MEGA LECTURE

# AQA (GCSE Notes)

## Chapter 2: Ratio, proportion and rates of change

**Q1.** A car travels 180 miles in 4 hours. How long would it take the same car to travel 315 miles at the same speed?

**Q2.** A worker is paid £13.50 per hour. How much does she earn for working 37.5 hours?

**Q3.** A recipe requires 200 g of flour for 8 cookies. How much flour is needed for 30 cookies?

**Q4.** A block of metal has a mass of 540 g and a volume of 90 $cm^3$. Calculate its density.

**Q5.** Water is leaking from a tank at a constant rate. After 3 hours, 7.5 litres have leaked. How much would have leaked after 8 hours?

**Q6.** The mass of 6 identical balls is 2.4 kg. What is the mass of 10 such balls?

**Q7.** A person runs 800 m in 2 minutes. Find their average speed in metres per second.

**Q8.** A machine produces 45 units in 3 hours. How many units can it produce in 8 hours?

**Q9.** A car accelerates from 0 to 60 mph in 8 seconds. Find the average acceleration.

**Q10.** A student earns £270 for working 18 hours. What is their hourly rate of pay?

**Q11.** Convert 1.75 hours into minutes.

**Q12.** A cyclist travels 40 km in 2 hours and 30 minutes. Calculate the speed in km/h.

**Q13.** A builder mixes cement in the ratio 5:2:1 of sand, gravel, and cement. If he uses 84 kg of gravel, how much sand does he need?

**Q14.** A bottle contains 1.5 litres of juice. How many millilitres is this?

**Q15.** The pressure on a surface is 60 $N/m^2$ and the force is 1200 N. Find the area.

**Q16.** The density of a liquid is 1.2 $g/cm^3$. What is the mass of 500 $cm^3$ of this liquid?

**Q17.** A bus travels 120 miles in 2.5 hours. What is its average speed?

**Q18.** Convert 2.4 $km^2$ to $m^2$.

**Q19.** A person walks 6 km at 4 km/h. How long does the journey take?

**Q20.** A job takes 6 men 10 days. How many days will it take 4 men, working at the same rate?

**Q21.** A car travels 90 km at an average speed of 60 km/h. How long does the journey take in minutes?

**Q22.** Convert 0.85 $m^3$ into litres.

**Q23.** A mixture contains water and alcohol in the ratio 3:2. If the total volume is 750 mL, how much is alcohol?

**Q24.** The area of a rectangle is 48 $cm^2$. If the length is 6 cm, what is the width?

**Q25.** A cylinder has a height of 10 cm and volume of 942 $cm^3$. Find the radius of the base (use $\pi = 3.14$).

**Q26.** A person earns £15 per hour for the first 40 hours and £22.50 for any extra hours. How much do they earn in a week if they work 48 hours?

**Q27.** The density of a substance is 8.5 $g/cm^3$. What volume is occupied by 255 g of the substance?

**Q28.** A machine produces 480 units in 6 hours. How many units does it produce per minute?

**Q29.** A pipe fills a tank in 3 hours. Another pipe can fill the same tank in 5 hours. How long will it take to fill the tank if both pipes work together?

**Q30.** A car travels 180 km in 2.25 hours. Calculate its average speed.

**Q31.** A cube has a volume of 125 $cm^3$. What is the length of one side?

**Q32.** A shop reduces the price of an item by 20%. The original price was £75. What is the new price?

**Q33.** A train travels 225 miles in 3 hours and 45 minutes. What is its average speed in mph?

**Q34.** If 6 pencils cost £2.70, what is the cost of 14 pencils?

**Q35.** A metal rod weighs 2.4 kg and is 120 cm long. What is the weight per metre?

**Q36.** A container holds 2.5 litres of paint. How many containers are needed to paint 45 $m^2$ if 1 litre covers 6 $m^2$?

**Q37.** A person runs a marathon of 42.2 km in 3 hours and 20 minutes. What is their average speed?

**Q38.** A garden path is 1.2 m wide and 8 m long. What is its area in square centimetres?

**Q39.** A car uses 6 litres of fuel to travel 90 km. How much fuel is needed to travel 150 km?

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**Q40.** A recipe that serves 4 people uses 300 g of flour. How much flour is needed to serve 10 people?

**Q41.** A box of cereal weighs 750 g. Convert this to kilograms.

**Q42.** The exchange rate is £1 = €1.18. How many euros would you get for £250?

**Q43.** The population of a town increases by 3% per year. If the current population is 12,000, what will it be next year?

**Q44.** A factory produces 240 units in 8 hours. How many units are produced per hour?

**Q45.** A bag of sugar weighs 1.5 kg. How many 250 g jars can be filled from one bag?

**Q46.** A boat travels 84 miles downstream in 4 hours. What is the speed of the boat?

**Q47.** The ratio of boys to girls in a class is 5:4. If there are 36 students in total, how many girls are there?

**Q48.** A tank has a volume of 0.75 $m^3$. Convert this to litres.

**Q49.** A person cycles at 15 km/h for 2.5 hours. How far do they travel?

**Q50.** A rectangular room is 5 m by 4.5 m. What is the area in square centimetres?

**Q51.** A tank holds 180 litres of water. It is emptied over 3 hours at a constant rate. How many litres of water are released per minute?

**Q52.** A cyclist covers 36 km in 1 hour 20 minutes. What is their average speed in km/h?

**Q53.** A car travels 150 miles using 12 gallons of fuel. What is the car's fuel consumption in miles per gallon?

**Q54.** Convert a speed of 72 km/h into m/s.

**Q55.** A cylindrical tank has a volume of 1.2 $m^3$. Convert this volume into litres.

**Q56.** The density of a metal is 7.8 $g/cm^3$ and its volume is 250 $cm^3$. Calculate its mass.

**Q57.** A block has a mass of 2.5 kg and a volume of 0.0005 $m^3$. Find the density in $kg/m^3$.

**Q58.** The pressure exerted by a force of 300 N on a surface is 50 $N/m^2$. Calculate the area of the surface.

**Q59.** If 5 workers can complete a task in 12 days, how long would 8 workers take, working at the same rate?

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**Q60.** A recipe that serves 8 uses 240 g of sugar. How much sugar is needed for a recipe that serves 5?

**Q61.** The cost of 7 kg of rice is £19.25. What is the cost of 3.5 kg of rice?

**Q62.** A car travels 40 km in 32 minutes. Calculate its speed in km/h.

**Q63.** A car moves with constant acceleration and its speed increases from 20 m/s to 40 m/s in 5 seconds. Find the acceleration.

**Q64.** Divide £84 between A and B in the ratio 5:7.

**Q65.** Divide 270 ml of a solution into two parts in the ratio 2:7.

**Q66.** Express 4:11 as a part : whole ratio.

**Q67.** Express the division of 80 items into two parts as a ratio, where one part is 20 and the other is 60.

**Q68.** In a mixture of juice and water in the ratio 3:2, how much juice is there if the total mixture is 1.25 litres?

**Q69.** In a class of 40 students, the ratio of girls to boys is 3:5. How many girls are there?

**Q70.** A map has a scale of 1:25,000. What is the actual distance in kilometres if the map distance is 8 cm?

**Q71.** A model car is built to a scale of 1:20. If the actual car is 4.2 m long, what is the length of the model in cm?

**Q72.** A rectangle is enlarged by a scale factor of 1.5. Its original area is 48 $cm^2$. What is the area of the enlarged rectangle?

**Q73.** A cube has a surface area of 150 $cm^2$. It is scaled by a factor of 2. What is the surface area of the scaled cube?

**Q74.** A jug contains a drink made by mixing orange juice and water in a 5:3 ratio. If there is 2 litres of water, how much orange juice is needed?

**Q75.** A car was purchased for £8,000. Its value depreciates by 15% per year. What is its value after one year?

**Q76.** A population of 5000 increases by 4% per year. What will the population be after one year?

**Q77.** A bank offers compound interest at 3% annually. How much will £2000 grow to after one year?

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**Q78.** A value grows from 150 to 180. Calculate the percentage increase.

**Q79.** A value reduces from 260 to 208. Calculate the percentage decrease.

**Q80.** A car travels 160 km in 2.4 hours. What is its average speed?

**Q81.** A packet of cereal weighing 1.2 kg is shared between two people in the ratio 5:7. How much cereal does each person receive?

**Q82.** A total of £96 is to be divided between three people in the ratio 2:3:7. Calculate each person's share.

**Q83.** A quantity is divided into two parts in the ratio 5:3. If the smaller part is 24, find the larger part.

**Q84.** In a school, the number of boys is 60% of the number of girls. Express the number of boys as a fraction of the total number of students.

**Q85.** A to B is in the ratio 2:3, and B to C is in the ratio 4:5. What is the simplified ratio of A:B:C?

**Q86.** If £36 is shared in the ratio 1:3, express the smaller share as a fraction of the total.

**Q87.** The mass of sugar in a mixture is 120 g, which is 3/5 of the total mass. What is the total mass?

**Q88.** A box contains red, blue and green balls in the ratio 2:5:3. If there are 60 balls in total, how many are green?

**Q89.** The ratio of width to height of a rectangle is 4:3. If the width is 28 cm, what is the height?

**Q90.** A map shows two towns 12 cm apart. The scale of the map is 1:100,000. What is the real distance in km?

**Q91.** A chemical solution is made by mixing acid and water in the ratio 1:4. If there are 300 ml of water, how much acid is needed?

**Q92.** A floor is to be tiled with square tiles. Each tile measures 30 cm by 30 cm. If the area of the floor is 9 $m^2$, how many tiles are needed?

**Q93.** A factory produces 320 items in 5 hours. How many items does it produce per minute?

**Q94.** A machine fills 12 bottles in 4 minutes. How long does it take to fill 54 bottles?

**Q95.** A recipe uses 300 g of flour to make 12 cupcakes. How much flour is needed for 30 cupcakes?

**Q96.** A 2.5 $m^3$ container is filled with oil. Convert the volume into litres.

**Q97.** The ratio of cats to dogs in a shelter is 3:4. If there are 84 animals, how many are cats?

**Q98.** A train travels 180 miles in 3 hours. What is its average speed?

**Q99.** A salary increases from £1200 to £1320. What is the percentage increase?

**Q100.** A compound increases in value by 5% annually. If its current value is £1500, what will it be after one year?

**Q101.** A recipe requires flour and sugar in the ratio 3:2. If you have 480 g of flour, how much sugar is needed?

**Q102.** A map has a scale of 1:50,000. If two towns are 7.5 cm apart on the map, what is their actual distance in kilometres?

**Q103.** A car travels 180 miles using 15 gallons of fuel. How many miles per gallon does the car achieve?

**Q104.** If the pressure exerted by a force of 400 N on a surface is 80 N/m², find the area of the surface.

**Q105.** The density of a metal is 8.4 g/cm³. Calculate the mass of a 250 cm³ block of the metal.

**Q106.** A train travels at an average speed of 75 km/h. How long will it take to cover 225 km?

**Q107.** The value of a machine depreciates by 12% per year. If it is currently worth £8,000, what was its value a year ago?

**Q108.** A tank fills in 6 hours when water is pumped in at a constant rate. How long will it take to fill 5 such tanks?

**Q109.** A laptop originally costing £1,200 is now being sold at a 25% discount. What is the sale price?

**Q110.** The surface area of a cube increases by a scale factor of 4. What is the scale factor of the side length?

**Q111.** If 3 workers complete a job in 10 days, how many days would it take 5 workers to complete the same job?

**Q112.** A quantity increases from 240 to 312. Calculate the percentage increase.

**Q113.** A solution is made by mixing acid and water in the ratio 2:5. If there are 150 ml of water, how much acid is used?

**Q114.** Express 72 as a percentage of 300.

**Q115.** A population increases by 8% each year. What will be the population after 2 years if the current population is 25,000?

**Q116.** A car's speed changes from 60 km/h to 90 km/h in 10 seconds. What is the average acceleration?

**Q117.** A machine produces 360 units in 45 minutes. What is its production rate in units per hour?

**Q118.** If the ratio of girls to boys in a class is 5:6 and there are 22 girls, how many boys are there?

**Q119.** The pressure on a surface is 100 N/m² and the area is 0.5 m². Calculate the force exerted.

**Q120.** Convert a speed of 90 km/h to metres per second.

**Q121.** A pipe can fill a tank in 4 hours. A second pipe can fill it in 6 hours. How long will it take to fill the tank if both pipes are used together?

**Q122.** A jacket is marked down by 30% in a sale. Its sale price is £56. What was the original price?

**Q123.** A car uses 12 litres of petrol to travel 180 km. Calculate the fuel efficiency in km per litre.

**Q124.** The ratio of red to blue balls in a bag is 3:4. If there are 56 balls in total, how many are red?

**Q125.** A company's revenue increases from £50,000 to £65,000. What is the percentage increase?

**Q126.** A train travels at a constant speed and covers 180 km in 2.25 hours. What is its speed in km/h?

**Q127.** A tank contains water and oil in the ratio 2:3. If the total volume is 25 litres, how much oil is in the tank?

**Q128.** A student scored 18 out of 30 in a test. Express the score as a percentage.

**Q129.** A pair of shoes originally cost £80. After a 15% discount, what is the new price?

**Q130.** If the mass of an object is 5.6 kg and its volume is 0.007 m³, find its density in kg/m³.

**Q131.** Two quantities are in the ratio 7:5. If the larger quantity is 49, find the smaller.

**Q132.** A factory produces 1200 items in 5 hours. How many items are produced per minute?

**Q133.** A cyclist covers 24 km in 1.5 hours. What is the average speed?

**Q134.** A population of 18,000 grows by 5% per year. Find the population after one year.

**Q135.** Express 9:4 as a fraction of the whole.

**Q136.** A mixture contains alcohol and water in the ratio 3:7. If there are 84 litres in total, how much alcohol is present?

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**Q137.** A car depreciates by 10% each year. What is its value after one year if originally worth £18,000?

**Q138.** A triangle's side lengths are increased by a scale factor of 3. By what scale factor does the area increase?

**Q139.** A painter charges £15 per hour. How much would it cost for 6 hours and 30 minutes of work?

**Q140.** A train travels 144 miles in 3 hours and 36 minutes. Calculate its average speed in mph.

**Q141.** A £40 shirt is reduced by 35% in a sale. What is the sale price?

**Q142.** A school has a student to teacher ratio of 25:1. If there are 400 students, how many teachers are there?

**Q143.** A quantity increases from 320 to 400. What is the percentage increase?

**Q144.** A 2.5 $m^3$ container is filled with a liquid. Convert this volume into litres.

**Q145.** A loan of £5,000 accumulates simple interest at 6% per annum. What is the interest after one year?

**Q146.** A cyclist rides 84 km in 3 hours. How many minutes would it take to ride 56 km at the same speed?

**Q147.** A metal alloy is made from copper and zinc in the ratio 5:3. If there are 120 g of zinc, how much copper is used?

**Q148.** A company's profit falls from £240,000 to £192,000. Calculate the percentage decrease.

**Q149.** A car travels 120 km in 80 minutes. Calculate the speed in km/h.

**Q150.** A population of 9600 is made up of adults and children in the ratio 5:7. How many are children?

**Q151.** A sum of money increases by 12% per year. If it's now £560, what was it a year ago?

**Q152.** A train covers 150 km in 1 hour and 40 minutes. Find the average speed in km/h.

**Q153.** A force of 900 N is applied over an area of 3 $m^2$. What is the pressure?

**Q154.** A map scale is 1:25,000. How many cm on the map represent 2.5 km in real life?

**Q155.** A £90 jacket is increased in price by 20%. What is the new price?

**Q156.** A car uses 50 litres of petrol to travel 650 km. What is the fuel consumption in km/litre?

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**Q157.** A 3:2 ratio of boys to girls represents 45 children. How many are girls?

**Q158.** A speed of 20 m/s is equivalent to how many km/h?

**Q159.** If a 15% tip is added to a £60 bill, what is the total amount paid?

**Q160.** A student earns £12 per hour. How much will they earn in a 37.5-hour week?

**Q161.** A bottle contains a solution with water and alcohol in the ratio 4:1. If there is 1.2 litres of alcohol, how much water is there?

**Q162.** A phone is reduced by 30% in a sale and now costs £350. What was the original price?

**Q163.** A lorry travels 360 km in 4.5 hours. Find the average speed.

**Q164.** A cylinder has a volume of 0.75 $m^3$. Convert this volume into litres.

**Q165.** A factory produces 450 units in 75 minutes. What is the production rate in units per hour?

**Q166.** A bag of flour weighs 2.5 kg. A recipe uses 0.4 kg per cake. How many full cakes can be made?

**Q167.** A person walks 1.8 km in 20 minutes. What is their speed in km/h?

**Q168.** A block has a mass of 4.5 kg and a volume of 0.003 $m^3$. Find its density.

**Q169.** The price of a laptop increases from £480 to £600. Find the percentage increase.

**Q170.** A job pays £9.50 per hour. How much is earned in 7 hours and 15 minutes?

**Q171.** A mixture contains paint and thinner in a 5:1 ratio. If there is 7.5 litres of thinner, how much paint is used?

**Q172.** A person invests £2,000 at 5% simple interest per annum. What will the value be after one year?

**Q173.** A class has 24 girls and 16 boys. Express the ratio of girls to boys in simplest form.

**Q174.** A car's value depreciates by 18% in a year. If the value is now £12,300, what was it a year ago?

**Q175.** A triangle's base and height are scaled by a factor of 3. How is the area affected?

**Q176.** A job is completed by 4 workers in 15 days. How many days would it take 6 workers?

**Q177.** A journey takes 2 hours 30 minutes at an average speed of 84 km/h. What is the total distance?

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**Q178.** A map distance of 4 cm represents 1.2 km. What is the map scale?

**Q179.** A machine makes 72 parts in 90 minutes. How many does it make in 4 hours?

**Q180.** A discount of 20% is applied to a price of £350. What is the final amount?

**Q181.** A metal block has a density of 7.2 g/cm³ and a volume of 300 cm³. Find its mass.

**Q182.** A student's mark improves from 64 to 80. What is the percentage increase?

**Q183.** The ratio of cats to dogs in a shelter is 5:3. If there are 64 animals, how many are dogs?

**Q184.** A bicycle is bought for £240 and sold for £180. What is the percentage loss?

**Q185.** A recipe uses ingredients in the ratio 2:3:5. If the total weight is 1 kg, how much is each ingredient?

**Q186.** A lorry's load weighs 2.4 tonnes. Convert this weight into kilograms.

**Q187.** A car travels 132 km in 1 hour and 36 minutes. What is the speed in km/h?

**Q188.** A £500 laptop increases in price by 8%. What is the new price?

**Q189.** A field has an area of 4.8 hectares. Convert this to m².

**Q190.** A salary is £2400 per month. What is the annual salary?

**Q191.** A factory's output grows by 6% per year. If current output is 10,000 units, what was it a year ago?

**Q192.** The mass of a cube is 250 g and its volume is 50 cm³. What is the density?

**Q193.** A train increases its speed from 80 km/h to 120 km/h. What is the percentage increase?

**Q194.** A shop buys items at £3 each and sells them at £5. What is the percentage profit?

**Q195.** A compound value grows 10% each year. If it's now £1,100, what was it a year ago?

**Q196.** A triangle's area is 120 cm². After enlargement by scale factor 2, what is the new area?

**Q197.** A worker is paid £11 per hour for weekdays and £15 on weekends. If they work 35 weekday hours and 8 weekend hours, what is the total pay?

**Q198.** A population decreased from 30,000 to 24,000. Find the percentage decrease.

**Q199.** A fuel tank holds 40 litres. If the car uses 8 litres per 100 km, how far can it travel?

**Q200.** A phone plan charges £15 per month plus £0.10 per text. How much is the bill for 120 texts?

**Q201.** A cyclist covers 72 km in 3 hours. What is their average speed in km/h?

**Q202.** A worker earns £9.80 per hour. How much will they earn for working 42 hours?

**Q203.** A shop sells 5 apples for £1.45. Find the unit price for one apple.

**Q204.** A block of metal has a mass of 450 g and a volume of 150 $cm^3$. Calculate the density of the metal.

**Q205.** A force of 600 N is applied to an area of 0.5 $m^2$. Work out the pressure in $N/m^2$.

**Q206.** A cube has side length 6 cm. What is its volume?

**Q207.** Two similar rectangles have lengths in the ratio 2:5. What is the ratio of their areas?

**Q208.** The sides of a triangle are enlarged by a scale factor of 3. What is the scale factor of the new area?

**Q209.** The volume of a sphere is increased by a scale factor of 4. What is the scale factor of its radius?

**Q210.** Two cylinders are similar. The height of the smaller one is 5 cm and the height of the larger one is 15 cm. Find the ratio of their volumes.

**Q211.** A triangle has angles 30°, 60°, and 90°. One side is 6 cm. Use trigonometric ratios to find another side.

**Q212.** In a right-angled triangle, the hypotenuse is 13 cm and one side is 5 cm. Find the size of one of the other angles.

**Q213.** X is inversely proportional to Y. If Y = 4 when X = 10, find the equation linking X and Y.

**Q214.** X is directly proportional to Y. If Y = 3 when X = 9, write the equation linking X and Y.

**Q215.** When a car travels at 60 mph, the journey takes 2 hours. If the speed is reduced to 40 mph, how long does the journey take?

**Q216.** The time taken to do a job is inversely proportional to the number of workers. If 4 workers take 6 days, how long would 8 workers take?

**Q217.** The gradient of a line is 3. What is the rate of change of y with respect to x?

**Q218.** A straight line has the equation y = 2x + 5. What does the gradient represent?

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**Q219.** On a graph, a curve passes through the point (3, 4). Draw a tangent at that point and estimate the gradient.

**Q220.** Find the average rate of change between x = 1 and x = 5 for the function $y = x^2$.

**Q221.** A population of 500 people grows by 4% each year. What is the population after 3 years?

**Q222.** A machine loses 3% of its value each year. If it is worth £500 now, what is its value after 5 years?

**Q223.** £200 is invested at a compound interest rate of 5% per annum. What is the value after 2 years?

**Q224.** A town's population increases by 2.5% per year. Use an iterative process to estimate the population after 4 years if it starts at 10,000.

**Q225.** Use iteration to solve $x = \sqrt{(10 + x)}$, starting with $x_0 = 2$. Perform three steps.

**Q226.** A quantity grows exponentially according to the formula N = 100(1.02)^t. What does 1.02 represent?

**Q227.** A ladder leans against a wall, making an angle of 70° with the ground. The ladder is 5 m long. How high up the wall does it reach?

**Q228.** A 3D model is made with a scale factor of 1:50. If the model is 6 cm tall, how tall is the real object?

**Q229.** Two squares are similar. The side of the smaller one is 4 cm, and the side of the larger is 10 cm. Find the ratio of their areas.

**Q230.** The pressure in a gas cylinder is 2000 Pa when the area is 0.5 $m^2$. Find the force applied.

**Q231.** A car travels 120 km in 1.5 hours. Calculate its speed in m/s.

**Q232.** If density is 7.8 $g/cm^3$ and the volume is 250 $cm^3$, find the mass.

**Q233.** A car uses 8 litres of fuel for 100 km. How many litres will it use for 350 km?

**Q234.** A graph shows distance against time. Explain how you can find the speed from the graph.

**Q235.** The height of a cone is increased by scale factor 2. What happens to the volume?

**Q236.** The surface area of two similar pyramids is in the ratio 1:9. What is the ratio of their heights?

**Q237.** X is proportional to 1/Y. If Y = 2, X = 6. Find X when Y = 8.

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**Q238.** A straight line goes through (0, 2) and (3, 11). Find its gradient.

**Q239.** Find the gradient of the curve $y = x^2$ at $x = 3$ using the tangent method.

**Q240.** Explain how the gradient of a chord estimates the average rate of change between two points.

**Q241.** A car's speed increases from 30 mph to 50 mph in 10 seconds. Find the average acceleration.

**Q242.** A rectangular tank holds 6000 litres of water and is 2 metres long and 1.5 metres wide. Find its height in metres.

**Q243.** A person earns £2500 per month. What is their annual income?

**Q244.** A builder is paid £150 for 8 hours of work. What is the rate of pay per hour?

**Q245.** A triangle has sides 5 cm, 12 cm and 13 cm. Show it is a right-angled triangle.

**Q246.** Use trigonometry to find the angle in a triangle where the opposite side is 7 cm and the hypotenuse is 14 cm.

**Q247.** Sketch a graph of a function showing inverse proportion.

**Q248.** Sketch a graph of $y = 3x$ and describe its gradient.

**Q249.** Use a tangent to estimate the rate of change at $x = 2$ for $y = x^3$.

**Q250.** A value triples every 5 years. If the current value is £200, what will it be in 10 years?

**Q251.** A car loses 15% of its value each year. If it's worth £12,000 now, estimate its value in 3 years.

**Q252.** A house value increases by 2% per month. If it is worth £150,000 now, what is it worth in 6 months?

**Q253.** Find the unit cost of 7 pencils costing £3.15.

**Q254.** Find the density of an object with mass 5.2 kg and volume 2.5 $m^3$.

**Q255.** Explain how pressure changes when force increases but area remains constant.

**Q256.** A population of 8000 increases at a rate of 1.5% per year. How many people after 2 years?

**Q257.** An investment grows from £2000 to £2200 in 2 years. Find the annual percentage growth rate.

**Q258.** A length of 4.5 m is increased by 60%. Find the new length.

**Q259.** A company makes 5 widgets in 2 hours. How many widgets in 10 hours?

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**Q260.** A straight line passes through (1, 2) and (4, 8). Find its gradient.

**Q261.** Use iteration to solve $x = (6 + x)/2$, starting with $x = 1$.

**Q262.** In a right-angled triangle, $\sin \theta = 0.6$. Find $\theta$.

**Q263.** A line has gradient 4. What is the change in y when x increases by 3?

**Q264.** If area is proportional to the square of the scale factor, what happens to the area if the scale factor is doubled?

**Q265.** Two cones are similar. Their heights are in the ratio 3:5. Find the ratio of their volumes.

**Q266.** A truck travels 250 km in 3.5 hours. Find the speed in km/h.

**Q267.** An object is 2.5 m tall in real life and 5 cm tall in a model. Find the scale factor.

**Q268.** A ball bounces to 80% of its previous height each time. If the first bounce is 2 m, how high is the third?

**Q269.** A salary increases by 3% each year. How many years until it grows by at least 10%?

**Q270.** Estimate the gradient of $y = x^2 + 1$ at $x = 2$ using a tangent.

**Q271.** A graph shows speed-time. What does the gradient represent?

**Q272.** A boat travels 240 km in 5 hours. Find the average speed.

**Q273.** A model is made with scale 1:100. What is the real length if the model is 7 cm?

**Q274.** An object loses half its value every year. If it's worth £400 now, what will it be worth in 3 years?

**Q275.** A tank fills at a constant rate. After 4 minutes, it contains 80 litres. How much in 7 minutes?

**Q276.** The side of a square increases by 50%. Find the percentage increase in area.

**Q277.** Water flows at 6 litres per minute. How much flows in 45 minutes?

**Q278.** A graph shows the curve $y = \sqrt{x}$. Estimate the gradient at $x = 4$.

**Q279.** X and Y are inversely proportional. If $X = 6$ and $Y = 2$, find Y when $X = 3$.

**Q280.** A straight line has the equation $y = 4x - 1$. What is the rate of change of y with respect to x?