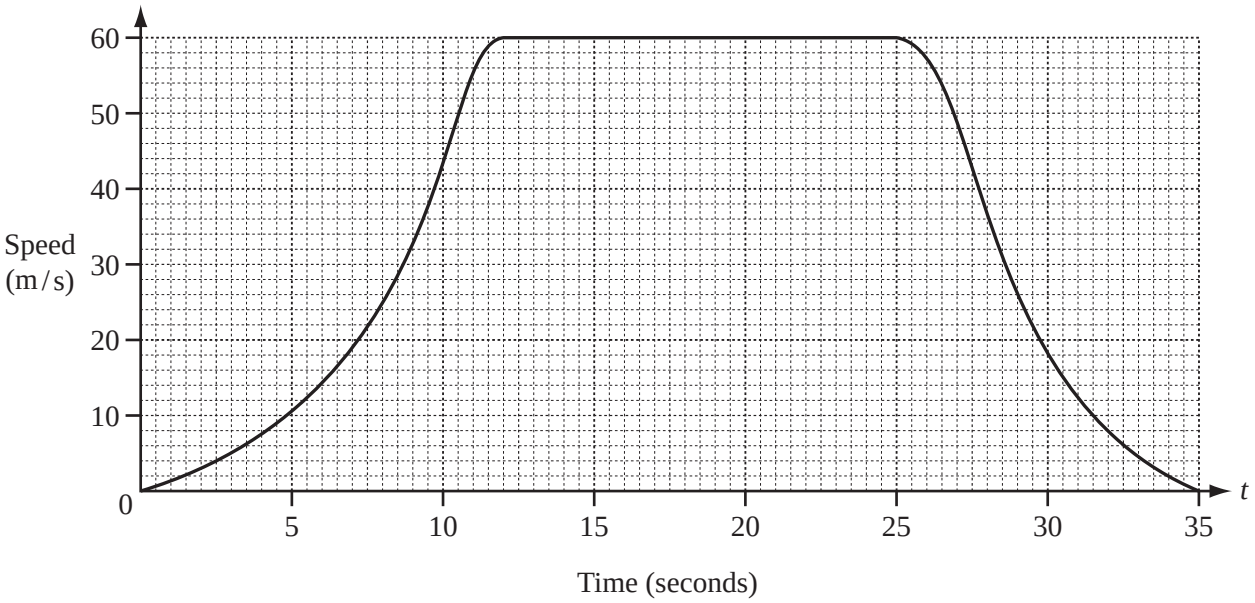
18



The graph shows the speed of a sports car after t seconds.

It starts from rest and accelerates to its maximum speed in 12 seconds.

(a) **(i)** Draw a tangent to the graph at $t = 7$. [1]

(ii) Find the acceleration of the car at $t = 7$.

Answer(a)(ii) ..... m/s^2 [2]

(b) The car travels at its maximum speed for 13 seconds.

Find the distance travelled by the car at its maximum speed.

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

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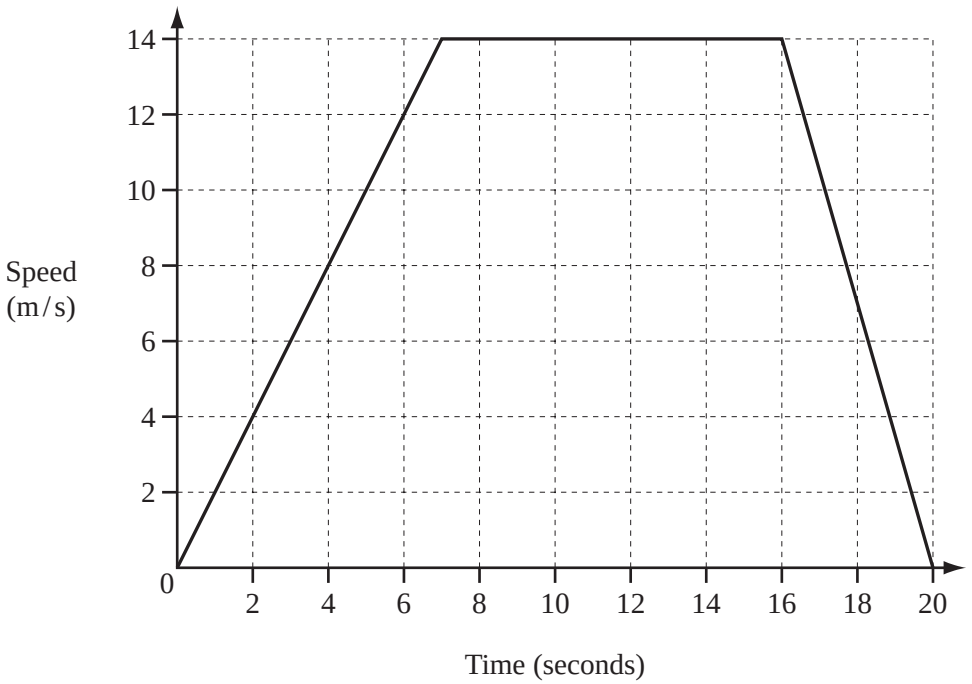
21 An animal starts from rest and accelerates to its top speed in 7 seconds. It continues at this speed for 9 seconds and then slows to a stop in a further 4 seconds.

The graph shows this information.



(a) Calculate its acceleration during the first seven seconds.

Answer(a) ..... m/s^2 [1]

(b) Write down its speed 18 seconds after the start.

Answer(b) ..... m/s [1]

(c) Calculate the total distance that the animal travelled.

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

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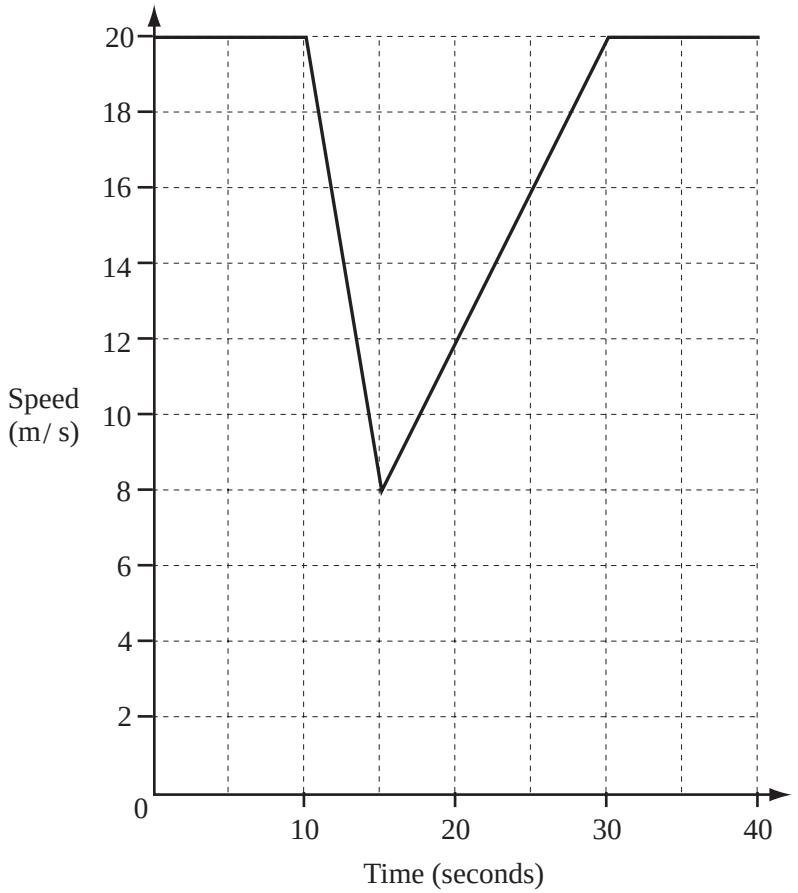
21



The graph shows 40 seconds of a car journey.

The car travelled at a constant speed of 20 m/s, decelerated to 8 m/s then accelerated back to 20 m/s.

Calculate

(a) the deceleration of the car,

Answer(a) ..... m/s^2 [1]

(b) the total distance travelled by the car during the 40 seconds.

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

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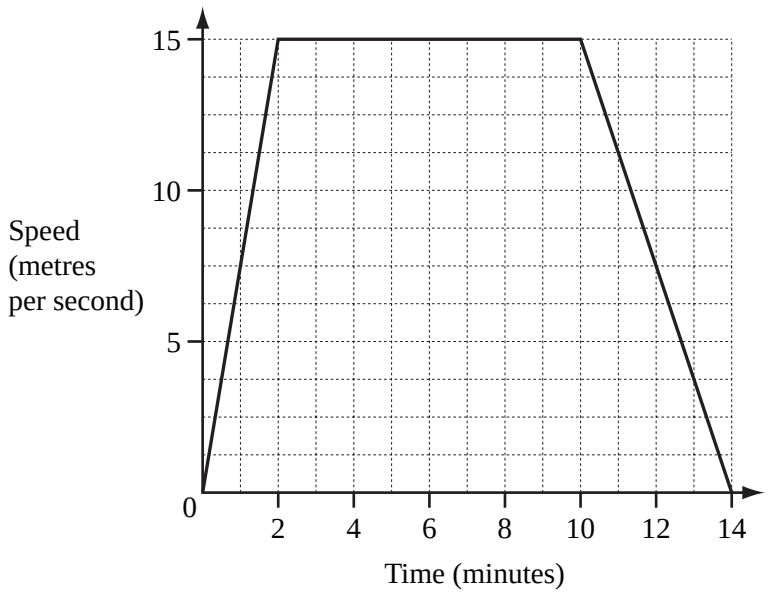
19



The diagram shows the speed-time graph of a train journey between two stations.
The train accelerates for two minutes, travels at a constant maximum speed, then slows to a stop.

(a) Write down the number of **seconds** that the train travels at its constant maximum speed.

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

(b) Calculate the distance between the two stations **in metres**.

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

(c) Find the acceleration of the train in the **first two minutes**.
Give your answer in m/s^2.

Answer(c) ..... m/s^2 [2]

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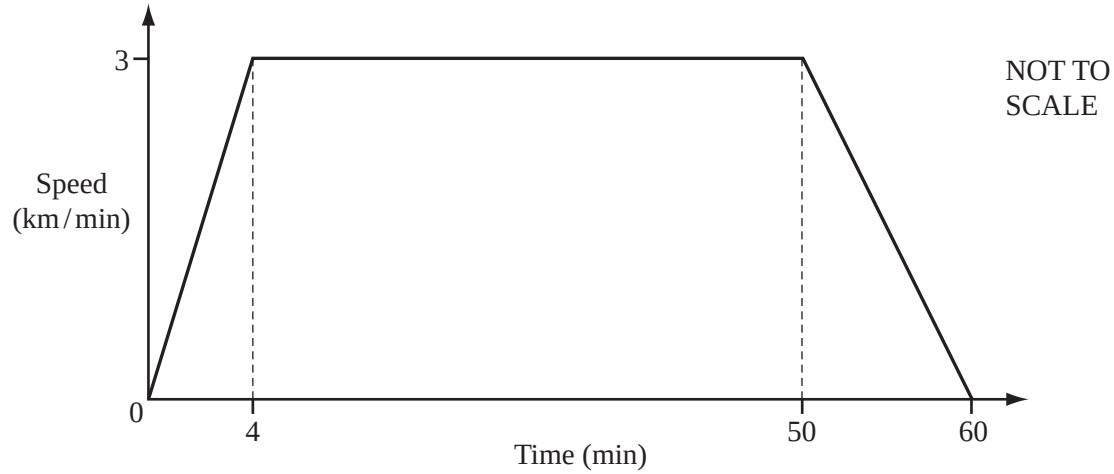
22



A train journey takes one hour.
The diagram shows the speed-time graph for this journey.

(a) Calculate the total distance of the journey.

Give your answer in kilometres.

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

(b) **(i)** Convert 3 kilometres / minute into metres / second.

Answer(b)(i) ..... m/s [2]

(ii) Calculate the acceleration of the train during the first 4 minutes.

Give your answer in metres / second^2.

Answer(b)(ii) ..... m/s^2 [2]

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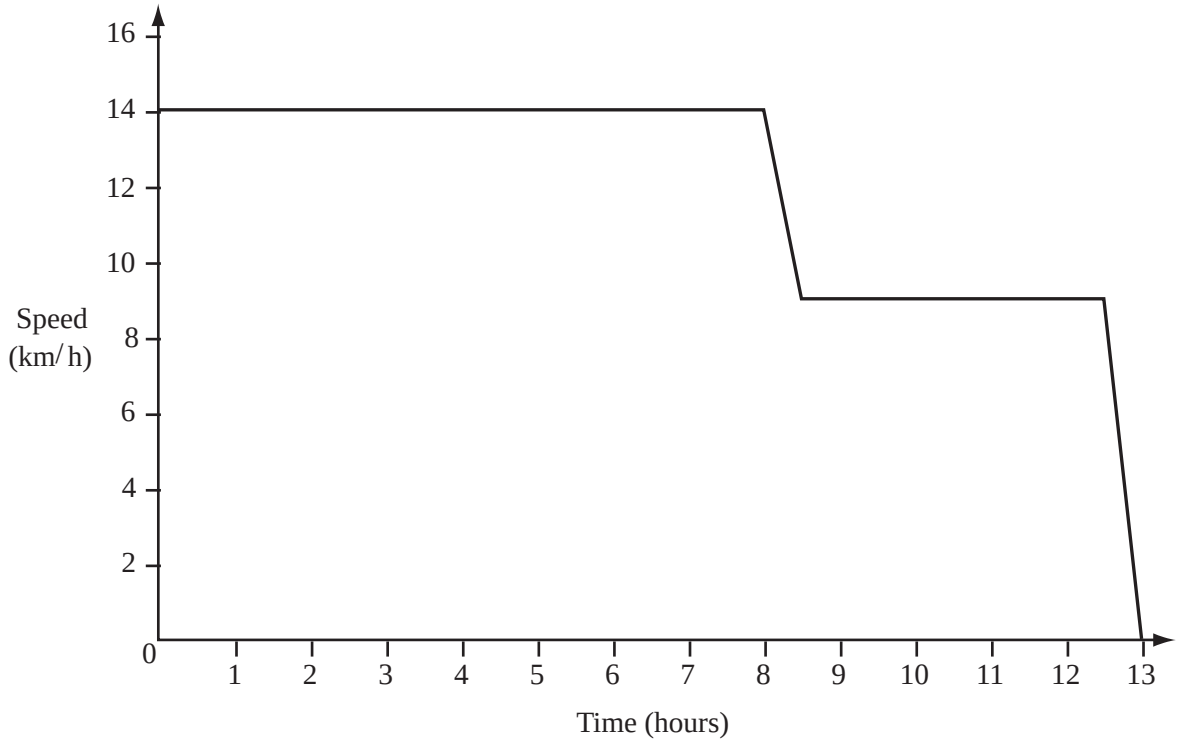
15 A container ship travelled at 14 km/h for 8 hours and then slowed down to 9 km/h over a period of 30 minutes.

It travelled at this speed for another 4 hours and then slowed to a stop over 30 minutes.

The speed-time graph shows this voyage.



(a) Calculate the total distance travelled by the ship.

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

(b) Calculate the average speed of the ship for the whole voyage.

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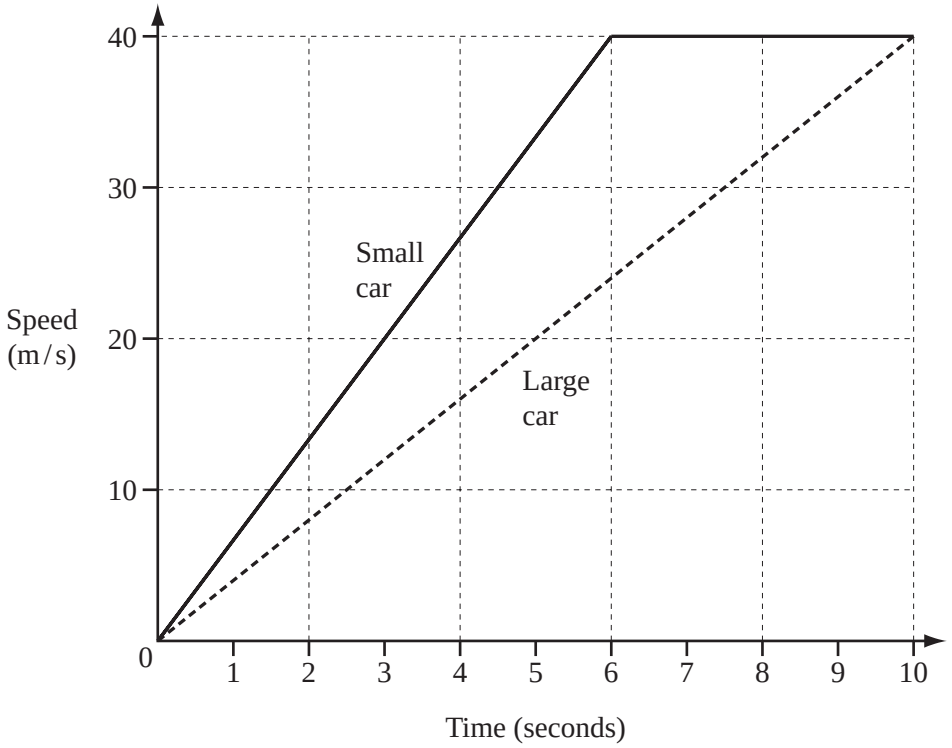
Answer(b) ..... km/h [1]

12



A small car accelerates from 0 m/s to 40 m/s in 6 seconds and then travels at this constant speed.
A large car accelerates from 0 m/s to 40 m/s in 10 seconds.

Calculate how much further the small car travels in the first 10 seconds.

Answer ..... m [4]

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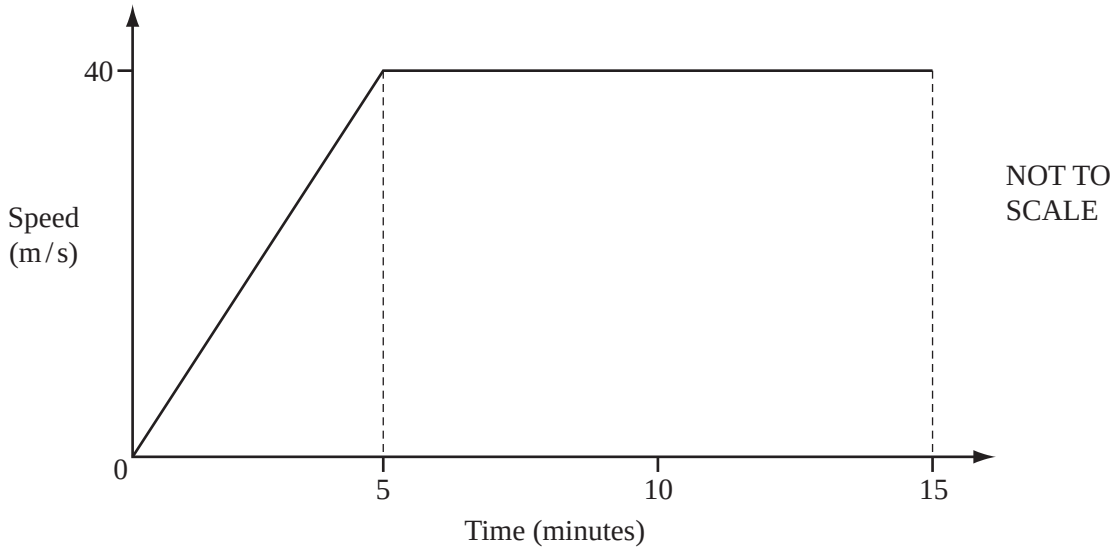
23



The diagram shows the speed-time graph for the first 15 **minutes** of a train journey.
The train accelerates for 5 minutes and then continues at a constant speed of 40 metres/**second**.

(a) Calculate the acceleration of the train during the first 5 minutes.
Give your answer in m/s^2.

Answer(a) ..... m/s^2 [2]

(b) Calculate the average speed for the first 15 minutes of the train journey.
Give your answer in m/s.

Answer(b) ..... m/s [3]

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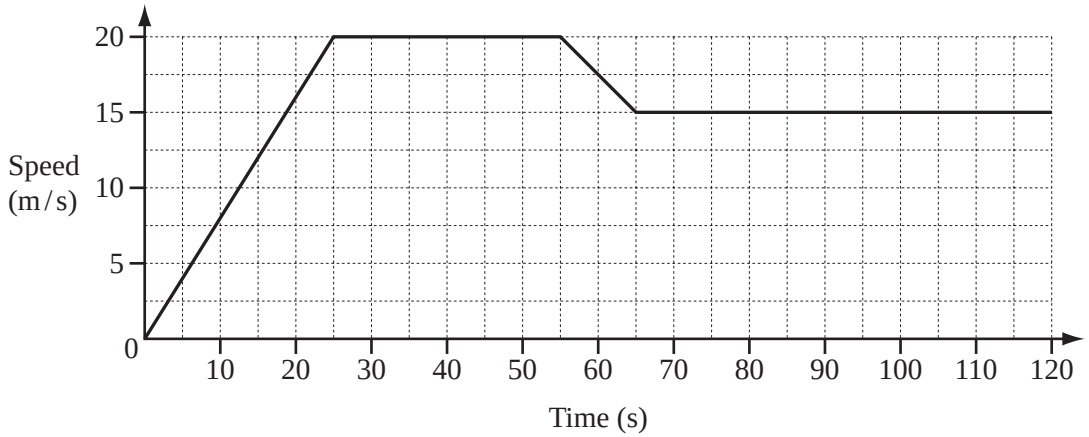
18



The diagram shows the speed-time graph for the first 120 seconds of a car journey.

(a) Calculate the acceleration of the car during the first 25 seconds.

Answer(a) ..... m/s^2 [1]

(b) Calculate the distance travelled by the car in the first 120 seconds.

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

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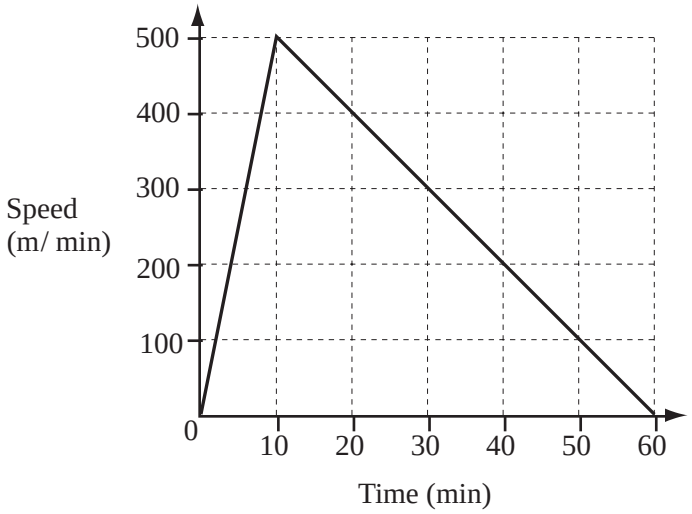
10



The diagram shows the speed-time graph for a boat journey.

(a) Work out the acceleration of the boat in metres / minute^2.

Answer(a) ..... m /min^2 [1]

(b) Calculate the total distance travelled by the boat.
Give your answer in **kilometres**.

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

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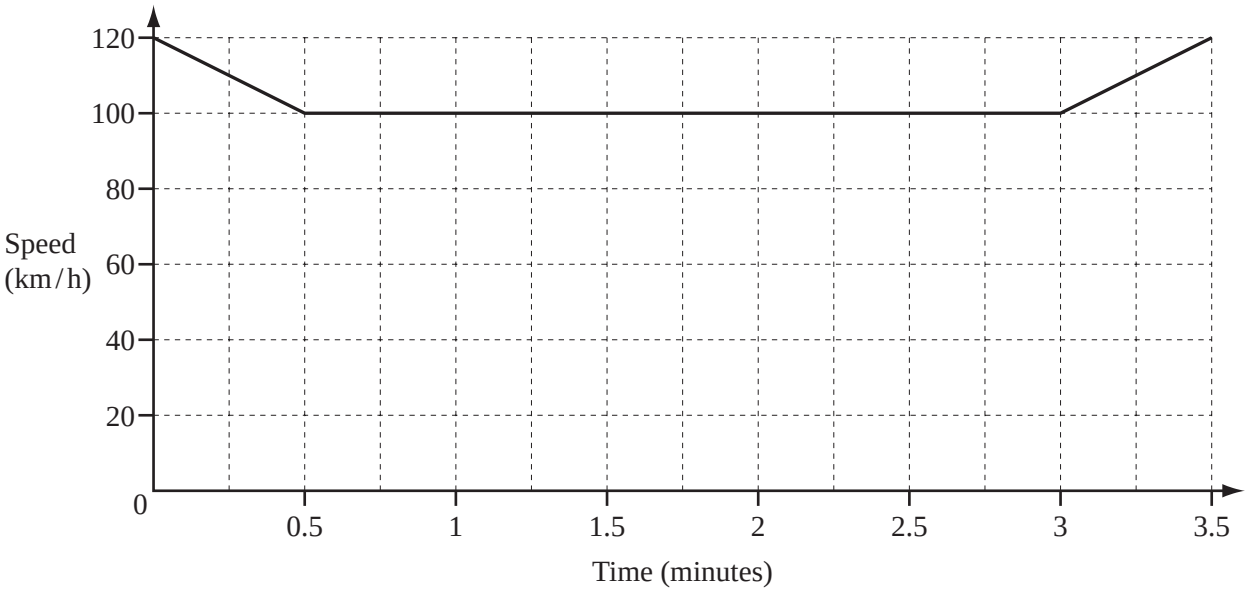
19



The diagram shows the speed-time graph for part of a car journey.
The speed of the car is shown in kilometres/**hour**.

Calculate the distance travelled by the car during the 3.5 **minutes** shown in the diagram.
Give your answer in kilometres.

Answer ..... km [4]

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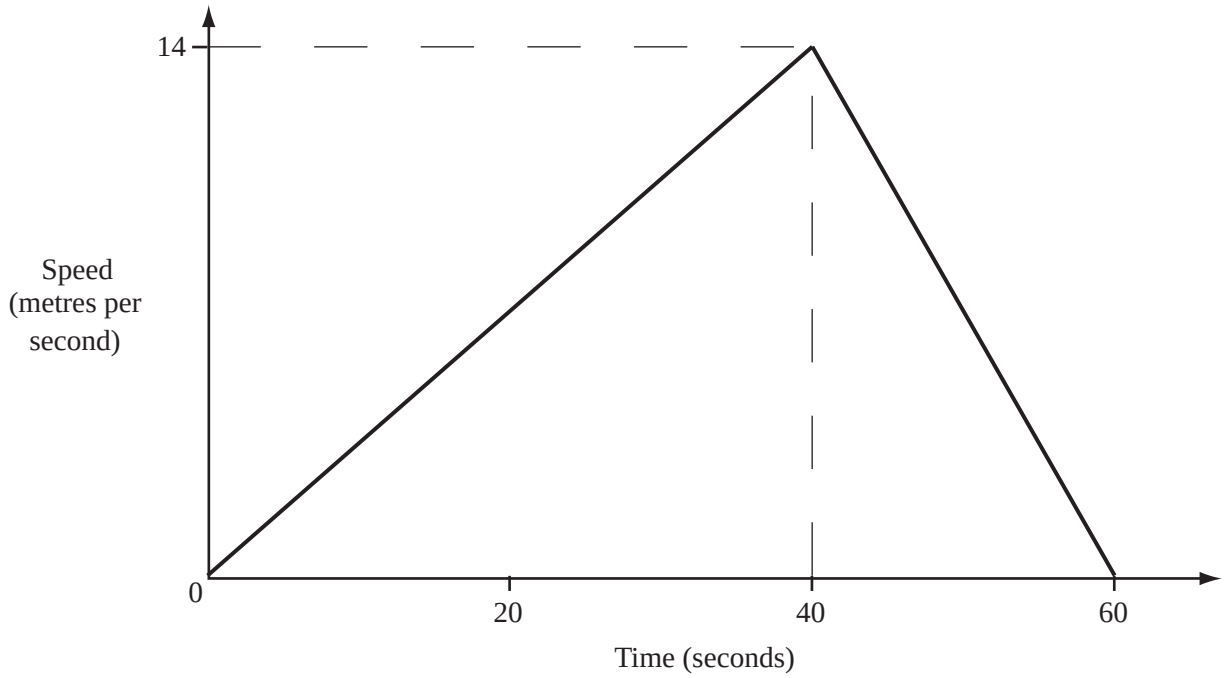
15



The diagram shows the speed-time graph of a bus journey between two bus stops.
Hamid runs at a constant speed of 4 m/s along the bus route.
He passes the bus as it leaves the first bus stop.
The bus arrives at the second bus stop after 60 seconds.

How many metres from the bus is Hamid at this time?

Answer ..... m [3]

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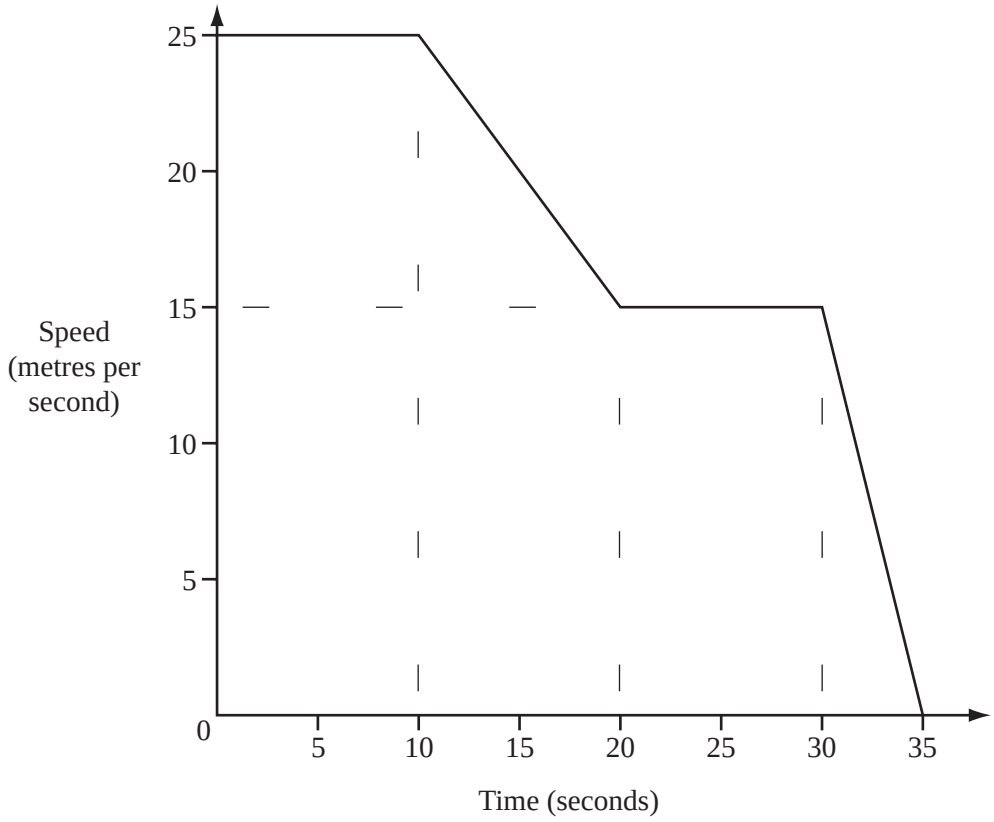
15



The diagram shows the speed-time graph for the last 35 seconds of a car journey.

(a) Find the deceleration of the car as it came to a stop.

Answer(a) ..... m/s^2 [1]

(b) Calculate the total distance travelled by the car in the 35 seconds.

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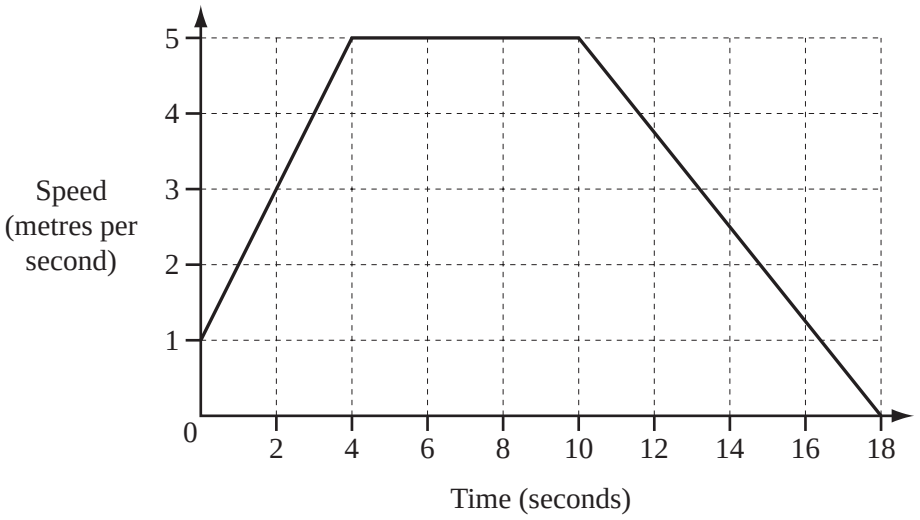
Answer(b) ..... m [3]

19



The diagram shows the speed-time graph for the last 18 seconds of Roman's cycle journey.

(a) Calculate the deceleration.

Answer(a) ..... m/s^2 [1]

(b) Calculate the total distance Roman travels during the 18 seconds.

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

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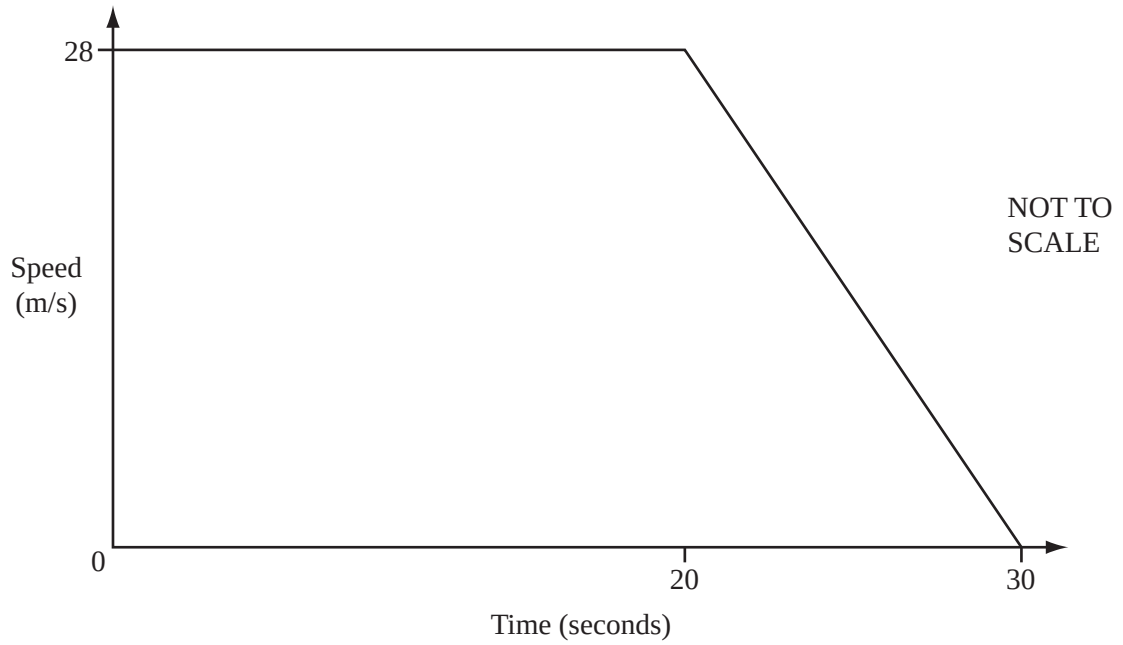
25



The diagram shows the speed-time graph of a car.
It travels at 28 m/s for 20 seconds and then decelerates until it stops after a further 10 seconds.

(a) Calculate the deceleration of the car.

Answer(a) ..... m/s^2 [1]

(b) Calculate the distance travelled during the 30 seconds.

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

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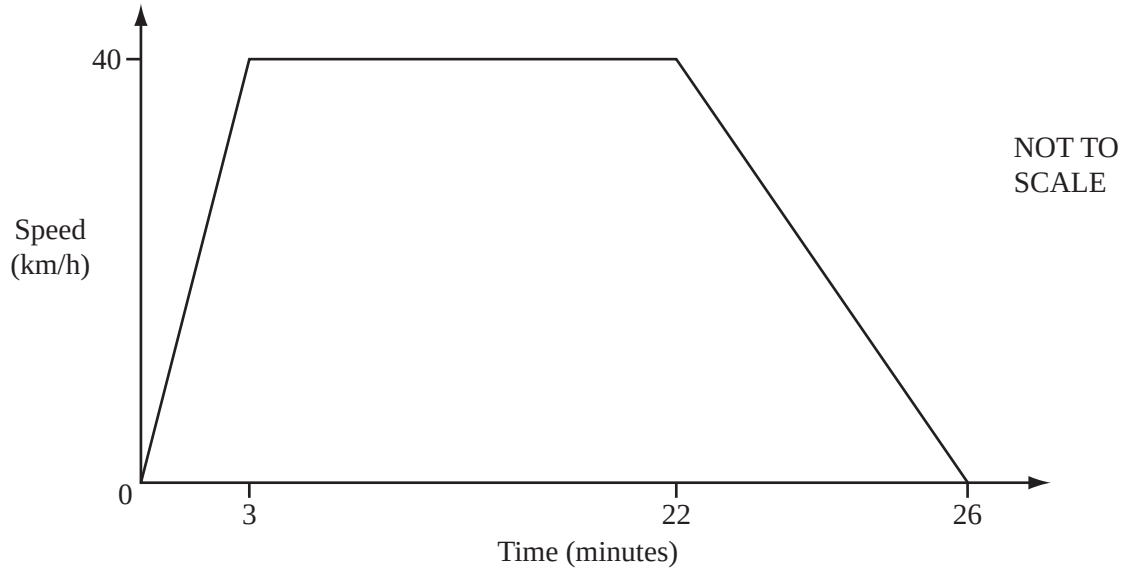
16



The diagram shows the speed-time graph of a train journey between two stations.

The train accelerates for 3 minutes, travels at a constant maximum speed of 40 km/h, then takes 4 minutes to slow to a stop.

Calculate the distance in kilometres between the two stations.

Answer ..... km [4]

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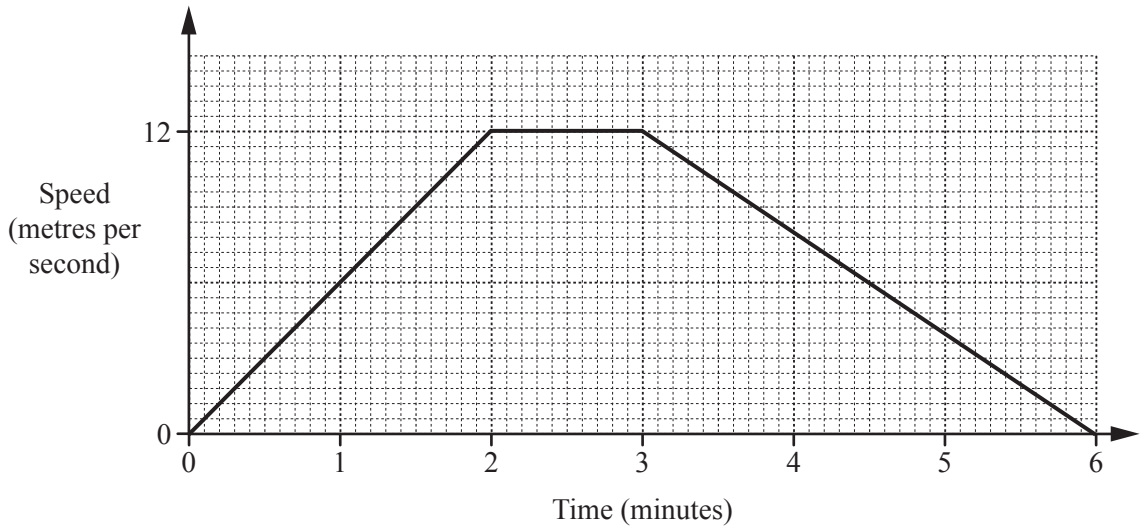
10



A tram leaves a station and accelerates for 2 **minutes** until it reaches a speed of 12 metres per second.
It continues at this speed for 1 minute.
It then decelerates for 3 minutes until it stops at the next station.
The diagram shows the speed-time graph for this journey.

Calculate the distance, in metres, between the two stations.

Answer ..... m [3]

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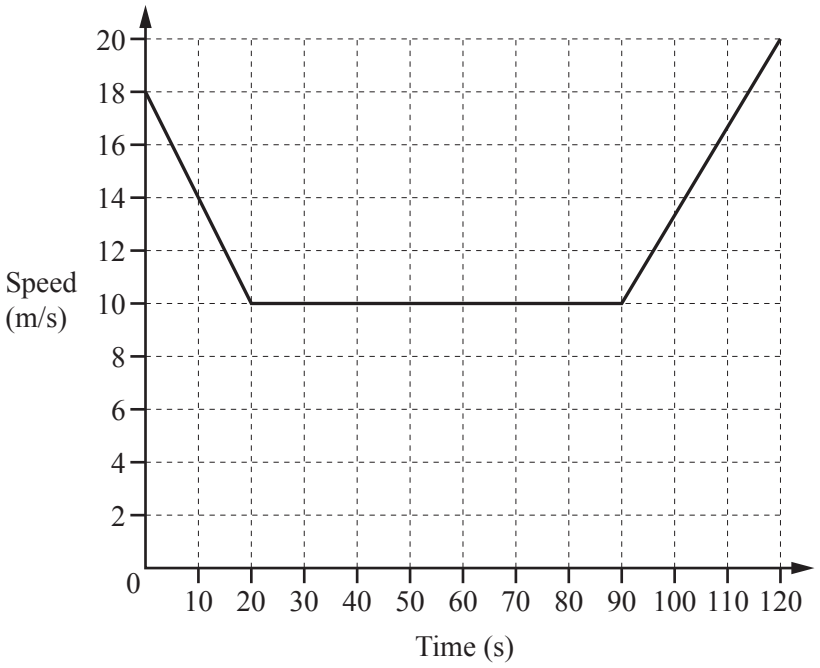
23



The diagram shows the speed-time graph for 120 seconds of a car journey.

(a) Calculate the deceleration of the car during the first 20 seconds.

Answer(a) ..... m/s^2 [1]

(b) Calculate the total distance travelled by the car during the 120 seconds.

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

(c) Calculate the average speed for this 120 second journey.

Answer(c) ..... m/s [1]

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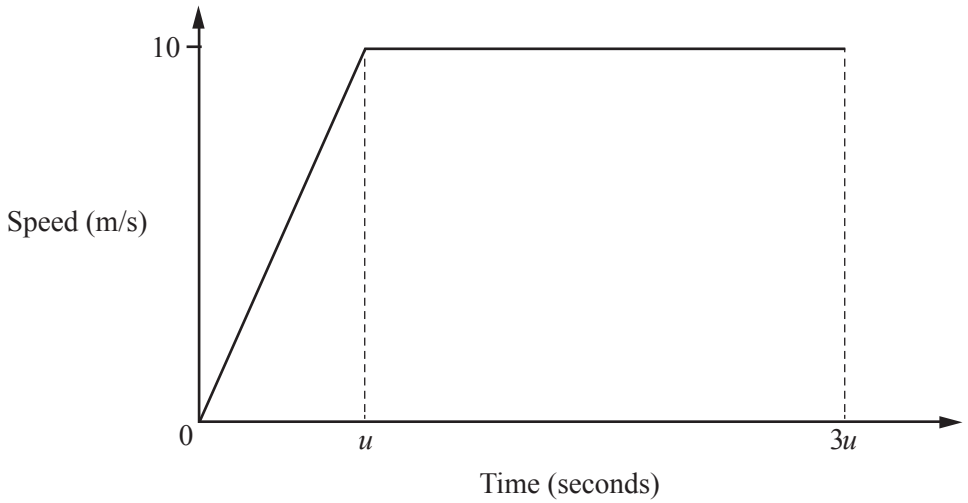

NOT TO SCALE

A car starts from rest and accelerates for u seconds until it reaches a speed of 10 m/s.
The car then travels at 10 m/s for $2u$ seconds.
The diagram shows the speed-time graph for this journey.

The distance travelled by the car in the first $3u$ seconds is 125 m.

(a) Find the value of u

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

(b) Find the acceleration in the first u seconds.

Answer(b) ..... m/s^2 [1]

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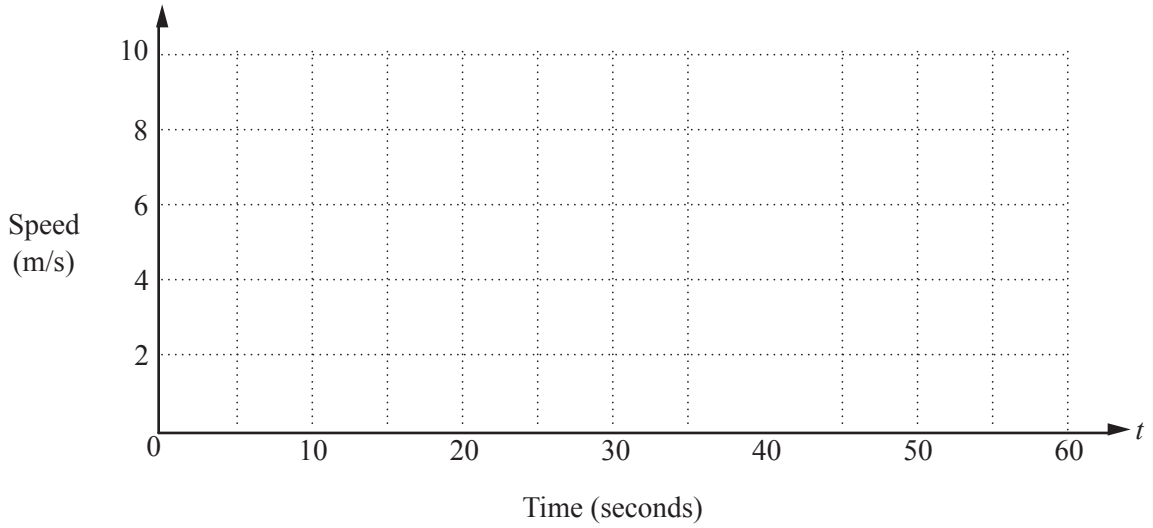
20 A car passes through a checkpoint at time $t = 0$ seconds, travelling at 8 m/s.
It travels at this speed for 10 seconds.
The car then decelerates at a constant rate until it stops when $t = 55$ seconds.

(a) On the grid, draw the speed-time graph.



[2]

(b) Calculate the total distance travelled by the car after passing through the checkpoint.

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

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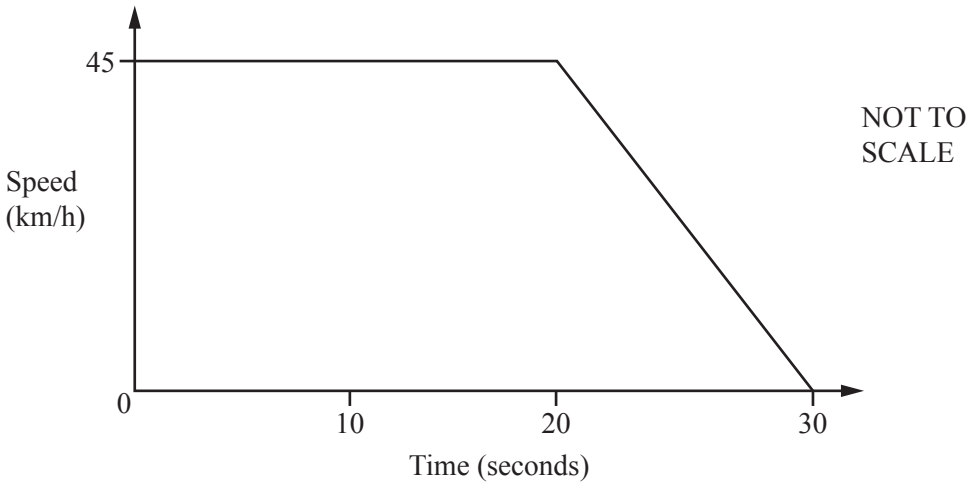

The diagram shows the speed-time graph of a car.
The car travels at 45 km/h for 20 seconds.
The car then decelerates for 10 seconds until it stops.

(a) Change 45 km/h into m/s.

Answer(a) ..... m/s [2]

(b) Find the deceleration of the car, giving your answer in m/s^2.

Answer(b) ..... m/s^2 [1]

(c) Find the distance travelled by the car during the 30 seconds, giving your answer in metres.

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

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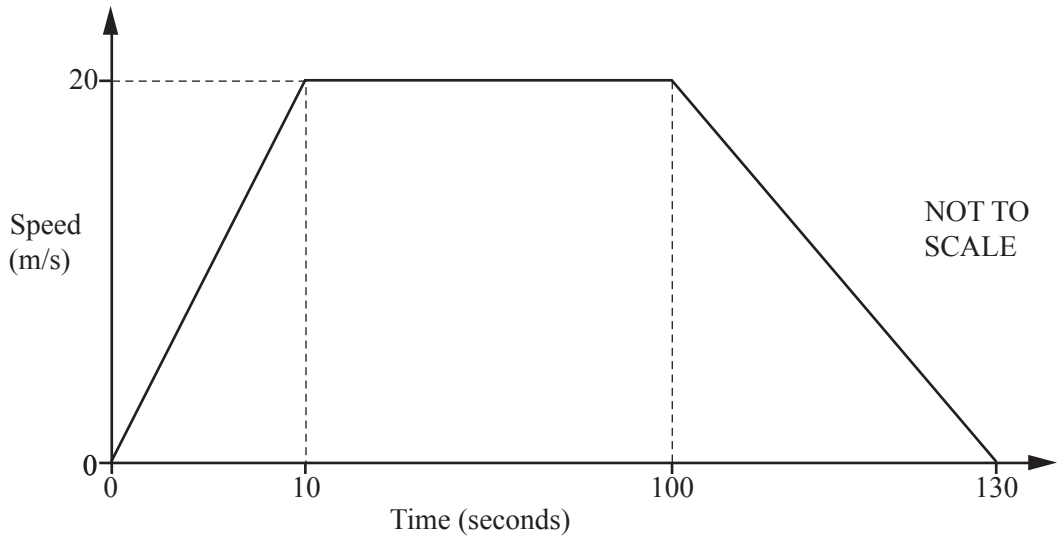

The speed time graph shows information about the journey of a tram between two stations.

(a) Calculate the distance between the two stations.

..... m [3]

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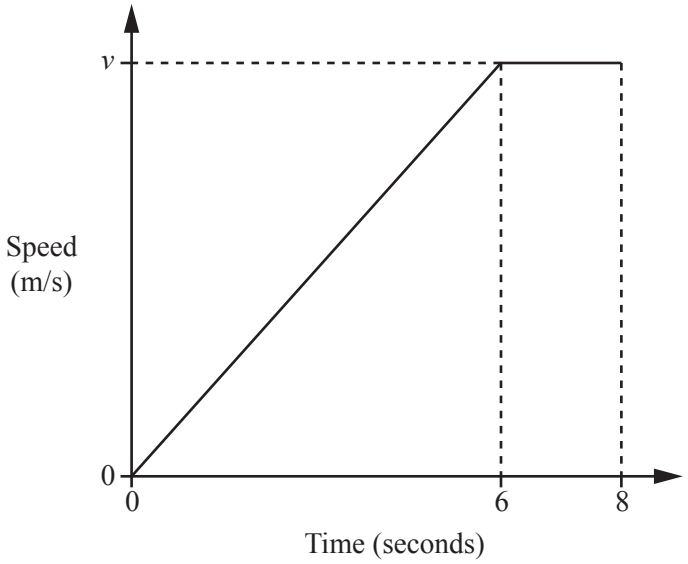
17 The diagram shows information about the first 8 seconds of a car journey.



NOT TO SCALE

The car travels with constant acceleration reaching a speed of v m/s after 6 seconds.
The car then travels at a constant speed of v m/s for a further 2 seconds.
The car travels a total distance of 150 metres.

Work out the value of v.

$v =$ ..... [3]

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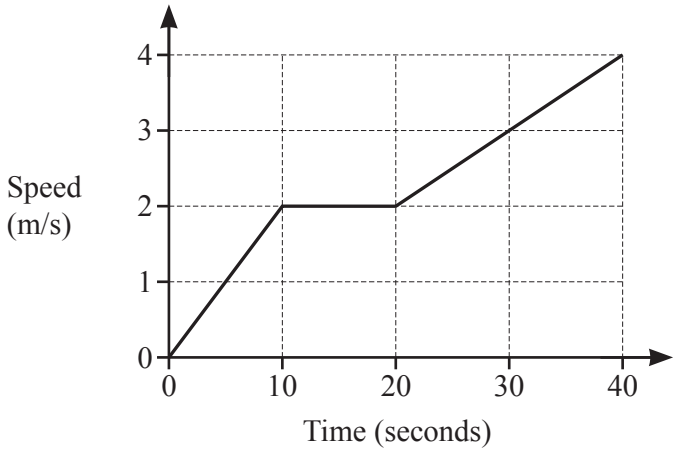

The diagram shows the speed–time graph for the first 40 seconds of a cycle ride.

(a) Find the acceleration between 20 and 40 seconds.

..... m/s^2 [1]

(b) Find the total distance travelled.

..... m [3]

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Linear Programing

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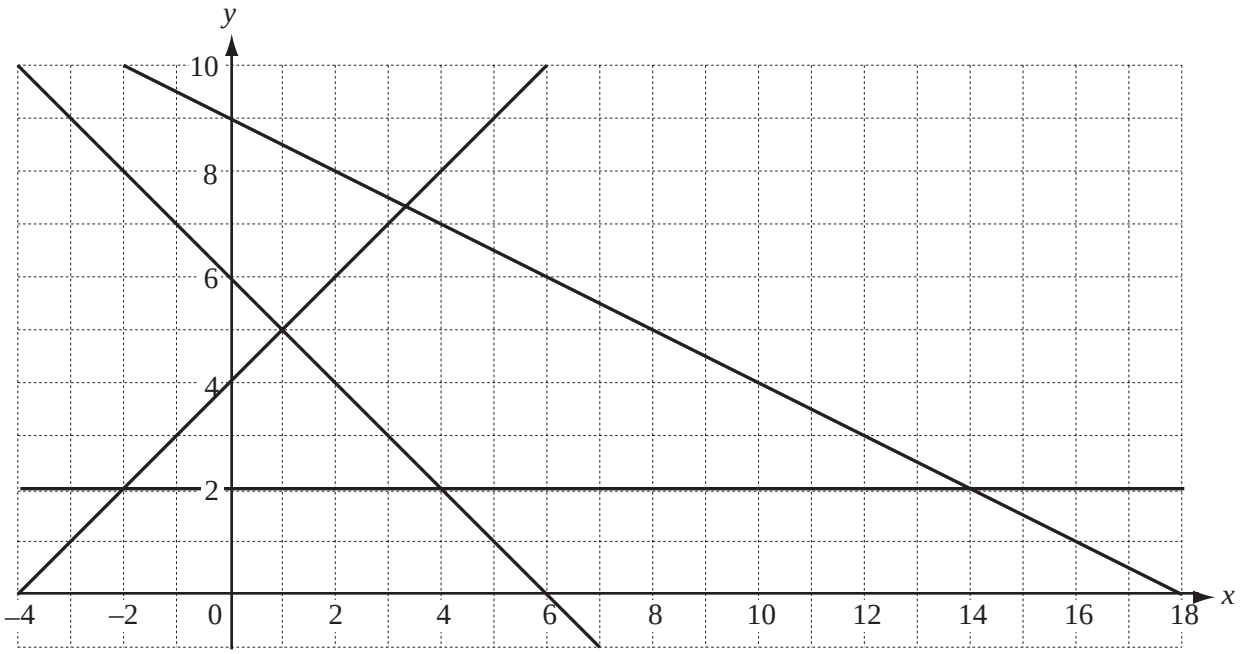
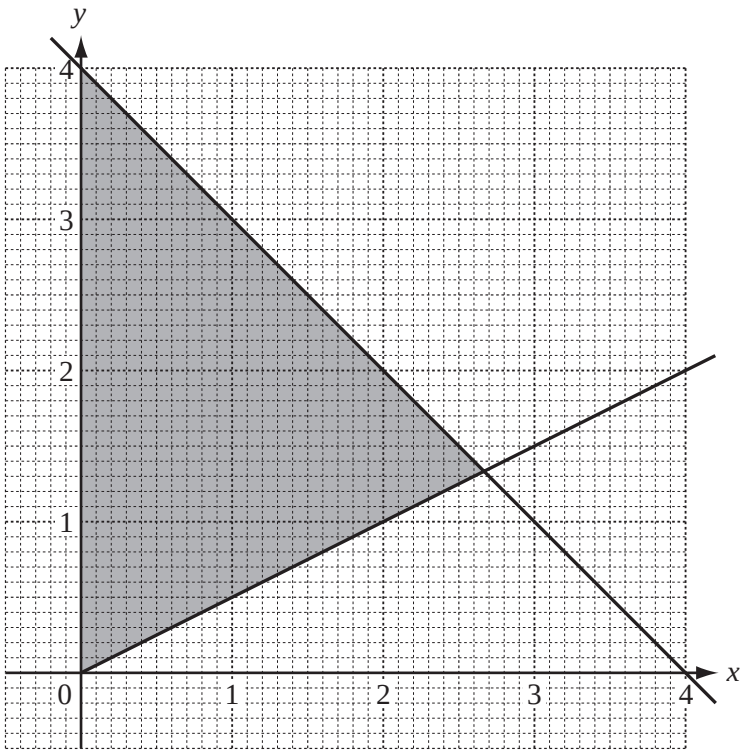


By shading the **unwanted** regions of the grid above, find and label the region R which satisfies the following four inequalities.

$y \geqslant 2$ $x + y \geqslant 6$ $y \leqslant x + 4$ $x + 2y \leqslant 18$ [4]

20



Find the three inequalities which define the shaded region on the grid.

Answer .....

.....

..... [5]

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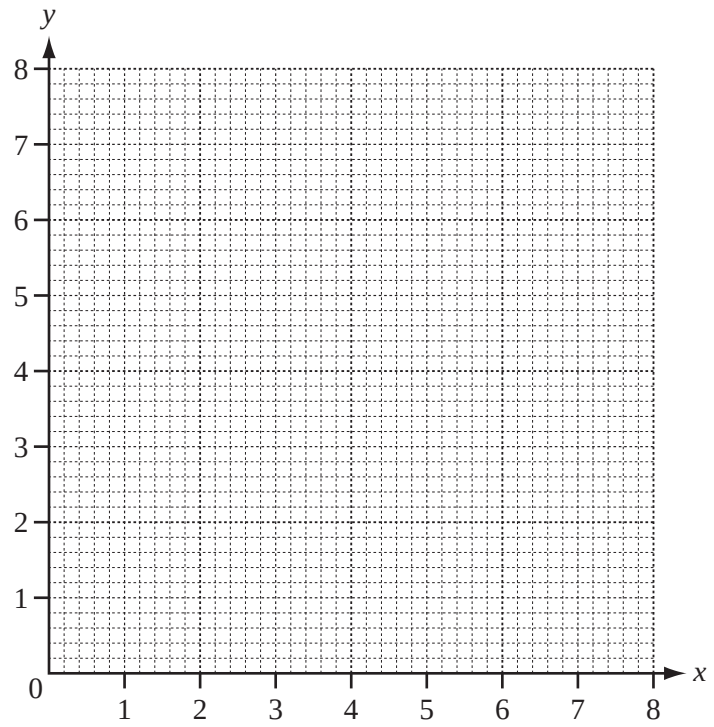
20



(a) Draw the lines $y = 2$, $x + y = 6$ and $y = 2x$ on the grid above. [4]

(b) Label the region R which satisfies the three inequalities

$x + y \geqslant 6$, $y \geqslant 2$ and $y \leqslant 2x$. [1]

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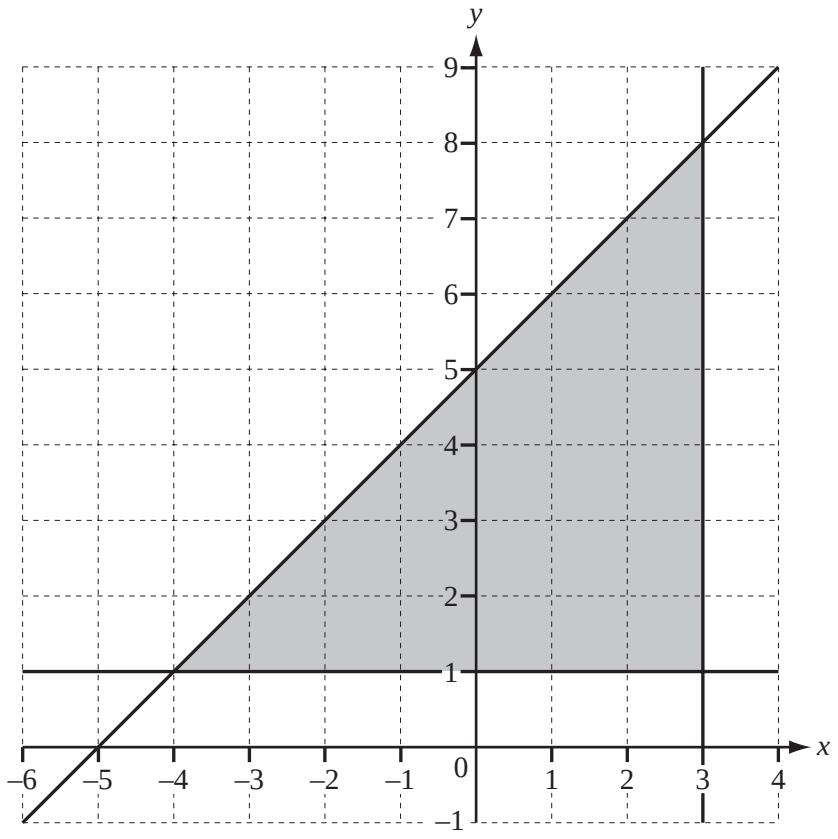

Find the three inequalities which define the shaded triangle in the diagram.

Answer .....

.....

..... [5]

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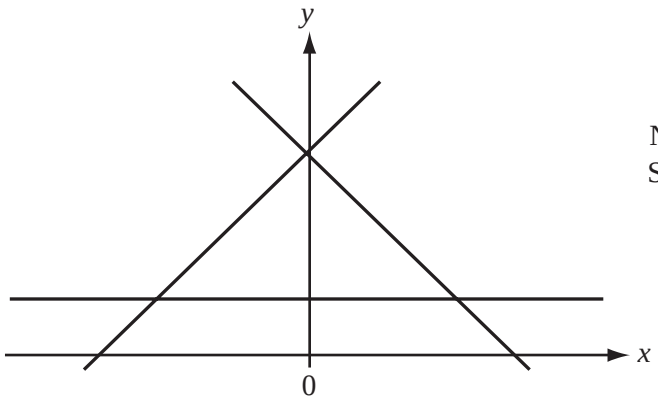

NOT TO SCALE

The diagram shows the lines $y = 1$, $y = x + 4$ and $y = 4 - x$.

On the diagram, **label the region R** where $y \geqslant 1$, $y \geqslant x + 4$ and $y \leqslant 4 - x$. [3]

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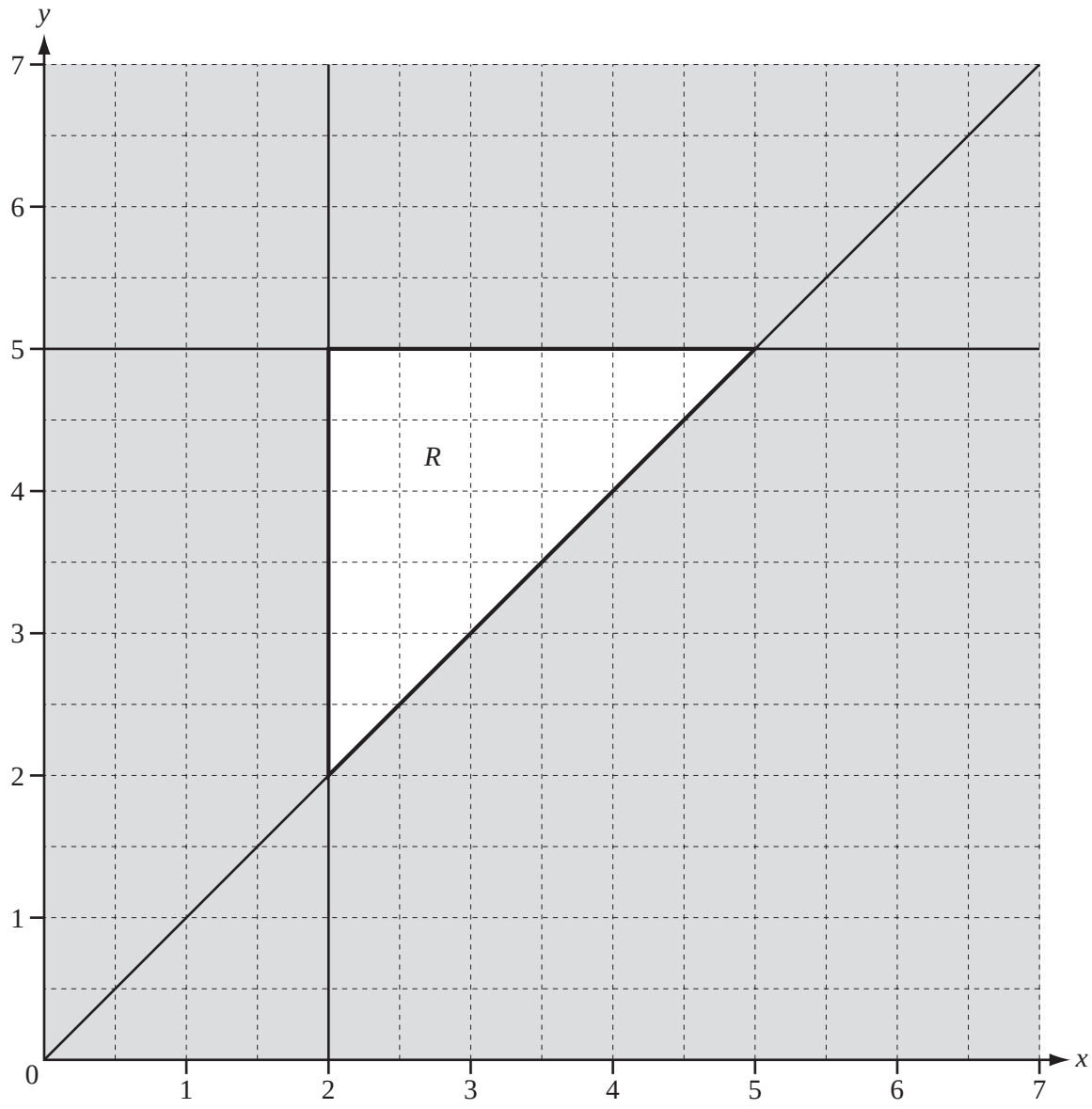
14



The region R is bounded by three lines.

Write down the three inequalities which define the region R.

Answer .....

.....

..... [4]

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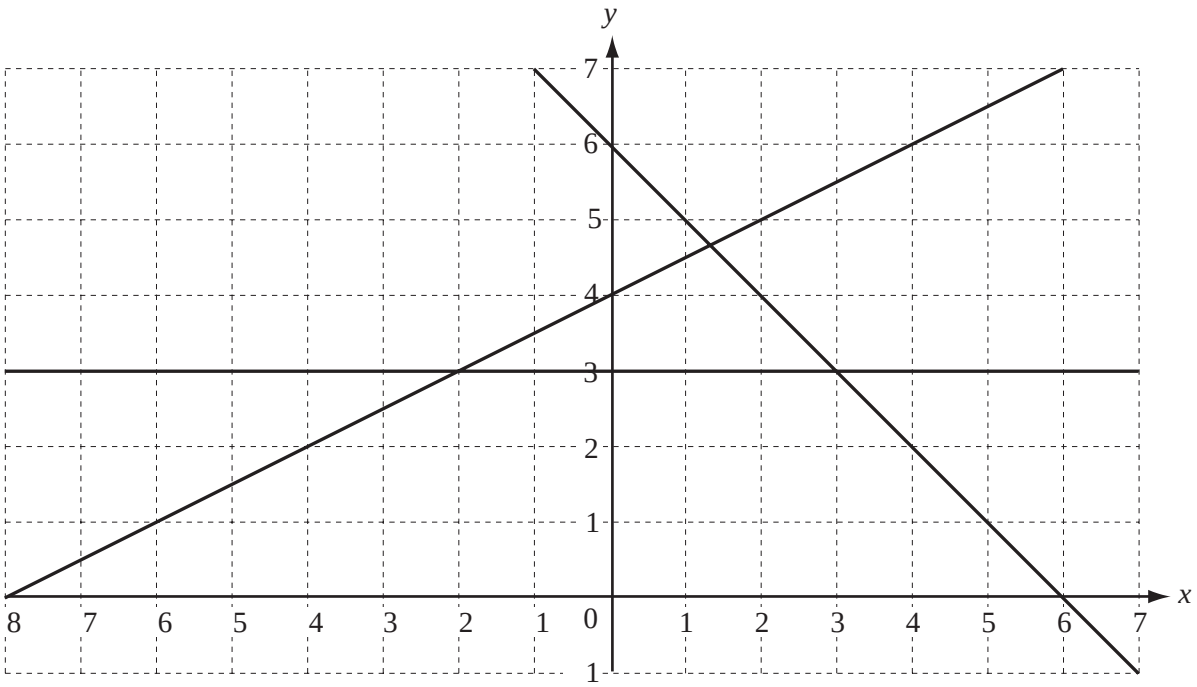

The region ***R*** contains points which satisfy the inequalities

$$y \leqslant \tfrac{1}{2}x + 4, \qquad y \geqslant 3 \quad \text{and} \quad x + y \geqslant 6.$$

On the grid, label with the letter ***R*** the region which satisfies these inequalities.

You must shade the **unwanted** regions. [3]

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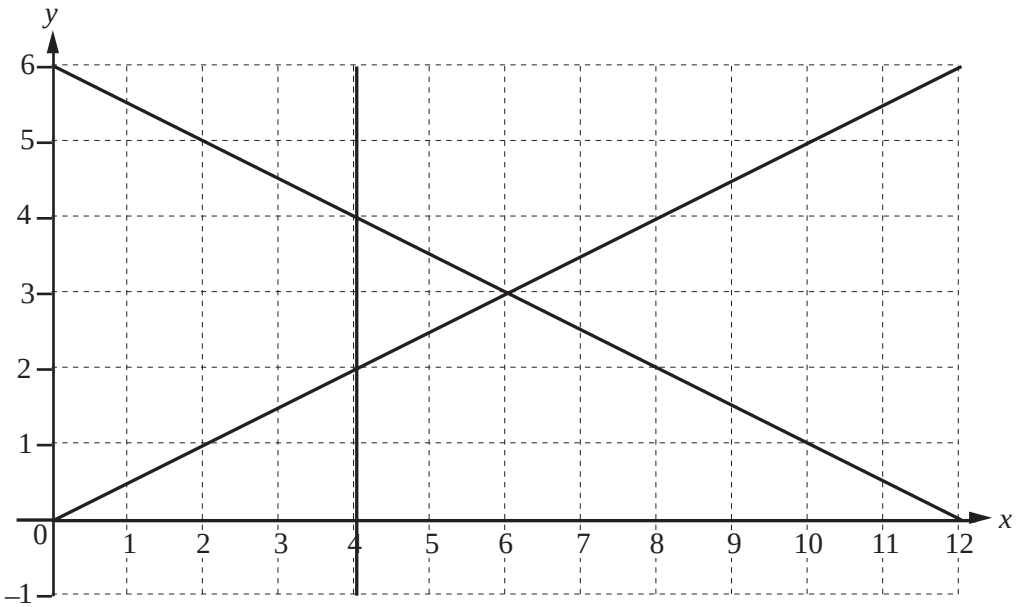
12



By shading the **unwanted** regions of the grid, find and label the region R which satisfies the following four inequalities.

$y \geqslant 0$ $x \geqslant 4$ $2y \leqslant x$ $2y + x \leqslant 12$

[3]

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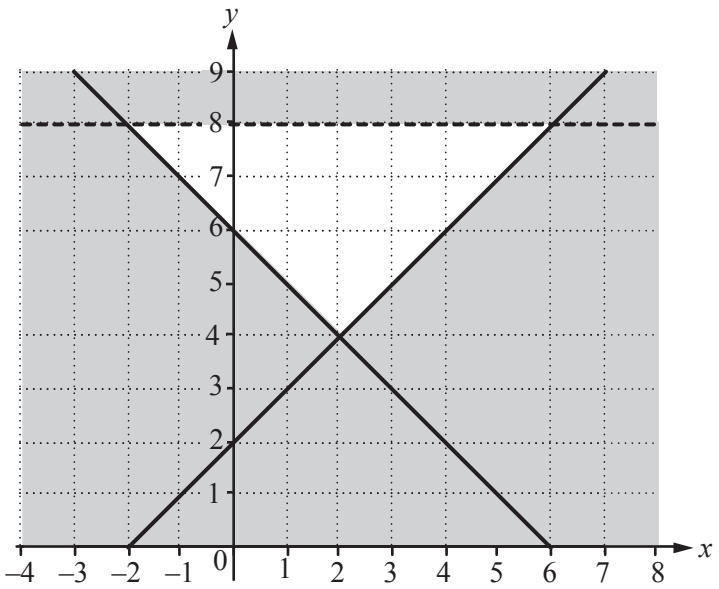

Write down the 3 inequalities which define the unshaded region.

Answer

.....

..... [4]

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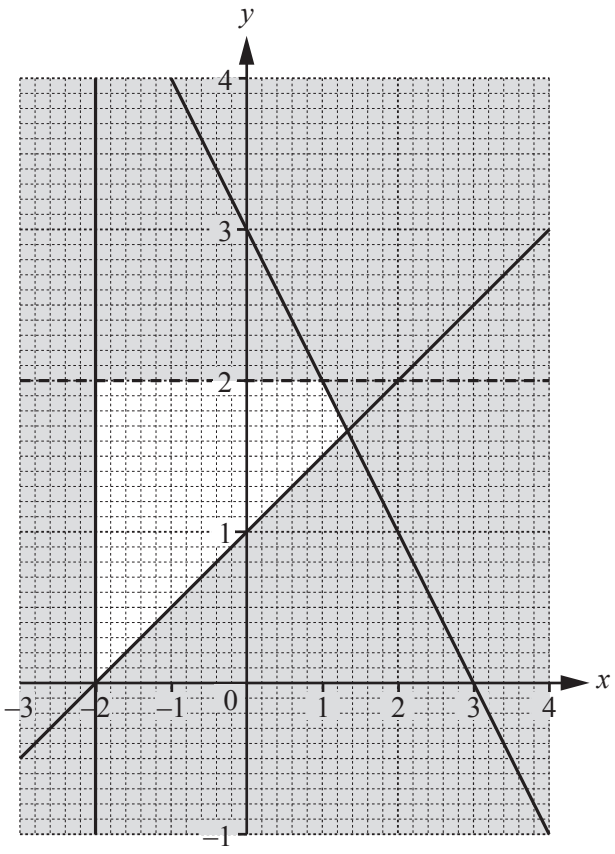

Find the four inequalities that define the region that is **not** shaded.

.....

.....

.....

..... [5]

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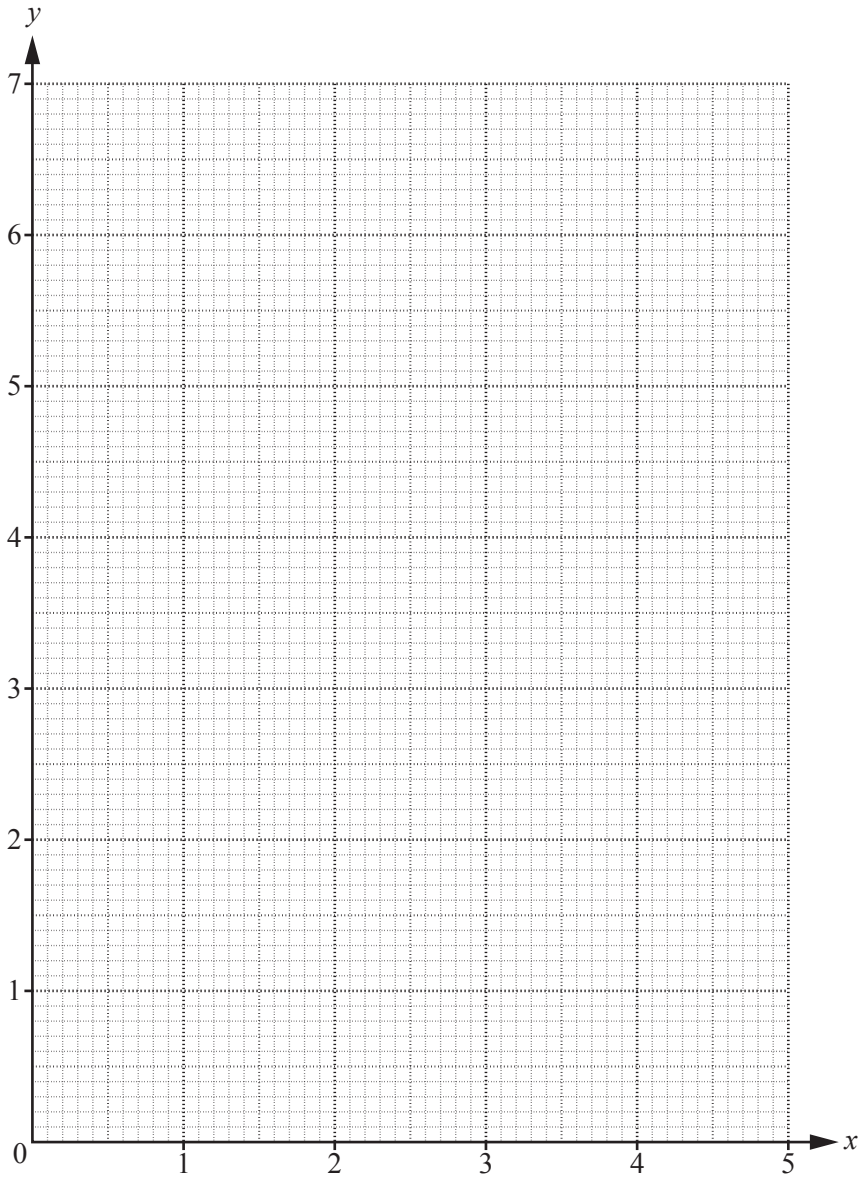

The region R satisfies these inequalities.

$y \leqslant 2x$ $\quad$ $3x + 4y \geqslant 12$ $\quad$ $x \leqslant 3$

On the grid, draw and label the region R that satisfies these inequalities.
Shade the **unwanted** regions.

[5]

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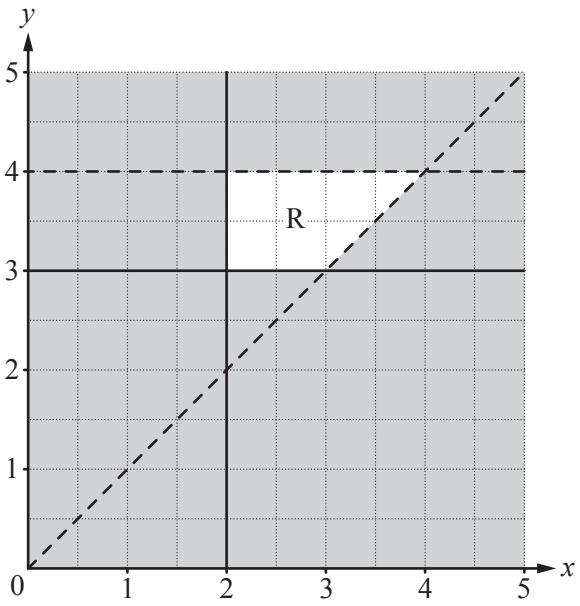

Find four inequalities that define the region, R, on the grid.

.....

.....

.....

..... [4]

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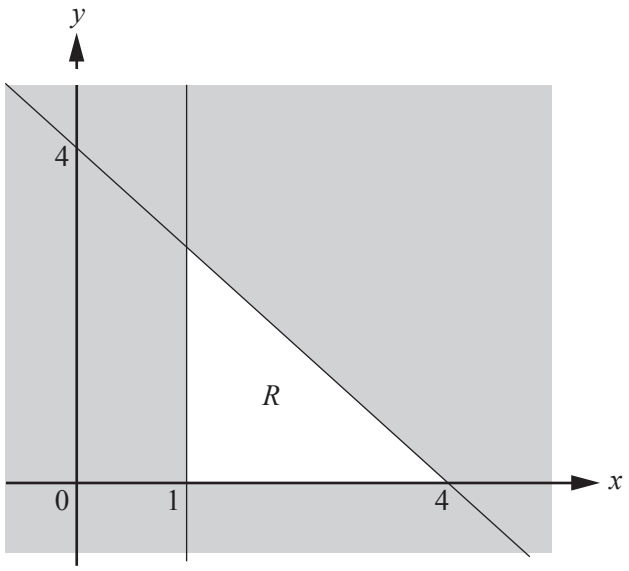
21



NOT TO SCALE

Write down the three inequalities that define the unshaded region, R.

.....

.....

..... [4]

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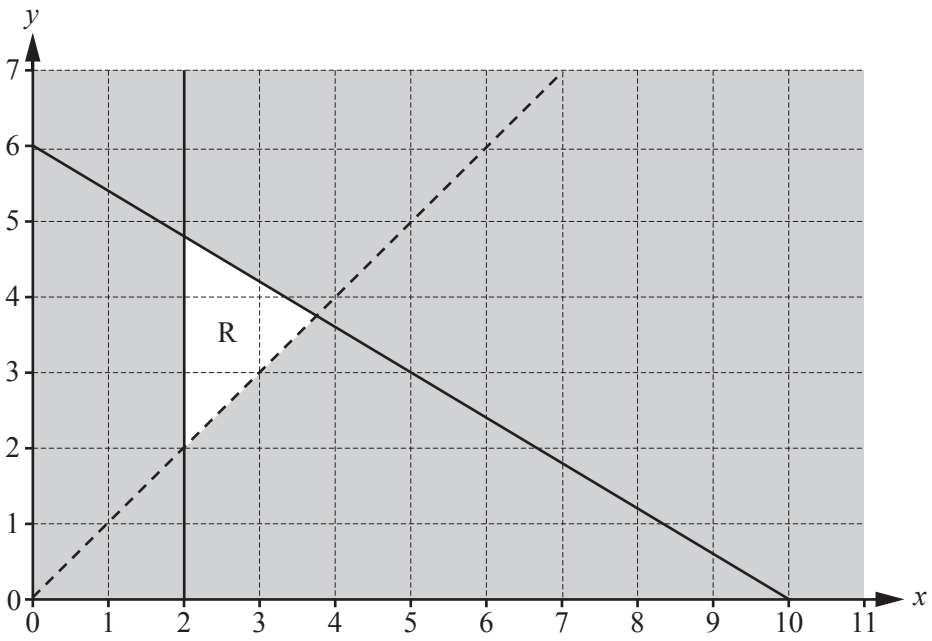
24



Find the three inequalities that define the unshaded region, R.

.....

..... [5]

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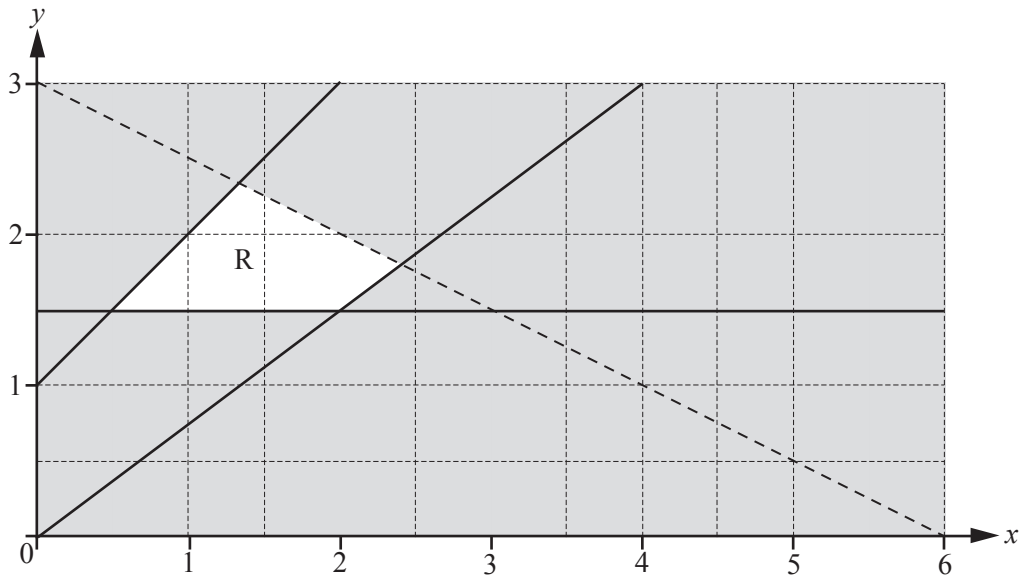
21



There are four inequalities that define the region R.
One of these is $y \leqslant x + 1$.

Find the other three inequalities.

.....

.....

..... [4]

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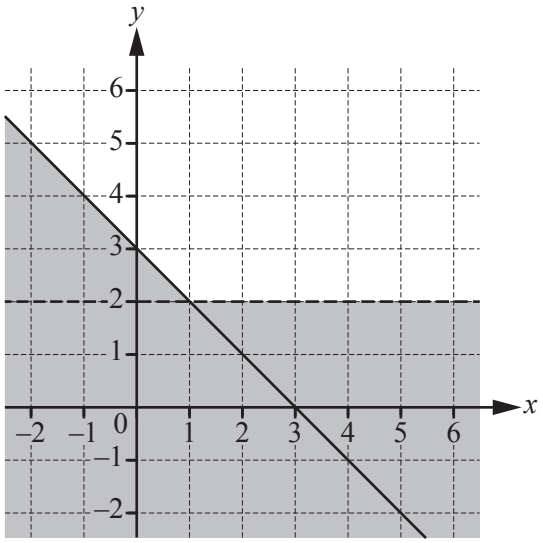
19



Find the two inequalities that define the region on the grid that is **not** shaded.

.....

..... [3]

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