Ratios

Model Answers

Question 1

The ratios of teachers : male students : female students in a school are 2 : 17 : 18. The total number of students is 665.

Find the number of teachers.

Answer:

First, we need to find the total ratio. The total ratio is 2 (teachers) + 17 (male students) + 18 (female students) = 37.

Next, we need to find the value of each ratio. Since the total number of students is 665, and the ratio of students (male and female) is 17 + 18 = 35, each ratio is equal to 665 / 35 = 19.

*Finally, we can find the number of teachers by multiplying the ratio of teachers (2) by the value of each ratio (19). So, the number of teachers is 2 * 19 = 38.*

Question 2

The scale on a map is 1 : 50000.
The area of a field on the map is 1.2 square centimetres.

Calculate the actual area of the field in square kilometres.

Answer:

*We convert the map area from square centimetres to square metres, because 1 square metre = 10000 square centimetres. So, 1.2 square centimetres = 1.2 / 10000 = 0.00012 square metres. Now, we can calculate the actual area using the area scale. The actual area = map area * scale = 0.00012 * 2500000000 = 300000 square metres.*

Finally, we convert the area from square metres to square kilometres, because 1 square kilometre = 1000000 square metres. So, the actual area = 300000 / 1000000 = 0.3 square kilometres.

Question 3

The volume of a child's model plane is 1200cm³.
The volume of the full size plane is 4050m³.

Find the scale of the model in the form 1:n.

Answer:

The scale of the model in terms of volume is the cube root of the ratio of the full size plane's volume to the model plane's volume. So, the scale is 1: cube root of (4,050,000,000 / 1200) The cube root of (4,050,000,000 / 1200) is approximately 160. So, the scale of the model is 1:160.

Question 4

A model of a ship is made to a scale of 1 : 200.
The surface area of the model is 7500 cm ².

Calculate the surface area of the ship, giving your answer in square metres.

Answer:

First, we need to understand that the scale of 1:200 means that every 1 cm on the model represents 200 cm (or 2 m) on the actual ship. However, when dealing with surface area, the scale factor is squared. This is because surface area is a two-dimensional measurement, involving both length and width. So, the scale factor for surface area is 200^2 = 40000.

*Therefore, the surface area of the actual ship is 7500 cm² * 40000 = 300000000 cm². Since 1 m² = 10000 cm², we need to convert the surface area from cm² to m². So, the surface area of the ship is 300000000 cm² / 10000 = 30000 m².*

Question 5

The scale of a map is 1 : 500000.

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

Answer:

*First, we need to convert the actual distance from kilometers to centimeters because the scale is given in centimeters. We know that 1 kilometer is equal to 100000 centimeters. So, 172 kilometers is equal to 172 * 100000 = 17200000 centimeters.*

Next, The scale tells us that 1 cm on the map represents 500000 cm in real life. So, to find the distance on the map, we divide the actual distance by the scale. So, the distance on the map is 17200000 cm / 500000 = 34.4 cm. Therefore, the distance between the towns on the map is 34.4 cm.

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

Answer:

If the area of the lake on the map is 12 cm^2, then the actual area of the lake is 12 * 25 = 300 km^2.

Question 6

A car company sells a scale model $\frac{1}{10}$ of the size of one of its cars

Complete the following table.

	Scale Model	Real Car
Area of windscreen (cm^2)	135	
Volume of storage space (cm^3)		408000

Answer:

13500

Question 7

A model of a car is made to a scale of 1 : 40.
The volume of the model is 45 cm³ .
Calculate the volume of the car.

Give your answer in m³ .

Answer:

First, we need to understand that when dealing with volume and scale, the scale factor is cubed. This is because volume is a three-dimensional measurement, involving length, width, and height. So, the scale factor for volume is 40³ = 64,000. Next, we multiply the volume of the model by the scale factor to find the volume of the actual car. 45 cm³ * 64,000 = 2,880,000 cm³

Finally, we need to convert this volume from cm³ to m³. There are 1,000,000 cm³ in a m³, so: 2,880,000 cm³ ÷ 1,000,000 = 2.88 m³ So, the volume of the car is 2.88 m³.

Question 8

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

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

Answer:

First, we need to understand that the ratio 5:4 means that for every 4 units in the original measurement, there are 5 units in the new measurement. So, to find the new measurements, we need to multiply the original measurements by the ratio 5/4. For the length of the screen:

44 cm * 5/4 = 55 cm For the width of the screen: 32 cm * 5/4 = 40 cm So, the measurements of the larger screen are 55 cm by 40 cm.

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

Answer:

We find the fraction of Model A's screen area to Model B's screen area by dividing the area of Model A by the area of Model B. This gives us 1408 cm^2 / 2200 cm^2 = 0.64 or 64/100, which simplifies to 16/25. So, the fraction of Model A's screen area to Model B's screen area in its simplest form is 16/25.

Question 9

A map is drawn to a scale of 1 : 1000 000.
A forest on the map has an area of 4.6cm².

Calculate the actual area of the forest in square kilometres.

Answer:

*The area on the map is 4.6 cm². Since 1 cm² on the map represents 10 km * 10 km = 100 km² in real life, the actual area of the forest is 4.6 cm² * 100 km²/cm² = 460 km². So, the actual area of the forest is 460 square kilometers.*

Question 10

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

(a) Calculate the amount Ralf receives.

Answer:

Each part is worth $19. Since Ralf gets 2 parts, we multiply $19 by 2 to find out how much he gets. $19 x 2 = $38. So, Ralf receives $38.

(b) Ralf gives $2 to Susie.

Answer:

*Ralf gets 2 parts which is 2*$19 = $38 and Susie gets 1 part which is $19. After Ralf gives $2 to Susie, Ralf will have $38-$2 = $36 and Susie will have $19+$2 = $21.*

Question 11

Pip and Ali share $785 in the ratio Pip :Ali = 4 : 1.
Work out Pip's share.

Answer:

We need to find out how much each part is worth. We do this by dividing the total amount of money ($785) by the total number of parts (5). So, each part is worth $785 ÷ 5 = $157.

Finally, we need to find out how much Pip gets. Since the ratio tells us that Pip gets 4 parts, we multiply the value of each part ($157) by the number of parts Pip gets (4). So, Pip gets $157 x 4 = $628.

Question 12

Ahmed and Babar share 240g of sweets in the ratio 7:3.
Calculate the amount Ahmed receives

Answer:

According to the ratio, Ahmed receives 7 parts. So, Ahmed receives 7 parts × 24g/part = 168g. So, Ahmed receives 168g of sweets.

Question 13

Ahmed, Batuk and Chand share $1000 in the ratio 8: 7 :5.
Calculate the amount each receives.

Answer:

First, we need to find the total parts in the ratio. This is done by adding all the numbers in the ratio. So, 8 + 7 + 5 = 20.

Next, we need to find the value of each part. This is done by dividing the total amount by the total number of parts. So, $1000 ÷ 20 = $50. This means each part is worth $50. Now, we can find out how much each person gets by multiplying the number of parts they have by the value of each part. Ahmed gets 8 parts, so he gets 8 x $50 = $400. Batuk gets 7 parts, so he gets 7 x $50 = $350. Chand gets 5 parts, so he gets 5 x $50 = $250. So, Ahmed gets $400, Batuk gets $350, and Chand gets $250.

Question 14

0 The diagram shows the plan, ABCD, of a park.
The scale is 1 centimetre represents 20 metres.
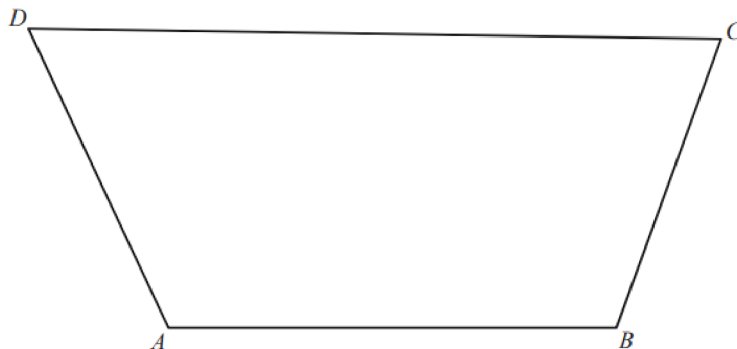
(a) Find the actual distance BC.

Answer:

102 to 106

Question 15

Hans draws a plan of a field using a scale of 1 centimetre to represent 15 metres.

The actual area of the field is 10800m2.

Calculate the area of the field on the plan

Answer:

First, we need to find the actual length and width of the field. Since the area of a rectangle is length times width, and we know the area is 10800m2, we can assume that the field is a square for simplicity. So, the square root of 10800m2 is 104m. This means the field is 104m by 104m.

Next, we need to convert these measurements to the scale on the plan. Using the scale of 1 centimetre to represent 15 metres, we divide 104m by 15 to get approximately 6.93cm. So, on the plan, the field is represented as a square that is 6.93cm by 6.93cm.

*Finally, to find the area of the field on the plan, we multiply the length by the width (6.93cm * 6.93cm), which gives us approximately 48.02cm2. So, the area of the field on the plan is approximately 48.02cm2*

Question 16

Pedro and Eva do their homework.

Pedro takes 84 minutes to do his homework.

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

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

Answer:

One part of the ratio equals 84 minutes divided by 7, which is 12 minutes. Since Eva's time is represented by 6 parts of the ratio, we multiply 12 minutes (one part) by 6 to find out how long Eva takes to do her homework. So, Eva takes 72 minutes to do her homework.

Question 17

Jamie needs 300 g of flour to make 20 cakes.

How much flour does he need to make 12 cakes?

Answer:

First, we need to find out how much flour is needed for one cake. We do this by dividing the total amount of flour by the total number of cakes. So, 300 g ÷ 20 = 15 g per cake. Then, we multiply the amount of flour needed for one cake by the number of cakes Jamie wants to make. So, 15 g x 12 = 180 g.

Therefore, Jamie needs 180 g of flour to make 12 cakes.

Question 18

Martha divides $240 between spending and saving in the ratio
spending :saving = 7:8.

Calculate the amount Martha has for spending

Answer:

First, we need to find the total parts in the ratio. The total parts are 7 (for spending) + 8 (for saving) = 15 parts.

Next, we need to find the value of each part. The value of each part is $240 (total amount) ÷ 15 (total parts) = $16.

Finally, we need to find the amount Martha has for spending. The amount for spending is 7 (parts for spending) × $16 (value of each part) = $112. So, Martha has $112 for spending.

Question 19

The scale on a map is 1: 20 000.

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

Answer:

If 2.7 cm on the map represents a certain distance in real life, we can find this distance by multiplying 2.7 cm by 20 000. This gives us 54 000 cm.

To convert this distance to kilometres, we divide by 100 000 (since there are 100 000 cm in a km). This gives us 0.54 km. So, the actual distance between the two points is 0.54 km.

(b) A field has an area of 64 400 m²
Calculate the area of the field on the map in cm² c

Answer:

The length of the field on the map is 254 m / 200 m/cm = 1.27 cm. Since the field is a square, its area on the map would be (1.27 cm)² = 1.6129 cm². So, the area of the field on the map is approximately 1.6129 cm².

Question 20

The scale of a map is 1 :250000

(a) The actual distance between two cities is 80 km.
Calculate this distance on the map. Give your answer in centimetres

Answer:

*First, we need to convert the actual distance from kilometers to centimeters because the map scale is given in centimeters. We know that 1 kilometer is equal to 100000 centimeters. So, 80 kilometers is equal to 80 * 100000 = 8000000 centimeters. The scale of the map is 1:250000. This means that 1 cm on the map represents 250000 cm in real life. So, to find out the distance between the two cities on the map, we need to divide the actual distance in centimeters by the scale of the map. So, 8000000 cm / 250000 = 32 cm.*

(b) On the map a large forest has an area of 6 cm².

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

Answer:

First, we need to understand that the scale of the map is 1 cm : 250000 cm. This means that 1 cm on the map represents 250000 cm in real life. Second, we need to convert the scale from cm to km because the question asks for the answer in square kilometres. We know that 1 km = 100000 cm. So, 250000 cm = 2.5 km.

*Therefore, the scale of the map is 1 cm : 2.5 km. Third, we need to calculate the actual area of the forest. The area on the map is 6 cm². Since the scale of the map is 1 cm : 2.5 km, the actual area of the forest is 6 cm² * (2.5 km)² = 6 * 6.25 km² = 37.5 km². So, the actual area of the forest is 37.5 square kilometres.*