Composite Figures Area and perimeter of composite figures Find the missing sides a and b of the given figure and calculate its perimeter. Answer: We get the length of side a by adding together the ones opposite it: 3 and 6. a = 3 cm + 6 cm = 9 cm Now, we need to subtract 7 from 10 to get side b. b = 10 cm 7 cm = 3 cm Perimeter = 10 + 3 + 3 + 6 + 7 + 9 = 38 cm. A composite shape or a composite figure is a shape that is made up of two or more common shapes. The area of the composite shapes is the area of combined shapes of one, or more simple polygons and circles. There are two general methods for finding the area of a composite shape. Method 1: Find the individual areas of each piece of the composite shape. The area of the composite shape will be the sum of the individual areas. Method 2: Find the area of a shape larger than the composite shape and the areas of the pieces of the larger shape that is not included in the composite shape. The area of the composite shape will be the difference between the area of the larger shape, and the areas of the pieces of the larger shape not included in the composite shape. Example 1: Calculate the area and the perimeter of the following shape. The composite shape is made up of a rectangle and a triangle. Area = area of a rectangle + area of a triangle = length breadth + 12 base height For the rectangle: Length = 16 cm, width = 12 cm For triangle: Base = 12 cm (same as width of rectangle) Height = (24 16) = 8 cm So, area = 16 12 + 12 12 8 = 192 + 48 = 240 cm2 Perimeter = sum of the lengths of 5 sides = 16 + 10 + 10 + 16 + 12 = 64 cm A rectangular window has a length of 7 centimeters and a width of 4 centimeters. Findthe perimeter of the rectangular window. What is the area of the given shape?A rectangular balcony has an area of 45 square feet and a perimeter of 28 feet. What arethe dimensions of the balcony? A rectangular deck has an area of 192 square feet. Its perimeter is 56 feet. What are thedimensions of the deck? A photograph is 6 inches wide and 10 inches tall with each opposite side beingcongruent. A frame shop charges $1.00 per inch for a silver frame. How much would itcost to buy a silver frame for the photograph? The sides of a square-shaped room measures 9 feet. Stephanie wants to buy carpet tocover the floor of the room. If the carpet costs $3.00 per square foot, how much will itcostto buy carpet for the room? Emily wants to purchase new carpet for her rectangular living room. The room is 14 feetwide and 18 feet long. There is also a rectangular fireplace that is 3 feet wide and 5 longthat takes up a portion of the room, Carpet costs $3.00 per square foot. How much wouldit cost Emily to carpet the room? Deannas backyard needs a new fence. The backyard is 10 yards long and 8 yards widewith each opposite side being congruent. It costs $3.50 per yard to install a fence. Howmuch would it cost Deanna to install a new fence? The area of rectangular envelope is 60 square inches. Its perimeter is 34 inches. Whatare the dimensions of the envelope? Daniel needs to paint the base area of his L-shaped pool. Dimensions of the pool aregiven in the figure below. What is the total area of Daniels pool that will be painted? Understand the meaning of composite figuresSolve composite figures by dividing them into two figuresSolve word problems involving estimating area of figuresSolve word problems involving area and perimeter of composite figures Perimeter of different shapes formulas: Find area and perimeter of figures made up of two or more common shapes. Perimeter is the distance around a shape. The perimeter of any figure must have a unit of measurement attached to it. If no specific units are given (feet, inches, centimeters, etc.), write units. Area is the amount of space inside a figure. If two figures are congruent, they have the same area (Congruent Areas Postulate). Figure \(\PageIndex{1}\) A composite shape is a shape made up of other shapes. To find the area of such a shape, simply find the area of each part and add them up. Area Addition Postulate: If a figure is composed of two or more parts that do not overlap each other, then the area of the figure is the sum of the areas of the parts. Consider a basic house drawn as a triangle on top of a square. How could you find the area of this composite shape? Example \(\PageIndex{1}\) Find the area of the figure below. All angles that look like right angles are right angles. Figure \(\PageIndex{2}\) Solution Divide the figure into a triangle and a rectangle with a small rectangle cut out of the lower right-hand corner. Figure \(\PageIndex{3}\) \(A=A_{\text{top triangle}}+A_{\text{rectangle}}A_{\text{small triangle}} \\ A=(\dfrac{1}{2} \cdot 6\cdot 9)+(9\cdot 15))(\dfrac{1}{2}\cdot 3\cdot 6) \\ A&=27+1359 \\ A&=153\text{ units}^2\)Example \(\PageIndex{2}\) Divide the shape into two rectangles and one triangle. Find the area of the two rectangles and triangle. All angles that look like right angles are right angles. Figure \(\PageIndex{4}\) Solution Rectangle #1: \(\text{Area} =24(9+12)=504\text{ units}^2\) Rectangle #2: \(\text{Area}=15(9+12)=315\text{ units}^2\) Triangle: \(\text{Area} =15(9)2=67.5\text{ units}^2\)Example \(\PageIndex{3}\) Find the area of the entire shape from Example 2 (you will need to subtract the area of the small triangle in the lower right-hand corner). Solution \(\text{Total Area} =504+315+67.5\dfrac{15(12)}{2}=796.5 \text{ units}^2\)Example \(\PageIndex{4}\) Figure \(\PageIndex{5}\) All angles that look like right angles are right angles. Divide the shape into two triangles and one rectangle. Find the area of the two triangles and rectangle. Find the area of the entire shape. Solution One triangle on the top and one on the right, the rest of the shape is a rectangle. The area of the triangle on top is \(\dfrac{8(5)}{2}=20\text{ units}^2\). The area of the triangle on the right is \(\dfrac{5(5)}{2}=12.5\text{ units}^2\). The area of the rectangle is \(375\text{ units}^2\). The total area is \(407.5\text{ units}^2\). Use the picture below for questions 1-4. The composite shape is formed of a square within a square. Figure \(\PageIndex{6}\) Find the area of the outer square. Find the area of one grey triangle. Find the area of all four grey triangles. Find the area of the inner square. Find the areas of the figures below. You may assume all sides are perpendicular. Figure \(\PageIndex{7}\) Figure \(\PageIndex{8}\) Find the areas of the composite figures. Figure \(\PageIndex{9}\) Figure \(\PageIndex{10}\) Figure \(\PageIndex{11}\) Figure \(\PageIndex{12}\) Figure \(\PageIndex{13}\) Figure \(\PageIndex{14}\) Use the figure to answer the questions. Figure \(\PageIndex{15}\) What is the area of the square? What is the area of the triangle on the left? What is the area of the composite figure? To see the Review answers, open this PDF file and look for section 10.6. Term Definition area The amount of space inside a figure. Area is measured in square units. composite shape A shape made up of other shapes. perimeter The distance around a shape. The perimeter of any figure must have a unit of measurement attached to it. If no specific units are given (feet, inches, centimeters, etc), write units. Composite A number that has more than two factors. Video: Area of a Triangle (Whole Numbers) Activites: Area of Composite Shapes Discussion Questions Study Aids: Perimeter and Area Study Guide Practice: Area and Perimeter of Composite Shapes LICENSED UNDER A context such as the following can be used to investigate drug absorption, using a product function model involving circular functions and exponential functions.For each of the following functions the behaviour and variety of shapes of their graphs is to be investigated. The modelling domain and corresponding range should be identified, as well as key features such as axis intercepts, stationary points and points of inflection, symmetry, asymptotes, and the shape of the graph over its natural domain, using the derivative function for analysis as applicable.The task will begin with an investigation of a graph that might model the concentration of a certain drug in a patient's system over time. The use of parameters in the family of the function gives students the opportunity to explore the effect the size of parameters has on the graph and hence on the magnitude of the drug in a patient's system over time. Students then explore a similar function that may model the situation more closely.Component 1Consider the function with rule f(x) = e-x sin(x).Graph the function identifying its key features and explain how the shape of its graph can be deduced from its component functions.The graph of d(t) = Ae-k tsin(kt),where A and k are positive real constants, can be used to describe drug absorption in a patient's bloodstream, using units mg/litre per unit of time in minutes.Consider the special case where A = 1 andk= 1,and discuss this with respect to a dose of a drug taken at t = 0.Select several pairs of values of A and k where 1 A 10 and 0.1 k 1, and explore and interpret features of the graph of d(t).Discuss the role of the sine function, the exponential function, and constants A and k where in determining the shape of the graph ofd(t).Component 2Consider the function d:[0,4] R,d(t) = Ae-kt sin(kt), where d(t) measures units mg/l per unit of time in minutes.Let A = 10 and k = 0.2. Graph this function, identifying its key features, and construct a corresponding table of values.Identify and interpret the maximum rates of increase and decrease, and when the concentration is half of its maximum value.Investigate what happens to the graph when A and k are systematically varied, and discuss any patterns.Jordan is in hospital and needs a particular drug to manage pain.Let dj :[0,10] R,dj (t) = 20e-0.5t sin(0.5t) where the particular drug in Jordan's bloodstream is measured in mg/l and time is measured in minutes. Draw the corresponding graph and compare this with the investigations above.Component 3Investigate any points of intersection between graphs off: [0,4] R,f(t) = Ae-kt sin(kt) and g:[0,4] R,g(t) = Ae-kt.Discuss where these points of intersection exist in relation to the stationary point(s) of the graph of f(t).Areas of studyThe following content from the areas of study is addressed through this task.Area of studyContent dot pointsFunctions, relations and graphs2, 3, 4, 5, 6Algebra, number and structure4, 5, 6Calculus3, 4, 5Data analysis, probability and statisticsOutcomesThe following outcomes, key knowledge and key skills are addressed through this task.OutcomeKey knowledge dot pointsKey skills dot points11, 2, 4, 6, 7, 8, 9, 10, 121, 2, 8, 9, 10, 11, 1221, 2, 3, 51, 2, 3, 4, 5, 6, 731, 2, 3, 4, 5, 81, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12A context such as the following could be used to investigate key features of the graphs of some polynomial functions of a real variable formed by products of other polynomial functions.For each of the following functions the behaviour and variety of shapes of their graphs is to be investigated. The maximal domain and corresponding range should be identified, as well as key features such as axis intercepts, stationary points, points of inflection and symmetry, and the shape of the graph over its natural domain, using the derivative function for analysis as applicable.The number, location and nature of key features should be determined with respect to different combinations of the parameters that define the product functions, and the different types of graphs identified and classified.Part 1Investigate the nature of graphs of polynomial product functions of the formf:R R,f(x) = xn (a - x)mwhere n and m are positive integers and a R.Part 2Investigate the nature of graphs of polynomial product functions of the formf:R R,f(x) = xn (a - x)mwhere n and mare positive integers and a R.Part 3Investigate the nature of graphs of polynomial product functions of the formf:R R,f(x) = (a - x)n (b - x)mwhere n and m are positive integers and a and bare real numbers such that a b.Areas of studyThe following content from the areas of study is addressed through this task.Area of studyContent dot pointsFunctions, relations and graphs1, 4, 5Algebra, number and structure1, 2, 5Calculus1, 3, 4, 5Data analysis, probability and statisticsOutcomesThe following outcomes, key knowledge and key skills are addressed through this task.OutcomeKey knowledge dot pointsKey skills dot points11, 2, 7, 9, 10, 111, 2, 5, 6, 7, 9, 10, 11, 1221, 2, 3, 51, 2, 4, 5, 6, 731, 2, 3, 4, 5, 6, 81, 2, 3, 4, 5, 6, 7, 9, 11, 12The application task is to be of 46 hours' duration over a period of 12 weeks.IntroductionA context such as the following could be used to develop an application task that investigates how a product function of an exponential decay function and a circular function can be used to model the motion of the pendulum of a clock after the driving force has stopped.Component 1Introduction of the context through specific cases or examplesDraw the graphs of f:R R,f(t) = 5e-kt for several (at least five) values of 0 kDraw the corresponding graphs of f(-t) and - f(t) on the same set of axes, and comment onthe similarities and differences between these graphs.Draw the graphs of g:[0,2] R,g(x) = sin(ax) for several (at least five) values of a together on the same set of axes. State the period for each function, and comment briefly on the similarities and differences between these graphs.Component 2Consideration of general features of the contextFor k = 0.2;a = 1, sketch the graphs of 1(t) = 5ekt , 2(t) = 5ekt and s(t) = 5ekt sin(at), where t [0, 4].Find the derivative of s(t), in terms of t, k and a, and hence for k = 0.2; a = 1, find the coordinates of the first two maximum/minimum points for s(t) with x coordinates closest to the y-axis.Find the coordinates of any points of contact between the graphs of s(t) and 1(t) and between the graphs of s(t) and 2(t). Briefly comment on the relationship between these points of contact and the graph of sin(t). Hence, state the exact x coordinate for the point of intersection closest to the y-axis.State the coordinates of intersection between the graphs of s(t) and sin(t), over the given domain. Comment on these findings. Hence, give the exact coordinates of these intersection points.Component 3Variation or further specification of assumption or conditions involved in the context to focus on a particular feature or aspect related to the contextBrian has recently purchased a grandfather clock. The rate at which the hands of the clock move is controlled by a pendulum, which is kept in regular motion by slowly descending weighted chains.When the weights reach their lower point and stop moving, the pendulum swing begins to change, causing the hands of the clock to slow down and gradually stop. From the time when the swing begins to change, the horizontal displacement, s cm, of the point, P, at the end of the pendulum, from the vertical, as shown in the following diagram, can be modelled by functions with the rules(t) = 5ektsin(at), where t > 0 is the time in seconds after the pendulum swing begins to change and k and a are real constants. For Brian's clock, k = 0.2 and a = 1.Find the horizontal displacement of the pendulum for several seconds after the weights stop descending, and draw a series of diagrams corresponding to the position of the pendulum at these times.Draw a series of diagrams of the position of the pendulum the first several maxima. If the pendulum is deemed to have come to rest when the swing is less than 0.01 cm, find how long the pendulum takes to come to rest.Brian has a friend, Jana, who also bought a similar grandfather clock. Jana's clock is modelled by the same rule for the horizontal displacement when the weights stop descending, where k = 0.4 and a = 1. Draw the graph of the two pendulums' horizontal displacement for t 22. Compare the behaviour of the two pendulums and discuss how the different values for k affect the motion of the point P after the swing of the pendulum begins to change.Areas of studyThe following content from the areas of study is addressed through this task.Area of studyContent dot pointsFunctions, relations and graphs2, 3, 4, 5, 6Algebra, number and structure4, 5Calculus2, 3, 4, 5Data analysis, probability and statisticsOutcomesThe following outcomes, key knowledge and key skills are addressed through this task.OutcomeKey knowledge dot pointsKey skills dot points11, 2, 3,4, 6, 7, 9, 10, 111, 2, 6, 7, 8, 9, 10, 11, 1221, 2, 51, 2, 4, 5, 6, 731, 2, 3, 4, 5, 6, 81, 2, 3, 4, 5, 6, 7, 9, 11, 12The application task is to be of 46 hours' duration over a period of 12 weeks.IntroductionA context such as the following could be used to develop an application task that investigates how a variety of functions, and piecewise (hybrid) functions constructed from these, could be used to model sections of pathway, such as parts of a bicycle track adjacent to a river, creek or wetland: for example, the Yarra Bend public park in Melbourne.The process of constructing such a function is called splining.Component 1Introduction of the context through specific cases or examples. Students shouldConsider the problem of determining a quadratic function f:R R,f(x) = ax2 + bx + c, the graph of which passes through three specified points. Suppose two of these points, A and B, have coordinates (1, 4) and (2, 2) respectively. The third point, C, has an x-coordinate of 4 and is given as (4, k) where k is an arbitrary real constant.Explore the effect of varying k on the graph of the function.Suppose that C is determined to be (4, 1.5). Investigate cubic functions of the form f:R R,f(x) = ax3 + bx2 + cx + d with graphs that pass through the points A, B and C.Explore the effect of d on the behaviour of the graphs of these cubic functions. Identify a value of d that gives a cubic function closely matching the quadratic function that passes through the same three points.A fourth point, D, has coordinates (0, m). For different values of m find pairs of quadratic functions, the first pair containing points D, A and B and the second containing the points B and C. These two curves must be smoothly joined at B. Determine the effect of m on the behaviour of the graphs produced.Component 2Consideration of general features of the context. Students shouldConsider the various sections of the river using different combinations of specified coordinates and dimensions. The following provides a sample.A new bicycle track is to be constructed along the Yarra River in Kew between two pedestrian bridges labelled A and B on the map shown below.The track cannot be constructed on the western side of the river due to the presence of the golf course.The track is to follow the curves of the river on the eastern side. That is, it will go from A to B by the boathouse kiosk, passing between the river and Smith Oval.Explore how a model can be developed between the pedestrian bridges A and B using a series of smoothly joined quadratic functions.Design a measure for how well the pathway matches the curve of the river and apply it to the model.Component 3Variation or further specification of assumption or conditions involved in the context to focus on a particular feature or aspect related to the context. Students shouldImprove the fit of your bicycle track, according to the measure you have designed, by using a combination of different types of functions.Alternatively, identify an outline, curve or path in some other context and suitably model this by a piecewise function, which may include function types other than polynomial functions.Areas of studyThe following content from the areas of study is addressed through this task.Area of studyContent dot pointsFunctions, relations and graphs1, 2, 5, 6Algebra, number and structure1, 4, 5, 6Calculus3, 4Data analysis, probability and statisticsOutcomesThe following outcomes, key knowledge and key skills are addressed through this task.OutcomeKey knowledge dot pointsKey skills dot points11, 4, 6, 7, 9, 10,1, 6, 9, 10, 1221, 2, 3, 51, 2, 3, 5, 731, 2, 3, 4, 5, 81, 2, 3, 4, 5, 6, 7, 9, 11, 12The application task is to be of 46 hours' duration over a period of 12 weeks.IntroductionA context such as the following could be used to develop an application task that investigates graphs of polynomial functions of the form f:R R,f(x) = m(x - a)s(x - b), the key features of these graphs, and the number of solutions to equations of the formf(x) = p, where p R.Component 1Introduction of the context through specific cases or examples. Students shouldConsider the function f:R R,f(x) = (x - 1)2 (x - 2). Sketch the graph of y = f(x), and clearly indicate all key features. Find the values of x for which f(x) = p has one, two or three solutions, where p is a real number.State the transformations required to map the graph of y = f(x) onto the graph of .If there is a turning point at (2, 3), find all possible values of n and k. Sketch the corresponding graphs.State the transformations required to map the graph of y = f(x) onto the graph of y = Af(x - h). If there is a turning point at(1, 4), find all possible values of A and h. Sketch the corresponding graphs.The graph of y = f(x) is mapped onto graph of y = Af(n(x - h)) + k. Discuss how the values of A, n, h and k change the graph of the original function under various transformations.Component 2Consideration of general features of the context. Students shouldNow consider the function f:R R, f(x) = m(x - a)2(x - b) where m, a, b R.Investigate the graphs of y = f(x) for combinations and ranges of values of the parameters a, b and m.In each of the cases in step a., find the values of p R for which f(x) = p has one, two or three solutions.State the transformations required to map the graph of y = f(x) onto the graph of y = Af(nx) + k, where A,n and k R. Investigate how A,n and k, and a, b and m relate to the location and nature of the stationary points of the graph ofy = Af(nx) + k.Component 3Variation or further specification of assumption or conditions involved in the context to focus on a particular feature or aspect related to the context. Students shouldConsider the function f: R R, f(x) = m(x - a)s (x - b), where m,a,b R a and s N. Investigate the graphs of y = f(x) for cases where a 0 and s N. What generalisations can be made?Let f: R R, f(x) = (x - a)s (x - b) where a,b R, a and s N. Find the values of p for which f(x) = p has zero, one, two or three solutions when s = 1, 2, 3, 4 and 5. What generalisations can be made?Areas of studyThe following content from the areas of study is addressed through this task.Area of studyContent dot pointsFunctions, relations and graphs1, 3, 4, 5Algebra, number and structure1, 4, 5Calculus3, 4, 5Data analysis, probability and statisticsOutcomesThe following outcomes, key knowledge and key skills are addressed through this task.OutcomeKey knowledge dot pointsKey skills dot points11, 2, 3, 9, 10, 111, 2, 6, 9, 10, 11, 1221, 2, 3, 51, 2, 4, 5, 6, 731, 2, 3, 4, 5, 81, 2, 3, 4, 5, 6, 7, 9, 11, 12The application task is to be of 46 hours' duration over a period of 12 weeks.IntroductionA context such as the following could be used to develop an application task that investigates the use of a special kind of cubic polynomial function, called Bernstein polynomials, whose graphs form what are called Bezier curves. These are named after the French automobile engineer Pierre Bezier who developed their application to a new computer-aided design tool for the Renault car manufacturing corporation in the 1960s. Today, Bezier curves are a key component of graphic design applications.Bezier curves use polynomial functions of low degree, such as cubic polynomials over a restricted domain, to specify the coordinates of the points that make up these curves. These functions, called Bernstein polynomials, provide local control of shape, based on a small set of points called control points, and have graphs that are continuous and smooth curves for which the derivative can be found at any point on the curve. Shapes constructed using drawing packages and the outlines of letters produced by printers are typically based on a set of routines that use these curves.A cubic Bezier curve drawn over the interval 0 t 1 is produced by graphing a relation that has its x and y coordinates specified respectively by the cubic polynomial functions:x = a(1 - t)3 + 3ct(1 - t)2 + 3et2(1 - t) + gt3y = b(1 - t)3 + 3dt(1 - t)2 + 3ft2(1 - t) + ht3Where the coefficients a, b, c, d, e, f, g and h are obtained from the coordinates of the four control points (a, b), (c, d), (e, f) and (g, h).The gradient of the tangent to the curve for a particular value of t can be determined, using the chain rule for differentiation, by the relationship:The shape of the Bezier curve produced depends on the selection of coordinate values for the control points. Where more than one Bezier curve is used to produce a required shape, these curves will need to be joined smoothly to produce a good image. The three components for an application task could be developed as follows.Component 1Introduction of the context: through specific cases or examples students shouldConsider the simpler case of quadratic Bezier curves.Select four distinct points as control points and determine the equations for the x and y coordinates as functions of t to specify a particular cubic Bezier curve. Represent the corresponding Bezier curve using a table of values and the graph of the relation.Consider the gradient of the tangent to the curve at various points on the curve, including the relation between the tangents to the first and last control points and the location of the second and third control points.Component 2Consideration of general features of the context students shouldVary the control points and consider the Bezier curves produced, including cases that lead to, for example, straight lines and loops.Investigate the selection of control points to produce a reasonable representation of a particular shape: for example, how many letters of the alphabet can be reasonably approximated by a single Bezier curve?Consider how well a cubic Bezier curve matches the required shape and any limitations on possible shapes that can be represented using these curves.Component 3Variation or further specification of assumption or conditions involved in the context to focus on a particular feature or aspect related to the context. Students shouldRepresent more complicated shapes formed by piecing together several Bezier curves.Identify the location of control points for a pair of cubic Bezier curves that are smoothly joined to represent other letters, or for several Bezier curves that are smoothly joined to represent a shape such as the outline or cross section of a car.Areas of studyThe following content from the areas of study is addressed through this task.Area of studyContent dot pointsFunctions, relations and graphs1, 5, 6Algebra, number and structure1, 5Calculus3, 4Data analysis, probability and statisticsOutcomesThe following outcomes, key knowledge and key skills are addressed through this task.OutcomeKey knowledge dot pointsKey skills dot points11, 3, 4, 7, 10, 111, 2, 7, 9, 11, 12, 1321, 2, 3, 51, 2, 3, 4, 6, 731, 2, 3, 4, 5, 81, 2, 3, 4, 5, 6, 7, 9, 11, 12The modelling or problem-solving task is to be of 23 hours' duration over a period of 1 week.IntroductionPolls provide a topical and regular insight into the relative popularity of political parties over time, in particular as events occur and are reported in the media and trends change.Popularity on a two-party preferred basis as indicated by polls is a context for inference about proportions with respect to a population based on sampling. Consider a country that has a population of around 15 million voters on an electoral roll. Polls inform public consideration and debate on various matters of policy.Part 1Plot graphs of the distribution of sample proportions for sample sizes of 50, 100 and 200 forp = 0.43, 0.52, 0.61Explain what these graphs indicate.Part 2Randomly select an integer in the range [30, 60] and use this to generate a population of 1000 voters, with that value as the percentage of the population who would vote for a given party on a two-party preferred basis.Generate 50 random samples of size n = 60 from this population and use each of these to find a point estimate for the true population proportion. Graph the distribution of the sample proportions and state its mean and standard deviation.Use each point estimate to construct a confidence interval for p at a 90% level of confidence. Graph all of these intervals together as a set of horizontal line segments, one under the other, and use them to explain the relationship between the true value of the population proportion, p, and this set of confidence intervals for a 90% level of confidence.Part 3The Margin of Error Table relates sample size, sample proportion and margin of error at a 95% level of confidence.Show how the figures for the row corresponding to a sample size of 2000 are obtained.Draw graphs of several functions to illustrate how the maximum margin of error varies for different sample sizes and levels of confidence.Suppose that it costs $50 per individual response gathered as part of a survey. Discuss what you think might be a reasonable combination of sample size, level of confidence, margin of error and total cost.Areas of studyThe following content from the areas of study is addressed through this task.Area of studyContent dot pointsFunctions, relation and graphsAlgebra, number and structureCalculusData analysis, probability and statistics1, 2, 4OutcomesThe following outcomes, key knowledge and key skills are addressed through this task.OutcomeKey knowledge dot pointsKey skills dot points11, 14, 16, 171, 16, 18, 19, 2021, 2, 4, 51, 2, 3, 4, 6, 731, 2, 3, 4, 6, 7, 81, 3, 4, 5, 8, 9, 10, 11The modelling or problem-solving task is to be of 23 hours' duration over a period of 1 week.IntroductionA context such as the following could be used to develop a two-part problem-solving task that involves a composition of functions leading to the standard normal distribution, and the use of simulations to investigate the distribution of proportions in probability experiments.Part 1Let f: R R,f(x) = ex and g: R R,g(x) = -x2.Plot the graphs of f(x) and g(x) and explain how the shape of the graph of f(g(x)) can be deduced from these.Plot the graph of f(g(x)) and clearly identify its key features.Use sets of trapeziumsto form a sequence of under-estimates and over-estimates for the area bounded by the graph of f(g(x)) and the horizontal axis between x = 10 and x = 10.Use the results from step c. to find approximate values for a and b such that h: R R,h(x) = ae-bx2 forms a probability density function, with mean 0 and standard deviation 1.Plot the graph from step d. on the same set of axes as the standard normal distribution and comment on similarities and differences.Part 2A pair of standard dice are rolled simultaneously. Use technology to simulate this experiment for 60 rolls of the dice and record the set of outcomes. What is the proportion of rolls for which the two dice had the same value?Run the simulation 100 times and plot the distribution of this proportion. Describe the distribution.Now consider two identical packs of 10 cards numbered 1 to 10. Both packs are shuffled thoroughly. The first card is turned over from each pack and the result is recorded. This is then repeated for the second card from each pack, the third card from each pack and so on, through to the 10th and final card of each pack. Use technology to simulate this experiment and record the set of outcomes. How many pairs of cards in the experiment had the same value?Run this simulation 100 times and plot the distribution of proportions for the number of times when the pair of cards had the same value. Describe this distribution.Give an estimate for the probability that there is at least one pair of matching cards and explain how this estimate was obtained.Areas of studyThe following content from the areas of study is addressed through this task.Area of studyContent dot pointsFunctions, relations and graphs2, 3, 4, 5Algebra, number and structure3, 5Calculus3, 4, 7, 9Data analysis, probability and statistics1, 2, 3OutcomesThe following outcomes, key knowledge and key skills are addressed through this task.OutcomeKey knowledge dot pointsKey skills dot points11, 2, 4, 6, 7, 11, 12, 13, 14, 171, 2, 4, 5, 12, 14, 15, 16, 17, 18, 19, 2021, 2, 4, 51, 2, 3, 4, 5, 6, 731, 2, 3, 4, 7, 81, 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13The modelling or problem-solving task is to be of 23 hours' duration over a period of 1 week.IntroductionA context such as the following could be used to develop a modelling or problem-solving task that involves modelling travel over different terrains at different average speeds for each terrain, and using this information to optimise the time of travel. Bushwalkers travel over different types of terrain, from cleared to dense bush. The denseness of the bush and the ruggedness of the terrain influence the average speed of travel. By planning a route to take such factors into consideration, the total time taken to travel from one point to another can be optimised. In calculating estimates of the time for a particular route, a walker uses his or her average speed for each different type of terrain they are likely to encounter.For a walk through a particular type of terrain, the distance travelled, d km, can be calculated as the product of the average speed, v km/h, and the time travelled at this speed, t hours. On a typical two-day walk a bushwalker might cover a distance of up to 30 km with walking speeds of up to 5 km/h over cleared terrain.Part 1For a typical two-day walk, choose several representative values for average speed and draw a graph of the relationship between t and d for each of these values.Similarly, choose several representative values for the distance to be travelled and draw a graph of the relationship between t and v for each of these values.Discuss the key features of each of the two families of graphs and the differences between them.Part 2A bushwalk is planned from Ardale to Brushwood. As shown in the diagram below.The direct route, a distance of 14 km, goes entirely through rugged bush country. However, there is a large square clearing situated as shown. This clearing has one diagonal along the perpendicular bisector of the direct route and one corner, C, at the midpoint of the direct route.One of the bushwalkers believes that time will be saved if they travel from Ardale to Brushwood on a route similar to the one shown passing through P and Q, where the section PQ is parallel to the direct route. The side length of the square clearing is 7 km, and the part of this route that goes across the square clearing is parallel to the direct route.Choose a suitable variable, and hence determine a mathematical relationship that can be used to determine the total time for a route of this type. Draw the graph of this relationship and discuss its key features.Find and describe the route for which the travelling time will be least and compare it with the direct route.Areas of studyThe following content from the areas of study is addressed through this task.Area of studyContent dot point(s)Functions, relations and graphs6Algebra, number and structure5Calculus1, 4, 5Data analysis, probability and statisticsOutcomesThe following outcomes, key knowledge and key skills are addressed through this task.OutcomeKey knowledge dot pointsKey skills dot points11, 4, 6, 7, 9, 101, 6, 9, 1221, 2, 3, 51, 2, 3, 4, 5, 6, 731, 2, 3, 4, 5, 6, 81, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13The modelling or problem-solving task is to be of 2 - 3 hours duration over a period of 1 week.IntroductionA context such as the following could be used to develop a modelling or problem-solving task which involves modelling the shape of a designer two-part window feature for a section of wall, and the dimensions and area of the design.The section of the wall is 4 m wide and 3.5 m high. The window is a symmetrical design which fits in the middle of the wall horizontally. The base of the window forms a straight line 0.5 m above and parallel to the floor and is 2 m in length. The lower part of the window has two straight line slant edges, and these are 1.5 m apart at the height of 1.5 m from the floor. The window designer is considering a range of possibilities for the upper part of the window, the highest point of which is to be at most 3 m from the floor.The designer constructs a graph of the window design using a set of axes with the origin on the floor at the middle of the wall.Part 1Initially the designer considers and upper part consisting of two-line segments which join onto the top of the lower straight edges, at an angle of 45 to the horizontal, and extend to the point where they meet.Use functions to define the sections of the window's edges and draw a graph showing the wall and the window, labelling all key points with their coordinates.Find the area of the window.Consider a family of related designs where the angle the edges of the upper part make with the horizontal is varied. Show several examples and calculate the area of the window in each case. What is the largest possible value for this angle, and the corresponding area of the window?Part 2As an alternative, the designer considers using an arch for the top part of the window.Draw the graph where the arch is a semi-circle. Calculate the area of the window. Do the lower and upper parts of the window join smoothly?Draw several graphs for the upper part defined by the family of functions with rule of the form f(x) = ax2 + b, where a and b are non-zero real constants.For the case where the lower and upper parts of the window join smoothly, calculate the corresponding area of the window.What happens when a function with rule of the form g(x) = a sin(bx) + c is used to model the upper arch, if the two parts are to be smoothly joined?The designer decides that while a smooth join of the two parts of the window is a critical requirement, it is not necessary for the arch to be smooth at its top point, so a symmetrical hybrid function based on part of the graph of some other function could be used to represent the arc.Consider some other possible modelling functions and identify which of these gives the maximum window area for different choices of functions and defining parameters.The following images show some arches from buildings along North Terrace in Adelaide.Areas of studyThe following content from the areas of study is addressed through this task.Area of studyContent dot pointFunctions, relations and graphs2, 3, 6Algebra, number and structure5, 6,Calculus3, 4, 5, 6, 10Data analysis, probability and statistics-OutcomesThe following outcomes, key knowledge and key skills are addressed through this task.OutcomeKey knowledge dot pointKey skill dot point11, 2, 4, 7, 10, 121, 2, 6, 10, 12, 13, 14, 1521, 2, 3, 51, 2, 3, 5, 732, 3, 4, 5, 82, 3, 4, 5, 6, 7, 9, 11,12, 13 A composite shape is made up of basic shapes put together. In this guide, you will learn how to find the area of composite shapes in a few simple steps. The composite shape consists of the main shapes together. The area of the composite shape is found by adding all the basic shapes. The area of composite shapes is the area of combined shapes of one or more simple polygons and circles. To calculate the area of composite shapes, we can add the area of all the major shapes together. The following figure gives an idea of finding the area of a composite shape. The unit area of compound shapes is expressed in \(m^2\), \(cm^2\), \(in^2\) or \(ft^2\), and so on. The area of composite shapes is a combination of basic shapes. With the following steps, we can calculate the area of the composite shapes. Break the compound shape into basic shapes. Find the area of each original shape. Add all the areas of basic shapes together. Show the answer in square units. A composite shape has an area of \(620 \space cm^2\). The shape consists of a circle and a triangle and the area of the triangle is \(450 \space cm^2\) square units. What is the area of the circle?\(\color{blue}{1,876}\) \(\color{blue}{54}\) \(\color{blue}{170 \space cm^2}\) by: Effortless Math Team about 3 years ago (category: Articles) 2 years ago Related to This Article More math articles Loading... Found a content error? Tell us Areas of Composite ShapesA compound shape is a shape that is built up from two or more simple shapes. A simple shape is a shape for which a formula for calculating area is readily available, such as triangles, rectangles and circles.To calculate the area of a complex shape, divide the complex shape into a number of simple shapes. There are often a number of ways to divide the shape up: it does not matter which combination is used so long as the whole complex shape is taken into account.The area of each simple shape is calculated separately; then added together as a total for the compound shape. What is the area of this shape?Split the compound shape into two simple shapes: a rectangle and a triangle:The area of the rectangle part is 12 x 10 = 120 cm2.The missing dimension for the triangle part is 20 - 12 = 8cm.Area of a triangleA= `frac(1)(2)bh`Substitute:= `frac(1)(2) xx 10 xx 8`= 40 cm2. Area of compound shape = area of rectangle + area of triangle = 120 + 40 = 160 cm2. A stained glass window is being manufactured as the centrepiece of a new home. The stained glass will cost 250 per square metre. How much will the stained glass cost for the window?The lower part of the window is a rectangle:Area of a rectangleA= `b xx h`Substitute:= `2 x 1.34`= 2.68 cm2.The upper part of the window is a semicircle (half a circle).The diameter of the semicircle is the width of the window; the radius is half of that = 1m.Area of a whole circleA= `r^2`Area of a semicircleeA= `frac(1)(2) xx r^2`Substitute:= `frac(1)(2) xx xx 1^2`= 4.25 cm2.Area of entire window = 2.68 + 1.57 = 4.25 m2Cost of window = 250 x 5.82 = 1062.50 Welcome back to another enlightening post from Brighterly, your trusted companion for making learning an enjoyable journey for your children. Today, we take on an exciting journey into the world of geometry. Were focusing on Composite Shapes a fascinating concept that broadens our understanding of how smaller geometric shapes combine to form more complex figures.Geometry, being an essential part of our daily lives, is seen in architecture, the design of objects we use, and even patterns in nature. Its crucial for children to understand these underlying principles that shape the world around us. Here at Brighterly, we believe in breaking down complex concepts into simple, digestible information.What Are Composite Shapes?Composite shapes are complex geometric figures that consist of two or more simple geometric shapes. We encounter them on a daily basis, be it in architecture, art, or even nature. Understanding composite shapes can help students visualize how different units of shapes can come together to form larger structures. In this blog post, we will delve into understanding them and practice this with examples.Definition of Simple Geometric ShapesBefore diving into composite shapes, lets define what simple geometric shapes are. Simple geometric shapes are the basic shapes that include squares, rectangles, circles, triangles, and so on. These shapes are the building blocks of geometry and are characterized by specific formulas for their area, perimeter, and other properties. For example, the area of a square is found by squaring the length of its side, and the area of a rectangle is found by multiplying its length by its width.Definition of Composite ShapesMoving onto composite shapes, these are shapes made up of a combination of two or more simple shapes. The shapes could be any combination of squares, rectangles, circles, triangles, or other simple shapes, and they can be overlapping or adjacent. Composite shapes are often found in design, architecture, and other practical applications. For instance, a rectangle combined with a triangle on top forms the shape of a common house.Properties of Simple Geometric ShapesEvery simple geometric shape has unique properties that define them. For example, a square has all its sides equal and all angles equal to 90 degrees. Similarly, a circle has all points on its edge equidistant from its center, and a triangle has the sum of its interior angles equal to 180 degrees. These properties help in the identification and analysis of these shapes in various mathematical problems.Properties of Composite ShapesComposite shapes, on the other hand, do not have a fixed set of properties because their characteristics depend on the simple shapes that compose them. They share the properties of their constituent simple shapes. For example, a composite shape consisting of a square and a rectangle will have some properties of a square and some properties of a rectangle.Difference Between Simple and Composite ShapesThe primary difference between simple and composite shapes lies in their complexity. Simple shapes have defined properties and formulas for their area and perimeter, while composite shapes depend on the simple shapes theyre composed of. Understanding both simple and composite shapes is crucial in problem-solving scenarios, especially when dealing with spatial awareness and calculations involving area and perimeter.Formulas for Area of Simple Geometric ShapesHere are some of the formulas for finding the area of simple geometric shapes:Square: Side length Side lengthRectangle: Length WidthCircle: (Radius)^2Triangle: 1/2 Base HeightThese formulas are fundamental to understanding geometry and are often used in calculations involving composite shapes.Formula for the Area of Composite ShapesThe formula for the area of composite shapes isnt fixed like simple shapes because it depends on the shapes it comprises. Generally, the area of a composite shape is found by breaking it down into its simple shapes, calculating the area of each simple shape, and then adding (or subtracting, in some cases) those areas together.Understanding the Formula for Area of Composite ShapesTo understand the formula for the area of composite shapes, imagine you have a shape thats made up of a rectangle and a triangle. First, you would find the area of the rectangle (length width) and the area of the triangle (1/2 base height). Then, you would add these areas together to find the total area of the composite shape. This process can be applied to any composite shape.Computing the Area of Composite ShapesNow that we understand the process, lets compute the area of a composite shape. First, identify the simple shapes that make up the composite shape. Then, use the formulas for each simple shape to calculate their areas. Finally, add (or subtract) all these areas to find the area of the composite shape. It may help to draw the shapes and label all necessary dimensions.Practice Problems on Area of Composite ShapesIts time to put our knowledge to the test. Here are a few practice problems on the area of composite shapes:Find the area of a composite shape made of a square with side 4cm and a rectangle with length 6cm and width 3cm.Calculate the area of a composite shape consisting of two circles with radius 5cm each and a rectangle with length 8cm and width 2cm.Remember to break down the shapes, calculate the area of each, and then combine them!ConclusionWeve journeyed through the fascinating world of composite shapes, exploring how they are formed, their properties, and the formulas for their area. This concept of combining simple shapes to form more complex figures is an essential part of geometrical understanding. Here at Brighterly, we aim to make these complex concepts easy and fun for children, fostering a love for learning and an inquisitive mindset.Remember, like any other skill, practice makes perfect. Weve provided practice problems and we encourage learners to solve them and apply the knowledge theyve gained. Dont forget to check our other blog posts for more learning resources.Lets continue exploring the vast universe of knowledge together, transforming challenges into opportunities for learning and growth. At Brighterly, we make math brighter and learning a delightful experience.Frequently Asked Questions on Area of Composite ShapesWhat is a composite shape?A composite shape, in the most basic terms, is a geometric figure thats composed of two or more simple shapes. These could be squares, rectangles, triangles, circles, or any other simple shape. In real life, you can find composite shapes in architectural designs, layout of a park, or even the design of a piece of furniture. Its essentially seeing how smaller, basic shapes come together to create a more complex form.How do I calculate the area of a composite shape?Calculating the area of a composite shape involves a few steps. First, you need to break the composite shape down into its simple shapes. Look for squares, rectangles, circles, and triangles within the composite shape. Next, use the relevant formulas to calculate the area of each simple shape. For instance, the area of a square would be side length squared, and for a rectangle, it would be length times width. Once you have the area of each simple shape, you then add those areas together. That gives you the total area of the composite shape.Can composite shapes be made of any simple shapes?Absolutely! A composite shape can be made from any combination of simple shapes. It could be a combination of squares and circles, triangles and rectangles, or even a combination of all these shapes. This flexibility makes composite shapes incredibly versatile, and you can see a myriad of different composite shapes in real-life applications.Do composite shapes have a fixed formula for their area?Unlike simple shapes which have a fixed formula for their area, composite shapes do not have a one-size-fits-all formula. This is because a composite shape can be composed of any combination of simple shapes. Therefore, the formula for calculating the area of a composite shape depends on the simple shapes its composed of.Why is understanding composite shapes important?Understanding composite shapes is fundamental as it helps children visualize and understand how smaller units, the simple shapes, can come together to form larger structures. This understanding is not only crucial in mathematics but also in other subjects like Art and Design. Besides, its a critical skill in daily life. It aids in spatial awareness, problem-solving skills, and develops an understanding of the structures and patterns we see around us daily.Information Sources Poor Level Weak math proficiency can lead to academic struggles, limited college, and career options, and diminished self-confidence. Mediocre Level Weak math proficiency can lead to academic struggles, limited college, and career options, and diminished self-confidence. Needs Improvement Start practicing math regularly to avoid your child`s math scores dropping to C or even D. High Potential It's important to continue building math proficiency to make sure your child outperforms peers at school. Jo-ann Caballes 13 articles

What is the area of composite figure. What is the formula for area of composite shapes. Compound shapes area. Composite area.