About

MATHEMATICS
(YEARLY)

About Thinking Process

In solving mathematical problems, we always work backward. After indentifying our main target, we go 'backward' to look for the 'easier' targets until we are able to solve the problems.

Thinking process reveals how the teacher actually goes about solving a sum in the above-said manner.

About Teacher's Comments

It reveals the extra but relevant information which is not required as part of the solutions but are extremely useful in knowing how the solutions are arrived.

period	**2015 to 2024**
contents	**June & November,**
	Paper 1 & 2, Worked Solutions
form	**Year By Year**
compiled for	**O Level**
special features	**Thinking Process,**
	Teacher's Comments

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E-Mail:	info@redspot.com.pk
Website:	www.redspot.pk
Address:	P.O. Box 5041, Model Town, Lahore, Pakistan.

C O N T E N T S

Revised Syllabus

J u n e   2 0 2 4
——— PAGE 1 ———
——— PAPER 1 ———

⚡ *means " before that, do this ! "*

Answer **all** *questions.*

Calculators Must Not Be Used In This Paper.
You must show all necessary working clearly.

1   *Topic: 1*

Work out.
(a) Here are five temperatures in °C.
    4   1   –6   0   –2
Write these temperatures in order, starting with the lowest.   [1]
(b) Write these numbers in order of size, starting with the smallest.   [1]

$$0.45 \qquad \frac{3}{8} \qquad 40\%$$

Thinking Process

(a) Lowest temperature is –6 °C and highest is 4 °C.
(b) ⚡ Express the fractions as decimals

Solution

(a) $-6 \quad -2 \quad 0 \quad 1 \quad 4$ **Ans.**

(b) Writing the numbers in decimal form,

        0.45   0.375   0.40

∴ starting with the smallest, the numbers are,

   $\frac{3}{8}$ 40%   0.45 **Ans.**

2   *Topic: 11*

(a) Shade **one** more small square so the diagram has one line of symmetry.
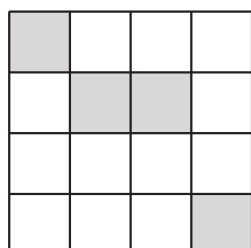
[1]

(b) Shade **one** more small square so the diagram has rotational symmetry of order 2.

[1]
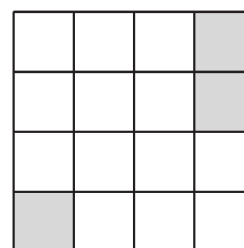
Thinking Process

(a) ⚡ Remember that line of symmetry is the axis of reflection.
(b) Understand the definition of rotational symmetry.

Solution

(a)

(b)

3   *Topic: 18*

Olga writes a list of five numbers.
The median of the numbers is 12.
The mode of the numbers is 11.
The range of the numbers is 10.
The sum of the numbers is 75.
Find the five numbers in Olga's list.   [3]

Thinking Process

Since there are 5 numbers, median 12 must be the 3rd number.

Mode 11 occurs more than once, thus 1st two digiits are 11.

Use the range to find the largest number, and then find the 4th number using the given sum of 75.

Solution

Median (mid-value) of numbers = 12

Mode of numbers = 11

So, the first three numbers are,

$$11, \quad 11, \quad 12$$

Range = Largest number − least number

$\Rightarrow \quad 10 = $ Largest number − 11

$\therefore \quad$ Largest number $= 10 + 11 = 21$

Therefore the five numbers could be,

$$11, \quad 11, \quad 12, \quad x, \quad 21$$

Given that, sum of five numbers = 75

$\Rightarrow \quad 11 + 11 + 12 + x + 21 = 75$

$$55 + x = 75$$

$$x = 75 - 55 = 20$$

$\therefore \quad$ The Five numbers are,

$$11, \quad 11, \quad 12, \quad 20, \quad 21$$

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4   *Topic: 1a*

(a) Convert 4 kilograms to grams.   [1]

(b) Convert 250cm^3 to litres.   [1]

Thinking Process

(a) Multiply by 1000.

(b) Note that, 1 litre = 1000 cm³.

Solution

(a) $1 \text{ kg} = 1000 \text{ g}$

    $4 \text{ kg} = 1000 \times 4$

         $= 4000 \text{ g.}$ **Ans.**

(b) $1000 \text{ cm}^3 = 1 \text{ litre}$

    $250 \text{ cm}^3 = \dfrac{1}{1000} \times 250$

           $= \dfrac{1}{4} = 0.25 \text{ litres.}$ **Ans.**

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5   *Topic: 10*

In this question all dimensions are given in centimetres.

(a)
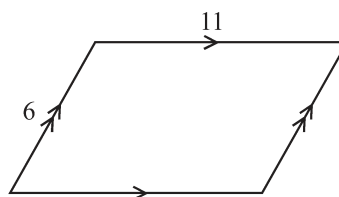
The diagram shows a parallelogram.
Find the perimeter of the parallelogram. [1]

(b)
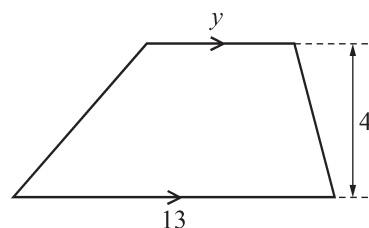
The diagram shows a trapezium.
The area of the trapezium is 36 cm².
Find the value of y.   [2]
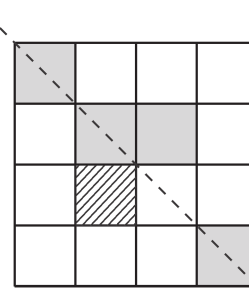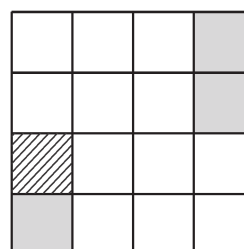
Thinking Process

(a) Add up all the sides to find the perimeter.

(b) To find y ✏ Apply formula for area of a trapezium

Solution

(a)   Perimeter $= 2(6 + 11)$

              $= 2(17) = 34 \text{ cm}$ **Ans.**

(b)   Area of trapezium $= \dfrac{1}{2} \times 4(13 + y)$

          $36 = 2(13 + y)$

      $13 + y = \dfrac{36}{2}$

      $13 + y = 18$

          $y = 18 - 13$

            $= 5 \text{ cm}$ **Ans.**

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6   *Topic: 1*

(a) Jack uses number cards to make a 2-digit number.

Complete the missing card to give a 2-digit number that is **not** a prime number.   [1]

(b) Mei says:

     When I add two multiples of 3, the answer is always a multiple of 6.

Give an example to show that Mei is wrong.   [1]

Thinking Process

(b) Add different multiples of 3 to check

Solution

(a) 2-digit number can be, 33 or 63 or 93   **Ans.**

(b) $3+6=9$ (not a multiple of 6)

$3+12=15$ (not a multiple of 6)

$6+9=15$ (not a multiple of 6)

From above examples, we see that

Mei is wrong.

7   *Topic: 1*

(a) Work out $\dfrac{2}{7} \div \dfrac{1}{3}$.   [1]

(b) Work out $\dfrac{5}{6} + \dfrac{3}{4}$.

Give your answer as a mixed number.   [2]

Thinking Process

(a) ✏ Rewrite as $\dfrac{2}{7} \times \dfrac{3}{1}$.

(b) ✏ Make common denominator.

Solution

(a) $\dfrac{2}{7} \div \dfrac{1}{3}$

$= \dfrac{2}{7} \times \dfrac{3}{1} = \dfrac{6}{7}$ **Ans.**

(b) $\dfrac{5}{6} + \dfrac{3}{4}$

$\dfrac{10+9}{12}$

$= \dfrac{19}{12} = 1\dfrac{7}{12}$ **Ans.**

8   *Topic: 1a*

(a) A train leaves station *A* at 07 43.

The train arrives at station *B* at 10 27.

Work out the time the train takes to travel from station *A* to station *B*.   [1]

(b) A bus leaves the bus station at 06 25.

It arrives at the airport at 07 05.

The distance from the bus station to the airport is 24 km.

Calculate the average speed of the bus for this journey.

Give your answer in km/h.   [3]

Thinking Process

(a) ✏ Write 10 27 as 09 87.

(b) Find the total time taken for the whole journey.

Apply, Average Speed $= \dfrac{\text{total distance}}{\text{total time}}$

Solution

(a) $10\ 27 - 07\ 43$

$= 09\ 87 - 07\ 43$

$= 02\ 44$

∴ Time taken from station *A* to *B*

$= 2$ hours 44 minutes   **Ans.**

(b) $07\ 05 - 06\ 25$

$= 06\ 65 - 06\ 25 = 00\ 40$

∴ Time taken from bus station to airport

$= 40$ minutes

$= \dfrac{40}{60}$ hours

$= \dfrac{2}{3}$ hours

Average speed $= \dfrac{\text{total distance}}{\text{total time}}$

$= \dfrac{24}{\frac{2}{3}}$

$= 24 \times \dfrac{3}{2} = 36$ km/h   **Ans.**

9   *Topic: 5*

There are red pens, blue pens and black pens in a box.

There are *x* red pens.

The number of blue pens is 5 more than the number of red pens.

The number of black pens is 2 times the number of blue pens.

(a) Write an expression, in terms of *x*, for the total number of pens in the box.

Give your expression in its simplest form.

   [2]

(b) The total number of pens in the box is 27.

Find the number of red pens in the box.

   [2]

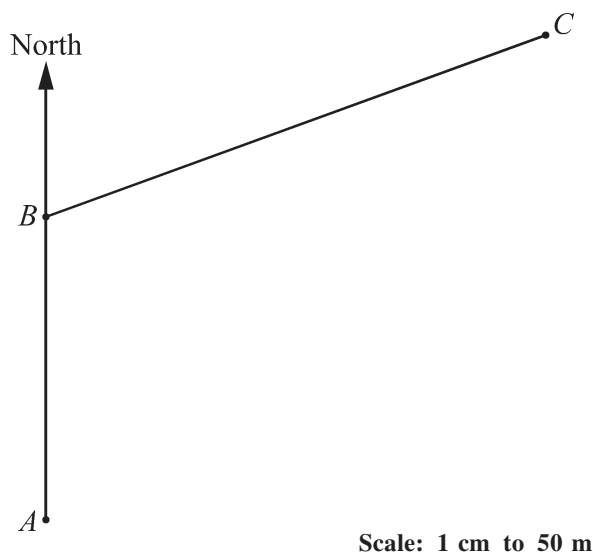### Thinking Process

(b) Equate the expression of part (a) to 27.

Solution

(a) Number of red pens $= x$

Number of blue pens $= x+5$

Number of black pens $= 2(x+5)$

∴   Total number of pens $= x+x+5+2(x+5)$

$= 2x+5+2x+10$

$= 4x+15$ **Ans.**

(b) Using the result of part (a),

$$4x + 15 = 27$$
$$\Rightarrow \quad 4x = 27 - 15$$
$$\Rightarrow \quad 4x = 12 \quad \Rightarrow \quad x = 3$$
$$\therefore \quad \text{Number of red pens} = 3 \quad \textbf{Ans.}$$

10 *Topic: 12*

The scale drawing shows part of a field, *ABCD*.
The scale is 1 cm to 50 m.

Scale: 1 cm to 50 m

(a) Measure the bearing of *C* from *B*.   [1]

(b) *D* is 250 m from *C* and 300 m from *A*.
Use a ruler and compasses only to complete the scale drawing of the field *ABCD*.   [2]

(c) There is a path across the field.
The path is equidistant from *AB* and *BC*.
Use a straight edge and compasses only to construct the path.   [2]

Thinking Process

(a) To find the bearing ✎ use a protractor to measure the acute angle at *B*,

(b) Using the given scale, convert the distances *CD* and *AD* into cm. Then using these measurements draw two arcs with centre at *A* & at *C* to locate *D*.

(c) Construct angle bisector of angle *ABC*.

Solution

(a) Bearing of *C* from *B* = 070°   **Ans.**

(b) $\quad$ 50 m $\quad$—$\quad$ 1 cm

$$1\text{ m} \quad — \quad \frac{1}{50}\text{ cm}$$
$$250\text{ m} \quad — \quad \frac{1}{50} \times 250 = 5\text{ cm}$$
$$300\text{ m} \quad — \quad \frac{1}{50} \times 300 = 6\text{ cm}$$
$$\therefore \quad CD = 5\text{ cm}, \quad AD = 6\text{ cm}$$
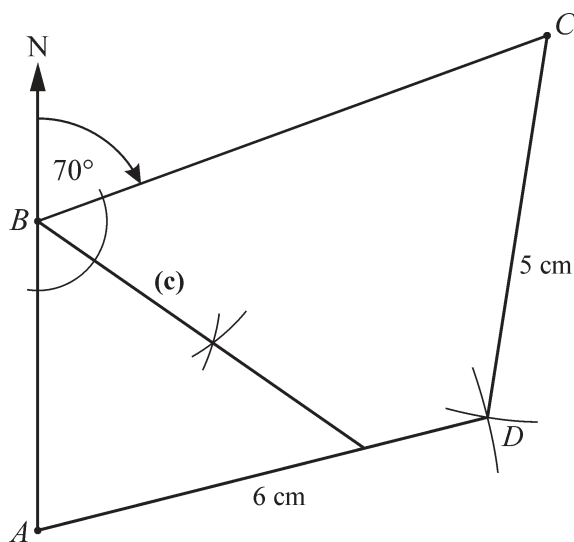
(c) Refer to diagram.

11 *Topic: 1*

By writing each number correct to 1 significant figure, estimate the value of

$$\frac{5.32 + 3.97}{\sqrt{878}}.$$ [2]

Thinking Process

Round off each number to one significant figure and simplify.

Solution

$$\frac{5.32 + 3.97}{\sqrt{878}}$$
$$= \frac{5 + 4}{\sqrt{900}}$$
$$= \frac{9}{30} = \frac{3}{10} \quad \textbf{Ans.}$$

12 *Topic: 5*

(a) $a = 5b + 7$
Find the value of *a* when $b = -2$.   [1]

(b) $c = 4d - 9$
Rearrange the formula to make *d* the subject.   [2]

Thinking Process

(a) To find a ✏ substitute the value of b into the given equation.

(b) Express d in terms of c.

Solution

(a) $a = 5b + 7$

    $\Rightarrow \ a = 5(-2) + 7$

          $= -10 + 7 = -3$ **Ans.**

(b) $c = 4d - 9$

    $\Rightarrow \ 4d = c + 9$

    $\Rightarrow \ d = \dfrac{c+9}{4}$ **Ans.**

13 *Topic: 15*

Kamal records the number of phone calls he receives at work each day for 20 days.
The results are shown in the table.

Number of phone calls	0 to 5	6 to 10	11 to 15	16 or more
Frequency	9	5	4	2

(a) Find the relative frequency of Kamal receiving 0 to 5 phone calls at work in one day.   [1]

(b) Kamal works for 160 days.
Find the number of these days Kamal would expect to receive 11 or more phone calls at work.   [2]

Thinking Process

(a) Divide 9 by the total frequency.

(b) Find the relative frequency of receiving 11 or more calls. then multiply it by 160.

Solution

(a)   Relative frequency $= \dfrac{9}{20}$ **Ans.**

(b)   Relative frequency receiving 11 or more

     calls $= \dfrac{4+2}{20} = \dfrac{6}{20}$

    $\therefore$ Number of days Kamal expects to receive

     11 or more calls $= \dfrac{6}{20} \times 160 = 48$ **Ans.**

14 *Topic: 2*

(a) Write $42\,000\,000$ in standard form.   [1]

(b) Evaluate $\left(1.3 \times 10^{-4}\right) + \left(7.4 \times 10^{-3}\right)$.

    Give your answer in standard form.   [2]

Thinking Process

(a) ✏ Standard form is $A \times 10^n$, where $1 \le A < 10$.

(c) ✏ Add by taking out common factor 10^{-3}.

Solution

(a) $42\,000\,000 = 4.2 \times 10^7$ **Ans.**

(b) $\left(1.3 \times 10^{-4}\right) + \left(7.4 \times 10^{-3}\right)$

    $= \left(1.3 \times 10^{-3} \times 10^{-1}\right) + \left(7.4 \times 10^{-3}\right)$

    $= \left(1.3 \times \dfrac{1}{10} + 7.4\right) \times 10^{-3}$

    $= (0.13 + 7.4) \times 10^{-3}$

    $= 7.53 \times 10^{-3}$ **Ans.**

15 *Topic: 9*
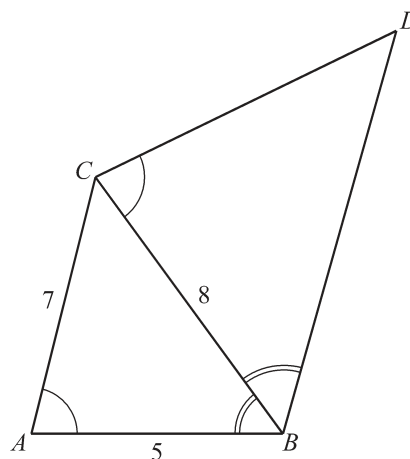
Triangle ABC is mathematically similar to triangle CBD.
$AB = 5$cm, $AC = 7$cm and $BC = 8$cm.
Calculate BD.   [2]

Thinking Process

Apply rule of similarity to find BD.

Solution

    $\dfrac{BD}{BC} = \dfrac{CB}{AB}$

    $\Rightarrow \ \dfrac{BD}{8} = \dfrac{8}{5}$

    $\Rightarrow \ BD = \dfrac{8}{5} \times 8$

    $\Rightarrow \ BD = \dfrac{64}{5} = 12.8$ cm   **Ans.**

November   2   0   2   4
_____ **PAPER 2** _____

⚡ *means " before that, do this ! "*

Total [100 marks]

*Answer **all** questions.*

1 *Topic: 1a*

(a) These are the contents of a bag of mixed fruit.

Pineapple	96 g
Mango	84 g
Papaya	60 g

Calculate the mass of mango as a percentage of the total mass of the mixed fruit. [2]

(b) Tom makes a drink by mixing juice and water in the ratio 3 : 7.
He makes 1.4 litres of this drink.
Calculate the amount of juice Tom uses.
Give your answer in millilitres. [2]

(c) The cost of a fruit drink is directly proportional to the amount of juice it contains.
A fruit drink containing 125 ml of juice costs $1.50.
Calculate the cost of a fruit drink containing 175 ml of juice. [2]

(d) Kofi has a bag containing nuts and raisins.
There are 285 g of raisins in the bag.
The remaining 62% of the mass in the bag is nuts.
Calculate the mass of nuts in the bag. [2]

(e) The mass of mixed nuts and seeds in a bag is 500 g, correct to the nearest 10 g.
The mass of nuts in the bag is 350 g, correct to the nearest 5 g.
Calculate the upper bound and the lower bound of the mass of seeds in the bag. [3]

Thinking Process

(a) ⚡ Find the total mass of mixed fruit.
(b) To find amount of juice ⚡ find the total number of parts of the drink.
(c) Using ratio concepts, find the cost of drink.
(d) 285 g is equivalent to 38%. Hence find 62% of the mass.
(e) To find the upper bound of mass, increase the mass of bag by 5 g and decrease the mass of nuts by 2.5 g.

To find the lower bound of mass, decrease the mass of bag by 5 g and increase the mass of nuts by 2.5 g.

Solution

(a) Total mass of mixed fruit $= 96 + 84 + 60$
$$= 240 \text{ g}$$
$\therefore$ Percentage of mass of mango $= \dfrac{84}{240} \times 100$
$$= 35\% \quad \textbf{Ans.}$$

(b) Sum of ratio $= 3 + 7 = 10$
$\therefore$ Amount of juice used $= \dfrac{3}{10} \times 1.4$
$$= 0.42 \text{ litres}$$
$$= 0.42 \times 1000$$
$$= 420 \text{ ml} \quad \textbf{Ans.}$$

(c) 125 ml of juice costs $= \$1.50$
175 ml of juice costs $= \dfrac{\$1.50}{125} \times 175$
$$= \$2.10 \quad \textbf{Ans.}$$

(d) $100\% - 62\% = 38\%$
285 g of raisins is equivalent to 38% of the mass of the bag

38 % —— 285 g

62% —— $\dfrac{285}{38} \times 62 = 465$

$\therefore$ Mass of nuts in the bag $= 465$ g **Ans.**

(e) Upper bound of mass of mixed nuts
and seeds $= 500 + 5 = 505$ g
Upper bound of mass of nuts $= 350 + 2.5$
$$= 352.5 \text{ g}$$
Lower bound of mass of mixed nuts
and seeds $= 500 - 5 = 495$ g
Lower bound of mass of nuts $= 350 - 2.5$
$$= 347.5 \text{ g}$$

$\therefore$ Upper bound of the mass of seeds
= Upper bound of mass of mixed nuts and seeds − lower bound of mass of nuts
$= 505 - 347.5 = 157.5$ g **Ans.**

Lower bound of the mass of seeds
= Lower bound of mass of mixed nuts and seeds − upper bound of mass of nuts
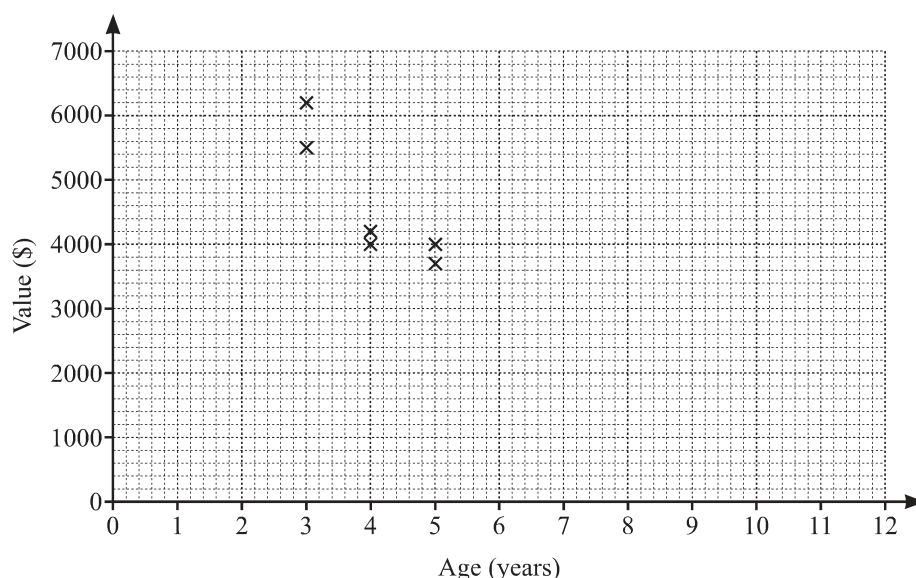$= 495 - 352.5 = 142.5$ g **Ans.**

2 *Topic: 18*

(a) The table shows the age and value of 10 cars of the same model.

Age (years)	3	3	4	4	5	5	5	6	8	8
Value ($)	5500	6200	4200	4000	4000	3700	4500	3000	1500	2000

(i) Complete the scatter diagram.
The first 6 points have been plotted for you. [2]

(ii) Draw a line of best fit. [1]

(iii) Use your line of best fit to find an estimate for the value of a car of this model that is 7 years old. [1]

(iv) Jay has a car of this model that is 12 years old and he wants to find its value.
Explain why Jay should not use this scatter diagram to find an estimate for the value of this car. [1]

(b) Jay records the distances travelled by 50 cars. The frequency table shows the results.

Distance (d thousand km)	$10 < d \leq 40$	$40 < d \leq 50$	$50 < d \leq 60$	$60 < d \leq 100$
Frequency	8	14	11	17

(i) Work out the fraction of the cars that have travelled more than 50 000 km.
Give your answer in its simplest form. [1]

(ii) Find the interval that contains the median. [1]

(iii) Calculate an estimate of the mean distance travelled. [3]

Thinking Process
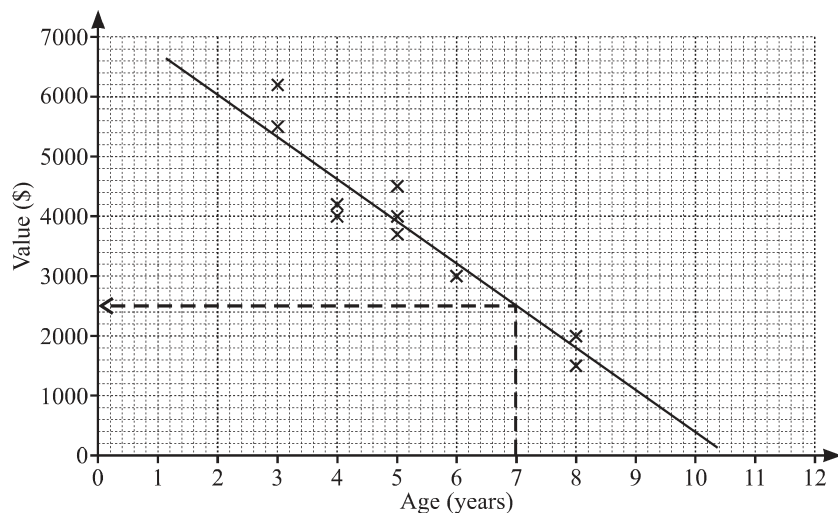
(a) (iii) From graph, find the value of the car that corresponds to 7 years.

(iv) Note that the line of best fit does not extend to 12 years.

(b) (i) From the table, express the number of cars that travel more than 50000 km as a fraction of total cars.

(ii) 🔑 Look for the class interval that contains the middle value.

(iii) To find the mean 🔑 compute the mid-point of each interval.

Solution

(a) (i) & (ii)

(iii) From graph, the value of

a 7 years old car = $2500.   **Ans.**

(iv) The line of best fit does not go as far as 12 years since 12 is outside range of data

Alternatively:

The line of best fit will show a negative value for a 12 year old car which is not possible

(b) (i)   Required fraction $= \dfrac{11+17}{50}$

$= \dfrac{28}{50} = \dfrac{14}{25}$.   **Ans.**

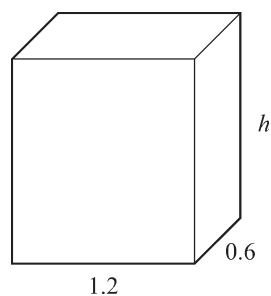**(ii)**   Median lies in the interval $50 < d \le 60$ **Ans.**

(iii)

Distance (*d* thousand km)	$10 < d \le 40$	$40 < d \le 50$	$50 < d \le 60$	$60 < d \le 100$
Mid-value	25	45	55	80
Frequency	8	14	11	17

Mean $= \dfrac{(8 \times 25) + (14 \times 45) + (11 \times 55) + (17 \times 80)}{50}$

$= \dfrac{200 + 630 + 605 + 1360}{50}$

$= \dfrac{2795}{50} = 55.9$ thousand km.   **Ans.**

3 *Topic: 10*

(a)

The diagram shows a tank.
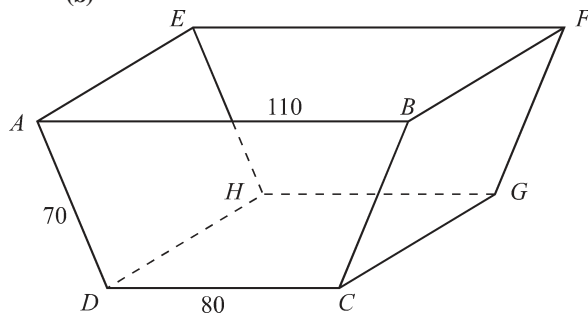The tank is a cuboid with length 1.2 m, width 0.6 m and height *h* m.
The volume of the tank is 1.8 m³.

(i) Calculate the value of *h*.   [2]

(ii) Fuel is pumped into the empty tank at a rate of 0.2 m³ per minute. Calculate the time taken to fill the tank to 90% of its volume. Give your answer in minutes and seconds.   [3]

(b)

The diagram shows a tank with an open top.

The tank is a prism with trapezium *ABCD* as its cross-section.
$AD = BC = 70$ cm, $CD = 80$ cm and $AB = 110$ cm.
The base of the tank is a square.
Calculate the total surface area of the outside of the tank.   [5]

Thinking Process

(a) (i) To find the height ✍ equate the formula for volume of cuboid to 1.8.
   (ii) Find 90% of 1.8 m³ then divide by 0.2 m³ to find the time taken
(b) Total surface area = area of 2 trapeziums + area of 2 rectangles + area of square base.

Solution

(a) (i) Volume of cuboid $= 1.8$ m³

$\Rightarrow 1.2 \times 0.6 \times h = 1.8$

$\Rightarrow 0.72\,h = 1.8$

$\Rightarrow h = \dfrac{1.8}{0.72} \Rightarrow h = 2.5$ m   **Ans.**

(ii) 90% of 1.8 m³

$= \dfrac{90}{100} \times 1.8 = 1.62$ m³

Time taken to pump 0.2 m³ $= 1$ minute

Time taken to pump 1.62 m³ $= \dfrac{1}{0.2} \times 1.62$

$\qquad\qquad = 8.1$ minutes

$\qquad\qquad = 8$ min 6 s **Ans.**

(b)
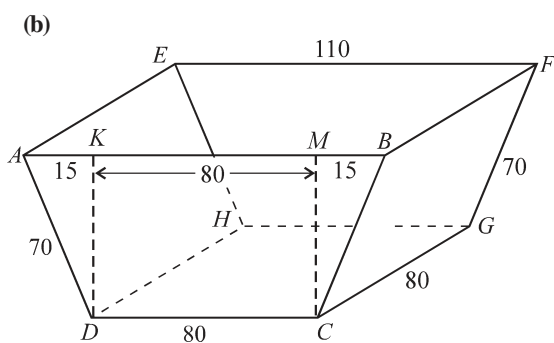
$AK + 80 + MB = 110$

$\Rightarrow 2AK + 80 = 110$ (as $AK = MB$)

$\Rightarrow 2AK = 30 \Rightarrow AK = \dfrac{30}{2} = 15$ cm

Using Pythagoras theorem on ΔADK,

$DK = \sqrt{70^2 - 15^2}$

$\quad = \sqrt{4675} = 68.37$ cm

$\therefore$ height of trapezium $= 68.37$ cm

Now,

Total surface area = 2(area of trapezium)
$\qquad\qquad\qquad$ + 2(area of rectangle)
$\qquad\qquad\qquad\qquad$ + area of base

$= 2\left(\dfrac{1}{2} \times 68.37(80 + 110)\right) + 2(80 \times 70) + (80 \times 80)$

$= 12990.3 + 11200 + 6400$

$= 30590.3 \approx 30600$ cm²   **Ans.**

4   *Topic: 1a*

(a) Anya buys 4 shirts and 3 hats.
She pays $100 and receives $21.50 in change.
Each shirt costs the same amount.
Each hat costs $13.50.
Work out the cost of one shirt.   [3]

(b) The exchange rate between dollars ($) and euros (€) is $1 = €0.91.
Anya buys a new camera for $150.
She sees the same camera for sale online for €140.
Calculate the difference between the price in dollars and the price in euros.
Give your answer in dollars, correct to the nearest cent.   [2]

(c) Anya invests $600 in a savings account.
The account pays compound interest at a rate of r % per year.
At the end of 3 years the total interest is $21.86.
Calculate the value of r.   [3]

Thinking Process

(a) Find the total cost of 4 shirts and 3 hats, then form an equation and solve it to find the cost of one shirt
(b) Divide €140 by 0.91 to find €140 worth of dollars, then find the difference between prices.
(c) Find the total amount Anya has after 3 years, then apply formula, $A = P\left(1 + \dfrac{r}{100}\right)^n$.

Solution

(a) Total cost of 4 shirts and 3 hats $= \$100 - \$21.50$

$\qquad\qquad\qquad\qquad\qquad\qquad = \$78.50$

Let s be the cost of one shirt

$\therefore 4s + 3(13.50) = 78.50$

$\Rightarrow 4s + 40.50 = 78.50$

$\Rightarrow 4s = 78.50 - 40.50$

$\Rightarrow 4s = 38 \Rightarrow s = \dfrac{38}{4} = 9.50$

$\therefore$ Cost of one shirt $= \$9.50$ **Ans.**

(b) €0.91 = \$1

$$€140 = \$\left(\frac{1}{0.91}\times 140\right) = \$153.85$$

∴ Price of online camera = \$153.85

Difference between prices = \$153.85 − \$150

= \$3.85 **Ans.**

(c) Amount of money Anya has after 3 years

= \$600 + \$21.86 = \$621.86

We have, $P = \$600$, $A = \$621.86$, $n = 5$

Using, $A = P\left(1 + \frac{r}{100}\right)^n$

$$\Rightarrow 621.86 = 600\left(1 + \frac{r}{100}\right)^3$$

$$\Rightarrow \left(1 + \frac{r}{100}\right)^3 = \frac{621.86}{600}$$

$$\Rightarrow 1 + \frac{r}{100} = \sqrt[3]{\frac{621.86}{600}}$$

$$\Rightarrow \frac{r}{100} = \sqrt[3]{\frac{621.86}{600}} - 1$$

$$\Rightarrow \frac{r}{100} = 0.011999$$

$$\Rightarrow r = 0.011999 \times 100$$

$$\Rightarrow r = 1.1999 \Rightarrow r = 1.2 \quad \textbf{Ans.}$$

5 *Topic: 15*

| 1 | 1 | 2 | 2 | 2 |

| 5 | 6 | 7 | 8 |

Mandeep has these 9 number cards.

(a) She takes one of the 9 cards at random, notes the number and replaces it.
Find the probability that the card shows an odd number. [1]

(b) Mandeep takes one of the 9 cards at random, notes the number and replaces it.
She then takes a second card at random.
Find the probability that both cards show the number 1. [2]

(c) Mandeep takes two of the 9 cards at random without replacement.
She calculates the product of the two numbers shown.
Find the probability that the product is less than 5. [3]

Thinking Process

(a) To find the probability ✐ count the number of cards that contain an odd number.

(b) Find $P(1) \times P(1)$.

(c) Find $P(1, 1) + P(1, 2) + P(2, 1) + P(2, 2)$

Solution

(a) Possible outcomes are, 1, 1, 5, 7

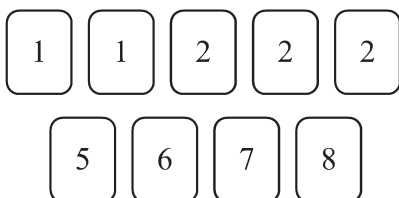$$P(\text{card shows an odd number}) = \frac{4}{9} \quad \textbf{Ans.}$$

(b) $$P(\text{both cards show the number 1}) = \frac{2}{9} \times \frac{2}{9}$$

$$= \frac{4}{81} \quad \textbf{Ans.}$$

(c) Possible outcomes are,

(1×1), (1×2), (2×1), (2×2)

∴ $P(\text{product less than 5})$

$= P(1, 1) + P(1, 2) + P(2, 1) + P(2, 2)$

$$= \left(\frac{2}{9}\times\frac{1}{8}\right) + \left(\frac{2}{9}\times\frac{3}{8}\right) + \left(\frac{3}{9}\times\frac{2}{8}\right) + \left(\frac{3}{9}\times\frac{2}{8}\right)$$

$$= \frac{2}{72} + \frac{6}{72} + \frac{6}{72} + \frac{6}{72}$$

$$= \frac{20}{72} = \frac{5}{18} \quad \textbf{Ans.}$$

6 *Topic: 7*

(a) Complete the table for $y = \frac{x}{4}(2x^2 - x - 10)$.

x	−3	−2	−1	0	1	2	3
y		0	1.75	0	−2.25	−2	3.75

[1]

(b) On next page, draw the graph of

$y = \frac{x}{4}(2x^2 - x - 10)$ for $-3 \leq x \leq 3$. [3]

(c) The equation $\frac{x}{4}(2x^2 - x - 10) = k$ has exactly two solutions.
Use your graph to find the possible values of k. [2]

(d) By drawing a suitable line on the grid, find the solutions of $2x^3 - x^2 - 10x = 2x - 4$. [4]