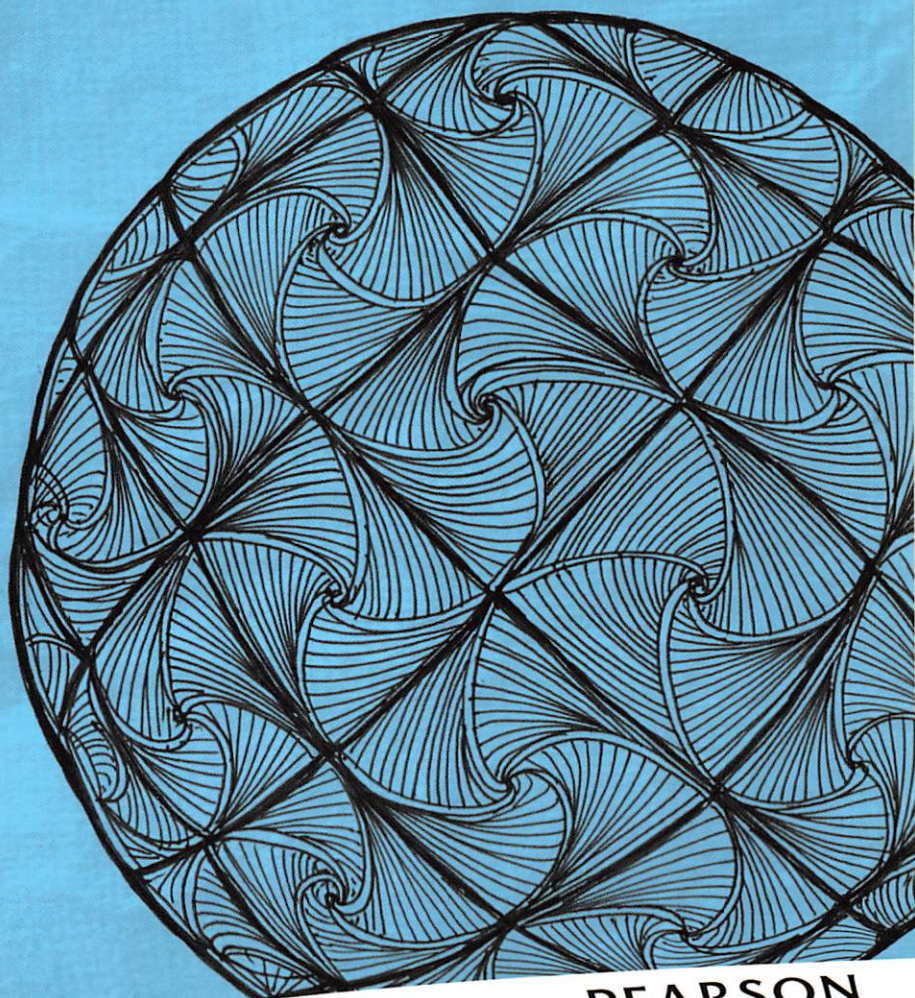
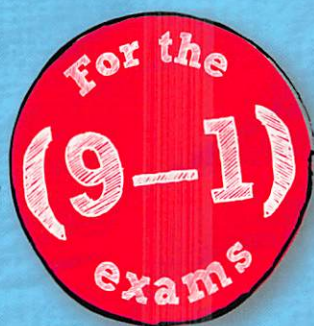


REVISE EDEXCEL GCSE (9-1)

Mathematics

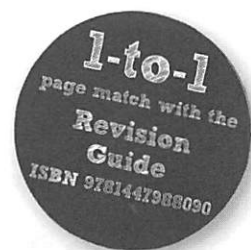
REVISION
WORKBOOK

Higher



PEARSON

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137 Answers & Imprint

A small bit of small print

Edexcel publishes Sample Assessment Material and the Specification on its website. This is the official content and this book should be used in conjunction with it. The questions in 'Now try this' have been written to help you practise every topic in the book. Remember: the real exam questions may not look like this.

Calculator skills 2



- 1 In a sale, normal prices are reduced by 12%. The normal price of a television was £720. Work out the amount of the reduction in price of the television.

Find 12% of £720

Guided

$12 \div 100 = \dots\dots\dots$

Reduction = $\dots\dots\dots \times \pounds 720 = \pounds \dots\dots\dots$ (3 marks)



- 2 Between 2005 and 2015 the population of Indonesia increased from 224 500 000 to 255 700 000.

(a) Work out the population increase from 2005 and 2015. $\dots\dots\dots$

(b) Write your answer to part (a) as a percentage of 224 500 000 $\dots\dots\dots$

(3 marks)



- 3 In May 2013 the population of the USA was 310 million. 40 million of these American people spoke Spanish as their first language.

(a) Express 40 million as a percentage of 310 million. Give your answer correct to 1 decimal place.

$\dots\dots\dots\%$ (2 marks)

(b) Between May 2013 and May 2015 the population of the USA increased by 6%. Work out 6% of 310 million. Give your answer correct to the nearest million.

$\dots\dots\dots$ (3 marks)



- 4 Ravina is going on holiday to France. The exchange rate is £1 = €1.420 13. Ravina changes £475 into euros.

(a) Work out how many euros she should receive. Give your answer to the nearest euro.

€ $\dots\dots\dots$ (2 marks)

(b) Ravina wants to buy a blouse. The cost of the blouse is €144. She uses an approximation of £2 = €3. Using this approximation, work out an approximate cost of the blouse in pounds.

£ $\dots\dots\dots$ (3 marks)

(c) Is it reasonable to use the approximation £2 = €3 to work out the cost of the blouse in pounds instead of using the exact exchange rate £1 = €1.420 13?

You must give a reason for your answer.

$\dots\dots\dots$ (1 mark)

Ratio



- 1 (a) Divide £50 in the ratio 2 : 3.

Total parts = +

1 part = $50 \div \dots\dots\dots = \dots\dots\dots$

2 parts = \times =

3 parts = \times =

(2 marks)

- (b) Divide £750 in the ratio 2 : 5 : 8.

..... (2 marks)



- 2 Amish, Benji and Cary save some money in the ratio 3 : 4 : 9.

Cary saved £120 more than Benji.

- (a) Show that Amish saved £72.

(3 marks)

- (b) Show that the total amount of money saved was £384.

(2 marks)



- 3 Solder is made from lead and tin.

The ratio of the weight of lead to the weight of tin is 2 : 3.

Kyle made 70 grams of solder. Work out the weight of the lead used.

Total parts = +

1 part = $70 \div \dots\dots\dots = \dots\dots\dots$

2 parts = $2 \times \dots\dots\dots = \dots\dots\dots$

(2 marks)



- 4 Gabby and Harry shared some money based on their ages. The ratio of Gabby's age to Harry's age is 3 : 8

Harry received £2000 more than Gabby.

How much money did they share?

$8 - 3 = 5$ parts

5 parts = £2000

1 part = $\pounds 2000 \div 5 = \dots\dots\dots$

11 parts = $11 \times \dots\dots\dots = \dots\dots\dots$

In total they shared

(3 marks)

Guided

Guided

Guided

PROBLEM SOLVED!

You will need to use problem-solving skills throughout your exam - **be prepared!**



Harry received £2000 more than Gabby and $8 - 3 = 5$ so 5 parts of the ratio represents £2000.

Proportion



Guided

- 1 10 men take 8 days to build a wall.
How long will it take 4 men to do the same job?

10 men work 8 days

1 man works \times =

4 men work \div =

Work out how long it will take 1 person to build the wall.

Will 4 men take more time (\times) or less time (\div)?

..... days (2 marks)



- 2 A large basket of sweets costs £4.80 and holds 200 g. A medium basket of sweets costs £4.50 and holds 175 g. Which size basket is better value for money?

Show all your working and then write a conclusion.

(3 marks)



- 3 A school building can be decorated by 12 men working 8 hours a day for 5 days. Mike wants to know how long it would take 10 men working 6 hours a day.

..... days (2 marks)



- 4 Here is a list of the ingredients needed to make scones for 4 people. Gemma wants to make scones for 10 people. Does she have enough ingredients? You must show all your working.

Scones for 4
200 g flour
2 eggs
50 g currants
100 ml milk

Gemma's ingredients
0.7 kg flour
5 eggs
240 g currants
0.2 litres milk

Work out how much of each ingredient is needed for 10 scones

(4 marks)



- 5 2.25 kg of a type of ham costs €28.32 in Germany.
 $2\frac{3}{4}$ lb of the same ham costs £12.42 in Scotland.
In which country is it cheaper to buy the ham? Show all of your working.
1 kg = 2.2 lb £1 = €1.39

(3 marks)

Percentage change



Guided

- 1 Aaron is comparing the cost of flights from two airlines. Both airlines charge a credit card charge and a booking fee.
- Mega-jet charges 3% for using a credit card and a £3.50 booking fee.
 - Air-whizz charges 5% for using a credit card and a £2.10 booking fee.
- A ticket is advertised as costing £90 from both airlines. Work out which airline is cheaper after the additional charges are applied.

Mega-jet

$$\frac{3}{100} \times \dots = \pounds \dots$$

$$\pounds \dots + \pounds \dots + \pounds \dots = \pounds \dots$$

Air-whizz

$$\frac{5}{100} \times \dots = \pounds \dots$$

$$\pounds \dots + \pounds \dots + \pounds \dots = \pounds \dots$$

..... is cheaper. (4 marks)



- 2 Noah and Chloe are collecting reward points in an online video game.
- (a) Noah collected 3200 points last month and 4315 points this month. Work out the percentage increase in the number of points he collected.
-% (3 marks)

- (b) Chloe collected 5100 points last month and 3672 points this month. Work out the percentage decrease in the number of points she collected.
-% (3 marks)



- 3 Niamh and Owen work for the same company. In 2014 Niamh earned £24 500 per year. In 2015 she received a pay rise to £25 970. In 2014 Owen earned £22 000. In 2015 he received the same percentage pay rise as Niamh. Work out Owen's salary in 2015.
- £..... (4 marks)



PROBLEM SOLVED!

- 4 The price of a holiday in 2013 was £1450. The same holiday cost an extra 14% in 2014. In 2015 the same holiday was reduced by 12% of its price in 2014. Work out the price of this holiday in 2015.

You will need to use problem-solving skills throughout your exam - **be prepared!**

£..... (4 marks)



- 5 In 2014, Brickworld made 150 000 clay bricks and a profit of £2080. In 2015, it increased its production by 18%. It costs £45 to produce 1000 bricks. Brickworld sells a crate of 100 bricks for £6. Assuming all the bricks are sold, work out the percentage profit for 2015.
-% (4 marks)

Reverse percentages



- 1 In a sale all prices are reduced by 30%. Andy buys a shirt on sale for £42. Work out the original price of the shirt.

Guided

$$100\% - 30\% = \dots\dots\dots\%$$

$$\frac{\dots\dots\dots}{100} = \dots\dots\dots$$

$$£42 \div \dots\dots\dots = £\dots\dots\dots$$

First work out the multiplier for a 30% decrease.

(3 marks)



- 2 Brinder receives a pay rise of 6%. After the pay rise Brinder earns a salary of £35 245. Work out Brinder's salary before the pay rise.

Guided

$$100\% + \dots\dots\dots\% = \dots\dots\dots\%$$

$$\frac{\dots\dots\dots}{100} = \dots\dots\dots$$

$$£35\,245 \div \dots\dots\dots = £\dots\dots\dots$$

First work out the multiplier for a 6% increase.

(3 marks)



- 3 Kam bought a new car. The car depreciates by 15% each year. After one year the car was worth £28 560. Work out the price of the car when it was new.

Check that your answer makes sense. The original price of the car should be greater than £28 560.

£..... (3 marks)



- 4 Between 2014 and 2015 a large company increased its workforce by 4%. Following this increase it had 780 employees. Work out the numbers of employees at the company in 2014.

..... (3 marks)



- 5 Kate's weekly wage this year is £560. This is 8% more than her weekly wage from last year. Ken says, 'Your weekly wage was £515.20 last year'. Is Ken correct? You must show your working.

You can do this question without using reverse percentages. Increase £515.20 by 8% and compare your answer to £560. Remember to write a conclusion.

(3 marks)



PROBLEM SOLVED!

- 6 Alison and Nav invested some money in the stock market in 2014. This table shows the value of their investments in 2015.

	Value in 2015	Percentage increase since original investment
Alison	£1848	12%
Nav	£1764	5%

You will need to use problem-solving skills throughout your exam - be prepared!



Who invested more money originally? Give reasons for your answer.

(4 marks)

Growth and decay



- 1 Raj invests £12 000 for 4 years at 10% per annum compound interest. Work out the value of the investment at the end of 4 years.

First work out the multiplier for a 10% increase.

Guided

$$100\% + 10\% = \dots\dots\dots\%$$

$$\frac{\dots\dots}{100} = \dots\dots\dots$$

$$£12\,000 \times \dots\dots\dots = £\dots\dots\dots$$

(2 marks)



- 2 Neil invests £5800 at a compound interest rate of 6% per annum. At the end of n complete years the investment has grown to £6907.89. Work out the value of n .

Choose some values of n and work out the amount of investment after n years.

..... (2 marks)



- 3 Chris bought a lorry that had a value of £24 000. Each year the value of the lorry depreciates by 15%.

Guided

- (a) Work out the value of the lorry at the end of four years.

$$100\% - \dots\dots\dots\% = \dots\dots\dots\%$$

First work out the multiplier.

$$\frac{\dots\dots}{100} = \dots\dots\dots$$

$$£24\,000 \times \dots\dots\dots = £\dots\dots\dots$$

(2 marks)

- (b) Shelley bought a new car for £12 000. Each year the value of the car depreciates by 12%. Work out the value of the car at the end of five years.

£..... (2 marks)



- 4 Daljit invested £1500 on 1 January 2010 at a compound interest rate of $r\%$ per annum. The value, £ V , of this investment after n years is given by the formula $V = 1500 \times (1.065)^n$.

- (a) Write down the value of r .

$r = \dots\dots\dots$ (1 mark)

- (b) Work out the value of Daljit's investment after 10 years.

£..... (2 marks)



- 5 Terry buys a new vacuum cleaner for £350. The value of the machine depreciates by 25% each year. Terry says, ' $4 \times 25\% = 100\%$, so after 4 years the vacuum cleaner will have no value.'

Explain why Terry is wrong.

..... (2 marks)

Speed



1 The distance from Manchester to Rome is 1700 km. A plane flies from Manchester to Rome in 4 hours. Work out the average speed of the plane.

..... km/h

This is the formula triangle for speed.

(2 marks)

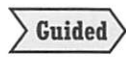


2 David runs 400 metres in 44.7 seconds. Work out his average speed.

$Speed = distance \div time$

$Speed = \dots \div \dots = \dots \text{ m/s}$

(2 marks)



3 Tracy drives 250 km in 2 hours 40 minutes. Work out Tracy's average speed.

Write 2 hours and 40 minutes in hours.

..... km/h (3 marks)



4 Chandra travels for 4 hours. Her average speed in her car is 60 km/h. Work out the total distance the car travels.

$Distance = \dots \times \dots$

Always write down the formula.

$Distance = \dots \times \dots = \dots \text{ km}$

(2 marks)



5 Pavan is driving in France. The legal speed limit on French motorways is 130 km/h. He travels from one junction to another in 15 minutes and he covers a distance of 35 000 m. Show that he has broken the speed limit.

(3 marks)



6 Jane travelled 50 km in 1 hour 15 minutes. Carol travelled 80 km in 2 hours and 45 minutes. Who had the lower average speed? You must show your working.

(3 marks)

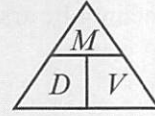


7 At a school's sports day the 100 m race was won in 14.82 seconds and the 200 m was won in 29.78 seconds. Which race was won with a faster average speed? You must show all your working.

(3 marks)

Density

This is the formula triangle for density.



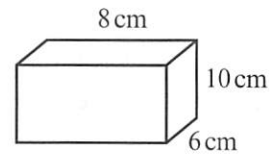
(2 marks)

Always write down the formula.

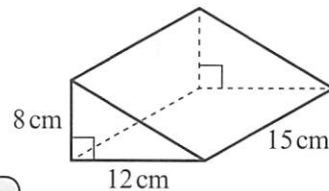
(2 marks)

Convert kg into g.

..... cm³ (3 marks)



..... g (4 marks)



(3 marks)

The volume of a prism is given by:
volume = length × area of cross-section

..... g

Metal	Density g/cm ³
Gold	19.3
Copper	8.6
Bronze	9.9

(3 marks)

..... g/cm³ (4 marks)



- 1 A piece of wood has a mass of 17.5 grams and a volume of 20 cm³. What is its density?

Guided

Density = mass ÷ volume

Density = ÷ = grams



- 2 Grace has a silver ring which has a volume of 14 cm³. The density of silver is 10.5 grams per cm³. Work out the mass of the silver ring.

Guided

Mass = ×

Mass = × = grams



- 3 Petrol has a density of 0.8 g/cm³. The petrol in a can has a mass of 8.3 kg. How much petrol, in cm³, does the can contain?



- 4 The solid cuboid is made of plastic. The plastic has a density of 0.9 grams per cm³. Work out the mass of the cuboid.



- 5 The diagram shows a solid triangular prism. The prism is made of iron. Iron has a density of 7.87 grams per cm³. Work out the mass of the prism.



- 6 Gavin weighed some metal beads. They had a mass of 950 grams. The volume of the beads was 96 cm³. Gavin worked out the density and claimed that the metal was gold. Use the information in the table to work out whether Gavin is correct. You must show all of your working.



- 7 The density of tin is 5.77 g/cm³. The density of lead is 9.78 g/cm³. 60 cm³ of tin and 40 cm³ of lead are mixed together to make an alloy called solder. Work out the density of solder.

Other compound measures



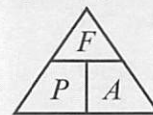
Guided

- 1 A safe exerts a force of 600 N on to the floor. The area of the base of the safe is 1.5 m². Work out the pressure exerted on the floor.

Pressure = force ÷ area

Pressure = ÷ = N/m²

This is the formula triangle for pressure.



(2 marks)



- 2 Ray exerts a force of 900 N on to the ground. His feet have a total area of 0.048 m². Work out the pressure he exerts on the ground.

..... N/m² (3 marks)



Guided

- 3 The pressure between a car's four tyres and the road is 400 000 N/m². The car exerts a force of 10 000 N on the road. Work out the area of contact between each tyre and the road.

Area = ÷

Total area = ÷ = m²

Area for one tyre = ÷ = m²

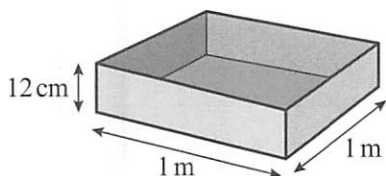
Always write down the formula.

(2 marks)



PROBLEM SOLVED!

- 4 An overflow pan at a factory can be modelled as a cuboid.



You will need to use problem-solving skills throughout your exam – **be prepared!**



The pan is half-full of water.

The water flows out of the pan at an average rate of 250 millilitres per second. Show that the pan will be completely empty after 4 minutes.

1 cm³ = 1 ml. Remember to convert metres to cm before calculating the volume of the cuboid.

(3 marks)



- 5 The area of the Falkland Islands is 12 170 km². The population density is 0.24 people per km². Charles states that the population of the Falkland Islands is 50 708. Is Charles correct? You must show all of your working.

(3 marks)



- 6 The peak of Ben Nevis can be reached by walking up the Pony Track. The rate of walking is 1200 metres per hour. The Pony Track is 16 km long. Helen begins her journey at 9 am. Can she reach the peak by 11 pm on the same day? You must show all your working.

(3 marks)

Proportion and graphs



Guided

- 1 The force F measured in newtons (N) on a mass is directly proportional to the acceleration a of the mass. Given that $F = 650$ when $a = 25$, work out the value of F when $a = 45$.

$$\frac{F}{45} = \frac{650}{25}$$

$$F = \dots \times \dots = \dots \text{ N}$$

You can compare ratios to work out F .

(2 marks)



Guided

- 2 The resistance, R ohms, of a wire is inversely proportional to the cross-sectional area, $A \text{ cm}^2$, of the wire. Given that $R = 30$ when $A = 0.1$, work out the value of R when $A = 0.4$.

$$R \times 0.4 = \dots \times \dots$$

$$R = \dots \div \dots = \dots \text{ ohms}$$

When R is inversely proportional to A , you write it as $R \propto \frac{1}{A}$

(2 marks)



- 3 This graph shows the relationship between the extension, in m, of a spring and the force, in N.

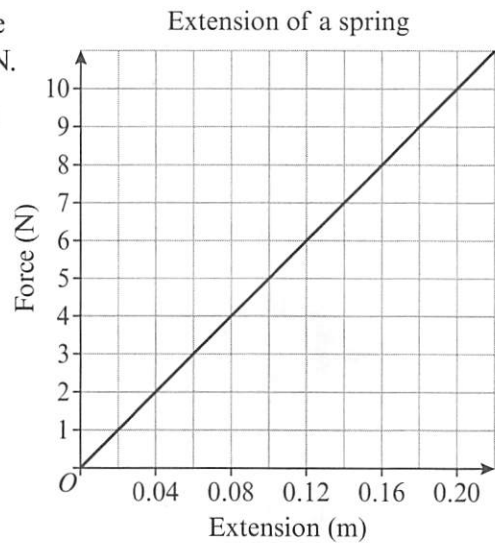
- (a) Use the graph to find the extension when the force is 8 N.

..... m (1 mark)

- (b) Use the graph to find the force when the extension is 0.1 m.

..... n (1 mark)

- (c) What evidence is there from the graph to show that force is directly proportional to extension?



..... (2 marks)



- 4 This graph shows the relationship between pressure, in kPa, and volume, in litres.

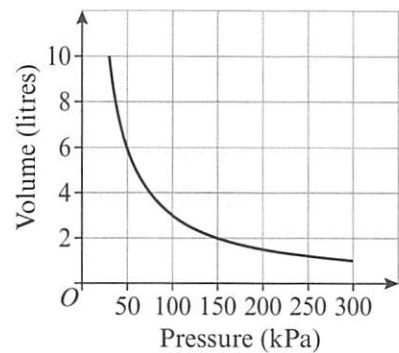
- (a) Use the graph to find the volume when the pressure is 150 kPa.

..... litres (1 mark)

- (b) Use the graph to find the pressure when the volume is 6 litres.

..... kPa (1 mark)

- (c) What evidence is there from the graph to show that volume is inversely proportional to pressure?



..... (2 marks)

Proportionality formulae



Guided

- 1 The time, T seconds, it takes a water heater to boil some water is directly proportional to the mass of water, m kg, in the water heater. When $m = 150$, $T = 900$.

(a) Find T when $m = 175$.

$$T \propto m$$

$$T = km$$

$$900 = k \times 150$$

$$k = \dots\dots\dots$$

$$T = \dots\dots\dots \times \dots\dots\dots = \dots\dots\dots \text{ seconds}$$

(3 marks)

The time, T seconds, it takes a water heater to boil a constant mass of water is inversely proportional to the power, P watts, of the water heater. When $P = 1500$, $T = 280$.

(b) Find the value of T when $P = 700$.

$$T \propto \frac{1}{P}$$

$$T = \frac{k}{P}$$

$$k = T \times P$$

$$k = \dots\dots\dots \times \dots\dots\dots$$

$$k = \dots\dots\dots$$

$$T = \frac{\dots\dots\dots}{P}$$

$$T = \frac{\dots\dots\dots}{\dots\dots\dots} = \dots\dots\dots \text{ seconds}$$

(3 marks)



- 2 The weight of a piece of wire is directly proportional to its length. A piece of wire is 100 cm long and has a weight of 24 grams. Another piece of the same wire is 60 cm long. Work out the weight of the 60 cm piece of wire.

$\dots\dots\dots$ g **(3 marks)**



- 3 In a spring, the tension, T newtons, is directly proportional to its extension x cm. When the tension is 176 newtons, the extension is 8 cm.

(a) Express T in terms of x .

$$T = \dots\dots\dots \text{ (3 marks)}$$

(b) Calculate the tension, in newtons, when the extension is 14 cm.

$\dots\dots\dots$ N **(1 mark)**

(c) Calculate the extension, in cm, when the tension is 319 newtons.

$\dots\dots\dots$ cm **(2 marks)**



- 4 f is inversely proportional to d . When $d = 30$, $f = 196$.

(a) Find the value of f when $d = 70$.

(b) Find the value of d when $f = 24$.

$\dots\dots\dots$ **(3 marks)**

$\dots\dots\dots$ **(3 marks)**

Harder relationships



1 d is directly proportional to the square of t . $d = 100$ when $t = 5$.

The square of t can be written as \dots^2 .

Guided

(a) Express d in terms of t .

$$d \propto t^2$$

$$d = kt^2$$

$$100 = k \times 5^2$$

$$k = \dots\dots\dots$$

$$d = \dots\dots\dots t^2$$

$$d = \dots\dots\dots \times \dots\dots\dots = \dots\dots\dots \quad \text{(3 marks)}$$

(b) Work out the value of d when $t = 6$.

$$d = \dots\dots\dots \quad \text{(1 mark)}$$

(c) Work out the positive value of t when $d = 64$.

$$t = \dots\dots\dots \quad \text{(2 marks)}$$



2 The shutter speed, S , of a camera varies inversely as the square of the aperture setting, f . When $f = 6$, $S = 90$.

(a) Find a formula for S in terms of f .

$$\dots\dots\dots \quad \text{(3 marks)}$$

(b) Hence, or otherwise, calculate the value of S when $f = 8$.

$$s = \dots\dots\dots \quad \text{(1 mark)}$$



3 The current, I , in an electrical circuit varies as the square root of the power, P . When the current is 4.5 amps the power is 36 watts.

(a) Find a formula for I in terms of P .

$$\dots\dots\dots \quad \text{(3 marks)}$$

(b) Work out the value of I , in amps, when $P = 49$ watts.

$$I = \dots\dots\dots \quad \text{(1 mark)}$$

(c) Work out the value of P , in watts, when $I = 5$ amps.

$$P = \dots\dots\dots \quad \text{(2 marks)}$$



4 T is directly proportional to S^3 . When $S = 3$, $T = 324$. Find the value of S when $T = 96$.

$$S = \dots\dots\dots \quad \text{(4 marks)}$$

Problem-solving practice 1



- 1 Karen wants to buy a game for her new PS4. She finds that two online shops sell the game she wants.

Nile Game costs £35.50 Online discount 16% Delivery charge £2.75

T-bay Game costs £30.90 + VAT VAT at 20% No delivery charge
--

Karen wants to pay the lowest price. Which shop should Karen buy her game from? You must show all your working.

(4 marks)



- 2 Angus, Beth and Caitlin save their pocket money. They have saved the money in the ratio 4 : 7 : 12. Caitlin saved £240 more than Angus.

(a) Show that Angus saved £120.

(2 marks)

(b) Work out the total amount of money saved.

£ (2 marks)



- 3 Avtar has a full 900 ml bottle of patio sealer. He is going to mix some of the patio sealer with water. Here is the information on the label of the bottle. Avtar is going to use 900 ml of water. How many millilitres of patio sealer should Avtar use? You must show your working.

Patio sealer (900 ml) Mix $\frac{1}{5}$ of the patio sealer with 5400 ml of water

(4 marks)

Problem-solving practice 2



- 4 Mario is driving on the motorway in Italy. The speed limit in Italy is 81 km/h. He drives 325 km in 3 hours 28 minutes. Does Mario break the speed limit? You must give a reason for your answer.

(3 marks)



- 5 Brett is going to buy some bird food. Bird food is sold in 200 g boxes costing £2.50 and in 1000 g boxes costing £10.50. Which box of bird food gives better value for money? You must show your working.

(3 marks)



- 6 Kim wants to save £17 500 in 4 years for a deposit on a house. He invests £14 000 in an ISA for 4 years at 6% per annum compound interest. Will he have enough money after 4 years for a deposit? You must show your working.

(3 marks)



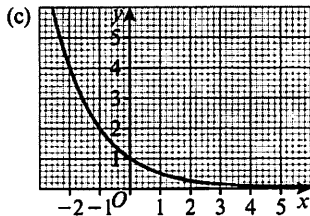
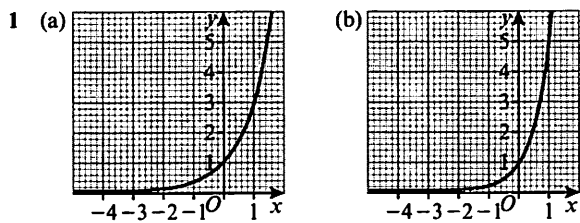
- 7 The intensity, I candela, of light on an object is inversely proportional to the square of the distance, x metres, of the object from the light.
The intensity of light is 9 candelas at a distance of 4 metres.
Asha carried out an experiment to test this rule. She works out the intensity of light is 48 candelas when the distance is $\sqrt{3}$ m.
Is she correct? You must show all your working.

(4 marks)

52. Algebraic proof

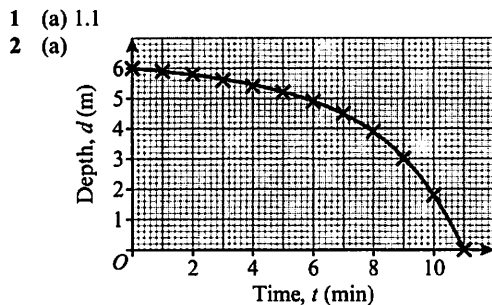
- $LHS = 4n^2 - 2n - 2n + 1 + 4n^2 + 2n + 2n + 1$
 $= 8n^2 + 2 = 2(4n^2 + 1) = RHS$
- $5x - 5c = 4x - 5$
 $x = 5c - 5$
 $x = 5(c - 1)$
- $(3x + 1)^2 - (3x - 1)^2$
 $= (3x + 1)(3x + 1) - (3x - 1)(3x - 1)$
 $= 9x^2 + 3x + 3x + 1 - (9x^2 - 3x - 3x + 1)$
 $= 9x^2 + 3x + 3x + 1 - 9x^2 + 3x + 3x - 1$
 $= 12x = 4(3x)$
- $2n + 2n + 2 + 2n + 4 = 6n + 6 = 6(n + 1)$
- $n(n + 1) + (n + 1)(n + 2) = n^2 + n + n^2 + 2n + n + 2$
 $= 2n^2 + 4n + 2 = 2(n^2 + 2n + 1)$
 $= 2(n + 1)^2$
- $\frac{1}{n} - \frac{1}{n+1} = \frac{n+1-n}{n(n+1)} = \frac{1}{n(n+1)}$
- $(10a + b)^2 - (10b + a)^2$
 $= 100a^2 + 20ab + b^2 - 100b^2 - 20ab - a^2$
 $= 99a^2 - 99b^2 = 99(a^2 - b^2)$

53. Exponential graphs



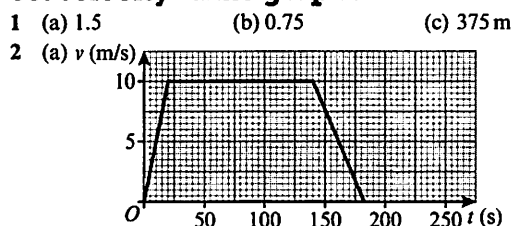
- $a = 4$ and $k = 1$
- (a) $2000 \times 1.2^3 = 3456$
 (b) $a = 2000$ and $b = 1.2$
 (c) $k = 1.728$

54. Gradients of curves



- (b) 0.55 (c) 0.2
- (a) 0.52 (b) 0.58

55. Velocity-time graphs



- (b) 1500 m
- (a) 3.2
 (b) It is the acceleration of the object at $t = 3$ seconds

56. Areas under curves

- (a) 19.5
 (b) Underestimate, because the trapeziums are below the curve
- (a) 6.75
 (b) Underestimate, because the trapeziums are below the curve
- 28.5

57. Problem-solving practice 1

- $x = 4$
- $x = 5$ and $y = 14$
- D is at (3, 6)
 $m_{AB} = \frac{3}{2}, m_{CD} = -\frac{2}{3}, m_{AB} \times m_{CD} = -1$
 So, no she is incorrect, CD is perpendicular to AB
- $n^2 - 3n + 3$

58. Problem-solving practice 2

- 1 m
- Area under graph is 47 m
 No, the driver does not stop before the traffic lights
- (4, 7) and (-1, -8)

RATIO & PROPORTION

59. Calculator skills 2

- £633.60
- (a) 31 200 000 (b) 13.9%
- (a) 12.9% (b) 19 000 000
- (a) 675 euros (b) £96
 (c) Yes, because the calculations can be done without a calculator and 1.5 euros to the pound is a good approximation.

60. Ratio

- (a) £20 : £30 (b) £100 : £250 : £400
- (a) 5 parts = £120
 1 part = £24
 Amish = $3 \times £24 = £72$
 (b) $(3 \times 24) + (4 \times 24) + (9 \times 24) = £384$
- (a) 28 g (b) 42 g
- £4400

61. Proportion

- 20 days
- Large basket
- 8
- No, because she has only 200 ml of milk and needs 250 ml
- Germany: 4.95 lb = £20.37 so 1 lb = £4.11
 Scotland: 2.75 lb = £12.42 so 1 lb = £4.52
 Cheaper in Germany

62. Percentage change

- Mega-jet is cheaper
- (a) 34.8% (b) 28%
- £23 320
- £1454.64
- 33.3%

63. Reverse percentages

- £60
- £33 250
- £33 600
- 750
- No, she earned £518.52 last year
- Alison invested £1650 and Nav invested £1680, so Nav invested more

64. Growth and decay

- £17 569.20
- 3
- (a) £12 528.15 (b) £6332.78
- (a) 6.5% (b) £2815.71
- It is worth £110.74

65. Speed

- 425 km/h
- 8.9 m/s
- 93.75 km/h
- 240 km
- Pavan's speed is $35 \div 0.25 = 140$ km/h
- Jane's speed is 40 km/h and Carol's speed is 29.1 km/h, so Carol has the lower average speed
- 100 m speed is 6.75 m/s and 200 m speed is 6.72 m/s, so 100 m race had the faster speed

66. Density

- 0.875 g/cm³
- 147 g
- 10 375 cm³
- 432 g
- 5666.4 g
- $950 \div 96 = 9.9$, so Gavin is not correct; it is bronze
- 7.374 g/cm³

67. Other compound measures

- 400 N/m²
- 18 750 N/m²
- 0.006 25 m²
- Volume = $120\,000 \div 2 = 60\,000$
Time = $60\,000 \div 250 = 240$ s = 4 min
- No, population is $12\,170 \times 0.24 = 2921$
- It takes 13 hours and 20 min; she gets there at 10.20pm; yes, can reach the peak by 11pm

68. Proportion and graphs

- 1170
- 7.5
- (a) 0.16 (b) 5
(c) The graph is a straight line through the origin; there is a constant increase / as extension increases force increases
- (a) 2 (b) 50
(c) As pressure increases volume decreases

69. Proportionality formulae

- (a) 1050 s (b) 600 s
- 14.4 g
- (a) $T = 22x$ (b) 308 N (c) 14.5 cm
- (a) 84 (b) 245

70. Harder relationships

- (a) $d = 4t^2$ (b) 144 (c) 4
- (a) $S = \frac{3240}{f^2}$ (b) 50.625
- (a) $I = 0.75\sqrt{P}$ (b) 5.25 (c) 44.4
- 2

71. Problem-solving practice 1

- Nile: £32.57
T-bay: £37.08
Nile is cheaper
- (a) 8 parts = £240
1 part = £30
Angus = $4 \times 30 = £120$
(b) $(4 \times 30) + (7 \times 30) + (12 \times 30) = £690$
- 30 ml

72. Problem-solving practice 2

- $325 \div 3\frac{7}{15} = 93.75$ km/h
Yes, he breaks the speed limit
- 1000 g
- Yes, he saves £17 674.68
- Yes, she is correct

GEOMETRY & MEASURES

73. Angle properties

- $x = 18$, because angles on a straight line add up to 180, and $y = 68$, because alternate angles are equal so angle $DBC = 72 \div 2 = 36$

- $x = 14$ and $y = 8$
- 17°

74. Solving angle problems

- $x = 24$ and $y = 24$
- (a) 20° (b) angle $DAC =$ angle DCA
- $x = 36^\circ$
Base angles in an isosceles triangle are equal
Angle $ADB =$ angle DBC are alternate angles
- (a) $2x$
(b) Angles in a triangle add up to 180°
Base angles in an isosceles triangle are equal
Angle $CDB = (180 - 2x) \div 2 = 90 - x$
and angle $BDA = x$
Angle $CDA = 90 - x + x = 90$

75. Angles in polygons

- (a) 40° (b) 9
- (a) 12 (b) 10
- 135
- (a) 18 (b) 2880°
- Exterior angle = 60°
Interior angle = 120°
 $x + 120 + x = 180$
 $x = 30$

76. Pythagoras' theorem

- (a) 10.7 (b) 6.75 (c) 15.7
- 14.37
- Suitcase diagonal = 119 cm
No, it will not fit
- Diagonal of cross-section of pool = 5.8 m
No, it cannot be totally immersed

77. Trigonometry 1

- (a) 54.3 (b) 57.8 (c) 31.1
- 62.8°
- 53.0
- She can use smooth tiles on her roof, because x is 20.4 and hence the angle is greater than 17°
- $y = 31.8$, so no he cannot

78. Trigonometry 2

- (a) 14.3 (b) 16.3 (c) 19.1
- 5.35 m
- 55.1 m
- (a) 21.0 m (b) 60.3°

79. Solving trigonometry problems

	0°	30°	45°	60°	90°
sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	-

- (a) 9 (b) 4.9 (c) 16.9
- (a) 30° (b) 30° (c) 30°
- $30\sqrt{3}$
- Height above ground is opposite angle of elevation and length of plank is hypotenuse.
Angle of elevation = $\sin^{-1}(3 \div 6) = \sin^{-1}(0.5) = 30^\circ$

80. Perimeter and area

- (a) 53 cm (b) 148 cm²
- 44 cm
- (a) $2(3x - 2) + (3x - 2)(2x + 5) = 25$
 $6x^2 + 17x - 39 = 0$
(b) $x = 1.5$ and $-13/3$ (c) 25
- 250 cm²